

PATH TO GLORY

SPACE EXPLORATION

Editor's note: To celebrate the 100th anniversary of the founding of the Communist Party of China, China Daily is publishing a series of stories on the changes and developments in various fields and industries

China lifts national pride with space program's achievements

Three astronauts prepare to enter station's core module, becoming first occupants and preparing for next steps

By ZHAO LEI

hina plans to conduct its latest manned space-flight in June, sending three astronauts to enter the recently launched con tion and work there for three months, according to a senior

Hao Chun, director of the China Manned Space Agency, said earlier this month that the astronauts on board the Shenzhou XII spacecraft will become the first occ the core module and will be tasked with undertaking preparation work for the next steps in the sta-

They have begun final training

They have begun final training for the coming mission, he said, adding that other astronauts selected for future spaceflights are also receiving intensive training.

Before the Shenzhou XII mission, the Tianzhou 2 robotic carpo spacecraft is scheduled to be launched in late May to dock with the currently unmanned core module and then perform autonomous refueling and resupply operations, x zhou X: Launched on June

The Tianzhou 2 was transported to the Wenchang Space Launch Center in Hainan province in mid-April, and the Shenzhou XII arrived in the Jiuquan Satellite Launch Center in northwestern

The official said that in Septem be lifted to dock with the core module and the next month, anothe three-crew team will fly with the Shenzhou XIII to the module to stay there for six months.

In 2022, two large space labs will core module. Moreover, two manned missions and two robotic cargo flights will be made that yea ese space station, which is sched

China's most adventurous snace China's most adventurous space endeavor, the multimodule space station, named Thangong, or Heavenly Palace, will consist of three main components — a core module attached to two space labs — with a combined weight of nearly 70 metric tons. The entire station is set to work for about 15 years, mission planners have said.

planners have said.
The core module, named Tianhe, or Harmony of Heavens, was lifted by a Long March 5B heavy-lift carrier rocket at the Wenchang launch

Previous manned spaceflights

2003, lasting 21 hours. China's first manned space mission. One astronaut. Shenzhou VI: Launched on Oct

12, 2005, lasting nearly 5 days. China's first multi-staff spaceflight. Two astronauts. Shenzhou VII: Launched on Sept. 25, 2008, lasting nearly 3 days. China's first extravehicular activi-

Tiangong I: Launched on Sept 29, 2011 lasting about four and a last rangong r. Launched on Sept. 29, 2011, lasting about four and a half years. As China's first space labo-ratory, it received two batches of astronauts from Shenzhou IX and Shenzhou X missions.

Shenzhou IX: Launched on June

China's first space docking (with the Tiangong I) and the first time for Chinese astronauts to enter a space laboratory. Three astro-

Shenzhou X: Launched on June 11, 2013, lasting nearly 15 days. During the mission, the first space lecture for Chinese students was made. Three astronauts. Tlangong II: Launched on Sept 15, 2016, set to last two years. It was China's second space labora tory and received astronauts from 17, 2016, lasting 33 days. The longest stay in the space by Chinese astronauts. Two astronauts.

craft China has ever constructed the module is 16.6 meters long and has a diameter of 4.2 meters. The craft's weight, at 22.5 tons, is equal dard-size automobiles. It has three support and control section and a

The cansule will be central to the The capsule will be central to the Tiangong station's future opera-tions, given that astronauts will live there and control the entire station from inside. It will also be used to host scientific and technological experiments

experiments.
Upon its completion, Tiangong will be manued regularly by groups of three astronauts in periods lasting several months. During handovers to new three-astronaut groups, the station will accommodate unto six astronauts.

date up to six astronauts.

The facility will be capable of docking with multiple crewed and

Speaking of the station's future Hao said his agency will strive to use of the asset to advance space science, technology and applica

He said scientists will be able to take advantage of the facility's unique environment to perform mutation breeding experiments produce special medicines and cre ate new materials, thus generating scientific, technological and eco

In addition, the agency has In addition, the agency has signed agreements with the United Nations Office for Outer Space Affairs on space station coopera-tion. The two organizations have jointly issued a statement inviting scientists from around the world to submit their research proposals for an opportunity to conduct their own experiments aboard the Chi-nese station.

ness station.

"As of now, 17 nations have confirmed their participation in nine scientific tasks on our station, with related work proceeding well," Hao said. "We will continue working with the UNS outer space office to solicit proposals for future scientific collaborations."

more than 20 cabinets aboard the station reserved for scientific instruments that were designed in accordance with international standards, adding that they will be available for collaborators.

Moreover, Hao said there definitely will be foreign astronauts on

In April 1971, the former Soviet, Union became the first in the world to operate a space station with the deployment of its Salvut 1 station in a low-Earth orbit, Since then, 10 and most of them were built by the

urrently, the only operational ion is the International Space

Beidou has grown into world-class navigation system

astronaut candidates selected from $$ planet in the Shenzhou V space-elite Air Force pilots. All of their $$ craft.

work was kept secret. stopped in the mid-1970s due to financing and technological obsta-

From the mid-1980s. Chinese scientists began to urge the govern ment to consider reopening the manned space program as they were convinced that it would be crucial to the future of the country's

Currently, the only operational station is the International Space Station, a Joint effort by several national space agencies including the United States' NASA and Russia's Roscosimos. However, China has been excluded from the project since its very beginning mainly because of US objections.

Tortuous path

Tortuous path

As a major symbol of the space age, manned spaceflight first emerged in China's space plans in the mid-1960s. Chinese scientists and engineers son began research and development for a crewed spaceship and started training a small group of bour Journey around the mother

Since then, China has conducted totaled 68 days and orbited Earth nauts have traveled more than 46

> Chinese astronauts have under taken extravehicular activity, con inside two prototype space stations and delivered a 40-minute lecture

The first Chinese in space, Yang recalled that during a visit to New York in 2004, an 80-something Chinese-American held his hands and tearfully told him that, for overseas Chinese, China's achievements in space reflected the fact that "our motherland has risen", which gave them prepared courses and

2012. At the end of 2018, it started

providing basic global services.

Now, there are 30 third-genera
tion Beidou satellites in three types



ry for lunar expeditions.

Space officials have said the Long March 9 is undergoing research and development at the research and development at the China Academy of Launch Vehi-cle Technology in Beijing and is expected to enter service around

ty of 25 tons to a low-Earth orbit. It was used to send China's Tian-

China Aerospace Science and China Aerospace Science and Technology Corp, the rocket's maker, has estimated that about 10 Long March 9s will be needed each year from 2030 to 2035 to satiate China's robust demands at that time for heavy-lift rock-

China Aerospace Science and Technology Corp has also conducted two sea-based launches using its Long March 11 rocket, making China the only nation The 20-story-tall Long March that is independently able to car-



Tianwen 1 Mars mission to land soon

Tianwen 1 China's first inde rover on Martian soil in the coming days if everything goes

as planned, the Tianwen 1 rov er, recently named Zhurong after an ancient Chinese god of fire, will be the sixth such vehicle deployed on Mars, follow by the United States. It will also give Chinese scientists their first opportunity to closely observe Mars, which was firs cle bone inscriptions in about

The selected landing site for ong is in the sout of the Utopia Planitia, a large

solar system.

The rover is 1.85 meters high and weights about 240 kilograms. It has six wheels and four solar panels, can move at 200 meters an hour on the Martian surface, and carries six scientific instruments, including a multispectral camera, an argound-penetrating radar. If the semi-autonomus craft functions efficiently, it will work for at least three months

of all of Tianwen 1's mis objectives — orbiting Mars for comprehensive observation, landing on the planet and scientific operations — also making Tianwen 1 the first Mars expedition to accomplish all three goals with one probe.

The Tianwen 1 probe, named after an ancient Chinese poem, was launched by a Long March 5 heavy-lift carrier rocket on July 23 from the Wenchang Space Launch Center in the of Hainan, kicking off China's planetary exploration program. Consisting of two major sec-

Consisting of two major sec-tions — an orbiter and a land-ing capsule — the spacecraft traveled more than 470 million kilometers before entering a Martian orbit on Feb 10, when

ernment said it was ready to start a lunar program and appointed three scientists to head the project team. In January 2004, the first phase of the Chang'e program was officially approved, mark-ing the formal opening of Chiing the formal opening of Chi-

ha's lunar exploration mission.

After nearly four years of preparations, the first space-craft stemming from the program — Chang'e 1 — was launched on Oct 24, 2007, from the Xichang Satellite Launch Center in Sichuan province. It na's lunar probe technologies. obtaining lunar images and performing scientific surveys

Since then, the country has lunar exploration in an incre

Chang'e 3, lifted in December 2013, was the first Chinese spacecraft to soft-land on the moon and also the first craft to August 1976. It reles

first Chinese lunar rover, Yutu, on the moon.
Change 4, launched in December 2018, landed on the far side of the moon, becoming the first spacecraft to closely observe the little known "dark side of the moon". The probe also deployed a rover named Yutu 2.

Yutu 2. The most significant event in China's space field in 2020, and year - the Chang'e 5 robotic mission — was launched on Nov 24 at the Wenchang launch center and successfully

landed on the moon on Dec 1.

The landmark mission
brought 1,731 grams of lunar rocks and soil back to Earth on Dec 17, achieving a historic accomplishment about 44 years after the last lunar substances were brought back from our nearest celestial

The 23-day mission made

China plans to use the Chang'e 6 mission to collect samples from the moon's south pole or even the celestial body's far side, space officials have

Top: The ascender of the Chang'e 5 probe soars as it leaves the lunar surface on Dec 3. JIN LIWANG / XINHUA Above: Space engineers control the Tianwen 1's deep space maneuver as it adjusts its course to Mars on Oct 9, car yang / xinhua to catch up with the red planet. and magnetometer. It will also

> China the third country that has retrieved lunar samples, after the US and the former

Soviet Union.

Chang'e 5's orbiter is now flying around Lagrange Point 1—
which is located between the

Super-heavy lift rocket in works

China is designing the Long March 9, a super-heavy carrier rocket that will likely become one of the world's largest and mightiest launch vehicles.

port spacecraft with a combined weight of 140 tons to a low-Earth ships weighing up to 50 tons to

duct tests on the 500-ton-thrust liquid oxygen/kerosene engine, which is poised to become the nation's most powerful rocket engine and will provide major propulsion to the Long March 9, propulsion to the Long March 9, the company said.

The Wenchang Space Launch Center in Hainan province plans to construct new testing and support facilities as well as a new launchpad for the super-powerful rocket.

Engineers have started to con-

duct tests on the 500-ton-thrust

ful rocket.

The Long March 9 will be crucial to realizing the nation's ambitious plans of landing its astronauts on the moon and sending large robotic spacecraft

operation, its carrying capacity will be more than five times that the mightiest in China's rocket

wen 1 Mars probe and the Chang'e 5 lunar sample-return

Depending on the two plan-ets' orbits, the distance between Mars and Earth ranges from 55 million km to 400 million km. The red planet is now about 318 million km from

On Feb 24, Tianwen 1 On Feb 24, Tlanwen 1 released to the street of the spacecraft was programmed to maintain that orbit for about three months to examine the preser landing site before releasing its landing capsule to descend through the Martian atmosphere and touch down on the surface.

Of those missions were successful.

Lunar accomplishments

Back in 1970, the year China the pace, some scientiss suggestion to program.

programmed to maintain that programmed to maintain that orbit for about three months to examine the preset landing site before releasing its landing acquisite to descend through the dhartian atmosphere and touch down on the surface. Up in the Martian skies, the orbiter will continue circling the red sphere for mapping and measurement tasks with seven scientific instruments, including a high-resolution imager.

relay signals between ground control and the rover. Tianwen 1 is the world's 46th

October 1960, when the former Soviet Union launched the first Mars-bound spacecraft. Only 19 of those missions were su

By ZHAO LEI After decades of planning and

After decades of planning and construction, China possesses one of the world's major navigation satellite systems—the Beidou Navigation Satellite System. Beidou is currently the country's largest space-based system and one of four global navigation networks, along with the United States GPS, Russias GLONASS and the European Union's Gaillieo.

"Beidou is the fruit of the determination and planning by the Party

concerted effort of numerous peo-ple involved in the program, and of he enormous support from the

The research and development of navigation and positioning system satellites, including the first four

government in February 1994, aim-ing to mitigate the country's heavy reliance on foreign networks.

More than 300,000 scientists, engineers and technicians from more than 400 domestic institutes,

Deen involved in bentura development and construction.

In June, the final satellite to complete Beldout bird, generation network was lifted by a Long March 3B carrier rocket at the Xichang Satellite Launch Center in Sichuan province and was placed into a goostationary orbit about 36,000 kilometers above the Earth.

The following month, President

The following month, Pres Chinese people," said Yang Chang- Xi Jinping announced that the sys Since 2000, a total of 59 Beidou



of them having retired.

launched on 44 rockets, with some messaging services to civilian users of them having retired. in China and other parts of the Beidou began providing posi-

Workers set up a China Mobile 5G base station integrated with the Beidou system at a camp 6,500 meters above the sea level en route to the peak of Mount Qomolangma — also known as Mount Everest - in May last year. JIGME DORJI / XINHUA

tion Beidou satellites in three types of orbit — 24 in medium-Earth orbit, three in inclined goosynchronous satellite orbit and three in geostationary orbit.

Compared with previous ones, the third-generation models feature higher accuracy and stability, a clearer signal and more state-of-the-art technologies such as interstellite links, satellite-based augmentation and global emergency search capability, designers said, or search capability, designers said,

and services, China Satellite Navi