



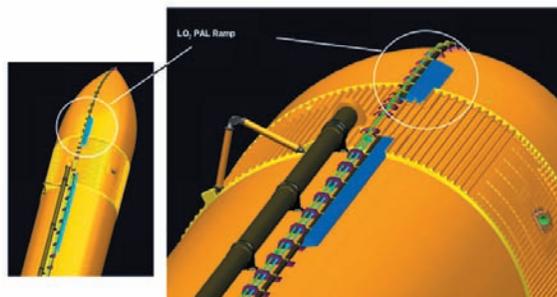
Return To Flight

Liquid Hydrogen and Liquid Oxygen Cable Tray Tests

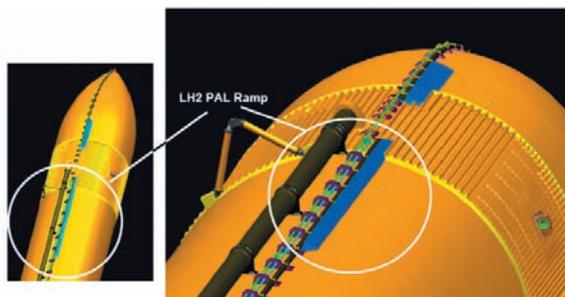
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Due to the major role the foam material played in the Space Shuttle Columbia accident, a thorough investigation was conducted to find any place that foam could be eliminated or reduced in size. The protuberance air load (PAL) ramps offered large areas of foam that, if not needed, could be removed and thus eliminate a potential source of debris.

The NASA Glenn Research Center (GRC) team of employees working on this task documented the airflow environment over the PAL ramps located next to the cable trays on both the liquid hydrogen (LH₂) and the liquid oxygen (LO₂) portions of the external tank. They also calculated the aerodynamic loads on the cable trays to determine if the PAL ramps could be eliminated, reduced in size, or redesigned to minimize the possibility of foam loss during Shuttle ascent.



LO₂ cable tray and PAL ramp configuration.

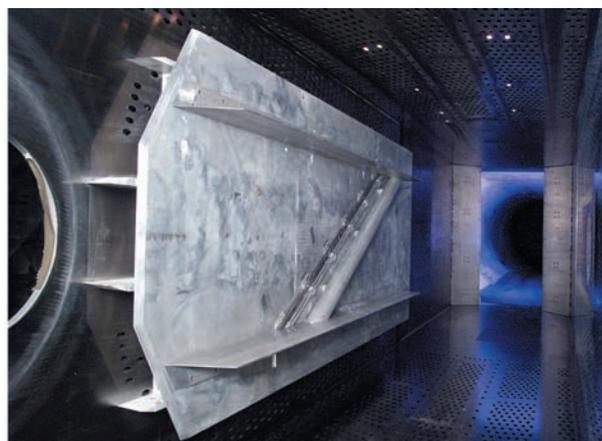


LH₂ cable tray and PAL ramp configuration.

The LH₂ cable tray test, which incorporated existing designs and hardware from a 1983 test conducted in GRC's wind tunnel as well as new hardware, was designed, fabricated, installed, and tested by GRC personnel within 2 months of the initial inquiry made during the summer of 2003 by the Return To Flight (RTF) team. Because of the outstanding job done on the LH₂ cable tray test, the RTF team requested a test for the LO₂ cable tray. Working with no previous design, the LO₂ hardware was designed, fabricated, installed, and tested within 6 months of the LO₂ cable tray test initial request.

By obtaining data with the PAL ramps installed and with the PAL ramps removed, the RTF team has a better understanding of the flow fields over the external tanks and the loads on the cable tray. All of the data collected is currently being evaluated by the RTF team to provide recommendations on modifications to or removal of the PAL ramps.

This GRC project utilized the 8- by 6-Foot Supersonic Wind Tunnel and involved personnel from many different skill sets across the Center. These included test engineering, facility technicians, engineering design, machining, fabrication, instrumentation, and central services.



LH₂ hardware installed in the 8- by 6-Foot Supersonic Wind Tunnel.