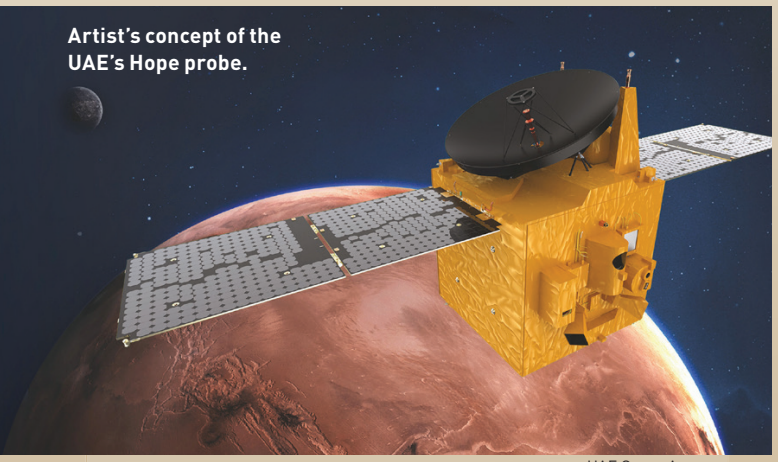
Mission: MARS

Three space missions are scheduled to reach Mars in February 2021—expanding the search for life and paving the way for future exploration.

Mission timing: Mars and Earth are at their closest every ~26 months

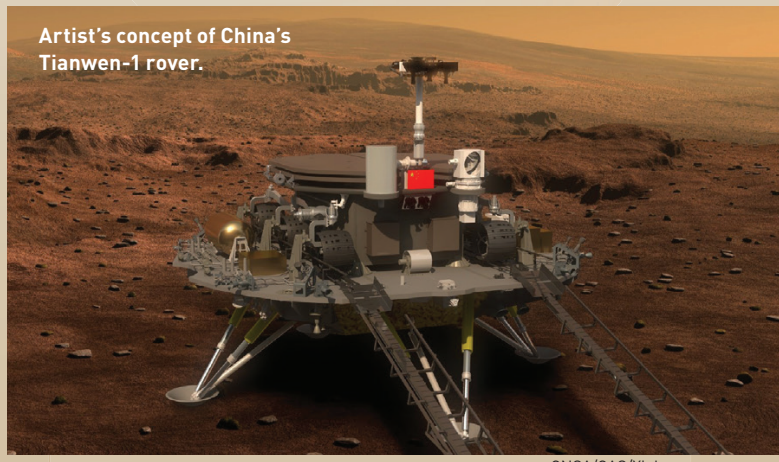
EARTH → MARS = ~62 M km

6 October 2020



Artist's concept of the UAE's Hope probe.

UAE Space Agency



Artist's concept of China's Tianwen-1 rover.

CNSA/CAS/Xinhua

Hope Probe (مسبار الأمل)

United Arab Emirates Mars orbiter

LAUNCHED: 19 July 2020, Tanegashima Space Center, Kagoshima, Japan

MARS ORBITAL INSERTION: 9 February 2021 (planned)

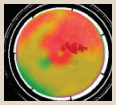
MARS ORBIT: 20,000 km periapsis and 43,000 km apoapsis, with an orbital period of 55 hours and orbital inclination of 25°

MISSION DURATION: 1 Mars year

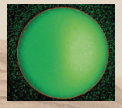
MISSION: Provide a complete picture of the Mars atmosphere—collecting 1 TB of novel data

HOPE PROBE INSTRUMENTS

Emirates exploration imager (EXI) will capture hi-res images of Mars and measure water, ice and ozone in the lower atmosphere



Emirates Mars IR spectrometer (EMIRS) will measure temperature and optical depth of dust, ice clouds and water vapor in the lower atmosphere



Emirates Mars UV spectrometer (EMUS) will measure carbon monoxide and oxygen in the thermosphere and oxygen and hydrogen variability in the exosphere

Tianwen-1 (天问一)

China National Space Administration
Mars orbiter, lander and rover

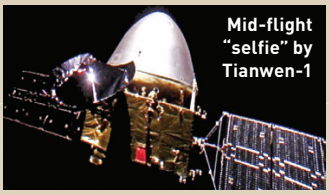
LAUNCHED: 23 July 2020, Wenchang Spacecraft Launch Center, Hainan, People's Republic of China

MARS ORBITAL INSERTION: 11–24 February 2021 (planned)

MARS LANDING: 23 April 2021, Utopia Planitia (planned)

MISSION DURATION: 1 Mars year (orbiter), 90 Sols (rover)

MISSION: Assess the Mars environment and search for evidence of current and past life



Mid-flight "selfie" by Tianwen-1

Xinhau/CNSA

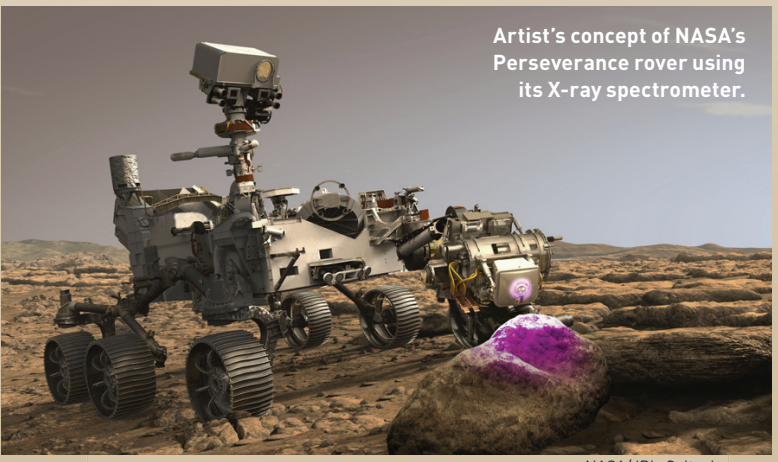
ORBITER INSTRUMENTS: Medium and high-res cameras, with 100-m and 2-m resolution from 400-km orbit / magnetometer / mineralogy spectrometer, to determine elementary composition / subsurface radar / ion and neutral-particle analyzer / energetic-particle analyzer

ROVER INSTRUMENTS: Ground-penetrating radar, to image ~100 m below the Mars surface / surface magnetic field detector / meteorological measurement instrument / surface compound detector / multi-spectrum camera / navigation and topography camera

Ingenuity, Mars 2020 helicopter

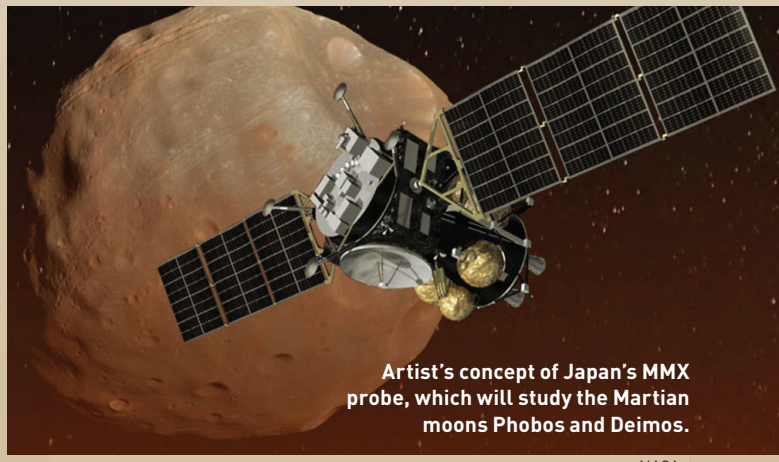
Perseverance will also carry a helicopter to Mars—a separate technology demonstration, which will be the first aircraft to fly in a controlled way on another planet. The experiment will begin sometime in the spring of 2021 and last 30 Sols.

1 SOL = 1 MARS DAY = 24:37:23 **1 MARS YEAR = ~687 EARTH DAYS**



Artist's concept of NASA's Perseverance rover using its X-ray spectrometer.

NASA/JPL-Caltech



Artist's concept of Japan's MMX probe, which will study the Martian moons Phobos and Deimos.

NASA

Perseverance

NASA Mars 2020 rover

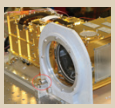
LAUNCHED: 30 July 2020, Cape Canaveral, Florida, USA

MARS LANDING: 18 February 2021, Jezero crater (planned)

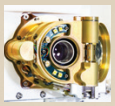
MISSION DURATION: At least one Mars year

MISSION: Search for signs of ancient microbial life, collect samples for future return to Earth and test technologies for future human exploration of Mars

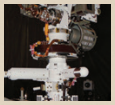
PERSEVERANCE INSTRUMENTS



Mastcam-Z camera system has panoramic and stereoscopic imaging capability and SuperCam will provide imaging, chemical-composition analysis, and mineralogy



A UV Raman spectrometer (SHERLOC) and an X-ray fluorescence spectrometer (PIXL) will determine fine-scale elemental composition of Martian surface materials



RIMFAX ground-penetrating radar will provide geologic structure of subsurface and MEDA sensors will provide measurements of temp, wind, pressure, humidity and dust

MOXIE is an exploration technology investigation that will produce oxygen from Martian atmospheric CO_2

The 2021 missions won't be alone when they reach Mars—more than 40 spacecraft have attempted the journey. Several are still active and more missions are planned.

Current operational Mars missions

NASA Mars Odyssey orbiter, *Oct. 2001*
ESA Mars Express orbiter, *Dec. 2003*
NASA Mars Reconnaissance orbiter, *Mar. 2006*
NASA Curiosity rover, *Aug. 2012*
ISRO Mars orbiter (Mangalyaan), *Sep. 2014*
NASA MAVEN orbiter, *Sep. 2014*
ESA/Roscosmos ExoMars Trace Gas orbiter, *Oct. 2016*
NASA InSight lander, *Nov. 2018*

Mars missions in development

ESA/Roscosmos Rosalind Franklin rover
LAUNCH: 2022 (planned)
MARS LANDING: 10 June 2023, Oxia Planum (planned)

NICT Terahertz Explorer (TEREX) orbiter and lander
LAUNCH: 2022 (planned)
MARS LANDING: date TBD, Isidis Planitia (planned)

ISRO Mars Orbiter 2 (Mangalyaan-2)
LAUNCH: 2024 (planned)

JAXA Martian Moons Exploration (MMX) probe
LAUNCH: 2024 (planned)

Sources: www.emiratesmarsmission.ae, https://en.wikipedia.org/wiki/Tianwen-1, https://mars.nasa.gov/mars2020, www.planetary.org / Infographic by Alessia Kirkland