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Success Story

COMPRESSOR RESEARCH FACILITY ADDS HEATED INLET CAPABILITY



A new heated inlet capability in the Propulsion Directorate's Compressor Research Facility (CRF) will allow researchers to operate fans and compressors undergoing testing at the actual mechanical speeds experienced in operational engines. Testing with the heated inlet allows researchers to continue matching aerodynamic parameters while matching the actual mechanical speeds encountered in an engine environment more closely. This increases the quality of aeromechanic data collected and is important for evaluating new materials and structures for use in fans and compressors.



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Accomplishment

Directorate engineers successfully demonstrated a new heated inlet capability during a test of an advanced military fan developed as part of the Integrated High Performance Turbine Engine Technology (IHPTET) program. This new capability recirculates hot exhaust gas from the test compressor back into the incoming atmospheric air, resulting in elevated inlet temperatures up to 750°F and enhancing CRF's ability to simulate engine conditions more realistically.

Background

The CRF is a steady-state facility capable of testing full-scale fan and compressor hardware-simulating engine properties based on aerodynamic similarities. It is used to determine the performance of the most advanced compressors and fans in the world, while enhancing the understanding of their complex internal flow physics.

Previously, fans and compressors were tested at aerodynamically corrected conditions. These tests resulted in lower rotational speeds than would be experienced in actual engine environments, although these test conditions correctly matched the aerodynamic performance.

The heated inlet was first used in the structural evaluation of the highly successful Pratt & Whitney XTE67 Fan Test program. It was used to elevate the mechanical speed of the compressor to investigate potential flutter conditions. With the new heated inlet capability, the CRF can fully support the compression system objectives and goals of IHPTET and turbine engine affordability initiatives of the Versatile Affordable Advanced Turbine Engines program better. Aeromechanical data collected in the CRF is also important to increase the performance of engines, as well as increase understanding of high cycle fatigue requirements.

Propulsion
Support to the Warfighter

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (03-PR-29)