

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Technologies for Future Space Transportation Systems (5)

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SELF-SUPPORTING MULTI-LAYER INSULATION FOR LAUNCH VEHICLES

Abstract

Cryogenic propellant storage is a critical component of cislunar transportation and long duration space travel. Launch loads from Earth complicate the challenge, as thermal insulation is often not structurally stable by itself. Ball Aerospace and Quest Thermal are providing an update on self-supporting, Multi-Layer Insulation (MLI) and its variants. This technology greatly reduces heat flux while providing other benefits in a single, integrated system for launch vehicles and other applications. Updates on the latest Phase II SBIR testing will be provided in this session.

The MLI construction is self-supporting and it is the unique combination of load bearing material plus heat flux reduction. Potential uses include launch vehicles, in space transportation, propellant storage facilities in space and on other bodies such as the Moon, and long duration spaceflight.

Quest Thermal Group Ball Aerospace have partnered to develop a vapor cooled thermal insulation to reduce heat leak for cryogenic propellants. Vapor Cooled Structure MLI (VCSMLI) is a novel system that uses a sealed vapor transport layer within IMLI for lightweight, efficient vapor cooling of tank skirts and struts. Recent testing results performed on an advanced vapor cooled structure prototype connected to 400-liter liquid nitrogen tank in a vacuum chamber will be shared. Heat flux reductions have been proven and are continuing to be tested at larger volumes and colder temperatures.