NASA SBIR 2009 Phase I Solicitation

X5.02 Composite Structures - Cryotanks

Lead Center: LaRC

Participating Center(s): GRC, GSFC, JSC, MSFC

The use of composite materials for smaller cryotanks offers the potential of significant weight savings. Composite cryotank technology would be applicable to EDS propellant tanks, Altair propellant tanks, lunar cryogenic storage tanks and Ares V tanks. A material system (resin+fiber) which displays high resistance to microcracking at cryogenic temperatures is necessary for linerless cryotanks, which provide the most weight-saving potential.

This subtopic will focus on development of toughened, high strength composite materials, because the literature indicates that they have the highest microcrack resistance at cryogenic temperatures. Greatest interest is in novel approaches to increase resin strength and/or reduce resin CTE, thereby increasing resistance to microcracking at cryogenic temperature.

Performance would be evaluated by a characterization program, which would ideally generate temperature-dependent material properties including strength, modulus, and CTE as functions of temperature. Additionally, notch sensitivity, plain strain fracture toughness, and microcracking fracture toughness as functions of temperature are desirable. Tests will need to be performed at temperatures between -273Â°C and 180Â°C to fully characterize any nonlinearity in material properties with changes in temperature.

Initial property characterization would be done at the coupon level in Phase 1. Generation of design allowables, characterization of long-term material durability, and fabrication of larger panels would be part of follow-on efforts.