Webinar | Mars Exploration: Blueprint for the Red Planet

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Similarities, Yesterday and Today

Earth

Wadi Rum Valley, Jordan

Mars

Dingo Gap, Mars
MSR Campaign Mission Elements

**M2020 Rover** (July, 2020)
- Land in Jezero Crater
- Explore and characterize
- Collect samples for future return. Retain some samples for delivery to SRL. Deposit some samples on Martian surface for retrieval by the SFR
- Deliver retained samples to SRL for transfer to OS

**Sample Retrieval Lander** (July, 2026)
- Land in the proximity of Jezero Crater
- Deploy ESA-supplied SFR to retrieve samples cached by Mars 2020 at one or more depots, and receive samples delivered by M2020
- Transfer samples to OS onboard MAV
- Launch MAV to place OS in stable Low-Mars Orbit

**Earth Return Orbiter** (October, 2026)
- Deliver NASA-supplied CCRS payload to Mars orbit
  - Satisfy Planetary Protection requirements for returned samples
- Provide UHF relay support to SRL EDL and surface mission (SFR, M2020, and MAV)
- Capture OS in low-Mars Orbit
- Contain the captured OS
- Return to Earth and deliver the EEV on trajectory to UTTR landing

Robust Sample Retrieval Strategy
- SFR Fetch
- M2020 Delivery
Ready for MSR

✓ # Mars orbits flown by U.S. **193,560 orbits**
  - Mariner 9: ~700 orbits (deactivated in parking orbit), Viking 1 orbiter: 1485 orbits (deactivated in parking orbit), Viking 2 orbiter: ~700 orbits (deactivated in parking orbit), MGS: 35,885 orbits (lost), Odyssey: ~80,500 orbits (and counting), MRO: 63,418 orbits (and counting), MAVEN: 10,872 orbits

✓ # Successful U.S. Mars landings **8 landings**
  - Viking 1 lander, Viking 2 lander, Pathfinder/Sojourner, Spirit, Opportunity, Phoenix, Curiosity, InSight

✓ # Km driven by U.S. Mars rovers **75 km**
  - Sojourner: 0.104 km, Spirit: 7.73 km, Opportunity: 45.16 km, Curiosity: 22.093 km (and counting)

✓ # Years exploring Mars **49 yrs**

*(as of 6 Feb 2020)*
Sample Return is emerging as the next major exploration goal.
Mars Helicopter Tech Demo

“Ingenuity”