



China's Shijian-21 towed dead satellite to a high graveyard orbit

Description

CHINA: China's Shijian-21 space debris mitigation satellite has docked with a defunct Chinese satellite to drastically alter its geostationary orbit, demonstrating capabilities only previously exhibited by the United States.

Data and tracking from space monitoring firms show that Shijian-21 has been conducting sophisticated rendezvous and proximity operations (RPO) with other objects in and around the geostationary orbit belt since its launch in October last year.

This activity culminated in Shijian-21 docking with the defunct Beidou-2 G2 navigation satellite and towing it above the crowded belt of geostationary orbit some 36,000 kilometers above the equator.

In late December, Shijian-21 approached the defunct Beidou-2 G2 navigation satellite, matching its orbit and rendezvousing with, and eventually docking with the spacecraft, a video representation from space situational awareness (SSA) company COMSPOC shows.

Brien Flewelling of ExoAnalytic Solutions, speaking during a webinar hosted by the Center for Strategic and International Studies (CSIS) and the Secure World Foundation, said that Shijian-21 performed a large burn Jan.22, [taking the Beidou-2 G2 satellite 3,000 kilometers](#) above the GEO belt.

The docking and subsequent engine burn — which was unusually large, taking it beyond the usual “graveyard” orbit of 300 kilometers above GEO — has effectively moved it out of harm's way.

Shijian-21 undocked from Beidou-2 G2 on Jan. 26, leaving the defunct satellite in a disposal orbit. Shijian-21 has since returned to GEO, according to newly-released tracking data from U.S. Space Force's 18th Space Control Squadron (SPCS).

Beidou-2 G2 failed in orbit following its 2009 launch, has been drifting since 2010 and may have partially fragmented at some point.

Satellites in geostationary orbit match Earth's rotation and thus appear to be fixed over a point on

Earth below, making the GEO belt valuable orbital real estate for monitoring weather, communications and surveillance.

European and American entities are also working on On-Orbit Servicing, Assembly, and Manufacturing (OSAM) capabilities. Space Logistics, a wholly-owned subsidiary of Northrop Grumman, has launched two [Mission Extension Vehicles](#) (MEV-1 and MEV-2) and has released footage of rendezvous with target satellites.

“In regards to how one perceives this, it could go either way,” says Victoria Samson, Washington Office director at the Secure World Foundation. “You could look at China working to develop the capability to remove inactive satellites on orbit as a way in which it is being a responsible space actor and cleaning up debris that it caused. Or you could use the lens that a lot of the US-based China watchers use and say that this could indicate that China is developing an on-orbit offensive capability.”

China describes Shijian-21 as a space debris mitigation satellite. Still, no details of the satellite nor its planned objectives were released by its developer, the state-owned China Aerospace Science and Technology Corporation (CASC), following its successful launch. The classified nature of the mission suggests it may have at least some military stakeholders or objectives.

The launch, however, followed the [unveiling](#) of a servicing satellite model by the Shanghai Academy of Spaceflight Technology (SAST) at an airshow a month earlier, described as a space fuel tanker. A model of the spacecraft featured robotic arms which could be used for attaching to another spacecraft.

On Nov. 1, SPCS [cataloged a new object](#) alongside Shijian-21 with the international designator 2021-094C. The object was used for early RPO and inspection tests before Shijian-21 targeted the Beidou satellite, COMSPOC tracking shows.

“One thing that I find helpful here is that the existence of commercial SSA providers has allowed us this level of transparency and the ability to even discuss this capability by the Chinese,” says Samson.

While debris removal and on-orbit servicing to prolong the lives of satellites is becoming a reality, the same activity could be used for military means to disable or otherwise interfere with a satellite.

“I do like the idea of a precedent where countries feel obligated to tow their dead satellites and spent upper stages from the active GEO belt. I just wish China had done this activity with more transparency,” says Brian Weeden, director of program planning for the Secure World Foundation.

Weeden notes that China itself lumped together the MEV-1 with two explicitly military systems, the X-37B and CCS, in its [response](#) to United Nations General Assembly resolution 75/36 on threats to space capabilities.

“Deliberately blending all these activities together is not helpful, particularly if China itself wants to be doing similar debris removal and satellite servicing activities and have them not immediately judged as suspicious.”

USA 270, Chinese Shiyan-12 encounter

At the same time as orbital servicing and space tug tests, countries are also engaging in increasing counterspace activities. While China is able to conduct precise operations all the way up at GEO with satellites while receiving active signals, the country also has advanced levels of SSA, as evidenced by activity detected during a close encounter of American and Chinese satellites.

COMSPOC notes that this month [USA 270](#), a U.S. satellite, neared a pair of new Chinese technology test satellites, [Shiyan-12 \(01\) and \(02\)](#), as it drifted East just below the GEO belt during its operations.

“As you can see, as that [USA 270] satellite gets close, and does a maneuver in the vicinity of these two Chinese satellites, within a matter of two days, the Chinese satellites are on the move,” says Jim Cooper, lead for SSA solutions with COMSPOC.

“China has clearly been monitoring this satellite as it approaches; they’ve seen what the U.S. has done to maneuver, in a way that potentially could impact their satellites.

“They processed that; they understood it. And they effectively planned and executed a mitigation strategy around that U.S. satellite,” Cooper says, seeing both of these satellites leave the area in synchronicity to get away from that U.S. satellite.

“What we’re showing here is counterspace technology. So, they’re kind of employing a tactic, technique [and] procedure, or TTP, as it’s known by the U.S. Department of Defense, and are showing that they’ve got the exquisite, timely and responsive SSA to understand events that are unfolding.”

The closest approach between the U.S. and one of the Chinese satellites was around 73 kilometers, according to COMSPOC. Not close enough to threaten a potential collision, but enough for one party to decide if it wanted to leave the vicinity to avoid potential intelligence gathering or other activities by the other.

Such close approaches are not forbidden by existing space legislation but indicate a context of growing counterspace activity among major space powers.

“It’s happening more frequently,” says Cooper. “So this is the kind of thing that, going back three years, four years ago, did not happen.

“Over the past several years, we are starting to see these types of scenarios play out more where other countries are approaching and trying to do things around other countries’ satellites. And then we’re seeing those other countries’ satellites react to that situation and do something about it.”

Article updated at 5:27 p.m. Eastern, Jan. 27, to update on Shijian-21 undocking and return to GEO.

by Andrew Jones

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