

# The trajectory of the Small Mars System from launch to Mars atmospheric entry

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## Abstract

The Small Mars System (SMS) is a proposed mission to Mars. The project, currently at the end of phase 0, is funded by the European Space Agency. The prime contractor is ALI S.c.a.r.l., and the study team includes the University of Naples Federico II (UniNA), the Astronomical Observatory of Capodimonte (INAF-AOC) and the Space Studies Institute of Catalonia (IEEC). The objective of the mission is to deliver a small Martian lander carrying a particle dust analyzer (INAF-AOC) and an aerial drone (UniNA). The mission-enabling technology is an innovative umbrella-like heat shield, known as IRENE (Italian ReEntry Nacelle), developed and patented by ALI. The low-cost character of the mission severely constrains the launcher's selection and, as a consequence, the launch mass and the  $\Delta V$  budget of the trajectory. In this contribution, the strategy adopted to configure the ascent and interplanetary injection will be illustrated. This will be followed by the description of the way in which the interplanetary trajectory analysis has been conducted leading to the current baseline for the transfer from Earth to Mars. The direct approach to Mars through a hyperbolic trajectory has been appropriately tuned by means of a targeting maneuver which allows to achieve certain kinematic conditions at the upper limit of the Martian atmosphere, as required by the entry-descent-landing strategy. The criteria, the methods and the results obtained will be presented and discussed.

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