China Manned Space Programme
Achievements and future Developments

Mr. HAO Chun
Director
Scientific and Planning Division
China Manned Space Agency

chao_chun@cmse.gov.cn

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Part I: Introduction

- 1992

Chinese government decided to implement manned space program following the “three-step” strategy.
Three-step strategy of China Manned Space Programme

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

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

3rd step: To construct Chinese space station to accommodate long-term man-tended utilization on a large scale
Part II: Achievements up to date

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

- **Achieved goals:**
  - Laying a solid foundation for manned missions
Manned spaceflight missions – Basic Human Spaceflights

- Shenzhou-5, 2003, 1st manned spaceflight mission
- Shenzhou-6, 2005, 1st multiple-crew and multiple-day spaceflight mission

- Achieved goals:
  - Fulfilled the task of the 1st step of the three-step strategy
Manned spaceflight missions – **Space Walk**

**Shenzhou-7, 2008, 1\textsuperscript{st} 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, 1\(^{st}\) Chinese Female Astronaut, LIU Yang
- 2013, SZ-10 docking with TG-1, 2\(^{nd}\) Chinese Female Astronaut, WANG Yaping, Space class

6 Rendezvous and Docking Missions in total

China Manned Space Agency (CMSA)
So far, China has carried out 11 spaceflight missions in total, 5 of which were manned missions, sending 10 Chinese astronauts into space and returning them safely.
Part III: The future developments

In September 2010, Chinese government approved its space station project.

Objectives: Finish building China space station around 2020, mastering long term human spaceflight technology independently, acquiring the abilities of long term man tender space science and technology test and exploit the space resources comprehensively.
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:

• testify the key technologies in cargo transportation, on-orbit propellant re-supply, long-term stay of astronauts in space, and space science and applications in larger scale.
✓ T G-2 space lab, CZ-7 launch vehicle, and cargo spaceship are being developed;
✓ Wenchang Launch Site in Hainan was established.
✓ Four space flight missions have been planned.
◆ Space lab

- **Mission plan:**
  
  - 3rd quarter 2016, launch TG-2 space lab;
  - 4th quarter 2016, launch SZ-11 spaceship to dock with TG-2. Two crew members will stay in space for medium term;
  - 1st half 2017, TZ-1 cargo spaceship to test on-orbit propellant re-supply technology;
  - before the above missions, CZ-7 test-flight mission will be carried out.
**Space Station**

**Design specification**
- Modules: 3
- Inclination: 42° ~ 43°
- Altitude: 340~450 km
- Lifetime: ≥10 years
- Crew members: 3, Maximum 6

**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

**Station Expansion Capability**
- According to future requirements for utilization and international cooperation, newly built modules can be added, 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, un-presurized
- 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
China Space Station (CSS) 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 2020.

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 are all designed to feature advanced technology and multi-purpose facilities for space science.
Utilization Support Capability of CSS

- Ecology Science Experiment Rack (ESER)
- Biotechnology Experiment Rack (BER)
- Science Glove-box and Refrigerator Rack (SGRR)
- Fluids Physics Experiment Rack (FPER)
- Two-phase System Experiment Rack (TSER)
- Combustion Experiment Rack (CER)
- Material Furnace Experiment Rack (MFER)
- Container-less Material Experiment Rack (CMER)
- Cold Atom Experiment Rack (CAER)
- High-precision Time-Frequency Rack (HTFR)
- High Micro-gravity Level Rack (HMGR)
- Varying-Gravity Experiment Rack (VGER)
- Modularized Experiment Rack (RACK)

A. **Space life sciences and biotechnology**
B. **Microgravity fluid physics & combustion**
C. **Material science in space**
D. **Fundamental Physics in Microgravity**
E. **Multipurpose Facilities**
Ecology Science Exp. Rack (ESER)  
Biotechnology Exp. Rack (BER)  
Science Glove-box and Refrigerator Rack (SGRR)
Fluid Physics Exp. Rack (FPER)

Two-phase System Exp. Rack (TSER)

Combustion Exp. Rack (CER)

China Manned Space Agency (CMSA)
Material Furnace Exp. Rack (MFER)

Container-less Material Exp. Rack (CMER)
Varying-Gravity Exp. Rack (VGER)

In-situ Maintenance and operation Rack (IMOR)

Robotic arm
机械臂单元
Waste Management Subsystem
三废处理子系统
Tool Box
备件箱
Electric Control Box
(include Diagnosis And Testing Module)
Work Volume
操作箱

China Manned Space Agency (CMSA)
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 CSS in case of maintenance or updating science instruments
- Shares resource (crew flights and cargo-ships) with CSS.
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
Thank you very much for attention!

Website: en.cmse.gov.cn