Electrically Activated Shape Memory Composite Deployable Boom, Phase I Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)

ABSTRACT

CRG proposes to advance the solar sail boom system with a bi-stable, deployable, composite boom which implements a composite electrically activated shape memory polymer (EASMP) to transition the matrix with characteristics representing an elastomer, for storage and deployment, into a thermoset creating a rigid boom. This bi-stable solution will allow for a lightweight, reliable, and controlled solution of deployment while consuming less power upon deployment compared to current metal booms. This technology will not be limited by mission; it is scalable for larger solar sails in future missions and missions with similar applications such as the Lunar Flashlight.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: Supporting NASA's materials and structures capabilities, specifically at NASA Langley, this project's technologies directly address requirements for lightweight deployable solar sail booms for cubesats. The proposed technologies offer deployable booms at a fraction of the weight, with reduced deployment power. Through this project, tailoring EASMP for space applications opens a new frontier for novel material applications for various space systems such as, but not limited to; deployable solar arrays, deployable antennas, micro-actuators, variable vibration dampening structures, and tunable signal cancellation panels. Other NASA applications may benefit from the material?s ability to stay flexible and soft below -100?C, such as seals, couplings, or dampers.

To the commercial space industry:

Potential Non-NASA Commercial Applications: This project's technologies, developed for NASA systems, would directly apply to systems operated by other government and commercial enterprises. Government systems that would derive the same benefits would include deployable composites for satellites

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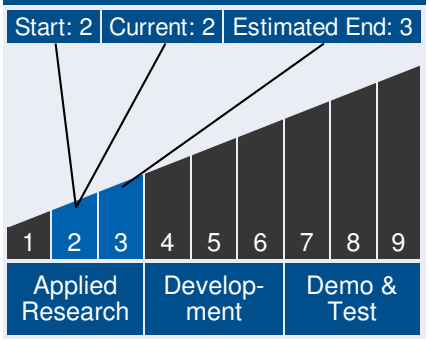
Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

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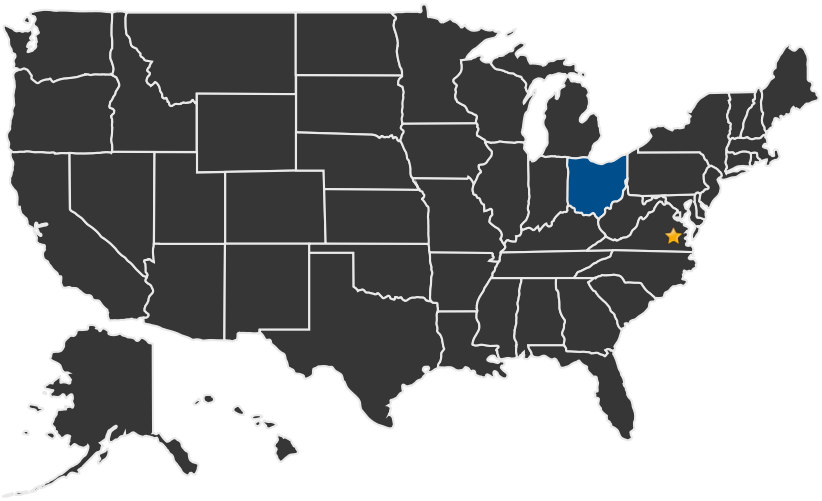
operated by the Department of Defense, Department of Interior? s EROS, National Oceanic and Atmospheric Administration (NOAA), and the Federal Aviation Administration. This technology's attributes for tunable composite modulus should yield a high potential for private sector commercialization for various space materials and systems for companies such as Boeing, Sierra Nevada, SpaceX, Virgin Galactic, and many more.

U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Cornerstone Research Group, Inc. (Dayton, OH)

PROJECT LIBRARY

Presentations

- Briefing Chart
  - (http://techport.nasa.gov:80/file/23449)

Management Team *(cont.)*

Principal Investigator:

- Jason Hermiller

Technology Areas

Primary Technology Area:
Materials, Structures, Mechanical Systems and Manufacturing (TA 12)
└ Structures (TA 12.2)
  └ Lightweight Concepts (TA 12.2.1)

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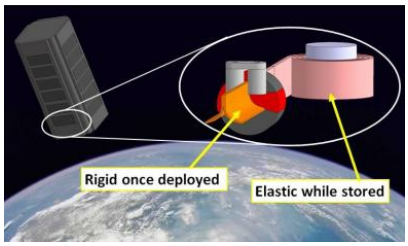
IMAGE GALLERY



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DETAILS FOR TECHNOLOGY 1

Technology Title

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Potential Applications

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