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Factsheet

Experimental IXV mission, shortly before take-off

On 11 February, the European Space Agency will break new ground in space exploration. This will be the first time that a steerable spacecraft from Europe carries out a mission to explore the possibilities of re-entry into the atmosphere. The test flight, which will begin with a Vega launcher, aims to validate cutting-edge technologies and systems and to collect valuable data from the rarely researched extremely high speed re-entry flight through the upper layers of the atmosphere. Systems and components from Switzerland are also on board the spacecraft.

What is IXV?

Atmospheric re-entry is a key technology of the space industry that is difficult to master. It is the cornerstone for a wide range of applications in space transportation, such as the return of astronauts and equipment from space infrastructure (like a space station), the return of samples from other celestial bodies, and for the reuse of launcher stages. Although only non-manoeuvrable capsules are used today, the USA (Space Shuttle, X-37) and Russia (Buran) both developed manoeuvrable winged craft in the past, and in the case of the space shuttle, operated them for over 30 years.

Re-entry has only been tested experimentally once in Europe (Atmospheric Re-entry Demonstrator, ARD, in 1998), using a capsule design. The IXV (Intermediate eXperimental Vehicle) is the first craft to be tested in flight using a new technology.

The IXV is a 'lifting body', which is a specially engineered hull shape capable of generating sufficient lift even without wings. It allows the spaceship to fly at high speeds after re-entry through the upper and middle layers of the atmosphere. Similar lifting body vehicles were developed by NASA in the 1960s and 1970s, and were tested at low level. A lifting body is a compromise solution between a capsule with limited controllability, but with a relatively simple construction, and a winged spaceship, which, although highly manoeuvrable, is a complex system in terms of both development and flight characteristics. The IXV is the first lifting body system to be part of a fully representative re-entry demonstration. The demonstration will involve the testing and validation of new technologies in the fields of heat shield materials, autonomous navigation, flight control; measurements of flight performance and environmental characteristics will be conducted using over 300 on-board sensors.

An exceptional mission

The IXV will be launched from Europe's spaceport in Kourou, French Guiana on 11 February. A Vega launcher will take the spacecraft to an altitude of about 320 km. After separation from the upper stage, the IXV will climb to a maximum altitude of 420 km before turning back to earth. The spacecraft will re-enter the atmosphere at an altitude of about 120 km. It is here above the Pacific Ocean that what is known as the hot phase of the flight begins, as the spacecraft descends through the thin, upper layers of the atmosphere. The on-board computer will instruct the thrusters and two aerodynamic rudders at the tail of the fuselage to autonomously stabilise and steer the vehicle. The inner architecture of the vehicle is equipped with specially engineered ceramic heat shield tiles to protect the spaceship from the extreme heat of re-entry. After decelerating, the space plane will deploy a large parachute at an altitude of 26 km, which will slow its descent for a safe splashdown. A ship will recover the IXV and transport it back to Europe. From take-off to splashdown, the IXV will circumnavigate the planet in about one hour and forty minutes. From the onset of re-entry to touchdown alone, the vessel will travel about 7300 km.

In addition to accurate preparation of the launch, as required for conventional satellite missions, this particular mission also requires close monitoring of the trajectory by ground stations as well as the necessary logistics for localising, recovering and transporting the spacecraft.

Swiss technology on board

The major contractor for the development of the IXV is Thales Alenia Space, a multinational company with offices in several European countries, which leads a consortium of 40 companies from across Europe. The Swiss aerospace industry is involved in a number of roles in the development and flight of the IXV. RUAG Space AG in Zurich developed the IXV's main structure as well as some of the sensors and mechanisms, including components for the control flaps. RUAG also worked with the ETH Zurich to develop and build an infrared camera with a retractable periscope that will take pictures of the control flaps

throughout re-entry. This will provide valuable information about the IXV's temperature distribution and other physical properties, which can be analysed after the flight with the collaboration of the participating actors. Last but not least, the Vega launcher's payload fairing is also supplied by RUAG Space. APCO Technologies based in Aigle is providing mission-specific ground support equipment for the Integration of IXV in Kourou and for the IXV's recovery at sea. CFS Engineering is supporting the mission by providing expertise in the field of aerothermodynamic computer simulations.

The involvement of these companies, which is made possible through Switzerland's participation in the ESA programmes to develop and operate launch vehicles, as well as the new experience and expertise gained, help the Swiss aerospace industry to have a stake in ESA's future development activities in the field of launchers, and in other areas of application such as exploration.

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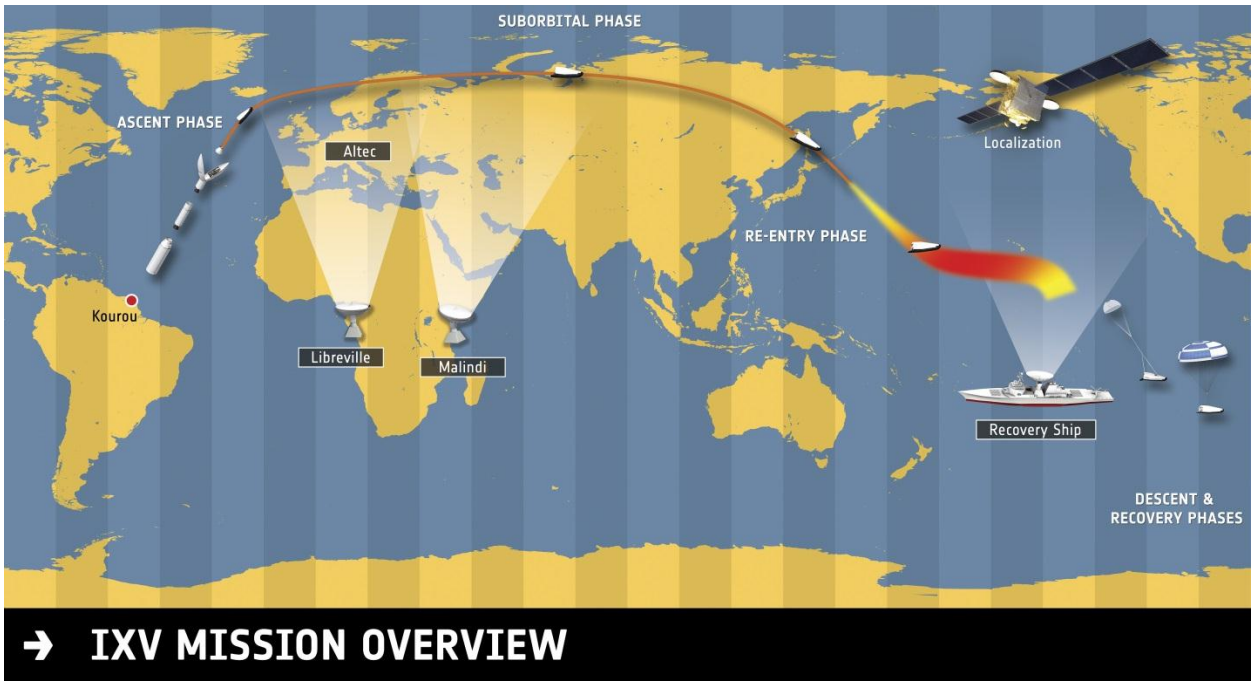

Overview of the IXV mission (Image: ESA).

The IXV space plane is prepared for take-off at the European spaceport in Kourou, French Guiana (Photograph: ESA).

The IXV prototype is recovered and brought on board a ship during the test flight in June 2014. The orange balloons are floating devices, which inflate when the IXV touches down to ensure the IXV floats in the correct position in the water (Photograph: ESA).