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PRESS NOTE

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Leonardo-Finmeccanica: the role in the ExoMars programme

Promoted by the European Space Agency (ESA) in cooperation with the Russian Space Agency (Roscosmos) and with a significant contribution by the Italian Space Agency(ASI) - which has also developed the INRRI (INstrument for landing-Roving laser Retroreflector Investigations) jointly with the National Nuclear Physics Institute (INFN) -, the ExoMars programme's main scientific objectives are the search for traces of past and present life on Mars, the planet's geochemical characterisation, gaining knowledge on the environment and its geophysical aspects and the identification of potential risk factors for future manned missions.

The programme is divided into two missions. The main feature of the mission that was launched in March 2016 is the TGO module (Trace Gas Orbiter), which will reach the Mars orbit to investigate the presence of methane and other gases present in the atmosphere as possible signs of alien life. Just prior to reaching orbit, the spacecraft will release an Entry and Descent demonstrator Module (EDM), containing a weather station and other instruments. The 2016 mission will also provide a data connection between Earth and a Martian rover, to be used in subsequent missions.
The aim of the second mission (2020) is to take to Mars a vehicle able to move on the planet's surface and to penetrate into and analyse its soil. The spacecraft will consist of a Carrier Module and a Descent Module, whose landing platform will house the rover, capable of collecting soil samples at a depth of two metres and of analysing their chemical, physical and biological properties.

Leonardo has a leading role in the ExoMars programme.

Through Thales Alenia Space (joint venture between Thales and Leonardo), Leonardo has the leadership of both missions as well as overall responsibility of all mission equipment. For ExoMars 2016, Thales Alenia Space has built the EDM module in its Turin facility and the TGO orbiter at its site in Cannes. As regards the 2020 mission, Thales Alenia Space Italia is in charge of developing the navigation and guidance system for the carrier module and descent module, as well as designing the rover system and building an Analytical Laboratory (ALD), to be integrated onto the rover.

Leonardo also contributes to ExoMars 2016 by supplying a number of its on-board technologies: photovoltaic power generators, the units that will process and distribute electric power throughout the satellite (the PCU – Power Conditioning Unit - and PCDU – Power Control and Distribution Unit) and two electric power distribution boards for the EDM module's CTPU (Central Terminal and Power Unit). All these electronics equipments are from the company's Nerviano site.
At its Campi Bisenzio facility, Leonardo has developed for ExoMars 2016 the star trackers (AA-STR) – which will allow the Trace Gas Orbiter to orient itself in space, guiding the probe all the way to Mars – as well as the optronics core of the CASSIS observation instrument. Speaking of the 2020 mission, in addition to the photovoltaic assemblies powering the spacecraft and the rover, Leonardo makes at Nerviano – with funding from ASI, the Italian Space Agency – the special drill with which mankind will dig into the Mars subsoil for the first time in its history, at a depth that might store traces of past or

present life. The drill houses the Ma_Miss spectrometer (Mars Multispectral Imager for Subsurface Studies) to analyse the geological and biological evolution of the Martian subsoil, also developed by Leonardo, at its Campi Bisenzio facility.

Finally, through Telespazio (joint venture between Leonardo and Thales), Leonardo is responsible for the development of several key systems of the Exomars Ground segment, amongt others the Mission Control System (MCS) – that will monitor and control the TGO, allowing mission operation teams to manage the system throughout the life of the mission - and of the infrastructure that will provide the rover control centre with the necessary communications to conduct the operations. Telespazio staff forms a large part of the ESOC Teams, being involved in pre-launch activities, LEOP and routine operations.

The Martian drill system

The operational scenario of the 2020 ExoMars mission involves the acquisition of Martian soil samples down to a maximum depth of 2 metres, in a variety of soil types, and their on-board analysis using special spectroscopic techniques in both the visible and the infrared spectra. The 2018 ExoMars mission will last more than 200 days, during which time approximately 20 rock samples will be taken.

Leonardo is responsible for developing, producing and integrating the tool that will collect these samples, the so-called "drill".

The drill will collect samples of material which will then be distributed to a designated container; they will then be conveyed into the rover's analytical laboratory, and sent to the specific scientific instruments for detailed examination.

The ExoMars drill is a true technological marvel. Its power is just 80 watt (one fifth of the drills we use at home) and is designed to work in extreme conditions, at a temperature of 80 degrees below zero and a pressure of 5-10 millibar: working at 80 RPM with a constant thrust equal to 40-50 kilo, it will drill through the soil with a polycrystalline diamond bit, making a hole 25 millimetre across.

In this critical task of drilling the soil and collecting samples, the drill will be aided by another Leonardo tool: Ma_MISS (Mars Multispectral Imager for Surface Studies), a miniaturised IR spectrometer located inside the drill itself that will image the walls of the borehole created by the drill to study Martian mineralogy and rock formation. This will provide valuable information for the study of subsurface soil and rock layers (i.e., stratigraphy), the distribution and state of water-related minerals, and will help to characterise the geophysical Martian environment.