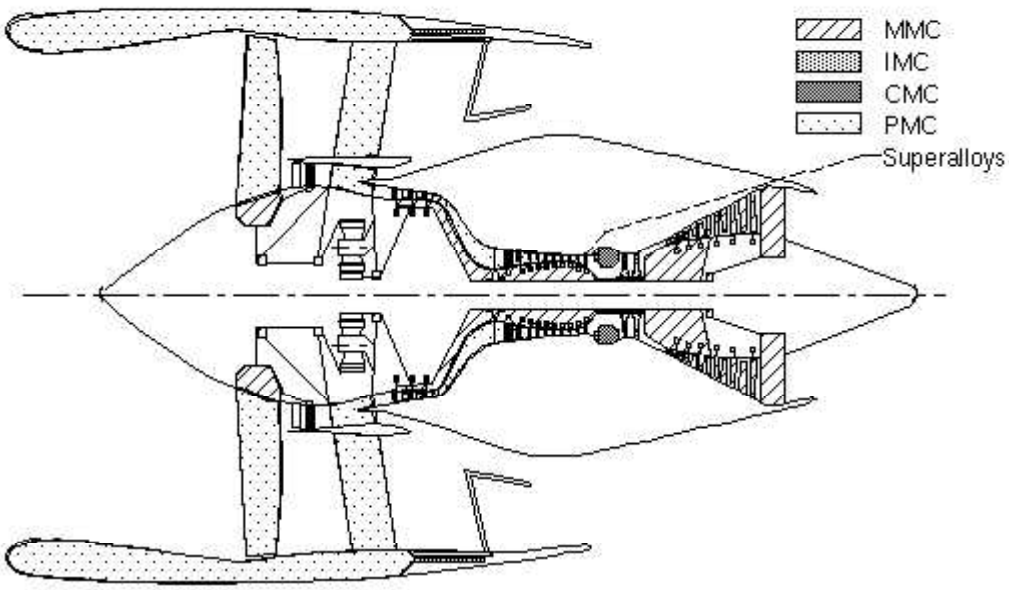
Advanced High-Temperature Engine Materials Technology Progresses



Advanced materials for 21st century civil propulsion systems with greatly increased fuel economy, improved reliability, extended life, and reduced operating costs.

The objective of the Advanced High Temperature Engine Materials Technology Program (HITEMP) is to generate technology for advanced materials and structural analysis that will increase fuel economy, improve reliability, extend life, and reduce operating costs for 21st century civil propulsion systems. The primary focus is on fan and compressor materials (polymer-matrix composites--PMC's), compressor and turbine materials (superalloys, and metal-matrix and intermetallic-matrix composites--MMC's and IMC's) and turbine materials (ceramic-matrix composites--CMC's). These advanced materials are being developed by in-house researchers and on grants and contracts.

NASA considers this program to be a focused materials and structures research effort that builds on our base research programs and supports component-development projects. HITEMP is coordinated with the Advanced Subsonic Technology (AST) Program and the Department of Defense/NASA Integrated High-Performance Turbine Engine Technology (IHPTET) Program. Advanced materials and structures technologies from HITEMP may be used in these future applications.

Recent technical accomplishments have not only improved the state-of-the-art but have wide-ranging applications to industry. A high-temperature thin-film strain gage was developed to measure both dynamic and static strain up to 1100 C (2000 F). The gage's unique feature is that it is minimally intrusive. This technology, which received a 1995 R&D 100 Award, has been transferred to AlliedSignal Engines, General Electric

Company, and Ford Motor Company. Analytical models developed at the NASA Lewis Research Center were used to study Textron Specialty Materials' manufacturing process for titanium-matrix composite rings. Implementation of our recommendations on tooling and processing conditions resulted in the production of defect-free rings. In the Lincoln Composites/AlliedSignal/Lewis cooperative program, a composite compressor case is being manufactured with a Lewis-developed matrix, VCAP. The compressor case, which will reduce weight by 30 percent and costs by 50 percent, is scheduled to be engine tested in the near future.

The annual review of the HITEMP program was held October 24 to 25, 1995. Details of research accomplishments are published in the conference report HITEMP Review 1995, NASA CP-10178. (Available to U.S. citizens only. Permission to use this material was granted by Hugh R. Gray, January 1996.)