Mars MetNet Mission Status

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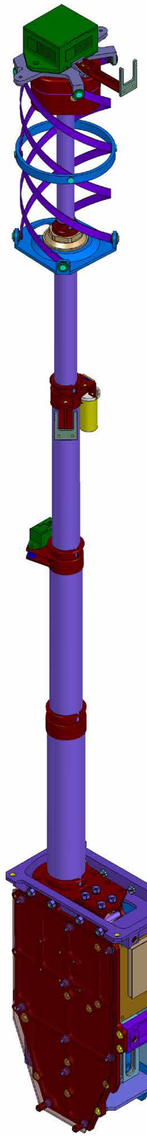
Mission Scientific Objectives

- Atmospheric dynamics and circulation
- Surface to Atmosphere interactions and Planetary Boundary Layer
- Dust raising mechnanisms
- Cycles of CO_2, H_2O and dust
- Evolution of the Martian climate

A new kind of planetary exploration mission for Mars is being developed in collaboration between the Finnish Meteorological Institute (FMI), Lavochkin Association (LA), Space Research Institute (IKI) and Institutio Nacional de Tecnica Aerospacial (INTA). The Mars MetNet mission is based on a new semi-hard landing vehicle called MetNet Lander (MNL).

The main idea behind the MetNet landing vehicles is to use a state-of-the-art inflatable entry and descent system instead of rigid heat shields and parachutes as earlier semi-hard landing devices have used. This way the ratio of the payload mass to the overall mass is optimized and more mass and volume resources are spared for the science payload. MetNet Mission payload instruments are specially designed to operate in very low power conditions.



Payload Instruments

The payload of the two MNL precursor models includes the following instruments:

Atmospheric instruments:

- MetBaro Pressure device
- MetHumi Humidity device
- MetTemp Temperature sensors

Optical devices:

- PanCam Panoramic
- MetSIS Solar irradiance sensor with OWLS optical wireless system for data transfer
- DS Dust sensor

The descent processes dynamic properties are monitored by a special 3-axis accelerometer combined with a 3-axis gyrometer. The data will be sent via auxiliary beacon antenna throughout the descent phase starting shortly after separation from the spacecraft.

MetNet Mission payload instruments are specially designed to operate in very low power conditions. MNL flexible solar panels provides a total of approximately 0.7-0.8 W of electric power during the daylight time. As the provided power output is insufficient to operate all instruments simultaneously they are activated sequentially according to a specially designed cyclogram table which adapts itself to the different environmental constraints.

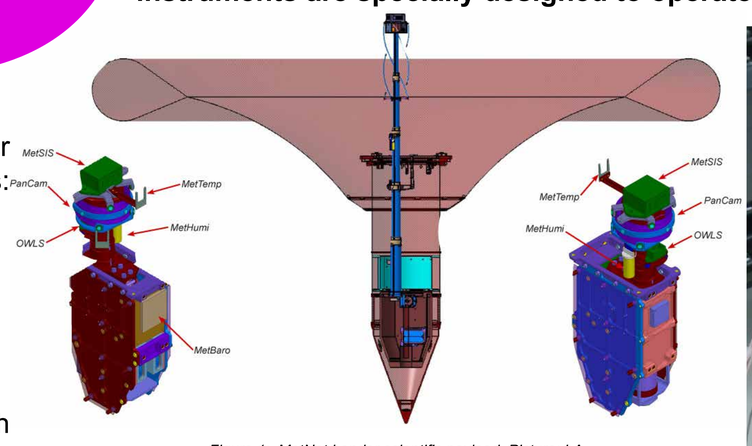
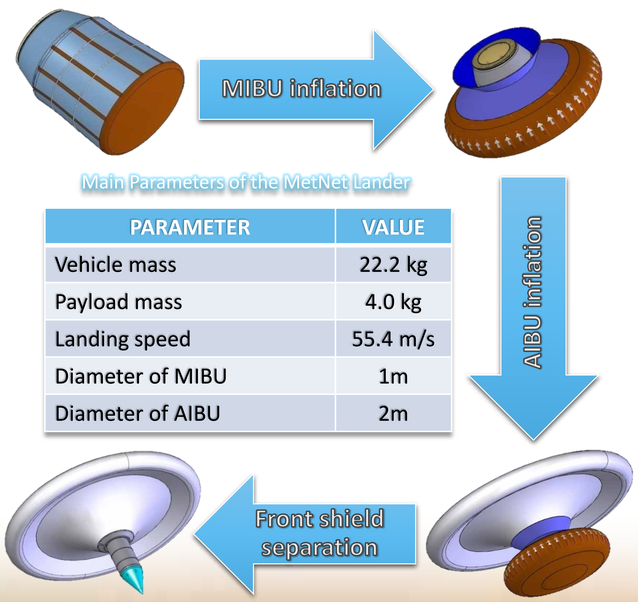
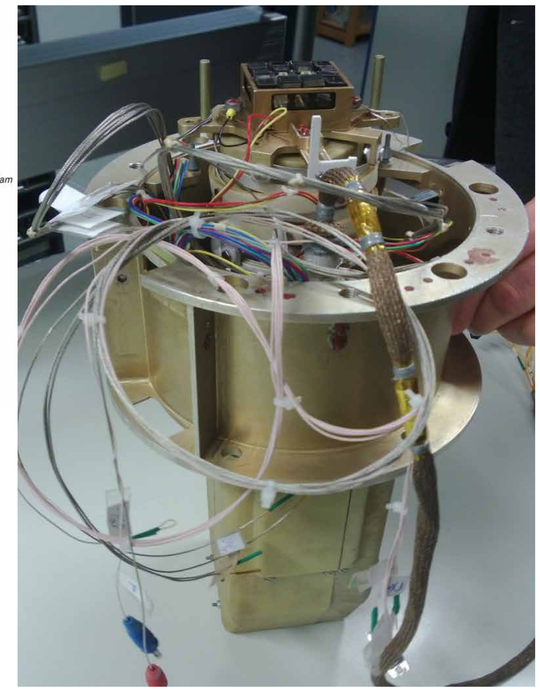


Figure 1: MetNet Lander scientific payload. Picture: LA.



PARAMETER	VALUE
Vehicle mass	22.2 kg
Payload mass	4.0 kg
Landing speed	55.4 m/s
Diameter of MIBU	1m
Diameter of AIBU	2m

Figure 2: MetNet Lander main parameters. Picture: LA.



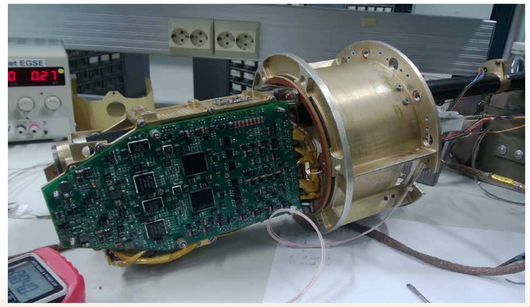


Figure 3: MetNet Lander payload bay and computer in tests in FMI. Picture: FMI.

Mission Status

Full Qualification Model (QM) of the MetNet landing unit with the Precursor Mission payload is currently under functional tests. In near future the QM unit will be exposed to environmental tests with qualification levels including vibrations, thermal balance, thermal cycling and mechanical impact shock. One complete flight unit of the entry, descent and landing systems (EDLS) has been manufactured and tested with acceptance levels. Another flight-like EDLS has been exposed to most of the qualification tests, and hence it may be used for flight after refurbishments. Accordingly two flight-capable EDLS systems exist.

The eventual goal is to create a network of atmospheric observational posts around the Martian surface. Even if the MetNet mission is focused on the atmospheric science, the mission payload will also include additional kinds of geophysical instrumentation. The next step in the MetNet Precursor Mission to demonstrate the technical robustness and scientific capabilities of the MetNet type of landing vehicle. Definition of the Precursor Mission and discussions on launch opportunities are currently under way. The baseline program development funding exists for the next five years. Flight unit manufacture of the payload bay takes about 18 months, and it will be commenced after the Precursor Mission has been defined.

More information from the Mars MetNet Mission website http://metnet.fmi.fi

Poster design: Harri Haukka, FMI
Background image: NASA