Variable Cycle Advanced Technology (VCAT)

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At a Glance

What is it?

- The VCAT Program will identify and mature critical, relevant variable/adaptive cycle turbine propulsion technology for future carrier-based TACAIR/ISR systems resulting in dramatic performance and capability improvements.

How does it work?

- The VCAT Program is working with Industry experts to conduct systems analyses and Navy-unique/important turbine engine technology development options for future naval aviation platform capability desires.
- These efforts are leveraging the Air Force's ADVENT variable/adaptive cycle engine S&T demonstration effort and other VAATE efforts; VCAT is a part of an overall integrated propulsion, power and thermal management system (IPPTMS) requiring further S&T maturation.

What will it accomplish?

- Advancements in propulsion system technology are essential to meet desired Warfighter goals for future carrier-based TACAIR/ISR systems.
- Enhanced energy security for naval aviation and the Nation has been, and will continue to be, an important part of the VCAT Program's vision for the future.

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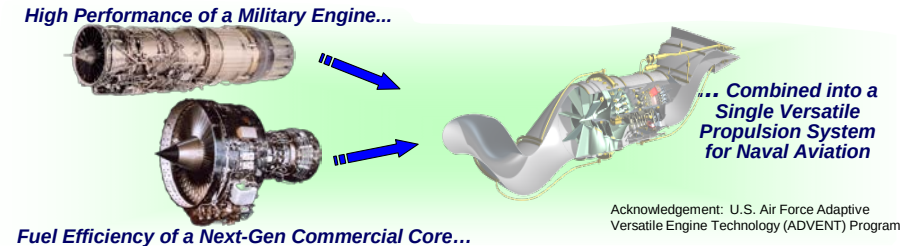

Acknowledgement: U.S. Air Force Adaptive Versatile Engine Technology (ADVENT) Program

The Variable Cycle Advanced Technology (VCAT) Program is a partnership effort between ONR and the Department of the Navy's Task Force Energy (TFE) initiative to realize the potential benefits of recent advancements in variable/adaptive cycle turbine engine technology. Advancements in propulsion system technology are essential to meet desired Warfighter needs for future carrier-based Tactical Aircraft (TACAIR)/Intelligence, Surveillance and Reconnaissance (ISR) systems. This program was conceived to provide the anticipated enhanced mission capability, energy security, and jet noise reduction requirements expected of future TACAIR/ISR systems.

In close coordination with NAVAIR and the overall Naval Aviation Enterprise, the VCAT Program objectives are to identify and mature critical, relevant variable/adaptive cycle turbine engine technologies for future carrier-based naval aviation systems. However, for the Navy to realize that potential capability, marinization/carrier suitability attributes must be addressed. Details of technologies associated with those suitability attributes were defined in a systems analysis effort titled "VCAT Application Studies" beginning in FY11. These studies are being executed with the primary Weapon System Contractors and Original Equipment Manufacturers for military turbine engines. Technology development efforts are to begin in FY12.

Projected VCAT engine technology benefits for future carrier-based aviation systems are showing dramatic capability improvements in range and loiter capability for selected conceptual platforms/missions. The benefits are primarily due to improved thermal and propulsive efficiencies from advanced material/component technologies as well as from the variable/adaptive engine features. Aligned with TFE goals for reducing fuel consumption, results showing reduced specific fuel consumption also offer the potential for significant reductions in both annual fuel costs and logistics tail (i.e., less demand for deployed fuel and tanker aircraft support).

Research Challenges and Opportunities:

- Aerodynamic and mechanical sizing of variable/adaptive engine technologies for naval aviation applications
- Naval aviation propulsion-unique challenges:
  - Catapult/trap Loads
  - Low speed thrust response, for approach, wave-off and bolter
  - Environmental and corrosion resistance in a marine environment
  - Takeoff water/steam ingestion
  - Carrier-based Electromagnetic Environmental Effects (E^3)
  - Carrier susceptibility to jet exhaust impingement
  - Dimension and weight constraints to meet aircraft/ship integration requirements
  - Onboard maintainability and supportability