

Satellite internet

A thousand sails

China is building a system of its own to rival Elon Musk's Starlink

On DECEMBER 5TH a Long March-6a rocket (pictured) blasted off from Tai-yuan Satellite Centre, in Shanxi province in northern China. Aboard was the third batch of satellites for the Qianfan, or "SpaceSail" network, which aims to deploy a "mega-constellation" of thousands of satellites to beam fast internet access to users anywhere in the world.

Qianfan is similar to Starlink, a satellite-internet service provided by SpaceX, Elon Musk's rocket company. Starlink has been a big success in the four years since it started operations, signing up airlines, cruise ships and more than 4m individual users, and helping boost SpaceX's valuation to a reported \$350bn. Providing snappy, high-speed internet anywhere on Earth requires enormous numbers of satellites. Starlink already has almost 7,000 of them in orbit. It has regulatory permission to fly up to 12,000 within the next few years, and has filed paperwork requesting as many as 42,000 in total.

Qianfan appears to be designed on a similarly heroic scale. Although precise details are hard to come by, documents filed with the International Telecommunication Union, which regulates such things, suggest the constellation could eventually grow to nearly 14,000 satellites. The first two batches, of 18 satellites each, were launched in August and October. Reports in Chinese state media suggest a target of

648 satellites in space by the end of 2025. Qianfan, which is backed by the Shanghai city government, appears to have beaten GuoWang, a similar constellation backed by China's central government, to orbit.

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The system could help connect people in China's rural hinterland to the internet. Despite the country's rapid industrialisation, around 300m people are thought to lack regular internet access. Starlink is not an option since that network does not have an operating licence in China, whose authorities run a sophisticated and pervasive system of internet censorship. And Qianfan might find markets overseas too—besides China, Starlink is also forbidden from operating in Iran and Russia.

Even countries that are not outright hostile towards America might welcome a competitor to SpaceX, says Steven Feldstein, an analyst at the Carnegie Endowment for International Peace—especially given the close links between Mr Musk and Donald Trump, America's president-elect. "Even countries with a more neutral foreign policy, like India or Turkey—that might give them pause," he says.

In November, for instance, Qianfan announced a deal with the government of Brazil. Earlier in the year Mr Musk had entered into a bitter public row with a Brazilian judge who had been investigating X, a social network that Mr Musk owns. As part of the dispute SpaceX's Brazilian bank ac-

counts were frozen. Afterwards the firm said it would not comply with the judge's order to block Brazilian users' access to X, though it later backed down.

Qianfan is part of a suite of technologies that make up China's space ambitions. "We've seen a pretty wide push when it comes to Chinese investment in space technology," says Mr Feldstein. He cites projects like the Tiangong series of space stations, or the Chang'e-6 mission, which in June became the first probe to return samples taken from the far side of the Moon, as well as China's ambitions to land astronauts on the Moon by 2030.

Rather than more scientific firsts or space-exploration prestige, though, Qianfan's other use is likely to be military. "It's becoming increasingly clear that [megaconstellations] are a strategically important piece of infrastructure for countries of a certain size and ambition," says Blaine Curcio, who runs Orbital Gateway Consulting, a business based in Hong Kong that focuses on the Chinese space industry. China's government made building a Starlink-style mega-constellation an official priority in 2020. Governments in Europe, India, Russia and Taiwan have all expressed interest in building constellations of their own.

Starlink has proved its military utility in Russia's war against Ukraine, where Ukrainian soldiers came to rely on the system as a means of fast, ubiquitous front-line connectivity, useful for everything from controlling drones to communicating with headquarters. Besides its uses there, SpaceX has set up a dedicated government division called Starshield. It has signed deals with America's Space Force and with the National Reconnaissance Office, which runs the country's spy satellites.

One looming question is how quickly China can build the system it has designed on paper. The country presently lacks access to reusable (and therefore much cheaper) rockets like SpaceX's Falcon 9, which are used to launch Starlink satellites, let alone the much bigger, cheaper Starship rocket that the firm is testing. SpaceX has also been able to drive down the cost of both the satellites themselves and the high-tech antennas necessary to receive their signals on the ground.

But China is good at mass production. And, says Mr Curcio, it has a thriving cluster of between 40 and 50 rocket-launch startups, many of which are hard at work on reusable rockets. Some of those engineers seem to have been taking copious notes: at a trade show held in November, the state-controlled China Academy of Launch Vehicle Technology unveiled a version of the Long March-9, a new rocket it is developing, that bore a remarkable resemblance to SpaceX's Starship. It is due, apparently, to make its first flight in 2033.