Launch Services Program: Engineering

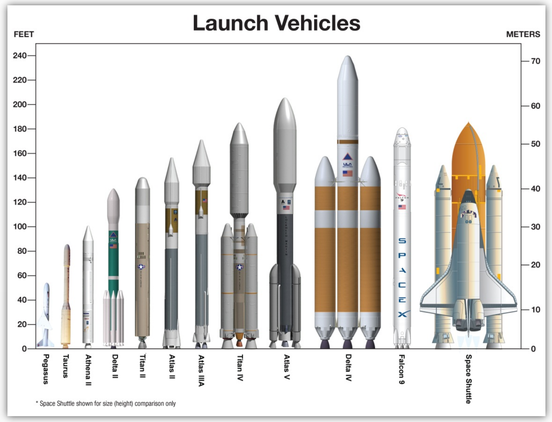
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What is LSP?

NASA’s Launch Service Program was created in 1998 and has acted as an interface between launch vehicle providers and those looking to send unmanned payloads into space. The launch vehicles are as varied as the missions, ranging in size and payload capabilities from the relatively small Pegasus XL, which is being used for the ICON mission, to the massive Delta IV Heavy used recently for the Parker Solar Probe mission. Whether the mission is scientific research close to home or deep space exploration, LSP will continue to be Earth’s Bridge to Space!



NE-C3

NE-C3 is the Launch Vehicle Mechanical Systems Branch of the Commercial Systems Division within LSP. It is responsible for the verification and validation of mechanical systems, namely the fit, form, and function of a component. The branch verifies the design to ensure all design requirements are met by reviewing such things as drawings and build paperwork, or assembling components in CREO. Every minute detail is checked to make sure that each component has the expected mass and dimensions, attaches correctly to where it should, doesn’t interfere with other components, and performs the desired tasks. Mechanical works closely with Vehicle Systems Engineers on all core launch vehicle related components, and with the Integration Engineers to confirm that the spacecraft will mate correctly with the launch vehicle.

What I am doing during my Pathways Internship

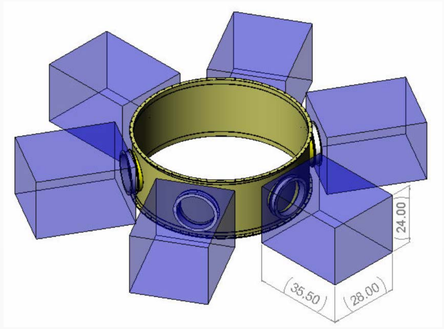
Introduction

As a Central Florida native, I grew up watching the Space Shuttle blast off into space with pure wonder and amazement. Although the Shuttle program is retired, I’ve been given the incredible opportunity to work with various launch vehicles as a part of the LSP team within the Mechanical Branch. Through extensive collaboration this team works tirelessly to ensure every component of every launch vehicle and spacecraft fulfills its required mechanical task in a safe and effective manner.



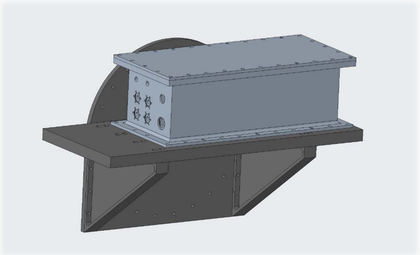
Main Project

For my second Pathways rotation, I was tasked with designing an ESPA adapter and mounting bracket for the Fiber Optic Sensor System. Design isn’t a role typically given to Mechanical, so I enjoyed the opportunity to get a little creative while learning more about the environments secondary payloads are exposed to. This task required a constant dialogue between personnel from AFRC, LSP Strength, and LSP Thermal to determine design requirements and prepare for flight as a auxiliary payload for the Landsat-9 mission.



FOSS Requirements and Final Design

There were several design requirements that helped guide the design of the FOSS mounting bracket. The adapter and FOSS box both had to fit inside of a 38x24x28 inch Auxiliary Payload flight envelope while maintaining a center of gravity within 20 inches from the interfacing plane. The total mass of the box is expected to be approximately 32 pounds, and the adapter will weigh approximately 38 pounds. With a combined weight near 70 pounds, total mass falls well within the limit outlined in the MOOG ESPA Users Guide. Special considerations were also given to ensure that there was a satisfactory conductive path for thermal dissipation from the box AND thermal isolation from the ESPA ring.

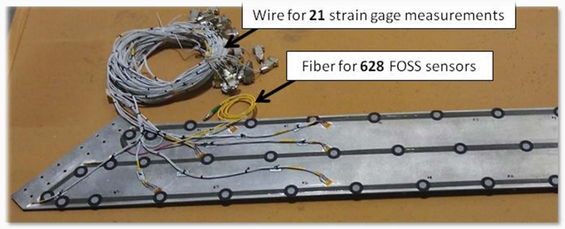


Next Steps

The final design resulted in an assembly of four pieces to be constructed of 6061 aluminum: the baseplate upon which the FOSS box will sit, two brackets for support, and finally an interfacing back plate which will attach to the ESPA port. Strength and thermal analysis will soon be underway to provide further insight on ways to iteratively improve our design.

Fiber Optic Sensor System (FOSS)

FOSS was developed by NASA’s Armstrong Flight Research Center as a potential replacement for traditional strain and temperature gauges. This light-weight and low-cost alternative is made possible by using fiber optics with built-in Bragg Gratings every quarter inch that are capable of reflecting certain wavelengths of light back to the sensor. Approximately the thickness of a human hair, a 40 foot line with nearly 2000 sensors can be installed in 2 days, significantly reducing traditional strain or temperature gauge installation times.



CREO

3D CAD software like CREO helps simplify the task of verifying design and performing analysis. Some of the capabilities of PTC CREO are:

- Parametric and Freestyle Surfacing
- Direct Modeling
- Augmented Reality
- Tolerancing
- 2D Drawings
- Mechanism Design
- Rendering
- 3D Animation
- Structural Analysis
- Thermal Analysis