Active Project (2014 - 2021)

Mars Science Laboratory Entry Descent and Landing Instrument (MEDLI) 2 Project

Game Changing Development Program | Space Technology Mission Directorate (STMD)

ANTICIPATED BENEFITS

To NASA funded missions:

Data derived from the MEDLI2 instrument will benefit the EDL Reconstruction effort for the Mars 2020 mission.

To NASA unfunded & planned missions:

Measurement approaches used with MEDLI2 will eliminate any developmental efforts needed for future missions that will require the same type of data.

Updates to models and analytical approaches through reductions in uncertainties and modifications to margin approaches will be able to improve the accuracy of their EDL performance.

To the commercial space industry:

Measurement approaches used with MEDLI2 will eliminate any developmental efforts needed for future missions that will require the same type of data.

Updates to models and analytical approaches through reductions in uncertainties and modifications to margin approaches will be able to improve the accuracy of their EDL performance

DETAILED DESCRIPTION

MEDLI2 will reduce uncertainty in aeroshell TPS response with the potential to reduce TPS mass by up to 130 kg MEDLI2 will reduce uncertainty in supersonic aerodynamic predictions with the potential to reduce the landing footprint size by 30% MEDLI2 fills critical EDL knowledge gaps which represent a technology advancement in EDL

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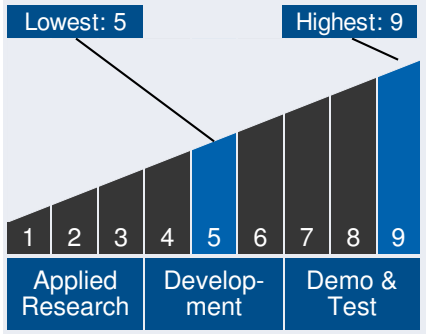
Technology Maturity



Management Team

Program Executive:

- Lanetra Tate

Program Manager:

- Mary Wusk

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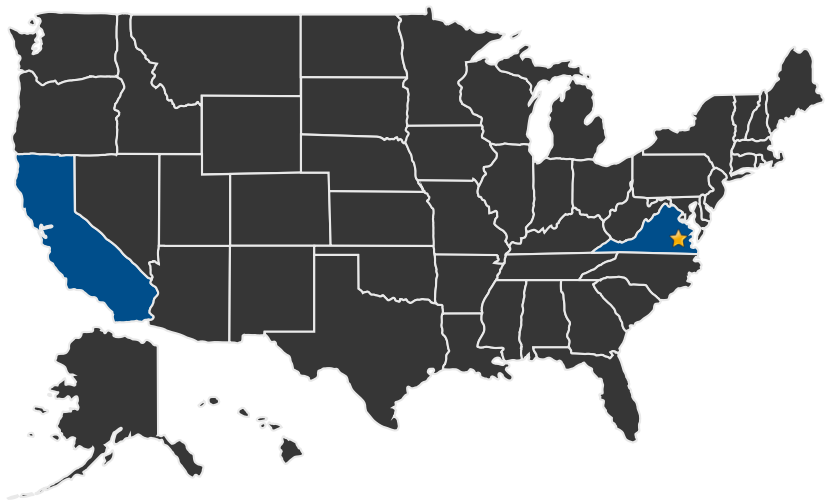
U.S. WORK LOCATIONS AND KEY PARTNERS



U.S. States With Work

Lead Center:
Langley Research Center

Other Organizations Performing Work:

- Human Exploration and Operations Mission Directorate
- Science Mission Directorate

Management Team *(cont.)*

Project Manager:
- Henry Wright

Principal Investigator:
- Deepak Bose

Technology Areas

- Entry, Descent, and Landing Systems (TA 9)
- Descent and Targeting (TA 9.2)
- Thermal Protection System (TPS) Instrumentation (TA 9.4.6.1)

DETAILS FOR TECHNOLOGY 1

Technology Title

1. Backshell Heat Flux Measurements

Technology Description

This technology is categorized as a hardware component or part for unmanned spaceflight

The current MEDLI2 baseline heat flux sensor configuration leverages the approach used for EFT-1. Similar configurations for a range of TPS' (PICA and Avcoat) have been manufactured and then successfully tested via arc jet testing. Fabrication and

assembly procedures have been developed. Modeling and analysis tools have been updated to reflect the characteristics of the heat flux plugs. Procedures for installation of the heat flux plugs into the aftbody SLA TPS have not been developed. Activities planned include defining and selecting the heat flux plug configuration, completing development of the fabrication and assembly process to emphasize the aftbody SLA TPS, updating the Modeling and Analysis tools, and conducting arc jet testing needed for the aftbody heat flux plugs.

Capabilities Provided

Ability to directly measure surface heat flux on the backshell of a Mars entry vehicle.

Potential Applications

Use on future missions to continue to improve predictive capability leading to reductions in backshell TPS mass.

Performance Metrics

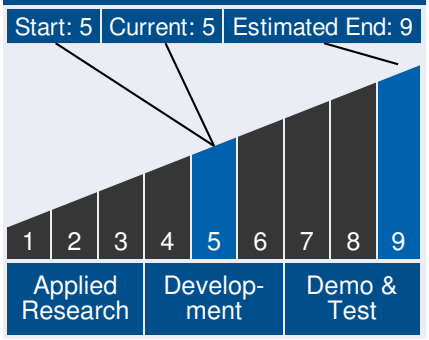
Metric	Unit	Quantity
Heat flux accuracy	%	25

Technology Areas

Primary Technology Area:
Entry, Descent, and Landing Systems (TA 9)
└ Vehicle Systems (TA 9.4)
  └ Instrumentation and Health Monitoring (TA 9.4.6)
    └ Thermal Protection System (TPS) Instrumentation (TA 9.4.6.1)

Secondary Technology Area:
Entry, Descent, and Landing Systems (TA 9)
└ Descent and Targeting (TA 9.2)

Technology Maturity



DETAILS FOR TECHNOLOGY 2

Technology Title

2. Entry and Descent Performance Knowledge Improvements

Technology Description

This technology is categorized as an architecture for unmanned spaceflight

Technology Areas

Secondary Technology Area:
Entry, Descent, and Landing Systems (TA 9)

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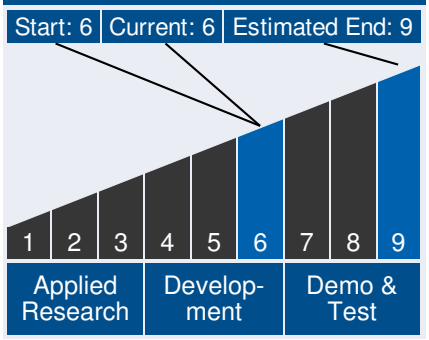
Through the blend of ground testing and flight data, will improve modeling and analysis methods for EDL performance leading to reductions in uncertainties, potential reductions in TPS mass, and potential reductions in landing footprint.

Technology Maturity



Capabilities Provided

Reductions in uncertainties used in EDL Modeling and Analysis.

Potential Applications

All future EDL missions can use the new knowledge to better understand their EDL performance.

Performance Metrics

Metric	Unit	Quantity
EDL Performance Uncertainty	%	