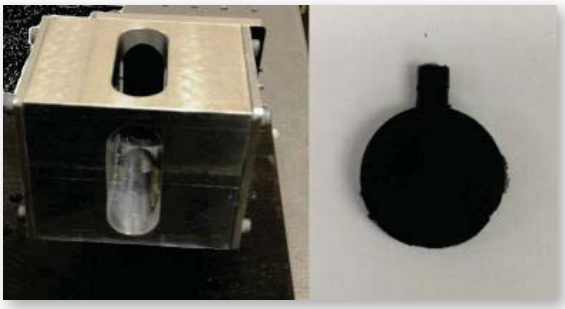
Magnetic Nano-Particle Based Composite Materials/Magnets Project

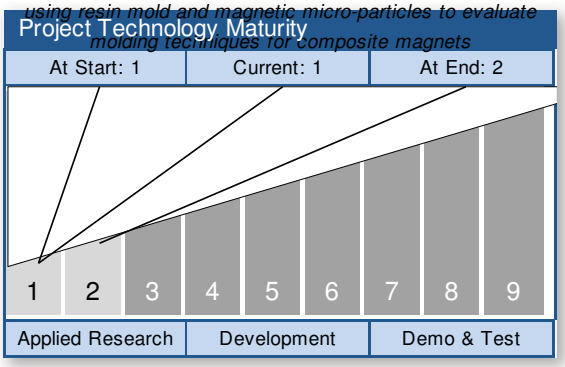
Center Innovation Fund: KSC CIF Program

Space Technology Mission Directorate (STMD)

National Aeronautics and Space Administration



Magnetic alignment apparatus and proof-of-concept specimen using resin mold and magnetic micro-particles to evaluate molding techniques for composite magnets



ABSTRACT

Develop and evaluate novel advanced composite materials which contain magnetic nano-particles. The primary goal is to develop a new class of lightweight magnetic composite materials.

Technology Area: Materials, Structures, Mechanical Systems & Manufacturing TA12 (Primary)

ANTICIPATED BENEFITS

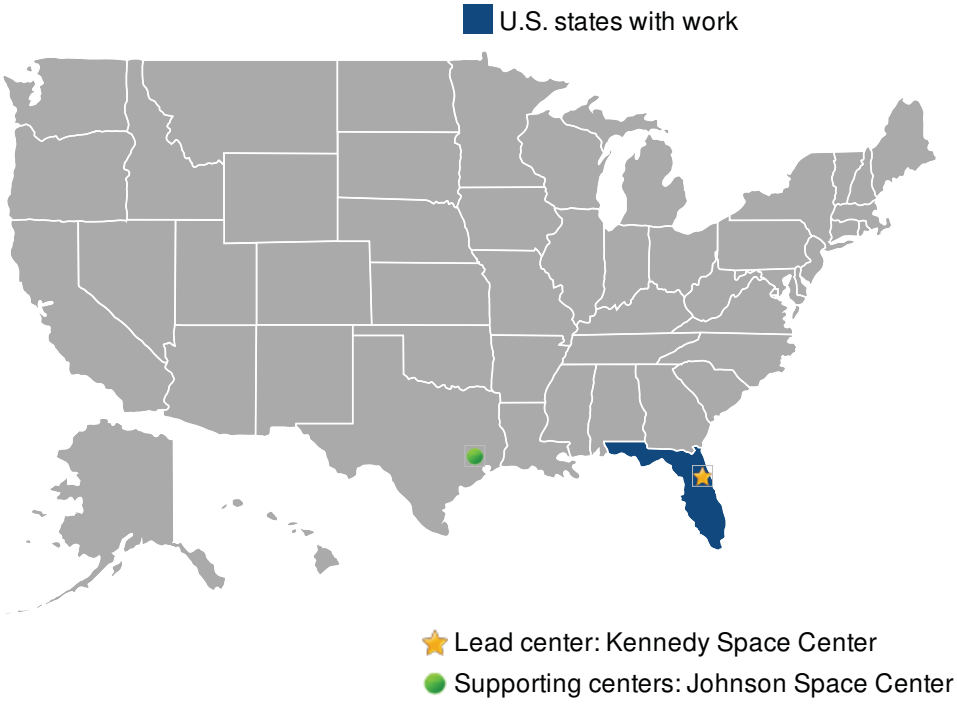
To NASA funded missions:

This work primarily aligns with TA12-Materials/Structures/Mechanical Systems and Manufacturing, and is expected to impact Space power and energy storage through its impact on flywheels. Additionally, the development of lightweight magnetic materials will reduce the mass of space operations, thereby increasing the weight available for other systems.

To NASA unfunded & planned missions:

Same as the benefits to NASA for funded...

Read more on the last page.



Other Organizations Performing Work

Florida Agricultural and Mechanical University (FAMU)
Florida Institute of Technology (FIT)

DETAILED DESCRIPTION

This project seeks to develop and evaluate novel advanced composite materials which contain magnetic nano-particles. The primary goal is to develop a new class of lightweight magnetic materials. During this project, several key technical challenges will be investigated, including development of robust methods to produce magnetic nanoparticles, synthesis of novel polymers and other matrix materials to improve composite magnet performance and durability, and development of alignment methodologies for magnet fabrication.

MANAGEMENT

Program Executive:
John Falker

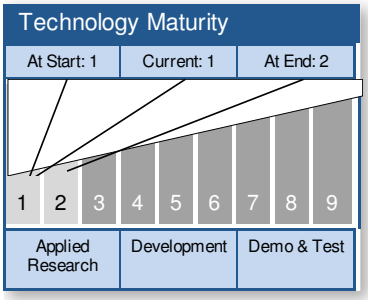
Program Manager:
Karen Thompson

Project Manager:
Nancy Zeitlin

Principal Investigator:
Martha Williams

TECHNOLOGY DETAILS

Magnetic Nano-particle Based Composite Materials/Magnets



TECHNOLOGY DESCRIPTION

- This project seeks to develop a new class of lightweight composte materials containing magnetic nano-particles.
- This technology is categorized as a material for other applications
- Technology Area
    - TA12 Materials, Structures, Mechanical Systems & Manufacturing (Primary)

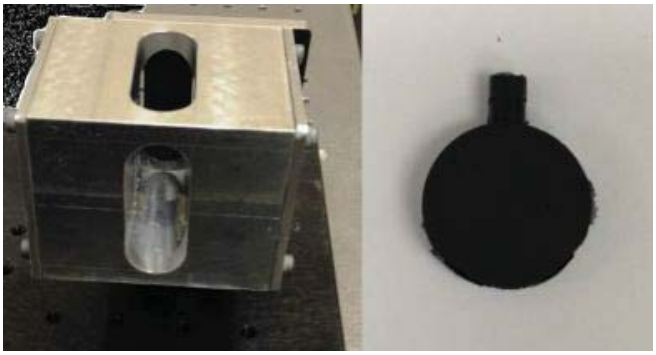
CAPABILITIES PROVIDED

This technology provides the capability to produce robust composite magnets for use in a wide variety of systems and reduces the dependence on rare-earth materials.

This technology is expected to impact Space power and energy storage through its impact on flywheels. Additionally, the development of lightweight magnetic materials will reduce the mass of space operations, thereby increasing the weight available for other systems.

Performance Metrics		
Metric	Unit	Quantity
Flux Density	Tesla	0.3
Thermal Stability	Deg C	200
Coercivity	kA/m	200

IMAGE GALLERY



Magnetic alignment apparatus and proof-of-concept specimen to evaluate molding techniques for composite magnets

ANTICIPATED BENEFITS

To NASA unfunded & planned missions: (CONT'D)

missions.

To other government agencies:

The Congressional Research Service (CRS) released a report in 2012 that the supply of rare earth metals are at a critical concern to the United States. The important issue of supply vulnerability of rare earth metals would be important to such applications as magnets; alternative light weight magnets could help address some of those concerns. Since magnets have such a critical use in both the government and private sector, it is envisioned that the development of new, lightweight magnets will be a game-changing event. Developing a new source of 0.5 Tesla magnets would affect products including speakers, motors, wind turbines, and hybrid vehicles.

To the nation:

Same as benefits to other government agencies. Also, if higher fields can be achieved then areas such as magnetic resonance imaging (MRI) might be affected.