TEXUS 49 lifts off with four German experiments on board

29 March 2011

The TEXUS 49 sounding rocket lifted off from the Esrange Space Center near Kiruna in northern Sweden on 29 March 2011 at 06.01 CET. The German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) rocket, carrying four German experiments for medical and materials research, reached an altitude of 268 kilometres. The experiments were subjected to close to six minutes of microgravity during the twenty-minute long flight before the payloads were parachuted back to Earth, as scheduled.

Alloys in microgravity

TEXUS' main payload was the German-developed electromagnetic levitation system (Elektromagnetische Levitationsanlage; EML). With it, research scientists from the DLR Institute of Materials Physics in Space in Cologne performed two experiments to study the thermophysical properties and solidification behaviour of metal alloys of interest to industry. One of the experiments analysed an aluminium-nickel compound used in aviation and other transport systems.

The second experiment examined a nickel-tantalum alloy with ceramic particles, which were added to improve the composite's wear characteristics. The results obtained in the microgravity environment are more accurate than those obtained in a laboratory on Earth because the forces required to maintain the particles in suspension and the disruptive internal flows in the liquid metal are substantially reduced. The researchers obtained high-precision data that is important for the development of computer simulations required for modern industrial manufacturing processes.

The TRACE+ (Transparent Alloys for Columnar Equiaxed Solidification) materials science experiment, performed by the Aachen ACCESS research centre, investigated the processes and structures involved in the solidification of metallic alloys. This was done by analysing the behaviour of a mixture of organic substances with a solidification process similar to that of a liquid metal. The transparency of the organic alloy made it possible to observe its solidification process directly. The experiment will yield data for improving industrial casting processes.

SITI-1 investigates the human immune system in microgravity

The SITI-1 medical/biological experiment, carried out by a research group from the Otto von Guericke University of Magdeburg, studied the mechanisms leading to disturbances in the immune system when subjected to a microgravity environment. For example, some astronauts are prone to suffering infections during prolonged periods of time in space.

In addition, cell cultures were carried on board TEXUS 49 to monitor the activity of all genes in the immune system using modern DNA chip technology. Scientists suspect that certain molecules in cell membranes may be responsible for disrupting the immune system in microgravity. If these suspicions are confirmed, the findings could eventually lead to new approaches for fighting diseases.

DLR commissioned Astrium Space Transportation in Bremen for the launch preparations and implementation of the TEXUS 49 mission. Kayser-Threde in Munich and DLR's Mobile Rocket Base (MObile RAketenBAsis; MORABA) in Oberpfaffenhofen also participated in the mission. The VSB-30 two-stage launcher was a joint venture between the Brazilian aerospace organisations Centro Técnico Aeroespacial (CTA) and Instituto de Aeronáutica e Espaço (IAE),

together with MORABA and the Swedish Space Corporation (SSC). This was its seventh launch from Esrange under the TEXUS programme.

The TEXUS programme

The TEXUS (Technologie-Experimente unter Schwerelosigkeit – technology experiments under microgravity) programme, begun in 1976 under the joint sponsorship of the German Federal Ministry of Education and Research (Bundesministerium für Bildung und Forschung; BMBF) and the Federal Ministry of Economics and Technology (Bundesministerium für Wirtschaft und Technologie; BMWi) through DLR's Space Agency, uses sounding rockets to achieve microgravity experimental conditions lasting close to six minutes. The TEXUS 50 'Anniversary flight' is scheduled for either 2012 or 2013.

Up to two rockets are launched from Esrange each year. Following a parabolic trajectory, they can reach an altitude of up to 270 kilometres before parachuting back to Earth and being recovered by helicopter. During the flights, experiments are performed in separate, autonomous modules within the launcher. Data is acquired using telemetry during the flight and upon recovery of the scientific payloads. The tests can be directly controlled and monitored via telecommanding and video transmissions.

The TEXUS programme offers scientists the opportunity to perform independent experiments in microgravity and prepare experiments to be conducted on the International Space Station (ISS). It stands out for the re-usability of the payload, short preparation and access times, a regular, user-friendly access to zero gravity and, in comparison to manned missions, lower safety requirements. These factors allow for relatively low-cost research.

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Credit: Astrium GmbH.

Solidification in microgravity

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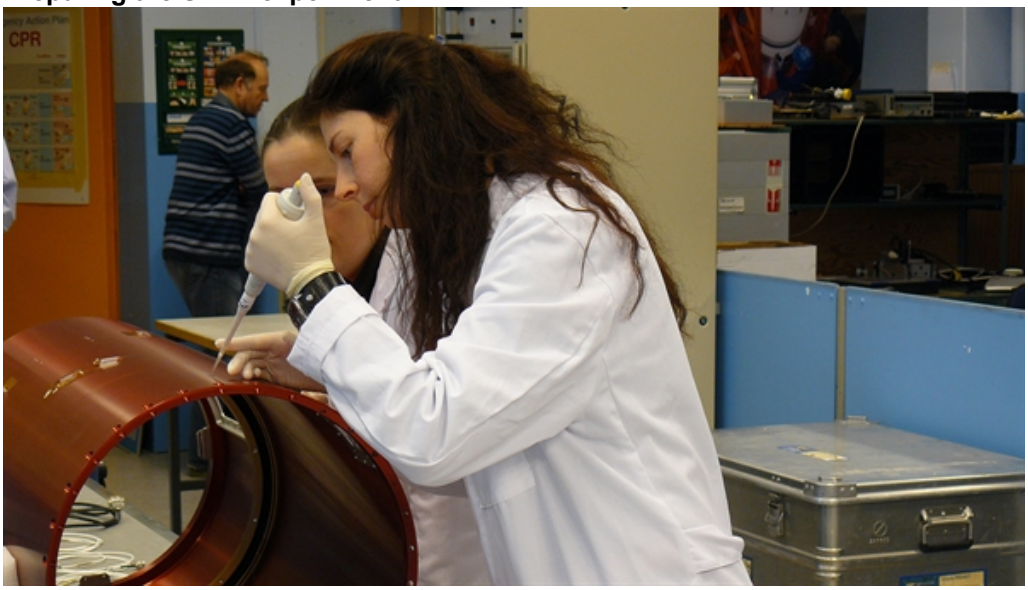
Credit: ACCESS/Astrium GmbH.

Preparing the SITI-1 experiment



The biomedical experiment SITI-1, designed by the University of Magdeburg, studies dysfunctions of the human immune system in weightlessness using cell cultures. In this image a scientist prepares the rocket's payload.

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Transport to the launch tower

The TEXUS 49 payload being transported to the launch tower, where it is will be mated with the rocket.

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