Mars Sample Return
Sample Retrieval Lander Concept Overview

16th International Planetary Probe Workshop – Oxford, England
July 8th-12th , 2019

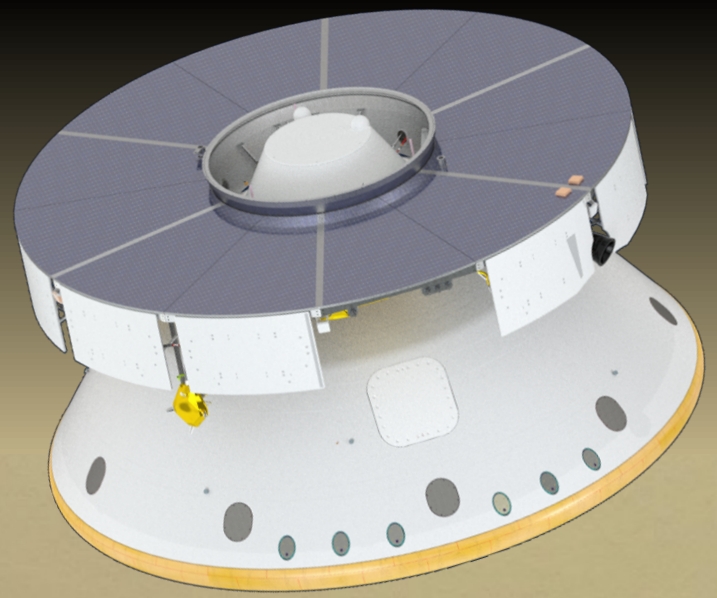
Martin Greco
Jet Propulsion Laboratory, California Institute of Technology

Pre-Decisional Information -- For planning and discussion purposes only.

BUILDING ON HISTORY

VIKING	MPF	MER	MRO	PHOENIX / I	MSL	M2020	JEZERO
	CRUISE SYSTEM Spin Stabilized	**CRUISE SYSTEM** Cruise Behavior					
EDL SYSTEM Heatshield Backshell Altimetry Radar DGB Term Descent R Propulsive Lanc Throttled Engine	**EDL SYSTEM** Direct Entry Monte Carlo : Sy EDL Behavior	**EDL SYSTEM** TR Velocimetry (	**EDL SYSTEM** HD Imaging Maps Dust Storm Trac		**EDL SYSTEM** Guided Entry Poly PWD&G PWD Divert Landed Mass Ultra-Soft Lander EDL Redundancy	**EDL SYSTEM** Strengthened (Range Trigger TRN / Haz Mar	**EDL SYSTEM** Known Landing Site Altitude
COMMUNICATIO Relay Comm	**COMMUNICATION** DTE EDL Comm	**COMMUNICATION** Relay Comm Mu					
	SURFACE MISSION Solar Mission Mobility	**SURFACE MISSION** Long Traverse Surface Behavio	**SURFACE MISSIO** HD Imaging Maps Dust Storm Trac	**SURFACE MISSION** Flex Solar Array		**SURFACE MISSIO** Sample Process Sample Cache Ground Truth	**SURFACE MISSION** Environment CFA Traverse Map

MARS SAMPLE RETURN
SAMPLE RETRIEVAL LANDER CONCEPT



LAUNCH/CRUISE

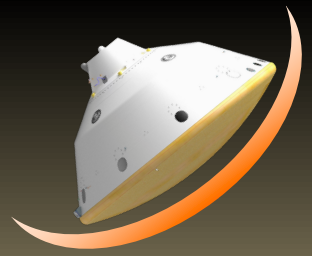
Heritage

Type III Cruise

Launch Mass Challenge

- Heavy Lift LV or Electric Propulsion?

Pre-Decisional Information -- For planning and discussion purposes only.



ENTRY

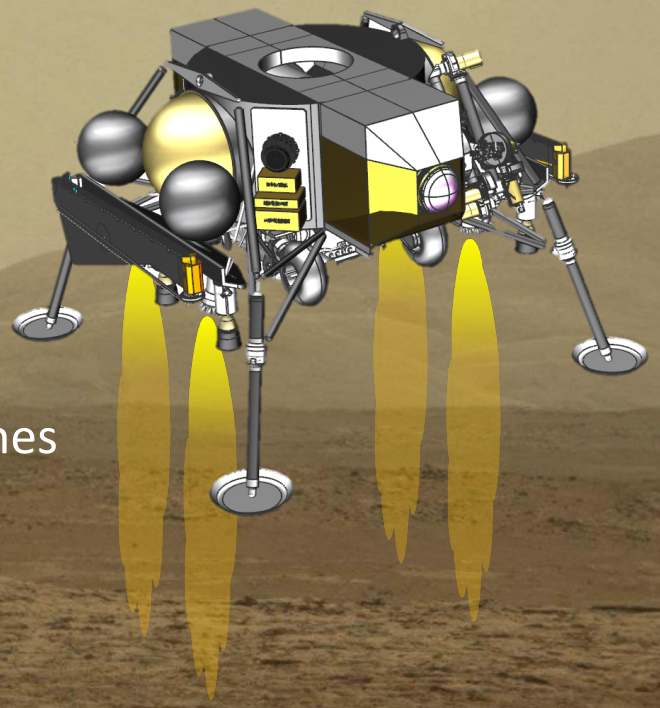
Enter 4 t Wet Vehicle

- 4.7 m Heatshield
- Larger Backshell

DESCENT

Augment Heritage Decelerator System

- Decelerators
- Algorithms
- Sensors



LANDING

Land 2 t Dry Vehicle

- 6 Main + 4 Showerhead Landing Engines

Large Divert Capability

- Landing Safety
- SFR Risk Reduction

Pre-Decisional Information -- For planning and discussion purposes only.

SAMPLE FETCH ROVER EGRESS

Provide Robust Egress Paths

- Provide Two Paths
- Clear 35 cm Obstacles

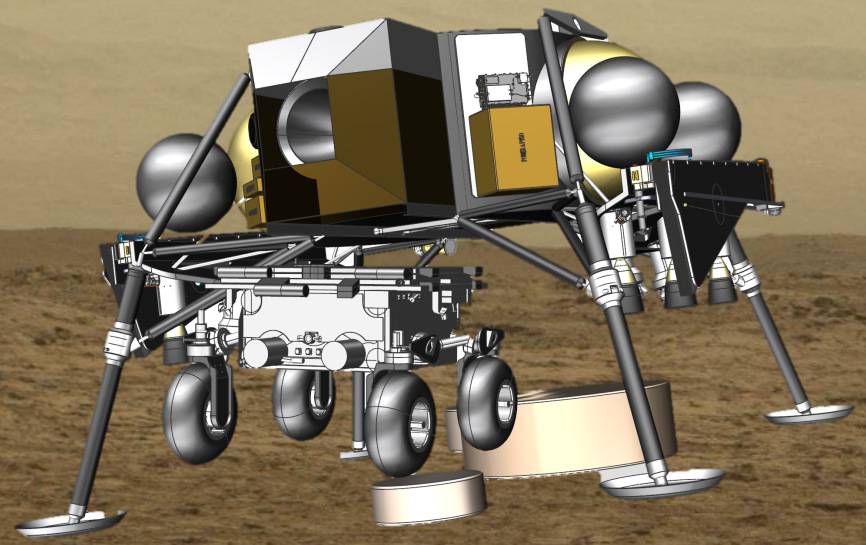
SURFACE MISSION

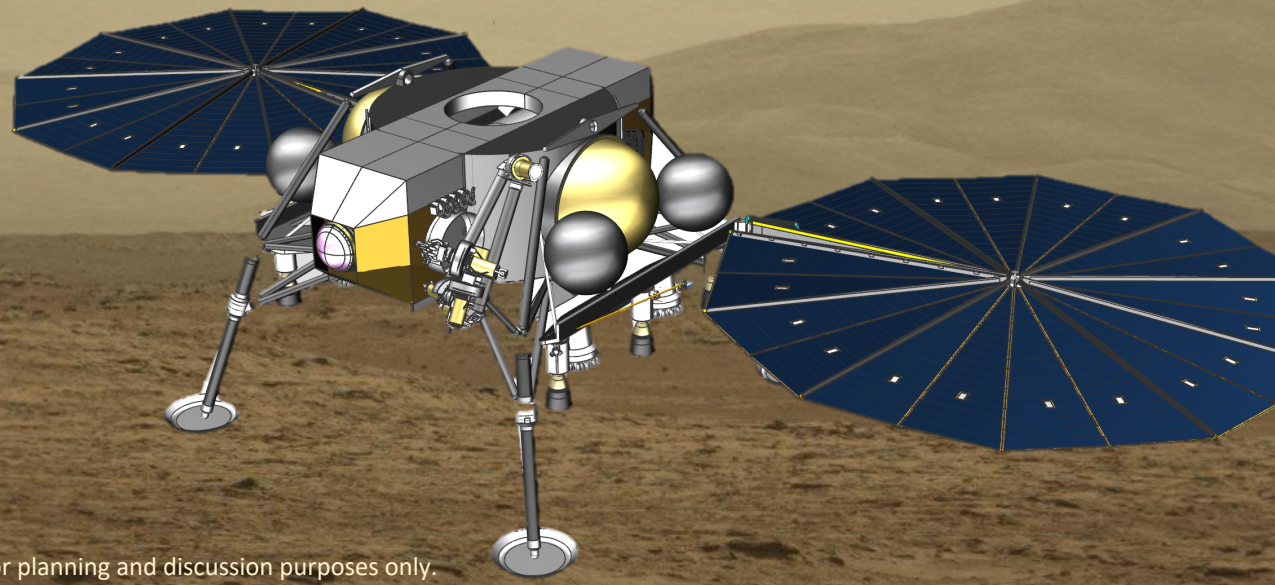
Solar Power System

- Maintain MAV at Storage Temp.
- Survive Tau 3 Local Storm
- Surface Timeline Avoids Martian Winter

No Science Payload

- Simplified Operations
- Growth Risk Reduction





Pre-Decisional Information -- For planning and discussion purposes only.

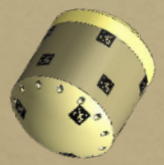
SAMPLE TRANSFER

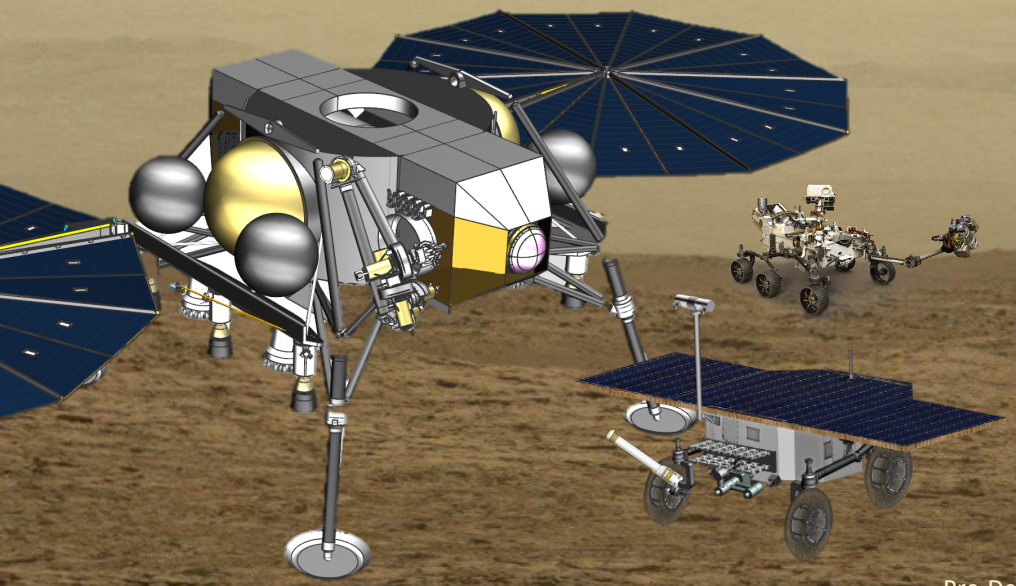
Collect Samples

- Fetch Rover or M2020

Load Samples On Orbiting Sample (OS)

Closeout the MAV





MAV LAUNCH

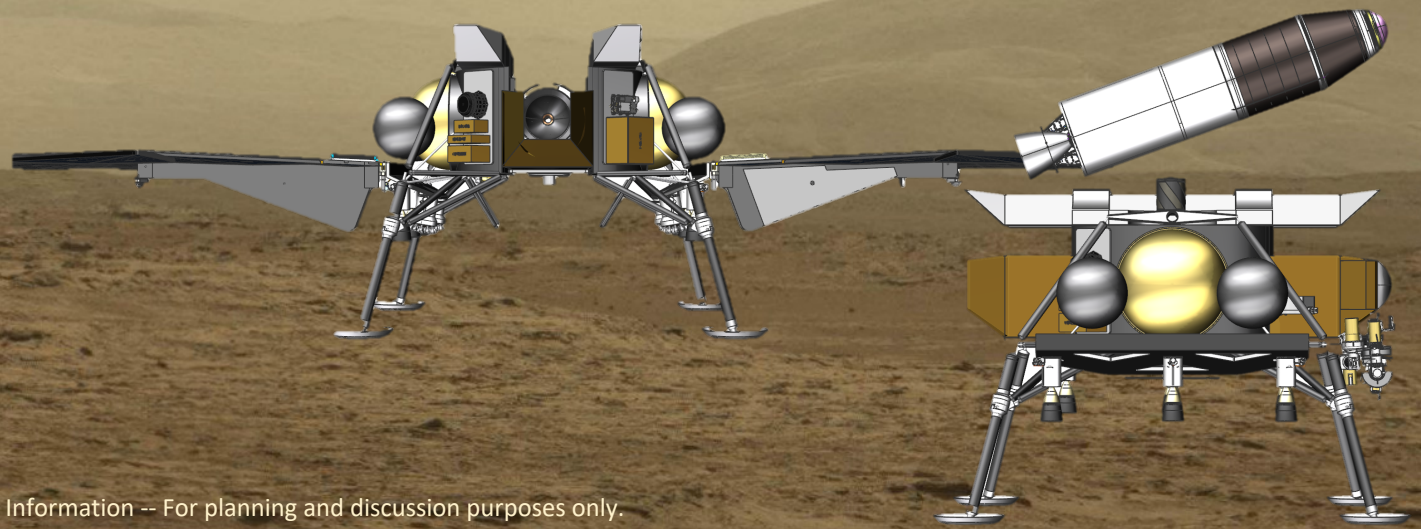
Warm MAV to Operational Temp.

Initialize MAV

Open MAV Thermal Barrier

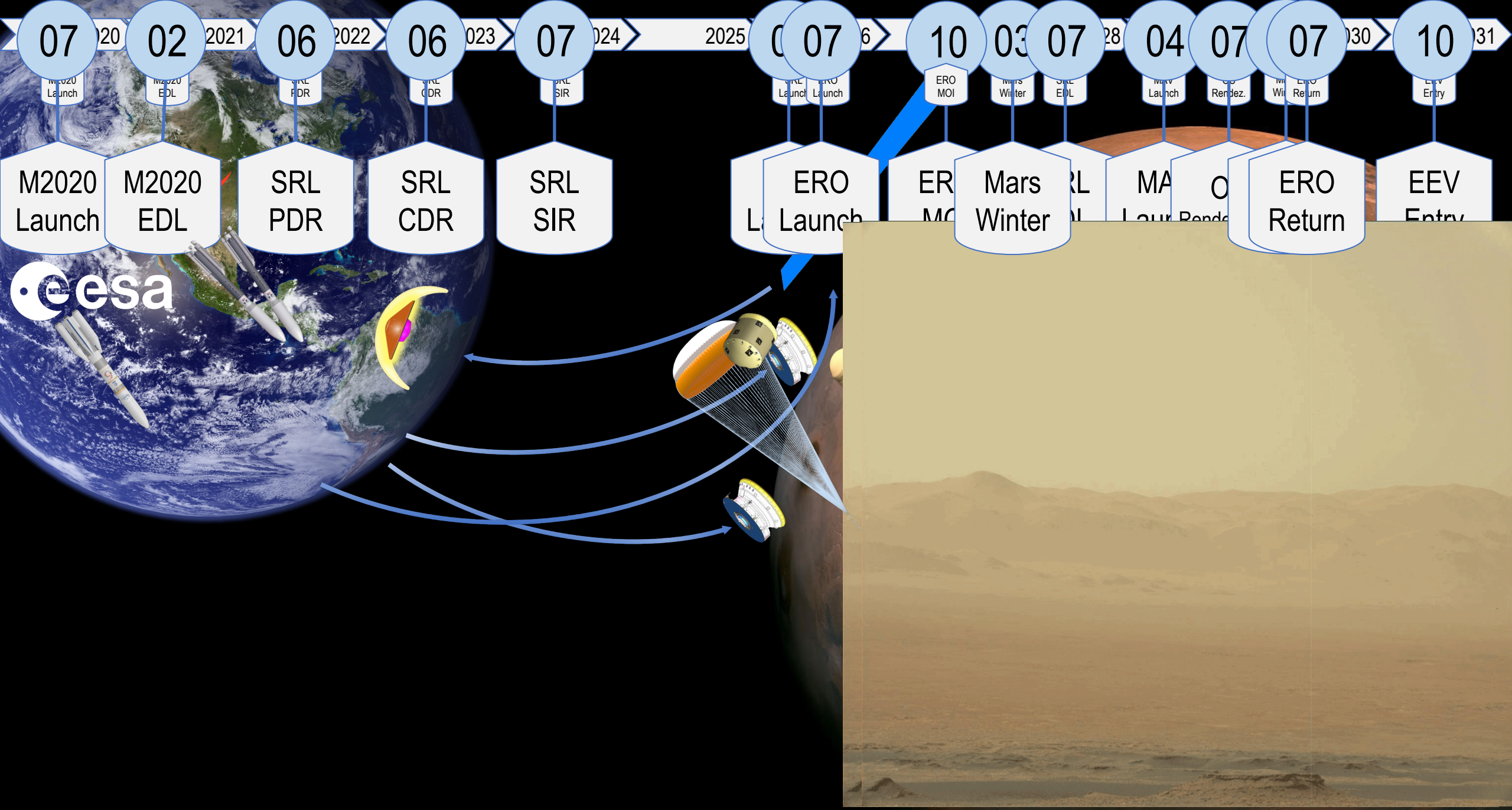
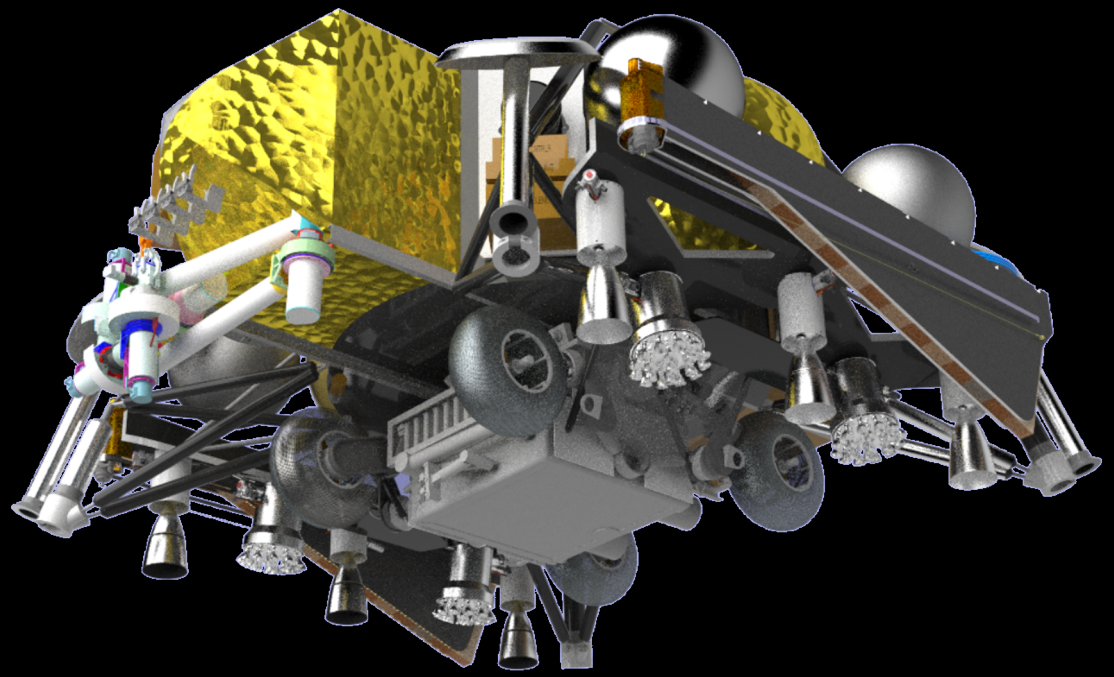
Launch MAV

- Minimize MAV-SRLP Interactions
- Minimize SRLP-Ground Interactions



Pre-Decisional Information -- For planning and discussion purposes only.

MARS SAMPLE RETURN
NOTIONAL MISSION OVERVIEW


07
02
2021
06
2022
06
07
2025
07
10
03
07
04
07
07
10
M2020 Launch
M2020 EDL
SRL PDR
SRL CDR
SRL SIR
ERO Launch
Mars Winter
ERO Return
EEV Entry
ERO MOI
esa

QUESTIONS?