ESRA 30K ROCKETRY TEAM PAYLOAD

The ESRA team intends to design, manufacture, and compete with a solid-fuel rocket that will reach 30,000 feet. The payload sub-team serves to design and manufacture a scientific payload to compete in the SDL Payload Challenge.

Project Summary

The Payload subteam designs and manufactures the experiment and testing equipment for the experimental rocket mission.

The Experiment

- Test on the effectiveness of shear thickening fluid (STF) as a damping material during flight
- Investigated quantitatively and qualitatively
- 3-axis accelerometers record G forces felt in different materials
- Zebrafish embryos provide qualitative observation of hatching rates and survivability
- Zebrafish chosen for scientific relevance as a common lab animal

The Setup

- T6061 aluminum frame designed and manufactured in-house
- Conforms to 3U CubeSat layout (30cm x 10cm x 10cm)
- Two experiment bays for STF and foam control samples
- Electronics and zero-damping control sample in central bay

Figure 1: Assembled payload shell

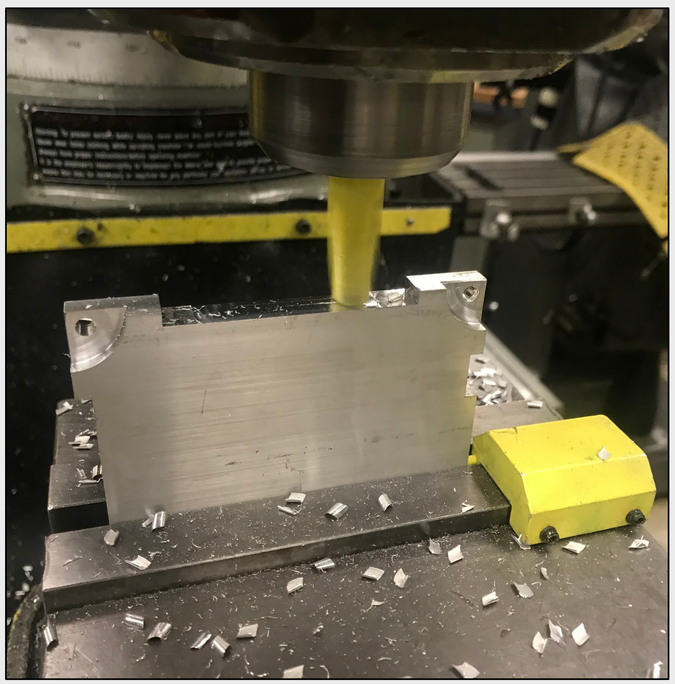

Figure 2: Machining features on end cap of payload frame

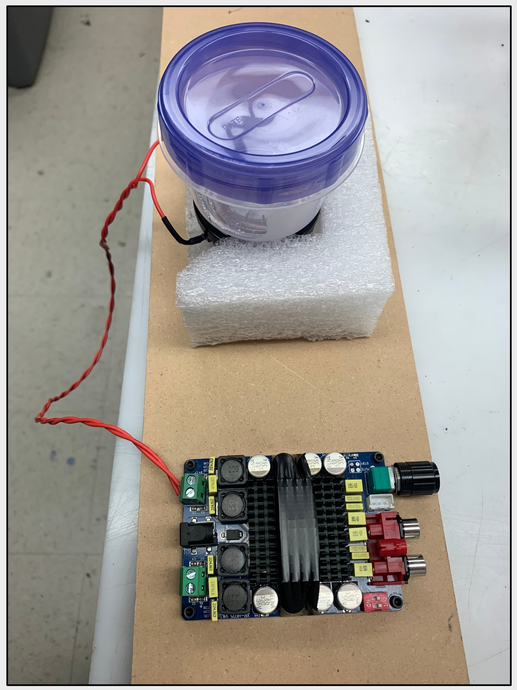

Figure 3: STF audio exciter testing fixture

MANUFACTURING:

All components of the frame were manufactured in-house by payload subteam members.

Manufacturing methods that were utilized include turning, milling, tapping, 3-D printing and waterjet cutting.

The data logging system was made from purchased components then soldered together and mounted in-house.

TESTING:

The frame was dropped from 14 feet to simulate a maximum descent velocity of 30 ft/s, as specified by competition rules.

Vibration data was collected from static motor fires and used to generate frequency patterns.

Various STFs were tested with these patterns to characterize optimal mixtures for controlling high amplitude frequencies found in testing.

Data logging system tested at 14 hours of continuous logging to account for flight delays.

TEAM MEMBERS
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PROJECT SPONSOR
OSU American Institute of Aeronautics and Astronautics (AIAA)

PROJECT STATUS

- All components have been manufactured and assembled
- Accelerometer recording system tested at a launch in Brothers, OR.
- Observe zebrafish development for any variation from control samples
- Anodizing and etching the frame in preparation for SDL judging

Figure 4: CAD payload design

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