

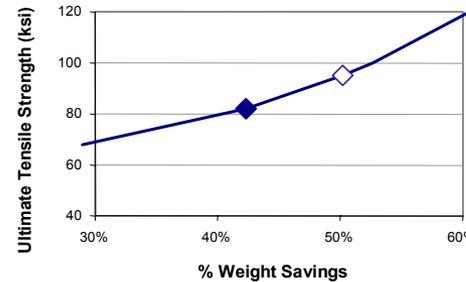
Rapid Manufacture of Combustion Chambers

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Proposal No: X7.02-9732

Identification and Significance of Innovation

- Potential for 160 lbs wt savings on Main Combustion Chamber of the space shuttle main engine, Block 2 design with replacement of nickel based superalloy with reinforced aluminum.
- Preliminary mechanical test data indicates that discontinuous fiber reinforced aluminum (FRA) can replace superalloys.
- Triton FRA exhibits a weight specific strength that is nearly 60% greater than the current combustion chamber jacket/manifold material, Inconel 718
- Projections from existing data for FRA's suggest that over 3% minimum elongation is attainable.



Fiber Reinforced Aluminum Benefits

- >50% weight savings
- 3-5% elongation
- Possible replacement for nickel superalloys

Technical Objectives

- Identify key material performance requirements,
- Conduct a study to determine material property trade-offs.
- Perform experiments to determine effects of preform architecture on FRA properties.
- Determine the effect of infiltration pressure on properties.
- Provide a correlation between predictive and test properties.
- Demonstrate fiber preform compatibility with affordable, low-pressure casting processes.

Work Plan

1. Component Selection and System Performance Definition.
2. Materials Trade-off and Analysis.
3. Specimen Fabrication.
4. Testing and Analysis.
5. Manufacturing Assessment.
6. Program Review and Reporting

NASA and Non-NASA Applications

Triton's proposed approach will support critical next generation launch requirements for weight savings, improved thrust to weight ratios and reduced hardware and manufacturing costs. Potential to replace the nickel based superalloy in the main combustion chamber of the space shuttle main engine, Block 2 design. Potential commercial applications include: engine components, electronic packaging, space structures, machine components, engine blocks and brake components.

Firm Contacts

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