# China’s satellite expansion raises new alarms over space debris and orbital safety



The rapid expansion of China's satellite capabilities, through ambitious projects like the Guowang and Qianfan constellations, is stirring unease within the international community. With plans to deploy over 20,000 satellites, primarily in low Earth orbit (LEO), concerns regarding orbital congestion and the associated risks of space debris have come to the forefront. As these initiatives progress, the management—or, some argue, mismanagement—of space debris becomes increasingly critical, heightening the potential for incidents that could threaten both existing satellites and future space missions.

At the heart of the issue lies China's practice of leaving spent rocket boosters in high, persistent orbits. These elements of rocket stages can remain in space for over a century, representing a long-term risk for collisions. Commentators point to China's recent launches, including those for the Tiangong space station, which ended in uncontrollable reentries. One such incident forced Spain to close parts of its airspace, underscoring the immediacy of the threat. Experts like Jim Shell observe that with more than 1,000 additional launches projected for China’s constellations, the country could soon account for a significant portion of the orbital debris in LEO.

Further complicating matters, the altitudes at which China is launching its satellites are notably higher than best practices suggest. The Long March rockets, including the Long March 6A and 8, which operate at altitudes between 447 and 484 miles, allow debris to persist far longer than necessary due to reduced atmospheric drag. Meanwhile, China’s Guowang and Qianfan are situated even higher, at approximately 621 miles, nearly double the altitude of competing initiatives like SpaceX's Starlink. Though China has developed a self-deorbiting upper stage known as Yuanzheng-2, its usage remains limited, raising vital questions about the country's commitment to safe orbital practices.

The international reaction to China’s approach has been critical. Following a particularly hazardous uncontrolled reentry in 2022, former NASA Administrator Bill Nelson publicly appealed for transparency and cooperation among nations. This cautious tone reflects growing apprehension about potential disasters stemming from space debris, particularly as China continues its aggressive expansion in satellite technology. Harvard astronomer Jonathan McDowell has indicated that the risks associated with Chinese rocket reentries are higher than those posed by other nations, emphasising the need for responsible behaviour to minimise environmental hazards.

China is not the sole actor contributing to the growing problem of space debris. SpaceX, with its Starlink constellation, has also faced scrutiny. Planning to launch 30,000 additional satellites on top of its current fleet of over 6,700, the company has drawn attention not just for the volume of satellites but also for obstruction of scientific observations due to the reflective nature of its hardware. As the threat of Kessler Syndrome looms—a scenario where a single collision escalates into a cascade of further impacts—the necessity for responsible deployment and management of satellites becomes ever more pressing.

Moreover, as geopolitical tensions mount, particularly regarding competing interests in high-speed satellite internet services between the likes of SpaceX and state-backed Chinese initiatives, there exists an added layer of complexity. China's plans to deploy 15,000 satellites by 2030 through its SpaceSail initiative are viewed not only as a challenge to Starlink's dominance but also as a potential extension of Beijing's influence into global digital realms. This highlights the intersection of space technology with broader military and strategic concerns, raising questions about how satellite services will be employed in international relations.

In conclusion, as both China and its rivals expand their satellite networks, the implications for scientific research, environmental stability, and international cooperation must be carefully navigated. The current trajectory indicates a race toward not just technological advancements but the very sustainability of our shared orbital environment. As nations grapple with the balance between innovation and preservation, the responsibilities of all space-faring entities will only grow in significance.

### Reference Map

1. Paragraph 1: (1), (2)
2. Paragraph 2: (1), (2)
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## Bibliography

1. <https://www.sustainability-times.com/policy/chinas-satellite-swarms-are-a-threat-starlink-rival-could-overwhelm-earths-orbit-and-spark-global-space-crisis/> - Please view link - unable to able to access data
2. <https://www.sustainability-times.com/policy/chinas-satellite-swarms-are-a-threat-starlink-rival-could-overwhelm-earths-orbit-and-spark-global-space-crisis/> - China's ambitious satellite megaconstellations, including the Guowang and Qianfan projects, each consisting of 10,000 satellites, are raising concerns about orbital congestion and space debris. The practice of leaving spent rocket boosters in orbit could lead to long-lasting space debris, posing collision risks for over a century. China faces criticism for a lack of transparency and adherence to international best practices in managing space debris. The global race for satellite dominance raises the threat of Kessler Syndrome, potentially affecting scientific research and environmental safety.
3. <https://time.com/6235112/chinese-rocket-space-debris-threatens-starlink/> - An uncontrolled breakup of a Chinese Long March 6A rocket's first stage at around 500 km above Earth has created debris posing a risk to SpaceX's Starlink satellites. Observations have identified more than 40 fast-tumbling fragments. Speculation about the incident being deliberate arises from China's objection to Starlink, which aids Ukraine's military, posing a perceived national security threat to China. However, with China's Tiangong space station in a lower orbit, hosting three astronauts, it's unlikely China would intentionally add risk to its own space assets.
4. <https://www.axios.com/2022/11/15/space-norms-china-rocket-boosters> - The uncontrolled reentry of rocket debris from China's Long March 5B, which fell into the Pacific Ocean on November 4, 2022, highlights significant concerns surrounding space safety and existing norms. As space becomes increasingly populated with satellites, rockets, and even humans, clear and adhered-to guidelines are essential to prevent potential damage, harm, or international conflict. Notably, no other major space-faring nations, including Russia, intentionally allow their large boosters to crash uncontrolled. While China is a repeat offender, it is not alone in past uncontrolled reentries. Although the likelihood of being struck by falling space debris is currently minimal, repeated or increased occurrences elevate the risk to populated areas. Establishing and enforcing behavioral norms among nations may prove challenging but is critical to maintaining space safety, especially as more nations engage in space activities.
5. <https://time.com/6203176/space-debris-chinese-rocket-spacex/> - The article reports on the growing threat of falling space debris. The first instance of space debris occurred when Sputnik, the world's first satellite launched on October 4, 1957, fell back to Earth on January 4, 1958. Since then, a large amount of space junk has accumulated, posing risks to spacecraft and people on Earth. Recently, the 25-ton core stage of a Chinese Long March 5B rocket fell uncontrollably, with debris landing near villages in Borneo. Additionally, debris from a SpaceX mission was found on an Australian farm, highlighting that both national and private space programs contribute to the problem. NASA criticized China for not sharing trajectory information, although SpaceX's incident also raised concerns. The article calls for international cooperation to manage space traffic and address the growing debris issue to ensure safe and open access to space in the future.
6. <https://www.reuters.com/technology/musks-starlink-races-with-chinese-rivals-dominate-satellite-internet-2025-02-24/> - Elon Musk’s Starlink is facing increased competition in the high-speed satellite internet sector, particularly from Chinese state-backed SpaceSail and Jeff Bezos’s Project Kuiper. SpaceSail, based in Shanghai, plans to deploy thousands of LEO satellites, with expansion projects in over 30 countries including Brazil and Kazakhstan. The company aims to launch up to 15,000 satellites by 2030, challenging Starlink’s dominance. China is heavily investing in satellite technology, with significant funding for rival networks and a push for international influence through these developments. The expansion of satellite internet services has raised concerns about potential extensions of Beijing's internet censorship and geopolitical influence. Researchers call for close cooperation with global nations to contest China's digital dominance. Meanwhile, China is also developing tools and algorithms to monitor and track Starlink's megaconstellations, highlighting the growing intersection of space technology and military research.
7. <https://time.com/6228973/china-tiangong-space-station-rocket-danger/> - China recently completed its Tiangong space station with the launch of the Mengtian module via a Long March 5B rocket. While this accomplishment has notable scientific and international cooperation aspects, attention has been drawn to the 23-ton first stage of the rocket undergoing an uncontrolled reentry back to Earth. This scenario is not new; previous Long March 5B launches also resulted in similarly uncontrolled and potentially hazardous reentries. NASA's Administrator Bill Nelson criticized China for not sharing trajectory information, which is crucial for predicting landing zones and mitigating risks. Despite the potential dangers, experts like Henry Hertzfeld suggest the risk of any individual being harmed remains low. China, bound by the 1972 Liability Convention, could be opting to deal with possible damage compensation financially rather than adjusting the Long March 5B technology for controlled reentry.