

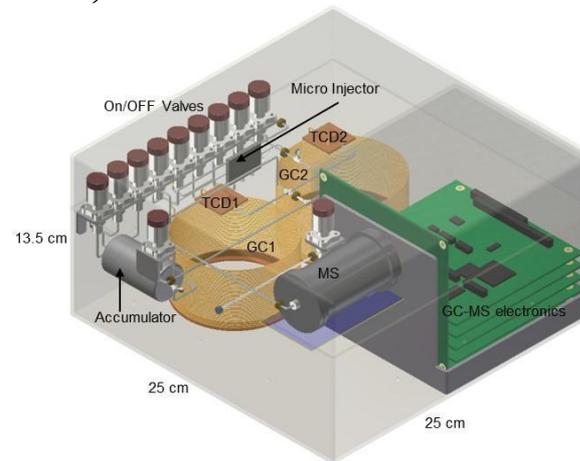
**NASA SBIR/STTR Technologies**  
**X1.01-9003 Miniature Gas Chromatograph Mass Spectrometer**  
**for In Situ Resource Utilization**  
**PI: Paul H. Sorensen**  
**Creare Incorporated – Hanover, NH**



**Identification and Significance of Innovation**

NASA's Regolith & Environment Science and Oxygen & Lunar Volatile Extraction (RESOLVE) mission to the Moon will require an instrument to analyze volatile gases. Creare's miniature GC-MS utilizes components already developed for other applications that makes it compact, low mass, and low power compared to other designs. It will be capable of detecting, identifying, and quantifying ppm to 100%-level concentrations of the compounds of interest. In addition, the system will be capable of performing GC-MS and MS only analysis, providing capabilities to separate gas samples of interest, and to analyze isotopic composition of the volatile samples.

Expected TRL Range at the end of Contract (1-9): Begin: 4, End: 6



**Technical Objectives and Work Plan**

The objective of the Phase II project is to develop, build, test, and deliver a brass board gas chromatograph mass spectrometer system (GC-MS) tailored for the RESOLVE mission to analyze volatiles evolving from a regolith sample. The GC-MS will be designed to analyze and quantify all the required gases, including saturated water vapor at 150 deg C. The system will use commercial off the shelf electronics.

We have planned four technical tasks and one management task:

- Task 1: Finalize GC-MS design
- Task 2: GC-MS thermal and structural analysis
- Task 3: Brassboard GC-MS Fabrication
- Task 4: Brassboard GC-MS Testing
- Task 5: Manage and Report

**NASA and Non-NASA Applications**

The main initial application area for the proposed gas chromatograph mass spectrometer for ISRU plants will be in NASA's future missions to the Moon and Mars, as well as other bodies such as Near Earth Objects (NEOs). The ability to analyze volatile gas mixtures in these types of plants will be critical in any NASA ISRU mission.

The primary private sector applications for a miniature GC-MS system is for performing portable chemical analysis, particularly when looking for harmful gases. The sensitive and specific sensor that we propose to develop will not only help ensure the timely generation of data for hazardous gas detection, but will also provide this capability to commercial organizations wishing to perform chemical analysis in the field.

**Firm Contacts**

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**NON-PROPRIETARY DATA**