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**CubeSat Active Thermal Control: A review of the Active CyroCubeSat (ACCS) and Advanced Thermal Architecture (ATA) Projects**

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Abstract:

Utah State University and the Jet Propulsions Laboratory have developed an advanced active thermal control technology for thermal management and support of high-powered payloads for 6U CubeSats and larger. Funded by separate NASA SSTP grants, the Active CryoCubeSat and Active Thermal Architecture projects have developed this technology into a relevant ground-based prototype and qualified it to a TRL of 6.

This technology is based on a two-stage design. A mechanically pumped fluid loop circulates a working fluid between a first-stage internal heat exchanger and a deployable tracking radiator through a flexible rotary fluid joint. A Ricor K508N tactical cryocooler forms the second stage and provides cryogenic cooling for remote sensing electro-optical systems. State-of-the-art Ultrasonic Additive Manufacturing techniques are used to simplify and miniaturize the system. This technology requires less than 3 W of input pumping power and is capable of rejecting more than 100 W of thermal load while maintaining CubeSat ambient temperatures less than 60 C while supporting the continuous operation of an integrated cryocooler, despite variations in orbit and mission, at cold tip temperatures below 90 K with 0.25 W loads. This presentation will review the performance and relevant ground-based characterization of this advanced active thermal control technology.