**MUREP Inclusion Across the Nation of Communities of Learners of Underrepresented Discoverers in Engineering and Science (MUREP INCLUDES)**

**Title: Broadening Participation in Engineering, Robotics and Computer Science using Zero Robotics on Astrobee**
**Organization: Navajo Technical College**
**Primary Investigator: Peter L. Romine**

**Summary:** This proposal responds to two interrelated "Broadening Participation" challenges in the engineering field. The first "Broadening Participation" challenge is increasing the number of Indigenous and Hispanic students and educators participating in computer science and space robotics activities. The second "Broadening Participation" challenge is increasing Indigenous and Hispanic students 'self-assessed identity as participants in computer science and space robotic activities. To pursue these challenges, this team pursues a two-part strategy: The first Strategic Element forms a consortium called CHIERS (Consortium for Hispanic and Indigenous Education on Robotics in Space, pronounced "Cheers") that includes Navajo Technical University (NTU, the first Tribal University to achieve ABET accreditation for engineering degree programs), California State University Long Beach (CSULB, a Hispanic-Serving Institution), the Massachusetts Institute of Technology (Founder of the Zero Robotics STEM program), Ke'yah Advanced Rural Manufacturing Alliance (KARMA, an educational nonprofit spinoff of NTU), and Innovation Learning Center (educational nonprofit and key Zero Robotics partner). The consortium provides a platform to share knowledge and best practices for addressing the Broadening Participation challenges among the CHIERS organizations and with a broader network of institutions that each CHIERS member engages. The second Strategic Element is that the members of the consortium submitting this proposal collaborate to implement the Zero Robotics programming competition which provides people from multiple roles the opportunity to engage with computer science, space robotics, and the microgravity environment. The consortium pursues Zero Robotics with a model that invites active roles for university faculty, university students, Middle and High School educators and students, and nonprofits. Based on the location of the consortium members, the proposal targets Indigenous and Hispanic students in the southwest United States. The proposal is built around an understanding of barriers limiting the participation of Indigenous and Hispanic middle school, high school, and college students in computer science and space robotics. The barriers are linked to historic discrimination and resulting inequities in socioeconomic resources, educational offerings in the schools and colleges, the experience of teachers, and awareness of opportunities to participate in NASA-related STEM programs. The Strategic Elements of creating a multi-sector consortium for knowledge sharing and cooperating within the framework of the Zero Robotics programs together respond to the Broadening Participation challenges. This project builds on ten years of impactful delivery of the Zero Robotics programming competition between 2009 and 2019 during which almost 20,000 students participated from all over the world. The CHIERS team aims to achieve the following outcomes: 40 new teachers will be trained to mentor Middle and High School students in the Zero Robotics programming competition in the regions of Los Angeles, California, and in Navajo Nation or collaborating Tribal regions. During the period of performance from 2021 to 2024, the project team will host two to three rounds of the annual Zero Robotics competition cycle and create an ecosystem in

which university faculty and students from Navajo Technical University and California State University Long Beach mentor nearby Middle and High School educators and students as they participate in Zero Robotics during summer or fall sessions. The proposal outlines the specific activities by which participants in the Zero Robotics ecosystem engage, including from industry, universities, non-profits, and schools.