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International cooperation in the peaceful uses of outer space: activities of Member States

The present conference room paper contains a submission received by the Secretariat from Germany on 14 January 2014. The document is issued without formal editing.

Replies received from Member States

Germany

The “space strategy of the German Federal Government” published by the Federal Ministry of Economics and Technology in 2010 is the main backbone of space activities in Germany.

Objectives of space activities are the accomplishment of central global challenges and to max out the inherent economic potentials more efficiently.

Guidelines of Germany’s space policy are “orientation at benefit and demand” as well as at the “principle of sustainability” and the “intensification of international cooperation”.

According to the development of strategic space competency, the launch and transfer to geostationary orbit of ESA’s Alphasat I-XL in July 2013 was one milestone. LCT, the Laser Communication Terminal is a payload for demonstration purposes and has been developed under German leadership with the significant funding of the Federal Ministry of Economics and Technology. With this technology demonstration Alphasat I-XL opens the door for the European EDRS (European Data Relay Satellite).

In June 2013 a special passenger was on board during launch of ESA’s fourth Automated Transfer Vehicle (ATV): the STEREX experiment, jointly funded

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by the German space agency (DLR) and the European Space Agency (ESA). With a system of four cameras the separation of ATV from the Ariane 5 was recorded for the first time in 3D, the latest acquisition after the precursor in 2006. This new 3D-perspective is very helpful to better understand and analyse the dynamic processes in that phase.

METImage, a multispectral, mapping radiometer will become the core instrument of the future second generation of European weather satellites to be run by the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) from 2020 onwards.

In November 2012 DLR signed for the next phase in the development of METImage. It is its first contribution to an operational Earth observation satellite system and is funded by the Government. The instrument aims to acquire data for meteorology, oceanography and monitoring of climate change with a so-far unprecedented quality.

The launch of the TET-1 small satellite in summer 2012 with a Soyuz launch vehicle together with four other satellites from the Russian Federation, Belarus and Canada was another remarkable activity. TET-1 is a technology testbed with 11 experiments to close the gap between ground qualified systems and operational space applications. With the offered flight opportunities to German industry and science institutes new technologies are to be validated. Therefore, TET carries payloads from industry and research institutes like battery system, solar panels, propulsion system, IR camera system, data storage, GPS and communication system. After one year of operation it has changed to the FireBird mission. TET-1 was funded by the Federal Ministry of Economics and Technology.

The sustainable strengthening of space research comprises research activities in fields like physics, biology, medicine or material science. One initiative in this nucleus is the TEXUS-Mission.

Thirty-five years after the first TEXUS-Mission in 1977, Germany's sounding rocket programme celebrated its 50th TEXUS-rocket launch in April 2013. For the research in microgravity four German biology and materials research experiments were carried. With the electromagnetic levitation facility EML investigations of thermo physical properties and behaviour of metal alloys were conducted. Results are of significant interest to industry. Other experiments focused on initial reactions of organisms to changes in gravity and impacts of gravity on genes.

The launch of the sibling rockets REXUS 13 and 14 in May 2013 focused on education for young academics concerning space debris, space weather and cosmic rays. It is part of the REXUS/BEXUS Rocket and Balloon Experiments for University Students programme. A group of 50 students from Germany, Sweden, the United Kingdom of Great Britain and Northern Ireland, Switzerland and Hungary have planned and built the experiments, the rocket launch was conducted through the Swedish space agency SNSB. The German Space Agency is responsible for the programmatic framework of the German experiments. In contrast to REXUS BEXUS focuses on balloon experiments for university students. Both launch on an annual basis. The international groups of young academics benefit tremendously from both initiatives.

Since June 2013 the SKIN-B experiment on the International Space Station (ISS) investigates the impact of space on human skin. It is a follow-up mission of the Astrolab-Mission in 2006, conducted by the German astronaut Thomas Reiter. Skin transformations are very common for astronauts at the ISS and severely affect their life and work in space.

E-Nose is an electronic gas sensing system for detecting microbial contamination online developed by German scientists. After the transportation with a Soyuz launch vehicle the electronic nose started its work in February 2013 in the Russian segment of the ISS. E-Nose will materially contribute to the safety of crews on the ISS and possible long-term missions in the future. Combining advanced IT technologies, sensor technology, and evaluation software, it opens up a wide field of possibilities for use in space as well as in closed systems on Earth.

Already in 2009 Alexander Gerst was chosen as the next German astronaut for the ESA astronaut corps for the ISS. Lift-off will be in May 2014, his return is foreseen in November 2014. During his stay he is going to conduct about 40 scientific experiments in the fields of material physics, human physiology, radiobiology, solar research, biology and biotechnology, fluid physics, physical astronomy, technology demonstrations.

Additionally German research institutions advance space related developments in overarching activities which together serve several objectives of the German space strategy.

With the long awaited launch of the latest successor of the long-standing BION series of Russian research satellites in April 2013 two experiments funded by Germany were included: the mini-ecosystem Omegahab and the series of three picosatellites, the BeeSats. With Omegahab the response of the entire organism to microgravity was investigated. The purpose of the BeeSat initiative was research and education for university students. Not to forget that this activity also documented the close collaboration between the Russian Federation and Germany.

On the other hand :envihab, sometimes called the earthly sibling laboratory to ISS, has been initiated as a German platform for the initiation of interrelated international networks of scientists with industry and the general public. :envihab was ceremonially opened in July 2013. It is run by the Institute of Aerospace Medicine at the German aerospace centre. The institute is a world leader in aviation and space medicine. With the one-of-a-kind medical research facility :envihab ground-breaking research can be conducted concerning the adjustment of people to extreme environments and other stressful situations. Based on eight separate modules :envihab (derived from the terms environment and habitat) enables for the first time research in space and flight physiology, radiation biology, space psychology, operational medicine, biomedical research and analogous terrestrial situations. First negotiations with international industry and research are underway to start long-term projects at the beginning of 2014.

During July 2013 the Stratospheric Observatory for Infrared Astronomy (SOFIA) has been deployed for the first time to the southern hemisphere after a deployment to the northern hemisphere in 2011. SOFIA is a joint project of the National Aeronautics and Space Administration (NASA) and the DLR aerospace center. The extensively modified Boeing 747SP carried the far-infrared spectrometer German Receiver for Astronomy at Terahertz Frequencies (GREAT) which is designed for

studies of the interstellar gas and stellar life cycle. A crew of 60 scientists, technicians from the United States of America and Germany conducted the missions. The German component is funded by the Federal Ministry of Economics and Technology.

Further international cooperation — besides European Union (EU), ESA and EUMETSAT which are very important partners for Germany — such as Germany's membership in the International Charter Space and Major Disasters since 2010 strengthens the guideline “intensification of international cooperation”. Starting in April 2013 Germany chaired the International Charter for six months before handing over the chair to Argentina.

Data of the German satellites TerraSAR-X and TanDEM-X has been provided several times after activation of the Charter. The German ZKI, the Centre for Satellite based Crisis Information also contributed significantly, especially during the flood events in Northern India and Nepal as well as during the German flood in summer 2013. ZKI provides regularly, and on a 24/7 basis, satellite analysis and humanitarian mapping services for the German Government and its respective relief organizations since January 2013. The Centre also delivers data for international requests.

TerraSAR-X and TanDEM-X are two of overall 15 German satellites in operation: TerraSAR-X in formation flight with TanDEM-X, the TET-1/Firebird and the RapidEye fleet consisting of 5 satellites, and others.

International Cooperation

Germany's space cooperation with Canada is further intensified via the signing of the framework agreement on space science and technology during IAC in September 2013 in Beijing, China. Focus Areas of cooperation will cover Earth observation, satellite operations, space exploration systems and space technology.

The Mexican Space Agency (AEM) is exemplary for several emerging countries' space ambitions. Its establishment has already had an impact on national development policies. Germany, not least through the ground station in the country, has been a partner of Mexico particularly in Earth observation for many years. The ground station at Chetumal will be handed over to AEM in 2014 with further joint use.

Very important space collaboration projects between Japan and Germany are the Japanese asteroid mission Hayabusa2 and space based radar. The launch of the Hayabusa2 mission (where a Memorandum of Understanding (MOU) between JAXA and DLR was signed in November 2012) is scheduled for 2014. Germany will develop the Mobile Asteroid Surface Scout (MASCOT) together with France.

The NEOShield project under German leadership is EU-funded and consisting of 13 partners including the United States and the Russian Federation to analyse open questions relating to realistic options for preventing a disaster triggered by a collision of a NEO with the Earth.

Germany, through the University of Koblenz-Landau, supports also the work of Action Team 6 to improve public health services. Focus is on the implementation of low cost technology including space based technology and information. They work closely together e.g. with El Salvador, and they coordinated various international workshops together with the United Nations Office for Outer Space Affairs in the last year.