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Space exploration

Secret Chinese spaceplane lands after two days

Jonathan O'Callaghan

CHINA seems to have launched an experimental spaceplane, which may be the precursor to a vehicle that can carry humans to and from space.

Early on 4 September, China launched a Long March 2F rocket from its Jiuquan Satellite Launch Center in the Gobi desert. While there was no official announcement prior to the launch, several observers noticed air traffic restrictions that indicated a launch was taking place.

The state-run Xinhua News Agency later confirmed the launch, saying that a "reusable experimental spacecraft" was on board that would "test reusable technologies during its flight, providing technological support for the peaceful use of space".

On 6 September, Xinhau reported that the craft had landed after a two-day mission. "The successful flight marked the country's important breakthrough in reusable spacecraft research and is expected to offer convenient and low-cost round trip transport," it said.

Orbital data confirmed that the vehicle had been placed in an orbit up to 350 kilometres in altitude, a similar height to China's previous crewed flights. Much about the launch remains shrouded in mystery, however, including the size of the vehicle and what it did while in orbit.

China is known to have been working on spaceplane technology for the past decade. It announced in 2017 that it aimed to fly such a vehicle by 2020. "There have been some clues that this mission might happen," says Andrew Jones, a journalist who covers the Chinese space programme,

STR/AFP VIA GETTY IMAGES

A Long March 2F rocket like this one was used to launch a mystery craft

including modifications to the launch tower and a potential mission patch referencing the spacecraft. "But the actual timing was a surprise."

Such a vehicle could take Chinese astronauts to and from orbit, possibly to a planned future Chinese space station. Jean Deville, a space analyst who tracks China's activities, says a reusable crewed spaceplane could be part of China's ambitious crewed space programme, which includes its operational Shenzhou spacecraft and a new deep space vehicle.

"We don't know if this is a scaled version to test certain technologies or a full-sized version"

"A spaceplane is an ideal technology for atmospheric re-entry due to less brutal accelerations for the human body," she says.

Another possibility is that the vehicle is more similar to the secretive US X-37B spaceplane, a small uncrewed reusable craft built by Boeing, which has flown to space multiple times on missions lasting more than a year, performing unknown activities in orbit. "There [are] undeniable military uses for a spaceplane," says Deville. "China has shown a strong interest in developing these technologies."

Regardless of its true purpose, the launch is another signal of China's growing capabilities. "If you look at what they're doing in the commercial sector, promoting innovation and low-cost launch vehicles, this is part of a wider context of Chinese plans for space transportation," says Jones. "But it's hard to say how big this [spaceplane] is in China's plans."

Now, observers will be watching keenly to get more information about the vehicle. "We don't know if this is a scaled version to test certain technologies or a full-sized version," he says. "It's so vague, so secretive. It's very interesting, but it's also quite frustrating." ▮

Physics

Ultracold atoms work together to shape and steer light

Karmela Padavic-Callaghan

EXTREMELY cold atoms can control the shape and direction of light when they work together, relying on a type of physics that was proposed more than 400 years ago but has only now been proved possible.

To shape light by manipulating both the electrical and magnetic interactions between it and atoms, previous research had to rely on specially designed metamaterials.

But Janne Ruostekoski and Kyle Ballantine at Lancaster University in the UK have shown this can be done with natural elements like ytterbium and strontium. They calculated that controlling the behaviour of atoms cooled to a billionth of a degree kelvin above absolute zero turns them into a powerful instrument for shaping light.

Under these conditions, the atoms move extremely slowly and can be manipulated through quantum mechanical effects that are negligible at higher temperatures.

The researchers then used lasers to excite the atoms and coax them into one shared motion. They found that when the atoms act collectively, they can shape and steer light through their electrical and magnetic interactions with it. This shared behaviour allows them to act like a collection of electric charges or atomic magnets that affect the light (arxiv.org/abs/2002.12930).

The work also connects to the ideas of 17th-century physicist Christiaan Huygens. Ruostekoski and Ballantine effectively found a way to build a so-called Huygens' surface out of ultracold atoms. Each atom on this surface determines the shape of the emanating wave of light that passes through it, making it a tool for engineering light waves.

This work could help us study quantum information and potentially improve quantum memory devices by using the cooperative atom-light interaction. ▮