PROJECT SUMMARY

Structural Integrity and Creep Modeling of Friction-Stir-Welded Joints of Al-2195 Alloy.

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ABSTRACT
Aluminum-Lithium alloys (Al-2195) with improved mechanical properties over conventional aluminum alloys have been extensively used in aircraft to satisfy the advancing technological needs of space structures. Friction-stir-welding procedure is the most-recent upgrade technology that has been employed for the fabrication of the space shuttle's gigantic external tank. The application of advanced aluminum alloys to Reusable Launch Vehicle (RLV) structures requires the characterization of the temperature and time dependent creep properties of the alloys. This project will investigate the creep behavior of friction-stir-welded joints of Al-2195 in various critical loading conditions. The Al-2195 plates will be friction-stir-welded and through creep testing procedure the creep crack growth rate will be determined at various loads and temperatures conditions according to ASTM standard. Finite element analysis of creep modeling will be conducted using ANSYS software. The creep crack growth data generated from numerical models will be compared with experimental and/or published data from the literature. Micrographic samples will be prepared from the fracture surfaces of un-welded and welded specimens; and creep crack initiation, stable propagation, and fast growth areas will be scanned by Scanning Electron Microscope (SEM) and the characteristics features will be analyzed and numerical prediction will be validated.