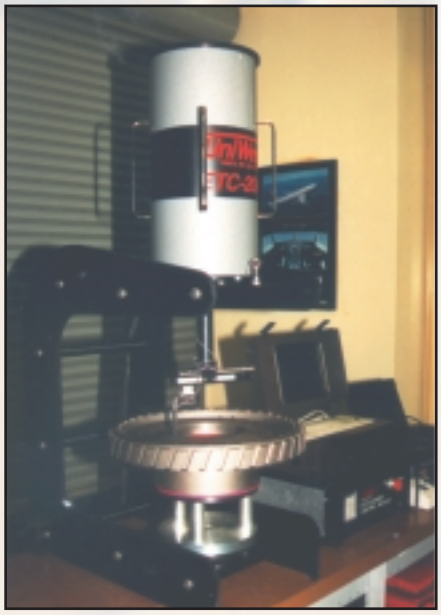
FAA Engine Titanium Consortium

The FAA established the Engine Titanium Consortium (ETC) in 1993 to respond to recommendations made by the FAA Titanium Rotating Components Review Team (TRCRT) for improvements in inspection of engine rotating components.



The ETC was established with the objective of providing the FAA and engine manufacturers with reliable and cost-effective new methods and/or improvements in mature methods for detecting cracks, inclusions, and imperfections in titanium material and components. This program also involves the material manufacturers and the airlines. The work of the consortium is being expanded to include critical rotating parts made of nickel alloys The ETC consists of a team of researchers from academia and industry: the participating organizations are Iowa State University, General Electric Aircraft Engines, Honeywell, and Pratt & Whitney. Major advancements are being made in the industry's ability to inspect critical rotating components both in production and in-service.

The ETC program was formulated with two distinct phases. In Phase I the ETC addressed the high-priority specific recommendations of the 1990 TRCRT report. Phase I, completed in 1998, was a 5-year effort focused on developing an understanding of the fundamental material properties of titanium and hard alpha defects as they relate to their response to ultrasonic interrogation, developing billet inspection technology, developing tools for the detection of fatigue cracks typical of those that might emanate from hard alpha inclusions, and developing and applying tools to assess the reliability of inspection of anomalies. Shown above is a portable scanner that has been developed for use in airline overhaul and maintenance shops. The portable scanner consists of a generic mechanical scanning system with application specific tooling for probe positioning and manipulation. Adapter plates are used to mate the mechanical scanning system to a variety of engine disks by using the bolt hole patterns to align the system to specific disks.

An enhanced ultrasonic technique was developed and implemented to detect defects in the titanium billet material used to manufacture engine rotating components. The system has demonstrated a four-fold improvement in defect detection compared to the current inspection and detected a defect that was missed by the conventional inspection system. The new inspection technique will decrease the possibility of engine failure due to undetected anomalies and increase the reliability and efficiency of inspection procedures for engine critical components.

Safety

An industry-wide ultrasonic billet inspection specification based on the new technique was developed and approved by the Society of Automotive Engineers (SAE) Committee K and the SAE Aerospace Council.

Phase II of the ETC Program is focused on leveraging the technologies and tools developed in Phase I for application to other critical materials and applications.

Phase II is currently planned as a five year effort. The production inspection area involves development of nickel billet and titanium forging inspection systems, as well as further increases in the sensitivity of inspections of titanium billet. Further advancement of in-service inspection tools to address emerging needs will be developed and the extension of reliability assessment methodologies to other applications including in-service eddy-current inspections will be continued.

Throughout Phase II, which began in the summer of 1999, the ETC will continue to coordinate and cooperate with organizations pursuing related efforts. These organizations include the Rotor Integrity Subcommittee (RISC), the Jet Engine Titanium Quality Committee (JETQC), the Special Metals Processing Consortium (SMPC), the Rotor Manufacturing Subcommittee(RoMan), and the Air Transport Association's Nondestructive Testing (ATA NDT) Network.

To find out more about the FAA Engine Titanium Consortium, contact:

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