

A Look Inside China Space Station

Edited by QI Liming

China's space program is making impressive progress as seen by the success of China Space Station (CSS) Tiangong in low Earth orbit between 340 and 450 km above the surface. It is China's first long-term space station and has some innovative technology under its skin.

Apart from its own space development, in the future China also plans to carry out more in-depth space related exchanges and cooperation with other countries in its commitment to the peaceful use of outer space.

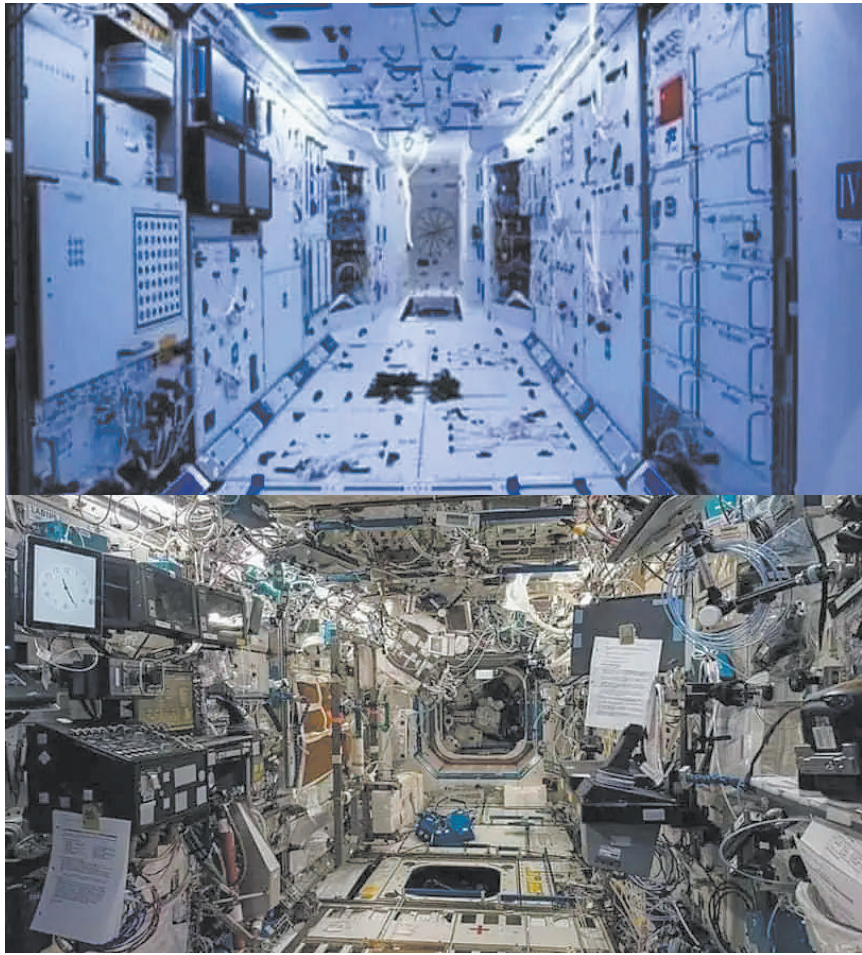
Life in Tiangong
According to the information released on Space website and data from Xinhua, CSS is identified as a modular space station, and is assembled in orbit from modules launched separately. This is a feature of third-generation space stations.

As the core module of CSS, Tianhe provides living quarters for the crew members, containing three separate sleeping berths, a toilet, shower facility, and gym equipment.

At least one berth features a small window, a headphone, ventilation, and other amenities. Other properties and facilities include:

- The planned pressurized (habitable) volume will be 110 m³.
- Neuromuscular electrical stimulators to prevent muscle atrophy.

Tiangong has a Wi-Fi network for wireless connection and each astronaut wears a bone-conduction headphone and microphone for easy communication.



The interior of China's Tiangong space station (up) VS the International Space Station. (PHOTO: SCREENSHOT)

120 different types of food, selected based on astronauts' preferences, are stored aboard CSS. Food storage is resupplied by trips of the Tianzhou-class cargo ship. Fresh fruits and vegetables are stored in coolers.

All the taikonauts have a handheld terminal connected to an APP to operate the cabin light among work, sleep, and

exercise modes.

A private voice channel has been reserved for the crew to call their families and friends on Earth.

CSS VS ISS interiors side-by-side
As Our Planet website reported that once completed, CSS will have a mass between 80 to 100 tons. Its interior will look more futuristic than that of

the International Space Station (ISS), but that's not the only difference. Other major differences include:

● CSS will be lighter than ISS, at about between 80 and 100 tons in weight. ISS weighs about 400 tons following the recent addition of Russia's Nauka module.

● CSS is fitted with the Chinese Docking Mechanism, based on the Russian Androgynous Peripheral Attach System (APAS- 89/APAS- 95). ISS also has APAS- 95 docking ports, so both space stations' docking systems should be compatible in theory.

● The regular size of ISS crew is six, but it has supported as many as 13 crew members onboard. CSS is currently equipped to handle three taikonauts.

● CSS will be quieter. The noise level in the working area is 58 decibels (dBA), while in the sleeping area, the noise is kept at 49 dBA. Acoustic levels at most locations on ISS are close to 60 dBA.

What does CSS convey
According to BBC journalists, China is keen to develop satellite technology for telecommunications, air traffic management, weather forecasting and more.

Andrew Jones, a freelance space journalist, said that CSS is also likely to host international astronauts in the future.

Meanwhile European Space Agency astronauts Samantha Cristoforetti and Matthias Maurer trained with their Chinese counterparts in 2017, in a small step toward a possible future visit to CSS, the European Space Agency reported. Astronauts from other countries, particularly those involved in China's Belt and Road Initiative, may travel to CSS as well.

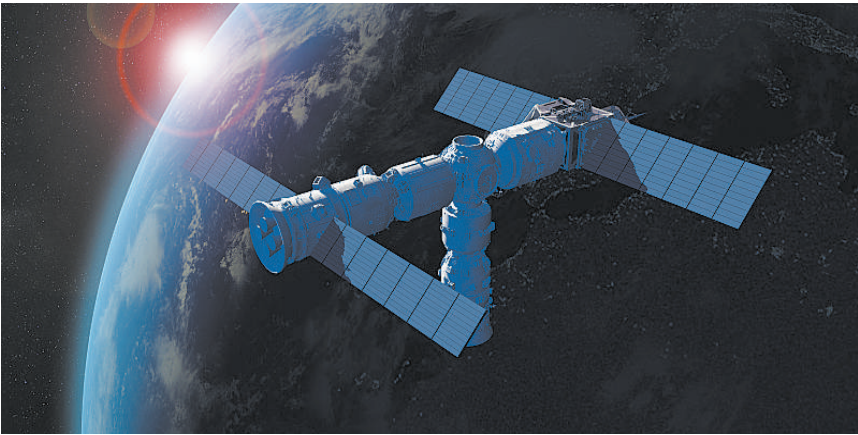
Hi! Tech

Black Technologies Onboard CSS

By QI Liming

The Shenzhou-14 crew successfully entered CSS a couple of weeks ago. A feature of the current mission is the use of so-called "black technologies" onboard CSS.

Temperature Control Coats Protect Both Astronauts and Spacecraft Equipment



CSS in the extremely low temperature environment caused by the irradiation of the sun. (PHOTO: VCG)

The docking mode of Shenzhou-14 and the flying position of the space station assembly make the spacecraft con-

tinuously blocked by other modules, resulting in the spacecraft being in an extremely low temperature environment

for a long time. The lowest temperature can reach below minus 100 °C.

Conversely, when the space station is in certain configurations, parts of the spacecraft are constantly irradiated by the sun, and the highest temperature outside exceeds 100 °C.

The extreme high and low temperature environment outside severely tests to the health of the astronauts and normal functioning of spacecraft equipment.

In view of this temperature control challenge, engineers designed and developed a "temperature control coat" that provides low absorption and low emission thermal control coating.

Low absorption means the coating itself has low solar absorption characteristics, which can effectively reduce the

temperature rising due to solar irradiation.

Low emission means that the coating has a low infrared emittance, which can effectively block the radiative heat leakage from the interior of the spacecraft to the external cryoenvironment (below minus 100 °C environment), and avoid the continuous reduction of the temperature in the cabin.

At the same time, according to the ship structure, power and characteristics of space thermal environment, engineers designed specific absorption and emission properties.

"Temperature control coat" can ensure the cabin remains in the appropriate temperature range even in the long-term extreme high and low temperature environment.

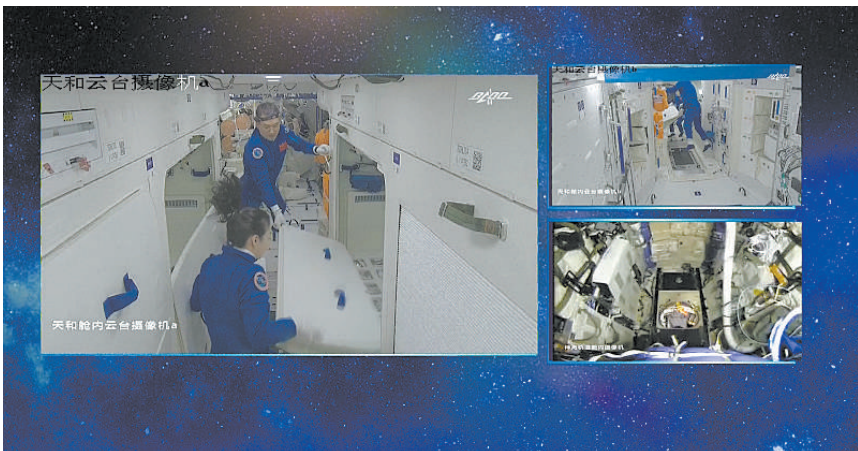
Intelligent Administrator to Deal with Massive Data

The Shenzhou-14 spacecraft and CSS generate a large amount of data all the time. In order to turn these complex parameters into intuitive values that astronauts can grasp, the application software of the instrument controller will act as an "intelligent administrator."

When each subsystem of the spacecraft starts to operate, the data generated will be collected into the data management subsystem. Then the "intelligent administrator" will summarize the data, and convert it into content that astronauts can intuitively identify and operate, when displayed on the screen of the instrument controller.

Application software of the instrument controller uses unique graphics display technology, and displays the spacecraft trajectory, posture, flight status and information of each subsystem through text, graphics, and animation.

With the help of this unique graphic display technology, it gets novel display effect of the instrument controller, and makes the processing and display of the graphics and text from space intelligent instrument into reality, which also provides a clear, intuitive, and comfortable display interface for astronauts to perform tasks.



Footages captured by the PTZ camera in Tianhe capsule. (PHOTO: VCG)

Opinion

UK's High Potential Individual Visa Causes Controversy

By YU Haoyuan

A High Potential Individual visa (HPI) was launched by UK government recently, which enables some recent non-UK graduates who wish to work, or look for work to stay in UK for at least two years. Something that is even more remarkable is this visa can switch to other long-term employment visas, if applicants meet the eligibility requirements. However, despite this the visa has sparked controversies from many quarters.

According to the requirements, in order to qualify for an HPI visa, applicants must, in the last 5 years, have been awarded an overseas degree level academic qualification from an institution which appears on the Global Universities List. These universities were selected if they appeared in the top 50 in two out of three selected ranking tables – the UK-based QS, Times Higher Education rankings, and the Shanghai-based Academic Ranking of World Universities.

The three ranking tables to make the Top 50 list have been questioned. Critics have long argued that these university rankings are beneficial to countries such as the U.S., which concentrate most of their research funding on a few large comprehensive research-oriented universities that eventually dominate the top of the list. Universities with a strong specialty, such as Dutch Delft University of Technology and German RWTH Aachen University, don't dominate this ranking.

Critics also pointed out that the policy is highly discriminatory as it does not cover universities from all continents. The list is made up of about 20 universities in the U.S., four in China, both EU and Canada have three, while Singapore, Switzerland and Japan all boast two, and Australia one. It does not feature a single institution from south Asia, South America or Africa.

Christopher Trisos, Director and Senior Researcher at the University of Cape Town, told the BBC that it is a deeply inequitable approach. He stated if the UK wants to address issues such as the climate crisis, energy access and future pandemics, it should recognize the expertise and knowledge that graduates from developing countries possess.

Apart from the criticism of geographical choice, the way of deciding

who is really talented is also being questioned. Home Secretary Priti Patel did say that the HPI visa aims to attract, "The brightest and best, not where someone comes from." But to evaluate students' ability to work after graduation by using this method seems inappropriate.

Let's take a look at the standard application for the HPI visa. The UK government wrote on its website that applicants must prove that they "can read, write, speak and understand English to at least level B1 on the Common European Framework of Reference for Languages (CEFR) scale." When compared to the International English Language Testing System (IELTS), B1 is equivalent to IELTS 4.0, even lower than the minimum language requirements for applying to UK universities. Students who apply to a British university must score at least an average IELTS 5.5 for the undergraduate degree and 6.5 for the master's degree. So, does this signify that those non-UK students who graduated from UK universities are better in every aspect?

Phil Baty, Chief Knowledge Officer of Times Higher Education, also noted that on LinkedIn the rank was initially set up to evaluate the ability of the university in the field of research.

"This current use of the rankings to determine emigration visas will clearly exclude many highly talented individuals studying at great universities around the world, that just happen not to fit with the research-heavy (and resource-intensive) focus of the current global rankings," he wrote.

Actually, choosing graduates from specific countries/colleges with a lower standard of English level required, even without a UK job offer, it obviously serves what UK government wants — to win the contemporary global competition for talent.

The British right-wing faction are often heard to say that immigration has become Britain's "most important issue" since the 21st century, as UK is not a country of immigrants. The issue is also the main reason caused the UK's exit from EU. However, the statement is not entirely correct. In the global high-end talent market, many countries suddenly open borders to immigrants in order to win competition for talent, whether it is UK or the U.S., where anti-immigrant sentiment has also gotten stronger in recent years.

Drinking Soybean Milk in Space

By Staff Reporters

Following the launch of Shenzhou-14, what astronauts eat has once again captured the public's imagination.

For example, drinking soybean milk in space requires three elements: soybean milk powder, drinking water and heat. To bring this together, Jiuyang company, as the designer, came up with a hot air heating device and "space soybean milk" technology in the space kitchen.

The heater uses an innovative method of 360°C hot air circulation from bottom to top, which solves a series of problems, including the slow heating speed of food, the inability of a microwave to heat aluminum foil, and space food packaged in metal cans.

A cup of space soybean milk differs from the conventional method of adding water and grinding soybeans directly. Instead of grinding, soybean milk powder is used, produced on the ground specifically for direct drinking in space. At the same time, the soybean milk powder can be directly dissolved in purified water of appropriate temperature from the water dispenser, without worrying about

how to heat it.

In addition, brewing soybean milk in a weightlessness environment makes it easy to cause bubbles, which requires precise control during brewing, to ensure the uniformity of water and avoid bubbles. The drinking water system in the space kitchen can also effectively remove silver ions from raw water. Moreover, it innovatively uses the function of instant heating to achieve accurate control of water temperature and volume, so as to ensure that astronauts can drink hot water filtered and purified by space technology at any time, as if they were at home.



Space food. (PHOTO: VCG)