

Preface

Mars Orbiter Mission

Mars Orbiter Mission (MOM) is Indian Space Research Organization's first interplanetary mission, with an orbiter craft (satellite) designed to orbit Mars in an elliptical orbit of nearly $368 \text{ km} \times 80,000 \text{ km}$. It was launched on 5 November 2013 using the PSLV-XL rocket. After 10-month long journey, interlaced with several complex and precise manoeuvres, MOM satellite was inserted into the desired Mars orbit on 24 September 2014. Designed for a nominal mission life of 6 months, MOM successfully completed the mission objectives on 24 March 2015 and continues to function satisfactorily and collect data. By the time this article appears in print, the MOM would have completed one year (terrestrial year) in the Martian orbit.

This special section of *Current Science* on MOM provides a brief description of the conceptualization, the overall mission and instrumental details of the experiments onboard. MOM has been a challenging technological mission considering the critical launch requirements, mission operations and stringent requirements on propulsion, communications and other bus systems of the spacecraft. The various considerations including conceiving, design and planning, which finally culminated into a distinctively successful Indian Mars Orbiter Mission are discussed in this special section. The MOM mission involved three phases, namely, the Earth-centred phase, the heliocentric phase and the Martian phase. The crucial first step was the precise launch of MOM by PSLV and details of the challenges involved, mission automation and autonomy are discussed. Optimal utilization of existing launch systems and minimum-energy orbit placement around Mars with an innovative highly elliptic orbit formed one of the major factors of the mission. Choice of a highly elliptical orbit facilitated both high-resolution localized observations, as well as full disc/columnar

observations. These are highlighted in the first few articles of this special section.

Besides development and successful demonstration of several complex technological challenges and control requirements, that led to a successful Martian insertion on the maiden attempt by any space faring nations, MOM carried on-board five special payloads to study the surface and atmosphere of Mars. These included the Mars Colour Camera (MCC) for obtaining high resolution as well as full disk images of Mars, the Methane Sensor for Mars (MSM) to locate and measure methane emissions, if any, on Mars, the TIRS (Thermal Infrared Imaging Spectrometer) to measure the surface temperatures, the MENCA (Mars Exospheric Neutral Composition Analyzer) to continuously measure the neutral composition of the Martian Exosphere and its variation with radial distance from the planer and LAP (Lyman-Alpha Photometer) to estimate the isotopic (D/H) abundance of hydrogen. All these payloads have been performing as designed, ever since insertion in the orbit and voluminous data have been generated. The instrument capabilities to make these observations are addressed in articles on the payloads on MOM.

We are sure that compilation of these articles would be useful to the wide community, interested in the details of the mission. We would like to thank Chairman, ISRO for the foreword. Thanks are due to the various authors who have contributed to this special section, within their busy schedule, as many of them are already busy with other forthcoming projects. We also thank the referees whose critical evaluation have helped in improving the manuscripts. Finally, we thank INSES Office at ISRO for the design of the cover page.

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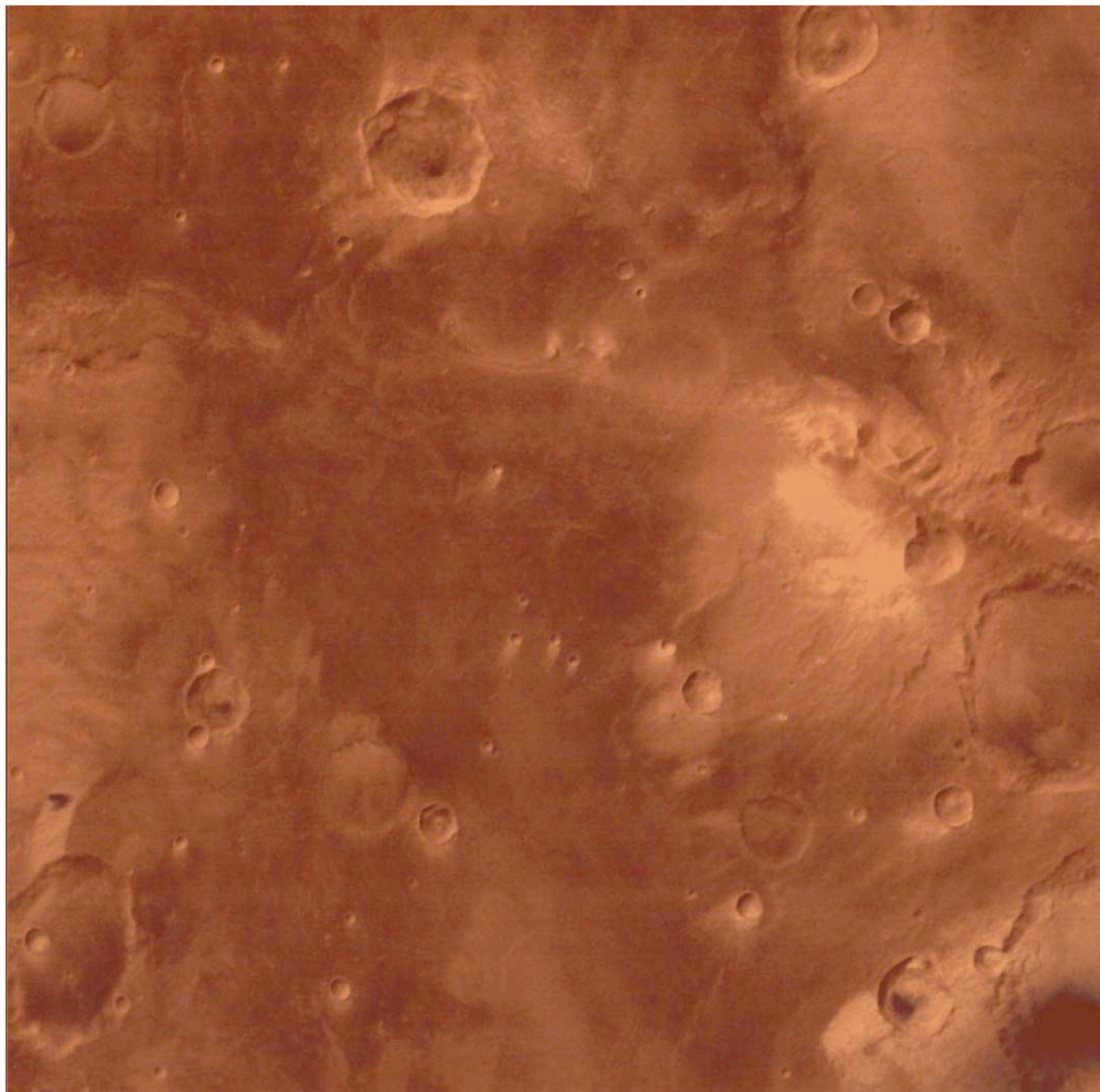


Image is pertaining to Sinus Sabaeus quadrangle of Mars, taken by Mars Color Camera after MOM blackout. This image was captured on 14 July 2015 at an altitude of 2555 km with a resolution of 132.8 m.