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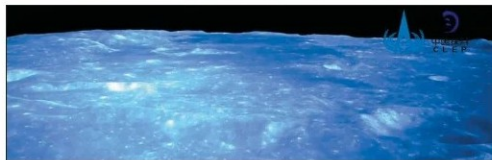
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Historic moon mission



Clockwise from top: Staff members at the Beijing Aerospace Control Center review data from the lunar far side transmitted by the Chang'e 6 robotic probe on Sunday; a simulation shows the probe's landing craft touching down at a designated site in the South Pole-Aitken Basin; and a video grab of the lunar surface captured by the lander's descent camera. The Chang'e 6 probe is on a historic mission to collect samples from the moon's far side. JIN LIUWANG / XINHUA, PROVIDED TO CHINA DAILY **See more, page 3**

Historic probe to explore, gather samples from far side of moon

Dust and rocks expected to offer clues about lunar, solar system origins

By ZHAO LEI

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China's Chang'e 6 robotic mission reached a crucial moment in the nation's historic lunar odyssey on Sunday morning, when its landing craft successfully touched down on the moon's little-known far side.

With assistance from the Queqiao 2 relay satellite, the Chang'e 6 landing craft softly settled on the lunar surface at 6:23 am at a designated site inside the South Pole-Aitken Basin, the moon's largest, oldest and deepest basin.

The landing marked the arrival of China's, and the world's, second-ever spacecraft on the moon's far side, which scientists believe holds clues to many mysteries surrounding the moon as well as the solar system.

In the next two days, the craft is set to use a robotic arm and a drill to collect surface and underground substances and place them in a container that will be sealed before the materials are sent into lunar orbit for the journey to Earth.

If the mission goes according to plan, it will be the first time that dust and rocks from the lunar far side have been retrieved. The new samples will probably offer researchers around the globe useful keys for answering questions about the moon, and will likely bring a range of invaluable scientific payoffs.

According to the China National Space Administration, Chang'e 6's complex landing operation began on Thursday, when the landing craft separated from the combined orbiter and reentry capsule in preparation for the landing.

When everything was ready on Sunday morning, the landing craft began its descent at 6:09 am.

The craft continued making adjustments during the descent as its main engine worked to reduce the flying speed. Its special cameras took pictures of the selected destination and transmitted them to computers to determine the final landing point and also to identify possible hazards on the surface, such as large rocks, so that the craft could maneuver to avoid them.

When reaching an altitude of about 100 meters above the moon, the landing vessel suspended its descent and hovered for a short time to carry out accurate laser scanning of obstacles before continuing to descend at a slower and steady speed.

At the last moment of the challenging operation, when the craft was several meters above the surface, its main engine was stopped, and the craft activated a buffer system and touched down smoothly on the lunar surface. It thus became the second spacecraft to arrive on the lunar far side after Chang'e 4, which achieved the feat five-and-a-half years ago.

Soon after the landing, the craft's solar panels and directional antennas unfolded and went through initial checks and setup, and then the collection devices began to gather samples.

Meanwhile, two European scientific apparatus carried by the Chang'e 6 landing craft — a radon-measuring instrument from France's national space agency and a dedicated negative ion instrument developed by the Swedish Institute of Space Physics with support from the European Space Agency — have begun to operate on the lunar surface, according to the Chinese space administration.

The Chang'e 6 spacecraft, representing the world's first attempt to bring samples from the far side of the moon back to Earth, was launched by a Long March 5 heavy-lift carrier rocket on May 3 from the Wenchang Space Launch Center in Hainan province. It entered lunar orbit on May 8.

Like all previous Chinese lunar probes, the 8.35-metric-ton Chang'e 6 spacecraft was designed and built by the Beijing-based China Academy of Space Technology, a subsidiary of China Aerospace Science and Technology Corp. It consists of four major components — an orbiter, alander, an ascender and a reentry capsule.

By analyzing the physical and chemical characteristics of the samples from the moon's far side, scientists will be able to deepen their understanding of the origins and evolution of the moon and the solar system, said Ge Ping, one of the senior space officials overseeing the nation's lunar programs.

He added that the Chang'e 6 probe will also help space mission planners to gain more experience for follow-up explorations on the lunar far side.

The lunar far side is the hemisphere of the moon that permanently faces away from Earth due to tidal forces on the planet. As it is never visible from Earth, that region was once dubbed the "dark side of the moon", although it receives just as much sunlight as the near side.

The vast region had never been reached by any spacecraft until January 2019, when the Chang'e 4 probe landed in the South Pole-Aitken Basin. The Chang'e 4 surveyed the site but did not collect and send back samples.

Before the latest mission, China had fulfilled a lunar sample-return mission — the Chang'e 5 in the winter of 2020, which landed on the moon's near side and gathered 1,731 grams of samples, the first lunar substances obtained since the Apollo era. It made China the third nation, after the United States and the former Soviet Union, to have collected lunar samples.

So far, Chang'e 5 lunar samples have enabled Chinese researchers to make a number of academic strides, including the discovery of the sixth new lunar mineral, named Changsite-(Y).

Changsite-(Y), which falls in the category of lunar merillite, is the first lunar mineral discovered and identified by Chinese scientists.

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Chang'e 6 brings moon's far side touch nearer

Supported by the Queqiao 2 relay satellite, the lander-ascender combination of the Chang'e 6 probe landed at the designated landing area on the far side of the moon early on Sunday morning.

Chang'e 6 consists of an orbiter, a returner, a lander and an ascender. Since its launch on May 3 this year, it has gone through various stages such as Earth-moon transfer, near-moon braking, lunar orbiting and landing descent. The lander-ascender combination separated from the orbiter-returner combination on May 30.

The Chang'e 6 mission is tasked with collecting and returning samples from the moon's far side, the first endeavor of its kind in the history of human lunar

exploration. It has achieved a breakthrough in the design and control technology of the lunar retrograde orbit and aims to realize key technologies of intelligent and rapid sampling, as well as take-off and ascent from the far side of the moon.

The landing site is the South Pole-Aitken basin, which was chosen for its potential scientific exploration value, as well as the conditions of the landing area, including communication and telemetry conditions and the flatness of the terrain. The terrain on the far side of the moon is more rugged than the near side, with fewer continuous flat areas. However, the basin is relatively flatter than other areas on the far side, which is conducive to landing.

After the landing, the probe is scheduled to complete sampling within two days. It will employ two methods of moon sampling, namely using a drill to collect subsurface samples and grabbing samples from the surface with a robotic arm.

Due to the moon's obstruction, the Earth-moon communication window period on the far side of the moon, even with the help of the Queqiao 2 relay satellite service, is still shorter than that on the near side. Therefore, the sampling time of Chang'e 6 will be reduced to about 14 hours, compared with the 22 hours of its predecessor Chang'e 5, which collected samples from the near side of the moon.

—XINHUA NEWS AGENCY