



All set for space! – the MASCOT asteroid lander

27 November 2014

Latest: the launch of Hayabusa 2 and MASCOT has been delayed until 1 December 2014 at the earliest, due to predicted adverse weather conditions at the launch site. This page will be updated when a new launch time is announced by JAXA.

Originally scheduled for launch at 05:24 CET on 30 November 2014, the MASCOT (Mobile Asteroid Surface Scout) asteroid lander will now set off from Tanegashima Space Center on board the Japanese Space Agency (JAXA) orbiter Hayabusa 2 no earlier than 1 December, destined for asteroid 1999 JU3. The voyage will last roughly four years. Once there, MASCOT, the lander developed by the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR), will be deployed onto the surface of the asteroid with its four instruments. Weighing just 10 kilograms, the lander will use an eccentric arm installed in its interior to 'hop' almost 70 metres across 1999 JU3 – delivering the first measurements from different locations on an asteroid's surface.

Meanwhile, the Hayabusa 2 spacecraft will remain in orbit, and will acquire surface samples that it will then bring back to Earth. The mission will be conducted as a cooperation between the Japanese and French space agencies. "Following in the footsteps of Philae's unique comet landing earlier this year, this venture represents the next stage in an exciting journey into space – and is a perfect example of how international cooperation is set to continue," said Hansjörg Dittus, DLR Executive Board Member for Space Research and Technology.

Livestream: Start launch at Tanegashima Space Center in Japan

<http://www.ustream.tv/embed/5612412?v=3&wmode=direct>

Broadcast live streaming video on Ustream

The live broadcast will start just before the launch

Tested by dropping and shaking

Several falls through the weightless environment of a drop tower, severe vibration tests on a shaker table and simulations of the harsh conditions of space in a thermal vacuum chamber – the MASCOT asteroid lander was asked to withstand all of these challenges in preparation for its journey. "Although MASCOT has to be light, it also needs to be extremely stable," explains DLR Project Manager Tra-Mi Ho from the DLR Institute of Space Systems. "This posed as much of a challenge as the integration of four instruments in a very confined space." The MASCOT lander measures just 30 by 30 by 20 centimetres – roughly the size of a shoebox. The DLR Institute of Planetary Research has contributed a radiometer (MARA) that, among other things, will measure temperatures on the surface of the asteroid. The Institute has also provided the MASCAM camera, which will acquire its first images as the lander descends towards the asteroid surface and, once there, is designed to analyse the fine structure of the surface. TU Braunschweig will use a magnetometer (MasMag) to research magnetisation of the rock, and the French Space Agency, CNES, will deploy the MicroOmega spectrometer to analyse the minerals and rocks on 1999 JU3.

Looking back into the past

Before MASCOT touches down, the Japanese Hayabusa 2 orbiter is initially scheduled to circle and map the asteroid. Once deposited on the surface, MASCOT will act as a scout for its mother craft, which will ingest particles swirled up from the asteroid's surface and bring them

back to Earth. "Among other things, the data that our lander will acquire can also be used to supplement the information acquired by the orbiter and the laboratory analyses back on Earth," emphasises Tra-Mi Ho. MASCOT will descend to the surface of the asteroid – which measures just one kilometre across and whose gravitational acceleration is 60,000 times weaker than that here on Earth – from a height of approximately 100 metres. Mascot will conduct its measurements over two full asteroid days and nights – a period lasting up to 16 Earth hours.

The scientists are primarily interested in investigating the origins of the Solar System. This celestial body, practically unchanged for 4.5 billion years, will allow the planetary researchers to look back into the past. "Our target asteroid, 1999 JU3, belongs to one of the most common classes of near-Earth asteroids," says Ralf Jaumann from the DLR Institute of Planetary Research, scientific spokesperson for the lander experiments. "Telescope measurements conducted here on Earth suggest that it may contain water." This could indicate that asteroids colliding with Earth might have been one of the original sources of water on the planet.

Contact with DLR control centre

Several institutes within DLR are cooperating with the Institute of Space Systems and the Institute of Planetary Research to enable the landing on asteroid 1999 JU3; among them, the DLR Institute of Composite Structures and Adaptive Systems was responsible for the landing craft's stable structure. The Robotics and Mechatronics Center at DLR developed the eccentric arm that will allow MASCOT to 'hop' across the asteroid. Just like the Philae comet lander, which is part of ESA's Rosetta Mission, MASCOT will be monitored and controlled at the DLR Microgravity User Support Center (MUSC) in Cologne. "We are planning to switch MASCOT on for the first time after launch on 12 December and check that it is in a 'good state of health'," says Christian Krause, a member of the the DLR mission control team.

Contacts

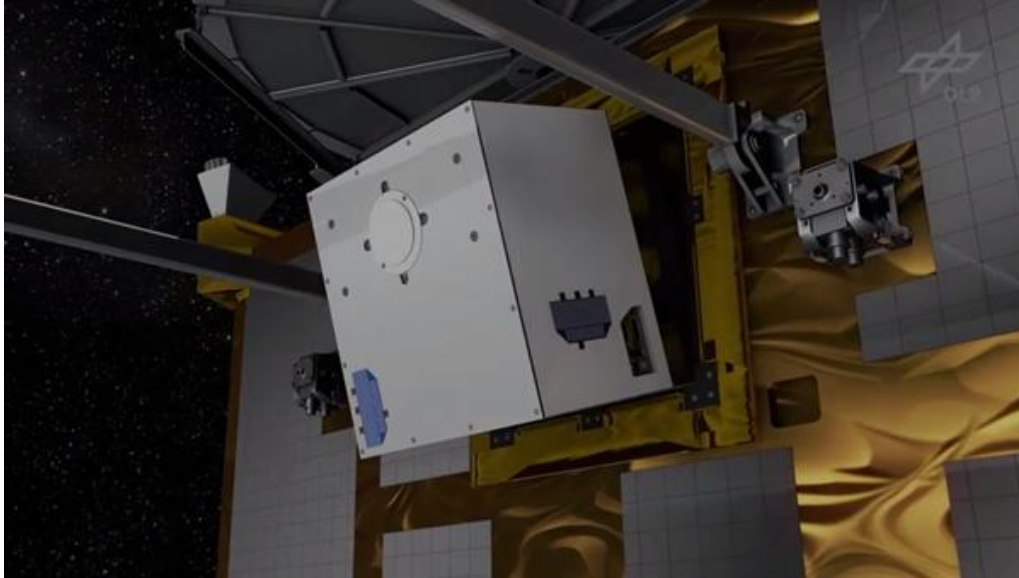
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Animation –MASCOT asteroid lander



The German Aerospace Center (DLR) MASCOT asteroid lander will launch in December 2014 on board the Japanese Hayabusa 2 spacecraft, with asteroid 1999 JU3 as its destination.

Credit: DLR.

Mobile asteroid surface scout (MASCOT)



MASCOT is a highly-integrated asteroid lander whose development was co-ordinated by DLR scientists collaborating with the French space agency CNES and the Japanese space authority JAXA.

Credit: DLR (CC-BY 3.0).

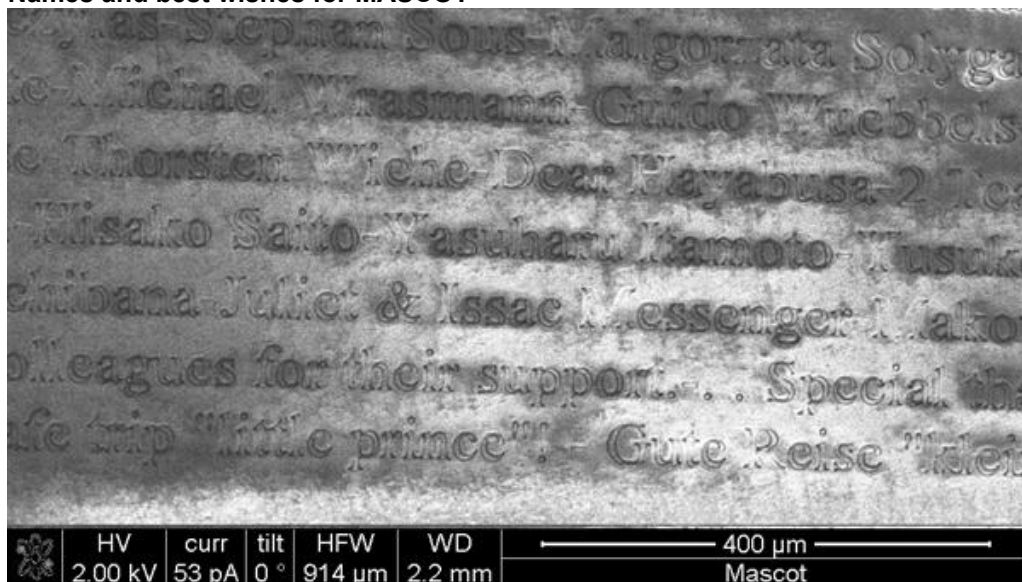
Giving MASCOT the finishing touches



Engineers at the German Aerospace Center (DLR) assemble the MASCOT asteroid lander for the Japanese Hayabusa 2 spacecraft.

Credit: DLR (CC-BY 3.0).

Names and best wishes for MASCOT



3500 space fans sent their names and good wishes to the DLR MASCOT asteroid lander, destined for asteroid 1999 JU3. Two small foils with the names and messages are attached to MASCOT.

Credit: DLR (CC-BY 3.0).

MASCOT teamwork



A team at the German Aerospace Center (DLR) developed, built and tested the MASCOT asteroid lander, which will travel to asteroid 1999 JU3 on board the Japanese Hayabusa 2 spacecraft.

Credit: DLR (CC-BY 3.0).

Landing craft MASCOT



The Japanese space agency JAXA will send in 2014 the German landing craft Mobile Asteroid Surface Scout (MASCOT) to asteroid 1999 JU 3 on board the Japanese orbiter Hayabusa 2. A stable, yet extremely light cover will protect the shoe box-sized lander as it falls to the asteroid's surface. The four instruments designed to conduct in situ measurements on the asteroid are located inside the DLR landing craft: the French infrared spectrometer that will analyse the surface composition and a magnetometer from TU Braunschweig to investigate the magnetic field.

Credit: DLR (CC-BY 3.0).

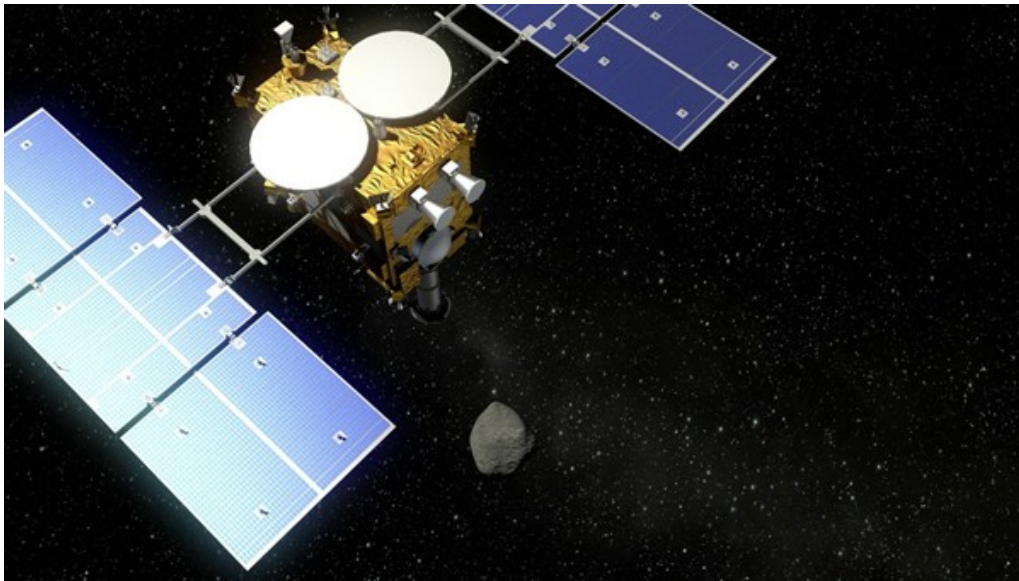
Ready to go – Hayabusa 2 and MASCOT



The German Aerospace Center (DLR) will journey to asteroid 1999 JU3 on board the Japanese Hayabusa 2 spacecraft. Originally scheduled for launch at 05:24 CET on 30 November 2014, the MASCOT (Mobile Asteroid Surface Scout) asteroid lander will now set off from Tanegashima Space Center on board the Japanese orbiter Hayabusa 2 no earlier than 1 December.

Credit: JAXA.

Reconnaissance mission to an asteroid



The Japanese Hayabusa 2 spacecraft will launch in 2014 to visit the asteroid 1999 JU 3. On board will be the German Aerospace Center (DLR) developed MASCOT (Mobile Asteroid Surface Scout), which will land on the asteroid and perform measurements with its four instruments.

Credit: DLR (CC-BY 3.0).

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