

# Chinas Big Station Plan

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2006 has seen more changes and reshuffling to China's human spaceflight program than any other period that's publicly on record. We've seen the first spacewalk postponed, and we have also seen a proposal for a three-spacecraft complex that's effectively a small modular space station.

Plans for a large space station, to be launched by a new heavy lift rocket, have been scapped for the moment. It seems likely that the heavy lift rocket itself has also been cancelled or postponed. But what was China originally planning to do? Clues to the evolution of China's space station program have been scarce, and somewhat contradictory.

China exhibited a model of a modular space station that seemed

reminiscent of the International Space Station at an exhibition in Hannover in 2000. It's unclear if this was ever a realistic proposal, or simply a model cooked up at short notice by an exhibition planner who needed to fill space.

The fact that China also exhibited a small model of Chinese astronauts exploring the moon with an Apollo-style Lunar Rover suggests that the latter is true. Neither of these plans seem consistent with any solid short-term goals, even if China is aiming for such grand feats over the course of a couple of decades.

Photographs of a small space station mockup have been exhibited in the Chinese media. This stubby cylindrical module, with an androgynous docking port at one end, looked believable as an early space station project. It also seems to have enjoyed more genuine support from mission planners.

Resources would not be expended on a large full-scale mockup unless China was harbouring serious plans for launching one. But the diameter of this module was substantially larger than a Shenzhou spacecraft, and it was obvious that it could not fit under the payload shroud of a Long March 2E or 2F. Something larger and heavier would be needed to lift this module, which lends support to the overall suggestion that China's initial space station proposals dovetailed with the introduction of a new heavy lift vehicle.

The revamp of the Shenzhou program suggests that this large module will not fly in the next six years, while China develops a smaller type of space laboratory. But what was China originally hoping to do? One illustration, which has attracted little commentary in the aerospace media, potentially sheds some light on this.

Mark Wade, compiler of the online Encyclopedia Astronautica,

collected a curious image that was apparently shown on Chinese television during the mission of Shenzhou 6 in 2005. This picture depicts a large cylindrical space station with what appears to be an Apollo-style capsule at one end. The diameter of the space station can be estimated by looking at the instrument box on the front of the capsule's nose.

This is an "antenna farm" of the sort carried by Shenzhou 1, and it is dwarfed by the overall size of the station. The size would seem to be similar to the space station mockup previously mentioned, which the Encyclopedia Astronautica rates at 4 to 5 metres in diameter. Could the mockup, and the obscure image, be variants on the same theme?

If so, they suggest that China's original plans for a large space station were far from settled before they were put on hold. The large mockup has a docking port that seems designed to receive a Shenzhou carrying its crew on a taxi mission, just as Russia uses Soyuz spacecraft to carry crews to her own space stations. But the television picture, which is either a painting or a computer-generated illustration, suggests a different mission plan. No docking ports are visible.

Admittedly, there could be one at the (unseen) rear of the station, but the flared base of the station, and overall design, suggest that this area houses rocket motors instead of a docking port. So how would a crew be sent to the station? They would be launched at the same time as the station itself, strapped aboard the Apollo-style capsule that caps the spacecraft!

After reaching orbit, the crew would transfer from their capsule to the station, possibly through a hatch in its underside. At the end of their mission, they would re-enter the capsule. Thrusters in the station would plunge station, capsule and all towards the upper atmosphere in a de-orbit burn. The capsule would separate, and return to a parachute landing in China. The station, like a gigantic Apollo service module, would face

a destructive re-entry.

This may sound like an unorthodox mission architecture for a space station, but it is worth remembering that both the USA and the Soviet Union dabbled in similar mission plans. The US Air Force designed a small military space station called MOL, or Manned Orbiting Laboratory. MOL was a small pressurised module with a Gemini capsule mounted on top of it. The station would be launched with a two-astronaut crew inside Gemini.

Once in orbit, the crew would enter the MOL and then become high-altitude photo tourists over interesting parts of the Soviet Union, such as military bases. At the end of their photoreconnaissance foray, the astronauts would return to Gemini and then splash down, together with some interesting cassettes of exposed film. MOL was cancelled in 1969, but not before a crude prototype was sent on a test launch without a crew on board.

Similarly, the Soviet Union developed and flew the TKS system, a small pressurised module with a conical re-entry capsule at its tip (known as VA). This was originally expected to replace Soyuz as a ferry vehicle to Russian space stations (principally military ones), but TKS never fulfilled this role. Its most famous role was the Cosmos 1443 mission, which docked with the Salyut 7 space station, expanding the space available to the crew, and giving them a chance to return material to Earth in the TKS capsule. TKS never became a Soyuz replacement, but it did act like an upgraded version of the Progress supply spacecraft.

With Soviet and American precedents to draw upon, it is unsurprising that China has at least considered launching a space station with a crew capsule at the same time. But why? One potential advantage lies in the fact that there's no need to two launches, or the potential hazards of rendezvous and docking. All mission elements are on the one rocket, in

the same place.

But the Chinese architecture does have the disadvantage of allowing only one crew to visit the station, and also possibly destroying the station at the end of the mission. This could be explainable if the Chinese station, like MOL and the Almaz military stations that the Soviet TKS was designed to service, is military. China may wish to destroy the space station over Chinese territory once its primary mission is complete, to prevent debris from falling into foreign hands. Future missions could be serviced by brand new space stations, probably placed into different orbital inclinations to favour different photographic targets.

Like MOL and the TKS before it, this Chinese capsule/station combination seems to have failed to live up to its original plans. Problems in developing the new Chinese heavy-lift rocket could be one show-stopper. But there's also the possibility that, after Shenzhou 6, China has concluded that manned photoreconnaissance from space isn't worthwhile. Other analysts have speculated that Shenzhou 6 aimed to test the usefulness of using astronauts for photoreconnaissance. If the previous experiences of the USA and Russia are any guide, they were probably disappointed. The general consensus among military space observers is that this a job best left to unmanned satellites, for technical and economic reasons.

So, China must look for new directions with its space station program, and this probably de-emphasises the need for a Chinese MOL.

There could be another hidden aspect to the sidelined space station. Has a factional battle erupted somewhere within China's manned space program? The early Soviet space program, which holds so many parallels with China's own human spaceflight efforts, was legendary for its Titanic power struggles between "Chief Designers" such as Korolyev and Chelomei.

Alternative plans for human spacecraft and space stations were advanced as ways to enable one designer to trump the other. Has such a war broken out behind closed doors in China? Has the Big Station faction lost ground? The details will probably remain obscure for years to come.

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