

Automation for Vehicle and Crew Operations

### Qualtech Systems

#### Technical Abstract

Space missions are immensely costly endeavor &#150; fault free function of the hardware and software used therein are highly critical to mission success. Being highly complex, manual intervention in operation, troubleshooting, and health management related areas are labor intensive and time consuming. On top of that with time the complexities of the systems are increasing, and the performance and availability requirements are become even more stringent. In the face of this situation, automation technologies are increasingly looked upon to perform critical tasks in short time, without manual intervention (or with minimal intervention) in error-free manner. Qualtech Systems, Inc., in collaboration with TRAC Labs, Inc., proposes developing novel capabilities in the areas of health management, providing information for health and capability-related situational awareness, acquisition of data from onboard systems, and generating and invoking procedures for troubleshooting, restoration of operation, and/or initiating safety assurance processes.

#### Company Contact

Sudipto Ghoshal  
(860) 257-8014  
sudipto@teamqsi.com

Graded Density Carbon Bonded Carbon Fiber (CBCF) Preforms for Lightweight Ablative Thermal Protection Systems (TPS)

### Fiber Materials, Inc.

#### Technical Abstract

FMI has developed graded density CBCF preforms for graded density phenolic impregnated carbon ablator (PICA) material to meet NASA's future exploration mission requirements for higher performance ablative TPS. Graded Preform PICA (GPP) will be achieved by the continued development of lightweight, graded density carbon preforms which will decrease the overall areal mass of the resulting TPS material while enhancing its thermal performance capability. The preform material designed to achieve this goal is comprised of a more mechanically robust, ablating outer layer and a lower weight, lower thermal conductivity inner layer than state-of-the-art PICA material. The ablative outer layer and thermal inner layer will be integrated in a continuously cast, monolithic material with equivalent capability for resin impregnation and conversion to PICA as the baseline existing preform material (FiberForm&#174;). During the proposed Phase II program, FMI will continue to develop its capability to produce graded density preform material to achieve TPS areal mass reductions estimated between 17-25% relative to PICA with the goal of improving ablation performance. The developed preform materials will be converted to GPP and then characterized mechanically, thermally, and tested for ablation performance. In addition to providing a pathway for these enhancements to tile acreage PICA TPS ablator material, FMI will incorporate the developed processing methodology to produce near net-shaped cast PICA TPS material preforms with a reduced density gradient compared to baseline manufacturing techniques.

#### Company Contact

Steven Violette  
(207) 282-5911  
sviolette@fibermaterialsinc.com