

News Archive: Undergraduate

DLR in 2009 – Research for society

28 January 2009



From basic research to innovative applications

The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) is one of the leading research institutions in Europe. Its scientific work focuses on safeguarding the environment, mobility, energy supply and security for society, and on finding answers to socially relevant questions in the context of its public-service mission. In pursuit of these objectives, DLR links basic research with innovative applications, thus accomplishing the transfer of knowledge and research results to industry and politics.

In this way, DLR scientists are making a significant contribution to Germany's position as a scientific and economic hub, and to economic growth in Europe as a whole, for instance through the deployment of fuel cell technology, a satellite mission to explore the universe, and new approaches to energy research.

Aeronautics

The objectives of DLR's aeronautics research are to strengthen the competitive advantage of the national and European aeronautical industry and aviation sector, and to meet political and social demands. One of DLR's main tasks in this area is to help reduce the adverse environmental effects of aviation emissions. In order to achieve this, DLR focuses especially on the development and application of new technologies such as the fuel cell and materials such as carbon-fibre reinforced polymer (CFRP).



High-tech motorglider flies using fuel cell technology

Antares: The first aircraft to take off using fuel cell technology

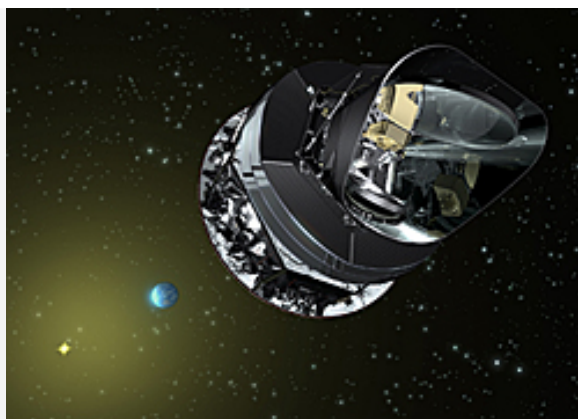
Antares is the world's first piloted aircraft capable of taking off using fuel cell propulsion. The maiden flight of this high-tech motorglider is scheduled to take place in May 2009. The aircraft is based on the Antares 20E motorglider. In cooperation with Lange Aviation GmbH, DLR has installed a 20-kW fuel cell system and hydrogen tanks underneath the specially strengthened wings. In this way, the fuel cell system can supply sufficient energy for the operation of the aircraft's engine, propeller and on-board electronics. This enables Antares to take off and fly with zero emissions. In the future, it will be possible to carry out the necessary tests for the further development of fuel cell technology in aviation more quickly and cost-efficiently by using the motorglider instead of DLR's large Airbus A320 ATRA research aircraft, which already has a fuel cell system that can take over the on-board power supply in case of an emergency.

ATRA: Fuel-saving electrically powered nose wheel for Airbus aircraft

This spring, DLR's A320 ATRA research aircraft will undergo its first taxi tests using an electrically powered nose wheel. Significant fuel savings can be achieved and noise pollution at airports can be reduced by using this new drivetrain.

Lighter aircraft thanks to carbon fibre materials

In early February, the CFK Valley in Stade and the planned centre for lightweight construction and production in Augsburg will take German research into the application of carbon fibre materials to a new level. DLR is one of the key partners in the future activities at these locations. In Augsburg, for instance, DLR will not just contribute with the fruits of its aeronautics research, but also the robotics expertise of its space institutes.



Herschel-Planck space telescope

Space

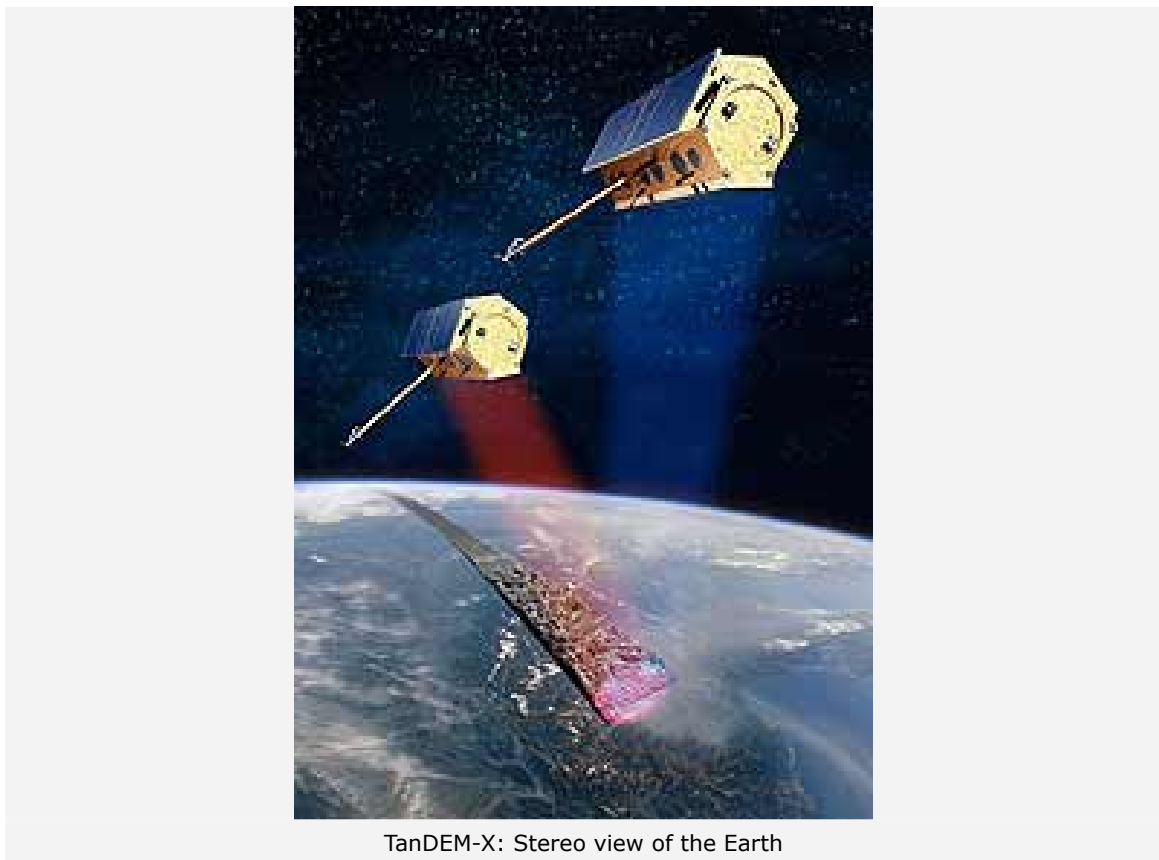
Space telescope Herschel-Planck to be launched

The launch of the European Herschel-Planck astronomy mission using the Ariane 5 launch system in Kourou (French Guiana) is scheduled for 16 April 2009. It will be the last cornerstone mission of the Horizon 2000 programme drawn up by the European Space Agency (ESA) in 1984. Herschel will be the first space observatory to cover the whole spectral range from far infrared (FIR) to the sub-millimetre waveband (from 60 to 670 microns). After the launch, the observatory will travel 1.5 million kilometres to be injected into orbit around the second Lagrangian point (L2, a point located around 1.5 million kilometres beyond the Earth's orbit, where the gravitational forces of the Earth and the Sun are balanced out) of the Earth-Sun system. This is a particularly favourable position, as there is minimal interference from infrared radiation coming from the Sun and the Earth.

The Planck satellite (formerly called COBRAS/SAMBA) carries a telescope with a 1.5 x 1.75 metre mirror and two instruments capable of measuring microwave radiation in different frequency bands. The data that will be obtained will help to answer fundamental questions: What did the early stages of the formation of our universe look like? How did it reach its present state? What will its future development look like?

New experiments from Germany on board the ISS – increased capacity thanks to six- astronaut crew

After the European Columbus laboratory was successfully launched on 7 February 2008 and docked with the International Space Station (ISS), its experimental devices were taken into operation and scientific research on board the station started right away. German scientists play a leading role in this research: 40 percent of the European experiments are provided by German research institutions. Research on board the ISS will be given another boost in mid-2009: from then on there will be six astronauts on board the station at all times, which means that considerably more crew time will be available for scientific activities. Many of the experiments in biology, medicine, plasma crystal research, fluid physics and radiology that were started in 2008 will be continued, and in some cases also completed this year. New experiments will be added, such as projects of the Charité academic hospital in Berlin and the German Sport University Cologne on human thermal and circulatory regulation, or of the DLR Institute of Aerospace Medicine (DLR-Institut für Luft- und Raumfahrtmedizin) on the interplay between salt and water homeostasis and bone metabolism.



TanDEM-X: Stereo view of the Earth

TanDEM-X to be launched: a three-dimensional elevation model of the Earth

The TanDEM-X mission (TerraSAR-X add-on for Digital Elevation Measurement), scheduled to be launched in September, is based on two almost identical Earth observation satellites: TerraSAR-X and TanDEM-X. Both satellites are equipped with a powerful modern radar system, the Synthetic Aperture

Radar (SAR). Using SAR, it is possible to observe the Earth not just in daylight, but also at night and in overcast conditions. Just like the two eyes of human beings enable them to perceive the world in three dimensions, TanDEM-X's two SAR antennas will enable it to generate a three-dimensional high-resolution elevation model of the entire surface of the Earth.

Technology to enable high data-transfer rates to mobile end users

The German national satellite communications mission Heinrich Hertz is aimed at conducting scientific and technical studies and tests of new communication technologies in space, such as broadband communications capable of offering high data rates to mobile end users. In addition to this, the mission enables scientific institutions as well as industry to carry out a wide range of technological experiments. At the same time, the selection of the new German SmallGEO satellite for this mission contributes to developing systems expertise in this field, the objective pursued by ESA and the Federal Republic of Germany in the context of the ARTES 11 programme. Phase A of the project will start before the end of this year, and the launch is planned for 2014.

Energy

All areas of economic, public and private life are dependent on energy supply, which means that energy research is of great economic importance as well. Recent political problems relating to energy supply have shown that Germany needs to make structural changes to its energy policy, and that it should invest considerably more resources in energy research than before. DLR sets the benchmarks for the rest of Europe in this field and it is at the forefront of new developments.



Solar thermal tower power plant to be taken into operation in Jülich

A solar thermal tower power plant will be taken into operation by the public utility company of the city of Jülich in spring 2009. Plane mirrors with a total surface area of 18 000 square metres redirect the solar radiation onto a so-called receiver that has been installed on a tower at a height of 60 metres. This receiver, which forms the core of the plant, was developed and patented at DLR. The solar tower allows researchers in Germany to conduct test and development activities right around the corner, so to speak. The results they obtain can then be transferred to much larger plants in the sunbelt countries of southern Europe or North Africa. Solar thermal power plants hold great potential for the global energy supply of the future.

Hybrid power plant: gas turbine to be coupled with a fuel cell

DLR is also developing a hybrid power plant that couples a gas turbine with a high-temperature fuel cell (SOFC). In the long term, researchers hope that it will be able to produce electricity with the highest possible level of efficiency. The secret of this innovative power plant design lies in the connection between the high-temperature fuel cell and the gas turbine, through which the hot exhaust gases of the fuel cell enter the combustion chamber of the gas turbine. By way of comparison, a gas turbine generates electricity with an efficiency of 40 percent, whereas the fuel cell achieves an efficiency of 46 percent. Even in comparison to individual components of the highest quality, the hybrid power plant can achieve an efficiency increase of 14 percentage points.

In addition to this, DLR is developing more environmentally friendly decentralised power plant designs in collaboration with power supply company EnBW Energie Baden-Württemberg AG. Coupling a thermal gasifier or a biogas reactor to a micro gas turbine is a potential solution for the efficient production of electricity and heat from biomass in small plants in the lower power range. The new components and conceptual designs are implemented together in pilot and demonstration plants.

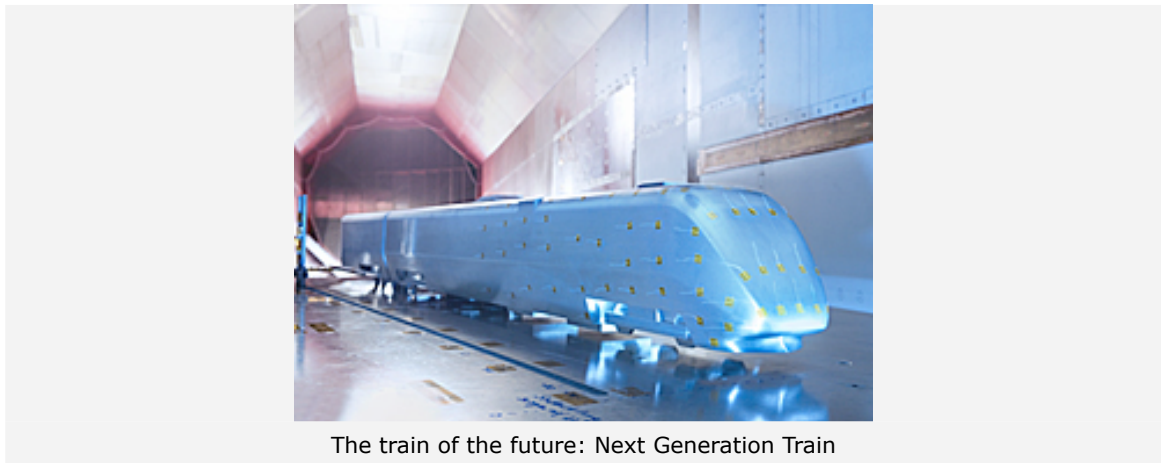
Focusing on the big picture: the Energy Pilot Study 2009 for the German Ministry for the Environment

As in previous years, DLR will draw up the 2009 edition of the Energy Pilot Study ("Leitstudie 2009") on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit; BMU), outlining the development of Germany's energy supply over the period 2009 - 2050. The study will assess whether Germany will be able to meet its target for reducing greenhouse gas emissions by expanding renewable energy and by realising its full potential for energy conservation.

Transportation

The economic costs of traffic congestion are enormous. Noise and exhaust emissions put a strain on the environment. The influence of transportation on the climate is no longer disputed. The most important topics for DLR's transportation research in the year 2009 are electric vehicle technology and alternative propulsion.

This, for instance, includes the further development of the thermoelectric generator TEG, which can generate electrical energy from the heat of exhaust gases. In 2009, the DLR researchers want to develop a generator that has a higher capacity than current models. New vehicle structure designs can lead to drastic weight reductions. In 2009, DLR researchers will work on a prototype for the front end of the SuperLIGHTCar.



The train of the future: Next Generation Train

Innovative vehicle energy systems, lighter coachwork, Next Generation Train

This year, scientists working on the development of the pioneering Next Generation Train will open a crosswind and tunnel simulator for trains and heavy goods vehicles that is based on new research methodology. With regard to DLR's research on airport management, this year will see the start of the Total Airport Management Suite project for integrated landside-airside airport management, a joint project with the German Federal Ministry of Economics and Technology (Bundesministerium für Wirtschaft und Technologie; BMWi) and national partners. DLR's research on the correlations between traffic growth and environment will focus on analysing the current and future potential for pure electric vehicles from a user's perspective.

Security

DLR's security research does not fall neatly into one of its focus areas, but instead forms a common focus for all research areas. In the areas of aeronautics and transportation research, for instance, DLR scientists are working on airport security and satellite-based crisis management, and in the area of energy research they are working on a decentralised energy supply. DLR has an extensive national, European and international network linking it to other research institutions in the field of security research. Through its research activities, DLR bolsters Germany's competitive position in Europe and the world.



Protecting the civilian population in the event of a natural disaster

GITEWS: German-Indonesian tsunami early warning system to become operational

This can be illustrated by the example of the German-Indonesian tsunami early warning system in Jakarta, which will be put into service in the summer of 2009, at which point it will be fully operational. Communities all over the world need protection and aid in the event of a natural disaster. In order to protect the population from disasters or to be able to provide aid quickly and effectively in an emergency, decision makers and aid agencies need fast and reliable information. To make tsunami advance warning even more reliable in the future, DLR investigated and realised the implementation of new Earth observation technologies in such a warning system. This research is also important for enabling transfer of the early warning system to other areas vulnerable to tsunamis, such as the Mediterranean.

Promoting the next generation of scientists - DLR_Graduate_Program

The aim of this special programme is to provide extra support to young scientific staff members. One of DLR's central tasks is to secure the future by promoting the next generation of scientists. This is especially important for high-tech sectors such as aerospace, transportation and energy.

The DLR_Graduate_Program was developed to provide young scientific staff members with intensive and high-quality supervision and to make DLR even more attractive for graduates. It is a professional training programme that offers important knowledge and skills that supplement the trainee's specialist work. It aims to provide subject-specific and interdisciplinary contexts as well as career-enhancing management and social skills. The programme will be offered to all doctoral researchers who join DLR from 1 January 2009, and it will start in June 2009.

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