German Aerospace Day – Comet lander, parabolic flight aircraft and a centrifuge

05 September 2013

Aerospace research covers a broad spectrum of activities – missions to celestial bodies are just as much a part of it as checking the health of astronauts or experimenting in microgravity on parabolic flights. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) will present these and other aspects of spaceflight during German Aerospace Day in Cologne, on 22 September 2013.

Ready for touchdown with the Philae comet lander

Tucked away on board ESA's Rosetta spacecraft, the Philae comet lander has been slowly but surely flying to its destination, the comet 67P/Churyumov-Gerasimenko, since 2004. In late 2014, the very first comet landing will take place. During German Aerospace Day, scientists and engineers at the Microgravity User Support Center (MUSC) will be presenting and explaining a full-scale model, and allowing visitors to take a look in the control rooms from which Philae and various experiments on the International Space Station are monitored and controlled.

Test runs in the wind tunnel

When an Ariane rocket is launched into the skies or a space capsule re-enters Earth's atmosphere, one thing is for sure – extreme thermal and mechanical stresses. The heat and pressure are very high; the speeds surpass sound. Researchers from the Supersonic and Hypersonic Technology Department at the DLR Institute of Aerodynamics and Flow Technology use five wind tunnels to analyse how these and other factors affect the in-flight behaviour of space transport systems and capsules. A wind tunnel will be operating on German Aerospace Day. There will also be an exhibition of the various models used to test engines and spacecraft in the wind tunnels.

:envihab – earthly sister to the ISS laboratory

A centrifuge that generates six-fold gravity to examine the impact on the human body and permits ultrasound examinations of the test subject's organs as it spins; a hypobaric chamber to simulate altitudes up to 5500 metres and a clinical facility for bed rest studies and investigating the effect of light on the test subjects. :envihab, the new major research facility that is part of the DLR Institute of Aerospace Medicine, consists of a variety of modules in which scientists can research the health of astronauts in space and also people on Earth. Visitors to German Aerospace Day can inspect the various modules and test whether their fitness makes the grade for space travel.

Twenty-two seconds of microgravity for research

There are few opportunities to test the influence of gravity and microgravity on material samples, plants or even the human body. The DLR parabolic flight campaigns give scientists the opportunity to experience up to 31 sequences of 22 seconds in a weightless environment. On German Aerospace Day, the A300 'ZERO-G' will return from its 23rd parabolic flight campaign and will be on show to visitors in the aircraft exhibition.

EAC – a look at astronaut training

Astronauts undergo a rigorous training programme before they set off into space. Experts from the European Astronaut Centre will take part in brief, moderated panel discussions to describe the wide variety of topics covered in training and supporting astronauts, including medical

services and ground control. Models of the Columbus research laboratory and the European ATV space transporter will also be on show in the training hall. Reporting from the ISS, astronaut Luca Parmitano will provide a glimpse into living and working in space, while other astronauts such as Hans Schlegel, Alexander Gerst and Samantha Cristoforetti will relate their experiences during 'Astronaut Talk'.

Programme highlights, photographs and background information can be found on the special DLR page for German Aerospace Day 2013.

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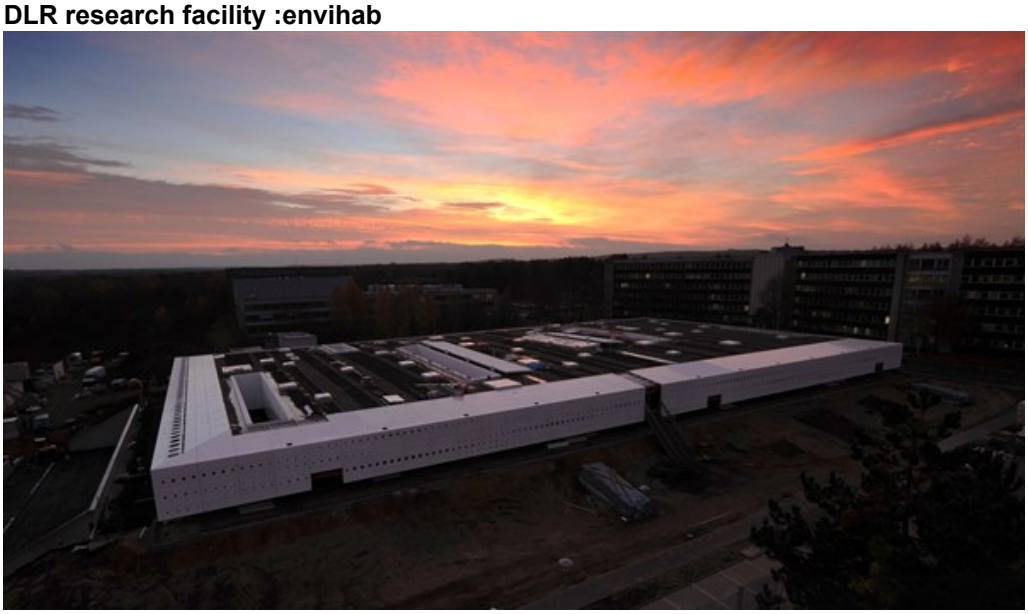
Touching down on a comet – Philae

Tucked away on board the European spacecraft Rosetta, the lander Philae is flying to the comet 67P/Churyumov-Gerasimenko. This first landing on a comet will enable scientists to conduct never-before accomplished measurements on the comet’s surface.

Credit: DLR (CC-BY 3.0).

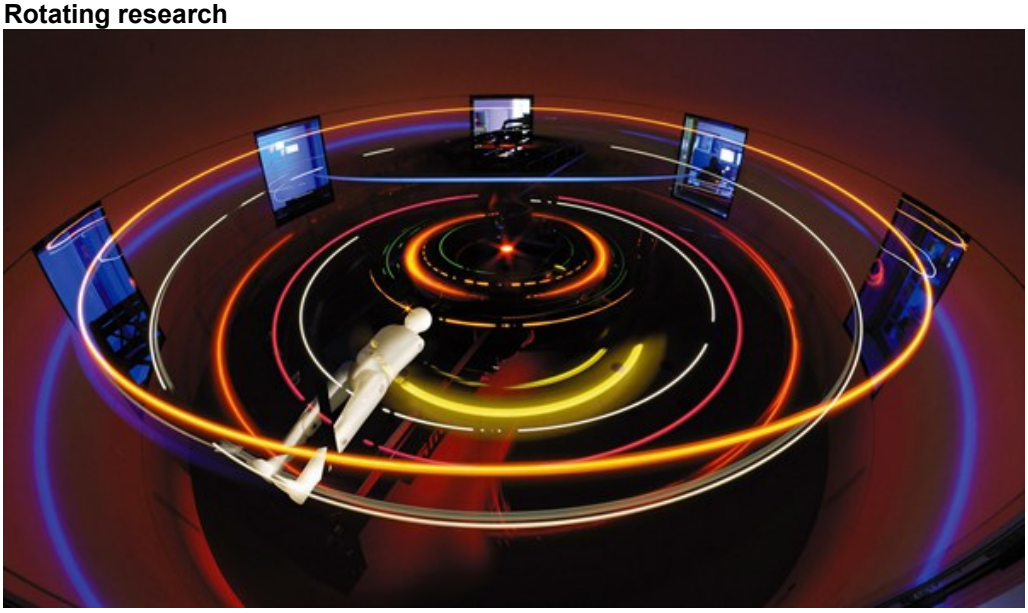
DLR research facility :envihab



The focus of the :envihab research facility, operated by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), and its eight modules, spread over 3500 square metres, is on people, their health and their performance levels.

Credit: DLR (CC-BY 3.0).

Rotating research



Up to four test candidates can be accelerated simultaneously at up to 6G on the ends of the centrifuge arms, providing unique conditions for experiments; these include developing training measures for astronauts to remain in a microgravity environment for prolonged periods. Complex sequences of movements in hypergravity can be recorded with high precision while remotely operated medical experiments are conducted. Doctors continuously monitor the test subjects during experiments on the centrifuge.

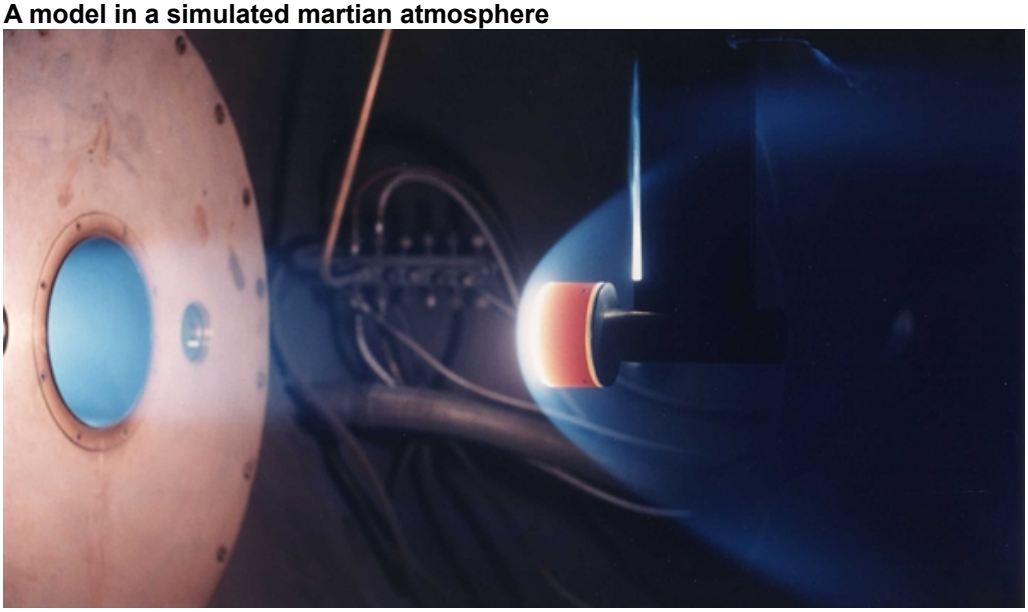
Credit: DLR (CC-BY 3.0).

A scientist during parabolic flight

The German Aerospace Center has offered parabolic flights on board the Airbus A300 'ZERO-G' since 1999. Here is how it works – a team of test pilots fly the aircraft along a trajectory that resembles a parabola. To do this, the aircraft climbs steeply from horizontal flight, reduces engine thrust and then follows a parabolic arc, creating free-fall conditions for about 22 seconds.

Credit: DLR (CC-BY 3.0).

A model in a simulated martian atmosphere



In Cologne, the researchers have access to a wind tunnel heated by an electric arc system, in which models can be exposed to realistic thermal loads. Optical and electronic metrology systems are used to examine the flow characteristics of the hot gases and the local thermal loads being experienced by individual sections of the model. Space capsules enter the atmosphere with their unstreamlined undersides facing in the direction of travel. This gives rise to a shock wave at high temperatures, while the gases flowing past the sides of the capsule are significantly cooler as they pass the other end of the capsule.

Credit: DLR (CC-BY 3.0).

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