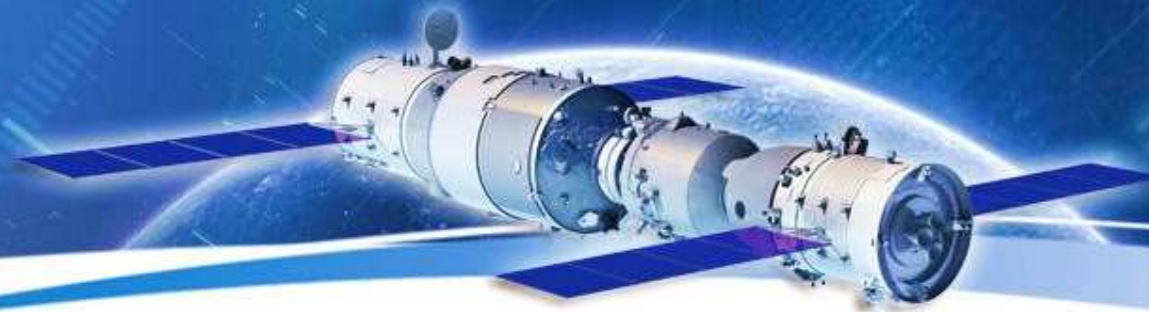




# China Space Station and International Cooperation



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# Contents

- ◆ China Manned Space Program
- ◆ China Space Station
- ◆ International Cooperation



# I. China Manned Space Program

# Background

## **Three-step strategy**

**First step: Manned spaceship project**

**Second step: Space laboratory, EVA, RVD**

**Third step: Space station project**







## 4 unmanned space flight missions, 1999-2003



# Where did we do?

- 2003-Shenzhou-5. Yang Liwei became the first Chinese astronaut to fly into space.
- 2005-Shenzhou-6. First multi-man and multi-day spaceflight.
- 2008-Shenzhou-7. First EVA by astronaut Zhai Zhigang.
- 2011-Tiangong-1, Shenzhou-8. automatic RVD (Unmanned mission).
- 2012-Shenzhou 9. Manual and automatic RVD with Tiangong, first Chinese female astronaut Liu Yang flew in space.
- 2013-Shenzhou 10. Manual and automatic RVD with Tiangong, space lecture in Tiangong by second female astronaut Wang Yaping.

**10 astronauts flew into space, 2 of them flew twice.**

Tiangong-1



Shenzhou





# Chinese Astronauts



YANG Liwei  
SZ-5, 15 Oct 2003



FEI Junlong  
SZ-6, 12 Oct 2005



NIE Haisheng



ZHAI Zhigang



LIU Boming  
SZ-7, EVA, 25 Sep 2008



JING Haipeng



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



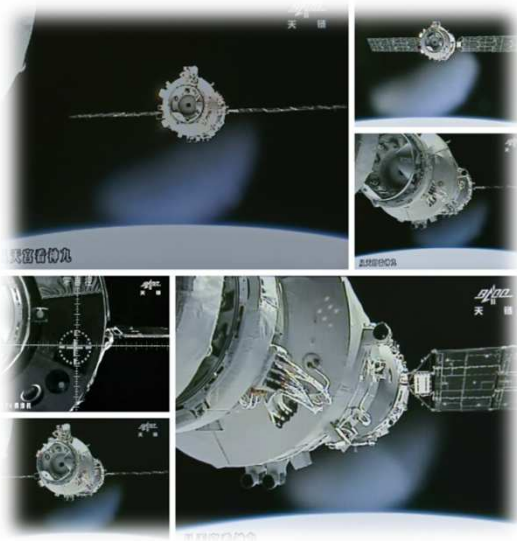


# Chinese Astronauts





# Spacecrafts





## **II. Chinese Space Station**



# System Architecture

- Orbit inclination:  $42 \sim 43^\circ$
- Altitude: 340km ~ 450km
- Designed Life: >10 years
- Crew member: 3~6
- Modules: 3 (basic shape)
- Robotic arms: 2
- Capsule extension is possible
- Mission duration: 6 months
- Weight  $\approx 70$  tons (basic shape)  
160~180 tons max
- Exposure platforms available
- 1 manned spaceship docked permanently
- Start to build in 2018, basic shape completed around 2022

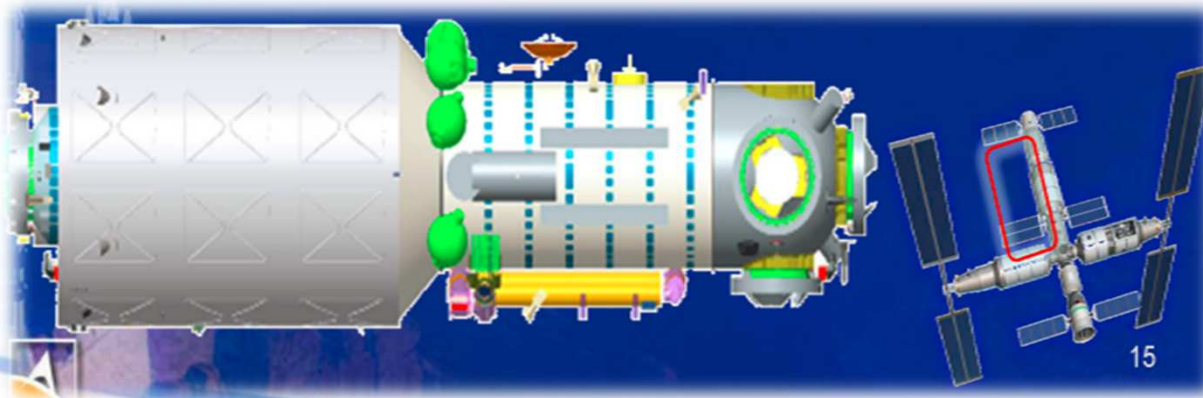




# Basic Configuration of CSS

## Core Module :

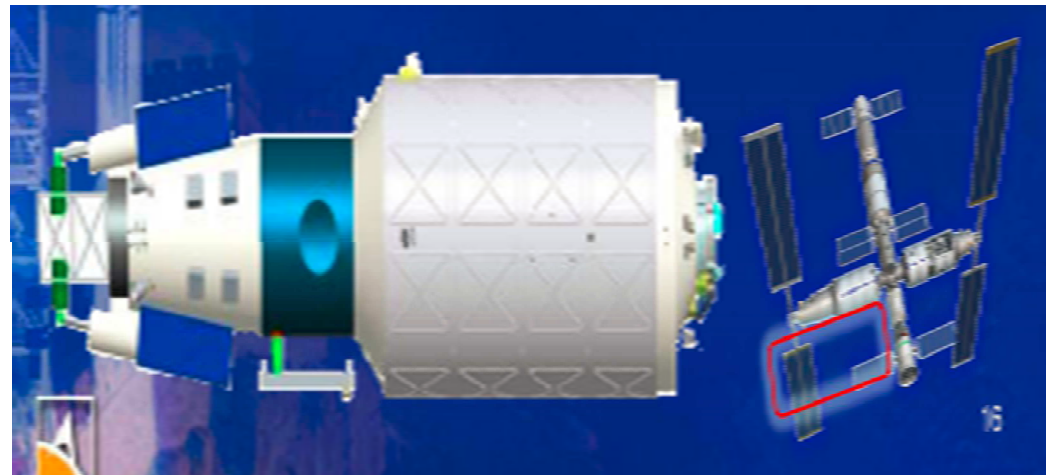
- manage and control center
- habitation cabin
- node module, serve as docking port and airlock.
- resource module, resupply, refuel.
- Robotic arm 1
- space medicine and life science research facility



# Basic Configuration of CSS

## Experiment Module I :

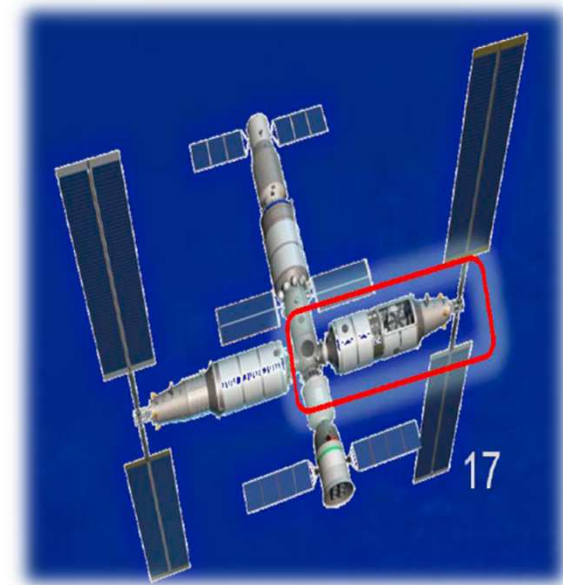
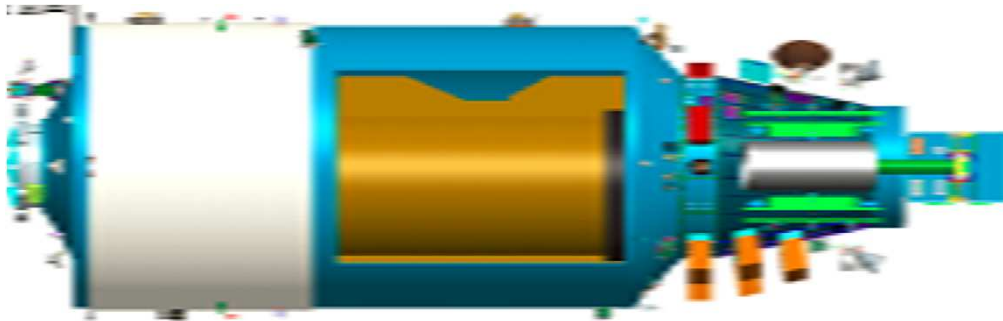
- habitation cabin
- internal research facility: Modular racks
- external payloads
- airlock
- 2DOF solar array
- robotic arm 2



# Basic Configuration of CSS

## Experiment Module II :

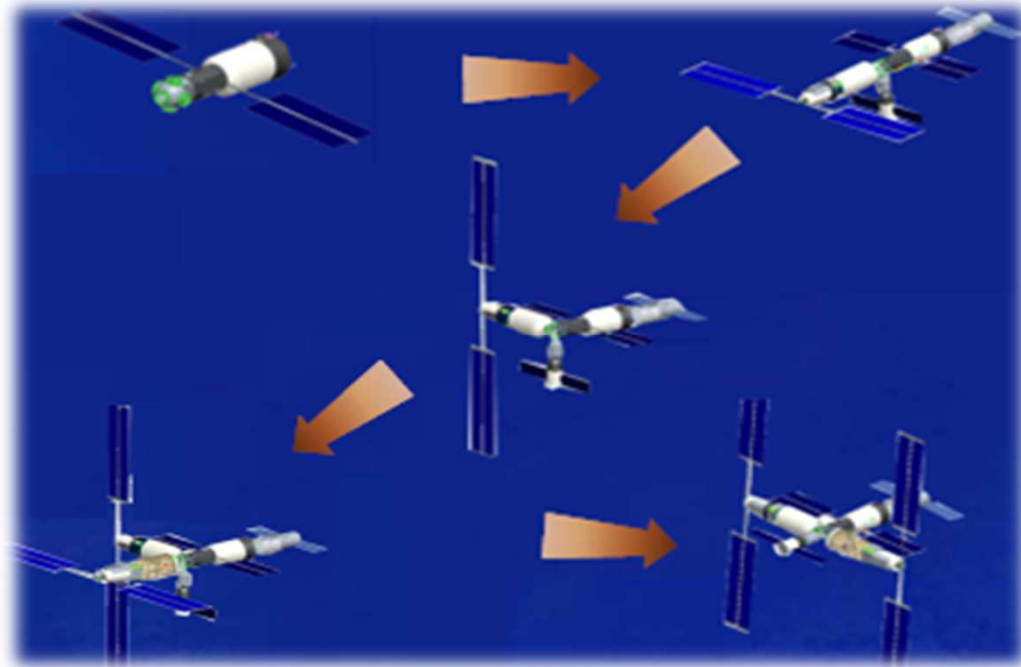
- internal and external payloads
- storage of crew consumes
- 2DOF solar array





# Assembling plan

- Experiment module I RVD
- Experiment module I transposition
- Experiment module II RVD
- Experiment module II transposition
- Core module



# Crew Transportation

- Crew transportation: Shenzhou spaceship

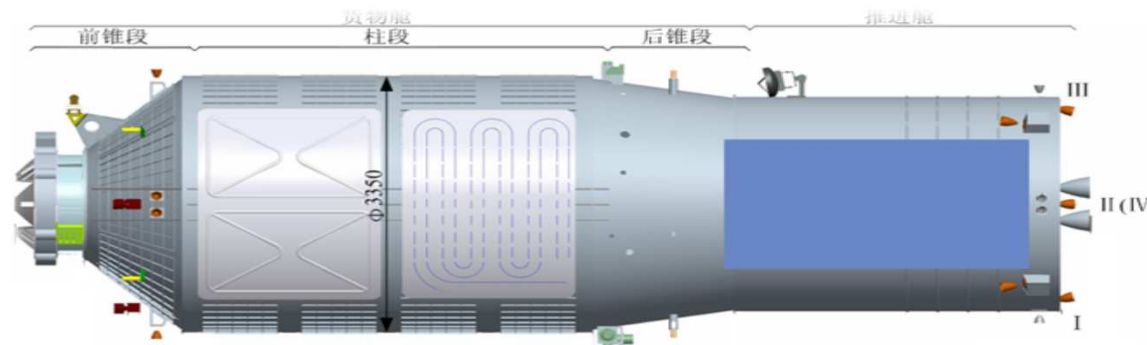


**Shenzhou manned spaceship**

- Shenzhou spaceship can berth on the CSS for 180 days while astronauts visit the CSS;
- Re-entry capsule can land on the landing site within 1 day after undocking

# Cargo Transportation

- The cargo spaceship consists of cargo module and propellant module.
- 3 types of cargo module:
  - pressurized module: encapsulation delivery goods
  - semi-pressurized module: extravehicular large payload
  - unpressurized module: experiment bed



货运飞船整船构形

Cargo spaceship



# Launch Vehicle

## Long March 2F

- launch the Shenzhou spaceships
- Launch site: Jiuquan
- LEO ability is about 8,000 kg



# Launch Vehicle

## Long March 7

- launch the cargo spaceship
- Launch site: Hainan
- LEO 13,000 kg
- compatibility, modularization and serialization
- cryogenic engine
- non-toxic propellants



# Launch Vehicle

## Long March 5B

- launch the three modules of the space station.
- Launch site: Hainan
- LEO ability : 20,000 kg
- compatibility, modularization and serialization
- cryogenic engine
- non-toxic propellants





# Utilization of Space Science

A satellite with solar panels is shown in orbit above the Earth's horizon. The background is a deep blue space with stars and the curvature of the planet.

- carry out experiments and applications researches to achieve
- breakthrough on science and technologies
- push original innovations
- provide platform to implement



# Areas of Utilizations in CSS

- space medicine
- life science and biology
- microgravity fluid physics and burn science
- material science
- microgravity fundamental physics
- astronomy and astrophysics
- earth science and technology
- space based information technology
- space new technology
- technology applications
- environment and physics
- space infrastructure technology

# Project Planning



2 phases:

- space lab:
  - Around 2016: launch the Tiangong-2 space, launch a manned spaceship and cargo spaceship and dock into the Tiangong-2.
  - Longer aboard the space lab,conduct space science experiments and technology tests.
  - Make Breakthroughs in key technologies such as in-orbit refilling of propellant.



# Project Planning

A satellite or space station in orbit above the Earth's horizon, with solar panels extended. The background is a deep blue space with stars and the curvature of the Earth.

- space station
  - Around 2018: launch the Core, and then the Experiment Module I and Experiment Module II.
  - Around 2022: In-orbit assembly completed
  - Astronauts long-term in-orbit stay and large-scale experiments in space science and applications



## **III. International Cooperation**

# Principle

A satellite or space station is shown in orbit above the Earth's horizon. The satellite has a white cylindrical body and two large blue solar panel arrays extending outwards. The Earth's blue and white atmosphere is visible in the background against the blackness of space.

- peaceful utilization of space
- equality and mutual benefit
- common development



# Area

4 areas of cooperation in the phase of space station:

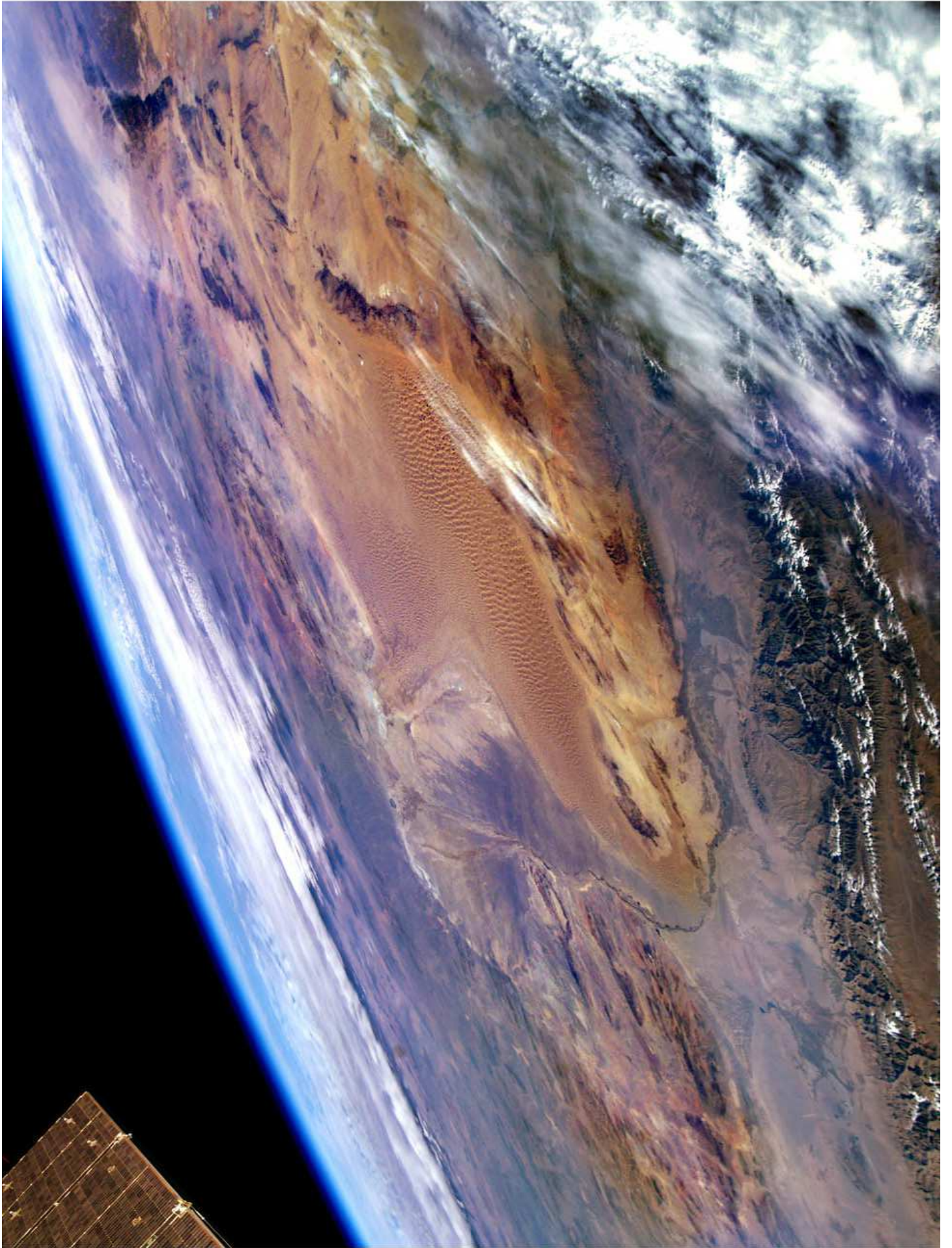
- cooperation in platform technology
  - individual facility or assemblies
  - sub-systems or modules
- cooperation in space applications
  - joint research
  - on-board experiments
  - in fields of space science and applications, space medicine,etc

# Area

## 4 areas of cooperation in CSS:

- Astronauts' selection and training
  - exchange and cooperation in astronauts' selection and training methods
  - select and train astronauts for other countries
  - fly jointly
- promote the technology transfer
  - benefite other countries, especially the developing countries and regions







Thanks!  
Question?

