

Observing US-China “Near space” Competition through the Spy Balloon Incident

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1. How high-altitude balloons intrude the US airspace

The discovery of Chinese high-altitude balloons in US airspace has further escalated tensions between the two countries. US intelligence officials believe that the Chinese high-altitude balloons are part of an extensive surveillance program conducted by the PLA, which has carried out at least 20 missions in recent years. There were similar sightings in Taiwan and Japan, but it is not clear if they are related to the balloons found in the US. It's been reported that there were two occurrences during the Biden administration; the most recent was in February 2022, when a similar high-altitude balloon approached the US Pacific Missile Range on Kauai, Hawaii. There were also 2 to 3 times during the Trump

administration period.

The North American Aerospace Defense Command (NORAD) began tracking the balloon as it approached US airspace. It passed north of the Aleutian Islands on January 28 and moved over Alaska, then into Canadian airspace. On January 21, the balloon re-entered US airspace from Idaho and passed through Montana on February 1 before approaching St. Louis on February 3. The balloon's flight path was judged to have passed through important US military facilities, including the Minuteman Ballistic Missile Launch Base in Montana. A report pointed out that the balloon was launched from Hainan Island and was originally intended to carry out reconnaissance missions over Guam; for unknown reasons, it deviated from the

route before drifting north to Alaska.¹

US officials said the US had taken actions to prevent the balloon from obtaining sensitive information while it was over Malmstrom Air Force Base in Montana. Malmstrom is home to the US Air Force’s 341st Missile Wing and the US Air Force Global Strike Command (AFGSC), where the Minuteman III intercontinental ballistic missiles are deployed. With 150 underground silos, Malmstrom is one of three US ballistic missile bases. Montana Senator Steve Daines said the balloon was used to conduct intelligence acquisition missions on US ballistic missile bases.²

On February 14, 2022, the US Pacific Air Forces sent F-22 fighters on a rapid response mission to Kauai, the northern tip of the Hawaiian Islands. A suspected Chinese balloon invasion was discovered, and civilian footage showed the balloon

appeared to be in a stationary state. The island houses rocket test sites of the US Department of Energy and the Sandia National Laboratories, and the western end has an even larger Pacific Missile Range, the US military’s most sensitive and advanced test site. Equipment including missile defense radar, Patriot missiles, and SM-6 missiles are tested there, which is bound to attract a high level of interest from the rivals of the US.³

2. Missions of the high-altitude balloons

The US had sent U-2 reconnaissance aircraft and RC-135 electronic reconnaissance aircraft to monitor the balloon. After President Joe Biden ordered the balloon shot down, two F-22s from the US Air Force 1st Wing neutralized the balloon at 2 pm local time on February 4 off the North Carolina coast. The F-22

1. “U.S. Tracked China Spy Balloon from Launch on Hainan Island Along Unusual Path,” *Washington Post*, February 14, 2023, <https://www.washingtonpost.com/national-security/2023/02/14/china-spy-balloon-path-tracking-weather/>.

2. “US Claims Suspected Chinese Spy Balloons Appeared in Sensitive Locations, and US Media Reports were Challenged with Two Major Suspicions,” *HK01.com*, February 3, 2023, https://www.hk01.com/article/863438?utm_source=01articlecopy=referral.

3. “F-22s Scrambled To Investigate A Mysterious High-Altitude Balloon Off The Coast Of Hawaii (Updated),” *the Drive*, February 18, 2022, <https://www.thedrive.com/the-war-zone/44352/f-22s-scrambled-to-investigate-suspicious-high-altitude-balloon-off-the-coast-of-hawaii>.

was flying at Mach 1.3 when it fired an AIM-9X missile 5 miles from the balloon to shoot it down. The F-22 pilot reported that the target was at 64,000 feet, and the F-22 fired the missile at 58,000 feet.⁴ Another two F-15Cs with Sniper targeting pods filmed the shooting process and marked the exact location of the balloons falling into the sea to facilitate salvage. In addition, another Navy P-8 patrol aircraft was close by to monitor the situation. The impact location needs to be far enough from shore to avoid endangering civilians and property on the ground and to ensure that the debris is scattered within US territorial waters before the balloon drifts more than 12 miles off the coast to enter international waters.⁵

Pentagon officials explained that the key to the shoot-down decision was the US intention to retrieve and analyze it and therefore understand its capability. The recovery operation would be very

different if the balloon were brought down in Alaskan waters. The Bering Strait is 13,000 feet deep, the winter temperatures are below freezing, and there is ice cover in northern Alaska, which poses additional risks to the recovery mission. However, the Department of Defense was still criticized by some Congress members for its slow decisions. The US House passed a 419-0 resolution condemning China for violating US sovereignty and requesting that the Biden Administration conduct a complete briefing to assess what data might have been collected and transmitted by the Chinese balloon as it passed through US airspace.⁶

The US is convinced that the balloon is part of a large surveillance program that China has been implementing for years; it has notified NATO and other allies since the US believes the Chinese surveillance program is active worldwide.

⁷ State Department officials also said the

4. “China Balloon: Many Questions about Suspected Spy in The Sky,” *AP news*, February 5, 2023, <https://reurl.cc/xl0LZL>.

5. “The Shooting Down Of China’s Spy Balloon In Moment-By-Moment Audio,” *The Drive*, February 7, 2023, <https://www.thedrive.com/the-war-zone/the-operation-to-down-chinas-spy-balloon-in-moment-by-moment-audio>.

6. “Chinese Balloon Wasn’t Downed Over Alaska Due to ‘Dangerous’ Recovery,” *Defense News*, February 10, 2023, <https://www.defensenews.com/congress/2023/02/09/chinese-balloon-wasnt-downed-over-alaska-due-to-dangerous-recovery/>.

7. “China Conducted Spy Balloon Program for Years, Pentagon Says,” *CAISRNET*, February 9, 2023, <https://www.c4isrnet.com/news/pentagon-congress/2023/02/08/china-has-conducted-spy-balloon-program-for-years-pentagon-says>.

balloon carries an array that could be used to collect meteorological and geolocation information, and it's equipped with a large solar cell array sufficient to power multiple active intelligence sensors.

Experts say such high-altitude balloons can provide advantages over satellites and drones with enhanced intelligence, surveillance, and detection capabilities. High-altitude balloons can fly closer to the ground than satellites and are capable of intercepting communications or electronic signals, which is impossible with satellites. The balloons can also take optical or infrared images or collect signal information. High-altitude balloons can provide more persistent and unpredictable coverage in the target area, while satellites are orbiting along a known trajectory that can be calculated. Balloons or airships can move in different directions taking advantage of air currents or automatic control systems, and they can also loiter over a fixed area for long periods.⁸

China insisted that the balloon was a civilian one that lost its course and condemned the US for shooting it

down, but the role of the balloon remains unexplained. Chinese Defense Minister Wei Fenghe also declined a request to speak with US Defense Secretary Lloyd Austin after the balloon was shot down. In addition to delaying Secretary of State Blinken's trip to China, the US announced sanctions against six related companies, while China also imposed retaliatory sanctions on US companies. The US has recently been repeatedly reported to have shot down unidentified flying objects as the subsequent impact of the balloon incident on the US-China relationship is still unpredictable.

3. Observing the US-China near space competition through the high-altitude balloon incident

This Chinese high-altitude balloon, flying at about 60,000 to 65,000 feet (18 to 20 km), should be a stratospheric balloon or aerostat flying at the altitude of “Near Space”. Near Space is the area between the altitude where traditional military and civilian air-breathing aircraft operate and the orbit of spacecraft or

8. “Why Stratospheric Balloons Are Used in Era of Space-Based Intelligence,” *CAISRNET*, February 6, 2023, <https://www.c4isrnet.com/battlefield-tech/space/2023/02/06/how-stratospheric-balloons-could-complement-space-based-intelligence/>.

satellites. It generally refers to the space between 20 and 100 km from the ground, including most of the stratosphere, the entire mesosphere, and part of the ionosphere. Except for rockets and experimental high-speed aircraft that traverse the atmosphere, humans have rarely ventured into Near Space in the past. With the development of technology, more countries are developing Near Space technology and considering that space as a new “high frontier” for national security.

Conventional aircraft fly in the troposphere below 65,000 feet (20 km). International airliners, such as Boeing 747 and other large passenger aircraft, fly at 40,000 feet; fighter jets fly at a maximum altitude of about 55,000 to 60,000 feet. The retired Concorde airliner cruised at 60,000 feet, while the SR-71 “Black Bird” reconnaissance aircraft can reach 80,000 feet (24 km). The denser atmosphere of the troposphere causes higher drag, making it difficult for conventional aircraft to fly at hypersonic speeds above Mach 5.

In space more than 100 km from the surface, the air is extremely thin; spacecraft or satellites cannot fly there

with aerodynamic force but rely on their own power from oxygen carried onboard. Although the air in near space is thin, aircraft is still controllable by aerodynamics; and there is a stable atmospheric environment with less drag. Chinese articles pointed out that Near Space can be used to expand the scope and depth of aerospace battlefields for military applications, which can form a seamless “air-space” warfare capability to support a vital strategic position.

The development and deployment of various types of aircraft and platforms in the Near Space arena will be a new area of power competition in the future. Near Space aircraft can be used in early warning, surveillance, communications relay, electronic warfare, navigation, and positioning to achieve effective interconnection and integration of air, space, and ground information. In addition, since Near Space aircraft can easily perform long-duration hypersonic flights, they are becoming the new favorite for long-range, rapid-strike weapons, and the pace of future war will also be significantly accelerated accordingly.⁹

With the development of new sensors

9. “Near Space: A New Military Front,” *Xinhua Net*, March 31, 2022, http://www.news.cn/globe/2022-03/31/c_1310523344.htm.

and materials, military applications of Near Space technology have become possible. In the intelligence, surveillance, reconnaissance, communications relay, early warning, navigation, and electronic warfare fields, Near space platforms have more advantages over air and space platforms.

Recent international developments of Near Space vehicles are mostly in the aerostat category, in which the US has started development earlier, and its technology is more advanced. The major US projects include high-altitude airships from the Missile Defense Agency for surveillance and communication relay, the “Near Space mobile vehicle” developed by the Air Force, and the inflatable, single-use high-altitude balloons and solar-powered drones by Johns Hopkins University.

The stratospheric aerostats have ultra-long endurance, short deployment cycles, lower cost than satellites, and broader coverage than ground stations. However, their development still faces technical challenges such as lightweight structure, RFC energy storage, thermal management, low-altitude operation, and system reliability.

4. China shows high interest in the Near Space applications

Although China claims that the balloons are only for meteorological research, internal documents show a significant increase in interest in the military applications of high-altitude balloons and similar devices, and it’s also looking to close the gap with other countries. An April 2022 article pointed out that one of the military uses of high-altitude balloons is to test enemy air defense systems. The article argued that balloons could be deployed to induce activation of the enemy air defense systems, which allows for easier electronic reconnaissance and assessment of the enemy’s detection and response capabilities. In addition, Chinese experts also believe that the balloons can collect high-altitude atmospheric data useful to the Chinese missile program or perform high-resolution photography to supplement the information acquired by satellites. The experts also believe that Near Space vehicles are more versatile and suitable for long-term observation for disaster warning, environmental research, wireless networks, and aerial reconnaissance than satellites.¹⁰

10. “China’s Balloons Are Part of A Strategy to Beat The US On A New Battlefield: ‘Near Space,’” *CNN*, February 10, 2023, <https://edition.cnn.com/2023/02/09/china/china-balloon-near-space-development-intl-hnk/index.html>.

A 2018 article in the *PLA Daily* pointed out that thanks to the rapid development of technology, information confrontation is no longer limited to land, sea, and low-altitude airspace; Near Space has become a new battlefield for modern warfare, and Near Space aircraft will play a key role in the future joint warfare from the outer space to the atmosphere.

The Institute of Aerospace Information, a Chinese Academy of Sciences division, is the unit most interested in high-altitude balloons. Its research articles are mostly scientific, including Near Space exploration and aerodynamics of balloons or aerostats, but there are also reports related to their military deployments and applications. In September 2022, the Institute for Aerospace Information was awarded a contract to develop a stratospheric balloon platform and later completed a balloon that could rise to 98,000 feet (30 kilometers) with a 1.2-ton payload. However, the Institute claims the research was not given a military mission.¹¹

In more than 1,000 Near Space

papers published by the Chinese military and civilians, most focused on near-space aircraft. In addition to procuring high-altitude balloons and related technologies from other countries, China established the Aerostat System Research and Development Center under the Institute of Aerospace Information to develop vehicles such as stratospheric test airships, tethered balloons, and high-altitude balloons that can rise to 40 kilometers. Many Chinese universities also set foot on the Near Space development. For example, Beihang University has developed an unmanned airship that flies at 65,000 feet, Shanghai Jiaotong University has a Near Space Innovation R&D Center, Zhejiang University has a Near Space aircraft Research Center, and the University of Chinese Academy of Sciences has a National Center for Space Science. Many other universities also have similar research projects and facilities.

Other Near Space aircraft include long-loitering, hypersonic, and suborbital aircraft. China’s Xingkong-2 wave-riding hypersonic aircraft is also a Near

11. “PLA Paper Called for the Development of More ‘Spy Balloon, Contradicting with Chinese Officials’ ‘Meteorological Research’ Claim,” *Up Media*, February 7, 2023, https://www.upmedia.mg/news_info.php?Type=3=165323.



Space vehicle. The future development of China’s Near Space sector and the competition among superpowers must be closely watched as the “Chinese spy balloon” incident marks the beginning of the confrontation between the US and China in the Near Space arena.

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