

Integration of a Tactical Cryocooler for 6U Hyperspectral Thermal Imager

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All of the usual considerations for spacecraft cryocooler integration, including radiation harness, exported vibration, electromagnetic interference (EMI), and heat rejection, become increasingly challenging as the size of the spacecraft decreases. Small satellites (smallsats) invariably have low power budgets due to the limited volume available for solar panels and batteries, so the thermodynamic efficiency of the cryogenic system (thermomechanical unit and cryocooler electronics) becomes a critical consideration in every design trade. Of course packaging volume, and to a lesser extent mass, is a major driver, particularly down in the CubeSat range of smallsats. This paper describes how these challenges are being addressed on an ongoing University of Hawaii-JPL led program called the Hyperspectral Thermal Imager (HyTI), which is a 6U hyperspectral spacecraft slated for launch in 2021 to perform a variety of environmental science missions. The HyTI Cryocooler System consists of an AIM SF-070 Cryocooler and a Creare Microcryocooler Control Electronics (MCCE). The selection of this approach and how it is meeting the wide range of integration challenges is discussed.