

China Might Be Planning Early Space Station Attempt

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If a picture paints a thousand words, then a few remarks about the future of the Shenzhou program can spawn a journalist to write more than a couple of thousand. That's going to be the rough total of the two commentaries I have now composed from dissecting the latest statements of Qi Faren, one of a handful of senior names publicly linked to the Shenzhou program.

Qi is described as a "former Shenzhou chief designer" in the latest Chinese state media report, which is a somewhat ambiguous statement. Certainly, if the final aspects of the design of Shenzhou have been finalised, it would be correct, if somewhat pedantic, to say that Qi is no longer designing the spacecraft. But the term "chief designer" also carries implications of holding a particular executive position, just as senior officials in the Soviet space program (such as Sergei Korolev) were known as "chief designers". Some insight into the internal bureaucracy of the Shenzhou program could be revealed by this.

In my earlier 2006 piece (Spacewalk for Shenzhou), I pointed out that the spacewalking plans for Shenzhou 7, to be launched in 2007, were on-track with previous reports. They also represented a logical, methodical progression in goals for the first Shenzhou missions. If Shenzhou 7 achieves its goals of demonstrating multiple crewmembers on an extended mission (several days in orbit) with EVA, it will be an outstanding achievement. More to the point, it will mean that China has done just about everything that can be accomplished with a free-flying capsule-style spacecraft. Any future "solo" Shenzhou missions would

simply be repeating tasks that had been previously demonstrated.

It's logical that China would plan more ambitious feats for missions beyond Shenzhou 7. China has previously stated that it intended to perform a docking with a mission soon after Shenzhou 7, and that the launch of a small "space laboratory", or space station, was being planned. But official statements were scarce and nondescript. Some seemed to imply that a crewed Shenzhou spacecraft would dock with the abandoned Orbital Module of another Shenzhou, left in orbit by a previous mission. Other theories suggested a docking between two Shenzhou spacecraft, one of which would hold no crew. Or two crewed Shenzhou vehicles could dock, and possibly exchange crewmembers.

The "space laboratory" was expected to come later, once China had introduced a new generation of heavy-lift rockets. The Long March 2F rocket, which launches Shenzhou, was apparently not powerful enough to lift it.

All change! The goals of rendezvous, docking and space stations are still there, but now in a different format. Reports state that a roughly three year-long hiatus will ensue after Shenzhou 7, with the next mission slated for 2010. But results should be worth the wait. Shenzhou 8 will be a "space laboratory module" with two docking ports. It will weigh eight tonnes. Then, in less than a month, Shenzhou 9 will be launched without a crew on board. It will dock with Shenzhou 8 and become a "second module" for the laboratory. Then, after another interval of less than a month, Shenzhou 10 will be launched. This will carry a crew to the newly orbited space complex. China will have united three spacecraft in orbit.

It's an ambitious plan, but probably quite feasible. But what exactly will this complex look like? China has previously released some images of a small, stubby cylinder with the Chinese characters for "space laboratory"

painted on its side. The laboratory was not unlike the Spacelab module built by the European Space Agency for the Space Shuttle's cargo bay. Is this the module that will be launched? Or is it just a forerunner for a new, modified version? China has stated that the design has changed to include two docking ports, unlike its original plan for a laboratory with a single port. But what else has changed? Perhaps the new module bears no resemblance to the prototype we have seen.

The specification of "eight tonnes" in mass is also noteworthy. According to published data, this is well within the lifting capacity of China's existing Long March 2F launch vehicle, or a potential variation on this vehicle. Perhaps a slightly modified Long March 2G vehicle, specially designed for this laboratory, could be introduced. It could feature an expanded payload fairing with no escape system. With no crew aboard, other safety equipment could also be deleted.

This suggests that China may simply want to hurry up the launch of its first space station, given the fact that Shenzhou 7 will finish all the major tasks that can be accomplished on solo flights. But it could also signify a shift away from dependence on the proposed heavy lift vehicles that were expected in the near future. Have there been problems in introducing these new rockets? Perhaps technical, budgetary or political setbacks have scuttled any chance of seeing a next-generation lifter introduced in the near future.

China could have conducted Shenzhou-to-Shenzhou dockings as a gap filler, and an interim step to docking with a space station. But this would have taken more time and money. It seems that the Chinese want to extract as many benefits and achievements as possible from every mission. This is understandable, given the slow rate of launches. So achieving docking and station goals together makes sense.

But China is setting out to achieve a three-spacecraft complex as its first

space station project. Is this going to far, too soon? Not really. The first docking is totally uncrewed, taking place between the station and the unoccupied Shenzhou 9. Potential safety risks to the crew are thus minimised. China would probably not want to attempt a manned docking without a practice run, and this has the added advantage of allowing the spacecraft to be used for other purposes once the docking test is complete.

I assume, without proof, that the Shenzhou 9 vehicle will actually be a traditional Shenzhou spacecraft. The use of the term "Shenzhou 8" to describe their space station is somewhat confusing, and suggests that "Shenzhou" now refers to the program as much as the spacecraft.

Shenzhou 9 will have no crew, but it will probably not be empty. China is probably planning to stock it with consumables for the space station crew, much in the way that Russia sends up supplies to space stations on its Progress vehicles. But making the delivery on a fully configured Shenzhou offers advantages. It allows China to test rendezvous and docking procedures using exactly the same vehicle that will carry the first station crew. It also provides a "lifeboat" for the station, in case problems with the crew's own Shenzhou develop. It also means that China doesn't have to design and test their own equivalent of Progress yet.

China may even deliberately elect for the crew to return on Shenzhou 9 as a test of "Shenzhou swap", just as Soyuz spacecraft are regularly interchanged on space stations.

The creation of a two-spacecraft complex before the arrival of the first crew on Shenzhou 10 also points to another logistical issue. A fully useful space station cannot be launched with a single flight of the current Long March system. The previous design, slated for launch by a heavy lift rocket, only featured one docking port. All the consumables and

interior room required by the crew would be carried in one shot, so there was no need to receive cargo vessels or additional modules. So the two-spacecraft complex is not merely a way of adding redundancy or resupply. It's the only way to assemble a sufficiently large station to make an extended mission worthwhile. Thus, China's space laboratory could be accurately regarded as a small modular space station.

For many years, analysts have noted the preparation of two launchpads at Jiuquan that seemed earmarked for Shenzhou. They speculated that China may have been planning to launch two Shenzhou spacecraft into orbit at almost the same time. Such plans now seem unlikely, but both pads will be necessary to support a flight rate of three missions in roughly three months. China will also need to ramp up its rocket and spacecraft production to deal with this demanding schedule.

But just when it seemed we had enough to tease us, Qi has also noted that there will be "a small, man-tended space station" launched in 2011 or 2012. Is this a second-generation version of the station China intends to launch on Shenzhou 8? Or is this something more ambitious, possibly launched by the long-awaited heavy-lift Long March? Perhaps China's plans will change yet again in the interim. In the meantime, we have plenty to anticipate.

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