National Aeronautics and Space Administration

Space Technology Mission Directorate

Game Changing Development Program

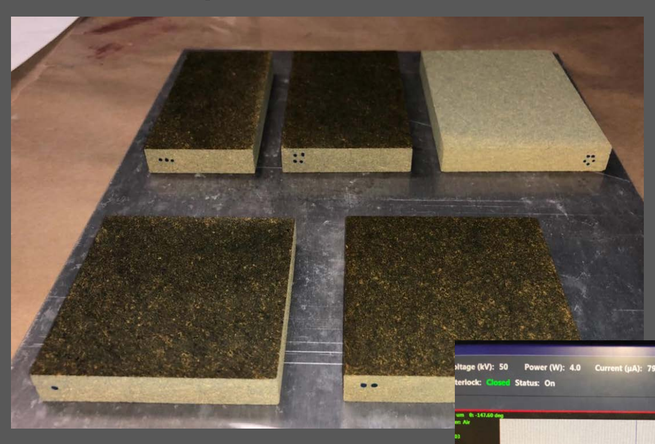
Entry Systems Modeling Project

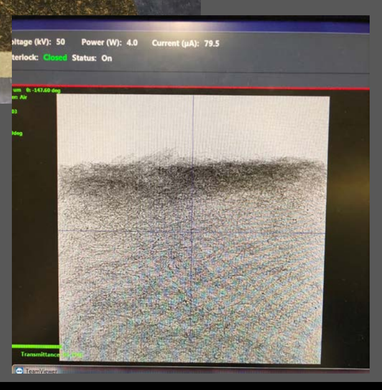
ESM is the only dedicated research effort for EDL modeling at NASA. ESM provides consistent support for experts to develop high-priority model improvements and validation testing, driven by mission needs, that can be delivered in 3-5 years to reduce mission risk and improve performance.

Focused research in four elements:

Predictive Materials Modeling

- Advanced models of PICA, PICA-NuSil, and woven TPS
- Micro- to engineering-scale analysis tools
- Detailed material characterization
- Computational material design



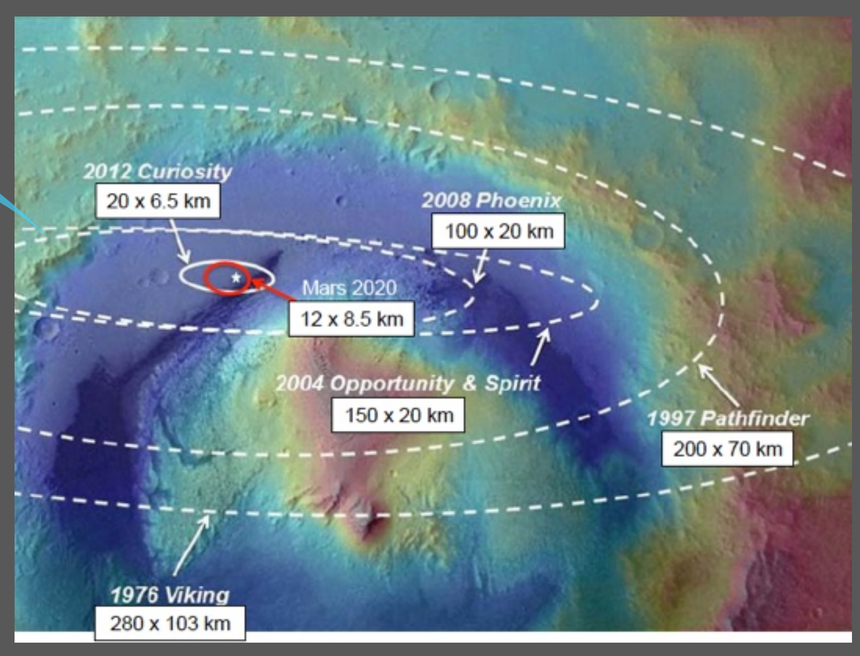


Top: NuSil-coated samples of PICA

Right: First micro-CT scans of PICA-NuSil samples

Guidance, Navigation, and Control

Methods for precision flight and landing of large robotic and human Mars missions using multi-axis (direct force) control



Human Mars exploration will require landing precision 100x greater than current state-of-the-art, Mars Science Laboratory

Computational and Experimental Aerosciences

- Parachute Dynamics (Orion and Mars)
- Free-flight CFD
- Fully coupled CFD & radiation toolset
- Magnetic Suspension Wind Tunnel

Magnetic suspension wind tunnel and levitation demo

Shock Layer Kinetics and Radiation

- Shock layer radiation databases and models for all destinations
- State-to-state non-equilibrium model in final stages of development
- First-of-kind expansion experiments

EAST expansion section is installed and ready for testing in Sep/Oct