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ExoMars-2020 Landing Platform scientific payload status.

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Abstract

ESA and Roscosmos have signed a cooperation agreement to work in partnership to develop and launch two ExoMars missions - in 2016 and 2020. The first mission is currently in progress, studying Mars' atmospheric composition in unprecedented detail [1,2].

The second ExoMars mission will be launched in July 2020 to target an ancient location at Oxia Planum interpreted to have strong potential for past habitability and for preserving physical and chemical biosignatures. The mission will deliver a Landing Platform with instruments for atmospheric and geophysical investigations and a Rover tasked with searching for signs of extinct life. The ExoMars rover will have the capability to drill to depths of 2 m to collect and analyze samples that have been shielded from the harsh conditions prevailing on the surface, where radiation and oxidants can destroy organic materials [3].

The Landing Platform (LP) will be equipped with instruments to study the Martian environment at the landing site. After the Rover egress the Landing Platform will serve as long-lived stationary platform with expected lifetime of one Martian year. The scientific objectives of the Landing Platform are [4]:

- Context imaging.
- Long-term climate monitoring and atmospheric investigations.
- Studies of subsurface water distribution at the landing site.
- Atmosphere/surface volatile exchange.
- Monitoring of the radiation environment.
- Geophysical investigations of Mars' internal structure.

The scientific payload (LPSP) consists of 13 instruments with total mass of 45 kg:

Instrument	Short description
BIP	LPSP management, collection of scientific data from LPSP instruments.
TSPP	Set of 4 cameras to create surface/EDL panoramas.
ADRON-EM	Subsurface water monitoring. Surface elemental measurements. Dosimetry.
MGAK	Gas Analytical package. Measurements of diurnal and seasonal variations of major and trace components of the Martian atmosphere near the surface.
PK (Dust Suite)	Dust particle and momentum measurements near surface, electrical field monitoring.
MTK (Meteo Suite)	Set of meteo sensors (temperature, humidity, wind velocity, pressure, solar irradiance, dust). Magnetic sensor. EDL measurements (temperature, pressure, acceleration, angular velocities). Optical depth sensor.
SEM	Seismic measurements.
MAIGRET	Magnetometer. Measurements of quasiconstant magnetic field and variable magnetic.
RAT-M	Passive radiometer. Surface temperature monitoring down to 1m depth. Dusty atmosphere temperature monitoring.

FAST	Fourier IR spectrometer. Sensitive trace gas detection, temperature and aerosol monitoring up to 20 km height, surface mineralogy.
M-DLS	Martian Multichannel Diode Laser Spectrometer. Continuous observations of chemical and isotopic atmosphere composition near the surface.
LARA	Lander Radio science. Information on the interior structure of Mars from the accurate determination of the precession and nutation.
HABIT	Investigation of habitability of the landing site in terms of the three most critical environmental parameters for life : availability of liquid water, UV biological dose and thermal ranges.

LPSP is being developed by Space Research Institute of RAS (Moscow, Russia) with contribution from ESA: LARA (Belgium), HABIT (Sweden), sensors in MTK (Spain and Finland) and MAIGRET (Czech Republic).

LPSP QMs and FMs are in final stage of development. A number of models (structural, thermal, interface simulators, additional test models, functional models) has been produced.

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References

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