

Exploration of Mars (08)
Robotic Mars Exploration (1)

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EXOMARS MISSION DESIGN STATUS

Abstract

This paper addresses the ESA-NASA mission, to be launched in 2016/2018, which comprises a Trace gas Orbiter (TGO), with scientific and data relay assets, and an Entry Descent and Landing Demonstrator Module (EDM) in 2016 and the Joint rover in 2018. On January 2016 the ExoMars Spacecraft Composite (SCC) will be launched into a Type-2 transfer trajectory to Mars which will be reached, after a cruise of about 9-month duration, on 16 October 2016. The EDM will be separated from the TGO and will coast autonomously for 3 days before crossing the Entry Interface Point (EIP) at 120 km from the Martian surface, from which it will perform the hyperbolic entry, descent and landing at its Meridiani Planum landing site (Longitude = 6.15 deg W, Latitude = 1.82 deg S). Twelve (12) hours after deploying the EDM, the TGO will execute the Orbiter Retargeting Manoeuvre (ORM) to raise the pericentre of the incoming hyperbola and avoid collision with Mars. This will be followed by the Mars Orbit Insertion (MOI) which will put the TGO into a highly eccentric orbit with period of 4 sols. At the second apocentre of the insertion orbit, 6 sols after MOI, an inclination change manoeuvre (ICM) will take place to reach 74 deg, the target inclination of the science (and data relay) orbit; at the next pericentre, 8 sols after MOI, the Apocentre Lowering Manoeuvre (ALM) will be performed in order to reduce the orbital period to 1-sol. Further reduction of the apoapses will be then achieved by aerobraking over a period of several months, to reach the final science and data relay circular orbit at an altitude of about 400 km in which detection, characterisation and source- localisation of the Mars atmospheric trace gases will be performed for a period of one Martian year. The science mission will have to be interrupted for few days in January 2019, to overview the arrival of the ESA-NASA joint Rover mission, to be launched in 2018.

After that, the science mission and the Rover data relay mission will continue in parallel until, nominally, end of July 2019, followed by further relay operations for future ESA-NASA missions to Mars through the end of the year 2022. Description of the status and the configuration for the 2018 Joint rover will be given as well