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A Glimpse into Chinese Space Prowess at the Zhuhai Air Show

T H Anand Rao

Senior Fellow, Centre for Air Power Studies



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The much-awaited air show in China kicked off at Zhuhai on November 12, 2024. This biennial aerospace trade expo has been held in Zhuhai, China, since 1996. It is an occasion that reveals China's rapidly expanding aerospace technology prowess. The Zhuhai Air Show, also called the China International Aviation & Aerospace Exhibition, is the largest air show in China. This year's exhibition and air display was held from November 12, 2024, to November 17, 2024.¹

China showcased its most advanced aviation, aerospace, and space technologies in this year's exhibition, highlighting its growing military aerospace capabilities. Amongst other aerospace technologies on display, the key attractions of its space technology included:

- (a) A model of a cargo space shuttle or a commercial uncrewed spaceplane.
- (b) A model of a next-gen fighter, which is an 'integrated space-air fighter.'
- (c) A reusable version of its Long March 9 rocket.

Spaceplane

The model of China's first commercial uncrewed spaceplane, which is also being called a cargo space shuttle, was displayed by the Aviation Industry Corporation of China, Ltd (AVIC), a state-owned aerospace company. A media release of AVIC revealed that it was being developed to deliver cargo to China's space station. According to the *China Daily*, the spacecraft brings "a low-cost reusable cargo shuttle solution with Chinese characteristics to space exploration". The *China Daily* also reported that China's Manned Space Agency awarded AVIC a contract for engineering flight verification of the spaceplane on October 29, 2024.²

The shuttle is named Haloong-1 or Sky Dragon.³ It will ferry logistical supplies back and forth to the Tiangong Space Station, which is already in orbit. The design of the spaceplane is said to be unique, allowing it relatively high manoeuvrability within the atmosphere and permitting more re-entry opportunities. The spaceplane will have to be launched in a conventional manner on a rocket. In an interview with the *Global Times*, the chief designer Fang Yuanpeng mentioned that the 'rear of the Haloong-1 shuttle will dock with the Tiangong Space station'. The space station crew will be able to access the shuttle's cargo bay to pick up and store goods. The return to earth on completion of the mission will be a re-entry and glide followed by a conventional landing on a runway. The shuttle is said to be 10 metres long and 8 metres wide with a 1.8-tonne cargo capacity. Its unique feature is its folding wings and solar arrays. Chinese state officials described the Haloong-1 as a "revolutionary reusable

spacecraft poised to transform space travel and drastically cut the cost of transporting cargo to China's space station". Presently, China sends cargo to its space station on the Tianzhou spacecraft. Tianzhou is a one-way cargo shuttle that burns up on re-entry into the atmosphere. The space shuttle on display has reached an engineering development phase, and a prototype is expected soon, as stated by the chief designer.⁴

Integrated Space-Air Fighter

A concept model of a next-gen fighter was on display at the air show. It is also being described as an 'integrated space-air fighter', or the 'Baidi', translated as 'White Emperor'. As for the spaceplane, this next-gen fighter is also a project from the AVIC. The design envisions an ability to fly at supersonic speeds at high altitudes, including above the Earth's atmosphere, to operate in space and similarly return through the atmosphere, thus justifying its designation as an 'integrated space-air fighter. The fighter plane will have an enlarged internal weapons bay to accommodate heavy air-to-ground armament, as stated on the display board adjacent to the model.⁵

Though the Baidi is being touted as an integrated space-air fighter, it may actually be a representation of China's sixth-generation fighter under development. The global specifications for a sixth-generation fighter remain undefined. However, it is expected to feature the capabilities of supersonic flight, all-aspect stealth and directed-energy weapons, such as laser and high-powered microwave weapons.⁶ The ability to operate in orbital space or sub-orbital space would require a hybrid or variable cycle engine to produce the thrust required to reach the orbital space. Moreover, the airframe would be required to withstand high velocities. The concept of a space-air fighter seems far-fetched technologically. However, it is possible that the Chinese next-gen fighter would be able to operate in the near space region.

Reusable Rocket

China's space agency unveiled a fully reusable design for its Long March-9 rocket booster stage. This was once again a model displayed for a two-stage reusable heavy-lift rocket, which is being developed by the China Academy of Launch Vehicle Technology (CALT).⁷ The recovery method is similar to the Falcon-9 booster recovery by SpaceX, a US space behemoth. A representative of China Aerospace Science and Technology Corporation (CASC), which oversees the activities of CALT, said its rocket could carry 100 tonnes to low-earth orbit and up to 50 tonnes to lunar-transfer orbit. The Long March 9 will be developed as a two-stage rocket, and both stages will eventually be fully reusable.⁸

The reusability is expected to significantly lower the launch costs while showcasing the superiority of Chinese space technology. Moreover, the payload capacity will facilitate trans-lunar missions and the expansion of China's space station, Tiangong.

Conclusion

The Zhuhai Air Show has highlighted China's aerospace ambitions as it modernises its military. Even though the space technology displayed at the air show was only concept designs and models, it did convey the Chinese vision to be a global leader in space. It shows the Chinese intent for trans-lunar and interplanetary missions, which is captured in its long-term goals for space. The design of highly manoeuvrable platforms also allows China to leverage space for military objectives. With these developments, China is inching closer to the US in aerospace technologies. India needs to take note and accelerate its efforts in indigenisation and research and development in the field of aerospace.

Notes:

¹ 'China shows off military technology at Zhuhai Air Show', *ANI*, November 12, 2024, at

<https://www.aninews.in/news/world/asia/china-shows-off-military-technology-at-zhuhai-air-show20241112150726/>. Accessed on November 14, 2024.

² Sophie Yu and David Kirton, "Zhuhai air show opens with orders for COMAC and a glimpse of a future spaceplane", *Reuters*, November 12, 2024, at <https://www.reuters.com/business/aerospace-defense/zhuhai-air-show-opens-with-orders-comac-glimpse-future-spaceplane-2024-11-12/>. Accessed on November 14, 2024.

³ Andrew Curran, "China Unveils Future Commercial Uncrewed Space Shuttle at Air Show", *Space and Defense*, November 14, 2024, at <https://spaceanddefense.io/china-unveils-future-commercial-uncrewed-space-shuttle-at-air-show/>. Accessed on November 14, 2024.

⁴ Ibid.

⁵ Enoch Wong, "China's Zhuhai air show to feature vision for next-generation warplanes", *South China Morning Post*, November 11, 2024, at https://www.scmp.com/news/china/military/article/3286103/chinas-zhuhai-air-show-feature-vision-next-generation-warplanes?module=perpetual_scroll_0&pgtype=article. Accessed on November 14, 2024.

⁶ Ibid.

⁷ Andrew Jones, "China unveils fully reusable Starship-like rocket concept", *Space News*, November 14, 2024, at <https://spacenews.com/china-unveils-fully-reusable-starship-like-rocket-concept/>. Accessed on November 18, 2024.

⁸ Gerry Duyle, "Reusable Long March 9 design on display at Zhuhai air show", *Reuters*, November 15, 2024, at <https://www.reuters.com/business/aerospace-defense/reusable-long-march-9-rocket-design-display-zhuhai-air-show-2024-11-15/>. Accessed on November 17, 2024.