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Russian contribution to the ExoMars project

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The ExoMars ESA-led mission is dedicated to study of Mars and in particular its habitability. It consists of two launches, one planned in 2016 to deliver to Mars a telecommunication and science orbiter Trace Gas Orbiter (TGO) and a demonstrator of entry into the atmosphere and landing on the Mars surface, Entry, Descent and Landing Demonstrator Module (EDM). In 2018 a rover with drilling capability will be delivered to the surface of Mars. Since 2012 this mission, previously planned in cooperation with NASA is being developed in cooperation with Roscosmos. Both launches are planned with Proton-Breeze. In 2016 Russia contributes a significant part of the TGO science payload. In 2018 the landing will be provided by a joint effort capitalizing on the EDM technology. Russia contributes few science instruments for the rover, and leads the development of a long-living geophysical platform on the surface of Mars.

Russian science instruments for TGO, the Atmospheric Chemistry Suite (ACS) and the Fine Resolution Epithermal Neutrons Detector (FREND) constituent a half of its scientific payload, European instrument being NOMAD for mapping and detection of trace species, and CASSIS camera for high-resolution mapping of target areas. The ACS package consists of three spectrometers covering spectral range from 0.7 to 17 μm with spectral resolving power reaching 50000. It is dedicated to studies of the composition of the Martian atmosphere and the Martian climate. FREND is a neutron detector with a collimation module, which significantly narrows the field of view of the instrument, allowing to create higher resolution maps of hydrogen-abundant regions on Mars. The spatial resolution of FREND will be ~40 km from the 400-km TGO orbit that is ~10 times better than HEND on Mars-Odyssey. Additionally, FREND includes a dosimeter module for monitoring radiation levels in orbit around Mars.

In the 2018 mission, Russia takes the major responsibility of the descent module. The primary goal of the descent module consists of the delivery of the 300-kg rover on the surface. The full mass of the module should not exceed 2000 kg. An aerodynamic shield and a parachute system assure the entry phase. A descent scenario with integrated retro-propulsion engines and landing on feet is being developed. Subsystems of the descend module are supplied by both Roscosmos and ESA.

On the rover, Russia contributes two science instruments. ADRON-RM is a passive neutron detector to assess water contents in the Mars surface along the rover track. ISEM is a pencil-beam infrared spectrometer mounted at the mast of the rover and is primarily dedicated for the assessment of mineralogical composition, operating in coordination with high-resolution channel of PANCAM. Both instruments will assist with planning rover traverse, rover targeting operations, and sample selection.

A major effort of the Russian science is concentrated on the 2018 landing platform. This is the part of the descent module remaining immobile after the rover egress. The platform, or the long-living geophysical station shall have guaranteed lifetime of one Martian year, and will be able to accommodate up to 50 kg of science payload. The final list of science investigations, which is yet to be finalized, includes the meteorological station, instruments to analyse atmospheric composition, geophysical instruments. Other investigations will provide analyses of the surface/shallow subsurface material complimentary to these on the rover, and other experiments, if resources permit.

Current status of the project and the developments will be presented.