Crashing space station shows why China must start to collaborate in orbit

September 27 2016, by Monica Grady

Workers wave flags as the rocket carrying the Shenzhou-9 spacecraft being moved to the launch pad. Credit: EPA

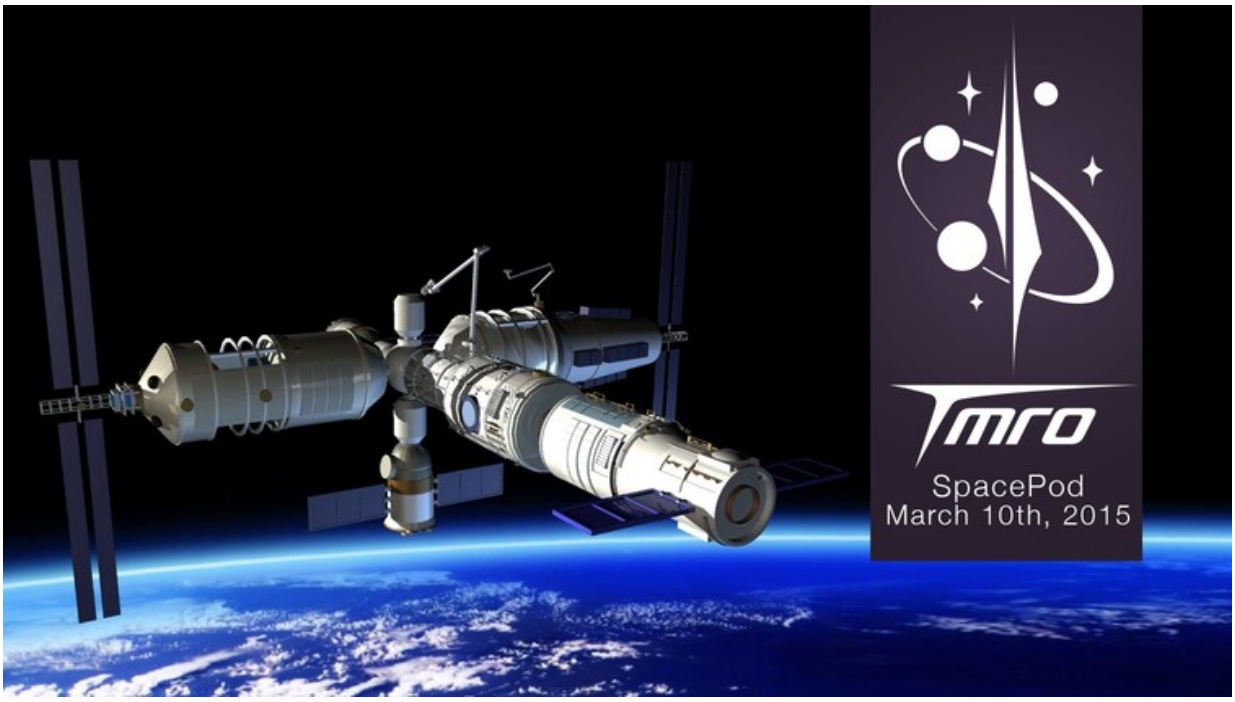
China launched the second vehicle in its "Tiangong" (meaning "Heavenly palace") programme to construct a space station in early September.

Despite the success of the launch, the announcement was overshadowed by the acknowledgement that the prototype module Tiangong-1 – which was always due to be replaced – is out of control and will, almost certainly, crash back down to Earth in late 2017.

The Chinese Space Agency revealed its plans to build a space station in 2007, and since then has made great progress towards achieving its goal. Tiangong-1 was unmanned, but was involved in three separate docking events with the Shenzhou transport vessel. Schenzhou 9 and 10 carried the first (Liu Yang) and second (Wang Yaping) Chinese female astronauts.

Tiangong-1 operated for its full two-year lifespan. The original programme suggested it would go through a planned de-orbiting prior to controlled Earth re-entry. The operation was extended for a further two years. There were no additional trips to the spaceship, and no news of what the purpose of its extended lifetime was – apart from a test of the space worthiness of components.

In March 2016, the Chinese Space Agency announced that Tiangong-1 had come to the end of its life, and also revealed that they had lost communication links with the satellite. In mid-September, the Chinese Manned Space Engineering (CMSE) Office confirmed that they were no longer able to control the satellite's orbit.



Tiangong-1. Credit: TMRO/youtube, CC BY

Calculating the risks

The announcement from CMSE came as no surprise to those working with satellites: all spacecraft in orbit around Earth are tracked, both by government agencies and enthusiasts among the public. It has been clear since the beginning of the year that Tiangong-1 was not following its planned trajectory – and calculations now predict that it will fall to Earth in 2017. Although de-orbiting of the spacecraft will not be controlled, according to CMSE most of it will burn up in the Earth's atmosphere, and there is little chance of flaming debris falling on populated areas.

This reassurance has not been accepted without comment. It is predicted that debris will land anywhere between 43° north and 43° north south of the equator, a large swathe of the globe in which almost 90% of human

population resides. The odds of a specific person being hit are very low, but the chance of someone being hit are relatively high, about 1 in 3,200. Eight tonnes of burning metal will certainly also be observable in the sky – and plenty of observers will track the spacecraft, even if its final entry point will not be known until entry occurs.

That said, we have survived far greater objects crashing to Earth in the past. The 150-tonne MIR space station burnt up in 2001 over the Pacific Ocean. This didn't harm anyone but resulted only in a few fragments falling down. Similarly, the 77-tonne Skylab re-entered 1979 over the Indian Ocean without causing any damage.

We survived MIR crashing – and it was way bigger. Credit: NASA

Isolated nation

One issue highlighted by Tiangong-1 is the Chinese Space programme, which operates almost completely independently of other space agencies.

While it is often good to have competition – because that is what drives innovation and achievement – there are areas where international cooperation is important. Although international cooperation may not have prevented the problems with Tiangong 1, better appreciation of technical developments, including communications, made by all users of the space environment, can only help to raise the level of technical advance by all. Big collaborations are likely to lead to fewer problems, and when there is a problem, collaborative expertise can help solve it more easily.

There is a clue to one of the great successes of the International Space Station in its name. Even though political relationships between the US and Russia are frosty at times, the ISS acts as a major diplomatic link between the two nations. It would be wonderful if a similar bridge could be built with China. Unfortunately, a Decree by the US Congress in 2011 banned US scientists from bilateral collaboration with their Chinese counterparts, and it would take presidential intervention to set this aside. But the American political situation currently suggests such intervention is unlikely in the near future.

There is hope, though, that the European Space Agency and RosCosmos (the Russian Space Agency) could facilitate access by China to the ISS: a collaborative agreement between ESA and the CSA signed in 2014 set up several working groups to explore areas of common interest to the space agencies. If one of the Schenzhou spacecraft that serviced the Tiangong-1 space station could dock at the ISS (through agreement with ESA and RosCosmos), then the scientific and engineering achievement may pave the way for diplomatic and political negotiation.

Another issue raised by the incident is the much-debated subject of who owns space. Who is responsible when something goes wrong? The bottom line is, of course, who pays? The United Nations has an Office of Outer Space Affairs in which specialists in space law have drawn up

treaties to cover such eventualities – but these are, by and large, designed to cover government responsibilities. But as space becomes ever more accessible, and tourism and resource exploitation led by private enterprise move closer to reality, existing laws and treaties are inadequate. It is surely time for a major reappraisal of space governance, in the way that the United Nations Convention on the Law of the Sea is regularly reviewed.

Let's hope that the prospect of burning debris from Tiangong-1 raining down on Earth will herald a new area of cooperation between space agencies, a new set of treaties on space law – and a real prospect for truly international space exploration.

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