Aerospace America Year In Review 2011
Materials Technical Committee Article
Advanced Rigid Ablative TPS

Matthew J Gasch
NASA Ames Research Center
Moffett Field, CA 94035

NASA Exploration Systems Mission Directorate's (ESMD) Entry, Descent, and Landing (EDL) Technology Development Project (TDP) and the NASA Aeronautics Research Mission Directorate's (ARMD) Hypersonics Project are developing new advanced rigid ablators in an effort to substantially increase reliability, decrease mass, and reduce life cycle cost of rigid aeroshell-based entry systems for multiple missions.

Advanced Rigid Ablators combine ablation resistant top layers capable of high heat flux entry and enable high-speed EDL with insulating mass-efficient bottom that, insulate the structure and lower the areal weight. These materials may benefit Commercial Orbital Transportation Services (COTS) vendors and may potentially enable new NASA missions for higher velocity returns (e.g. asteroid, Mars).

The materials have been thermally tested to 400-450 W/cm^2 at the Laser Hardened Materials Evaluation Lab (LHMEL), Hypersonics Materials Evaluation Test System (HyMETS) and in arcjet facilities. Tested materials exhibit much lower backface temperatures and reduced recession over the baseline materials (PICA). Although the EDL project is ending in FY11, NASA in-house development of advanced ablators will continue with a focus on varying resin systems and fiber/resin interactions.

Advanced rigid TPS materials with functionally graded material composition.