



PICA Status

New Frontiers and Discovery Missions

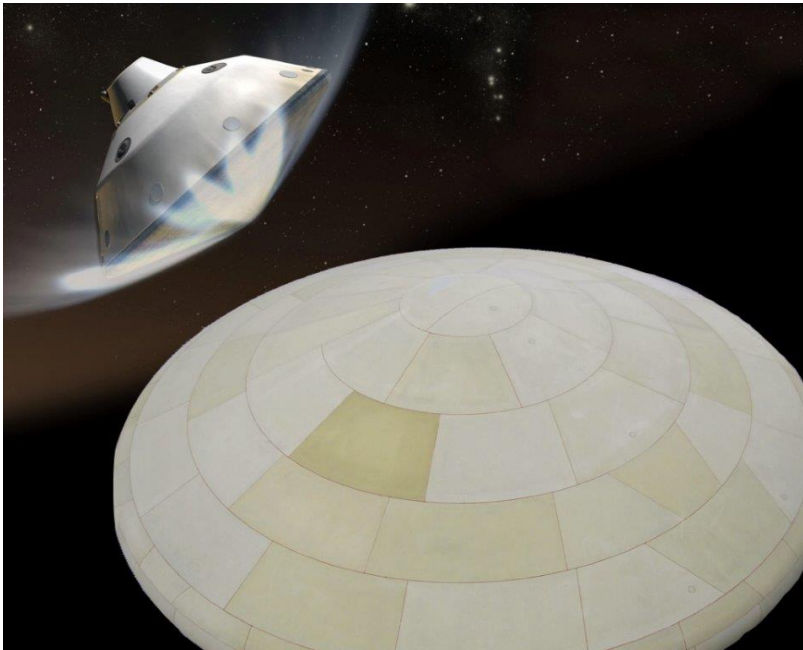
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and
Steven M. Violette
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OPAG Meeting, August 11-12, 2016
Flagstaff, AZ

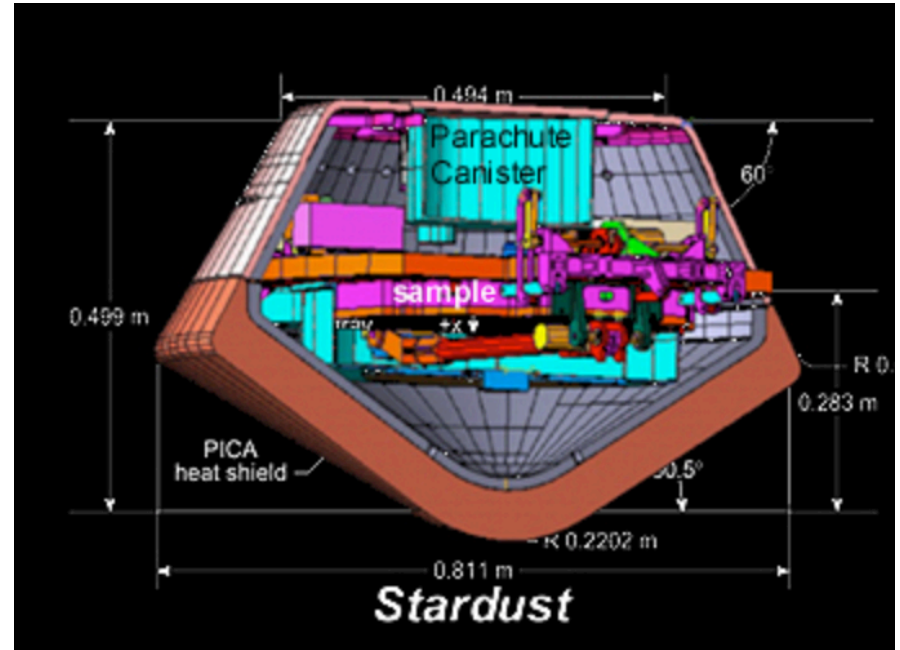


Need for PICA

Multi-piece tiled heat-shield
(MSL)



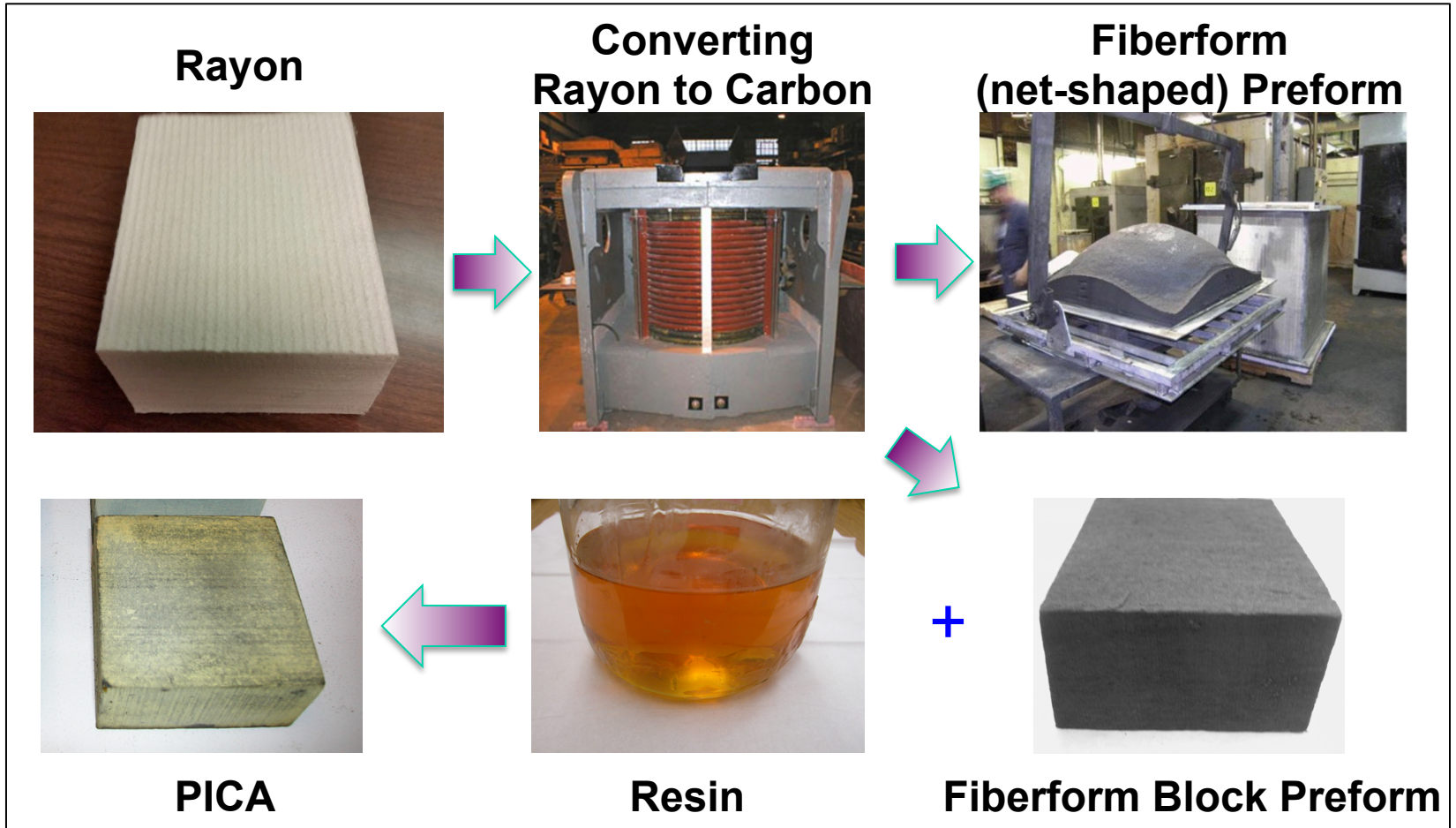
Single piece heat-shield
(Stardust/OSIRIS-Rex)
Net-shaped PICA



Upcoming NF-4 Mission proposals and future Discovery opportunities will need both single and multi-piece PICA TPS



Role of Rayon in PICA Manufacturing



In the past two decades, rayon manufacturers had to be switched twice. MSL, OSIRIS-REx and Mars 2020 use Spanish Rayon. In manufacturing commercial fiberform, FMI is switching over to a South Korean rayon.



PICA for NF-4 and future Discovery Missions

- Need:
 - Secure the remaining heritage (Spanish) rayon.
 - Develop and implement plans for certifying an alternate rayon based PICA.
- NASA (SMD-PSD) funded ARC to procure and graphitize all of the available rayon through FMI. FMI will store the carbonized yarn for future mission use to be decided by SMD-PSD.
 - **There is sufficient quantity to allow a heat-shield for a single mission - OSIRIS-Rex mission class.**
- **The quantity of heritage PICA is most likely insufficient to support PICA needed for larger heat-shield or back-shell**
 - Ames working together with FMI has proposed options to SMD-PSD. Certify PICA from
 - S. Korean Rayon
 - Domestic Rayom (Lyocell)
 - Will take (12 – 18) to procure the rayon and convert into PICA billets. Material property testing and arc jet testing followed by thermal response model and material property data base needed to support NF-4 missions.
 - Proposal is under consideration for funding by SMD-PSD



Single Piece PICA Heat-shield Going beyond ~1m size

- Stardust and OSIRIS-Rex are ~1m class net shaped (single-piece) PICA heat-shield
 - Current single piece heat-shield all follow Stardust experience and current tooling and set-up can be expanded to support larger single piece heat-shield
- FMI has current capabilities to manufacture up to 55 inch (1.4 m) diameter single-piece heatshields.
- FMI can modify/add equipment for a 80 inch (2.0 m) diameter single-piece heatshields.
 - Need lead time to scale up and demonstrate fabrication (~6 months)
 - Characterization (mechanical, thermal, etc.) and arc jet testing, if needed, will need additional time.