

TPS readiness for future SMD missions

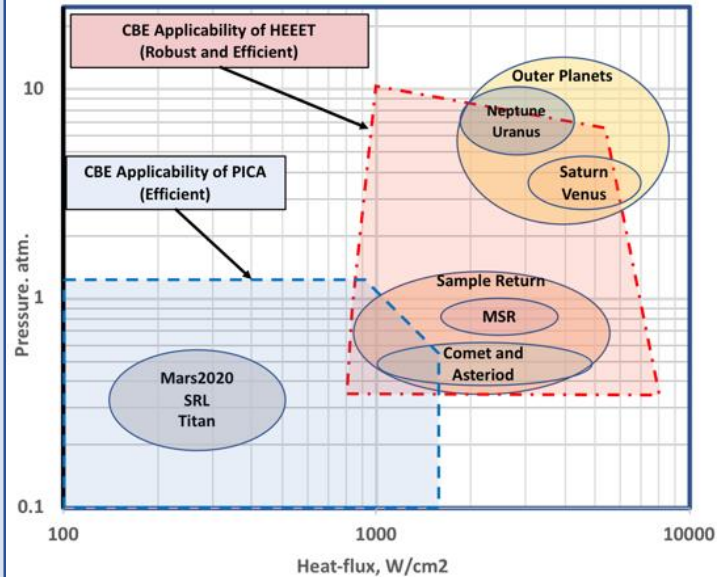
Heat-flux and pressure drive heatshield requirements

HEEET and PICA-D together can support future Science missions to all destinations

PICA

- Flown successfully on Stardust (single piece) and MSL (Tiled)
- Will be used on Mars 2020
- Raw material supply limitation has forced the development of a drop in replacement using domestic source (PICA-D) (CY'19 delivery)
- PICA-D will be used in future missions such as MSR SRL, Dragonfly to Titan and potentially for MSR Earth Entry Vehicle
- PICA-D will also be used for back-shell on Venus, Saturn, Uranus and Neptune.
- PICA-D development will deliver larger single piece heat-shield and higher aerothermal capability

(except Jupiter)



HEEET

- STMD/ SMD investment to address capability gap caused by atrophy of carbon-phenolic.
- Current development to TRL ~6
- Aerothermal efficiency allows for lower entry g-load during entry
- Enables use of delicate science instruments
- Manufacturing demonstrated at 1m scale using processes that are scalable to arbitrary size
- Performance demonstrated to 5 atm and 5000 W and high shear.
- Full suite of thermo-structural and structural tests have demonstrated excellent system capability
- Highly robust candidate for modest entry such as MSR EEV.

