As NASA enables commercial space access, there is a critical need for reusable, reliable, low-cost thermal protection systems (TPS). New material and computational technologies offer the potential of more durable and operable TPS for space transportation vehicles that can tolerate high temperatures while improving operability and reducing maintenance time and costs.

This subtopic requests innovative proposals in the following areas:

- Technologies and systems offering a factor of two or greater reduction in maintenance time and costs
  - Reusable space transportation vehicles being developed for Earth to orbit access and return,
  - In-space transportation systems using aero-braking and aero-capture, and
  - On-demand payload and crew return systems

- Multi-use and reusable TPS concepts applicable for insulated composite and metallic vehicle structures
  - With improved robustness
  - Reduced and/or automated inspection, repair and recertification,
  - While remaining weight competitive to current flight proven TPS

- TPS non-destructive evaluation techniques and new health management approaches and strategies
• Rapid TPS inspection, repair, and flight certifications techniques

• Designs and concepts for new TPS attachment methods,

• Designs for gaps and joints

• TPS designs for control surfaces and interfaces

Phase I Deliverables: Phase I deliverables include a final report detailing optimal design for the technology concept, including a feasibility assessment and summary of analysis, modeling and any prototype development and testing. For concepts that show good feasibility, the final report should also contain a plan for Phase II development and demonstration.

Desired deliverables at the end of Phase I should be at TRL 2-3.

Phase II Deliverables: Phase II deliverables include a working proof-of-concept available for NASA inspection and testing if applicable. Opportunities and plans should be identified and summarized for potential commercialization.

Deliverables expected at the end of Phase II should be at TRL 4-5 (minimum).