

Lightweight Materials and Structures (LMS): Inflatable Structures Project

Game Changing Development Program | Space Technology Mission Directorate (STMD)



ABSTRACT

Current inflatable structures are designed on the restraint layer's short term properties with a Factor of Safety of 4 due to lack of long-term data on structural fabrics. Long-term (5-years) end of life properties of restraint layer materials under loads, are unknown.

ANTICIPATED BENEFITS

To NASA funded missions:

Real time creep behavior and safe life evaluation methods were provided to HEOMD/AES/BEAM flight project in support of ISS flight experiment scheduled for 2015.

DETAILED DESCRIPTION

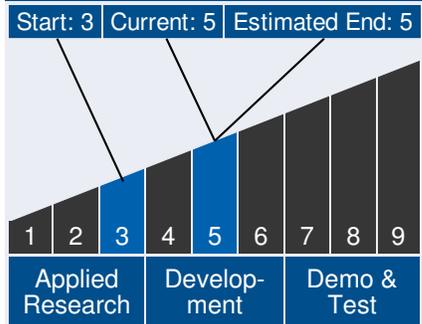
The Inflatable Structures (InSTAR) project goal is to demonstrate long term durability of inflatable habitat structures for potential utilization as either in-space or planetary habitats. Using a multi-center approach to leverage capabilities and recent contributions from prior NASA-funded inflatable technology projects, industry, and DoD activities. Unique test facilities will be designed and outfitted to conduct experimental tests on SOA high strength webbings and full configuration inflatable modules. Unique test hardware and data acquisition systems will be built to capture global displacements and strains of webbing materials. Collaboration with industry and government partners will be conducted. Periodic reviews of the technical work will be conducted, schedule will be tracked and budget will be monitored on a regular basis.



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Technology Maturity



Management Team

Program Executive:

- Ryan Stephan

Program Manager:

- Stephen Gaddis

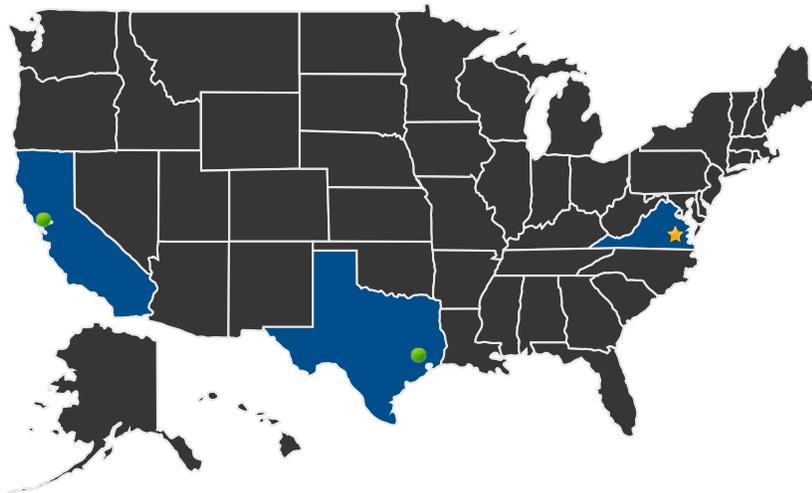
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U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States With Work **★ Lead Center:**
Langley Research Center

● Supporting Centers:

- Ames Research Center
- Johnson Space Center

Management Team (cont.)

Project Manager:

- Lynn Bowman

Principal Investigator:

- Peter Lillehei

Technology Areas

Primary Technology Area:

Materials, Structures, Mechanical Systems and Manufacturing (TA 12)

DETAILS FOR TECHNOLOGY 1

Technology Title

Lightweight Materials and Structures: Inflatable Structures

Technology Description

This technology is categorized as an architecture for facility buildings or infrastructure

The project aims to demonstrate long term durability of inflatable habitat structural fabrics and constitutive woven webbing components. The project will develop models capable of predicting global and local behavior, enhance experimental methodologies to evaluate modes of failure focusing on long-term material characteristics and damage tolerance, and evaluate creep behavior of webbing materials through accelerated and real-time tests. Where applicable, experimental data

Completed Project (2011 - 2014)

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will be compared to analytical data to validate baseline methodologies and assumptions. Technical work will center on advancing the TRL of inflatable structures for use in future space exploration missions.

Capabilities Provided

Novel test methodology developed for webbing material including new test grip and instrumentation methods and a new technique for full field strain measurement of webbings.

Potential Applications

Inflatable lightweight structures