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## Experiments on SHEFEX II successful

28 June 2012

### **DLR researchers begin evaluating data; as yet, no recovery of the spacecraft**

Following the flight of the SHEFEX II spacecraft on 22 June 2012, researchers at the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) have performed an initial assessment. "The flight of Shefex II followed the precomputed trajectory and we received extensive and valuable data from all the experiments in real time," says DLR Project Manager Hendrik Weihs. With SHEFEX II, researchers are investigating technologies to make spacecraft re-entry less expensive. The spacecraft landed west of Spitsbergen; here, a boat was intended to rescue the payload from the sea, but missing data during the last seconds of the flight and the harsh weather conditions have complicated this task. The researchers are now assessing the viability of locating and recovering it from the ocean floor.

Shortly after the completion of the 10-minute flight from the Andøya Rocket Range in Norway on the evening of 22 June 2012, a search aircraft received the first weak signals from SHEFEX II. "We know that the landing went as planned because the spacecraft was designed to emit a signal only after the parachute had opened," explains Weihs. Ideally, data from the last seconds of the flight would have been transferred to the ground station in Spitsbergen. "Unfortunately, the station was unable to track the spacecraft." It was planned that the experimental phase of the SHEFEX II flight through the atmosphere would last 55 seconds; researchers are missing data from the last five seconds. For the researchers, this was not such a great loss; the real challenge was the spacecraft's recovery from the ocean. "The signal received could only be from our spacecraft; we have analysed images acquired with the TerraSAR-X satellite and no other objects were visible at the landing site," says Weihs. But waves nearly three metres high prevented the salvage vessel from getting to the landing zone. On 24 June 2012, the search was called off. "We are now trying to determine where, exactly, the spacecraft sank, and whether it can be salvaged."

### **Active control and cooling**

To evaluate their experiments, the researchers acquired large quantities of data from the spacecraft, down to an altitude of 29 kilometres, from the ground stations at the launch site and on a nearby mountain. The experiment phase of the flight began at an altitude of approximately 100 kilometres, as the rocket re-entered the atmosphere, and ended at an altitude of 20 kilometres. "We know already that the 'fins', known as canards, functioned properly," says Weihs. The researchers were able to actively control the spacecraft, unlike SHEFEX I, which was launched in 2005. It was already clear during the flight that SHEFEX II had carried out the control manoeuvres as planned. In one of the experiments, nitrogen flows through a porous tile, actively cooling the craft during re-entry. "We have data for the gas outflow, and we have the spacecraft's surface temperatures – now, the evaluation begins." The researchers are also happy with the accurate trajectory of the spacecraft. "This is the first time that our mobile rocket base has developed and flown a launch system in this configuration." The experience gained with SHEFEX II will be incorporated to the follow-up project SHEFEX III – a spacecraft, whose atmospheric re-entry is scheduled to last up to 15 minutes. "The salvage of the spacecraft would be the icing on the cake," says Weihs.

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### **SHEFEX II – into space with sharp edges**



DLR's SHEFEX II spacecraft was equipped with more than 300 sensors. SHEFEX II was launched on 22 June 2012 from the Norwegian Andøya Rocket Range.

Credit: DLR (CC-BY 3.0).

### **SHEFEX on the way to Spitsbergen**



A wealth of information regarding pressure and temperature, among many other variables, was recorded during the flight of SHEFEX II. Now, researchers at the German Aerospace Center (DLR) will begin evaluating this data.

Credit: DLR (CC-BY 3.0).

## Launch of SHEFEX II on 22 June 2012 21:18 CEST



After a 10-minute flight, the sharp-edged SHEFEX II spacecraft landed safely west of Spitsbergen. DLR researchers launched the seven-ton and roughly 13-metre-long rocket and its payload from the Andøya Rocket Range in Norway at 21:18 CEST on 22 June 2012. As it re-entered the atmosphere, SHEFEX withstood temperatures exceeding 2500 degrees Celsius and sent measurement data from more than 300 sensors to a ground station.

Credit: DLR (CC-BY 3.0).

## Practise countdown for SHEFEX II



The SHEFEX II craft, its launch vehicle and the tower during a practise countdown.

Credit: DLR (CC-BY 3.0).

### Assembly of the SHEFEX II vehicle



A few days before the launch, DLR researchers assemble the various components of the SHEFEX II vehicle. The spacecraft is notable for its sharp-edged design.

Credit: DLR (CC-BY 3.0).

### SHEFEX II on its launch vehicle



SHEFEX II and its launch vehicle still in the horizontal position; just before lift-off, the roof opens and the launch tower is raised to the vertical position.

Credit: DLR (CC-BY 3.0).

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