MATERIAL TECHNOLOGY

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Advanced high pressure O_2/H_2 propulsion systems as exemplified by the Space Shuttle Main Engine (SSME) create challenging operating environments for materials. For example, the high pressure fuel pump turbine materials are subjected to thermal transients without precedent in man-rated reusable turbomachinery. Many components operate in either hydrogen or hydrogen-steam environments which may significantly degrade the performance of common alloys. These difficult operating conditions have caused a variety of durability concerns for this class of propulsion system.

The objective of the materials technology projects is to develop and evaluate candidate materials for application in advanced high pressure O_2/H_2 propulsion systems. These new and improved materials are to improve the durability or performance of the SSME or derivative engine.

The program includes projects on the following topics:

Hydrogen Resistant Alloys
High Pressure O_2 Ignition and Burning
Improved Turbine Blades
Improved Turbine Disk Material
Impact Reactivity in High Pressure O_2
Fiber Reinforced Superalloys

Advanced Coating Techniques
Advanced Turbopump Blade Materials Analysis
Weld Cracking in Inconel 718
Bearing Alloys for Cryogenic Applications

The papers that follow will include papers on: turbopump blade materials, effects of hydrogen on alloys, effects of oxygen on both metals and elastomers, understanding of microstructural relationship to weld cracking in Inconel 718 and requirements for advanced turbopump bearings. These papers are from industry, university, and government sources reflecting the integrated nature of our program which attempts to include work done in a variety of laboratories throughout the country.