China Manned Space Programme:
Its Achievements and Future Developments

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Part I: Development Strategy

In 1992, Chinese government decided to implement manned space program following the “three-step” strategy.

Three-step strategy

3rd step: To construct China's Space Station to accommodate long-term man-tended utilization on a large scale

The 2nd step: To launch Space Labs to make technological breakthrough in EVA, R&D, and accommodation of long-term man-tended utilization on a modest scale

The 1st step: To launch manned spaceships to master basic human space technologies

Part II: Achievements

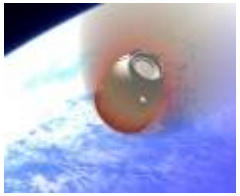
- **Unmanned spaceflight missions**
  - SZ-1, 20 Nov 1999
  - SZ-2, 10 Jan 2001
  - SZ-3, 25 Mar 2002
  - SZ-4, 30 Dec 2002


SZ-1


SZ-2

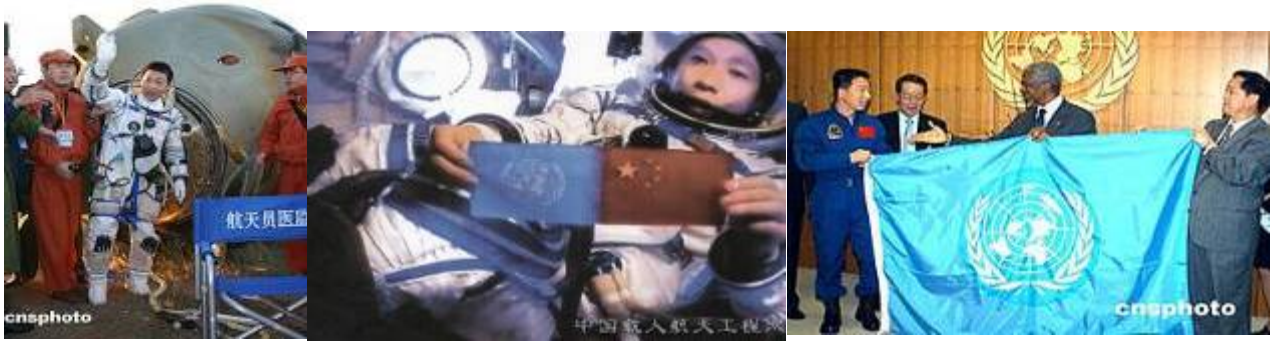

SZ-3


SZ-4



- **Achieved goals:**
  - Laid a solid foundation on manned space missions

- **Manned space missions – Basic Manned Space Missions**
  - Shenzhou-5, 2003, 1st manned spaceflight mission



  - Shenzhou-6, 2005, 1st multiple-crew and multiple-day spaceflight mission

- **Achieved goals:**
  - Fulfilled the 1st step of the three-step strategy

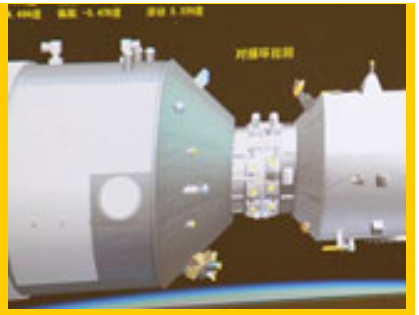
- **Manned spaceflight missions – 1st Space Walk**

  - Shenzhou-7, 2008, 1st Extravehicular Activity (EVA)

- **Manned spaceflight missions – Rendezvous & Docking**


2011, TG-1 Space Lab


2011, SZ-8 docking with TG-1

2012, SZ-9 docking with TG-1
Liu Wang:
1st Chinese Female Astronaut

2013, SZ-10 docking with TG-1,
Wang Yaping:
2nd Chinese Female Astronaut

Six Rendezvous & Docking missions in total

YANG Liwei, 1st Chinese Astronaut

SZ-5, 15 Oct 2003

FEI Junlong **NIE Haisheng**

SZ-6, 12 Oct 2005

ZHAI Zhigang **LIU Boming** **JING Haipeng**

SZ-7, EVA, 25 Sep 2008

JING Haipeng **LIU Yang** **LIU Wang**

SZ-9, Manual RVD with TG-1 , 16 Jun 2012

NIE Haisheng, **WANG Yaping** **ZHANG Xiaoguang**

SZ-10, Manual RVD with TG-1, 11 Jun 2013

So far, China has carried out 11 spaceflight missions in total, 5 of which were manned missions, sending 10 persons and 12 person-times of Chinese astronauts into space and returning them safely.

Part III: Future Developments

In September 2010, Chinese government approved its Space Station project.

Mission

- Building China Space Station around 2022;
- Mastering long-term human spaceflight technology;
- Acquiring abilities of long-term man-tended space science and technology test;
- Exploiting space resources comprehensively.

Two phases to implement the station project

- China's manned space programme has comprehensively entered into the stage of Space Station construction. The construction is well under way following the two-phase plan:
  - **Phase 1: Space Lab**
  - **Phase 2: Space Station**

◆Space lab

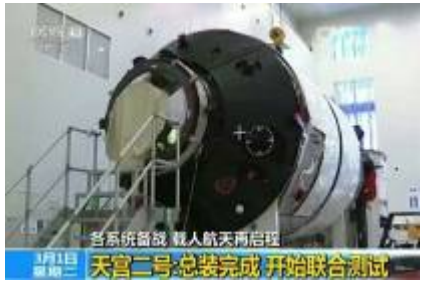
Mission Objectives

Verify key technologies in cargo transportation, on-orbit propellant re-supply, long-term stay of astronauts in space, and space science and applications on larger scale.

✓TG-2 space lab, CZ-7 launch vehicle, and cargo spaceship are being developed;
✓Wenchang Launch Site in Hainan has been established.
✓Four space flight missions have been planned.

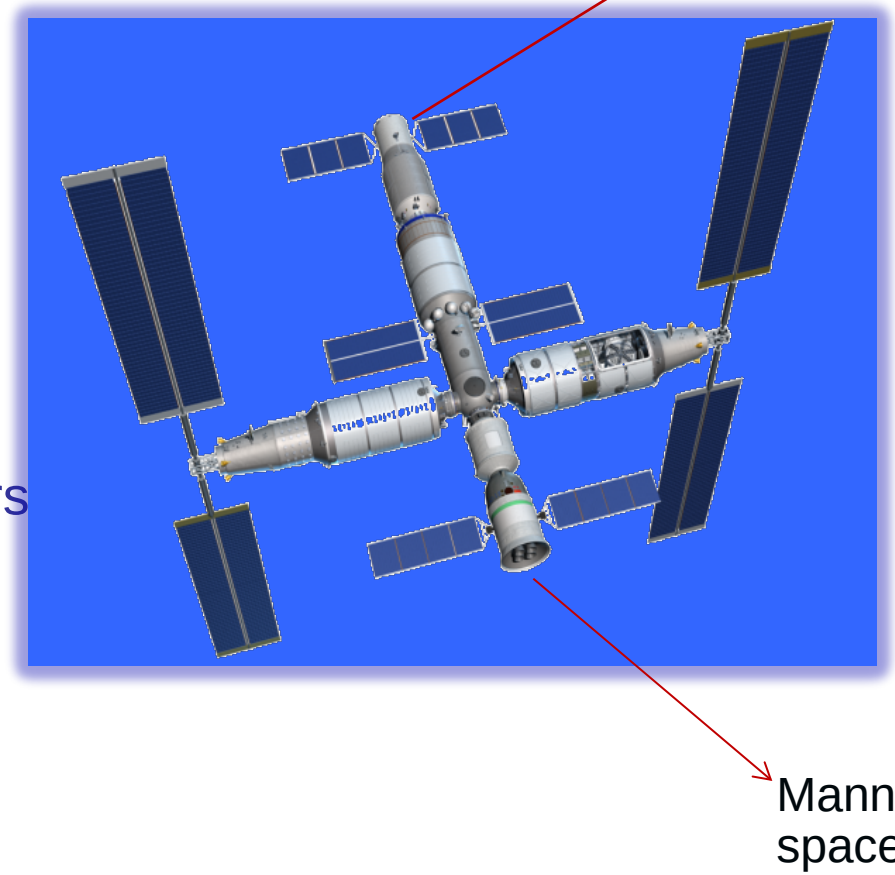
Mission Plan

- ✓Launch CZ-7, June 2016;
- ✓Launch TG-2 Space Lab, September 2016;
- ✓Launch SZ-11 spaceship to dock with TG-2, October 2016. Two crew members will stay in space for medium term ;
- ✓Launch TZ-1 cargo spaceship to test on-orbit propellant re-supply technology, 1st half 2017.

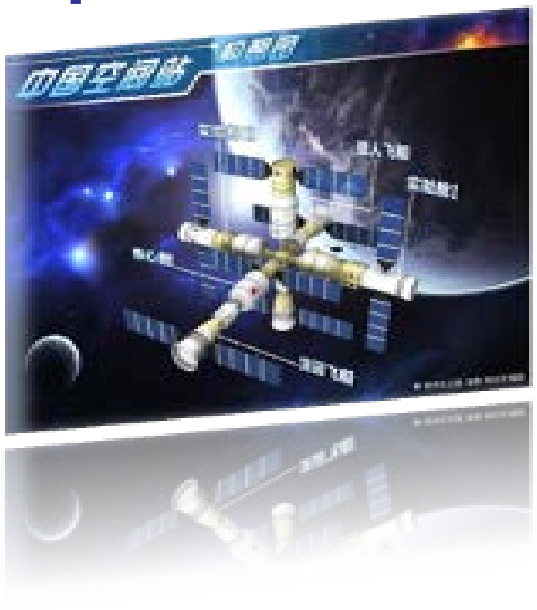


Space Station

- Design specification
  - Number of Modules: 3
  - Inclination: 42° ~ 43°
  - Altitude: 340~450 km
  - Lifetime: ≥10 years
  - Crew members: 3
  - Maximum 6 crew members during rotation



◆Space Station



- **Core module**
  - Control and manage the complex
  - Provide accommodation and working place for astronauts
- **Experiment module I and II**
  - Space science experiments
  - Space applications
  - Space technology demonstration

Expansion Capability

Upon future requirements for utilization and international cooperation, newly built modules can be added to the Station, and aboard payloads can be exchanged.

- **Station modules**
  - To be launched by the CZ-5B
  - At Hainan Space Launch Site.

- **Cargo transportation**
  - Pressurized, semi-pressurized, unpressurized
  - To transport airtight cargo, large extravehicular payloads, experiment platform
  - To be launched by CZ-7
  - At Hainan Space Launch Site

- **Crew transportation**
  - Shenzhou (SZ) Spaceship
  - CZ-2F launch vehicle
  - Crew members: 3
  - Crew rotation: up to 6 months
  - Launch site: Jiuquan

Construction Plan

- The Testing Core Module is scheduled to be launched in 2018, several manned spaceships and cargo spaceship will be launched to visit the Testing Core Module, conducting key technique tests such as on-orbit assembly, EVA, long-term manned flight, etc.

- The Experiment Module I and II will follow afterwards

- The Space Station with 3 modules will be put into operation around 2022

Currently, The CSS project is well under way. The modules of CSS and new types of launch vehicles as well as other related facilitates are under development

Space Science Experiments

The three modules of CSS will be featured with advanced technologies and equipped with multi-purpose facilities in international standards for space science.

Space life sciences and biotechnology

- Ecology Science Experiment Rack (ESER)
- Biotechnology Experiment Rack (BER)
- Science Glove-box and Refrigerator Rack (SGRR)

Microgravity fluid physics & combustion

- Fluids Physics Experiment Rack (FPER)
- Two-phase System Experiment Rack (TSER)
- Combustion Experiment Rack (CER)

Material science in space

- Material Furnace Experiment Rack (MFER)
- Container-less Material Experiment Rack (CMER)

Fundamental Physics in Microgravity

- Cold Atom Experiment Rack (CAER)
- High-precision Time-Frequency Rack (HTFR)

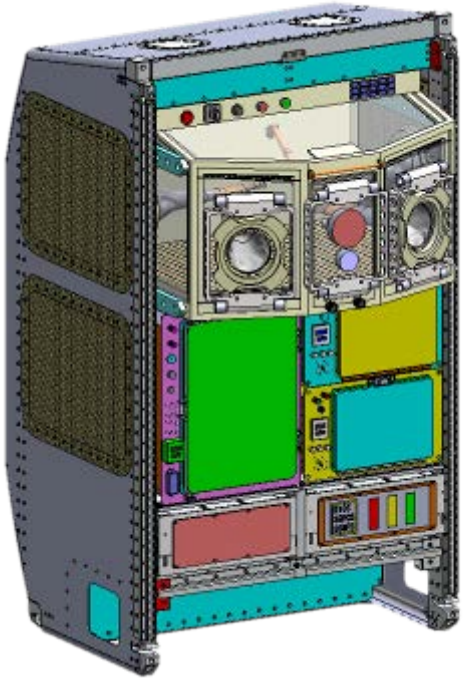
Multipurpose Facilities

- High Micro-gravity Level Rack (HMGR)
- Varying-Gravity Experiment Rack (VGER)
- Modularized Experiment Rack (RACK)

Space life sciences and biotechnology

Ecology Science Exp. Rack (ESER)

Biotechnology Exp. Rack (BER)



Science Glove-box and Refrigerator Rack (SGRR)

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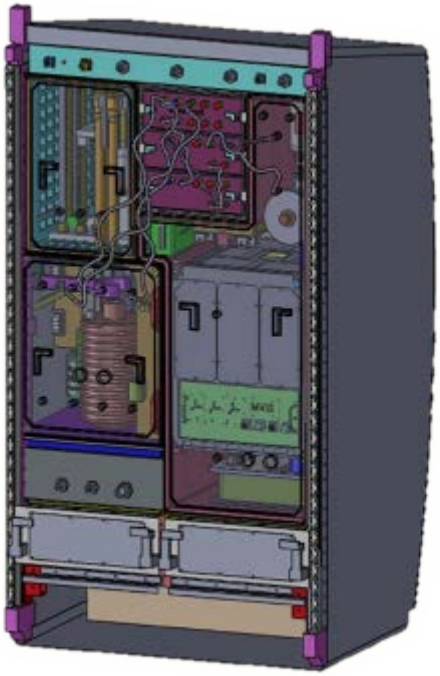
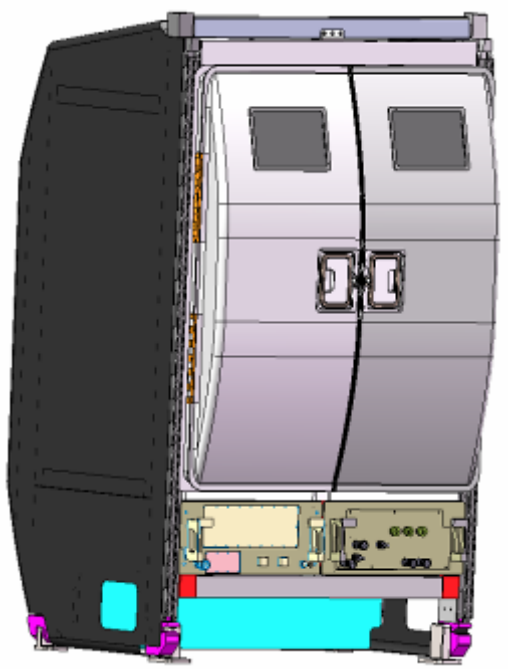
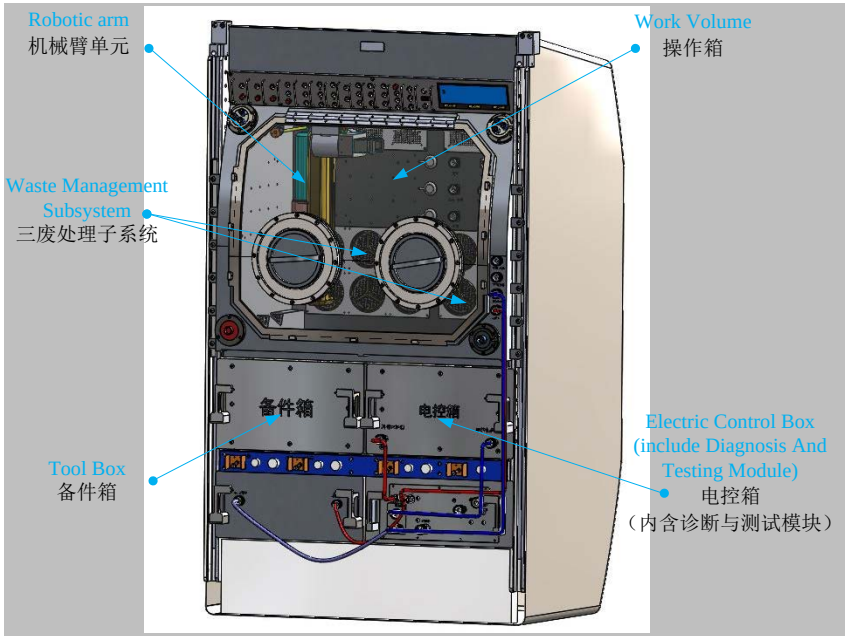


Material Furnace
Exp. Rack (MFER)

Container-less Material
Exp. Rack (CMER)





Varying-Gravity Exp. Rack (VGER)

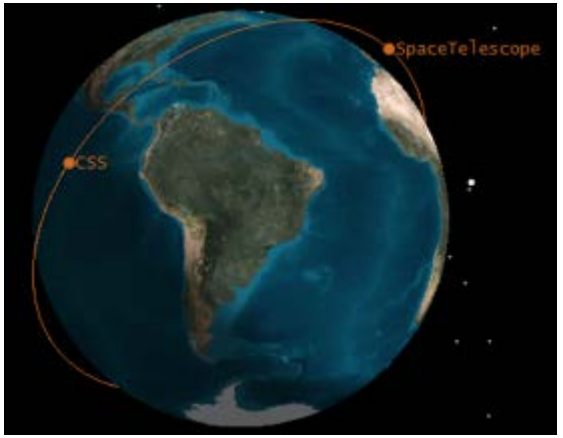
In-situ Maintenance and operation Rack (IMOR)

Space Telescope

Chinese first maintainable and repairable large-aperture space telescope for astronomy.

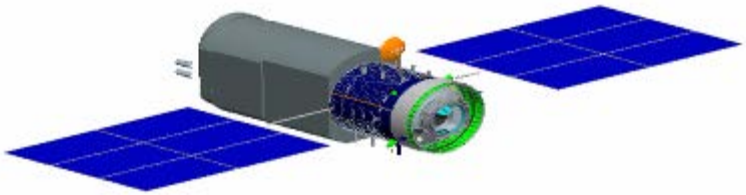
Science of sky survey:

- Formation and evolution of faraway celestial bodies: stars, planets, galaxies, black holes, quasars …
- Dark energy and dark mass research: nuance distortion of galaxies caused by gravity lensing by dark mass ;
- Cosmology research: restruction of perturbation to density of cosmos in earlier stage.



Engineering feature:

- RVD with China Space Station in case of maintenance or updating science instruments
- Shares resource (crew flights and cargo-ships) with China Space Station.



Part IV: 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)

UNITED NATIONS Office for Outer Space Affairs

ROSCOSMOS

esa

Others

Cooperation on the Utilization of China's Space Station

Framework Agreement

to the date of termination under this Agreement or legal instrument executed pursuant to this Agreement.

This Agreement shall enter into force upon signature.

IN WITNESS WHEREOF, the duly authorized representatives of the Parties affix their signatures on the present Agreement in the English language in two originals.

Done at Vienna, Austria this 31 March of 2016
(place) (day / month) (year)

For the United Nations

Ms. Simonetta Di Pippo
Director
Office for Outer Space Affairs
United Nations Office at Vienna

For the China Manned Space Agency

Mr. WANG Zhaoyao
Director General
China Manned Space Agency

Funding Agreement

Article XIII

ESS WHEREOF, the undersigned, being duly authorized thereto, have signed the present in the English language in two originals.

DONE at Vienna, Austria this 31 March of 2016
(place) (day / month) (year)

r the United Nations

Simonetta Di Pippo
ector
ice for Outer Space Affairs
ted Nations Office at Vienna

For the China Manned Space Agency

Mr. WANG Zhaoyao
Director General
China Manned Space Agency

Done at Vienna, 31 March 2016

Objectives of the Cooperation

- Under the Agreements, CMSA will **provide resources in regard to China's Space Station, and funding support** to UNOOSA.
- Both parties will work together for the following purposes:
  - To continue implementing the Human Space Technology Initiative (HSTI);
  - To provide opportunities for Member States to conduct space experiments on board China's Space Station;
  - To provide opportunities for Member States to fly their astronauts/payload experts on board China's Space Station.

Contribute China's Space Station to …

Over-arching Cooperation Areas

1. Promoting **international cooperation** in human space flight and activities related to space exploration;
2. Promoting **increased awareness** among United Nations Member States of the benefits of utilizing human space technology and its applications;
3. Providing **flight experiment and space application** opportunities on board China's space station for scientists from around the world;
4. Providing **flight opportunities for astronauts** and/or payload engineers from other countries to conduct hands-on experiments on-board China's Space Station;
5. Promoting **capacity building** activities by making use of human space technologies, including facilities and resources from China's manned space programme.

Cooperation Mechanism

- CMSA and UNOOSA will work closely to define procedures for the cooperation. The basic procedures would be:
  - UNOOSA, in cooperation with CMSA, to publicise **Announcement of Opportunity (AO);**
  - UNOOSA to **solicit proposals** from scientists all over the world;
  - International Selection Committees, to **select projects**;
  - **Bilateral agreements** between the selected partners and CMSA/Chinese counterparts to be signed for implementation;
  - UNOOSA to provide opportunities such as workshops and expert meetings for partners to **exchange progresses**.

Our Goal

- To further shared goals and objectives in regard to China's Space Station;
- To create opportunities for Member States, in particular developing countries, to take part in, and benefit from, the utilization of China's Space Station;
- To foster and promote cooperation between partners from developed and developing countries.

Conclusion

- CMSA is considering further and long-term development in human space exploration after the forthcoming accomplishment of the present three-step strategy
- It is certain that China will never halt its footsteps in human space exploration and will continue to explore the vast space, deeper and further!

Thank you for your attention !

Website: en.cmse.gov.cn