



Facility Factsheet

Two-phase (Φ) Thermal Energy Management System (ToTEMS)

Description:

Component and control architectures are tested in a flexible two-phase vapor cycle system (VCS). The ToTEMS VCS is one portion of an overall advanced vehicle thermal management system (TMS). The ToTEMS test rig enables testing and evaluation of new thermal VCS component technologies and energy optimizing control architectures. This effort supports future warfighter needs in areas such as aircraft and directed energy weapons (DEWs).



- Compressor Capacity – 50+kW
- Liquid Loads (simulated PAO) – 18 kW
 - Capable of utilizing multiple independent dissimilar loads
- Heat Sinking Capacity – 50 kW (liquid or fuel simulation)
- Growth capabilities include:
 - Loads (liquid and direct electrically heated)
 - Heat sinks – such as air cooled condensers
 - Multi-stage compression
 - DEW simulated transient load
 - Virtual link to power generation demonstrator

New adaptive control architectures are essential to the realization of energy optimized TMSs. The ToTEMS objective is to adaptively select the energy optimized VCS operating cycle for a particular application from varying external and internal constraints.

Purpose and Products:

The overall mission includes: (1) specification of the VCS control architecture for energy optimized aircraft systems of the future, (2) simulation and validation of the aforementioned optimum seeking control architectures, (3) validation of transient responses for highly coupled electrical and thermal system in a realistic hardware environment, (4) and the validation of transiently predictive thermal system models.

Availability:

Primarily in-house and related DoD contractor research. Other U.S. Government agency, DoD contractor and commercial customer programs upon request. Contact: 937-255-4275.