MARSNET: AN ESA CONTRIBUTION TO THE EXPLORATION OF MARS

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Following an ESA preliminary study on the possible areas of European participation in the future international exploration of Mars (1), and a recent ESA call for ideas of new missions, MARSNET, a network of small surface stations, was selected for further in-depth scientific and technical assessment studies (2) as a potential European contribution to such exploration.

Network concept: The MARSNET mission consists of a network of 3 semi-hard landers (Fig.1) to be placed on Mars surface, each station being located about 3500 km apart from each other, thus defining a global seismological network designed for an operational lifetime of one Martian year (687 days). Each semi-hard lander would be carried on-board its own 2 m in diameter aeroshell and deployed at 15 km altitude for landing at about 25 m/s. Each lander would be approximately 90 cm in diameter and in heigth (excluding booms), and 75 kg in weight, including a scientific payload of about 7 kg. The distribution of these three elements would take place from low Mars orbit or arrival hyperbola depending on the selected mission scenario. The small stations would be targetted for impact and landing in scientifically interesting sites in the Tharsis region of Mars, which is the most likely area to still show tectonic activity that would allow the seismometers to determine the internal structure of the planet.

Scientific objectives: In addition to the study of Mars internal structure, the other main scientific objectives would focus on science from the surface, and in particular the mineral and chemical composition of rocks and soils, the magnetic properties of minerals, and surface meteorology at sites of varied latitudes and altitudes. Also, atmospheric pressure and temperature profiles would be obtained during entry and descent, and surface and descent imagery would allow to interpret the geological setting of each landing site. The instruments on-board the small stations (Tab.1) would also allow to identify the surface and subsurface properties of Mars upper layers, as well as the amount of solar-UV radiation reaching Mars surface to infer the present exobiological conditions on the planet. The MARSNET mission would therefore contribute to provide a global perspective of Mars, and in particular would allow to answer outstanding questions concerning the internal structure and present activity of the planet; the elemental composition and most common minerals of volcanic and sedimentary rocks; the atmospheric pressure, temperature and dynamics, as well as other meteorological parameters; the present surface and subsurface water-ice distribution; and the conditions allowing or not organic compounds to exist on Mars surface.

Future Mars exploration: The MARSNET mission could be part of a precursor mission to the *Mars Rover Sample Return* and *Manned Exploration* missions. This initiative for possible European development would complement the already scheduled US *Mars Observer* and the USSR's *Mars-94* missions. International cooperation stands as a sensible approach for Europe, in order to accomplish its planetary exploration goals. Therefore, MARSNET could translate into a major and independent contribution to a larger international Mars exploration program. Potential partners have already shown significant interest in the joint development with ESA of a Mars Network mission.

References: (1) Chicarro A.F., Scoon G.E.N. and Coradini M., *Mission to Mars: Report of the Mars Exploration Study Team*, ESA SP-1117, European Space Agency, 140 pp, 1989. (2) *MARSNET: Report on the Assessment Phase Study*, ESA SCI(91)6, European Space Agency, in press, 1991.

MARS EXPLORATION IN ESA

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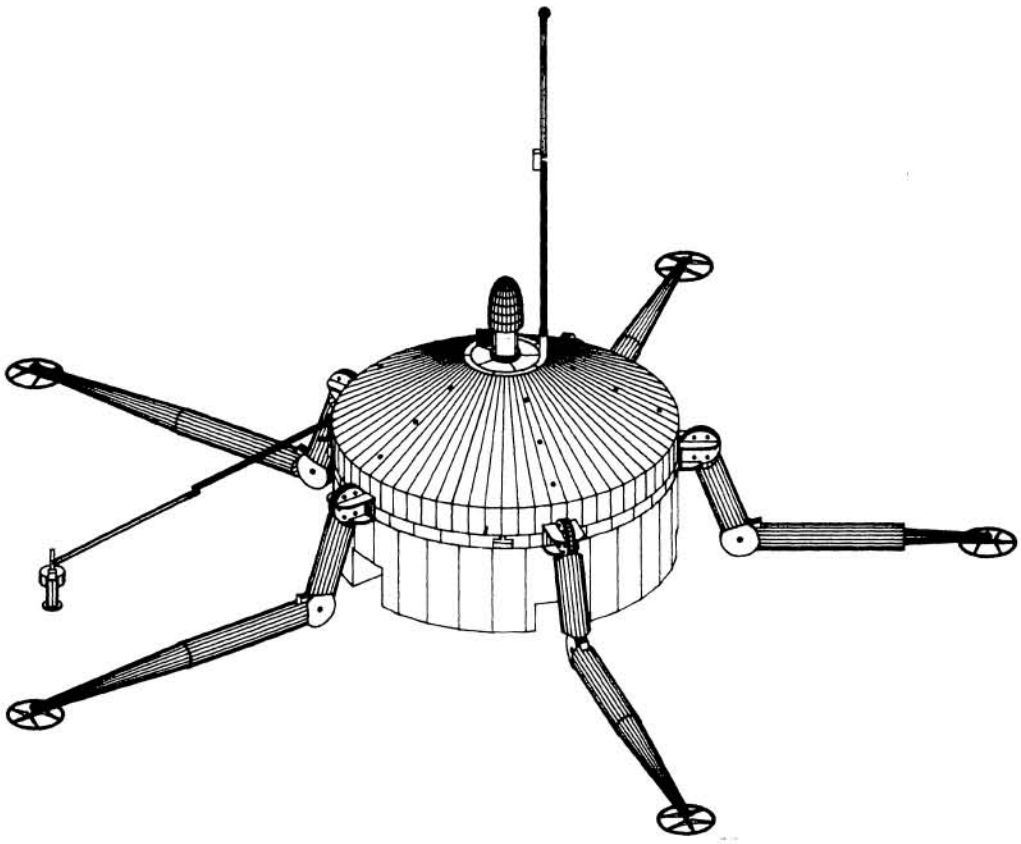

Figure 1: *Semi-hard lander configuration on Mars surface.*

MODEL PAYLOAD		
Disciplines	**Instruments**	**Acronyms**
Geophysics of the interior	Seismometer	SM
	Magnetometer	MAG
Geology	Television camera	TVC
	Descent imager	DI
Geochemistry and mineralogy	α-backscatter/XRF-spectrometer	AXS
	Neutron detector	ND
	γ-ray spectrometer	GRS
Magnetic properties of minerals	Coil experiment	CE
	Resonance circuits	RC
Meteorology	Meteorological package	MP
Atmospheric structure	Atmospheric structure instrument	ASI
Surface properties	Thermal array probe	TAP
	Permittivity meter	PM
Exobiology	Solar-UV dosimeter	SUV

Table 1: *Summary of scientific payload for each station.*