

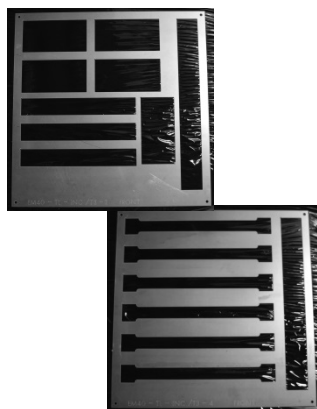


# Thermal Protection System Spray On Foam Insulation (SOFI)

## Custom Test Articles



Flange Mock-up



Spray Templates

The ability to rapidly develop mock-ups of complex geometries permits early development of materials and application processes. S-180 manual spray foam application is being evaluated on complex geometries such as the flange and pocket mock-up shown above. S-180 is also being sprayed onto aluminum and Inconel panels which will be sectioned into various sizes for laboratory testing of foam properties. Custom spray templates are utilized for Inconel specimens due to the difficulty of cutting Inconel after foam application. This eliminates the influence of machining induced stresses on the foam bond line. The panels are sprayed at various environmental conditions to qualify the material and process for use at conditions that may be experienced both inside and outside of the manufacturing facilities.

## The Chemistry of Foam

Spray on foam is produced by mixing a polyol blend containing blowing agents, surfactants, catalysts, and flame retardants with an isocyanate. The reaction is immediate when the chemicals are mixed, and produces an expanded closed cell structure. Densities are typically in the 2 to 3 pound per cubic foot range. The foam is sprayed in thin layers which are built up in a shingled fashion to achieve the desired overall thickness. The chemicals are dispensed under high pressure and are mixed by internal impingement near the exit of the spray gun. Since the foam is sprayed onto the surface it is good at conforming to the surface geometries.



## Manual Spray Equipment

Highly instrumented, PLC controlled foam dispensing equipment developed specifically for use on cryogenic fuel tanks is being utilized to develop application processes for the SLS Core Stage cryoinsulation.



Portable  
New Delivery System  
(PNDS)