Department of the Navy SBIR/STTR Transition Program

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Topic # N221-083
Conformal Two-Phase Switch for Sensor Thermal Control
Advanced Cooling Technologies, Inc.

WHO

SYSCOM: SSP

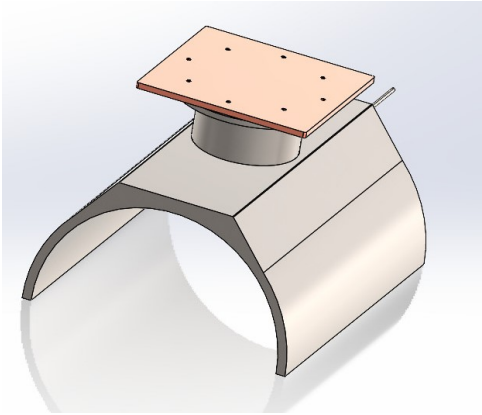
Sponsoring Program: Strategic Systems Programs (SSP)

Transition Target: High-precision sensors (including quantum sensors, inertial measurement units, inertial navigation systems), Geological resource exploration

TPOC: SSP.SBIR@ssp.navy.mil

Other Transition Opportunities:
Medical systems
Batteries
Electric Vehicles
Solar Cells
Data Centers
Space applications

Notes: Conformal thermal switch



WHAT

Operational Need and Improvement:
The Navy desires a technology that dynamically adjusts the thermal conductivity between a sensor and its environment to assist in maintaining a stable temperature with minimal power draw. The technology should be compact, robust, and easily adaptable to a variety of sensor shapes, sizes, and internal heat loads.

Specifications Required:
Sensor temperature must be maintained at 55 deg. C with a maximum 5 deg. C uncertainty for a range of environment temperatures -40 C to 85 deg. C. Sensor steady state heat load is between 1W and 50W. Sensor volume is between 2.5L and 25L. Additional volume allotted to the variable conductance system (VCS) must be less than 10 percent of the sensor volume. VCS power draw must be less than 1W.

Technology Developed:
ACT has developed a VCS that meets the requirement of the program and is easily adaptable to various sensor shapes, uses no additional power, is robust, and compact. The technology can be easily redesigned for temperature ranges other than those required by the program.

Warfighter Value:
Precise thermal management of various sensors used in military devices will give superiority to warfighters.

WHEN

Contract Number: N64267-24-C-0031 **Ending on:** Nov 24, 2025

Milestone	Risk Level	Measure of Success	Ending TRL	Date
On-conductance assessment	Medium	Overall contact resistance of less than 0.5 K/W	3	3rd QTR FY25
Develop the model for VCS design	Medium	Capability to design a VCS with any material for any condition.	3	3rd QTR FY25
Prototype 1 design complete	High	A VCS that works under scenario 1 conditions.	4	3rd QTR FY25
Prototype 1 manufactured and tested	High	Variable thermal conductivity demonstrated	4	4th QTR FY25
Second prototype manufactured and tested	High	Variable thermal conductivity demonstrated	4	4th QTR FY25
Third prototype manufactured and tested	High	Variable thermal conductivity demonstrated	4	4th QTR FY25

HOW

Projected Business Model:
The lessons learned from lab testing of the VCS by the Navy will be used in further developing the product. ACT will then start custom-designing and manufacturing the VCS for specific applications.

Company Objectives:
ACT's initial objective is to accept orders for custom manufacturing of the developed technology for specific requirement of the Navy. Additionally, after identifying the needs of other military units and civilian end-users, ACT plans to manufacture the VCS for the identified applications.

Potential Commercial Applications:
Potential commercial applications are identified as thermal management of medical devices that use precision sensors, heat rejection from electric batteries, with application in electric vehicles, thermal control of photovoltaic solar cells, localized heat rejection from components of data centers, and application in space missions. In addition, inertial measurement systems used in geological resource exploration by energy companies is a potential end-use market for the technology.

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