Mars MetNet Mission - Martian Atmospheric Observational Post Network

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MetNet
The Next Generation Lander Mission For Martian Atmospheric Science

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.

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

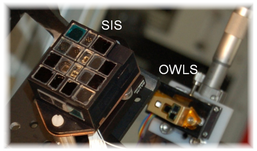
Composition and Structure Devices

- Tri-axial magnetometer MOURA
- Triaxis System Accelerometer and Gyroscope

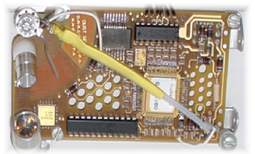
The descent processes dynamic properties are monitored by a special 3-axis accelerometer combined with a 3-axis gyrometer. The data will be sent via auxiliary beacon antenna throughout the descent phase starting shortly after separation from the spacecraft.

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.

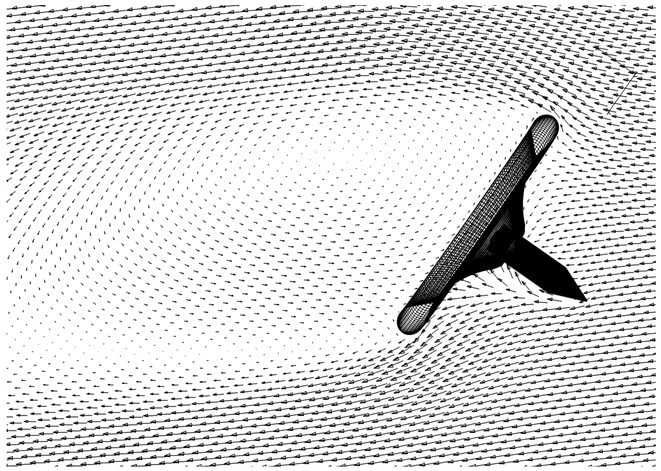
MetHumi. Photo: Markku Mäkelä.



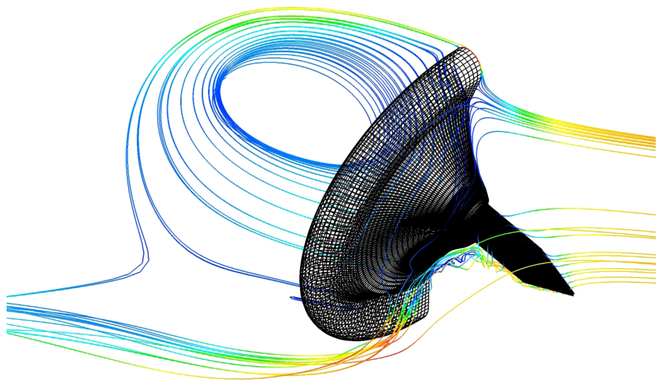
MetSIS and OWLS. Photo: INTA.



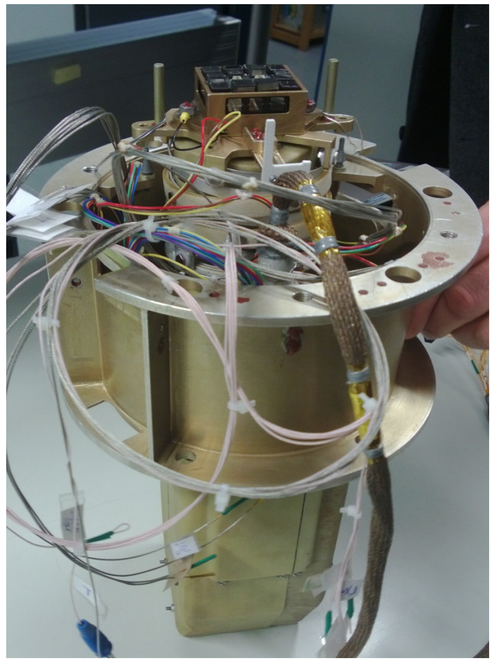
Dust Sensor: Photo: INTA.

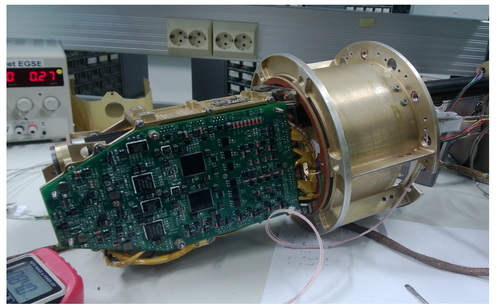


Velocity vectors around the MetNet AIBU configuration. Angle of attack = 35 degrees; Ma=0.7, Re=180000. Time averaged calculation. Picture/simulation: M.Palin (Aalto) / Finflo Ltd.



Streamlines for the MetNet AIBU case. Angle of attack 35 degrees; Ma=0.2, Re= 100000. Time averaged calculation. Picture/simulation: M.Palin (Aalto) / Finflo Ltd.





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

Mission Status

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 is the MetNet Precursor Mission that will 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 first MetNet Science Payload Precursors have already been successfully completed, e,g, the REMS/MSL and DREAMS/Exomars-2016. The next MetNet Payload Precursors will be METEO/Exomars-2018 and MEDA/Mars-2020.

The baseline program development funding exists for the next seven 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