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Science and Technology for Tomorrow's Air and Space Force

Success Story

JOINT TESTING DEMONSTRATES ABILITY TO MEASURE STRESSES INSIDE TURBINE ENGINE



The capabilities of the fourth-generation nonintrusive stress measurement system (NSMS) were demonstrated during tests of an AE3007 turbine engine conducted at Allison Advanced Development Company in Indianapolis, Indiana. The successful test opens the door for a reduction of costs for developmental engines and allows the US and the United Kingdom (UK) to exchange engine vibration data relevant to the Joint Strike Fighter engine acquisition program.



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Accomplishment

The Propulsion Directorate's Propulsion Instrumentation Working Group, a government and industry collaboration, developed the US system as a replacement for older systems that could not measure the main drivers for high-cycle fatigue (HCF) damage in turbine engines. The test was a joint effort between the US and the UK to compare respective measurement systems used to support the investigation of HCF in military turbine engines.

The test demonstration compared the capabilities of the US NSMS and the UK system, known as Tip Timing, developed by Rolls-Royce. During the test, these novel systems each monitored the same components simultaneously while conventional direct-reading strain gauges recorded stress measurements. The test results showed that the two new systems were quite comparable to each other and that both were very close to the strain gauge data. This joint compatibility testing was a rare opportunity for the US and UK to compare stress measurement systems at a single reference point to better support future turbine engine development programs.

Background

Over the past several years, the HCF program has been responsible for providing solutions for many difficult turbine engine developmental and in-service fatigue-related failure problems. Compatibility testing of the NSMS and the Tip Timing stress measurement systems is yet another notable accomplishment under this program.

Propulsion
Support to the Warfighter

Additional information

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