

## Creating Low Density Flexible Ablative Materials

NASA has created a new approach to make a low density flexible ablative Thermal Protection Surface (TPS) material. The material is foldable and can be stowed in space for very long periods of time (years) without compromising deployability or performance. These flexible ablaters offer an alternative to rigid TPS materials thereby reducing design complexity associated with rigid TPS materials resulting in reduced TPS cost. The low density flexible ablator is unique in that the material retains its flexibility after charring. The charred material has similar flexibility and strength to the virgin material. This is in contrast to other flexible ablator concepts where a stiffer char is produced during heating.

This technology is available for licensing from NASA's space program to benefit U.S. industry.

### Technology Details

The low density flexible ablator can be deployed by mechanical mechanisms or by inflation and is comparable in performance to its rigid counterparts of the same density and composition. Recent testing in excess of  $400\text{W}/\text{cm}^2$  demonstrated that the TPS char has good structural integrity and retains similar flexibility to the virgin material, thereby eliminating potential failure due to fluttering and internal stress buildup as a result of pyrolysis and shrinkage of the system. These flexible ablaters can operate at heating regimes where state of the art flexible TPS (non-ablative) will not survive. Flexible ablaters enable and improve many missions including (1) hypersonic inflatable aerodynamic decelerators or other deployed concepts delivering large payload to Mars and (2) replacing rigid TPS materials thereby reducing design complexity associated with rigid TPS materials resulting in reduced TPS costs.

### Commercial Applications

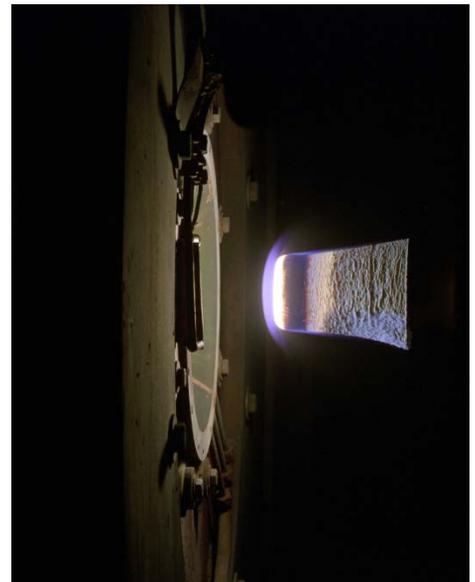
- Aerospace Engineering
- Spacecraft
- Furnace refractory manufacturing
- Thermal Management

### Patent

This technology is protected by a pending U.S. Non-Provisional Patent Application. (Reference No. ARC-16607-1)

### Benefits

- Flexible ablaters have significant design, system integration and performance advantages
- Allows for reduction in piece-parts
- Ease of assemble
- Enables larger diameter aero-shells
- Eliminates gap and seam issues (thermo-mechanical, aero-physics phenomena)



PICA being tested in ARC jet Facility