

## Active CryoCubeSat

### Development of a Miniaturized Active Thermal Control System for CubeSat Applications

The Active CryoCubeSat project will demonstrate an advanced thermal control system for a 6-Unit (6U) CubeSat platform. A miniature, active thermal control system, in which a fluid is circulated in a closed loop from thermal loads to radiators, will be developed. A miniature cryogenic cooler will be integrated with this system to form a two-stage thermal control system. Key components will be miniaturized by using advanced additive manufacturing techniques resulting in a thermal testbed for proving out these technologies. Previous CubeSat missions have not tackled the problem of active thermal control systems nor have any past or current CubeSat missions included cryogenic instrumentation. This Active CryoCubeSat development effort will provide completely new capacities for CubeSats and constitutes a major advancement over the state-of-the-art in CubeSat thermal control.

The active fluid loop will support removing more than 30 watts from a thermal load and a commercially produced cryocooler, suitable for CubeSats, will provide cooling for detectors to the 75-100 K range. Since the low Earth orbit (LEO) environment is generally too warm for passive cryogenic radiators, the approach of heat lifting with a combined active thermal system and a cryocooler will support the greatest diversity of future missions. Ultrasonic Additive Manufacturing in aluminum will be used to construct fluid channels and other elements within the structural chassis of the CubeSat to produce a compact system.

The Active CryoCubeSat project will expand the possibilities of CubeSat missions through the addition of advanced thermal control and management systems. This includes the ability to regulate increased power loads from elements such

as high data rate telemetry, electric propulsion, or computational systems. Such thermal control systems are needed to support future scientific missions on CubeSats requiring cryogenic cooling of miniature electro-optical instruments and will enable an entirely new generation of more advanced scientific CubeSat missions.

The Active CryoCubeSat project is led by Utah State University's Center for Space Engineering in Logan, Utah in partnership with NASA's Jet Propulsion Laboratory in Pasadena, California.

This project is funded through the SmallSat Technology Partnerships, a program within the Small Spacecraft Technology Program (SSTP). The SSTP is chartered to develop and mature technologies to enhance and expand the capabilities of small spacecraft with a particular focus on communications, propulsion, pointing, power, and autonomous operations. The SSTP is one of nine programs within NASA's Space Technology Mission Directorate.

**For more information about the SSTP, please visit: <http://www.nasa.gov/smallsats>**

**For more information on this project, contact:**

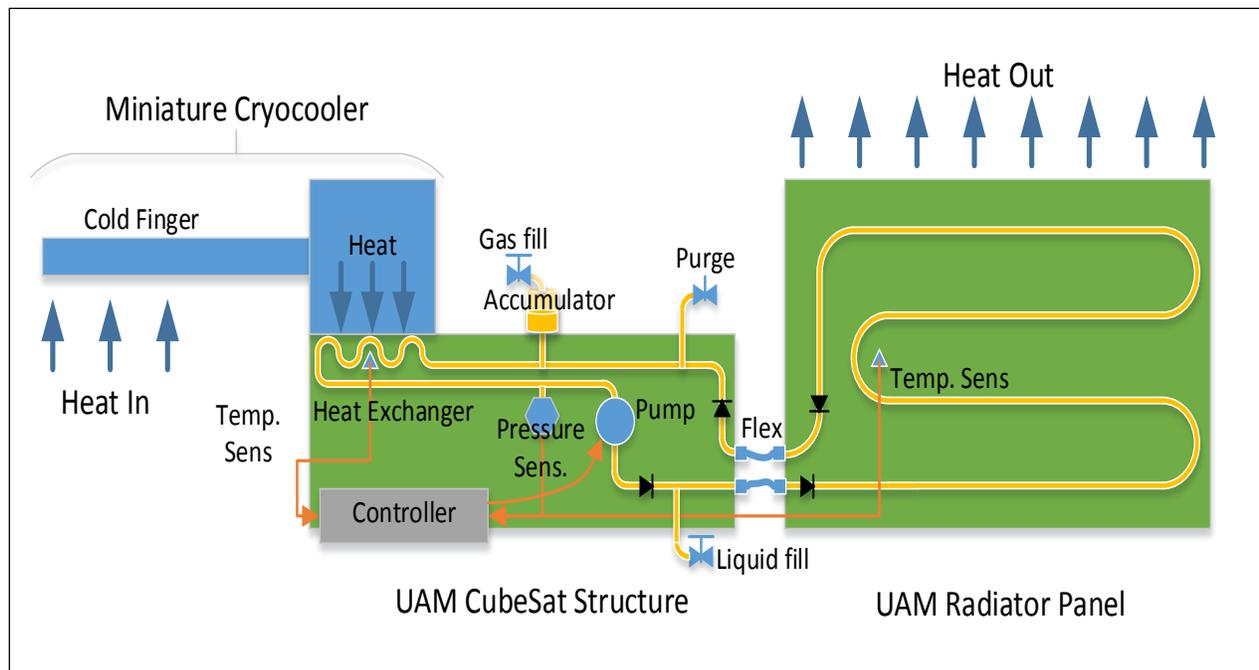
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*A conceptual diagram of the Active  
CryoCubeSat Test Bed*

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