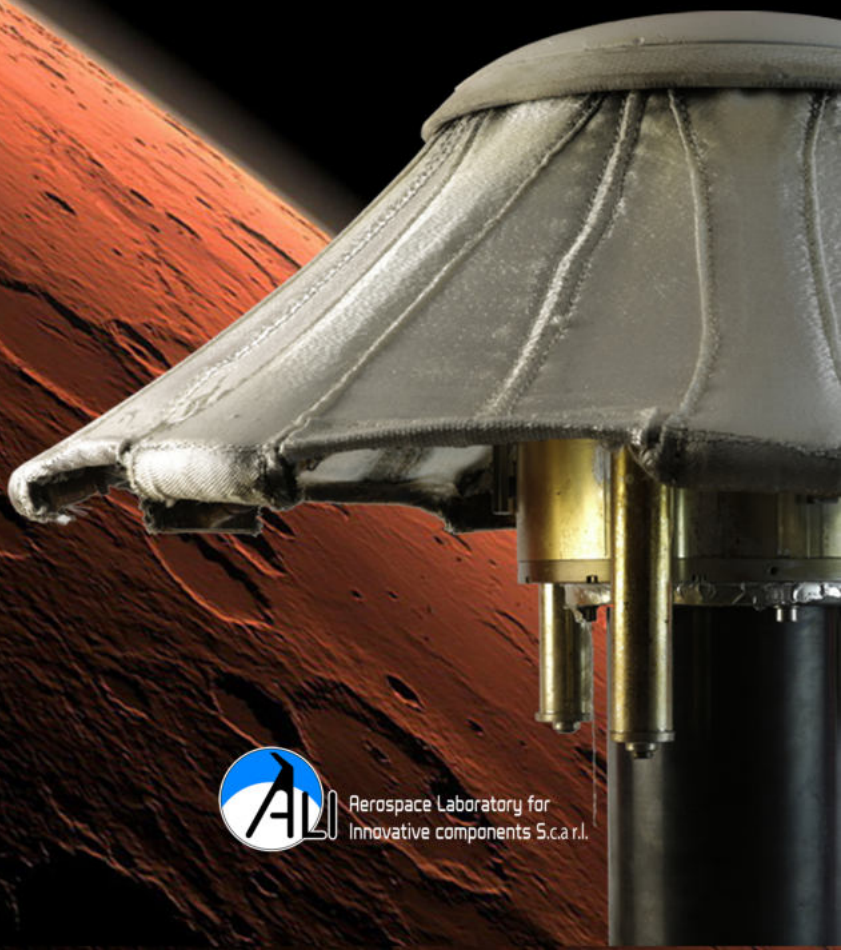
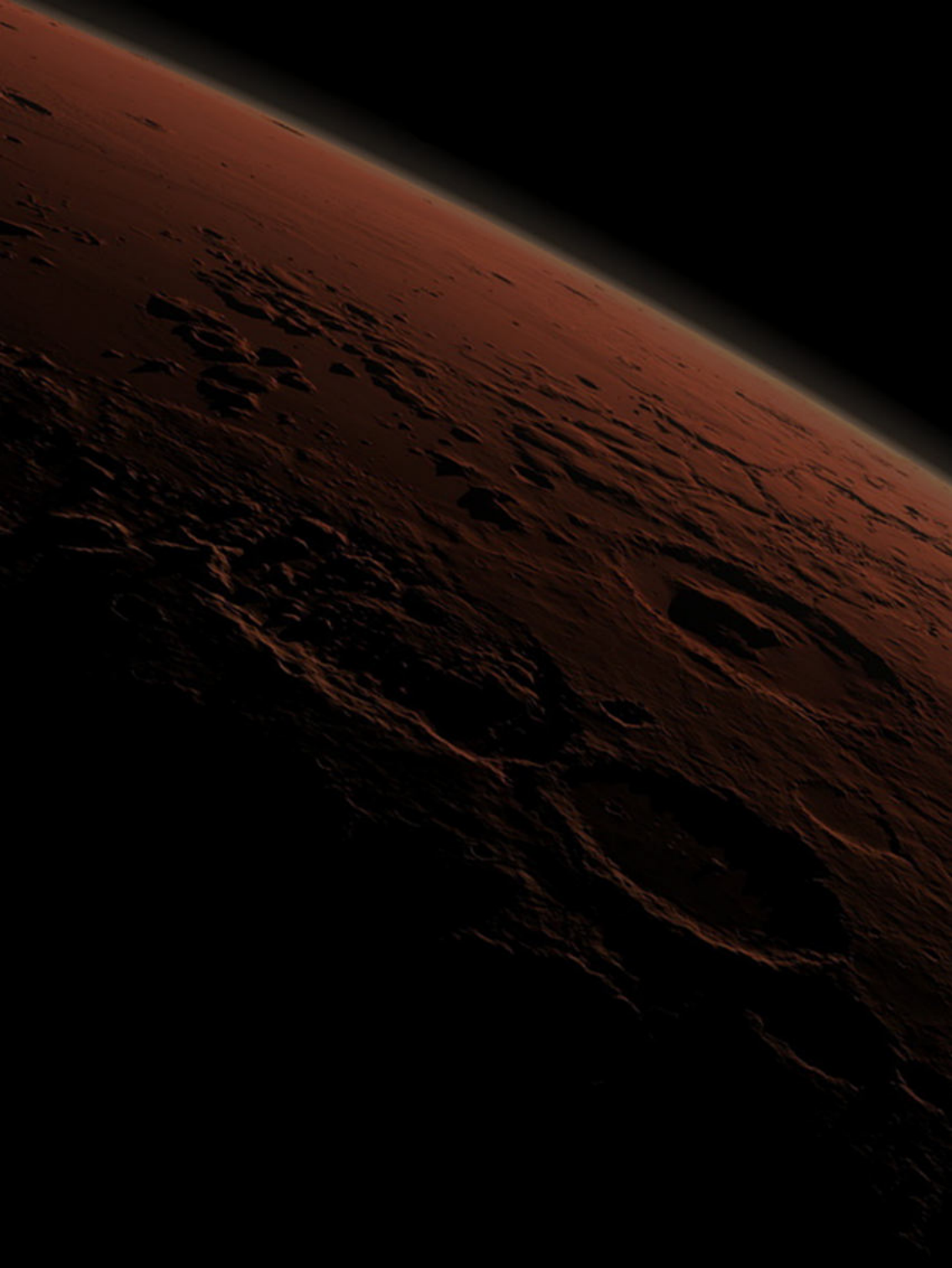


IRENE

Italian Re-Entry Nacelle



Aerospace Laboratory for
Innovative components S.c.a.r.l.



IRENE

Italian Re-Entry Nacelle

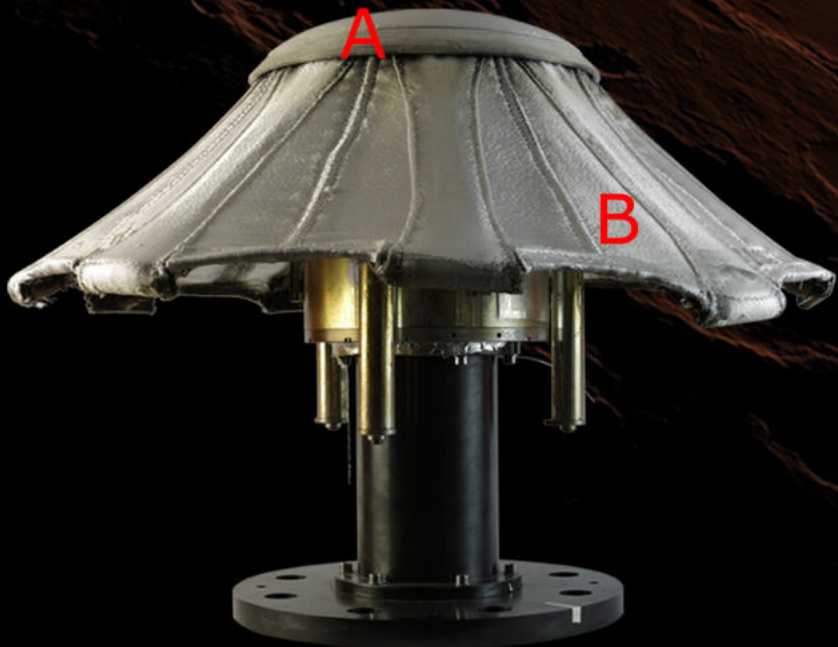
IRENE

The Italian Space Agency (ASI) and the European Space Agency (ESA) have been supporting since 2010 a research programme, called **IRENE "Italian RE-entry Nacelle"** to develop a **low-cost re-entry capsule**, whose innovative characteristics are the heat-shield opening mechanism (umbrella-like configuration) - covered by an international patent - and the (off the shelves) material used for the thermal protection. The deployable heat shield allows a drastic reduction of the ballistic coefficient which results into reduction of the peak heat flux and mechanical loads.

The associate companies of ALI participating in the IRENE program are:



A a fixed nose (made by a special ceramic material)



IRENE main feature

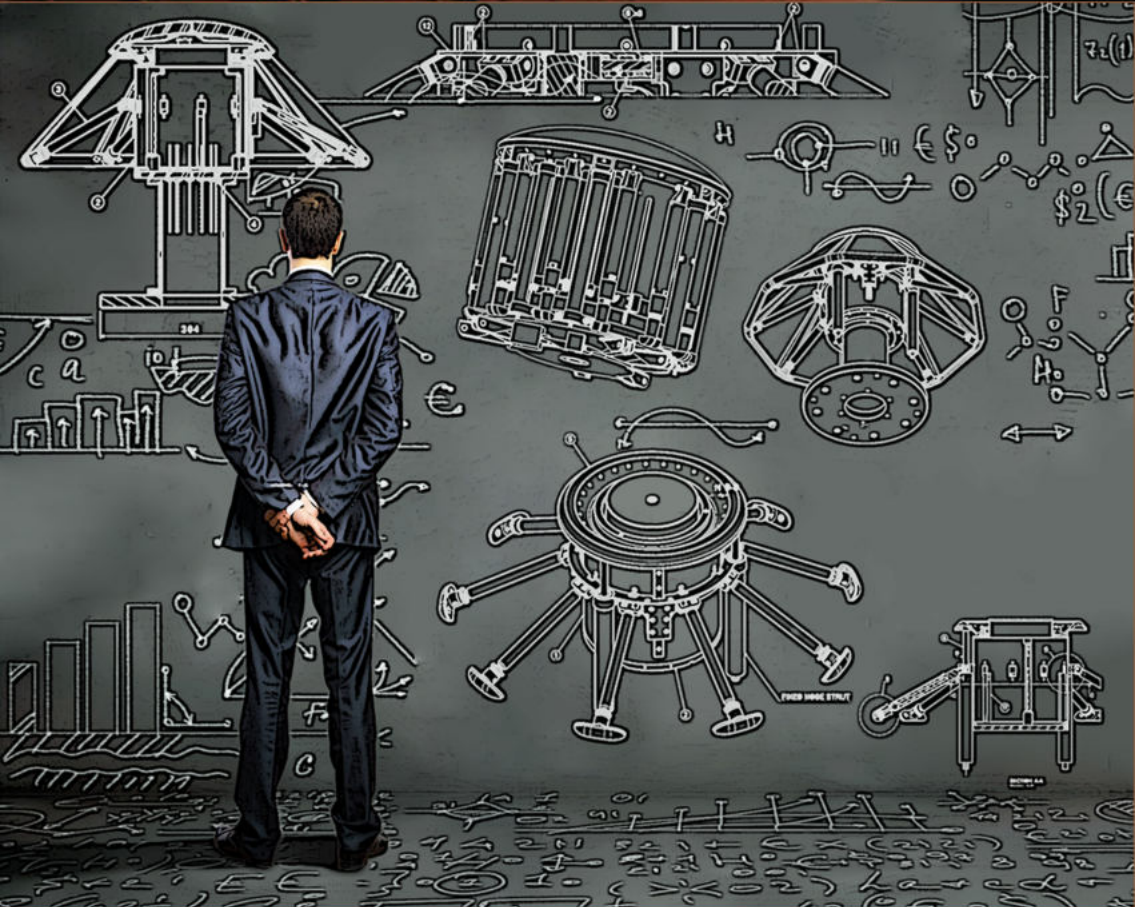
The heat shield is composed by:

A a **fixed nose** (made by a special ceramic material)

B a **deployable aero-brake** (umbrella-like, made by special multi-layered fabric).



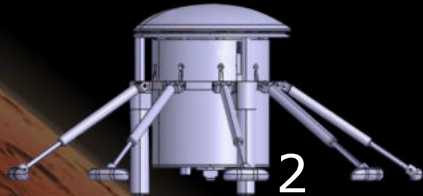
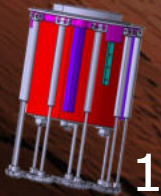
B a **deployable aero-brake** (umbrella-like, made by special multi-layered fabric).



Concept

The deployment of the heat shield is articulated in two phases:

1. In the first phase the rods are extended.
2. In the second phase the nose cap is extended, and the flexible TPS spreads the rods, while it is tensioned in order to withstand the mechanical loads.



ALI - Aerospace Laboratory for Innovative components

is the Industrial Partner. It is as a Consortium of 15 Companies operating within the fields of design, engineering, prototyping and realization of innovative aerospace subsystems and Ground Segment for technological and scientific platforms



CIRA - Centro Italiano Ricerche Aerospaziali

is the prime contractor. It was created in 1984 to manage PRORA, the Italian Aerospace Research Program, and uphold Italy's leadership in Aeronautics and Space. CIRA is a company with public and private shareholders.



The Team



Università degli Studi di Napoli Federico II

Is the Scientific Partner located in Naples, Italy and founded in 1224 it is the oldest public and laic university in the world.
It is now organized in 13 faculties.

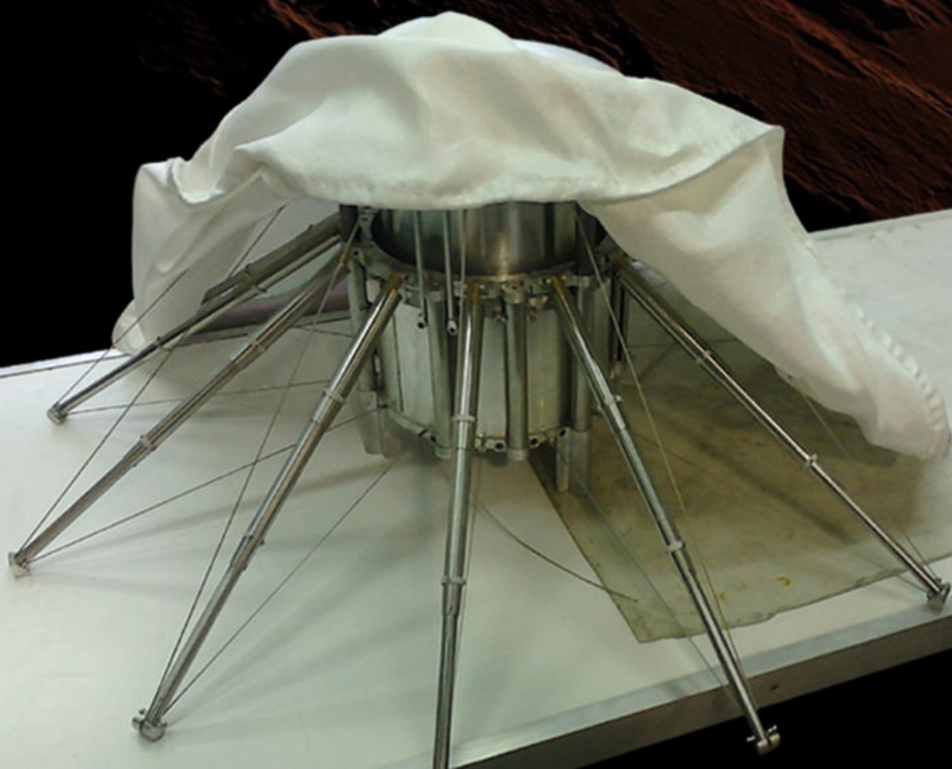


Swedish Space Corporation (SSC)

Will provide support to launch.
It is a comprehensive space company that has 40 years of experience in helping space organizations, companies and research centers with access to space.

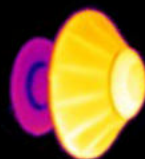
The feasibility study of this deployable re-entry system was carried out in 2011. The TPS materials, selected for the nose cone and for the flexible umbrella shield, were preliminarily tested in the SPES hypersonic wind tunnel at the University of Naples, and in the SCIROCCO PWT (Plasma Wind Tunnel) at CIRA (Centro Italiano Ricerche Aerospaziali) of Capua, Italy.

Other studies have been focused on the development of a scaled down prototype of IRENE, called MINI-IRENE, for suborbital flight on VSB-30 rocket and the current deployment logic has been conceived.

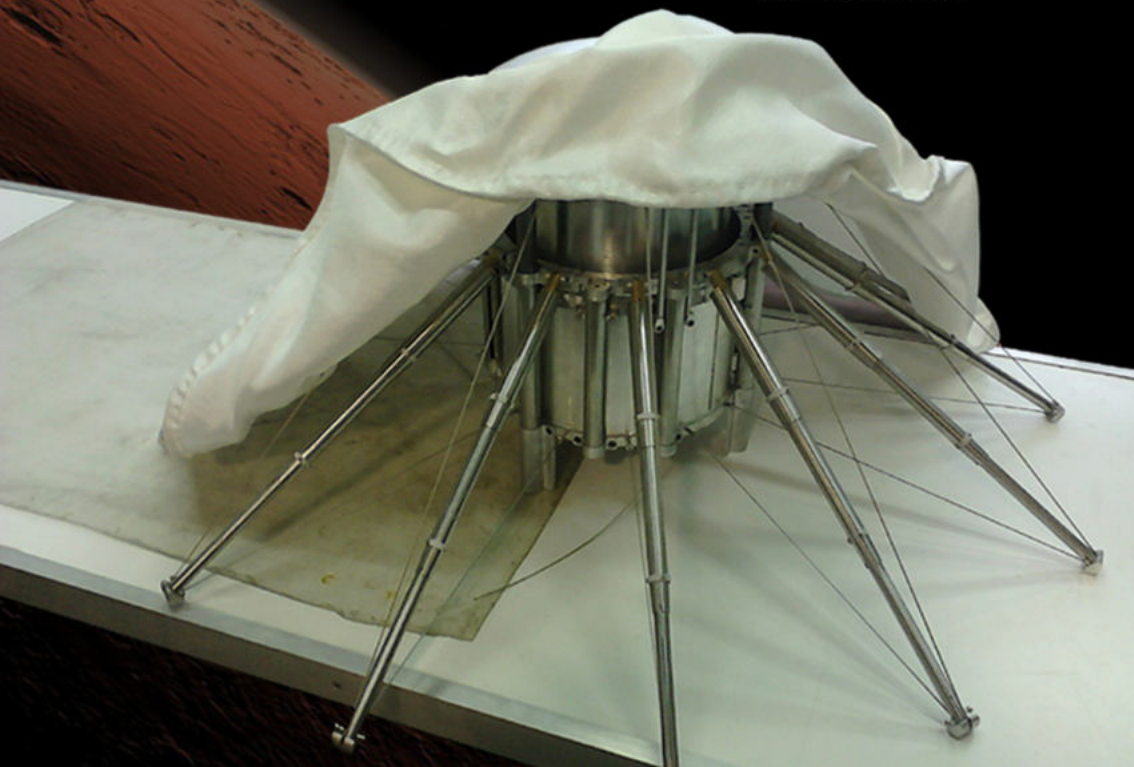


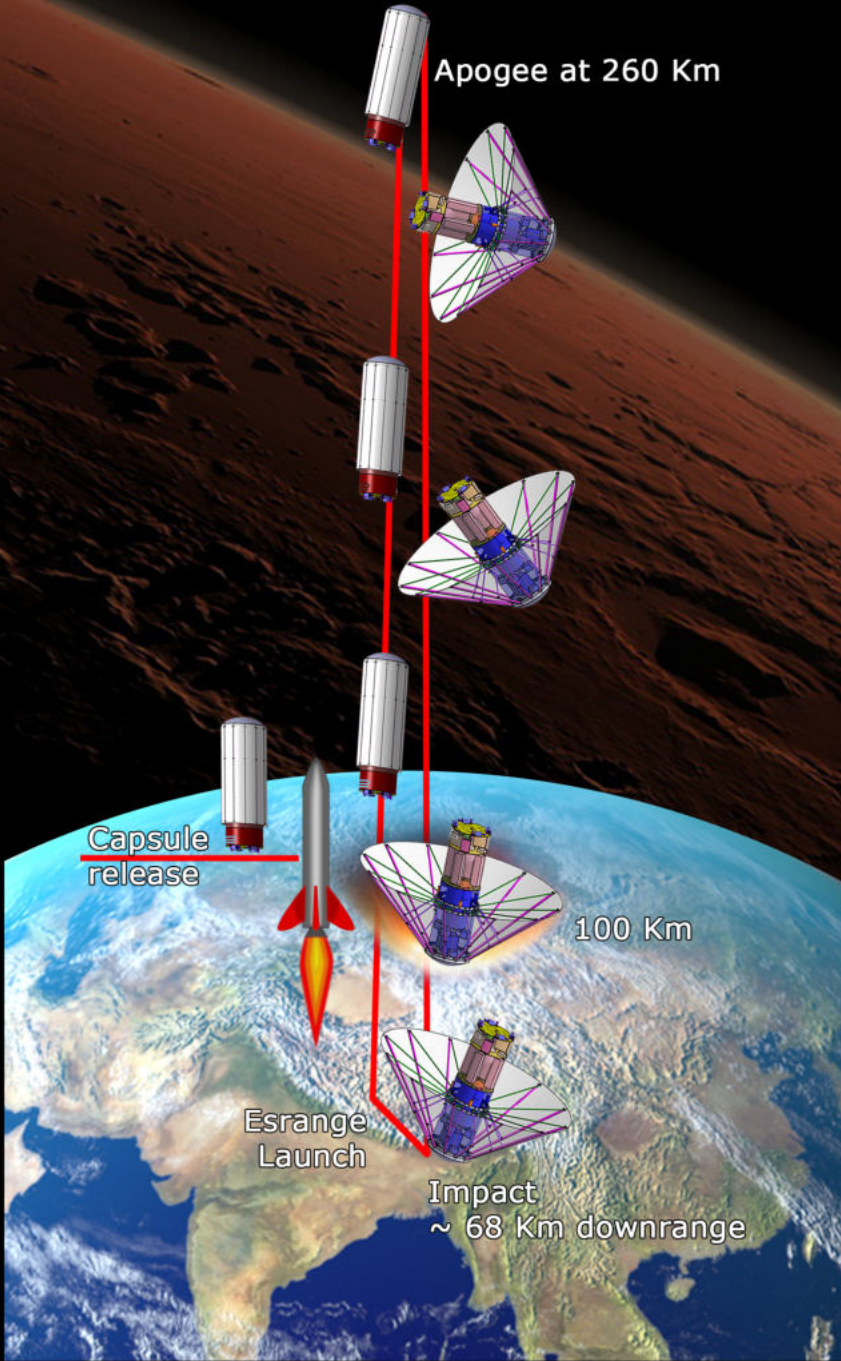
IRENE
Italian Re-Entry Nacelle

Heritage ALI activities



MINI IRENE
Ground Demonstrator





Apogee at 260 Km

Capsule
release

100 Km

Esrange
Launch

Impact
~ 68 Km downrange

MINI IRENE Flight Experiment

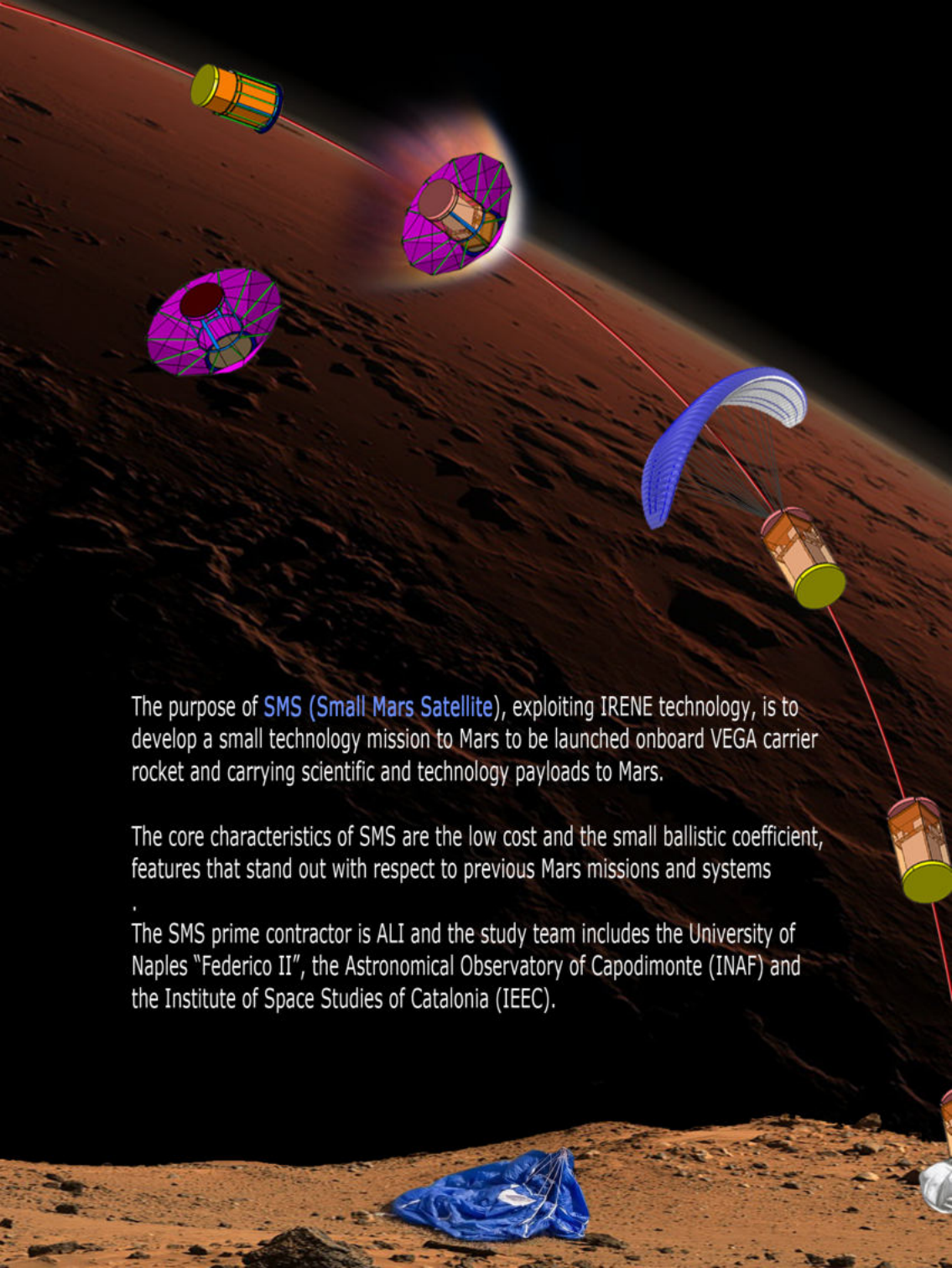
The capsule shall be dropped from the payload stage of an VSB-30 Rocket after the burn out of the second stage during the ascent, at 65 seconds from the lift off at an altitude close to 83km at a speed of about 1700 m/s.

The flight would continue up to a 250km altitude. The landing is scheduled 860 seconds after the separation from the Launcher.

Project objectives

The Mini-Irene Capsule objectives are:

- Survive the launch
- Separate from the rocket;
- Deploy the heat shield before the re-entry phase;
- Maintain aerodynamic stability and structural integrity during the flight;
- Acquire and store data during the flight (pressures, temperatures, accelerations, attitude);
- Endure (only the payload) the re-entry environmental conditions allowing the retrieval of data collected in flight;
- Be localized and retrieved after landing.



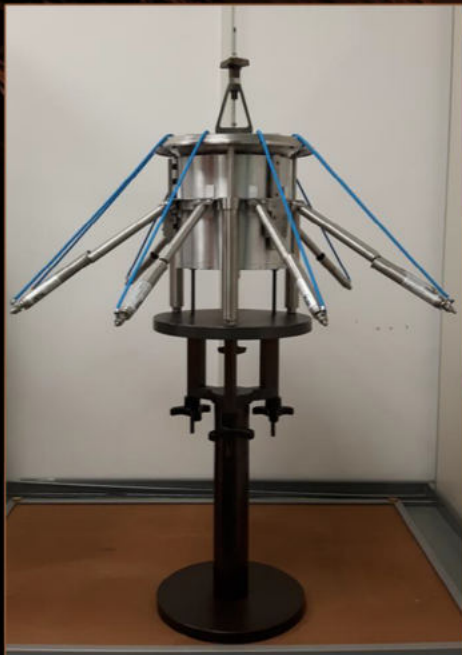
The purpose of **SMS (Small Mars Satellite)**, exploiting IRENE technology, is to develop a small technology mission to Mars to be launched onboard VEGA carrier rocket and carrying scientific and technology payloads to Mars.

The core characteristics of SMS are the low cost and the small ballistic coefficient, features that stand out with respect to previous Mars missions and systems

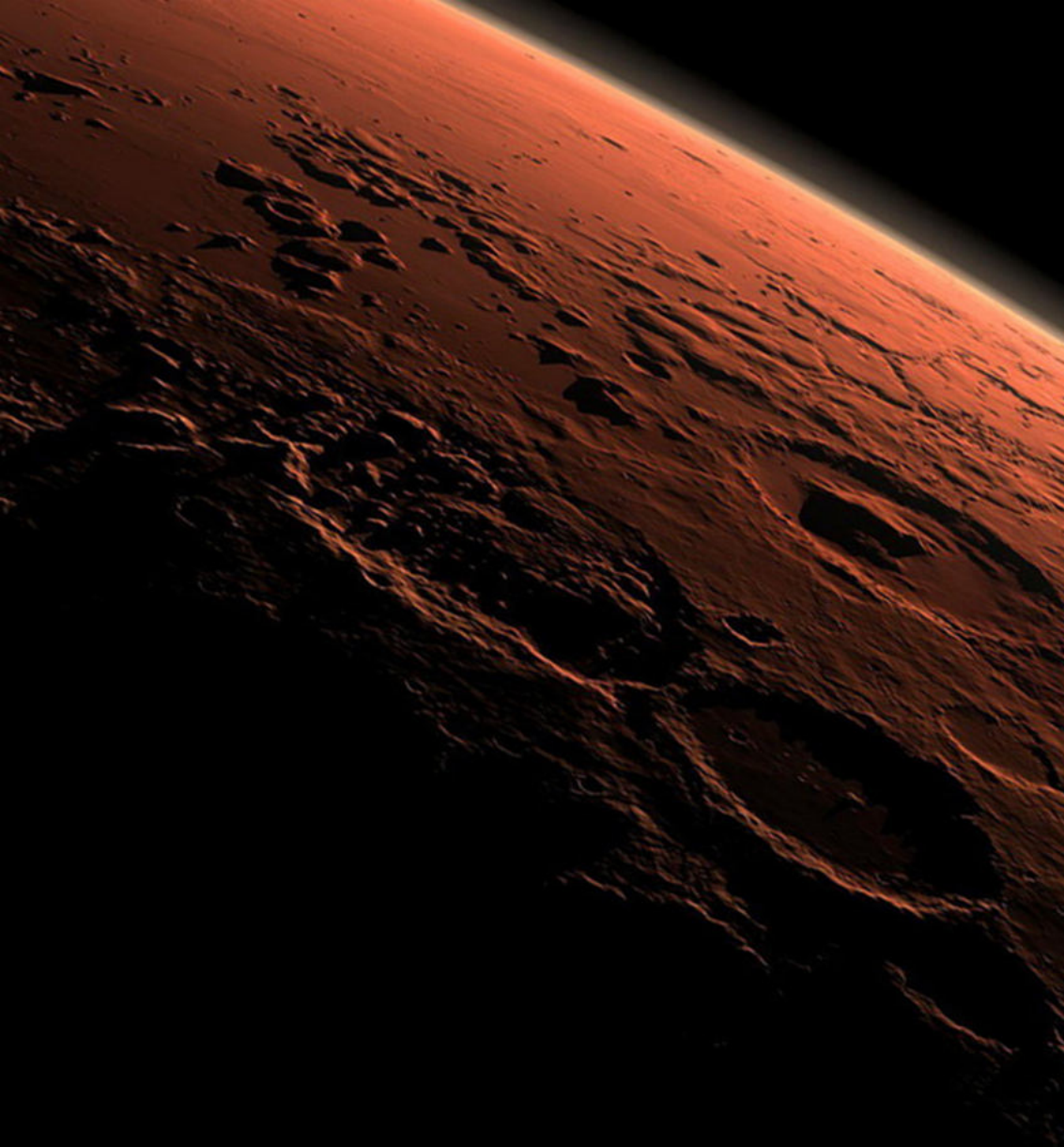
The SMS prime contractor is ALI and the study team includes the University of Naples "Federico II", the Astronomical Observatory of Capodimonte (INAF) and the Institute of Space Studies of Catalonia (IEEC).



ITE in closed configuration



ITE in opened configuration



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