Progress and International Cooperation
China Manned Space Program

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1. Program overview
2. Construction progress of China Space Station (CSS)
3. International Cooperation
4. Conclusion
Program overview

The Three-step Strategy

The First Step: launch a manned spaceship, set up primarily integrated experimental manned spacecraft engineering, and carry out space application experiments.

The Second Step: make technology breakthroughs in extravehicular activities (EVA) as well as space rendezvous and docking of manned spaceships and spacecrafts, launch a space lab, and provide a solution for space application of a certain scale with man-tending on a short-term basis.

The Third Step: establish a space station, and provide a solution for space application of larger scale with man-tending on a long-term basis.

The 1st step:
- manned spaceships
- basic space technologies in Earth-orbit crew transportation.

The 2nd step:
- Space Labs
- Technologies in EVA, R&D, and accommodation of short-term man-tended utilization on a modest scale

The 3rd step:
- China Space Station
- Long-term man-tended utilization on a large scale
From 1992 to 2005, four unmanned flight missions and two manned space missions
Breakthrough in the earth-to-orbit manned transportation system
Successfully completed the first step of CMSP.

**Unmanned spaceflight missions**

- **Shenzhou-1**
  - 20 Nov 1999

- **Shenzhou-2**
  - 10 Jan 2001

- **Shenzhou-3**
  - 25 Mar 2002

- **Shenzhou-4**
  - 30 Dec 2002

**Manned spaceflight missions**

- **Shenzhou-5**, 2003
  - 1st manned spaceflight

- **Shenzhou-6**, 2005
  - multiple-crew, multiple-day
From 2005 to 2007, China’s first EVA, Rendezvous & Docking Material supply, propellant refueling, a series of space science experiments and technology demonstrations with man-tending on medium and long-term basis TG-1 and TG-2 missions successfully accomplished all assignments, bringing off a completeness of the second step of CMSP.
Construction progress of China Space Station (CSS)

/ Introduction of CSS construction

Establishing a space station, and providing a solution for space application of larger scale with man-tending on a long-term basis, is the goal of the third step which was inaugurated.

Maiden Flight of Long March 5B

Marked the beginning of the 3rd step of China Manned Space Program

Assembly of CSS

Includes 11 fights will be completed around 2022
Construction progress of China Space Station (CSS) / Introduction of CSS construction

- Lifespan over 10 years
- 1 core module and 2 experiment modules
- > 90 tons
- T-shape configuration
- Supporting the docking of manned and cargo spaceships and other visiting spacecrafts.

- 3 crews, temporarily 6 during crew rotation,
- Support large scale space science experiments with man-tending on a long-term basis.

- XunTian optical telescope
- Be launched separately
- Common orbit flight with CSS
- Supporting research in space astronomy and related fields.
Construction progress of China Space Station (CSS)

Introduction of CSS construction

More complicated and technically challenging

A large number of core technologies:
- long-term manned flight
- in-orbit assembly and construction
- material supply in bulk
- space robotic manipulator and extravehicular operation
- research and development of large module
- new generation launch vehicle

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Construction progress of China Space Station (CSS)  
/ Mission of Tianhe Core module

April 29th 11:23 a.m. (Beijing Time), by Long March-5B/Y2 launch vehicle

- Function tests on rendezvous and docking, astronaut space stationing and robotic manipulator
- In-orbit performance checks of space application equipment

Core module was functioning and operating in good condition, well prepared for the follow-up missions.

Equipped with:
Robotic manipulator
regenerative environmental control and life support system
container-free material science rack
medical sample analysis and high microgravity science experimental system
human system research rack

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The successful launch marks the on-orbit construction of CSS in full swing, laying a solid foundation for subsequent key technology demonstration and smooth assembly and construction of CSS.
Construction progress of China Space Station (CSS) / Mission of Tianzhou-2 Cargo spaceship

May 29th 20:55 (Beijing Time), hosted on Long March-7, at Wenchang Launch Center
May 30th 5:01 (Beijing Time), in about 8 hours, docking to Tianhe Core Module in autonomous rapid rendezvous and docking mode
Propellant refueling and space application equipment testing was carried out according to the schedule

Carrying capacity of 6.9 tons, carrying ratio > 50%
The materials uploaded includes:
• Astronauts' living materials
• China’s self-developed new generation of “Feitian” EVA suits
• Platform equipment
• Application payloads and propellants

The first application flight of the cargo transportation system composed of Tianzhou Cargo spaceship and Long March-7 launch vehicle
Construction progress of China Space Station (CSS) / Mission of Shenzhou-XII Manned Spaceflight

June 17th 9:22 a.m. (Beijing Time), by Long March-2F Y12 carrier rocket, from Jiuquan Satellite Launch Center
3 crew astronauts: ending Nie Haisheng, Liu Boming and Tang Hongbo
About 6.5 hours later, the spaceship successfully completed autonomous rapid rendezvous and docking to Tianhe Core Module, forming a complex with the orbiting Tianzhou-2 Cargo spaceship

The crew of Shenzhou XII spaceship, would stay in-orbit for 3 months
Conduct:
Daily management of the complex
EVA and operations
Space science experiments and technical demonstrations
Crew health care.
On July 4th and August 20th, two EVA were conducted, successfully completed various extravehicular tasks as scheduled.

The first manned flight in CSS phase, CSS welcomed the first crew of space visitors.
International Cooperation / Overall International Cooperation

Principles:
- Peaceful use of outer space
- Equality and mutual benefit
- Joint development

Cooperation areas:
- Collaborative development of devices, components, subsystems, modules
- Space science experiments onboard Station
- Astronaut selection / training / flight
- Application of human space technology

UN Member States

Human Space Technology Initiative (HSTI)

Principles:
- Peaceful use of outer space
- Equality and mutual benefit
- Joint development
Since 2016, we’ve been working with UNOOSA to solicit cooperative projects from member states of UN with interest in CSS.

After primary and final selection, PESC confirmed the final selection results.

In June 2019, CMSA and OOSA jointly announced the result of the selected projects for the first cycle for space science experiments on CSS.

9 projects from 17 countries and 23 entities were selected, indicating a new stage of international cooperation of CSS.

- Space life science and biotechnology, 2
- Novel technology application, 1
- Microgravity fluid and combustion science, 3
- Space astronomy, 2
- Earth science, 1
Progress of the first cycle of cooperation projects

Effect of Microgravity on the Growth and Biofilm Production of Disease-causing Bacteria

- Jointly applied by Peruvian Branch and Spanish Branch of The Mars Society
- Designed in-orbit experiment duration: 48-72 hours
- The review of experimental scheme and design are expected to be finished in 2021
- Planned to be implemented onboard CSS in the second half of 2022
Progress of the first cycle of cooperation projects

Flame Instabilities Affected by Vortices and Acoustic Waves

- Jointly applied by Chinese and Japanese scientists
- Designed to have a 13-month in-orbit experimental research
- The Chinese technical support team has been helping the scientific team for the clarification of the technical indicators, in-orbit experimental resources and research schemes
- The experimental schemes and design review will be completed recently
Onboard Tiangong-2 space lab, Chinese and European scientists cooperated on the polarization detection of γ-ray burst and completed high-precision polarization detection of the instantaneous radiation.

- "POLAR-2", is γ-ray burst polarization detection onboard CSS
- Jointly applied by Scientists from Switzerland, China, Germany and Poland
- γ-ray burst related to gravitational waves is likely to be detected within the 2-year in-orbit experimental research
- Relevant interface information and upload scheme was defined
- The program scheme design, key technology research and review on scheme and design are expected to be completed this year.
CMSA are working closely with OOSA for further expansion of our cooperation.
• space science and application
• joint flight of Chinese and foreign astronauts
• transformation of technological achievements

We expect to make CSS a great platform for international cooperation, and involve more countries and regions committed to the peaceful use of outer space to be part of the manned space cause.
Thank you