

Title: NASA-MIRO: Center for Advanced Manufacturing in Space Technology & Applied Research at UDC (CAM-STAR)

Institution: University of the District of Columbia

City/State: Washington, DC

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Summary: The proposed Center for Advanced Manufacturing in Space Technology & Applied Research (CAM-STAR) at the University of the District of Columbia (UDC), a Historically Black College & University (HBCU), will focus on research and education on various advanced manufacturing (AM) techniques and their application in Space Exploration Technology and Research. The overarching vision of CAM-STAR is to comprehensively transform UDC from a conventional undergraduate teaching university to a state-of-the-art minority serving, Ph.D. granting research institution. Specifically, it aims to accomplish the four goals over the next three years:

- 1) To become a premier research institution that supports student research and professional development, primarily benefiting students from Underrepresented and minority groups.
- 2) To advance UDC's engineering curriculum by integrating multidisciplinary Space Technology-related education and hands-on laboratory experience to attract, train, and retain students, thereby forming a diverse workforce for NASA-related fields.
- 3) To support UDC's faculty cohort performing research on NASA related areas.
- 4) To strengthen UDC's collaboration with NASA, industries, research institutions, neighboring federal labs, minority serving colleges, and local middle/high schools.

CAM-STAR's four goals and their respective objectives are very much aligned with the UDC's mission and goals to serve the needs of the community of the District of Columbia and producing lifelong learners who are transformative leaders in the workforce, government, nonprofit sectors and beyond. CAM-STAR's research projects also align well with the following NASA's Mission Directorate: Space Technology Mission Directorate (STMD). Specifically, with the partnership with JSC, it will align with the following research focuses: 1. Passive Thermal Control using a). Nano-enhanced phase change materials (Sub-project 1); and b). Additively manufactured two phase heat exchangers (Sub-project 1); 2. Thermal Protection System: a). Nano-manufactured variable emissivity coating with robust thermal and mechanical properties (Sub-project 2); and b). Novel Additive Manufacturing compatible thermal protection system structures/coating materials (Sub-project 2); and 3. In-Situ Resource Utilization-Mars (ISRU): AM fabricated Lunar/Mars regolith processing tools (Sub-project 3).

The research activities proposed here will be seamlessly integrated with educational activities with a focus on student-active teaching and learning from middle school to Ph.D. level. Specifically, we will: 1. provide AM exposure and integrated research for undergraduate and graduate courses through new AM focused course and project-based learning; 2. provide

scholarships to undergraduates to conduct research while earning course credit, joint mentorship and financial support to selected NASA summer internship awardees; 3. Establish a Space STEM Outreach Program for middle, high schoolers, teachers and local community colleges and minority serving colleges to increase their awareness and engagement with NASA- related areas; 5. Offer professional development for UDC faculty and enhance the existing participation in NASA-related subjects.

Through this project, we will initiate and strengthen the partnerships with NASA-Johnson Space Center, University of Maryland, Clemson University, Industry Partners (ACT, Northrop Grumman), DC Space Grant Consortium, National Laboratories (NIST and NSWC), Trinity Washington College, Gallaudet University, Community Colleges, DC Public High Schools, and Middle Schools. It is expected to significantly build UDC's research capacity in STEM areas, especially the AM-focused and NASA-related areas; increase the awareness of aerospace research and development that aligned with NASA research priorities; and help provide a diverse further workforce in STEM and NASA-related fields.