649 TEST SYSTEMS SQUADRON

MISSION

LINEAGE
649 Test Systems Squadron

STATIONS

ASSIGNMENTS

COMMANDERS

HONORS
Service Streamers

Campaign Streamers

Armed Forces Expeditionary Streamers

Decorations

EMBLEM

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OPERATIONS
In fiscal year 2008, the 649th Test Systems Squadron (TESS) carried out technology development programs worth approximately $35 million. To successfully execute this program and meet a variety of test customer needs, the squadron has emphasized collaborative relationships that integrate and leverage technical expertise and various funding programs.

Working across AEDC and in coordination with internal and external customers, the 649th TESS identifies requirements that can potentially be met through technology development. The squadron then leverages the Small Business Innovative Research (SBIR), Test and Evaluation, Science and Technology (T&E/S&T), and the Air Force Office of Scientific Research (AFOSR) programs to mature and demonstrate many of the technologies. Once a technology has been shown to have potential, the squadron will then apply internal AEDC T&E, reimbursable outside customer or CTEIP funding to improve and transition the technology to AEDC mission areas. Technical expertise and advancements are also obtained through collaborative ventures with many organizations.

Direct test systems/facilities restoration, modernization, and improvement projects to deliver AEDC RDT&E capability. Direct applied test technology and analysis programs for improving RDT&E facilities, test techniques, instrumentation, analysis and evaluation capabilities. Manage the AEDC systems engineering process.

The Flight Systems technology development program included wind tunnel flow and trajectory visualization, computational fluid dynamics (CFD), pressure sensitive paint and model attitude and deformation. Particle Image Velocimetry (PIV) technology (a non-intrusive flow measurement technique) was demonstrated in collaboration with San-dia National Laboratory and NASA Glenn Research Center. When combined with CFD, the "off-body" flow interactions (such as vortices impacting the tail surfaces) can be better characterized.

The Aeropropulsion technology developments were focused on aerodynamic and structural modeling, emissions characterization, inlet distortion simulation as well as intrusive and non-intrusive diagnostics. AEDC's technology personnel collaborated with the Air Force Flight Test Center to integrate ground test analysis techniques with flight test data. Additional collaborations with AFRL and Tinker AFB, Okla., resulted in the development of an alternative fuels certification testing technique for synthetic fuels.

AEDC was recognized by Research & Development Magazine for a top 100 technology advancement award for the Rumble and Screech Spectral Mapping Analysis Tool (RASSMAT). RASSMAT was jointly developed by AEDC and Advanced Fuel Research, Inc. under the SBIR program. When fully implemented, RASSMAT will support engine health monitoring and augmenter instability testing at a significant cost savings to the government.

Space and Missile technology emphasis was on high enthalpy material erosion visualization, hypersonic flow characterization, arc heater segment technologies, space sensor scene generation and space environments characterization. Four hypersonic probes were developed under the T&E/S&T program and prototypes were tested in hypersonic facilities. These optical and flow field probes are designed to withstand continuous exposure to high speed and high temperature environments and will help more accurately characterize test results.

In support of test facility and plant operations and maintenance, technologies are being explored that improve facility controllability, allow remote equipment and valve monitoring, and predict

maintenance actions based on acoustical equipment monitoring. This year, the Non-intrustive Stress Measurement System (NSMS), developed by AEDC for aero-propulsion engine monitoring, was adapted to support facility health monitoring in both the 16T wind tunnel main compressor and the NFAC compressors.

A major part of the program was core technologies that have joint application across the mission areas or those technologies with projected payoffs five to 10 years in the future. These technologies include the introduction and integration of new sensor technology into the production environment, reducing test installation time and improving system performance and reliability. Advanced turbulence modeling will improve the store separation accuracy for advanced aircraft and prediction of aerodynamic flow fields for inlets.

The fiscal year 2009 workload for the 649th TESS is very comparable to the fiscal 2008 workload. Collaboration will continue with the SBIR, T&E/S&T and AFOSR programs as well as with our other technology development partners. Additionally, AEDC will continue to support a CTEIP project called Towed Airborne Plume Simulator (TAPS). The 649th TESS is supporting the Center for Countermeasures to develop the TAPS burner and control system as well as providing the ground test development facilities. TAPS will be used in flight test to simulate missile launches, which will allow airborne sensors like those in the Large Aircraft Infrared Countermeasures system to be tested more realistically.

Providing faster and cheaper analysis of customer test data while continuing to refine the integration of computational tools will be key parts of the squadron program. The program will include facility and plant modeling, distortion modeling, high cycle fatigue instrumentation and test methods, force balance accuracy improvement, captive trajectory and store separation modeling, on-line data validation for dynamic wind tunnel testing, arc heater performance improvement, hypervelocity range launch technologies, data warehousing and space chamber and sensor test technology.

Air Force Lineage and Honors
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Sources
Air Force Historical Research Agency. U.S. Air Force. Maxwell AFB, AL.