

SAGE III on ISS Lessons Learned on Thermal Interface Design

Warren Davis

NASA Langley Research Center (LaRC), Mail Stop 431, Hampton, VA 23681

Abstract

The Stratospheric Aerosol and Gas Experiment III (SAGE III) instrument – the fifth in a series of instruments developed for monitoring vertical distribution of aerosols, ozone, and other trace gases in the Earth’s stratosphere and troposphere – is currently scheduled for delivery to the International Space Station (ISS) via the SpaceX Dragon vehicle in 2016. The Instrument Adapter Module (IAM), one of many SAGE III subsystems, continuously dissipates a considerable amount of thermal energy during mission operations. Although a portion of this energy is transferred via its large radiator surface area, the majority must be conductively transferred to the EXPRESS Payload Adapter (ExPA) to satisfy thermal mitigation requirements. The baseline IAM-ExPA mechanical interface did not afford the thermal conductance necessary to prevent the IAM from overheating in hot on-orbit cases, and high interfacial conductance was difficult to achieve given the large span between mechanical fasteners, less than stringent flatness specifications, and material usage constraints due to strict contamination requirements. This paper will examine the evolution of the IAM-ExPA thermal interface over the course of three design iterations and will include discussion on design challenges, material selection, testing successes and failures, and lessons learned.