

# China's advances in submarines and aircraft carriers

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*The Type 094 Shang SSN is a modern nuclear attack submarine, built for blue water operations.*

The modernisation and expansion of the PLA Navy has become the subject of intensive debate in the West and across Asia, a debate that intensified last year as the rebuilt former Soviet aircraft carrier Varyag, sister ship to Russia's sole carrier the Kuznetsov, started early sea trials.

China's motivations for its large scale investment into the 'sharp end' of naval power have become the subject of intensive speculation in the West and Western-aligned nations in Asia, especially with the escalating dispute over the South China Sea, which erupted in late 2011 and continued well into 2012. While expansion and recapitalisation of China's lacklustre legacy submarine fleet is easily explained away by arguing the Second Island Chain doctrine, the expensive investment into what is likely to become a naval air arm of several carrier battle groups is more difficult to explain in terms of China's publicly stated purely defensive and non-interventionist posture.

What is clear is that China is shifting away from its traditional 'brown water' focus in the PLAN fleet structure, and is pouring significant national wealth into the development of a genuine 'blue water' capable fleet. Attaining the latter will take more than a decade of intensive effort. Not only must legacy 'brown water' vessels be replaced with 'blue water' equivalents but also operational technique and doctrine need to be developed, although ample opportunities exist to copy Western navies that have centuries of experience in this area.

The Second Island Chain strategy, or doctrine, is fundamentally an 'anti-access' or denial strategy, not unlike Australia's long standing 'denial of the sea-air gap' doctrine. The big difference lies in the geographical extent involved, with the Second Island Chain spanning an arc from the Aleutians, through the Marianas, the Indonesian Archipelago, through to the Andamans in the Indian Ocean. While Australia's sea-air gap is largely open ocean China's Second Island Chain encompasses most of the nations of the Far East in its footprint. As a result China's development of capabilities to deny the use of oceans and fixed sites under this doctrine puts most nations in Asia at risk of air or missile attack in a time of conflict. The Second Island Chain footprint also overlaps Australia's sea-air gap.

Much of China's force structure recapitalisation has been centred on developing 'anti-access' capabilities for denial within the Second Island Chain. China's development and deployment of modern 'Tomahawk-like' DH-10/CJ-10 and YJ-62 cruise missiles fits into this model, as does the

development and deployment of terminally guided and thus highly accurate Intermediate Range Ballistic Missiles (IRBM) and Anti-Shipping Ballistic Missiles (ASBM). The development of the new 2,000 NMI radius class H-6K 'turbofan Badger' capable of carrying up to seven large cruise missiles fits the model. Attack submarines (SSN/SSK) armed with cruise missiles also fit this model very closely, providing capabilities against surface fleets, resupply convoys, and land targets. Intelligence, Surveillance and Reconnaissance (ISR) developments have followed the same pattern, with Over The Horizon Backscatter (OTHB) radar, Radar Ocean Reconnaissance SATellites (RORSAT), imaging satellites, and most recently High Altitude Long Endurance (HALE) RPVs deployed or in development.

China's stated intention to deploy multiple aircraft carriers is often interpreted as a drive to develop a global intervention capability, modelled on the US Navy and Royal Navy paradigm of the 20th Century. The exact strategic intent behind this extensive investment has not been well articulated by the Chinese, magnifying discomfort across Asia.

The Soviet carrier fleet was built to defend ocean 'bastions' near the Soviet ballistic missile submarine (SSBN) bases, the intent being to defeat US Navy and Royal Navy attack submarines sent in to sink Soviet ballistic missile submarines, and later to keep US Navy CVBGs away from the bastions. While the Soviets developed the potent multirole Su-27K/Su-33 Flanker D for the latter role, the Soviet carrier air wing composition was strongly oriented to ASW, rather than the traditional Western CVW composition with its heavy

emphasis on ASuW strike and coastal target strike capabilities.

Western CVW composition has varied since the 1940s but traditionally the wing was split between specialised ASW assets, dual role ASW/ASuW assets, and sea control / land attack assets to defeat 'blue water' navies and support amphibious operations in contested space. The weak ASW/ASuW and air defence capabilities of current US Navy CVWs are a dramatic departure from the historical pattern, yielding primarily a littoral COIN and intervention capability against unsophisticated developing nations.

What China's strategic intent actually is in developing a carrier fleet will only be determined once the composition of the PLAN shipboard air wing is known. If the air wing is optimised for air defence and ASW, then clearly the fleet will be intended to protect PLAN SSBN bastions. If the air wing is oriented toward air superiority and strike operations, then the PLAN CVs would qualify as traditional CVAs or 'attack carriers', intended for blue water sea control and distant interventions. A balanced mix in air wing composition would yield less clear conclusions, but would also present difficulties given the smaller displacement of the Varyag class, compared to US Navy CVNs, and resulting smaller air wing size.

What is clear is that growth in China's submarine fleet, and its new carrier fleet, will inexorably change the strategic calculus in the Western Pacific region.

### ADVANCES IN CHINA'S SUBMARINE FLEET

The PLAN's deployment of the 7,000 tonne Type 093/09-III Shang class SSN/SSGN, and the construction of underground submarine pens on Hainan Island have produced considerable debate and speculation on the development of China's submarine fleet.

Historically, China has not been a major player in the submarine fleet game. For much of the Cold War period, China's principal submarine was the Type 033 Romeo SSK, a Chinese clone of the

Soviet Item 633 Romeo, which was a reverse engineered 1944 Kriegsmarine Type XXI U-Boot. Open sources disagree on the remaining number of Romeos in PLAN services, with anything between 12 and 24 boats cited.

The Romeos were supplemented and partly supplanted by the Type 035 Ming class SSK, an improved Romeo, of which 12 to 17 are claimed to remain in service.

The primary replacements for the Romeo and Ming class SSKs were imported Russian Kilo SSKs and the domestically built Type 039 Song and Yuan SSKs, modelled on the Kilo, and deployed over the past decade.

The PLAN has acquired two tranches of Kilo SSKs since the mid 1990s, comprising two Rubin Item 877EKM Kilo I boats, ten Rubin Item 636 Kilo II boats, and there are unsubstantiated claims that up to six stretched Air Independent Propulsion (AIP) capable Kilos were acquired in 2009-2010. The 2,000 tonne surfaced displacement class Kilo SSKs are highly regarded, as very quiet diesel-electric boats with a modern suite of sensors, and a flexible mix of torpedo, mine and ASCM armament. A typical weapon loadout for an 877 or 636 class boat is 18 rounds of 533 mm weapons, which can be conventional torpedoes, rocket propelled supercavitating 200 knot VA-111 Skval torpedoes, 3M54 Club / SS-N-27 Sizzler ASCMs, or naval mines.

The Chinese built Type 039/039G/039G1 Song SSK achieved IOC in 1999 and remains on offer for export, with 12 to 16 boats claimed to be operational. This is a modern quiet SSK, clad with anechoic tiles, with six 533 mm bow tubes and powered by three licenced German MTU 16V396SE84 diesel engines, with an electrically driven seven-blade low noise screw. An active/passive bow sonar is supplemented by a flank mounted low frequency passive sonar, both claimed to be based on Thales sonar equipment. Up to 18 x 533 mm weapons can be carried, typically a mix of Yu-3 and Yu-4 electrically powered homing torpedoes, and encapsulated YJ-82 / CSS-N-8 Saccade ASCMs, which are



Type 035 Ming SSKs during the 1980s.



Item 636 Kilo class SSK of the PLAN.



The Type 039/039G Song is competitive against the imported Russian Kilo SSKs.



The Type 039A/B or Type 41 Yuan class are successors to the Song SSK. Later boats have an enlarged fin, and retractable bow planes. The class is credited with a Stirling engine AIP system.



The Type 091 Han class was China's first SSN, and is now being replaced.



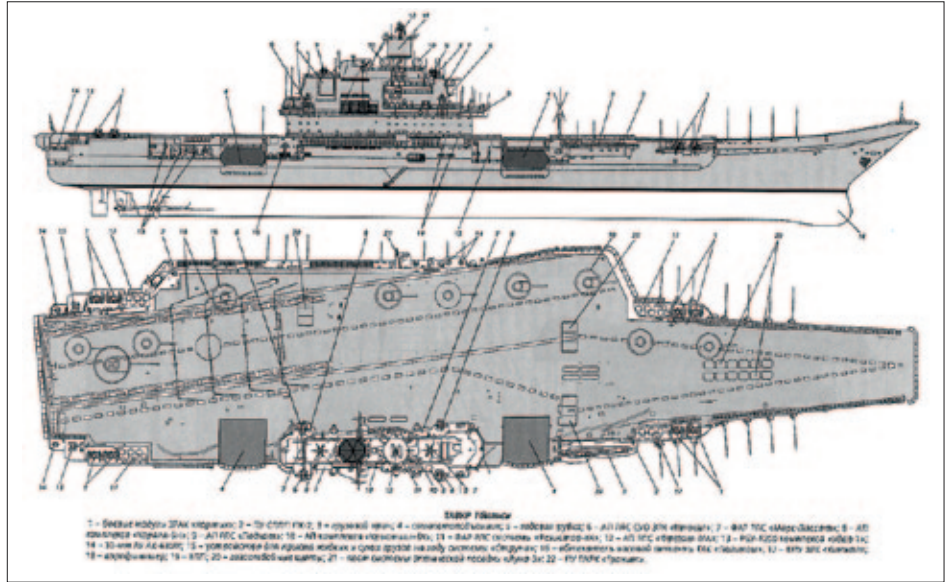




Only a single Type 092 Xia class SSBN was ever built.



New Type 094 Jin SSBN with missile tube doors open.



modelled on the AGM-84 Harpoon ASCM. Some sources cite the Song and Yuan classes as SSGs but as these boats are not specialised ASCM or SLCM carriers, they should be labelled SSKs.

A Song SSK is claimed to have successfully penetrated the defensive perimeter of the CV-63 USS Kitty Hawk CVBG in October 2006 during an exercise near Okinawa remaining undetected until it surfaced 5 NMI away.

The successor to the Song class is the further evolved Yuan class, designated the Type 039A/B or 041, depending on the source document. The hull shaping of the Yuan boats is much closer to the Kilo boat than the Song boats. Most sources credit the Yuan class with an Air Independent Propulsion (AIP) system, claimed to be an external combustion 100 kW Stirling engine, credited to the 717 Institute of the China Shipbuilding Industry Corporation (CSIC). The sensor and weapons package would appear to be a derivative of the Song. Four boats are currently in service.

The PLAN is also recapitalising its fleet of SSNs and SSBNs. Unlike the Western and Russian navies, which have operated large fleets of nuclear boats since the mid Cold War era, the PLAN has only ever maintained a small fleet of nuclear boats. This may be changing.

China's first SSN was the Type 091 Han class, a boat introduced in 1974, of which five were built by 1990, and three may still be in service. The boats were equipped with a 90 MW pressurised water reactor permitting submerged speeds of up to 25 knots. The 4,500 tonne surfaced displacement boat is armed with up to 20 weapons launched via six 533 mm bow tubes. Most open sources regard the Han class to be inferior in acoustic signature to its

US, Russian and European contemporaries.

The replacement for the Han SSN class is the new domestically built and 40 per cent larger Type 093 / 09-III or Shang class SSN, two of which are reported to be in service. Details on this boat are less robustly documented, and there has been continuing speculation about alleged intellectual property from the Russian Item 671RTM / Victor III class in the Shang. While the performance and capabilities of these boats remain classified, the emergence of the boat produced considerable disquiet in US analytical circles, as there seems to be a view that the Shang would be acoustically competitive against the Victor III and earliest Los Angeles configurations. The sensor and weapons suite on the Shang class appears to be a derivative of package deployed on the Song/Yuan SSKs and the Xia SSBN.

China's first SSBN was the 6,000 tonne displacement class Type 091 Xia class, of which only one boat was built, reaching IOC in 1983. The Type 091 is clearly modelled on the Soviet Item 667 / Delta class SSBN, employing a similar raised hull structure to house the vertical ballistic missile tubes. The boat has a payload of twelve JL-1 solid propellant two stage SLBMs.

The JL-1 is poorly regarded as an SLBM but has proven a successful IRBM in its land-based configuration as the DF-21.

The replacement for the Xia class is the new Type 094 / 09-IV Jin class boat, the first of which was launched in mid 2004. The Jin bears considerable similarity to the Shang class SSN and is frequently described as a derivative, which is likely to be correct given the relationship between the Han and Xia classes. Two Jins have been deployed to

date. The Type 094 is claimed to be armed with twelve JL-2 SLBMs, a 4,000 NMI range class solid propellant weapon claimed to be based on the land based DF-31 mobile ICBM. The sensor and weapons suite is otherwise likely to be similar to the Shang SSNs.

While most Western reporting on the PLA submarine fleet has focused on the characteristics of Chinese boats, much less attention has been paid to Chinese torpedoes, which remain the primary offensive weapon carried by SSKs and SSNs.

The most widely used weapon is the electrically powered legacy Yu-4, generally considered to be similar in performance to the Soviet SAET-50/60 series. These are supplemented by the wire-guided Yu-5/ET34/ET36 series, also silver-zinc battery powered. The Yu-6, introduced in 2005, is claimed to be a reverse engineered Mark 48, reported to be based on a US Navy round caught in a fishing net. The seeker in the Yu-6 is claimed to combine active/passive sonar and wake homing capabilities. The most interesting claims about PLA torpedoes are reports that China procured up to 200 supercavitating rocket propelled VA-111 Shkval torpedoes from Kazakhstan during the 1990s, as well as 40 Skval-E rounds from Russia to arm Kilo boats. Given China's track record of reverse engineering foreign torpedoes, it is most unlikely that the Shkval would not be reverse engineered and mass produced in China.

As China's submarine fleet recapitalisation effort progresses, it will have the largest fleet of modern boats in the Pacific, other than that of the US Navy. This will inevitably impact the strategic balance across the Western Pacific, but in time likely also the Indian Ocean.



US Navy image of the derelict Varyag being towed through the Bosphorus in 2001, ostensibly to become a floating casino in Macau.



Varyag at Dalian being refitted in 2009-2010.



Varyag sea trials in August, 2011.

## CHINA'S AIRCRAFT CARRIER PROGRAM

The PLAN commenced sea trials of the former Soviet Item 1143.5 aircraft carrier Varyag, sister ship to Russia's Admiral Kuznetsov, in August 2011. The Varyag was renamed as the Liaoning. The Varyag was built at Nikolaev in the Ukraine but still being outfitted with systems when the USSR broke up. The Varyag remained derelict in the shipyard until 2001 when it was towed to China following its purchase by a Hong Kong based company with the stated intent of its use as a floating casino in Macau. The Varyag, stripped of engines, wiring, and plumbing was towed to the Dalian naval shipyard, and subjected to a deep overhaul and refit.

The 60,000 tone full displacement class Item 1143.5 carriers are a derivative of the earlier Item 1143 Kiev class hull, enlarged and fitted for ski-jump / arrestor cable fixed wing aircraft. The original hull included twelve launch tubes, under the forward flight deck, for supersonic 320 NMI range P-700 Granit / SS-N-19 Shipwreck ASCMs, common to the Kirov class cruisers, and the Oscar class SSGNs. An air wing of 40 to 50 aircraft, comprising a mix of fighters and helicopters, could be embarked. The weapon system and air wing were optimised to defend Soviet SSBN bastions from US Navy SSNs and CVBGs, and the class were designated as 'heavy aviation cruisers', thus making them essentially ASW / AAW carriers. In practical terms, the Item 1143.5 provides about one half of the air wing deployment capabilities of a US Navy Nimitz class carrier, and with a steam turbine propulsion system, is dependent on supporting tankers. Conversely, the Item 1143.5 has almost three times the displacement of the UK Invincible class, and can deploy an air wing around 2.5 times larger.

The final systems fit, propulsion fit and air wing composition of the PLAN Varyag is not known, other than the intended use of the J-15 Flanker D, and ASW, AEW&C and CSAR variants of the Chenghe Z-8 Super Frelon helicopter (Refer <http://www.ausairpower.net/APA-PLAN-CV.html>). Therefore, any assessments of the vessel's role and strategic impact would be speculative.

There are numerous reports on PLAN work to develop and construct additional carriers, and claims these would use nuclear propulsion. At present detail is insufficient to form strong conclusions. It is likely that any indigenous carrier would be based largely on the Item 1143.5, as this



The J-15 Flanker D is a reverse engineered Russian Su-27K/Su-33, likely using Chinese systems developed for the J-11B Flanker.

is the lowest risk strategy for the PLAN.

What is certain is that the PLAN intends to operate a fleet of carriers, and these will be equipped with the very competitive long range J-15 Flanker D. As such, the PLAN will possess the strongest naval aviation capability in the Pacific, other than that of the US Navy.

### J-15: CHINA'S REVERSE ENGINEERED SU-27K FLANKER D

China's reverse engineering of the early model Su-27SK Flanker B airframe into the Chinese built J-11B is well documented, and resulted in a heated public dispute with Russia over violation of intellectual property rights and licence terms for the domestic build of the J-11A. The J-11B is indeed aerodynamically and structurally almost identical to the Su-27SK, but the avionics and systems are Chinese, and mostly different from the Russian hardware in the Su-27SK.

What has only emerged more recently, is that China had in parallel been reverse engineering the airframe of the navalised shipboard Su-27K/Su-33 Flanker D, the Russian Navy's equivalent to the F-14 Tomcat, and currently the core of the Russian Navy air wing on the Admiral Kuznetsov CV.

The Su-27K was the first canard equipped Flanker, as well as the first multirole Flanker, and introduced the first aerial refuelling probe, buddy refuelling store, and guided munitions on a

Flanker. The aircraft has a tailhook, folding wings and stabilators, and strengthened undercarriage for ski-jump launches and tailhook traps.

US analyst Richard Fisher reported in 2008 that China procured in the Ukraine at least one derelict former Soviet T-10K prototype Su-27K aircraft. This aircraft was shipped to China, disassembled, and reverse engineered using the technique refined in the reverse engineering of the Su-27SK in the J-11B. The J-15 commenced trials landings and takeoffs on the Liaoning this November, with numerous photographs and video footage released by the PLA.

It is most likely that the J-15 employs identical systems and weapons to the J-11B, following PLA practice of maximising commonality.

The J-15 will be a high performance naval fighter, competitive aerodynamically against the F-14B/D Tomcats, retired some years ago. It will robustly outperform all F/A-18 variants in the higher speed and altitude portions of the envelope, and provide superior range-payload performance. A more detailed assessment will have to wait until operational airframes are photographed, and the PLAN discloses avionics and weapons capabilities.

*Disclaimer: This article was compiled wholly from public domain sources, including the Xinhua and other Chinese websites, past Defence Today articles, the APA website and Wikipedia.*

