

## INTERMARSNET: AN INTERNATIONAL NETWORK MISSION TO MARS

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### Introduction:

The INTERMARSNET mission, based on previous studies (1, 2) by the European Space Agency (ESA), consists of four small landers to be placed on the surface of Mars and a carrier spacecraft/data-relay orbiter at Mars (3). The small landers will define a regional/global network of stations to carry out simultaneous geophysical and meteorological measurements and to investigate the local geology and geochemistry of the landing sites during the operational lifetime of the stations on Mars of one martian year (687 days). Three stations will be landed in the Tharsis region, which is the most likely area to still show tectonic activity, and the fourth station at the antipode in the eastern hemisphere. At present, the spacecraft design and mission concept, as well as the scientific priorities, are undergoing an in-depth evaluation.

### Scientific Objectives:

The INTERMARSNET scientific objectives to be addressed by a highly-sophisticated and miniaturised payload would focus on three main areas: interior, surface and atmosphere. These objectives are the following: internal structure and activity; magnetic field, heat flow and subsurface sounding; geodesy and rotational dynamics; surface geology and morphology; mineralogy and geochemistry of rocks, soils and volatiles; atmospheric structure, meteorology and surface radiation environment. The scientific payload would have a mass of about 10 kg for each station. Sharing of electronics will allow many of the sensors to be grouped into a smaller number of closely integrated instrument packages, which will be selected through an international A.O.

### Mission Scenario:

The current INTERMARSNET mission scenario includes a dedicated Ariane-5 launch in June 2003 into direct interplanetary hyperbolic trajectory with a cruising time of about seven months. The probe/landers will be independently targetted and have a mass of about 70 kg. The landers will reach the martian surface at <40 m/s and have a mass of about 42 kg. After landing, the seismometer and meteorological boom will be deployed. Also, an instrument deployment device will provide mobility to the geochemical instruments within several metres from the station. The altitude of the data-relay orbiter in circular martian orbit is 4600 km and the orbital period about 5 hours. The baseline configuration of the carrier spacecraft/data-relay orbiter is three-axis stabilised with a dry mass of about 1343 kg, while the fuel mass is about 1123 kg. The average instrument data volume with three ESA ground stations is about 3 Mbit/day for each lander.

### International Cooperation:

The INTERMARSNET mission is a joint ESA/NASA contribution to the international exploration of Mars. It represents the only network mission in the International Mars Exploration Working Group (IMEWG) scenario (4). In the current mission baseline, ESA would provide a carrier spacecraft/data-relay orbiter and an Ariane-5 dedicated launcher, while NASA would contribute four probe/landers with participation of European national space agencies. ESA and NASA are currently performing a joint INTERMARSNET Phase-A Study together with Industry.

### Concluding Remarks:

The INTERMARSNET mission would therefore contribute to provide a global perspective of the inner structure of Mars, a global monitoring of the martian meteorology, as well as geological and geochemical characterisation of the landing sites. INTERMARSNET represents the next step in the exploration of Mars following previous and complementary American and Russian missions. A joint ESA/NASA network mission to Mars is ideally suited to an appropriate division of effort and sharing of scientific return between the European and the U.S. scientific communities.

### References:

(1) Chicarro A., Scoon G. and Coradini M., Mission to Mars - Report of the Mars Exploration Study Team, ESA SP-1117, 140 pp. (1989). (2) Chicarro A., Scoon G. and Coradini M., MARSNET - A Network of Stations on the Surface of Mars, ESA Journal, vol.17/3, 225-237 (1993). (3) Chicarro A., Scoon G. and Coradini M., INTERMARSNET - An International Network of Stations on Mars for Global Martian Characterisation, ESA Journal, vol. 18/3, 207-218 (1994). (4) Chicarro A., Squyres S. et al., Together to Mars: An Initiative of The International Mars Exploration Working Group, ESA BR-105, 8 pp. (1994).