The Arab world’s first mission to explore Mars
Program Objectives

• Program goals announced by UAE’s Government on 16 July 2014:
  • Complete Mars orbiter insertion by the UAE’s 50th anniversary in 2021
  • Contribute to the development of the Science and Technology Sector in the UAE
  • Develop UAE Scientific Capabilities
  • Increase UAE’s Contribution to the Scientific Community

• Program Requirements
  • The mission should be unique, and should aim for significant discoveries.
  • The mission should have impactful contributions to the ongoing work of the global space science community, and should be of a great value to humanity.
  • The mission should help build a sustainable outer space exploration program in UAE.
  • The mission should include valuable contribution from UAE engineers and scientists.
Measure the weather on Mars

Study impact of changes in the lower atmosphere on the upper atmosphere

Study the erosion of the Martian atmosphere

Study seasonal climate cycles
We will study the Martian atmosphere
24 hours a day
Through all seasons
Partnerships to share knowledge
1000 GB of new data about Mars
Scientific contribution to the development of knowledge about the Martian atmosphere
EMM Instruments

**EMIRS**
(ASU/MBRSC)
Fourier Transform IR Spectrometer

**EMUS**
(LASP/MBRSC)
Ultra Violet Imaging Spectrometer

**EXI**
(LASP/MBRSC)
Imager with 12 MP camera with 6 bandpass filters (VIS/UV)
Spacecraft – Hope Probe

• Spacecraft Design is Low Mass and High Heritage

<table>
<thead>
<tr>
<th>Technical Specifications</th>
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<tbody>
<tr>
<td><strong>S/C Dimension</strong></td>
<td>3m x 7.9m</td>
</tr>
<tr>
<td><strong>Wet Mass</strong></td>
<td>1500kg</td>
</tr>
<tr>
<td><strong>RF Band</strong></td>
<td>X Band</td>
</tr>
<tr>
<td><strong>Power Requirement</strong></td>
<td>477 W</td>
</tr>
<tr>
<td><strong>Propulsion Type</strong></td>
<td>Monopropellant Hydrazine System</td>
</tr>
</tbody>
</table>

![Spacecraft Diagram](image)
Science Orbit

• EMM’s target orbit is exciting! No spacecraft has flown an orbit like it. Further, it is low-risk, simple to fly, and produces excellent opportunities to collect EMM’s science.

Key Features:
• Periapse altitude: 20,000 km
• Apoapse altitude: 43,000 km
• Orbital period: 55 hours
  3 orbits per week
  ~2.24 sols
• Inclination: 25 deg
• Periapse placed near equator: AOP: 177 deg
• Primary science collection starts ~May 2021
EMM Launch Segment

• Mitsubishi Heavy Industries, LTD (MHI) H-IIA launch vehicle
• Tanegashima Space Center, Yoshinobu Launch Complex

Launch scheduled for summer 2020
Mission Architecture Diagram

Emirates Mars Mission Timeline

- July 2020 ~7 Months
- Cruise
- MOI
- Capture Orbit
- 2 Month
- Transition
- 3 Weeks
- Science Phase
- 2 Earth Years
- Extended Mission
- 2 Earth Years
- Decommissioning

Capture 500km x 44,400km
~20° incl. ~35hrs

Transfer
Orbit Maneuvers

Science 20,000km x 43,000km
25° incl. ~55hrs

S/C Communication through LGA

S/C Communication through XGA

NASA DSN

Mission Ops MSF

Mission Ops MOC

SDC

ITF

ASI

LASP
Emirates Mars Mission [Hope Probe]

- Symbol of Capability & Hope
  - Inspiration for youth
  - Optimism and ambition can deliver the greatest achievements
  - Significant contribution to humanity and civilization
  - First Arab mission to another planet

- Catalyst for Knowledge & Skills
  - 100+ Emiratis engineers & scientists involvement by 2020
  - Technical knowledge will be developed in the UAE
  - Valuable and enduring legacy in the form of human capital
  - ~200 academic & research institutions are expected to benefit from it

- Anchor for New Space Industry in UAE
  - EMM is a turning point in the nation’s development
  - UAE aims to be among the top countries in the field of space technology
  - Vital to the economy of nation
  - The space sector is integral to many aspects of life

• Vital to the economy of nation
• The space sector is integral to many aspects of life