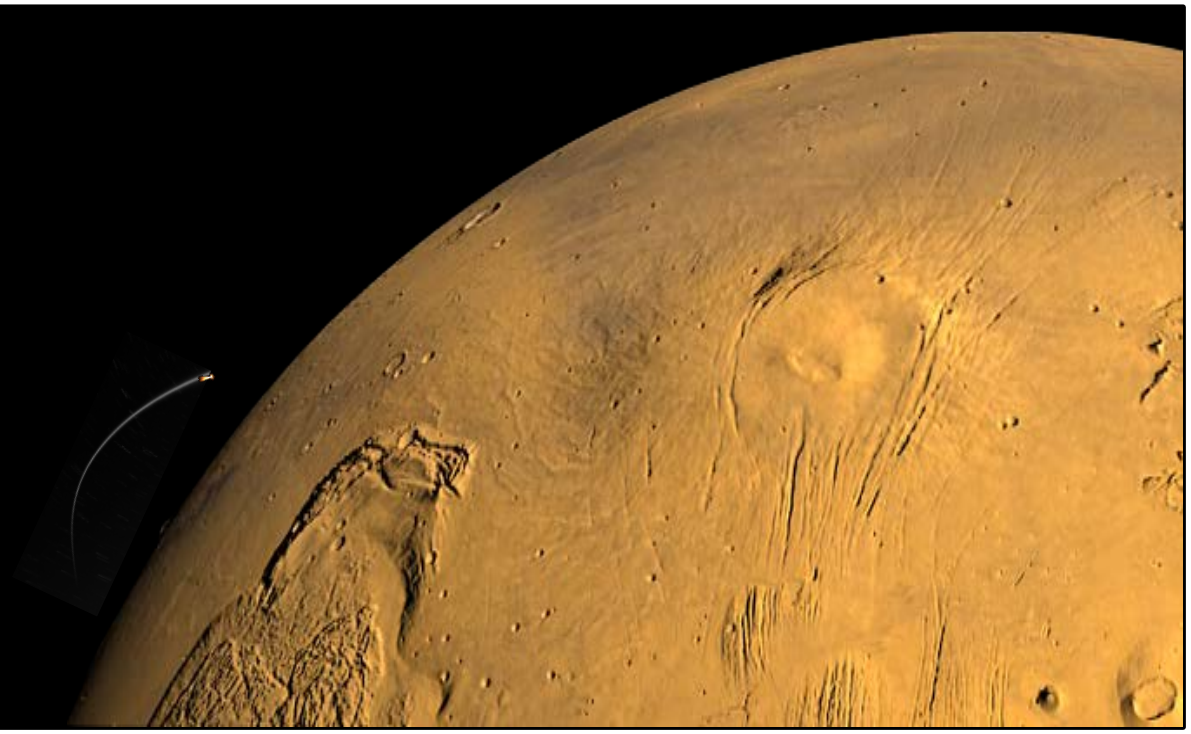
Mars Ascent Vehicle



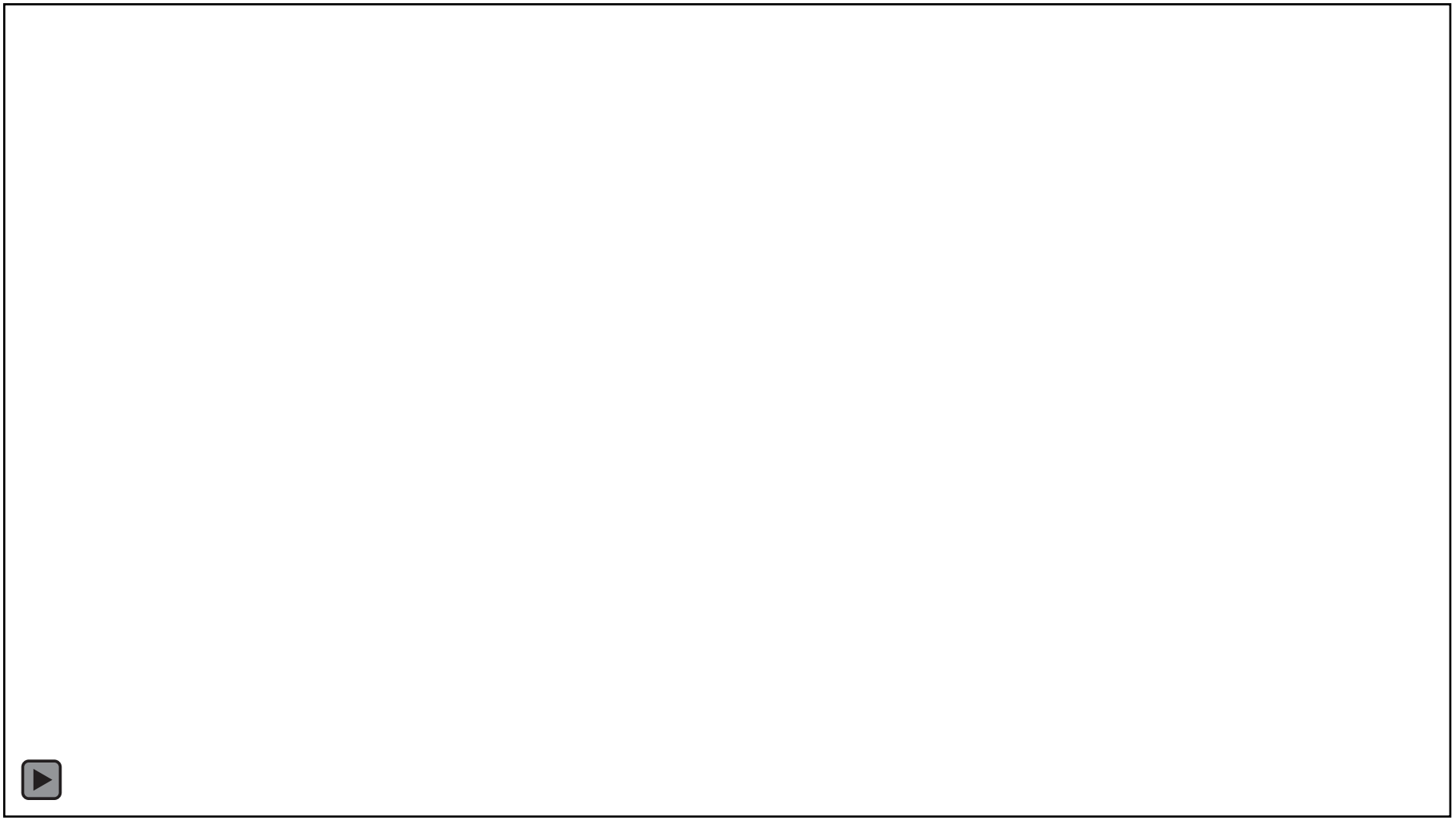
Jet Propulsion Laboratory
California Institute of Technology

MARSHALL SPACE FLIGHT CENTER

Throw Me Some Mars, Mister

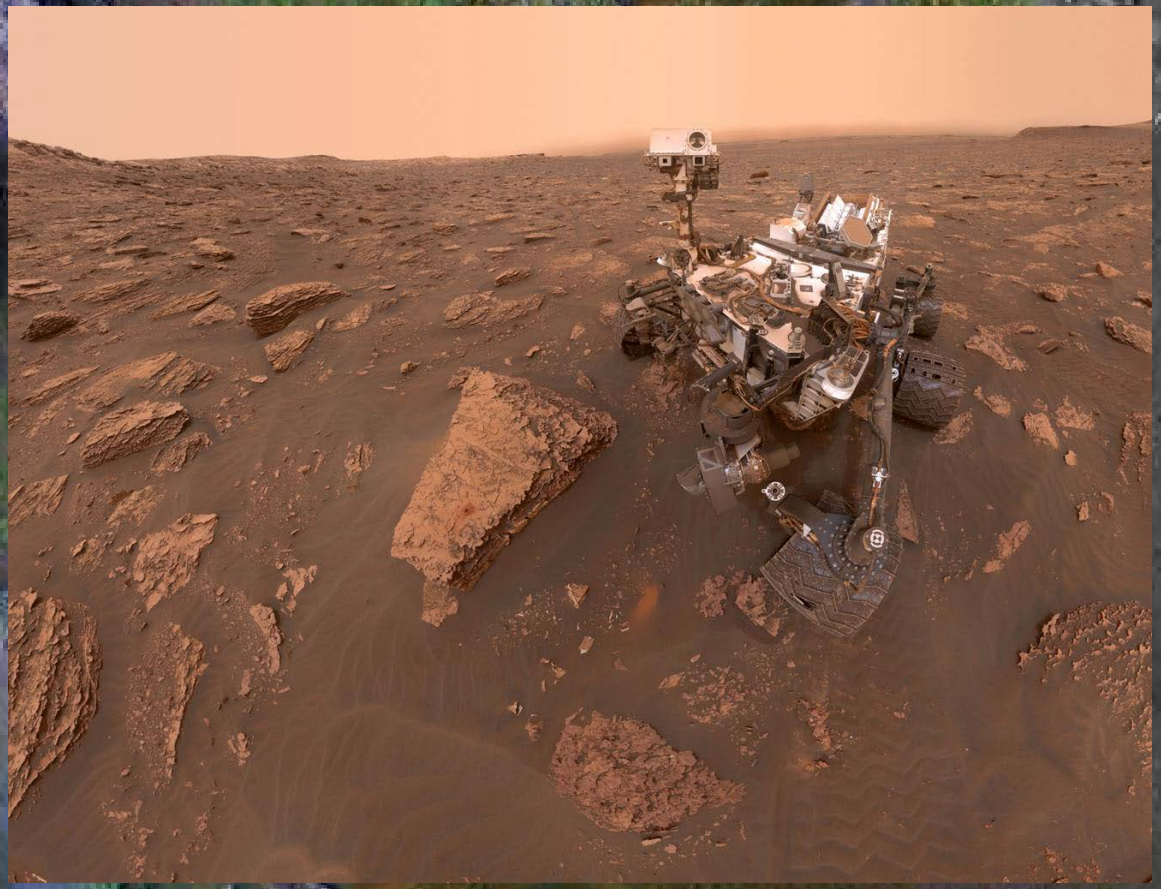
Angie Jackman
MAV Project Manager
NASA/MSFC

Sample Return Mission Overview



Why is Mars hard?

- Remote
- Temperature
- Atmosphere
- Radiation
- Dust



Jezero Crater: Wet and Dry and Wet Again

MAV Functions

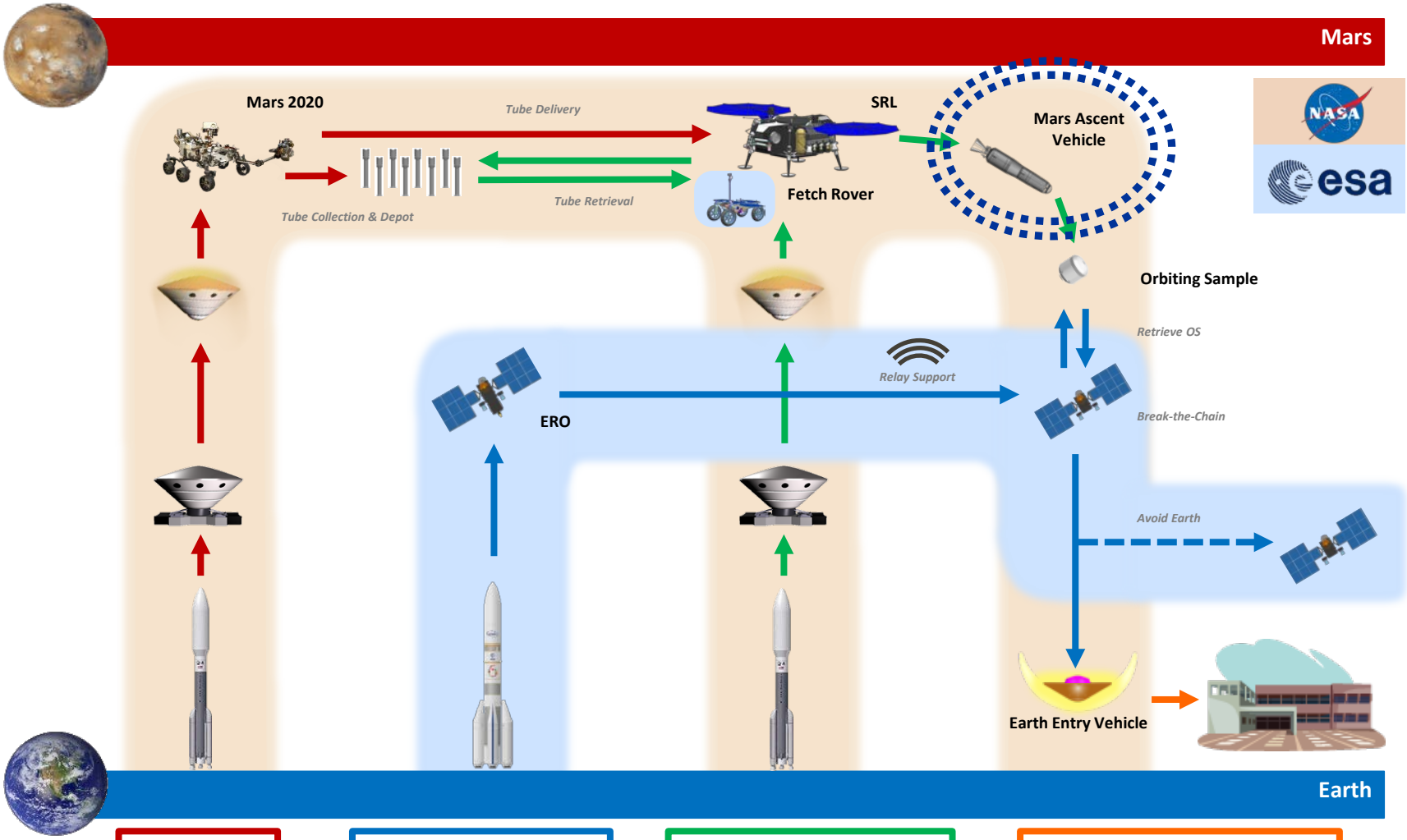
- Reside on Lander
  - Transit time to Mars ~ 2.5 year
  - Storage time on Mars ~ 430 sols
- Do not contaminate the planet
- Receive sample tubes from Rover into Orbiting Sample (OS)
- Launch OS with sample tubes from lander platform to Mars orbit
  - ~350nm, at 26 degrees
- Release OS with sample tubes

Columbia Hills, Gusev Crater: Home to Mars Rover Spirit

Mars Sample Return (MSR) Campaign

Objective: Collect Mars sample tubes and return to Earth

Mars Sample Return Campaign Architecture



Mars2020

- Mars 2020 rover collects samples and leaves tubes.

Earth Return Orbiter (ERO)

- ERO sent to Mars orbit.

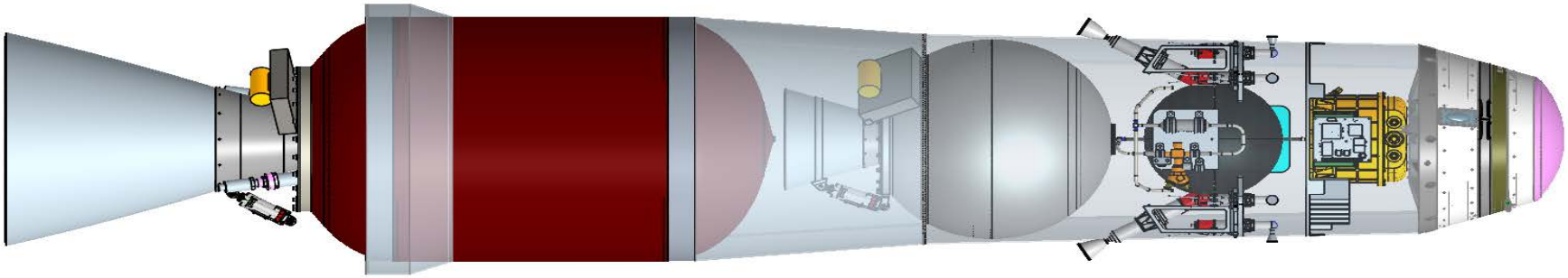
Sample Retrieval Lander (SRL)

- SRL w/MAV sent to Mars.

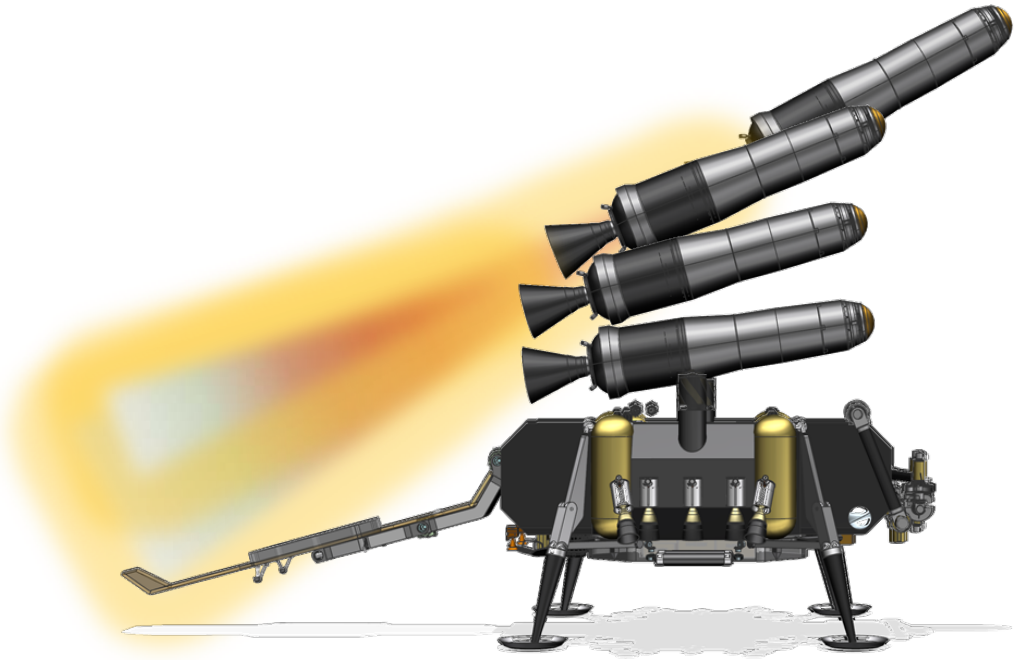
Sample Return and Science

- Sample tubes retrieved and loaded into the OS. MAV launches OS into Mars orbit. OS and ERO rendezvous. ERO's Earth Entry System (EES) returns OS to Earth.

Mars Ascent Vehicle Overview

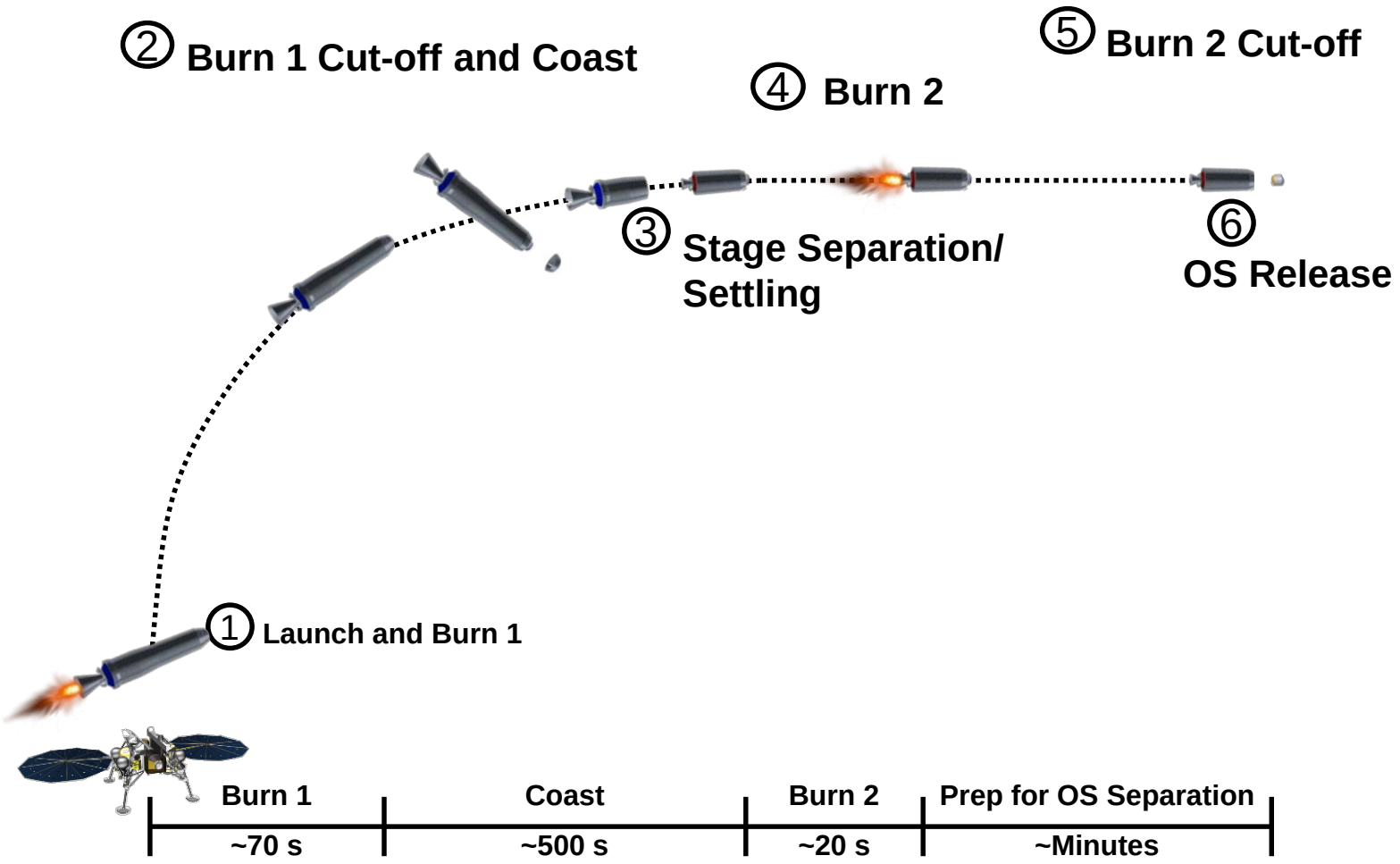


MAV is a two-stage, solid rocket launch vehicle delivering sample tubes to a pre-determined orbit about Mars.



MAV being ejected from SRL VECTOR System

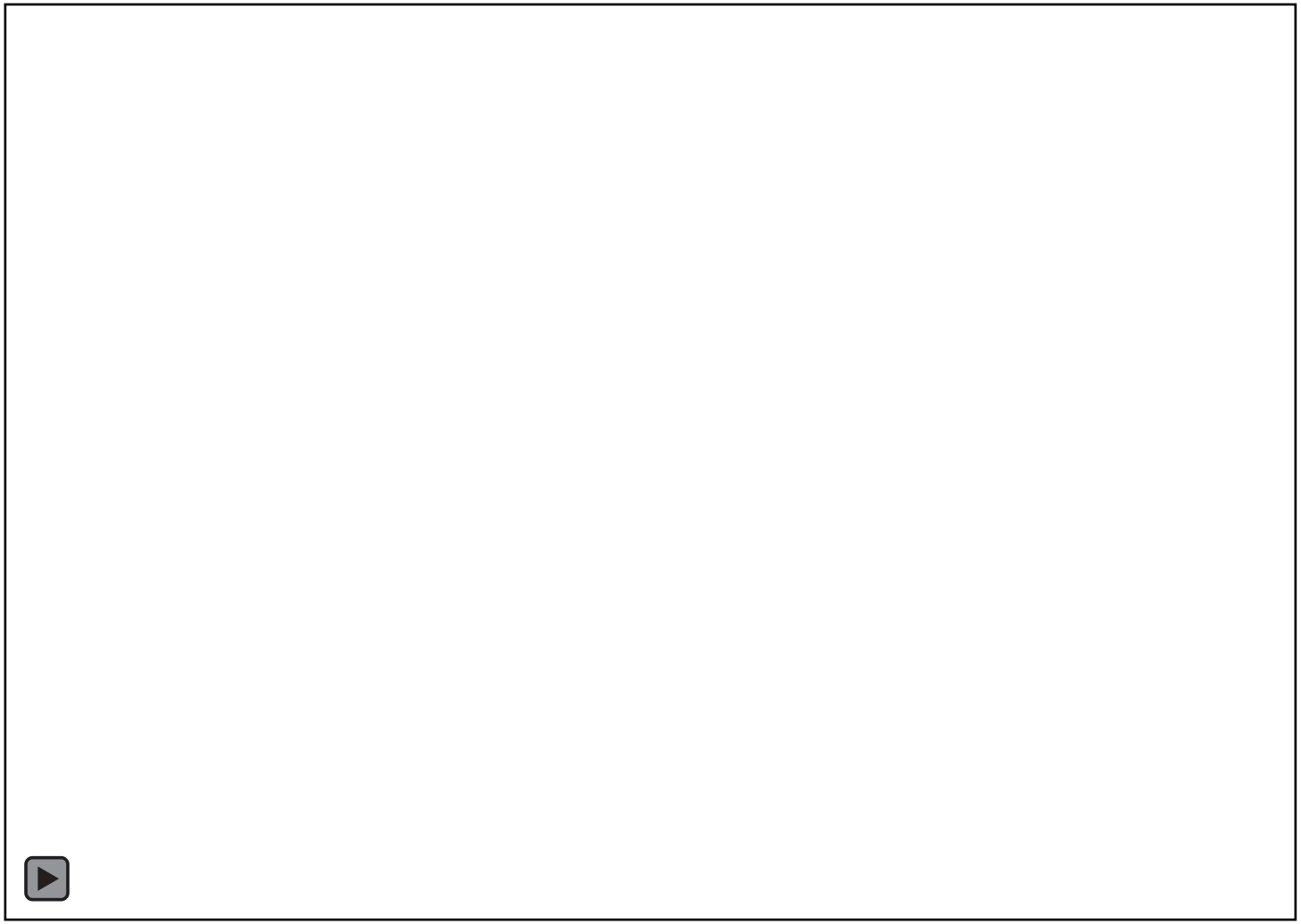
MAV Flight Operations Overview



⓪ **Pre-Launch**

*Conceptual elements shown. Not to scale.

VECTOR Launch System



Closing Thoughts

- MAV is one small piece of a highly-couple system that must work flawlessly to achieve mission success.
- The MAV team is a multi-disciplined, multi-center NASA team led by MSFC with plans to utilize industry partners.
- Design and development is well underway at MSFC with anticipation to complete first major lifecycle review and key decision point in 2020.
- The MAV Project has initiated the process to strategically involve industry in specific areas within MAV.
- Schedule is critical for planetary missions
  - Although MAV will be launched from Earth is 2026, hardware will be delivered as early as 2023 to begin assembly and test operations.

Mars is hard – we embrace the challenge

Questions?

