UAF Aeronautics Club

Aerodynamics

This club has almost exclusively built aircraft with rectangular-shaped fuselages with high-mounted wings due to their ease of manufacturing. However the fuselage shape has undoubtedly created increased drag and we are uncertain how wing position affects stability, thus the question we're trying to answer this year is is "by how much?" To answer this question, we will conduct two experiments: one varying the fuselage shape and one changing the wing height.

Fuselage Shape: Round fuselage vs. square fuselage and their effects on flight.

Wing placement: High vs. low wing placements and their effects on aerodynamic performance and stability.

Pilot Training

Trained pilots are something the club has been lacking and we've finally started addressing this issue by encouraging all members to practice on our RC flight simulator. Additionally, we've invested in a new laptop to provide a more realistic experience to our prospective pilots. Additional investments this year include

- Latest version of the RealFlight RC flight simulator
- Foam board RC plane kits for enhanced understanding of how the planes work without having to design one from scratch
- Larger trainer planes to provide an easy, stable platform to train on

These resources combine to provide an excellent opportunity to learn not only how these aircraft work, but how to fly them as well. The hope here is that training pilots on stable, professionally-designed aircraft is a much better starting point than the aircraft we typically build for competition, which are often barely stable in flight due to all of the design constraints we have to accommodate.

Data Analysis

Data collection and aerodynamic analysis are two things we would like to focus on in the future to improve preliminary aircraft design and aircraft redesign after flight tests.

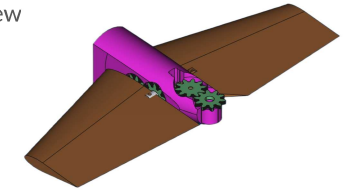
We have utilized two main pieces of equipment for aerodynamic analysis:

- A flight data logger to relay and record aircraft data from each flight. This allows us to gauge how well the aircraft responds to control inputs.
- A thrust analysis station allows us to take quantitative data on how much thrust certain propellers generate when paired with certain motors.

This data collection experiment will also help quantify the data from the aerodynamics experiments, as we will be able to get real data on things such as drag and stability. All of these things will help inform our future design decisions on things such as how many motors we have, what size propellers we use, and how big to make the control surfaces.

Design and Manufacturing

We experimented with new design and manufacturing methods for our aircraft both to reduce weight and to allow more complex geometries and mechanisms that would be otherwise unachievable with previous methods. These new methods include:



- Using gears for rear control surfaces
- Foam board wings instead of balsa wood
- 3D printing major components
- Using screws instead of glue for most applications
- Central carbon fiber skeleton

This experiment proved, among other things, that 3D printing is a viable manufacturing method for future aircraft. In addition to the lightweight design of our 3D parts, we have also purchased light-weight PLA filament, which will further reduce the components' weight and will allow us to further explore the capabilities of additive manufacturing in RC aeronautics.