

An Ultra Low Power Cryo-Refrigerator for Space
Contract No. NNX12CA39C

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<p>Identification and Significance of Innovation</p> <p>On this program, Creare developed and demonstrated 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 m² 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.</p>	
<p>Expected TRL Range at the beginning and end of Contract (1–9): 4 to 5/6</p>	<p>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.</p>
<p>Technical Objectives and Work Complete</p> <p>On the Phase II project, we built and tested a demonstration cryocooler and cryo-radiator. The demonstration system included a combination of new and existing components. The Phase II testing included cryogenic performance testing and launch vibration testing of the key structural component.</p>	<p>NASA Applications</p> <p>Applications include future satellites, probes and astronomical observatories utilizing superconducting bolometers, and infrared, far infrared, submillimeter and X-ray detectors.</p> <p>Non-NASA Applications</p> <p>Military space applications include space-based surveillance for Operationally Responsive Space missions.</p> <hr/> <p>Firm Contacts</p> <p>Mark V. Zagarola, Principal Investigator 603-640-2360; mvz@creare.com Sheryl D. Belanger, Contracts Manager 603-640-2341; contractsmgr@creare.com</p>