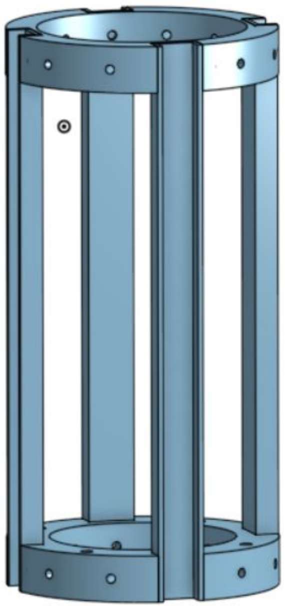
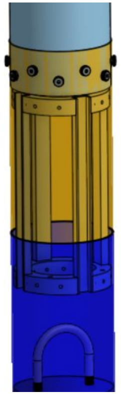
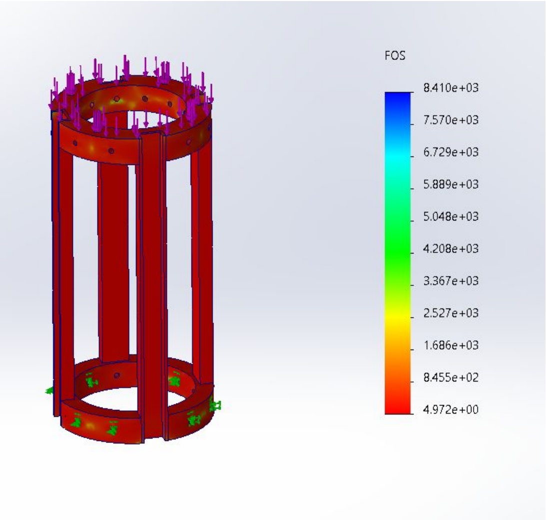
Airframe Chassis – Solid Demonstrator

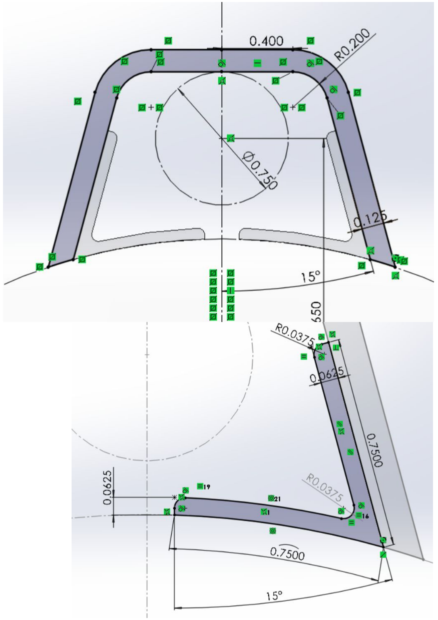


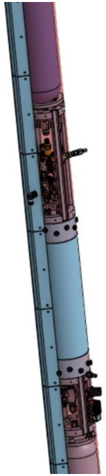


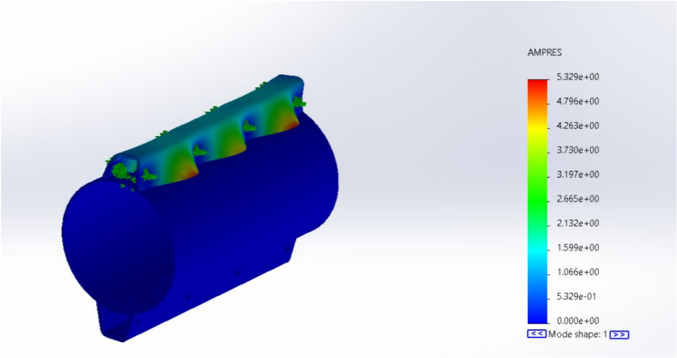


- Extended and redesigned the airframe chassis to remove a high-stress coupler and ensure full structural compatibility with the Solid Demonstrator rocket, improving stiffness and accurately representing primary flight load conditions.
- Added a chassis ring at every 1-ft interval to meet structural requirements, maintain tube alignment, and distribute axial loads evenly across the full length of the rocket.
- Conducted structural FEA by fixing the bottom ring bolt holes and applying an 1100 lbf axial load at the top of the chassis. Results showed a Factor of Safety ≈ 4, matching expectations from hand calculations and confirming sufficient stiffness under operational conditions. Evaluated stress and deformation profiles to verify uniform load paths, absence of critical stress concentrations, and acceptable displacement limits throughout the extended chassis geometry.

Airframe Runners







- Developed strategies and models to protect hardware, such as wiring, pipes, and other engine components that extend beyond the body tube against aerodynamic exposure and structural damage.
- Conducted a frequency analysis to verify that the chassis' natural frequencies remained well above expected vibration loads ensuring structural stability. Tested using bolted-only connections showed that:
    a. The 4-bracket configuration achieved a natural frequency of ~2.7 kHz, providing a significantly stiffer and more vibration-resistant structure compared to the 3-bracket design.
    b. A full 13-ft assembly analysis is planned, as longer structural spans typically exhibit reduced natural frequencies and will guide final bracket spacing decisions.