Department of the Navy SBIR/STTR Transition Program

Topic # N22A-T002
Multifunctional Heat Exchanger for Aerodynamic Aircraft Inlets
Candent Technologies Incorporated

WHO

SYSCOM: NAVAIR

Sponsoring Program: NAWCAD STTR Program

Transition Target: At this point in time, no Program of Record or specific weapon system has been identified as the target of this technology. However, the heat exchanger design and its embedded advanced technology would be applicable to current and future aircraft, both manned and unmanned, in particular those equipped with serpentine or long duct configuration aerodynamic turbine engine air inlets.

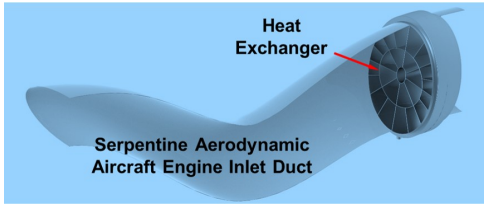

Image courtesy of Candent Technologies, Inc.

TPOC: (302) 858-2152

Other Transition Opportunities: Another potential transition opportunity is the application of the heat exchanger technology, and the multi-objective optimization/multi-physics design tools developed for the optimization and design of the heat exchanger system, to compatible turbine engine powered weapon system aircraft pods, or similar internal systems on board larger airframes carrying large numbers of weapons systems with electronics or directed energy weapons generating substantial waste heat loads. Candent is in contact with interested major Primes in the aerospace and defense sector

Notes: The heat exchanger system shown in the graphic above weighs less than 50 lbs and has the capability to dissipate well in excess of the Soliciation requirement of 20kW.

WHAT

Operational Need and Improvement: Modern military aircraft increasingly need better and more numerous capabilities enabled by electronic systems, which require more power to function and more heat rejection from the system, with an equally growing number and size of heat exchangers on board the aircraft. Typical turbine engine inlets have large air flow and can be used to simplify and integrate Thermal Management into a smaller and more effective system. While inlet guide vanes might be used, the required alterations come with larger volumes, greater weight, flow blockage, separation, pressure losses, and inlet distortion. Solutions are sought for a new heat exchanger technology that can simultaneously improve inlet diffuser aerodynamic performance and heat transfer effectiveness. The proposed technology needs to be fully understood to ensure gas turbine engine compatibility and enable future, advanced Navy propulsion systems

Specifications Required: The solution will be required to demonstrate the following criteria:
- Heat exchanger effectiveness greater than, or equal to, 0.4.
- A total pressure drop across the heat exchanger no greater than 8%.
- A decrease in the element average circumferential and radial distortions as defined in SAE AIR 1419C.
- The front face of the heat exchanger positioned no more than two (2) diameters upstream of the Aerodynamic Interface Plane (AIP).

Though not required criteria, proposed solutions are encouraged to consider impacts (e.g. maintainability, performance, weight (<50lbm total)) and capabilities on the turbine engine and air platform as a whole. Candent's design will meet all Threshold and Objective requirements.

Technology Developed: In Phase I Candent completed the conceptual and preliminary design of a fully compliant, optimized, compact, lightweight, high effectiveness heat exchanger, compatible with installation in a serpentine aerodynamic turbine engine air inlet duct. For greatly improved safety, the system utilizes a non-flammable coolant solution in lieu of aircraft fuel and is designed with due consideration of full and optimum airframe integration, including such aspects as aerodynamic and mechanical design, as well as aircraft stealth characteristics. The design and development of multi-objective optimization tools, closely coupled with multi-physics analysis and CAD capability, has been continued and refined during the Phase II program. Final design completion is imminent, which will lead to prototype construction, wind tunnel aerodynamic testing, and thermodynamic rig testing.

Warfighter Value: The technology under development by Candent will greatly enhance the capability of aircraft to incorporate more electronic weapons systems onboard, as the greater heat rejection capacity will provide the means to operate additional systems, thus increasing lethality, stealthiness, and survivability of the aircraft while minimizing the required numbers of heat exchangers and any detrimental effect on the aircraft's propulsion system.

WHEN

Contract Number: N68335-24-C-0216 **Ending on:** Mar 31, 2026

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Phase I, Multi-Objective Optimization & Multi-Physics initial boundary conditions	Medium	Multi-Objective optimization & Pareto analysis yield viable/compliant designs	4	4th QTR FY23
Phase II Optimization and Physics integration with CAD + additional design constraints	Medium	Algorithms/multi-physics analysis, coupled with CAD Pareto to produce optimum design configuration/Final design	4	4th QTR FY25
Phase II Prototype Aerodynamic and Thermodynamic Testing	Medium	Prototype aerodynamic wind tunnel tests and heat transfer rig test results meet stated test plan objectives	5	2nd QTR FY26

HOW

Projected Business Model: Commercialization involves marketing through conferences, trade shows, and expositions, such as Sea Air Space (SAS) and NAVAIR FST Event, using Navy STP facilitation. The recent acquisition of Candent by Bascom Hunter Technologies, a larger company with excellent engineering, R&D, and experience transitioning SBIR Phase II programs to Phase III, confirms plans to produce all models and variants for various aircraft in the US fleet, including manned and unmanned, through LRIP and FRP.

Company Objectives: The objective of the commercialization plan is to secure and expand its current market position and continue production of thermal management systems and devices for dual use aerospace and defense applications.

Potential Commercial Applications: Although no specific application has been confirmed at this time, Candent will pursue potential use on commercial aircraft, fixed wing, and other, unconventional configuration, as well as manned and unmanned aircraft.

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