Next Generation Semi-hard Penetrator MetNet for Mars

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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).

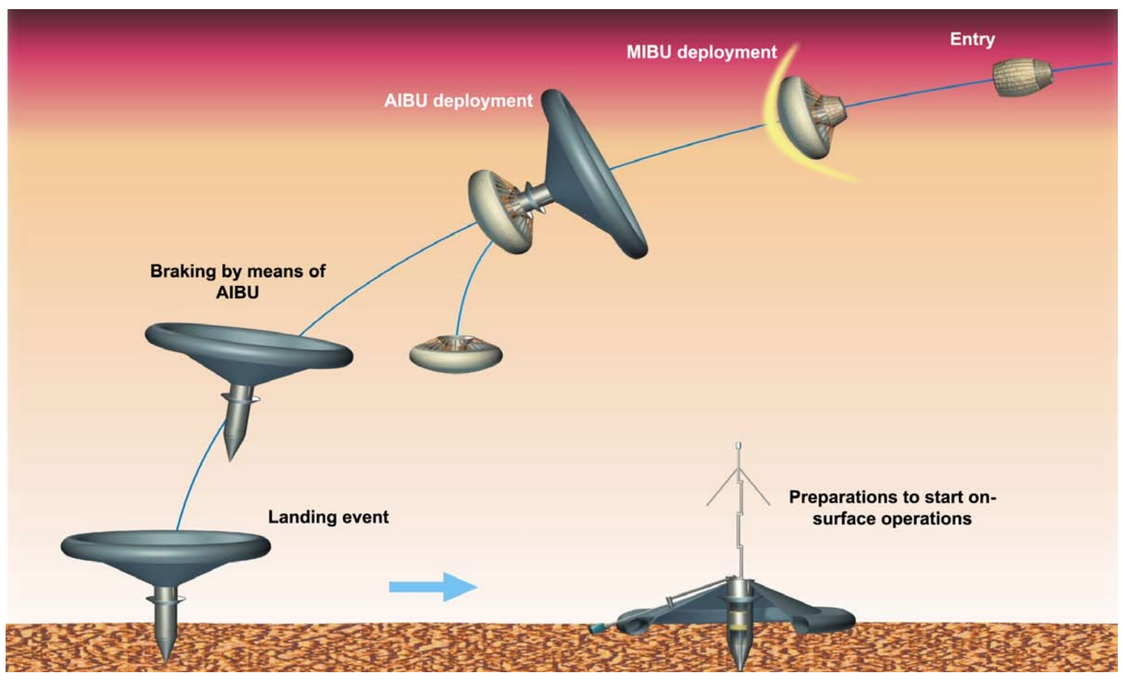
Innovative EDLS Technology

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 semihard 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. The vehicle decelerates its entry speed using the inflatable structure, and the final landing sequence includes a cone headed body penetrating the Martian soil.

The MNL atmospheric descent process is usually divided into two phases:

1. **Aerodynamic braking phase and**
2. **The phase of the MNL descent on the AIBU.**

At the first stage braking is executed by use of the inflatable braking device of torus shape covered with ceramic heat shield material. At this stage the main vehicle speed reduction takes place from hypersonic speed at the atmospheric entry moment to the speed, which is acceptable for the AIBU deployment. For MNL braking at the second, final, stage of descent in atmosphere, the additional inflatable breaking is used. When activating the AIBU by pressurizing the ring structure the aerodynamic breaking device is separated from the MNL. The separation of the aerodynamic breaking device and the penetrated part with the filled AIBU is controlled by different ballistic parameters.



Current Status of the Mission

The MetNet prototype has been developed and the critical subsystems have been qualified for Martian environmental and functional conditions. The first mission step in the MetNet Mission is to have a Mars MetNet Precursor Mission (MMPM) with a few MNL's deployed to Mars. Currently the Mars MetNet team is developing and manufacturing the flight models for the MMPM-1. There are already two manufactured lander body flight models in stock just waiting the final payload and system electronics to be installed. The launch of the MMPM-1 will be in one of the next launch windows starting from the year 2011.

Scientific Goals of the Mars MetNet Mission

The scientific scope of the MetNet Mission is to eventually deploy several tens of MNLs on the Martian surface using inflatable descent system structures.The MNL will have a versatile science payload focused on the atmospheric science of Mars. The scientific payload of the MetNet Mission encompasses separate instrument packages for the atmospheric entry and descent phase and for the surface operation phase. The MetNet-type of mission is what the Martian atmospheric science currently needs. The MetNet mission will provide the logical next mission tool in the field of Martian atmospheric science.

MetNet Mass Budget

EDLS	8.5 kg
Landing Module	13.8 kg
Lander Body	9.8 kg
P/L Module	4.0 kg
Total Entry Mass	**22.3 kg**

Payload Instruments

Atmospheric Instruments

- Pressure Device MetBaro (FMI)
- Temperature Sensors (IKI)
- Scientific Accelerometer (IKI)
- Humidity Device MetHumi (FMI)

Optical Devices

- Panoramic Camera (IKI)
- Solar Irradiance Sensor MetSIS (INTA) with Optical Wireless Link System OWLS
- Dust Sensor, DS (INTA)

Composition and Structure Devices

- Tri-axial magnetometer MOURA (INTA)
- Scientific Accelerometer (IKI)

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

Poster design: Harri Haukka, FMI