gled weld joint was prepared by machining the mating surfaces to 120°. The angled weld joint was then fixtured using an upper and lower containment plate of the same geometry of the angled weld joint. The weld joint was then stirred by the stir rod as it and the upper and lower containment plates traverse through the angled joint prep.

This work was done by Robert (Jeff) Ding for Marshall Space Flight Center. For more information, contact Sammy Nabors, MSFC Commercialization Assistance Lead, at sammy.a.nabors@nasa.gov.

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning nonexclusive or exclusive license for its commercial development should be addressed to the Patent Counsel, Marshall Space Flight Center. Refer to MFS-32895-1.

Next-Generation MKIII Lightweight HUT/Hatch Assembly

Applications for general aviation include the insulation around fuel tanks, especially wing-located tanks.

Lyndon B. Johnson Space Center, Houston, Texas

The MK III (H-1) carbon-graphite/epoxy Hard Upper Torso (HUT)/Hatch assembly was designed, fabricated, and tested in the early 1990s. The spacesuit represented an 8.3 psi (≈58 kPa) technology demonstrator model of a zero prebreathe suit. The basic torso shell, brief, and hip areas of the suit were composed of a carbon-graphite/epoxy composite lay-up. In its current configuration, the suit weighs approximately 120 lb (≈54 kg). However, since future planetary suits will be designed to operate at 0.26 bar (≈26 kPa), it was felt that the suit's re-designed weight could be reduced to 79 lb (≈35 kg) with the incorporation of lightweight structural materials.

Many robust, lightweight structures based on the technologies of advanced honeycomb materials, revolutionary new composite laminates, metal matrix composites, and recent breakthroughs in fullerene fillers and nanotechnology lend themselves well to applications requiring materials that are both light and strong.

The major problem involves the reduction in weight of the HUT/ Hatch assembly for use in lunar and/or planetary applications, while at the same time maintaining a robust structural design. The technical objective is to research, design, and develop manufacturing methods that support fabrication of a lightweight HUT/Hatch assembly using advanced material and geometric redesign as necessary. Additionally, the lightweight HUT/Hatch assembly will interface directly with current MK III hardware.

Using the new operating pressure and current MK III (H-1) interfaces as a starting block, it is planned to maximize HUT/Hatch assembly weight reduction through material selection and geometric redesign. A hard upper torso shell structure with rear-entry closure and corresponding hatch will be fabricated. The lightweight HUT/Hatch assembly will retrofit and interface with existing MK III (H-1) hardware elements, providing NASA with immediate "plug-and-play" capability.

NASA crewmembers will have a lightweight, robust, life-support system that will minimize fatigue during extraterrestrial surface sojourns. Its unique feature is the utilization of a new and innovative family of materials used by the aerospace industry, which at the time of this reporting has not been used for the proposed application.

This work was done by Mike McCarthy and Ralph Toscano of Air-Lock, Inc. for Johnson Space Center. Further information is contained in a TSP (see page 1). MSC-23941-1