

# NASA SBIR/STTR Technologies

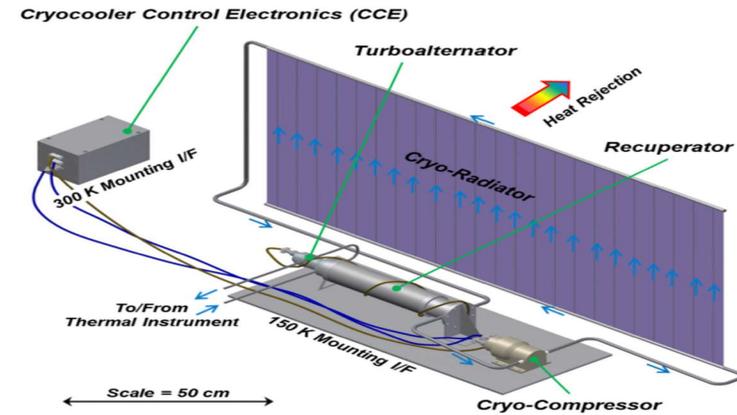
S1.07-9544 - An Ultra Low Power Cryo-Refrigerator for Space



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## Identification and Significance of Innovation

On this program, Creare proposes to develop and demonstrate an innovative cryocooler that produces refrigeration at temperatures of 30 to 70 K and rejects heat at a temperature of 150 to 210 K with extremely high efficiency. The heat rejected can be absorbed by an upper stage cryocooler or rejected to space through a small cryo-radiator. The overall mass of the cryocooler, cryo-radiator and electronics is nominally 6 kg, the area of the cryo-radiator is 0.8 m<sup>2</sup> and the input power is significantly less than current state-of-the-art cryocoolers. The electronics utilize parts that are tolerant to 300 kRad total ionizing dose. In addition, the cryocooler technology is extremely reliable and scalable, and produces no perceptible vibration.



**Ultra Low Power Cryo-Refrigerator for Space. Cryocooler was optimized to produce 300 mW of refrigeration at 35 K with 9 W of compressor power.**

Estimated TRL at beginning and end of contract: ( Begin: 4 End: 5 )

## Technical Objectives and Work Plan

On the proposed Phase II project, we will build and test a demonstration cryocooler and cryo-radiator. The demonstration system will include a combination of new and existing components. The Phase II testing will be structured to achieve a TRL of at least 5, and will include cryogenic performance testing and launch vibration testing. The cryocooler would be space-qualified during a follow-on Phase III project.

## NASA Applications

Applications include future satellites, probes and astronomical observatories utilizing superconducting bolometers, and infrared, far infrared, submillimeter and X-ray detectors. NASA missions include the Jupiter-Europa Orbiter (JEO), Wide Field Infrared Survey telescope (WFIRST), Single Aperture Far-IR (SAFIR) telescope, Space Infrared Interferometric Telescope (SPIRIT), Submillimeter Probe of the Evolution of Cosmic Structure (SPECS), and the International X-Ray Observatory (IXO).

## Non-NASA Applications

Military space applications include space-based surveillance for Operationally Responsive Space missions.

## Firm Contacts

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**NON-PROPRIETARY DATA**