

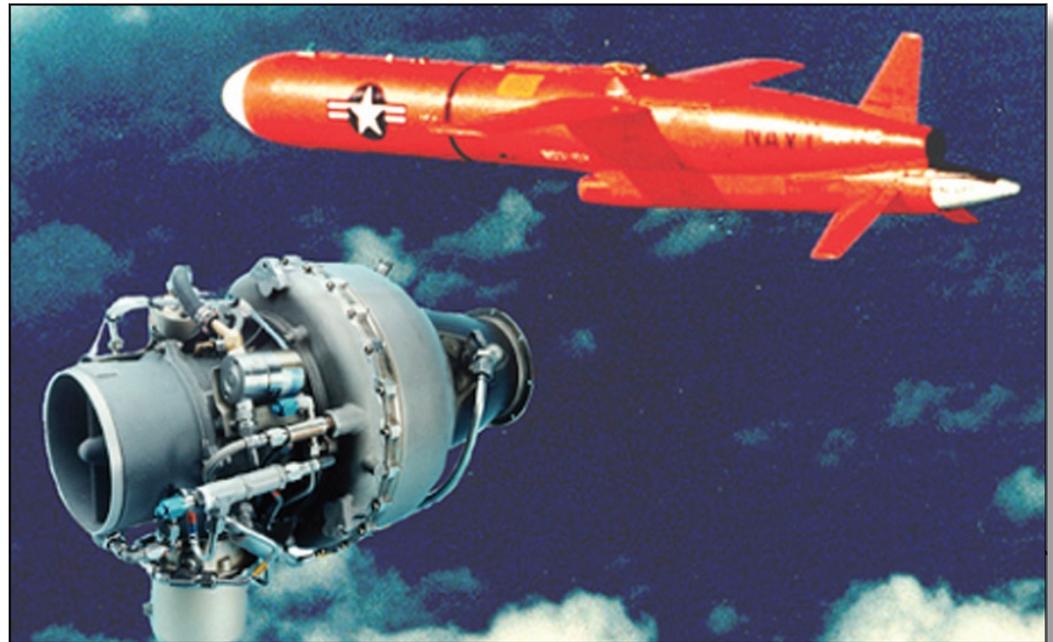


Air Force Research Laboratory | AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

COMPLIANT FOIL BEARINGS FOR ADVANCED OIL FREE TURBOMACHINERY SUCCESSFULLY TESTED



Compliant foil bearings support the rotor on a hydrodynamic air film, eliminating the need for rolling element bearings and the associated liquid lubrication system. Potential benefits for turbomachinery include increased rotational speed and operating temperature, improved storability, reduced maintenance, decreased life-cycle costs, and a 30% reduction in cruise missile engine cost and weight.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

Mohawk Innovative Technology, Inc. (MiTi®) of Albany, New York, and Williams International (WI) jointly funded an Independent Research and Development effort to demonstrate a compliant air foil journal bearing in a WJ24-8 turbojet engine. This bearing is similar to the one developed for WI's Joint Expendable Turbine Engine Concept (JETEC) engine demonstrator (XTL-87).

The WJ24-8 is a 240-pound thrust single spool turbojet that provides propulsion for the US Navy BQM-74 target drone. Fuel lubricates the WJ24-8's forward bearing, while oil mist normally lubricates the aft bearing.

In the demonstration test, WI engineers replaced the aft bearing and oil mist system with a MiTi airfoil journal bearing. The ongoing engine test program has accumulated over 12 hrs of cyclic and mission simulation testing with operation to maximum design speed and gas temperature and 70 start-stop cycles.

A preliminary post-test analysis of bearing hardware revealed no evidence of wear. Testing will continue to quantify benefits, such as reduced power loss, and investigate bearing life issues. WI estimates that this modification could reduce the cost of the WJ24-8 by as much as 20%. Propulsion Directorate researchers and WI engineers may use this test data to assess the applicability of foil bearings to other gas turbine engines for both military and commercial systems.

Background

The directorate recently completed a Phase II Small Business Innovation Research program called "Compliant Foil Bearings for Advanced Oil Free Turbomachinery" with MiTi. This program successfully developed and rig-tested a high-speed foil bearing for demonstration in WI's Integrated High-Performance Turbine Engine Technology Phase III JETEC XTL-87.

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-20)

Propulsion
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