Thaxted Astronomical Society

Space Missions

Mars 2020

Perseverance‘ And Ingenuity

Introduction

https://mars.nasa.gov/mars2020/mission/where-is-the-rover/

NASA Science MARS 2020 MISSION PERSEVERANCE ROVER

Mission Stats >

Mission type	Mars exploration
Operator	NASA · JPL
COSPAR ID	2020-052A
SATCAT no.	45983
Mission duration	1 Mars year (668 sols, 687 Earth days) (planned) 1 year, 10 months and 20 days (elapsed)
Spacecraft properties	
Spacecraft	*Perseverance* *Ingenuity*
Launch mass	3,649 kg (8,045 lb) jr
Start of mission	
Launch date	30 July 2020, 11:50:00 UTC
Rocket	Atlas V 541 (AV-088)
Launch site	Cape Canaveral, SLC-41
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https://en.wikipedia.org/wiki/Mars_2020

Mars 2020 >

Mars 2020 is a Mars rover mission forming part of NASA's Mars Exploration Program that includes the rover Perseverance and the small robotic, coaxial helicopter Ingenuity.

Mars 2020 was launched from Earth on an Atlas V launch vehicle at 11:50:01 UTC on 30 July 2020, and confirmation of touch down in the Martian crater Jezero was received at 20:55 UTC on 18 February 2021

As of 19 June 2022, Perseverance and Ingenuity have been on Mars for 473 sols (486 total days; 1 year, 121 days).

Perseverance will investigate an astrobiologically relevant ancient environment on Mars and investigate its surface geological processes and history, including the assessment of its past habitability, the possibility of past life on Mars, and the potential for preservation of biosignatures within accessible geological materials

It will cache sample containers along its route for retrieval by a potential future Mars sample-return mission.

The Mars 2020 mission was announced by NASA in December 2012 at the fall meeting of the American Geophysical Union in San Francisco.

Perseverance's design is derived from the rover Curiosity, and it uses many components already fabricated and tested in addition to new scientific instruments and a core drill

The rover also employs nineteen cameras and two microphones, allowing for audio recording of the Martian environment.

On April 30, 2021, Perseverance became the first spacecraft to hear and record another spacecraft, the Ingenuity helicopter, on another planet.

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Perseverance Rover >

The Perseverance rover was launched on an Atlas V-541 rocket from on July 30, 2020, at 4:50 a.m. PDT (7:50 a.m. EDT) Launch Complex 41 at Cape Canaveral Air Force Station, Florida

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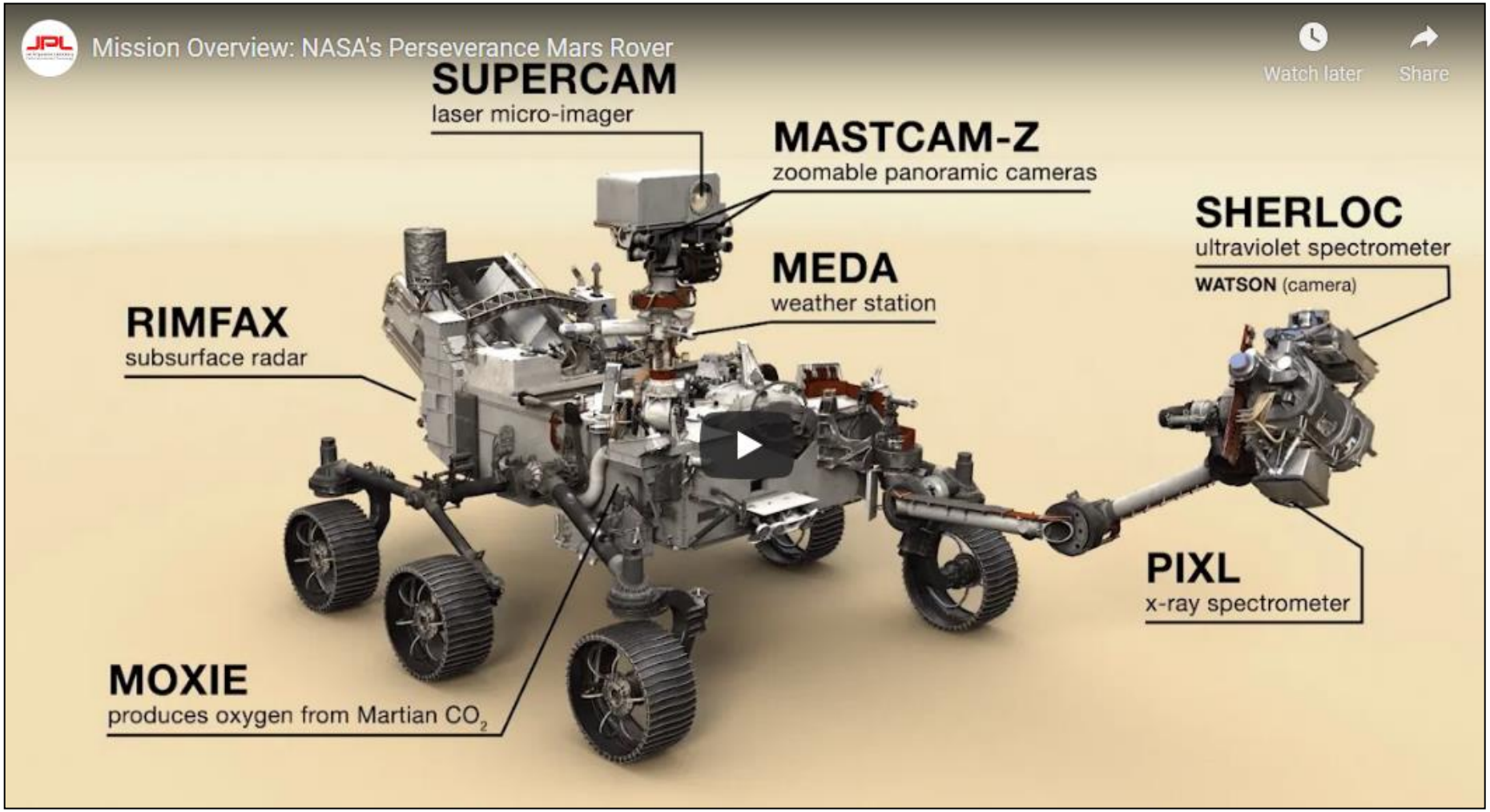
Perseverance Rover >



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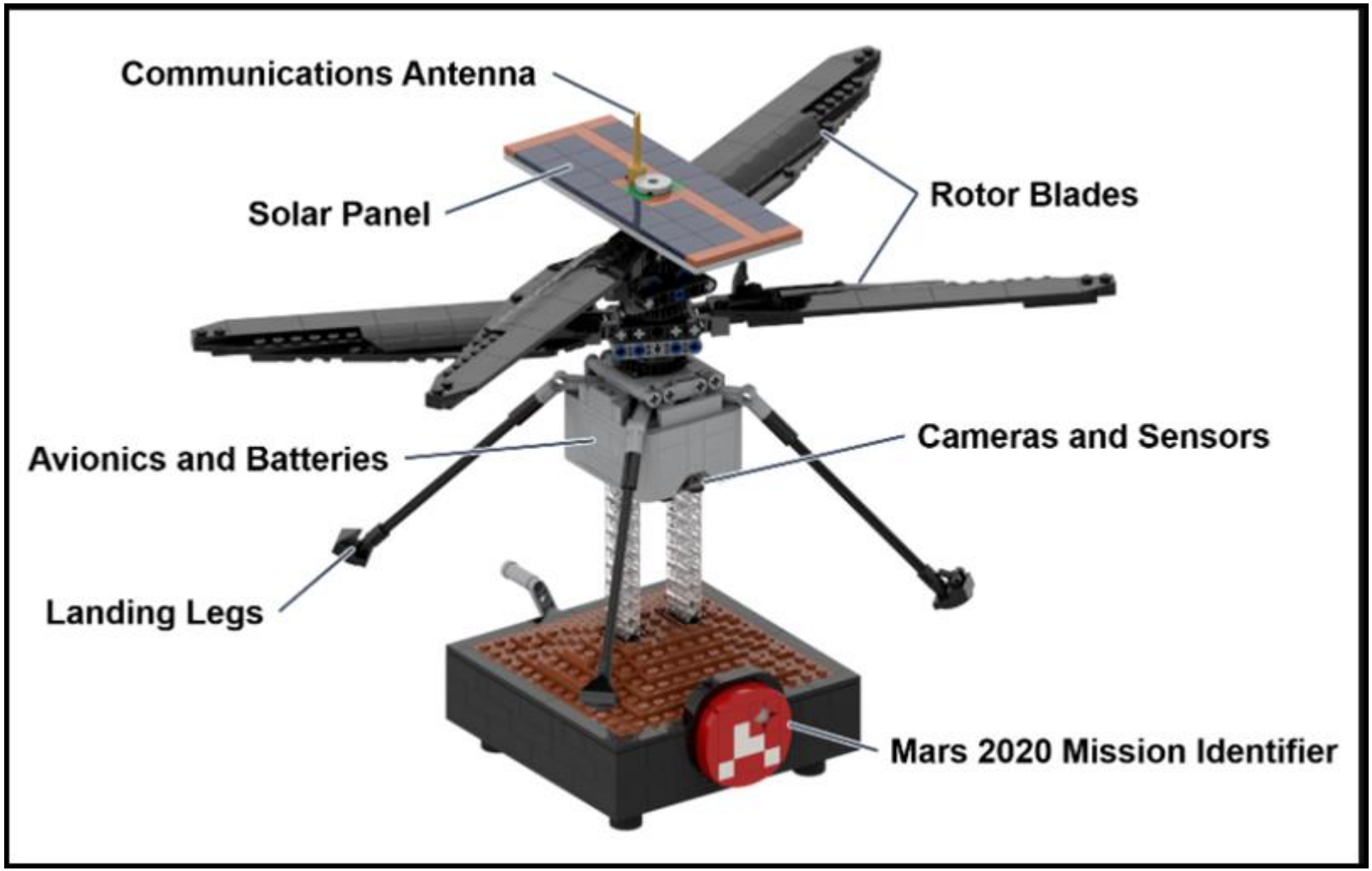
Ingenuity Helicopter >



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Quick Facts About NASA's Perseverance Rover >

Mission Name: Mars 2020

Rover Name: Perseverance

Main Job: The Perseverance rover will seek signs of ancient life and collect rock and soil samples for possible return to Earth.

Launch: July 30, 2020, Cape Canaveral Air Force Station, Florida

Landed: Feb. 18, 2021

Landing Site: Jezero Crater, Mars

Mission Duration: At least one Mars year (about 687 Earth days)

Tech Demo: The Mars Helicopter is a technology demonstration, hitching a ride on the Perseverance rover.

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Mission Overview >

The Mars 2020 Perseverance Rover will search for signs of ancient microbial life, which will advance NASA's quest to explore the past habitability of Mars

The rover has a drill to collect core samples of Martian rock and soil, then store them in sealed tubes for pickup by a future mission that would ferry them back to Earth for detailed analysis

Perseverance will also test technologies to help pave the way for future human exploration of Mars

Strapped to the rover's belly for the journey to Mars is a technology demonstration…

The Mars Helicopter, Ingenuity, may achieve a "Wright Brothers moment “ by testing the first powered flight on the Red Planet

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Mission Objectives >

The Perseverance rover has four science objectives that support the Mars Exploration Program's science goals:

Looking for Habitability >
Identify past environments capable of supporting microbial life.

Seeking Biosignatures >
Seek signs of possible past microbial life in those habitable environments, particularly in special rocks known to preserve signs of life over time.

Caching Samples >
Collect core rock and "soil" samples and store them on the Martian surface.

Preparing for Humans >
Test oxygen production from the Martian atmosphere.

All address key astrobiology questions related to the potential of Mars as a place for life.

The first three consider the possibility of past microbial life.

Even if Perseverance does not discover any signs of past life, it paves the way for human life on Mars someday.

https://mars.nasa.gov/mars2020/mission/where-is-the-rover/

Entry, Descent, and Landing (EDL) >

Prior to landing, the Science Team from an earlier NASA lander, InSight, announced that they would attempt to detect the entry, descent and landing (EDL) sequence of the Mars 2020 mission using InSight's seismometers.

Despite being more than 3,400 km (2,100 mi) away from the Mars landing site, the team indicated that there was a possibility that InSight's instruments would be sensitive enough to detect the hypersonic impact of Mars 2020's cruise mass balance devices with the Martian surface

The rover's landing was planned similar to the Mars Science Laboratory used to deploy Curiosity on Mars in 2012.

The craft from Earth was a carbon fibre capsule that protected the rover and other equipment from heat during entry into the Mars atmosphere and initial guidance towards the planned landing site.

Once through, the craft jettisoned the lower heat shield and deployed parachutes from the upper shield to slow the descent to a controlled speed.

With the craft moving under 320 km/h (200 mph) and about 1.9 km (1.2 mi) from the surface, the rover and skycrane assembly detached from the upper shield, and rocket propulsion jets on the skycrane controlled the remaining descent to the planet.

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Entry, Descent, and Landing (EDL) >

As the skycrane moved closer to the surface, it lowered Perseverance via cables until it confirmed touchdown, detached the cables, and flew a distance away to avoid damaging the rover

Perseverance successfully landed on the surface of Mars with help of the skycrane on 18 February 2021 at 20:55 UTC, to begin its science phase, and began sending images back to Earth

Ingenuity reported back to NASA via the communications systems on Perseverance the following day, confirming its status.

The helicopter was not expected to be deployed for at least 60 days into the mission.

NASA also confirmed that the on-board microphone on Perseverance had survived entry, descent and landing (EDL), along with other high-end visual recording devices

NASA then released the first audio recorded on the surface of Mars shortly after landing, capturing the sound of a Martian breeze as well as a hum from the rover itself

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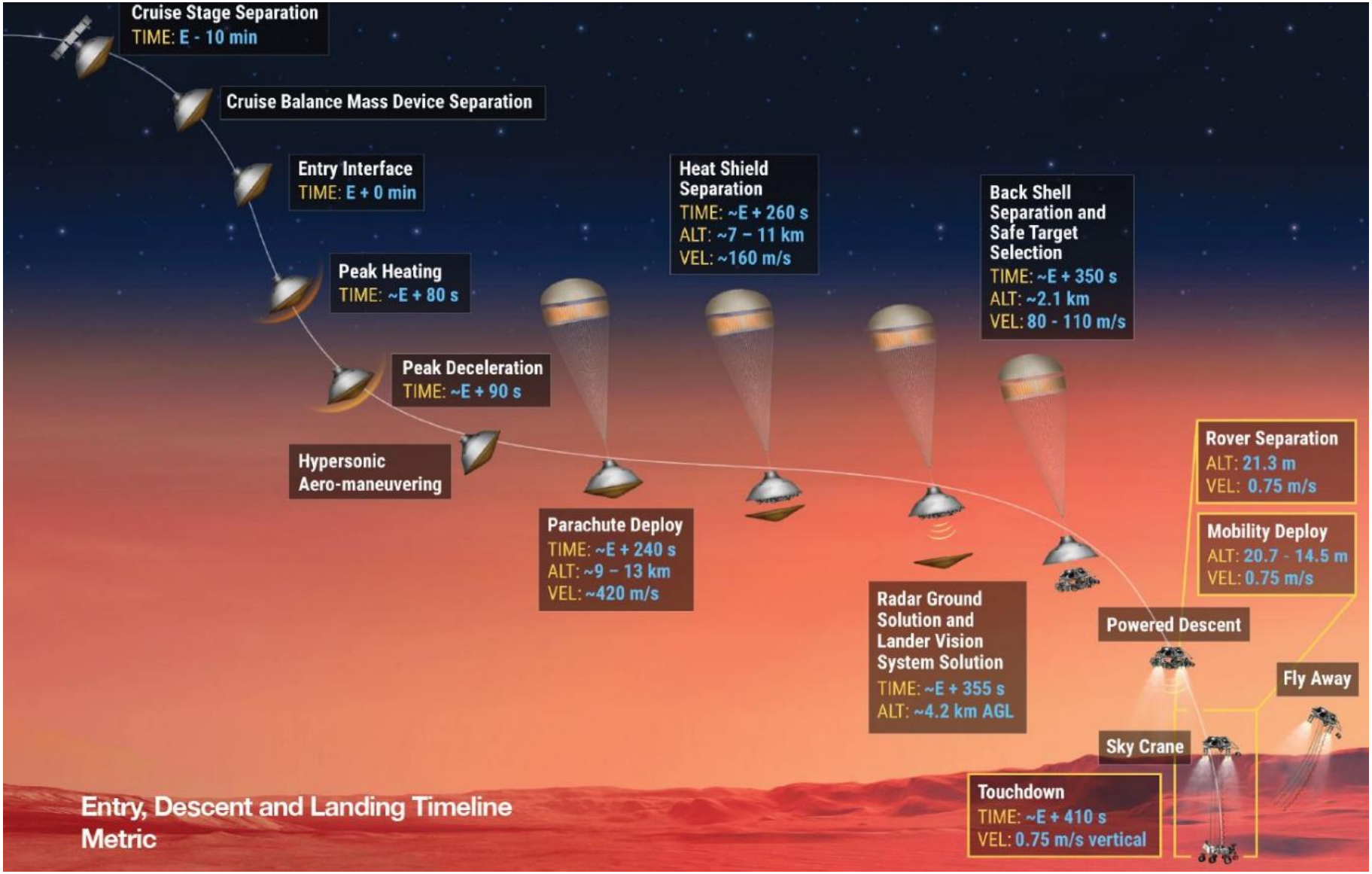
Entry, Descent, and Landing (EDL) >



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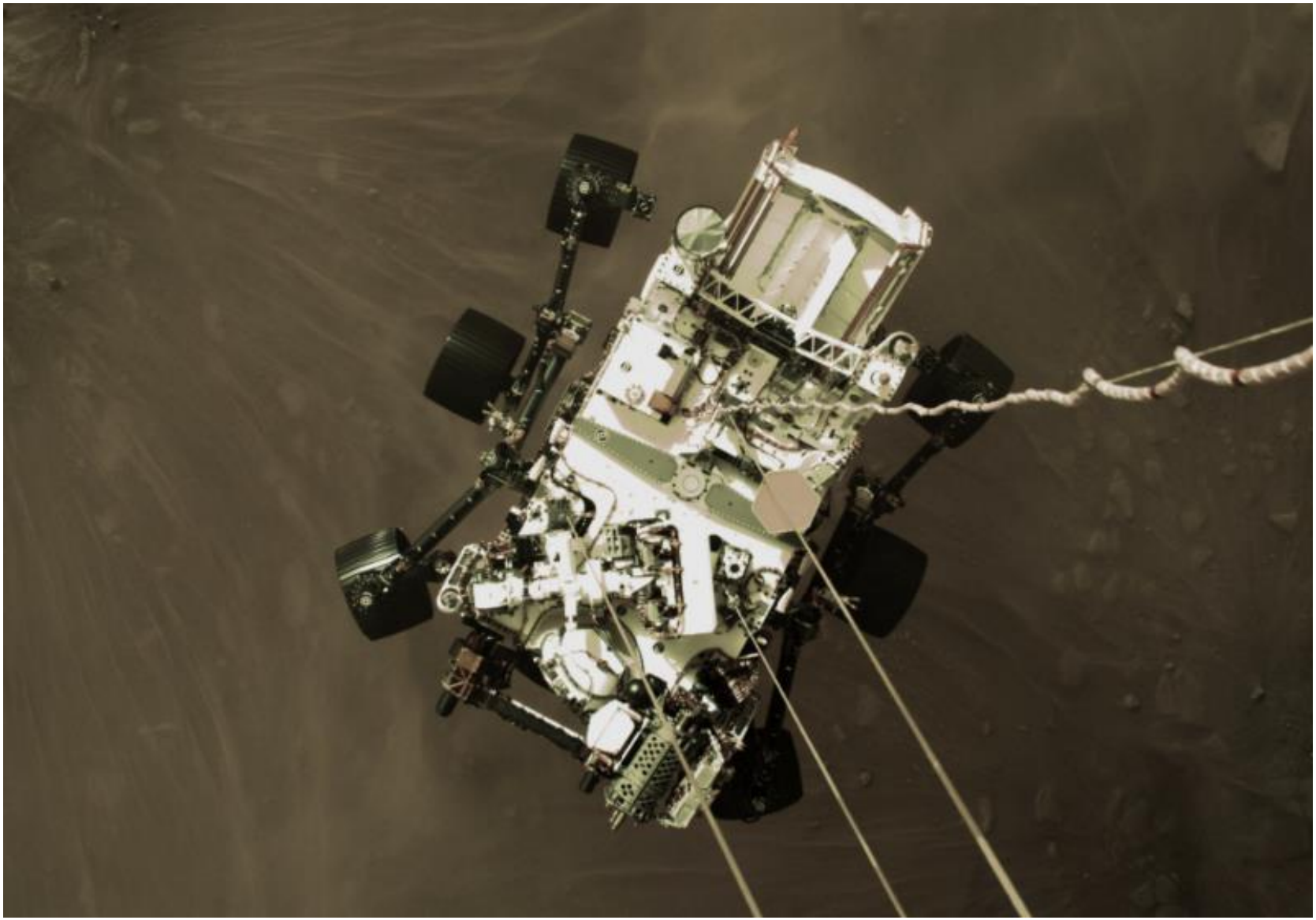

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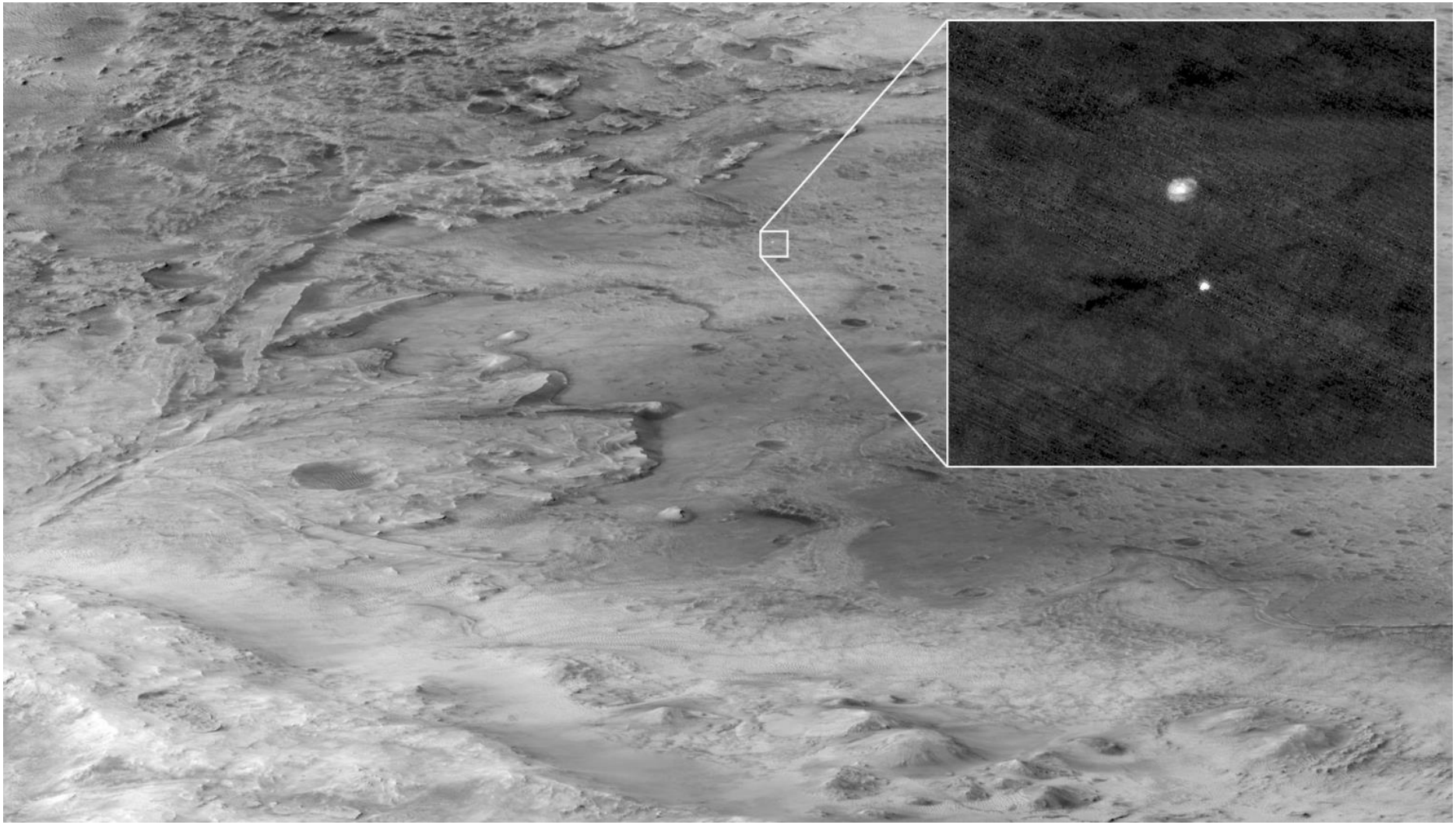
Entry, Descent, and Landing (EDL) >

Perseverance in mid-EDL descent, with its parachute opened, as captured by HiRISE aboard the Mars Reconnaissance Orbiter



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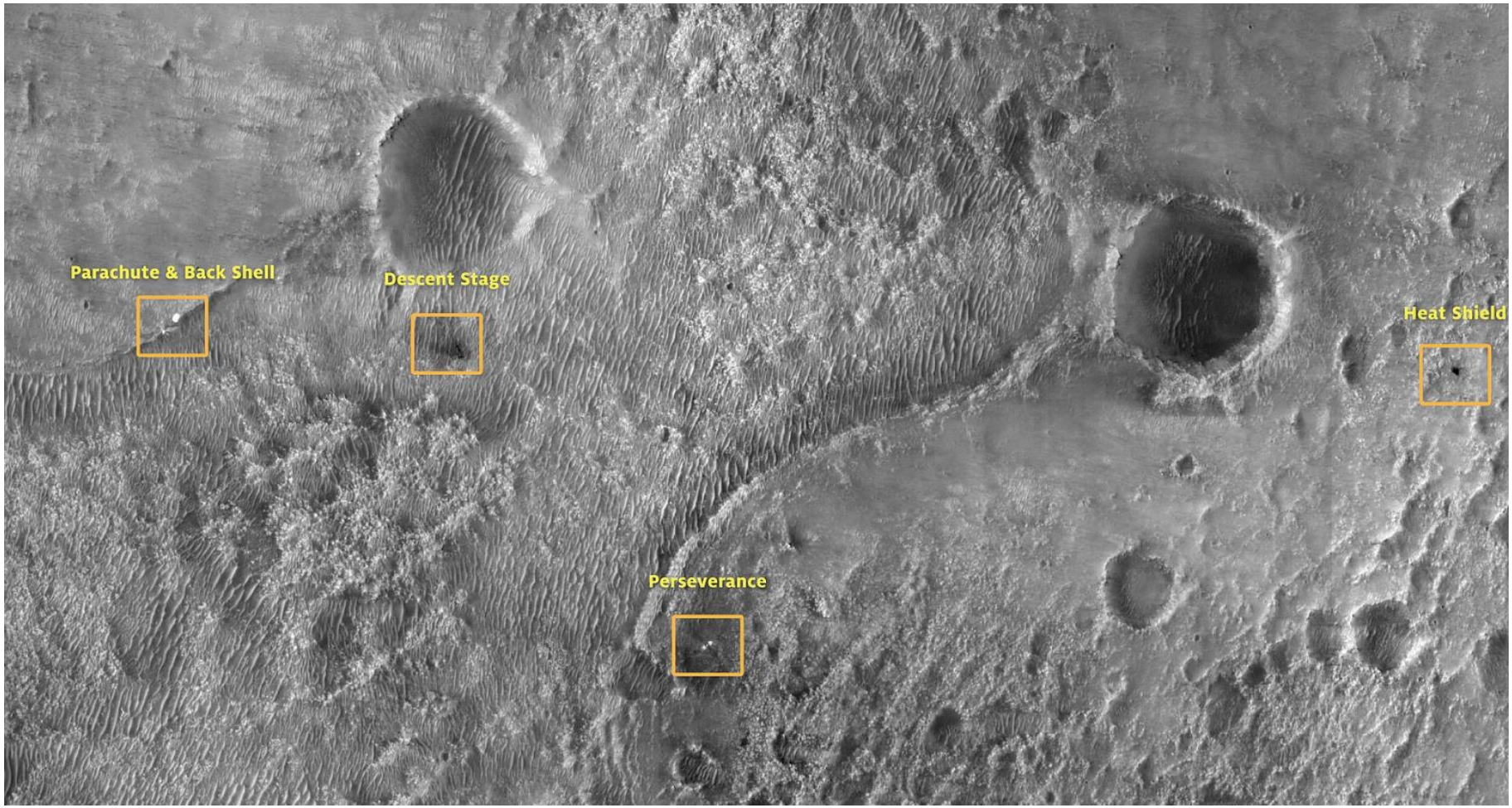
Entry, Descent, and Landing (EDL) >

Locations of the rover and components of the EDL craft after landing. The rover is highlighted at the bottom-center, the parachute and back shell on the far left, the descent stage to the mid-left, and the heat shield to the far right.



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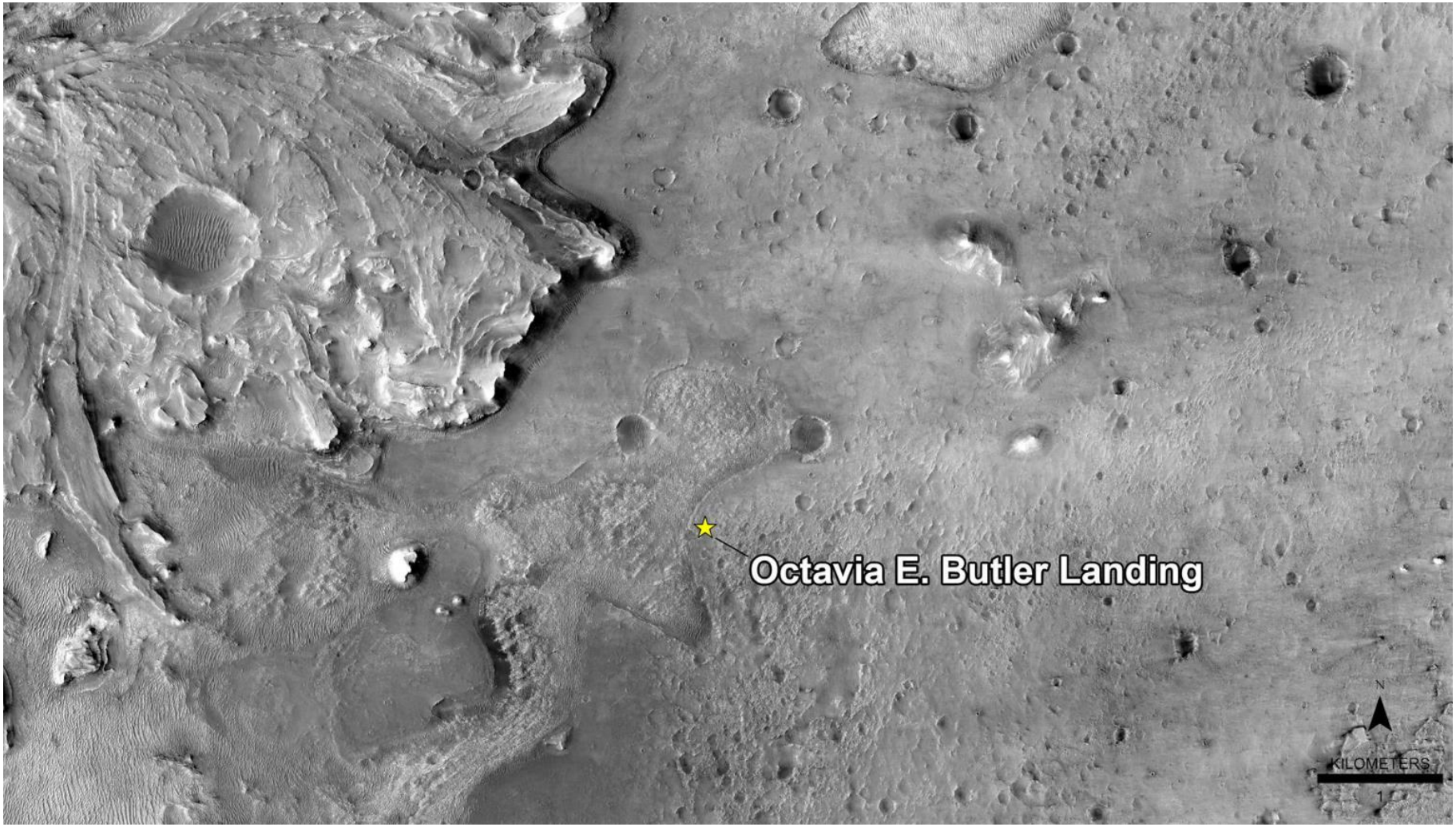
Entry, Descent, and Landing (EDL) >

Mars Perseverance rover – Octavia E. Butler Landing Site in the Jezero crater (5 March 2021)



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Entry, Descent, and Landing (EDL) >

First image taken by the rover after its successful landing

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Martian Landscape >

Mars 2020 selfie containing both perseverance rover and ingenuity

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Martian Landscape >

Mars 2020 selfie ingenuity Helicopter

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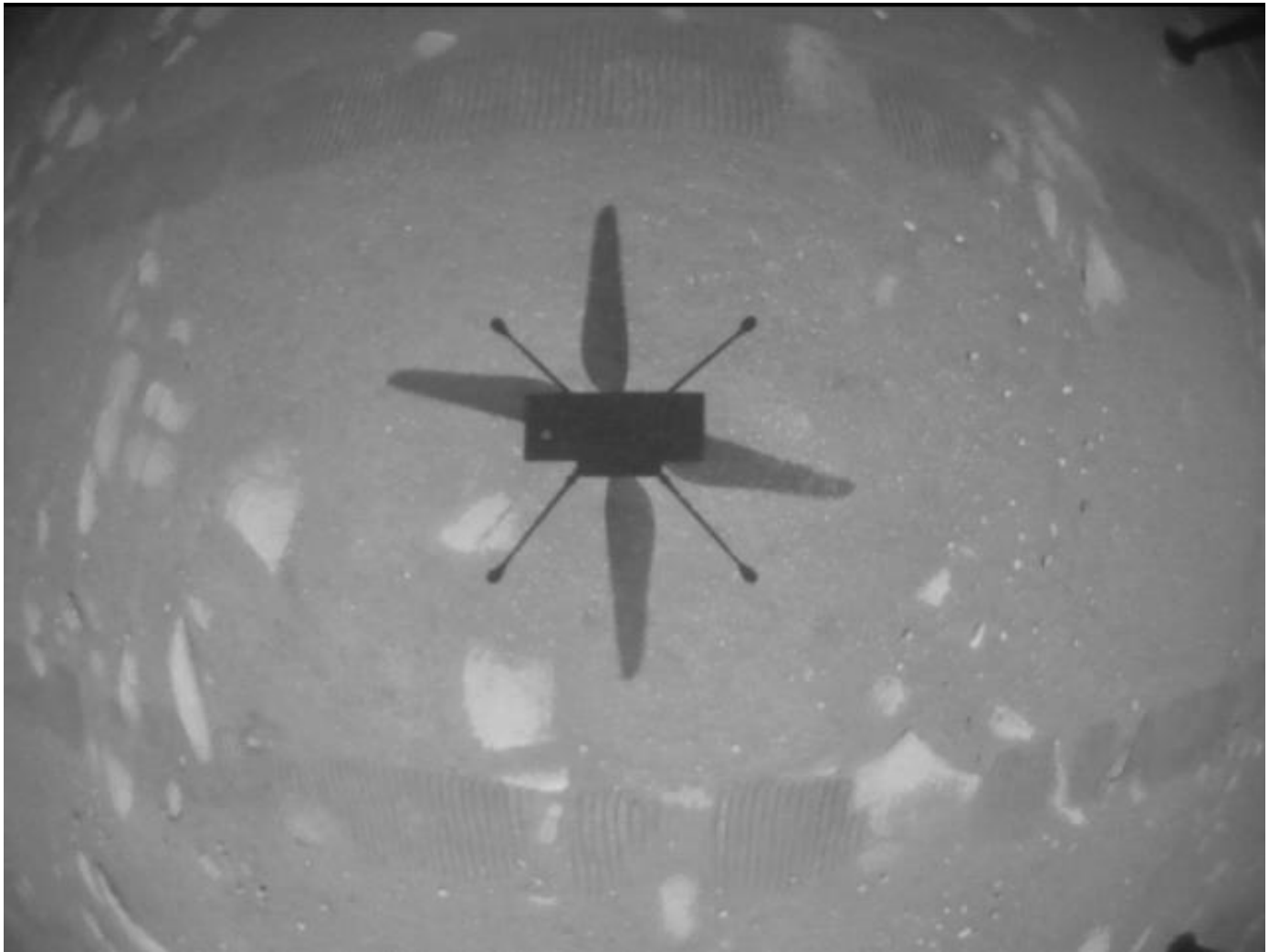
NASA Science MARS 2020 MISSION PERSEVERANCE ROVER

Martian Landscape >

Black-and-white photo from Ingenuity during its first test flight at an altitude of 1.2 m (3 ft 11 in), showing its shadow on the ground



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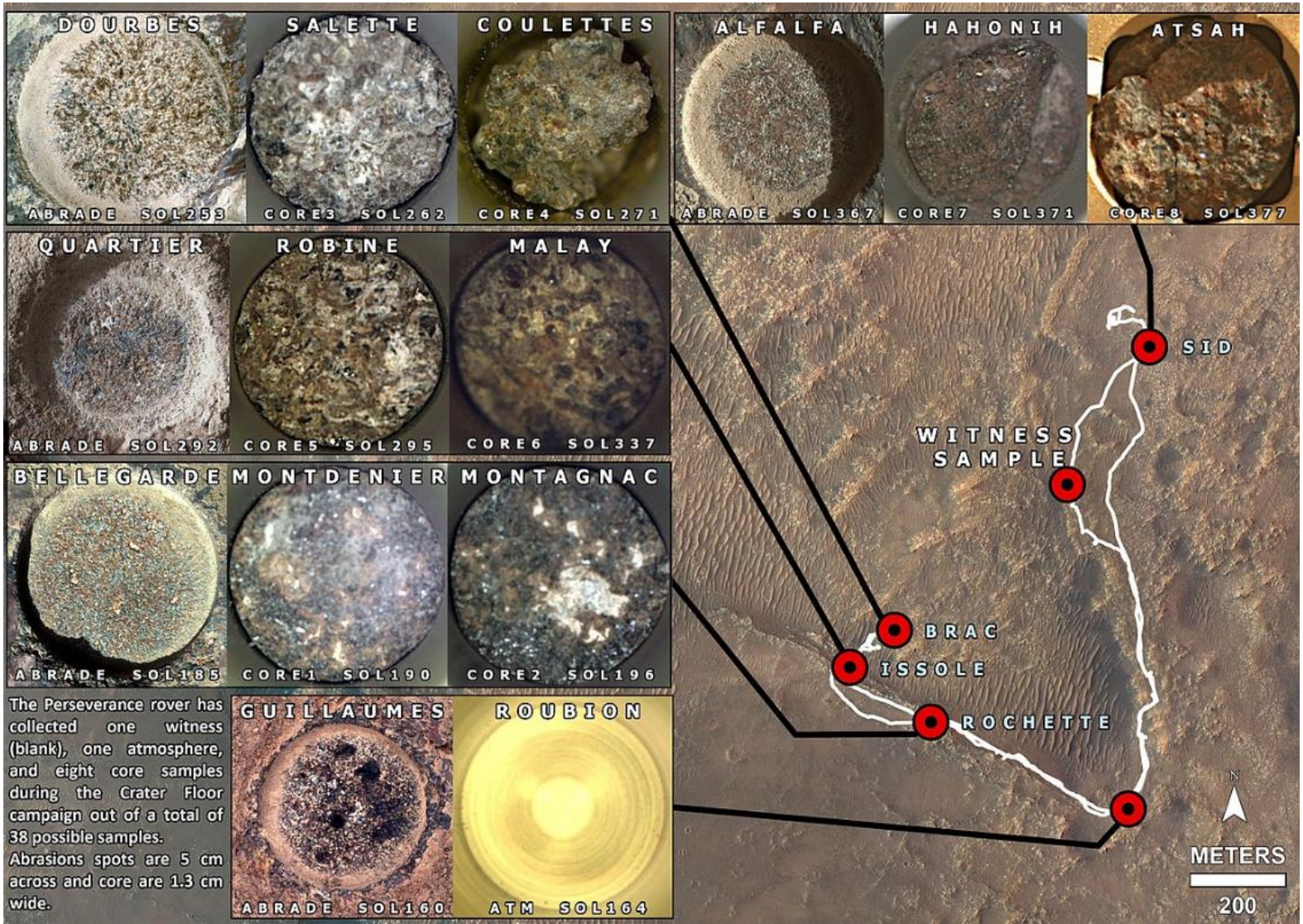
Sample Cores



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Campaign plans for 2021–2022

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Martian Landscape >

https://www.planetary.org/space-images/map-mars-major-features

Interactive Map Of Mars >

Jezero Crater is 28 miles (45 kilometers) wide, and is located on the western edge of a flat plain called Isidis Planitia, which lies just north of the Martian equator.