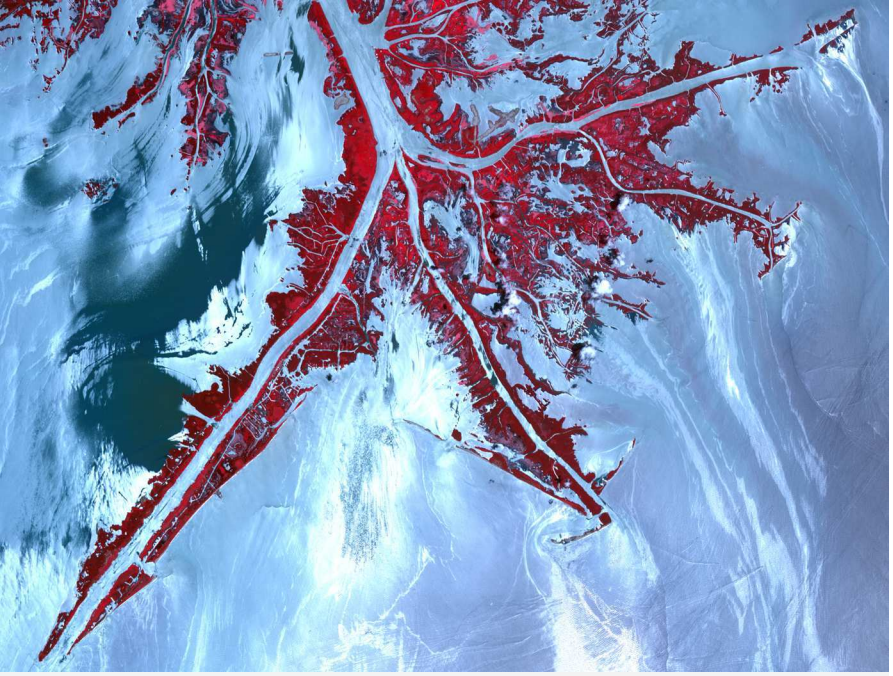

National Aeronautics and
Space Administration

technology solution

Mechanical and Fluid Systems

Design of cryogenic hydrogen radiation shield

A design for a human space flight ready radiation shield

This NASA independent research and development (IRAD) project will complete a preliminary space thermal system and ground operation system design of the cryogenic hydrogen radiation shield (CHRS) and also perform a radiation analysis and evaluation of solid hydrogen tank.

BENEFITS

- Radiation reduction
- Multipurpose liquid during spaceflight

THE TECHNOLOGY

Human susceptibility to the harsh space radiation environment has been identified as being a major hurdle for exploration beyond low Earth orbit. The high energy particles cause significant amounts of secondary radiation when they impinge on Aluminum, which is commonly used for spacecraft structure. Hydrogen or hydrogen rich materials are ideal materials for radiation shielding because hydrogen does not easily break down to form secondary radiation source. This liquid hydrogen would be stored at 20K in a tank that can withstand some pressure changes. A 37.2kg/m2 areal density of liquid hydrogen would reduce the radiation exposure of astronauts to allowable limits as dictated by a one-year exposure to the radiation. This approach is very cost significant as it is estimated at $24,000/kg. A benefit for using the CHRS system is that the liquid hydrogen can be used as fuel for a final burn; this dual use increases the mass advantage to the overall architecture.

APPLICATIONS

The technology has several potential applications:

- Radiation control

PUBLICATIONS

Patent No: 10144535

More Information

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