SWIFT UAV – Scientific Workhorse for In-Flight Testing

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Project Objectives and Goals

- Democratize aerial scientific research by developing an affordable, easy to manufacture, open-source, heavy-lift, fixed-wing UAV.
- Design an open-source UAV to be used as an affordable, standardized aeronautical test bed.
- The proposed UAV puts accessibility at the forefront of design with its 3D printed fuselage and its off the shelf avionics.

Background

Fixed wing UAVs are incredibly valuable for countless scientific applications due to their ability to fly long durations over long areas with a diverse set of sensor packages

Fixed Wing UAVs are commonly used in fields such as:

- Environmental monitoring
- Agriculture
- Surveying
- Weather and climate research

Though invaluable, Fixed wing UAVs are generally limited by their carrying capacity and by their often-prohibitive cost. **There is a clear need for an affordable open-source alternative to current solutions**.

Experimental Setup

A fixed wing UAV was designed with the following primary criteria:

- 5 kg Payload
- 1 hr Endurance
- Short take-off and landing

A combination of empirical and classical analytical approaches were used to drive key engineering decisions such as wing geometry, airfoil geometry, motor sizing, etc.

Data and Results

A preliminary design has been constructed to test the design structurally. The avionics and power systems have also been tested and confirmed working.

While still frequently changing the key specs are as follows:

- 13 Ah battery capacity
- 2.6 m Wingspan
- 10kg Empty take-off weight

Figure 1: A rendering of version 2.3 of the SWIFT UAV

Figure 2: "Iron Bird" test bed for the SWIFT UAV

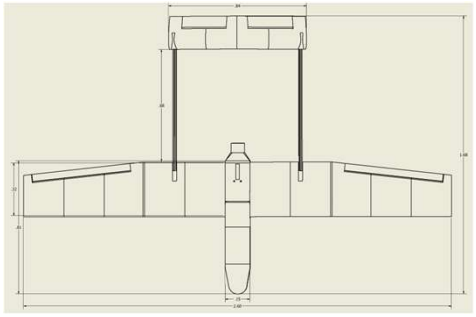

Figure 3: Top-down drawing of the SWIFT UAV

Figure 4: SWIFT UAV flat packed for transportation

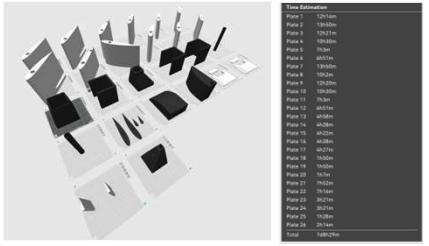

Figure 5: SWIFT UAV sliced for 3D printing

References

ARTS-Lab. 2025. "SWIFT-UAV: Scientific Workhorse for In-flight Field Tests – UAV," GitHub. https://github.com/ARTS-Laboratory/SWIFT-UAV

Future Studies

Future work will focus on improvements in several areas:

- Improved design for manufacturability
- Aerodynamic optimization of wing and fuselage
- Structural optimizations to the wing and tail
- Implementation of structural batteries to substantially reduce weight

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Publications

None yet, but check the SWIFT- UAV GitHub