Design and Manufacture of an Open-Hardware University Rocket Airframe using Carbon Fiber

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The amateur and university rocketry communities are rapidly reaching higher altitudes with more sophisticated rockets. However, most groups are still using heavy airframes made of metal or fiberglass. Commercial off-the-shelf airframes are either too expensive for low-budget university groups or too small to use as a platform for high altitude experiments. A capstone team of mechanical engineering seniors at Portland State University is developing a low-weight, modular carbon fiber airframe as an open-hardware technology for university rocketry. This will enable low-budget groups like the Portland State Aerospace Society to explore high altitude science and compete in the university space race.

I. Introduction

The Portland State Aerospace Society is an interdisciplinary group of engineering students and alumni of Portland State University with the long term goal of putting a cubesat into orbit with their own rocket. Their current airframe, named LV2, has served for over 12 years and hosted experiments ranging from custom patch antennas and long range WiFi technology to GPS navigation and a cold gas reaction controll system. The LV2 platform is mostly constructed of aluminum with a fiberglass shell, with many of the parts having been fabricated in home garages. This makes for a robust but heavy design. Additionally, this airframe is built with a 4.5 inch inner diameter which PSAS's experiments have outgrown.

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II. Significance

III. Plan of Work

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