



Smart delivery

Tech giants bet big on AI, robots to develop unmanned logistics

BUSINESS, PAGE 14

HK takes action against election disruption

HKSAR, PAGE 4

Living tradition

Mazu culture finds new vitality through global Gen Z dialogue [Z WEEKLY, PAGE 17](#)



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Emergency space mission accomplished

Shenzhou XXII vessel docks with Tiangong station, delivering crew provisions, payloads

By ZHAO LEI
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The unmanned Shenzhou XXII spacecraft arrived at the Tiangong space station on Tuesday afternoon, delivering crew provisions and mission payloads to the orbiting outpost. This marked the first emergency-response flight mission in the history of the nation's manned space program.

A Long March 2F rocket, carrying the spacecraft, lifted off at 12:11 pm from the Jiuquan Satellite Launch Center in northwestern China, according to the China Manned Space Agency.

About 10 minutes after the launch, the spaceship separated from the rocket and entered its designated orbit. After flying for about three-and-a-half hours on an elaborately designed trajectory, the vessel docked with the front port of the Tianhe core module of the space station.

The Shenzhou XXII spacecraft was originally scheduled to transport the mission's crew to Tiangong in April 2026. However, China's space authorities had to rearrange plans following an unexpected situation.

The Shenzhou XX vessel, which was meant to bring that mission's astronauts back to Earth on Nov 5,

was deemed unfit to fly after tiny cracks were discovered on the viewport window of its return capsule — damage suspected to be caused by the impact of space debris.

As the Shenzhou XX crew used the Shenzhou XXI vessel for their return journey on Nov 14, Tiangong was left without a flight-worthy crew ship for 11 days, a safety risk that the arrival of the Shenzhou XXII vessel removed.

Shenzhou XXII carries a full cargo load, including packaged premade meals, fresh fruits and vegetables, medicines, equipment needed for Tiangong's operations and tools to fix the damage on the Shenzhou XX vessel, the agency said. Shenzhou XX will continue to remain docked at the space station and serve as a platform for tests and experiments, it added.

The three Shenzhou XX astronauts, who returned safely to Earth nine days later than their planned landing, represented China's 15th manned spaceflight and the ninth group of residents aboard Tiangong. The crew spent 204 days in orbit, setting a record for the longest in-orbit stay by Chinese astronauts.

Orbiting Earth at an altitude of about 400 kilometers, Tiangong is currently the only operational space station independently run by a single nation.

'Bricks' for lunar base clear tough first test

By LI MENGHAN and LIU KUN

China has taken a concrete step toward realizing its ambition of building a permanent outpost on the moon by successfully exposing a batch of experimental "lunar bricks" to the harsh conditions in space for about a year and bringing them back almost intact.

The 34 sample bricks, weighing about 100 grams in total and made from materials that mimic lunar soil composition, were returned to Earth recently aboard the Shenzhou XXI spacecraft. Their survival outside the Tiangong space station for such a long duration marks a critical milestone in engineering and advances China's plan to build the International Lunar Research Station by 2035.

"At first glance, the bricks seem to be in good condition," said Zhou Yan, a scientist at Huazhong University of Science and Technology, the institute responsible for making the "lunar bricks", which are said to be more than three times stronger than standard bricks.

While the "lunar bricks" show no signs of cracks or pits, typically caused by the impact of space debris and meteoroids, they have become slightly pale in color, a change scientists are now investigating, Zhou added.

Scientists will then analyze how the space environment has altered the internal structure of these bricks, providing the data needed to ensure lunar bases are able to stand the test of time.

The experiment aims to address the biggest hurdle in lunar construction: the exorbitant cost of transporting building materials from Earth. Scientists are in the process of perfecting a technology to build on the moon using local resources.

"Due to the high costs of interplanetary transportation, we need to use lunar soil, solar energy and minerals to produce the bricks for construction," said Zhou Cheng, a professor at the National Center of Technology Innovation for Digital Construction.

The experimental bricks were made using volcanic ash from the Changbai Mountains in Northeast China, which has a chemical makeup very similar to lunar soil. To make the bricks, researchers used a process called hot-press sintering, which is essentially baking and pressing soil under high heat until it fuses into a solid.

The project was led by Ding Lieyun, an academician of the Chinese Academy of Engineering and chief scientist at the National Center of Technology Innovation for Digital Construction.

In November 2024, the Tianzhou 8 cargo ship transported these bricks to the Tiangong space station, which were then mounted outside the orbital outpost to weather space conditions that are difficult to simulate in a lab on Earth. The conditions included an environment of vacuum, punishing cosmic radiations, and extreme temperature changes ranging from -190°C to 180°C.

According to the researchers, the whole experiment is designed to last three years. While the first batch of "lunar bricks" has returned, other samples remain in space and will be retrieved annually to test how the material holds up over longer periods.

"After three years, we might be able to reveal patterns in the performance of these bricks and speculate on their service life trends over five, 10 or 20 years," Zhou Yan said.

Ding, from the Chinese Academy of Engineering, emphasized that understanding how these materials age is vital for future construction, because lunar buildings cannot be temporary structures. "When constructing a building, we don't expect it to last just a few years. This principle holds even greater significance when building on the moon," he said.

The brick experiment is part of a broader timeline laid out by Wu Weiren, chief designer of China's lunar exploration program.

China aims to land astronauts on the moon by 2030 and build a basic version of the International Lunar Research Station on the lunar south pole by 2035. An expanded version is planned by 2045, potentially serving as a launchpad for crewed missions to Mars.

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