Proposed ExoMars 2016 Trace Gas Orbiter Science Mission Overview

O. Witasse, European Space Agency
M. Allen, Jet Propulsion Laboratory, California Institute of Technology
• ESA and NASA have agreed to embark on a joint Mars robotic exploration programme:
  ➞ Initial missions have been proposed for the 2016 and 2018 launch opportunities;
  ➞ Missions for 2020 and beyond are in a planning stage;
  ➞ The joint programme’s ultimate objective would be an international Mars Sample Return mission.

2016 Proposed ESA-led mission
Baseline launch Vehicle: NASA – Atlas V 431
Orbiter: ESA
Payload: NASA-ESA
Science Ops: ESOC MOC; NASA-JPL SRA/SOC
Telecom: NASA-ESA
EDL Demo: ESA

2018 Proposed NASA-led mission
Baseline Launch Vehicle: NASA – Atlas V 531
Cruise & EDL: NASA
Rover 1: ESA
Rover 2: NASA
Proposed Mission Objectives

TECHNOLOGY OBJECTIVE
-> Entry, Descent, and Landing (EDL) of a payload on the surface of Mars.

SCIENTIFIC OBJECTIVE
-> To study Martian atmospheric trace gases and their sources.

-> Provide data relay services for landed missions until 2022.
**Scientific Goals and Payload**

**PRIORITISED GOALS**

1. **Detect a broad suit of atmospheric trace gases and key isotopes with high sensitivity:**

2. **Map their spatial and temporal variability with high sensitivity:**

3. **Determine basic atmospheric state by characterising P, T, winds, dust and water aerosol circulation patterns**

4. **Map their spatial and temporal variability with high sensitivity (≤ ppb):**

**INSTRUMENTS**

- **MATMOS**
  - (ppt)
  - **USA, CAN**

- **NOMAD**
  - (10^{-1} ppb)
  - **B, E, I, UK, USA, CAN**

- **EMCS**
  - (P, T, dust, ices, H₂O)
  - **USA, UK**

- **MAGIE**
  - (Full hemisphere WAC)
  - **USA, UK**

- **HiSCI**
  - (HRC 2 m/pixel)
  - **USA, CH, UK, I, D, F**

---

Excellent coverage of high-priority objectives.

**Pre-decisional – for Planning and Discussion Purposes Only**
Projected Mission parameters

Orbital inclination: 74° ± 10°
Orbital period: 2 hours
Altitude: 350-400 km
Duration: 1 Martian year

Observation modes
- Solar occultation
- Nadir
- Limb

Solar occultation coverage
Organisation of the project

Joint Mars Exploration Programme

ExoMars TGO / EDM Project Team

ESA ExoMars Project

NASA-JPL ExoMars/TGO Project

EDM SWT (ESWT) Chair

Project Scientist

Orbiter SWT (OSWT) Co-Chairs

M. Allen
O. Witasse

ESA ExoMars J. Vago

NASA ExoMars/TGO P. Crane

EDM Science Investigation Teams

Orbiter Science Investigation Teams

Mars Science Community

Pre-decisional – for Planning and Discussion Purposes Only
<table>
<thead>
<tr>
<th>Date Range</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-27 Jan 2016</td>
<td>Proposed Launch window</td>
</tr>
<tr>
<td>16 Oct 2016</td>
<td>Descent Module Release</td>
</tr>
<tr>
<td>19 Oct 2016</td>
<td>Mars Orbit Insertion, EDL Relay Coverage and EDM Landing</td>
</tr>
<tr>
<td>27 Oct 2016</td>
<td>End of surface operations and Relay Coverage</td>
</tr>
<tr>
<td>29 Oct 2016</td>
<td>Inclination change to Science Orbit</td>
</tr>
<tr>
<td>31 Oct 2016</td>
<td>Apocenter reduction</td>
</tr>
<tr>
<td>8 Nov 2016</td>
<td>Start of Aerobraking Phase</td>
</tr>
<tr>
<td>Spring 2017</td>
<td>End of Aerobraking Phase, start of the science!</td>
</tr>
<tr>
<td>11 Jul-11 Aug 2017</td>
<td>Superior Conjunction</td>
</tr>
<tr>
<td>14 Jan 2019</td>
<td>Start of Data Relay Phase for the two rovers</td>
</tr>
</tbody>
</table>
As for many missions/project, one could expect to broaden the mission community by releasing a call for

Guest Investigator

and

Inter-Disciplinary Scientist

a few years before launch.
Concluding remarks