

# Fabrication of Rocket and Payload Bay Area

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## Abstract

Rocket design, specifications, and payloads are being constructed at the Payload Applied Technology Operations (PATO) lab using state-of-the-art materials, manufacturing and 3D printing techniques. The rocket will be used as a platform to launch and test different payloads. By using ANSYS static structural analysis, the preliminary results simulate the maximum acceleration loads that the payload will experience during the main parachute deployment. Through this analysis, the resulting maximum acceleration load the payload would experience was determined to be  $310 \text{ m/s}^2$  ( $12,174 \text{ in/s}^2$ ). The design for the coupler tubes and nose cone have been finalized and are ready to be fabricated as represented in Figure 3 and Figure 4.

## Objectives

1. Utilize state-of-the-art materials, software and techniques for design, development and fabrication as shown in Figure 1 and Figure 2
2. The design and fabrication of the payload bay area was optimized to have four TubeSats and two Nanolabs
3. Build, test and investigate payload for desirable results and safety compliance



Figure 1: Sanding of motor tube

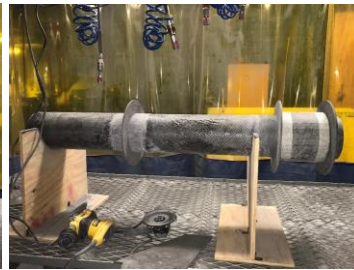


Figure 2: Centering rings placement

## Construction

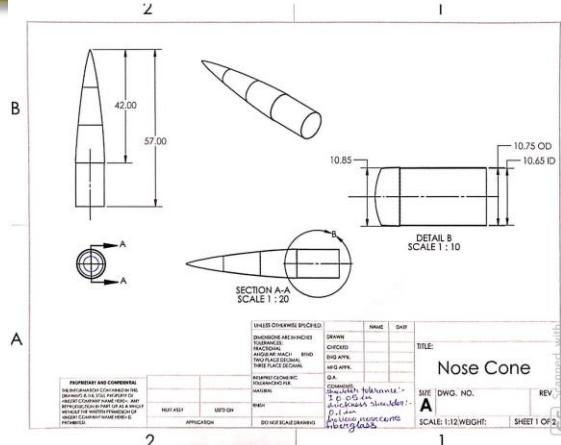


Figure 3: Nose cone design

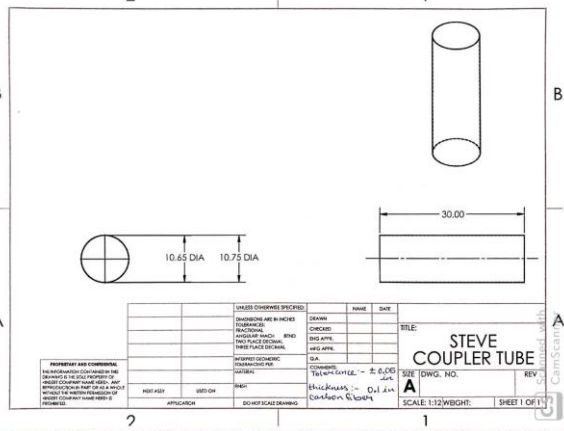
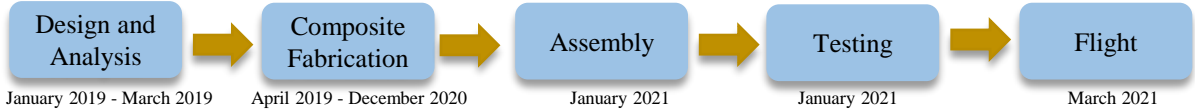


Figure 4: Coupler tube design

## Methodology

1. CAD design with CATIA for specifications of the nose cone, motor tube, and payload bay area
2. 3D Printing and CNC machining for fabrication for payload
3. Custom avionics identification and assembly
4. Rocket fin analysis using AeroFinSim software
5. Preparation of operating procedures and checklists
6. ANSYS software used for structural analysis for payload as shown in Figure 5-9

## Timeline



## Preliminary Results

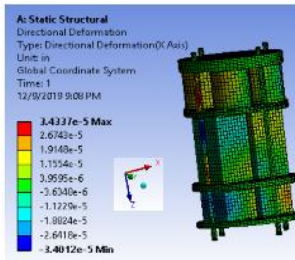


Figure 6: Deformation in the x-direction

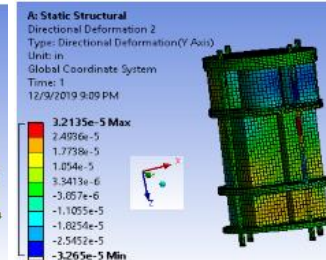


Figure 7: Deformation in the y-direction

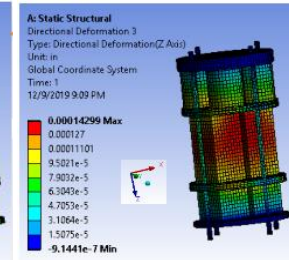


Figure 8: Deformation in the z-direction

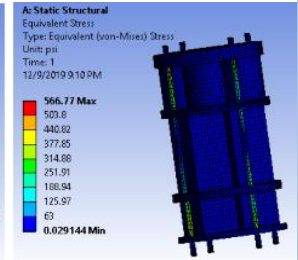


Figure 9: Equivalent Von-Mises Stress.

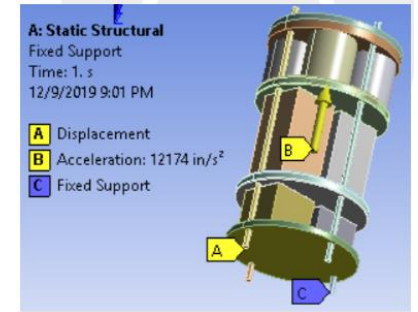


Figure 5: ANSYS model with boundary condition

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