



Image courtesy of NASA Dryden

CUSTOMER:
Composite Optics, Inc. (COI)

INDUSTRY:
Aerospace

PROJECT NAME:
X-38 Deorbit Propulsion Stage Analysis & Static Load Testing

CUSTOMER LOCATION:
San Diego, California

OVERVIEW

The X-38 vehicle is a NASA-funded project intended to be a precursor to the crew return vehicle for the International Space Station. The primary purpose of this vehicle is to serve as an emergency lifeboat for the astronauts. Composite Optics, Inc. (COI) was contracted to design, analyze, fabricate, and test the X-38 Deorbit Propulsion Stage (DPS) structure. The DPS must not only support the propellant tanks but also serve as the vehicle chassis within the shuttle cargo bay.

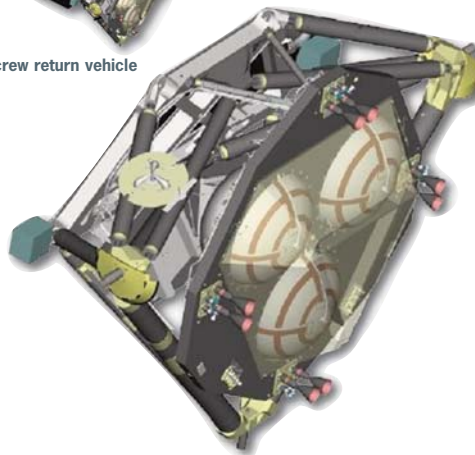
ATA Engineering, Inc. (ATA) supported COI throughout the detailed design analysis of the X-38 DPS Forward Structural Adapter (FSA) structure and provided engineering support for the static load test. ATA joined the project team after the flight hardware was already built, but before the loads were finalized. ATA worked with the X-38 team to accurately model and analyze the as-built hardware, comprehensively assess the structural performance of all critical components, and achieve positive margins for all load cases.

ATA SUPPORT INCLUDED:

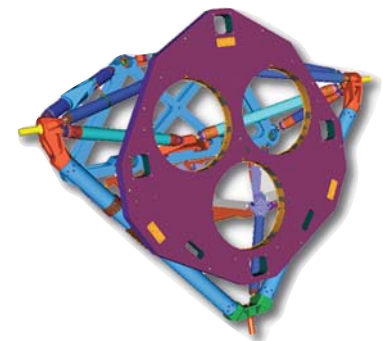
- ▷ Updated the system finite element model (FEM) of the structure to reflect the latest vehicle and battery models provided by NASA.
- ▷ Performed quasi-static analyses of the final design limit loads and thermal analyses to assess the effect of the coefficient of thermal expansion mismatch between metallic and composite components.
- ▷ Assessed nominal beam and panel stresses, fitting detailed stresses, bonded interfaces, and bolted joints.
- ▷ Designed the static load test on the flight hardware which required 20 load cases to fully test all critical components and bonded joints to 120% of the design limit loads.
- ▷ Verified that the test results correlated with analysis predictions to provide greater confidence in the modeling approach.



▲ X-38 crew return vehicle



▲ Close up of aft-end Deorbit Propulsion Stage



▲ Deorbit Propulsion Stage structural assembly

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