From the ISS to Mars

20 August 2013

Exploration: DLR and 11 other space agencies publish new roadmap

On 20 August 2013, 12 space agencies, among them the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), published the second version of a Global Exploration Roadmap. In it, the International Space Exploration Coordination Group (ISECG), has defined common objectives for future robotic and astronaut missions to the Moon, near-Earth asteroids and Mars. Jürgen Hill, Head of the Exploration Group within the DLR Space Administration, is the DLR representative at ISECG.

What is the Global Exploration Roadmap?

In a way, the Global Exploration Roadmap shows the way in which the manned and robotic exploration of space will develop by 2035. Building on the first publication in 2011, the new version details the initial attempt to present an internationally coordinated scenario in 50 pages. Twelve space agencies, among them DLR, the European Space Agency ESA, the US National Aeronautics and Space Administration, Roskosmos from Russia and JAXA from Japan, have agreed on common scientific objectives in exploring the Moon, Mars and asteroids; on the vehicles this requires, the supply units, other forms of infrastructure as well as regarding the specific preparation this will require on Earth and beyond. The roadmap therefore represents the foundations upon which the concepts and partnerships needed to prepare and execute missions can be built.

What scenarios are we talking about?

Effectively, the roadmap outlines a feasible scenario for exploration. It starts with the International Space Station ISS and proceeds to, step by step, expand the capabilities of manned space exploration with the aim of sending astronauts on a Mars mission. As a platform for technology and research, the ISS presents unique opportunities in the preparation of robotic and manned missions. Scientific and technological insight yielded during robotic missions to asteroids, the Moon and Mars will improve the safety of future manned missions, which by 2025 will be expanded to include routes from Earth to the Moon: There will be a focus on near-Earth asteroids, on astronauts spending several weeks or even months in space beyond Earth's orbit, and on exploring the surface of the Moon over longer periods of time. To achieve, it is necessary to design specific energy supply systems, in particular to bridge longer night-time periods without exposure to solar energy. Robots will continue to explore Mars for some time to come, and the ESA ExoMars programme will send an orbiter and a rover to the Red Planet as part of two missions earmarked for 2016 and 2018. DLR is also involved in the NASA landing mission InSight, scheduled for launch to Mars in 2016.

Cooperation within the scope of the roadmap also helps to bring together and analyse the development work each agency is engaged in. Firstly, this will ensure that important new technologies are available when needed, and secondly that sensible partnerships are identified, hence bypassing any redundancies. Moreover, analogous missions on Earth are useful in providing equivalent environmental conditions to test technical systems and operational concepts for their subsequent deployment during space missions. It is within this framework that DLR scientists have joined with other agencies in the AMASE (Arctic Mars Analogue Svalbard Expedition) project to put instruments, rovers and spacesuits through their paces in the Mars-like, arctic environment found in the region of Spitzbergen.

And what is DLR's role in all of this?

DLR has been an integral part of ISECG since the inception of the expert committee in 2008. It means that we are on an equal footing when speaking with our international partners about future missions and priorities. And from this ongoing discourse we can collect important information for planning programmes here in Germany and in Europe. We acquire deep insight into the ongoing work and plans of other agencies. It is also an excellent sounding board for our own expertise and technological capabilities. DLR institutions such as the Cologne-based research lab :envihab that opened in July 2013, or the planetary Rover Test Facility in Oberpfaffenhofen have a lot to contribute here. For instance, a prototype of the Mars rover for the European ExoMars mission was recently put through its paces here in the Rover Test Facility to make sure it would cope with the sandy soil and the obstacles found on the surface of Mars.

How do people on Earth benefit from the roadmap?

Exploring space pushes the boundaries at which we, as human beings, can exert an influence beyond our own immediate orbit. The ultimate purpose is to answer the most basic questions: Where do we come from? Is there life beyond Earth? How could life emerge in places other than this blue planet? And more than this: Exploration compels us to tackle challenges that themselves yield impetus for innovative technologies here on Earth. For example, we learn to understand and hence to manage the limited resources available on a manned space mission, including the atmospheric and water cycles or the power supply. Back on Earth, we can invest this knowledge in renewable energies and recycling processes. Or we can analyse commonalities between robotic lunar missions and deep sea research. And let us not forget that in the end, the roadmap allows us to forge international partnerships, and it is here that we invest knowledge and experience found in DLR and the German research and industrial sectors.

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Arctic Mars Analogue Svalbard Expedition

In the annual "Arctic Mars Analogue Svalbard Expedition" (AMASE), scientists from DLR and international partners are testing scientific instruments, robotic systems and operational concepts under Mars-like conditions on Svalbard.

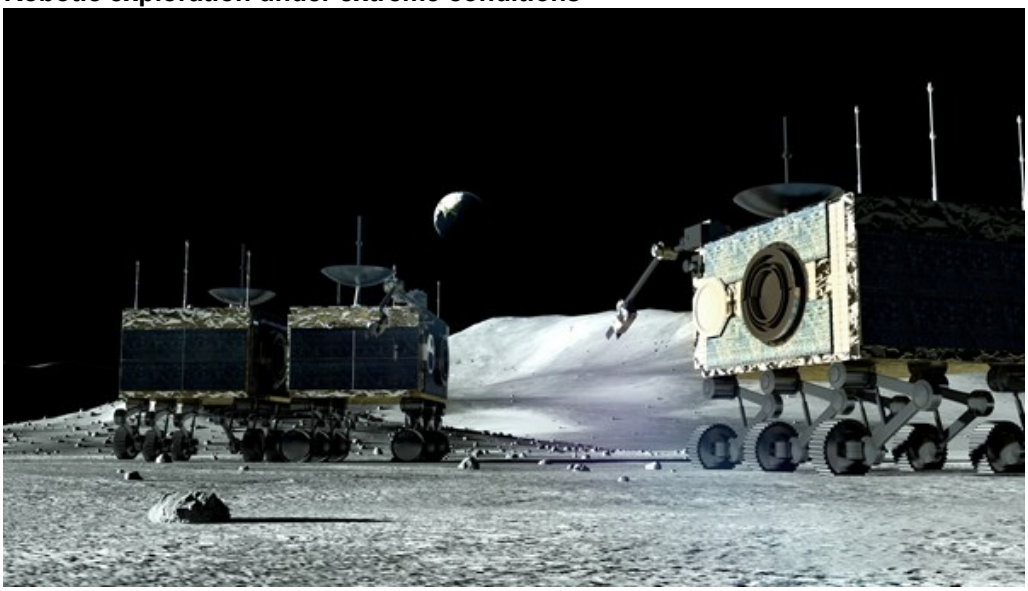
Credit: AMASE/Kjell Ove Storvik.

Jürgen Hill is Head of the Exploration Group within the DLR Space Administration

Jürgen Hill, Head of the Exploration Group within the DLR Space Administration, represents DLR in the International Space Exploration Coordination Group.

Credit: DLR (CC-BY 3.0).

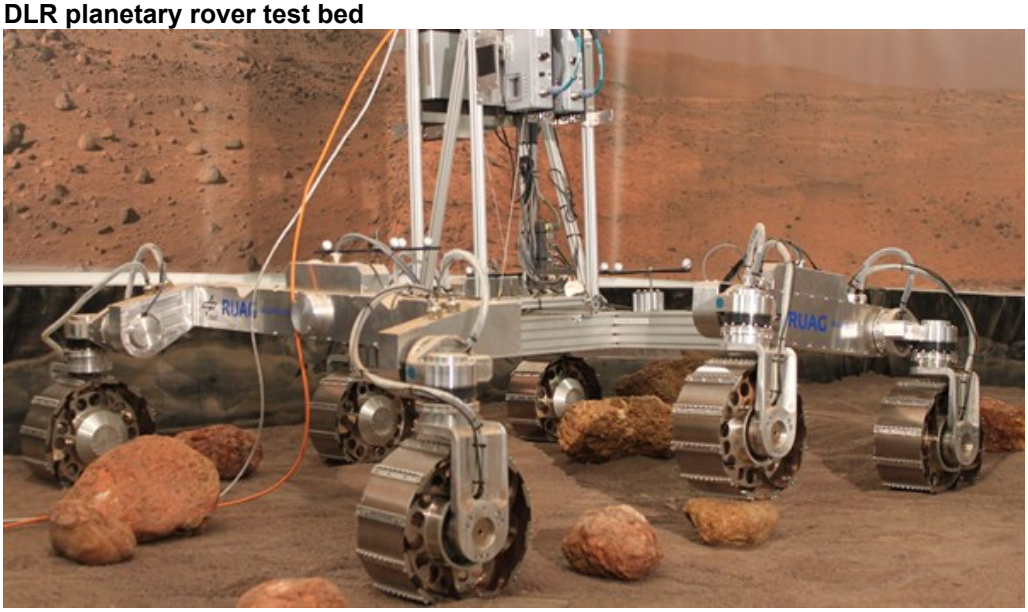
Robotic exploration under extreme conditions



The Helmholtz Alliance 'Robotic Exploration under extreme conditions - ROBEX' brings together the first space and deep sea exploration. A total of 15 institutions distributed all over Germany are jointly developing technologies that will enable the exploration of inaccessible regions with extreme environmental conditions, such as the deep sea, polar regions, the Moon, or other celestial bodies.

Credit: DLR (CC-BY 3.0).

DLR planetary rover test bed



In planetary rover test bed of the DLR Institute of Robotics and Mechatronics in Oberpfaffenhofen, DLR experts test a prototype of the ESA ExoMars rover, which will be launched to Mars in 2018.

Credit: DLR (CC-BY 3.0).

Philae lander in the DLR test facility LAMA

In the test facility for land vehicles LAMA at the DLR Institute of Space Systems in Bremen, scientists are examining how to place a vehicle on another celestial body. Here, a model of the Philae lander, on board Rosetta, which is scheduled to land on comet Churyumov-Gerasimenko in 2014.

Credit: DLR (CC-BY 3.0).

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