Air Force SBIR/STTR

Innovation

Air Force SBIR/STTR Success Story

Topic Number:
AF103-107

Topic Title:
Active Thermal Tile (ATT) System for Operationally Responsive Space (ORS)

Contract Number:
FA9453-12-C-0071

SBIR Company Name & location:
Infoscitex Corporation, Littleton, Massachusetts

Technical Project Office:
AFRL Space Vehicles Directorate, Kirtland AFB, New Mexico

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An example of a U.S. Air Force supported Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) developed technology that met topic requirements and has outstanding potential for the Air Force, other DoD agency, or commercial industry.

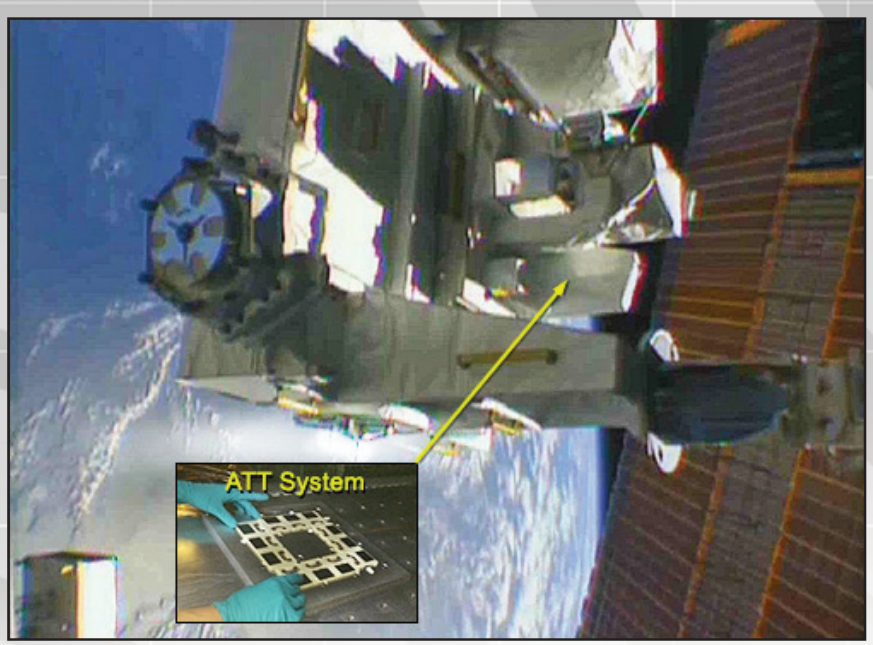

Figure 1: The International Space Station (ISS) photo depicts the use of the Active Thermal Tile (ATT) (see inset) that was part of the STP-H4 Flight Experiment. (Courtesy Photo)

Massachusetts Business Shapes Innovative Thermal Solution for Space Program

Infoscitex Corporation (IST) has developed a spacecraft thermal control solution, Active Thermal Tiles (ATT) (Fig1), which has successfully concluded its first spaceflight onboard the International Space Station (ISS) as a part of the Department of Defense (DoD)'s Space Test Program (STP) STP-H4 complement. The objectives of the STP-H4 ATT program were to measure the on-orbit performance, anchor the thermal model and measure on-orbit degradation. In September 2015, the experiment concluded after almost two years on-orbit without any performance issues or degradation.

Air Force Requirement

ATT thermal tiles meet the Air Force's requirement to provide a modular, reconfigurable thermal interface that drastically simplifies the thermal design of components and spacecraft, especially those with tight temperature requirements. Traditionally, thermal control systems must be vigorously designed, analyzed, tested and optimized from the ground up for every satellite to ensure that payloads, power systems and sensors can operate within their acceptable temperature range.

SBIR Technology

Working with the Air Force under a Small Business Innovation Research (SBIR) award, IST, a small business located in Littleton, Massachusetts, worked with the Air Force Research Laboratory in March 2012 to develop a rapidly integrated thermal control system solution for the ORS Office. Their ATT solution involved developing a tile that includes a versatile thermoelectric device, structurally robust composite frame mount and control electronics. These tiles meet ORS' challenge for timely design and integration with easily modeled performance, modular construction and reconfigurable rapid assembly during satellite construction.

The balanced design of its thermoelectric heat pump allows this reversible system to transfer heat to or from the component, which reduces dependency on survival heaters and oversized radiators. The string of ATT modules is controlled by the ATT controller which manages power, processes sensor data, executes control commands and communicates with the host. Operation of the system at a constant low power provides more efficiency than cooling systems that are not scalable and regulates temperature under various loads.

Potential Application

The primary impact for the ATT system is enabling the operationally readiness of the satellite system. Because of its reconfigurability, delays in satellite integration due to thermal control system (TCS) design are eliminated. The installation and integration with the satellite system is straightforward with modules rapidly snapped in place and bolted with the component to the structural panel. The tiles also enable thermal engineers to widen the power and temperature envelope for payloads, compensate for on-orbit system changes and reduce overall TCS costs.

Company Impact

"The STP-H4 ATT flight experiment has demonstrated that the ATT technology is ready for adoption by satellite integrators," said Jim Belcher, IST's principal investigator on the ATT program. "Now that the technology has been proven on-orbit, thermal engineers can include ATT technology in satellite thermal control systems."

In addition to developing a complete thermal control system, this versatile ATT controller hardware has many other uses for thermoelectric systems used in electronic devices and terrestrial temperature control applications.

To learn more about this company visit the IST website at http://www.infoscitex.com/.

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