# Chinese SSBN development presents intelligence challenges

[Content preview – Subscribe to **Jane's Intelligence Review** for full article]

**Nuclear-powered ballistic missile submarines are among a state's most closely guarded secrets. *Andrew Tate* examines the information available in open sources about China's Type 094 SSBN and analyses how the submarine fits into China's nuclear posture**

**Key Points**

- Open-source analysis can produce an increasingly detailed picture of China's Type 094 SSBN, but key questions about the design and operation of the fleet remain beyond the reach of open sources.
- The extent of foreign assistance in the development of the Type 094 design, the role of Chinese science and technology espionage in this process, and the acoustic signature of the boat are highly likely to be key intelligence targets for potential adversaries.
- The evolution of China's SSBN fleet will provide an ongoing indication of the intended direction of China's overall nuclear weapons programme and doctrine, albeit one among many.

Two Chinese Type 094/Jin-class nuclear-powered, ballistic missile-carrying submarines (SSBNs) were at the head of the fleet of 48 People's Liberation Army Navy (PLAN) submarines and warships reviewed at sea by President Xi Jinping on 12 April. The review reflected the growing power of the PLAN, and the prominent position given to the SSBNs reflected the importance that China attaches to the capabilities of its sea-based deterrent.

China's SSBN programme has had a long gestation period but appears to have reached a degree of maturity. The Pentagon's *Annual Report to Congress: Military and Security Developments Involving the People's Republic of China* in 2014 predicted that China would conduct its first sea-based nuclear deterrent patrol that year. The same forecast appeared in the 2015 and 2016 reports. The 2017 Pentagon report did not include such a forecast, suggesting that, by the end of 2016, the US had assessed that the PLAN had deployed its first Type 094 SSBN on an operational patrol. The current force of four Type 094 SSBNs cannot reliably support more than a single boat on continuous patrol, but the introduction of additional boats in the class or the next generation of SSBNs could change this.

China clearly intends to further develop the capabilities of its SSBNs. Much of this will draw on an increasingly capable indigenous military research and development effort. However , *The Washington Post* reported on 10 June that Chinese hackers from the Ministry of State Security had broken into the network of a US Navy contractor in January and February, "stealing massive amounts of highly sensitive data related to undersea warfare".

This reflects the relentless efforts that China is making to close the capability gap with the US, using all means at its disposal. As that gap diminishes, the pressure on China's potential adversaries to understand and to be able to counter China's capabilities will ramp up and encompass areas such as science and technology, operational intelligence, and nuclear command and control. A complete

summation of these intelligence challenges is beyond the scope of open sources, but publicly available information provides the basis for an informed assessment.

## SSBN fleet

The PLAN's first SSBN was the Type 092, completed in 1981. Although referred to as the Xia-class, only a single vessel was commissioned. It was based on China's first-generation nuclear attack submarines (SSNs), the Type 091/Han-class. A 2009 US Office of Naval Intelligence (ONI) report indicated that the Type 091 and 092 were the noisiest nuclear submarines of those compared, and significantly easier to detect than Russia's Victor III (Project 671RTMK) SSNs and Delta III (Project 667BDR) SSBNs of a similar age.

*Illustrative render of two Chinese Type 094 SSBNs, based on three-dimensional models derived from open-source imagery. (IHS Markit/Thegius Ltd/Nathan J Hunt)*

*1710322*

The Type 094 is China's second-generation SSBN, the first of which was laid down in 2001 at China's only nuclear submarine building yard, Bohai Shipbuilding Heavy Industry Company, at

Huludao (40.715556N, 120.992222E). In 2006, the submarine was imaged by satellites at the weapons testing support base at Xiaoping Dao (38.817500N, 121.493611E). *Jane's Fighting Ships* records that the boat was commissioned in 2007, although testing of the JL-2 (Ju Lang-2, or Giant Wave-2) submarine-launched ballistic missile (SLBM) continued for several more years.

Three more Type 094 hulls entered service in 2010, 2012, and 2014, and the Pentagon's 2016 report to Congress noted continuing production. However, its 2017 report assessed that the number of operational SSBNs remained at four and made no reference to further construction. The imagery below shows four Type 094 SSBNs alongside at Yulin Naval Base on 11 June 2017. Unless a fifth hull has entered service, this would imply that at the time the image was taken, there were no Type 094 SSBNs on patrol.

The raised 'turtleback' behind the fin of the Type 094, which is required to accommodate missile tubes that are longer than the diameter of the pressure hull, is similar in appearance to that of Russia's Delta-class submarines. The Pentagon's 2000 *Annual Report* stated that "Beijing's next generation nuclear submarine programs are expected to reflect a significant amount of Russian influence", and the 2003 report noted that the "Type 093-class will compare to the technology of the Russian VICTOR III SSN". However, it is unclear what assistance China received from Russia, if any, in its nuclear submarine programmes.

The PLAN procured 12 Russian Kilo-class (Project 877/636) diesel-powered conventional submarines (SSKs) over a 10-year period from the mid-1990s. However, the acoustic signature of a nuclear submarine is critically dependent upon minimising noise associated with the reactor plant and propulsion machinery, and the engineering of the Kilo-class will not have provided much insight into achieving this.

## Chinese R&D

Understanding the characteristics of a submarine's acoustic signature that can be exploited is fundamental to reducing its vulnerability to detection – and conversely is a key target for adversary intelligence agencies.

The gap in underwater capabilities between the US and the Soviet Union was narrowed during the Cold War through human intelligence. The Walker-Whitworth spy ring passed information on US anti-submarine warfare (ASW) operations to Soviet intelligence from the late 1960s until 1985, giving the Soviet Navy an understanding of how its submarines were being tracked. This enabled the navy to significantly reduce the vulnerability of its submarines. Determining whether Russia shared any of this knowledge, and related countermeasures, with China cannot be reliably established from open-source analysis. However, the broad extent of contemporary US underwater surveillance and the submarine signatures that can be exploited have become less well-kept secrets than during the Cold War.

It is likely that technical advances between China's first- and second-generation SSNs were mirrored in the SSBNs, resulting in a degree of commonality between the Type 093/Shang-class SSN and Type 094/Jin-class SSBNs. After the launch of the first two Shang-class boats in 2002/2003, there was a gap of 10 years before further hulls were constructed.

This delay may have been a consequence of limitations in production capacity at Huludao or funding priorities being directed to surface combatants. However, when Type 093 construction resumed, there were design changes and modifications that may indicate dissatisfaction with the earlier design, including an increase in length by 5 m, changes to the hull and fin to reduce flow noise, and

potentially modifications to the reactor design. Any shortcomings in the original design may also affect the Type 094 SSBNs, at least one of which displays external changes to improve hydrodynamic performance.

**[Continued in full version…]**

(1049 of 4080 words)

For the full version and more content: