National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

2016 ESA/NASA ExoMars/Trace Gas Orbiter

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European Space Agency

MEPAG

June 16, 2011

Artist's concept

Pre-decisional – for planning and discussion purposes only

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Overview

National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

- Joint ESA-NASA Mars Orbiter
  - Proposed launch in 2016
- Deliver ESA EDM
- 1 Mars year orbital science mission
- Telecom asset until 2022

Contributions

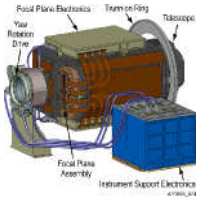
National Aeronautics and Space Administration
Jet Propulsion Laboratory
California Institute of Technology

NASA / JPL Proposed Mission Elements

EMCS

MAGIE

Electra



MATMOS

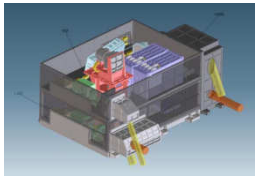
Atlas-V – Baseline Class

JPL-JG1

JPL DSN

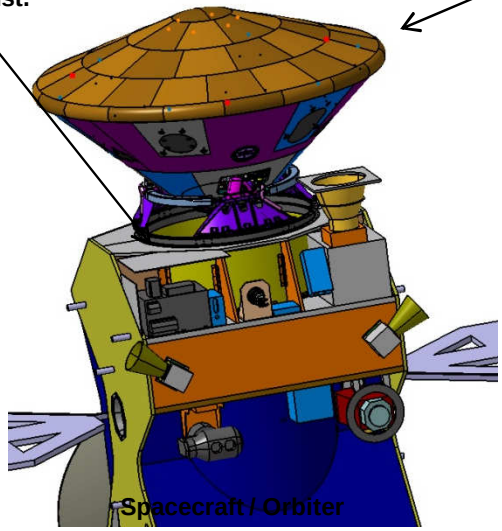
JPL SRA

ESA Mission Elements

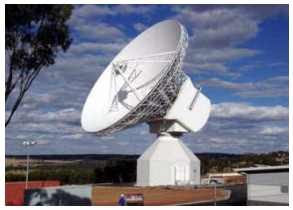


NOMAD Inst.

Entry / Descent Module (EDM)



Spacecraft / Orbiter



ESA ESTRACK

ESA ESOC

2016 ExoMars/TGO

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JPL-JG1 LV not selected yet

Janis Graham, 5/18/2011

EMTGO Mission Events *(proposed)*

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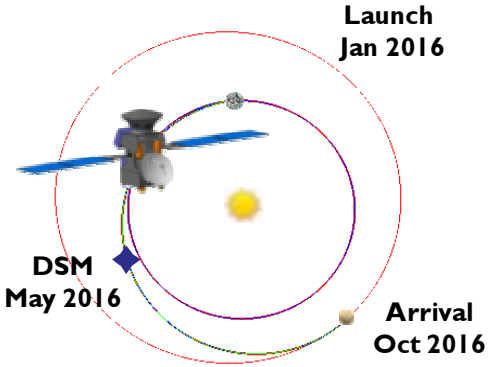
LAUNCH

Jan 2016

EMTGO in launch configuration

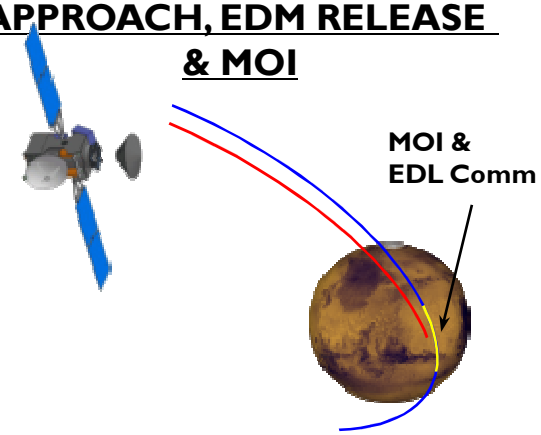
Atlas V 431

INTERPLANETARY CRUISE



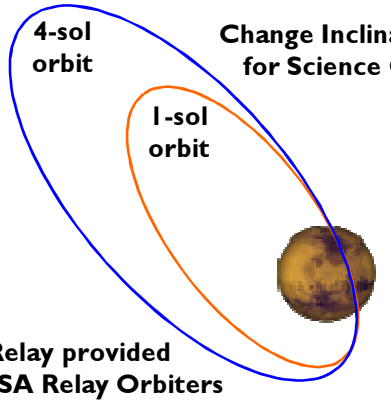
Type II Trajectory: C3 = 7.44 km^2/s^2

APPROACH, EDM RELEASE & MOI



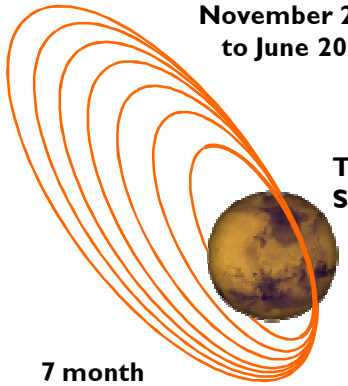
- EDM release at MOI - 3 days
- Orbiter retargets to MOI altitude
- MOI captures to 4 sol orbit

EDM RELAY & TRANSITION TO 1-SOL ORBIT



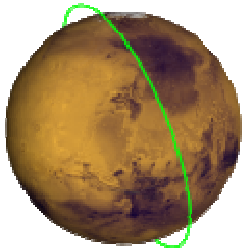
EDM Relay provided by NASA Relay Orbiters

AEROBRAKING PHASE



7 month Aerobraking

SCIENCE & DATA RELAY PHASE



Science & Relay Orbit
- 400 km Frozen
- Rotates every 4 months
- Phased for 2018 Relay

- Science Phase: 1 Mars Year 6-2017 to 6-2019
- Relay Phase: 2018 Rovers Jan 2019
- Relay Phase: Future Missions through 2022

Pre-decisional – for planning and discussion purposes only

Prioritized Science Objectives

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- Detect a broad suite of atmospheric trace gases and key isotopologues.
- Characterize the spatial and temporal variation of methane and other species that could be signatures of active biological and/or geological processes (for example, C_2H_6, SO_2, N_2O) and of photochemical species that determine atmospheric lifetimes (e.g., representative O_x, HO_x, NO_x species) and their source molecules (e.g., H_2O).
- Localize the sources and derive the evolution of methane and other key species and their possible interactions, including interactions with atmospheric aerosols and how they are affected by the atmospheric state (temperature and distribution of major source gases; e.g. H_2O).
- Image surface features possibly related to trace gas sources and sinks.

Proposed Payload

MATMOS

Solar occultation Fourier transform IR spectrometer *(w/ Canadian contribution)*

NOMAD

Occultation + mapping IR, Vis, UV spectrometer

(consortium of Belgium, Spain, Italy, UK)

EMCS

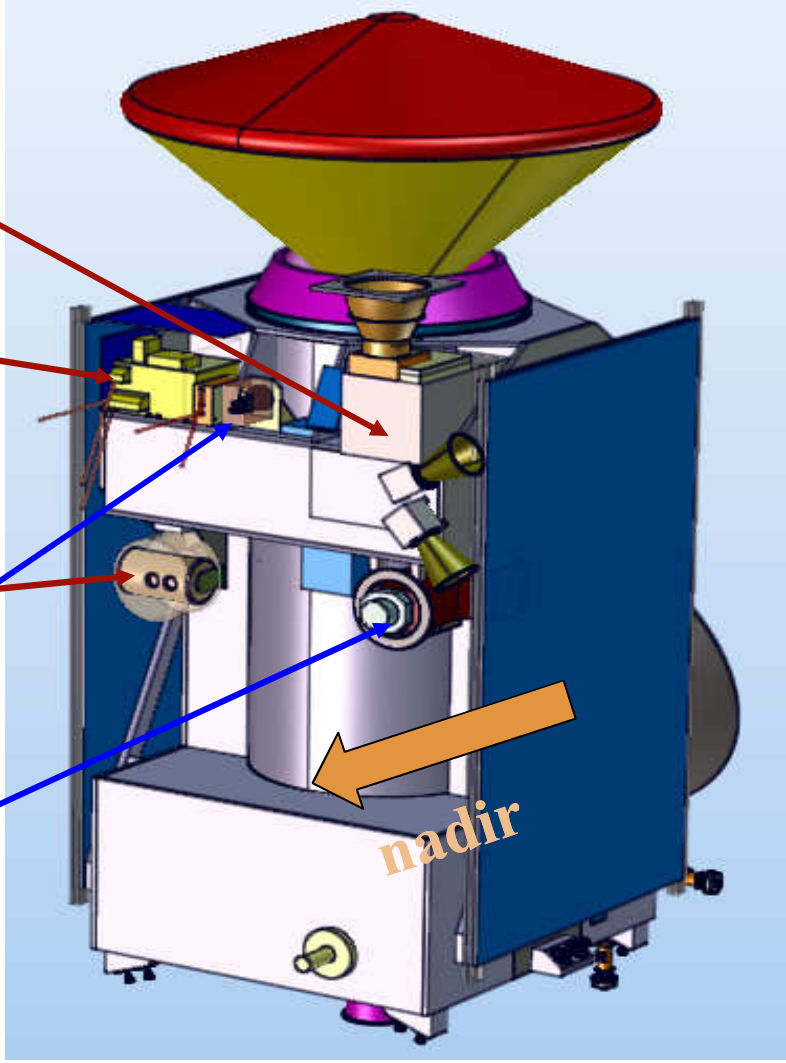
Thermal IR spectrometer

MAGIE

Wide-angle Vis-UV camera

HiSCI

High resolution, colour, stereo camera *(w/ Swiss contribution)*



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JPL-JG3 Is this all of the instruments?
Janis Graham, 5/18/2011

Solar occultation

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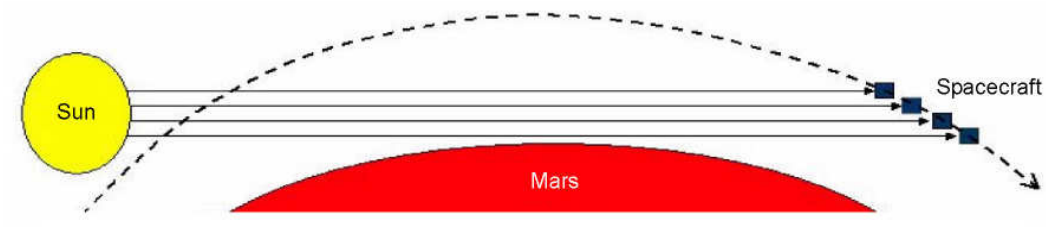
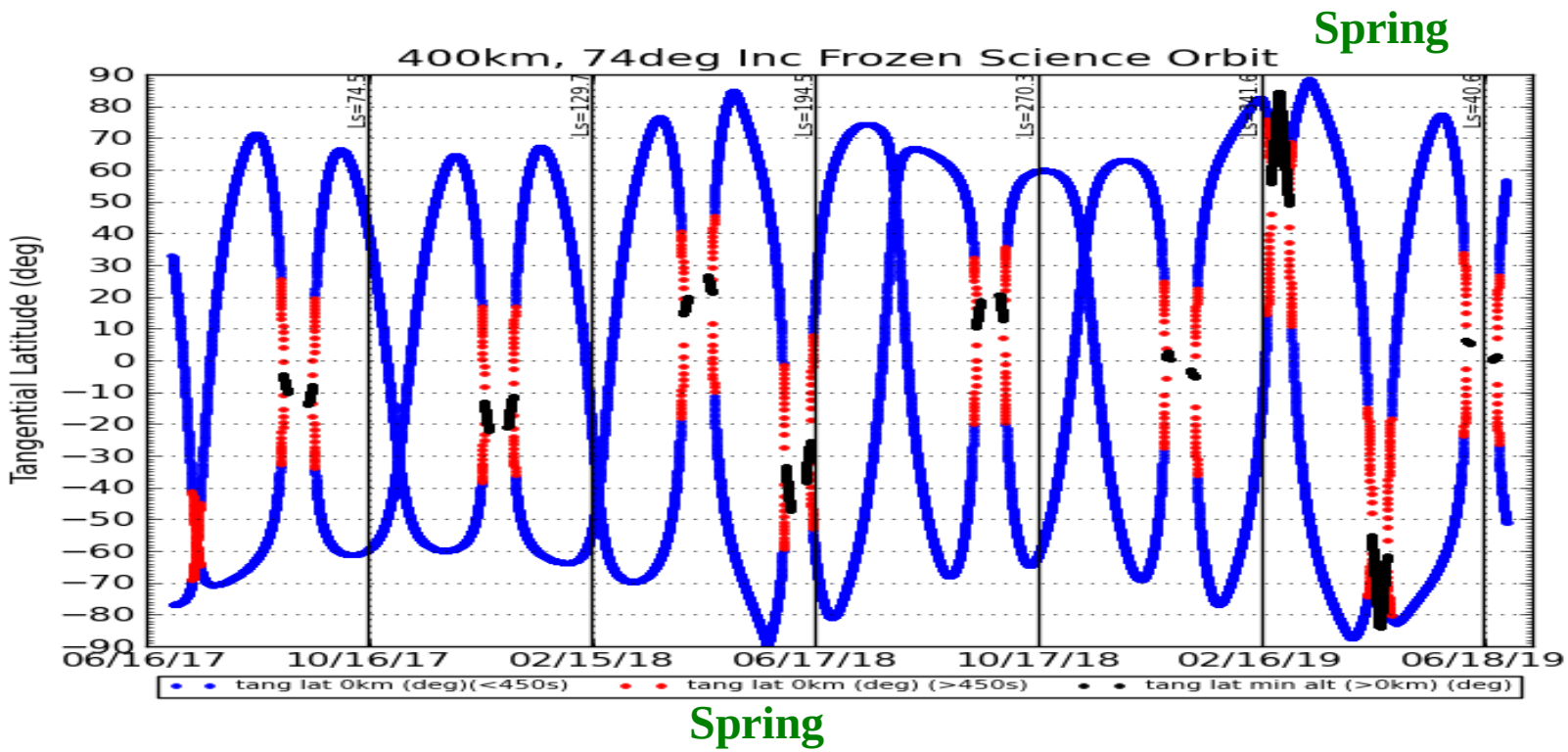
- Ultrahigh sensitivity
  - Bright light source
  - Long pathlength
- Orbit inclination: 74º





Nadir mapping

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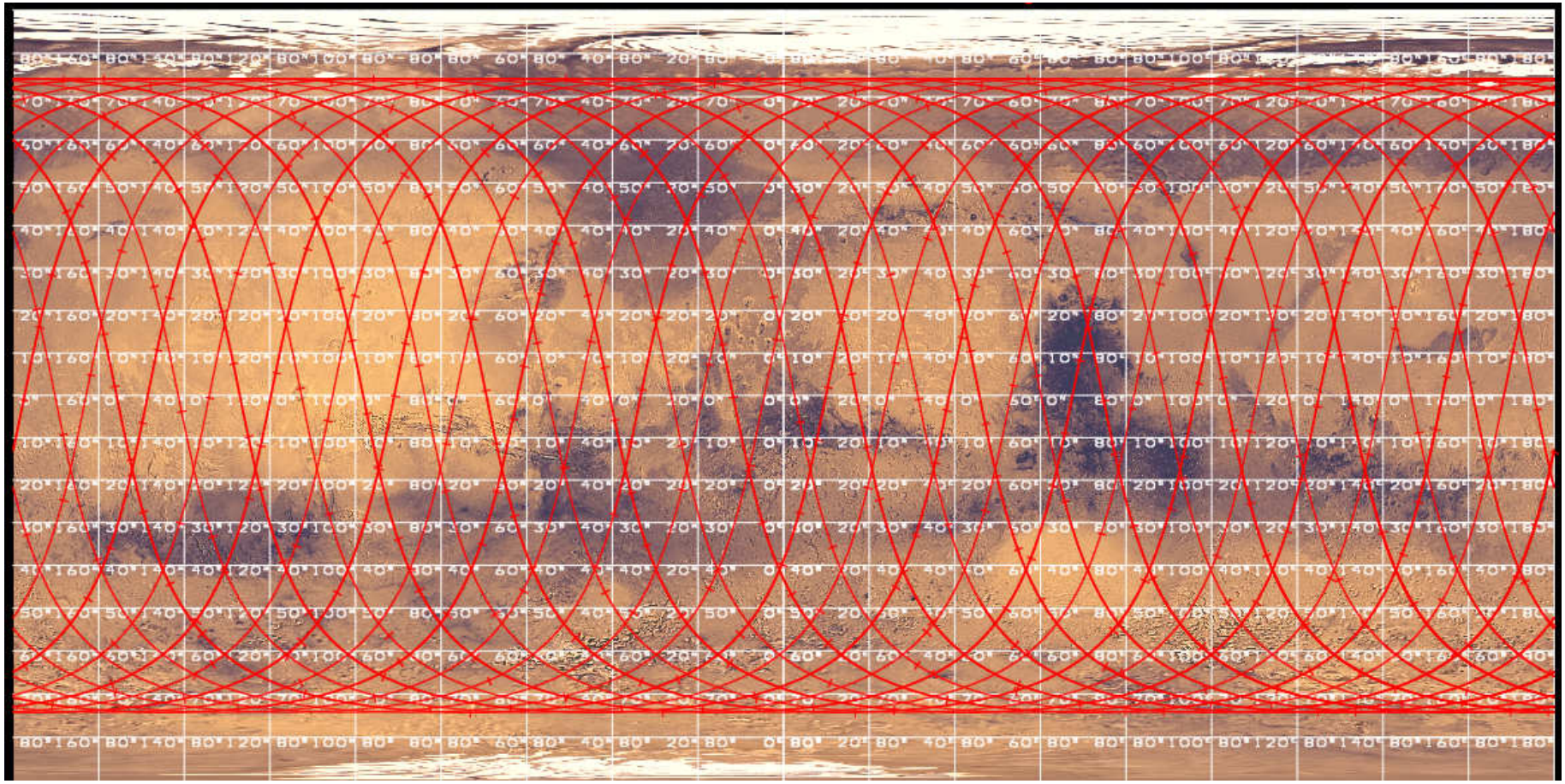
- Ground track for 3 days