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Lunar relay satellite all set for launch

Queqiao 2 to transmit signals from Chang'e 6 probe, aid future missions

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A relay satellite essential to the upcoming Chang'e 6 moon mission and other future lunar exploration programs is scheduled for launch within the next few days, according to the China National Space Administration.

The combination of the relay satellite Queqiao 2, or Magpie Bridge 2, and a Long March 8 carrier rocket, tasked with lifting the satellite, was moved on Sunday morning to the launching tower at Wenchang Space Launch Center in Hainan province.

The satellite and the rocket were individually transported in February to the Wenchang center, where they were examined and assembled. The rocket will undergo final checks before propellants are loaded, the space administration said in a news release. The launch will take place in due course, it noted.

Queqiao 1, the predecessor of Queqiao 2, was lifted by a Long March 4C rocket from the Xichang Satellite Launch Center in Sichuan province in May 2018. It currently serves as a relay platform for the Chang'e 4 lunar mission.

The Chang'e 4 probe landed in the South Pole-Aitken Basin on the far side of the moon in January 2019, becoming the first spacecraft

to be operated on the little-known semisphere.

If everything goes according to plan, the Chang'e 6 probe will be launched in the first half of the year, and will become the second spacecraft to reach the moon's far side. It is tasked to bring back samples from the lunar far side, an assignment that is challenging, sophisticated and has never been done before.

Communication services between the Chang'e 4 and Chang'e 6 spacecraft and the Earth require relay satellites due to their special locations. Transmitting signals is thus the primary task of Queqiao 1 and 2.

Pang Zhihao, an expert on space exploration technology who worked at the China Academy of Space Technology for decades, said the fact that Queqiao 2 will be transported using a Long March 8 rocket indicates that this relay satellite is larger and heavier than its predecessor.

"As far as I understand, the Queqiao 2 has been designed to have more functions and a longer life span. It will be key to China's next several lunar missions," he said.

The Chang'e 6 spacecraft will have four components—an orbiter, a lander, an ascender and a reentry module. In addition to sample collection instruments, it will also carry scientific instruments from Pakistan, France, Italy and the European Space Agency, according to its mission planners.



The relay satellite Queqiao 2 and the Long March 8 carrier rocket are vertically transferred to the launch area of the Wenchang Space Launch Center in Hainan province on Sunday. The satellite is expected to be launched at an appropriate time in the next few days. XINHUA

Space tech gives ground support as robot helps protect relics

China's strides in space technology are now enriching the preservation of cultural relics, as spacecraft engineers have repurposed a robot originally designed for orbital missions to protect tomb artifacts. The China Academy of Space Technology recently announced the development of the robot. Combined with electron beam irradiation technology, it can be used as an intelligent mobile system to eradicate bacteria that thrive on ancient murals in small tombs.

Equipped with a robotic arm mounted on a mobile wheeled chassis, this device can scan tomb walls and domes. Similar to radiation disinfection technology used in medical treatment, the electron beams can

eliminate harmful bacteria that cause murals to fade or chip over time.

The project was initiated by the Dunhuang Academy, an institute for the protection and research of the UNESCO World Heritage Site, the Mogao Caves, in China. It has accumulated rich experience in cave painting conservation over the decades. From 2020 to 2022, the academy has taken the lead in on-site protection of national tomb murals.

"Tomb mural preservation poses a great challenge," says Yu Zongren, head of the academy's conservation institute. Being buried deep underground for extended periods exposes tomb murals to

high humidity environments, fostering the proliferation of microorganisms that accelerate their deterioration. Furthermore, given the generally confined space within such tombs, any negligence in cleaning and protection work can result in additional damage to these priceless relics.

The conventional disinfection approach involves the use of chemical agents, which, unfortunately, may pose health risks to the people involved, as well as potentially affecting the murals.

As immovable cultural relics, murals need on-site protection, so using traditional biocide agents is not a sustainable option, Yu says.

In response, researchers from the Insti-

tute of High Energy Physics at the Chinese Academy of Sciences have undertaken the development of an intelligent mobile irradiation sterilization device. They proposed the requirement of "maintaining a small and precise size while prioritizing safety", and collaborated with engineers from the CAST to develop the robot.

Despite rich experience in developing robotic arms for large space capsules, the brief posed a new set of challenges for the engineers.

"We dedicated much of our effort to reducing size and enhancing the flexibility of the robot, making it more suitable for tomb applications," says Xu Jianping, head of the engineering team.

Laser sensors, installed on the remotely operated robot, can detect and avoid obstacles, ensuring a safe distance between the machine and the murals.

According to Xu, these technologies have been employed on China's spacecraft.

Although most of the engineers had never seen mural artworks before, they take pride in using space technology for the protection of centuries-old cultural relics, Xu says.

The robot was showcased for the first time at a domestic exhibition on cultural relic protection last September. The research team plans to conduct more experiments before putting it into service.

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