



Project Name: Propellant Transfer Valve Vibration Analysis
Application: Vibrational analysis on liquid management assembly
Customer: Altius Space Machines
Website: www.altius-space.com



PROVIDING OUT OF THIS WORLD VIBRATION CHARACTERIZATION ON COMPLEX, MISSION CRITICAL LIQUID MANAGEMENT ASSEMBLY

TESTIMONIAL

"PADT delivered above and beyond what was expected and worked closely with our team to support the entire process rather than just handing off a finished product. The end result was a realistic vibration simulation model that agreed well with tests, and a complete understanding of the results and process. Will be reaching out again and recommending to others."

– **Keith Drake**
Test, Prototype, Facilities, and Operations Manager
Altius Space Machines

BACKGROUND AND PROJECT PURPOSE

Altius Space Machines has been developing a system that enables transfer of anhydrous ammonia propellant between orbiting spacecraft. Within this system, they have a mission critical and complicated valve assembly. Altius needed to understand how this assembly would behave from a vibration standpoint during launch.

Altius' and PADT's goal during this analysis was to understand the resonant natural frequencies along with the excited modes and their relative energy present during launch of the assembly.

GOALS ACCOMPLISHED

With guidance from Altius, PADT was able to create an accurate structural model and conduct modal and random vibration simulation of the assembly for the requested configurations. PADT was able to deliver both the natural frequencies and margins for the supplied excitations.

WHY PADT?

Due to PADT's thorough understanding of structural loading during rocket launch events, and experience in working with complex space mechanisms, we were able to successfully assess, perform and deliver on the results and expectations the customer had set forth. PADT also relied on their established project management procedure to align with customers needs and deliver results in a timely manner.

PROJECT HIGHLIGHTS:

- Partnered on orbital spacecraft analysis
- Analysis on liquid management assembly
- Determined survivability during rocket launch
- Delivered simulations on time and on budget
- Studied various parameters, including:
 - General design approach
 - Resonant natural frequencies
 - Energy excitations
 - Vibration



In 2021, PADT worked with Altius to determine the resonance frequency and vibrational behaviors of a liquid management assembly

DISCIPLINES EMPLOYED

- Modal Analysis
- Random Vibrational Analysis
- Structural Analysis
- Project Management