NASA SBIR 2008 Phase I Solicitation

X4.05 Composite Structures - Cryotanks

Lead Center: LaRC

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

While Aluminum-lithium may be adequate for cryotanks (for immediate use and long-term storage) the use of composite materials 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 SBIR 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. Possible topics could include use of toughening agents, novel surface treatments for carbon fibers, reduced-temperature curing methods that reduce residual thermal stresses, etc.

Performance enhancements 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 23Â°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.