Minority University Research and Education Project (MUREP)

Institution: University of Houston
Award Name: MUREP Institutional Research Opportunity (MIRO) - Group 8
Award Number: 80NSSC24M0178
Title: NASA MIRO Inflatable Deployable Environments and Adaptive Space Systems (IDEAS^2) Center
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Award Fiscal Year: 2024

Summary: The vision of the NASA MIRO Inflatable Deployable Environments and Adaptive Space Systems (IDEAS2) Center at the University of Houston (UH) is to become a premier national innovation hub that propels a NASA-centric, state-of-the-art research and diversifies the 21st-century aerospace education. The mission of the Center is to establish a sustainable nexus of excellence in aerospace engineering research and education supported by targeted multi-institutional collaborations, strategic partnerships, and diverse educational initiatives. The Center will collaborate with the NASA Johnson Space Center (JSC) to support the mission of NASA's Space Technology Mission Directorate (STMD). The collaborations with Texas A&M University, Stanford University, the Houston Community College, and San Jacinto College, and the industrial partnership with Boeing, Axiom Space, Bastion Technologies, and Lockheed Martin will serve as a powerful foundation of complementing partners.

The specific goals of the Center are: (i) Establish UH as a premier academic hub in aerospace research and education, (ii) Conduct cutting-edge research on inflatable and deployable structures and adaptive space systems in close collaboration with NASA JSC, (iii) Cultivate the partnerships with NASA, the university partners, the community colleges, and industry to promote the Center's research objectives and educational goals, (iv) Support aerospace engineering education and training of the students through engagement in research, active project involvement, experiential learning, and internships emphasizing under-represented group recruitment and retention, (v) Promote and support a diverse STEM pipeline, building tomorrow's aerospace workforce, and (vi) Ensure the Center's continuity, prosperity, longevity, and ability to financially support itself after the end of NASA MIRO funding.

The research at the Center will support NASA's strategic goal to extend human presence on the Moon and Mars for sustainable, long-term space exploration, development, and utilization. The Center's research, in close collaboration with JSC, will contribute to the robust, scalable orbital and surface infrastructure and operational autonomy that will enable humans to live and work in space, establish a lasting presence on and around the Moon, and pave the way toward Mars exploration. Research Thrust 1, Inflatable and Deployable Structures, will examine the architectural design, configuration, deployment, and integrity analysis of space structural and infrastructure systems and assets. Research Thrust 2, Smart Actuator Systems and Soft Robotics will investigate novel smart material actuation and soft robotic technologies for structure deployment, reconfiguration and control, health monitoring, on-orbit servicing, and planetary exploration. Research Thrust 3, Adaptive Space Systems, will examine novel adaptation, unsupervised health monitoring, and control methodologies and processes to facilitate space system autonomy, reliability, and robust functionality.

The Center's student education and STEM outreach component will support NASA's strategic goal of developing a talented and diverse aerospace workforce and building the next generation of space explorers. The research-integrated educational activities will encompass graduate, undergraduate, and middle/high school students, providing opportunities for research, experiential learning, and STEM engagement in aerospace to excite their imagination, enrich their education, and promote their pathway to aerospace careers. Partnerships with the UH Mars Rover Celebration, the UH STEM Zone Saturday, the UH STEM Research Inquiry Summer Experience (STEM RISE), the UH St. Elmo Brady Academy, and the Science and Engineering Fair of Houston (SEFH) will actively engage the Center in youth camps and STEM events focusing on traditionally underserved and underrepresented populations.