Indian Mars Orbiter Mission

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The Mars Orbiter Mission (MOM) is the first inter-planetary mission of India launched by Indian Polar Satellite Launch Vehicle (PSLV-XL) on 5 November 2013. It departed from Earth's orbit on Dec. 1, 2013, on its 300-days journey to Mars. MOM will reach Mars on Sept. 24, 2014. The expected orbit of MOM around Mars is highly elliptical with periarion ~370 km and apoarion ~80000 km, inclination 151 degree, and orbital period 3.15 sols. The spacecraft mass is 1350 kg, with dry mass of 500 kg and science payload mass of 14 kg. The MOM has both, technological and scientific, objectives.

Figure 1. Logo of the Indian Mars Orbiter Misison.

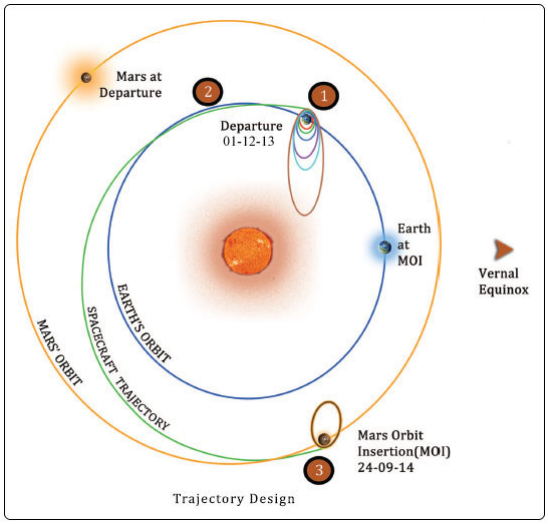


Figure 2. The three phases of the MOM: in orbt around Earth, heliocentric-phase, and Martian observation phase.

The technological objectives include: (i) design and realisation of a Mars orbiter with a capability to survive and perform Earth-bound manoeuvres, cruise phase of 300 days, Mars orbit insertion / capture, and on-orbit phase around Mars, (ii) deep space communication, navigation, and management, (iii) incorporation of autonomous features to handle contingency situations.

Figure. 3. Launch of PLSV-XL on Nov. 5, 2013, carrying the MOM spacecerfat.

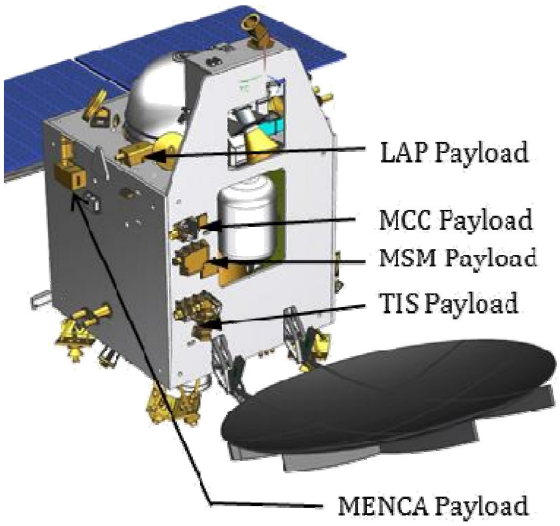


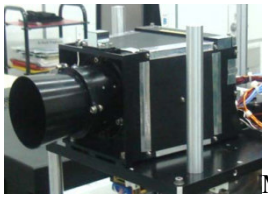
Figure 4. Accomodation of the five instruments on the MOM spacecraft.

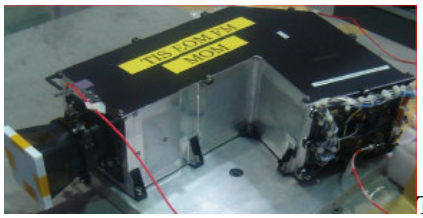
The scientific objectives include exploration of Mars surface features, morphology, mineralogy and Martian atmosphere by a suit of five indigenous scientific instruments, namely: Methane Sensor for Mars (MSM), Mars Colour Camera (MCC), Lyman Alpha Photometer (LAP), Mars Exospheric Neutral Composition Analyzer (MENCA), TIR Imaging Spectrometer (TIS).

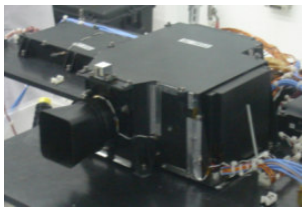
MSM is a differential radiometer based on Fabry-Perot etalon filters operating in the SWIR region for measurement column of Methane in the Martian atmosphere. MCC is a medium resolution camera with R-G-B Bayer pattern to map various morphological features on Mars and return visual images of Mars and its environs high geometrical fidelity. TIS is an imaging spectrometer in thermal IR which makes use of an un-cooled micro-bolometer array as the detector. The spectrometer has 12 programmable bands in the spectral region 7-13 μm. TIS will map thermal emissions in the Martian environment and may be able to provide composition and mineralogy of Mars surface.

LAP instrument is a FUV photometer operating on the principle of photo-absorption that measures relative abundance of deuterium and hydrogen in the Martian atmosphere, and determines the isotope ratio of atomic Deuterium/ Hydrogen (D/H) of Martian atmosphere from the ratio of the measured D, H Lyman α intensities.

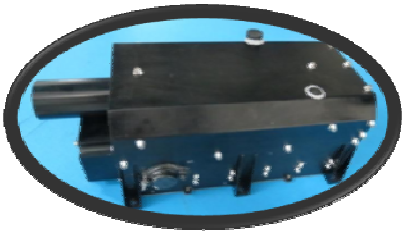
MENCA is a quadruple mass spectrometer-based instrument capable of measuring the neutral composition of Mars upper atmosphere-exosphere in the range of 1-300 amu with unit mass resolution. This talk will present the MOM, the instruments on MOM, observation plan, and possible science.


MCC


TIS


MSM


MENCA


LAP