News Archive: Undergraduate

REXUS 7 and 8 student research rockets launched successfully

4 March 2010

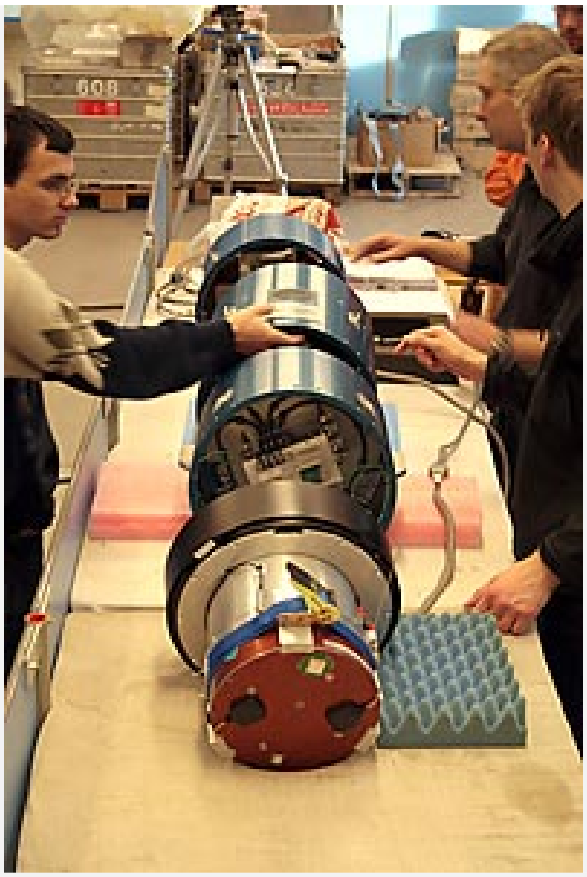
Launch of REXUS 8

On Thursday, 4 March 2010 at 11:15 CET, the research rocket Rexus 8 (**R**ocket **EX**periment for **U**niversity **S**tudents), a joint project of the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) and the Swedish Space Corporation (SSC), launched from SSC's Esrange Space Center near Kiruna, in Sweden. Students from the Technical Universities of Berlin (Technische Universität Berlin; TUB) and Munich (Technische Universität München; TUM) and from the Royal Institute of Technology (Kungliga Tekniska Högskolan; KTH) in Stockholm used the flight to conduct satellite communication experiments and also tested a newly-developed descent probe. The rocket reached an altitude of 88 kilometres during its flight. Rexus 7 was launched just two days earlier, on 2 March.

The flights lasted about five minutes each. They followed a year of intensive preparation, during which students from Germany, Sweden and Italy developed and built the experiments. While still in flight, most of the data were transmitted to the ground station at Esrange. They will be evaluated over the next few weeks. The scientific payloads landed by parachute, were retrieved by helicopter and the experiments were handed back to the students.

TUPEX-3, VECTOR and LAPLander test satellite communication and descent probe

During the REXUS-8 flight, students from TUB tested the TUPEX-3 experiment, which is a new communications system. Their intention is to deploy several CubeSat satellites and one ground station. In this experiment, four identical radio modules simulated a multi-satellite system. During the flight, the module on board REXUS exchanged data with the other three 'satellites' on the ground. In addition, new Sun sensors were tested. The energy consumption, mass and volume, of these units were optimised for use on CubeSats.



Bench test for REXUS 8

The VECTOR experiment conducted by the teams of students from TUM consisted of two parts. On REXUS-8, an onboard computer developed by the students was tested; the computer's telemetry system transmitted live data. An S-band antenna on the ground, designed for use in space applications, was used to track the flight paths of both rockets. The aim was for it to demonstrate the high accuracy of a new alignment mechanism for an autonomous and highly accurate inter-satellite communication system.

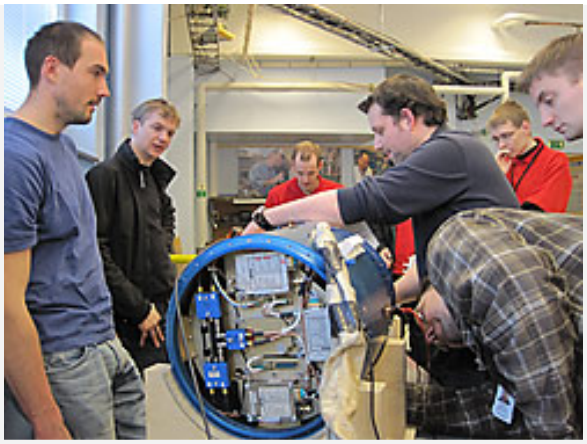
The LAPLander (Light Airbag Protected Lander) is a prototype descent probe developed by students at KTH. It was deployed from the rocket and returned to Earth independently. The intention was to enable testing of its airbraking, impact protection and recovery systems. To prepare for landing, at an altitude of about five kilometres it inflated four tubes with air and these were used to brace the parachute. These inflated tubes are also designed to cushion the impact of landing. To enable LAPLander to be rescued by the helicopter crew, the tiny disk-shaped descender has a GPS receiver and a radio beacon on board. A satellite transponder sends the latest position to the student team. Descenders like LAPLander are needed to carry out extended scientific examinations of regions of Earth's atmosphere beyond reach of balloons.

Atmospheric research and technology tests on REXUS 7

Rexus 7 launched on 2 March at 08:25 CET. On board were the experiments MONDARO, Vibra-Damp and BUGS. The rocket reached an altitude of 82.5 kilometres. The MONDARO experiment on REXUS 7, developed by students from the University of Rostock and the Leibniz Institute for Atmospheric Physics (Leibniz-Institut für Atmosphärenphysik) in Kühlungsborn, measured atmospheric pressure and calibrated pressure sensors for a very specific measurement configuration as the rocket rose above an altitude of 50 kilometres. The students used three low-cost and commercially available measuring devices. One pressure sensor was located on the central axis, directly below the tip of the rocket; the tip was jettisoned before the experiment began. With the help of the data obtained, it was possible to calibrate the other two sensors, which were located slightly further back and in less favourable aerodynamic locations. In future experiments, the central pressure sensor will not be necessary.

The team from Aachen University of Applied Sciences (Fachhochschule Aachen) developed a REXUS module by the name of Vibra-Damp, in the interior of which interference factors such as the residual rotation of the rocket or vibration can be damped. This creates better conditions for experiments in weightless conditions. It was tested for the first time on this flight. In a standard REXUS module, a

container was suspended on springs. As soon as this container starts to move relative to the module, it is constrained by eddies generated between the containers.



Joint work on the module

Undergraduates and doctoral students at the universities of Rome and Bologna used the BUGS experiment to test the deployment of a new kind of sensor arm under realistic space conditions – that is, in zero gravity and in a vacuum. In this process, they also examined the vibration characteristics of the arm. At a later date, the arm will be used to stabilise UniSat-5, an Italian microsatellite.

REXUS and BEXUS – programmes for the scientific talent of the future

The German-Swedish programme REXUS/BEXUS enables students to gain practical experience in the preparation and delivery of space projects. Their proposals for experiments in the capsule of a balloon (BEXUS - Balloon-borne EXperiments for University Students) or on high-altitude research rockets (REXUS - Rocket EXperiments for University Students) can be submitted on an annual basis every autumn. Half of these rocket and balloon payloads are available for students at German universities and other higher education institutions to use. The Swedish National Space Board has opened up the Swedish half to students from all the Member States of the European Space Agency (ESA).

Management of the programme and the invitation to German students to tender bids are handled by the DLR Space Management team in Bonn. The organisation, support of students and integration of German experiments are performed by the DLR Institute of Space Systems (Institut für Raumfahrtsysteme; IfR) in Bremen, in collaboration with experts from DLR, SSC and ESA. In turn, IfR reports to DLR's in-house project management team. The flight campaigns are carried out by EuroLaunch, a joint venture between DLR's mobile rocket base (Mobile Raketen Basis; MoRaBa) and the Esrange Space Center operated by SSC.

Proposals for new experiments for balloons in September 2011 and rockets in March 2012 can be submitted in the autumn of 2010.

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