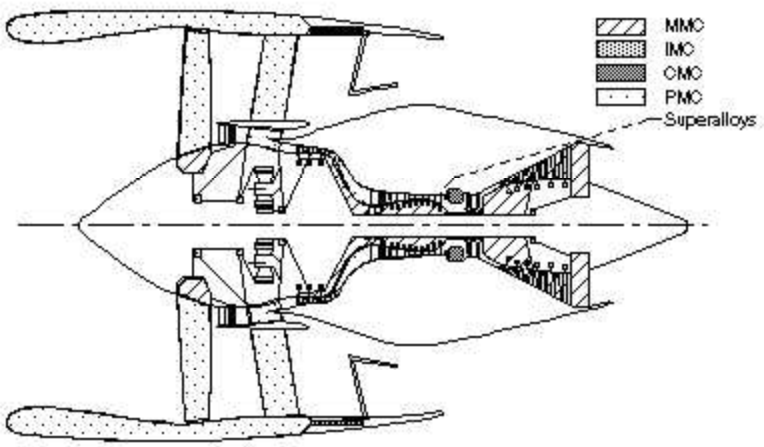
Advanced High-Temperature Engine Materials Technology Progresses

The objective of the Advanced High Temperature Engine Materials Technology Program (HITEMP) at the NASA Lewis Research Center 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 in-house by Lewis researchers and on grants and contracts.

NASA considers this program to be a focused materials and structures research effort that builds on our basic 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 for industry. An oxidation-resistant coating was developed that is chemically compatible with a TiAl-base alloy. The coating, optimized for toughness and oxidation resistance, is being evaluated in a cooperative program with the Allison Engine Company for future turbine engine applications. Our patented "Single Transducer Ultrasonic Imaging Method That Eliminates the Effect of Plate Thickness Variation in the Image" won a 1996 R&D 100 Award. Another product of HITEMP research, the computer code CEMCAN (Ceramic Matrix Composite Analyzer), was released to COSMIC for commercialization, and several other developmental codes were released to industry via software release agreements. In the Lincoln Composites/AlliedSignal/Lewis cooperative program, a composite compressor case, which was manufactured with the Lewis-developed matrix VCAP, is currently being rig tested at AlliedSignal Inc. to demonstrate the feasibility of VCAP in a high-temperature (500 °F) environment typical of jet engine applications.

The next annual review of the HITEMP program will be held April 29-30, 1997. Details of research accomplishments will be published in a conference report that will be available at the conference, which is open to U.S. citizens only. *(Permission to use this material was granted by Hugh R. Gray, January 1997.)*



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