

NASA SBIR/STTR Technologies

S1.09-9459 – Compact Vacuum Pump for Titan Lander Missions

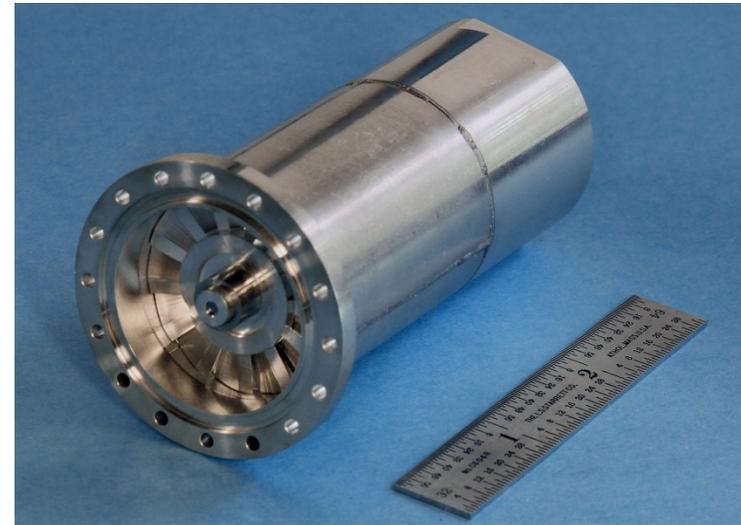


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Identification and Significance of Innovation

A compact vacuum pump is highly sought after by the science community, since it provides a hard vacuum in a compact, low-power package that can be directly used in both planetary and Earth atmospheres. Creare has developed highly miniaturized, hybrid turbomolecular/molecular drag pumps (TMP/MDPs) that are capable of generating the necessary high vacuum and directly exhaust to the Martian atmosphere. The purpose of the research conducted under this SBIR project is to design, build, and test a rough pump that can be compactly integrated with a Creare hybrid, TMP/MDP design to exhaust directly to Earth and Titan atmospheres. The Creare TMP comes in two versions: (1) a heritage unit developed under prior NASA programs, and (2) an enhanced high-flow version developed under this Enhancement project.

Expected TRL Range at the end of Contract (1–9): 5



Technical Objectives and Work Plan

The overall goal of the Phase IIE project was to develop and test an enhanced high-flow version of our standard TMP/MDP. As a result, our high-vacuum system would be able to support higher flow rates, which are often desired for portable analytical instruments. To achieve this goal, we will build on our Phase II hardware and improve performance of the existing TMP design by increasing the number of blade rows and their height. To minimize internal leakage within the pump, we plan to move toward the use of a welded stator assembly

NASA and Non-NASA Applications

Planetary atmospheric and solid sample analysis using mass spectrometers and electron microscopes include planned missions to Mars, Jupiter's moons, and the major moons of Saturn (notably Titan) and will require vacuum pump capabilities exceeding current technology. Terrestrial applications within NASA include atmospheric sampling instruments in support of several spaced-based remote atmospheric sensing systems. Another NASA application that would benefit from such a vacuum system would be an air-sampling instrument for the International Space Station. Commercial applications include portable mass spectrometer systems used for air sampling, radioactive material identification, homeland security applications, etc.

NONPROPRIETARY DATA