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North Korea modernises submarine fleet

North Korea continues to modernise its conventional submarine fleet, while developing a submarine-launched ballistic missile capability. Joseph S Bermudez Jr and Karl Dewey examine the North Korean fleet, and the threat it poses to South Korea and the region.

On 28 November 2015, North Korea attempted an historic launch of a ballistic missile from a submerged Sinpo-class experimental ballistic missile submarine (SSBA). This test appears to have ended in failure, with a South Korean official quoted by the Yonhap News Agency as saying that missile debris had been observed on the surface of the water. It is currently unclear what, if any, damage was sustained by the submarine. Less than a month later, on 21 December, North Korea conducted a further missile test, this time probably from the submerged barge it used in May 2015.

North Korea has been designing, manufacturing, and operating a wide range of patrol, coastal, midget, and specialised submarines since the mid-1960s, and maintains one of the world's largest submarine forces, with approximately 70 submarines in service.

Details concerning North Korea's submarine programmes have long been shrouded in secrecy and misinformation. The information that has been available has often been confused, contradictory, or simply incorrect. However, since the mid-1990s, a number of events have coalesced to allow some of the secrecy to be lifted and the confusion to be clarified.



South Korean military personnel captured a washed-up North Korean Sang-O-class submarine on a reef near the South Korean town of Kangnung in September 1996. Examination of the submarine revealed that it was equipped with a high percentage of off-the-shelf commercial communications and navigation equipment. (PA)

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Conventional threat

During the early 2000s, the KPN initiated a series of new naval construction and modernisation programmes. Among these was a refit programme for North Korea's Romeo-class conventional submarines (SS). These and other programmes appear to have been accelerated since 2011 under the rule of Kim Jong-un, and KPN submarines have frequently appeared in North Korean propaganda broadcasts. The refit programme for the Romeo class appears to have been focused

upon the Tasa-ri Naval Repair Yard on the west coast and the Mayang-do Naval Repair Yard on the east coast.

The Romeo fleet strength has remained relatively constant at about 22 boats since the early-1990s. However, one appears to have been scrapped at the Sinpo civilian shipyard between May and October 2015. It is likely that since the 1990s these boats have been restricted to patrols within North Korea's claimed Rason Special Economic Zone.

During the late 1980s, North Korea embarked upon an ambitious programme to build a coastal submarine that was small, versatile, and less expensive than the larger Romeo class. The 34 m Sang-O-class coastal submarine (SSC) was designed to be capable of supporting special operations forces and intelligence operations throughout the region and to augment, or ultimately replace, the ageing Romeo class in the anti-shipping and offensive mining missions.

The boat is of an indigenous design that embodies the culmination of construction and operational experience gained from the 32-m and larger submarines, and incorporates foreign off-the-shelf technology (see box on proliferation and procurement).

The Sang-O-class submarine is a simple steel-hulled submarine design that is built in two versions - a standard attack version for the KPN armed with torpedoes, and a reconnaissance version for the Reconnaissance Bureau's Maritime Department that has the torpedo tubes replaced by a diver lockout chamber in the first compartment. The exterior of the submarine has hard points to attach special operations equipment or naval mines. This reconnaissance version is intended to clandestinely insert special operations force units and intelligence agents into South Korea and Japan.

It appears that at some point during 1999-2000 a decision was reached to build an enlarged reconnaissance version of the standard boat known as the Sang-O II class (sometimes reported as the K-300-class SSC). Construction appears to have commenced during the early 2000s, and by 2005 several were in service.

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Sinpo-class SSBA

In July 2014, North Korea launched its first SSBA at the Sinpo South Shipyard. The new submarine has a length of approximately 66.75 m, a beam of 6.7 m, possesses a rounded bow, a conning tower located amidships, and diving planes on the bow. These dimensions suggest a dived displacement of 900-1,500 tonnes.



Airbus Defence and Space Imagery shows the secured boat basin at Sinpo South Shipyard. Between May and August 2015 the Sinpo SSBA relocated, indicating activity. Additionally, the submersible test stand relocated between August and October 2015, suggesting test activity occurred.

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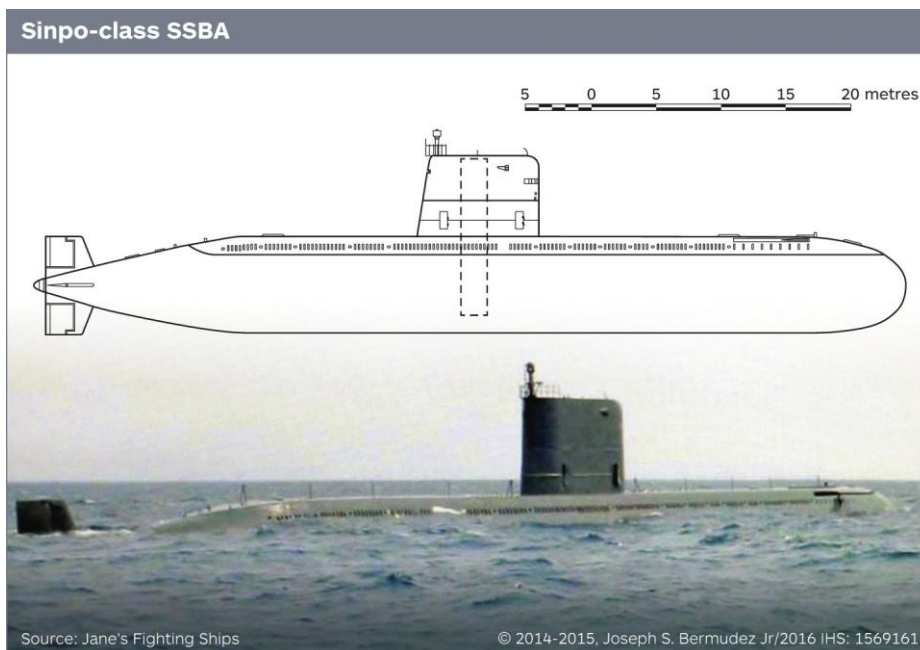
Airbus Defence and Space imagery shows the secured boat basin at Sinpo South Shipyard. Between May and August 2015 the Sinpo SSBA relocated, indicating activity. Additionally, the submersible test stand relocated between August and October 2015, suggesting test activity occurred. (© CNES 2015, Distribution Airbus DS / © 2016 IHS)

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The top-centre section of the conning tower has a rectangular section approximately 4.25 x 2.25 m that houses one or possibly two ballistic missile launch tubes. Given historical construction timelines at the Sinpo South Shipyard combined with observed activity at the facility, it is likely that construction of the boat began at the end of 2012 or the beginning of 2013. It was launched around July 2014.

The design origins of this submarine are unclear. Although the boat bears a superficial resemblance to the Russian Kilo- or Lada-class submarines, it lacks the teardrop hull-shape of the former and the conning tower-mounted diving planes of the latter. The boat does, however, have a resemblance in size and shape to the former Yugoslavian Sava- and Heroj-class submarines. A Yugoslavian influence for the design would not be unusual as the North Koreans maintained good military relations with that state from the 1970s until its break-up in the early 1990s.

This, in turn, was likely further influenced by access to ex-Soviet submarine technology in 1993-94, when North Korea acquired a number of former Soviet Pacific Fleet submarines to be scrapped at the No. 28 Shipyard in Najin. Among the submarines examined by North Korea at that time were a small number of Golf II-class (Project 629A) ballistic missile submarines (SSBs).



Sinpo-class SSBA. (© 2014-2015, Joseph S Bermudez Jr / 2016 IHS)

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Strategic implications

Given the need for fixed infrastructure, air- and land-based nuclear delivery systems are traditionally viewed as particularly vulnerable to an enemy attack. The decision to create the 'third leg' of the nuclear triad at sea is based on the fact that given the size and impenetrability of the oceans, in the event of a nuclear attack, SSBs will be difficult to find and target.

A core component of nuclear deterrence theory is having the ability to guarantee a nuclear response, regardless of the extent of the attack suffered. Ensuring this retaliatory, or 'second-strike', capability reinforces the credibility of a nuclear-armed state, as without this capability nuclear-armed adversaries may be tempted to launch a first strike.

At present, to ensure the survivability of its missile forces, North Korea has focused on developing dispersible road-mobile missile launchers. As with all relatively small nuclear forces, each individual weapon becomes more valuable and thus needs to be protected. North Korea relies on dispersal and camouflage, concealment, and deception (CCD) to minimise the risk that these assets could be targeted in a pre-emptive attack.

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Outlook

The Sinpo-class SSBA has every appearance of being an experimental boat intended to facilitate the design and testing of the Pukgeukseong 1 SLBM and serving as a test bed for technologies to be incorporated into a new class of SSB in the future. The development of an operational - in the Western sense - submarine-launched ballistic missile and associated SSB will be an expensive and time-consuming endeavour for North Korea with no guarantee of success.

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PROLIFERATION AND PROCUREMENT IN NORTH KOREA'S SUBMARINE PROGRAMME

A component of the 1960s decision by North Korea to acquire Yugoslavian submarine technology was the purchase in the early 1970s of six 16-m class SSMs. This purchase may have been arranged during a February 1975 visit to Yugoslavia by a North Korean military delegation headed by senior KPN officers. The submarines were delivered during the mid-1970s via a covert operation that funnelled the sale through Singapore using falsified end-user certificates. It is unclear whether the submarines were delivered as complete units or components that were assembled in North Korea.

During December 1983, North Korea purchased a civilian Sea Horse II SSM from Bruker Meerestechnik GmbH, a manufacturer of specialised underwater equipment located in Karlsruhe, West Germany. At that time, no export licence was required as the boat was reportedly earmarked for offshore civilian inspection work and prospecting for minerals and oil. The submarine was shipped in December 1983 to a trading company in Singapore and then reloaded in January 1984 onto a North Korean flag merchant vessel for the final leg of the voyage.

Subsequently, during December 1987, the sale of a second Sea Horse II valued at USD3.6 million was blocked by the West German Ministry of Economics as it required an export licence and there were concerns that it would be used for military or intelligence activities against South Korea. Delivery was scheduled to take place via Shanghai under a contract signed in May 1985. Bruker Meerestechnik GmbH subsequently refunded the down payment from the North Korean purchaser, the Daehung Shipping Company.

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COUNTER-SURVEILLANCE TECHNIQUES

As early as the late 1960s, North Korea was concerned about US aerial and satellite reconnaissance of its submarine force and constructed a decoy Whiskey-class SS that was observed at the Mayang-do Naval Base. The decoy consisted of a canvas-covered Artillerist-class patrol coastal vessel (49 x 5.8 m) with barges fore and aft measuring 73 x 6 m overall; North Korea's Whiskey-class SS measures 76 x 6.7 m.

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SOUTH KOREAN AND JAPANESE ASW CAPABILITIES

In light of North Korea's submarine development programmes, a number of South Korean government agencies have been tasked with the responsibility of developing weapons, systems, and platforms that can better protect the country against these underwater threats.

The drive to develop this capability took on an especially heightened tone from March 2010 after a Republic of Korea Navy (RoKN) Po Hang-class guided-missile corvette, RoKS *Cheonan*, sank near the Northern Limit Line (NLL), killing 46 crew members. A South Korean investigation into the incident concluded that the corvette was torpedoed by a North Korean vessel believed to be either a Yono-class midget submarine or a Sang-O-class SSC.

One of these agencies is the country's Defense Acquisition Program Administration (DAPA), which has co-developed a ship-launched short-range anti-submarine missile known as the Korean anti-submarine rocket (K-ASROC) or Hongsangeo, as it is locally known. The missile can carry a payload that can be either the 'Red Shark' lightweight torpedo with a weight of 280 kg or the 'White Shark' with a weight of 480 kg. Mass production for the K-ASROC, dubbed the 'submarine killer' by South Korean media, began in 2014 and the missile is likely to be intended for use on South Korea's latest guided-missile destroyers.

Another South Korean agency that has understandably been tasked with the duty to safeguard South Korea from hostile submarines is the RoKN. The service is currently undergoing a transformation into a blue-water force, and an important part of this evolution is the modernisation of its anti-submarine warfare (ASW) capabilities.

Two of the more prominent modernisation programmes are the RoKN's Incheon (FFX-1) and FFX-II classes of guided-missile frigates. The platforms feature hull-mounted and towed-array sonars for improved submarine-prosecution capability and can embark the AgustaWestland AW159 ASW helicopter that has been equipped with Thales' FLASH Compact Sonics low-frequency active-dipping sonar and acoustic processing suite.

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MIDGET SUBS

During the early-1960s North Korea initiated a low-intensity conflict with South Korea. To facilitate the infiltration of intelligence agents and special operations teams into South Korea, North Korea's intelligence community pushed for the development of a midget submarine (SSW).

The challenges with indigenously designing and producing a SSM during the 1960s led to the decision to acquire submarine related technology, midget submarines and swimmer delivery vehicles from Yugoslavia.

These 16-metre class SSM served as the basis for the subsequent indigenously designed and built 18-, 21-, and 22-m class SSMs. Collectively the 16-, 18-, 21- and 22-m class SSMs are generically referred to as Yugo class SSMs because of their nominal Yugoslavian ancestry. Larger boats in this series benefited from the experience gained with earlier models and the acquisition of foreign equipment and technology such as improved electronic support measures (ESM) equipment and snorkelling equipment.

During their service lives, these midget submarines, generally supported by 'mother' ships, operated in the East Sea as far down as Pusan and in the West Sea as far South as Cheju-do and Yeosu. While they operated from a number of forward bases (e.g., Sagon-ni, Haeju, Wonsan, Munchon, Kosong, etc.) two specialised bases were constructed for them.

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WASHED-UP BOATS

On 5 July 1965, South Korean security forces located and captured an example of the 5.7-m class SSM that had become grounded on a mudflat at the confluence of the Imjin and Han rivers, north northwest of Seoul. The boat was apparently on a mission to infiltrate agents into South Korea when it became stranded during a receding tide. The crew and passengers escaped before the boat was discovered. It is likely that this midget submarine was from the 448th Army Unit (an intelligence unit) operating out of the port of Haeju. This public failure likely resulted in the termination of work on the 5.7-m class SSM.

During June 1998, an example of a new 22-m class was captured off the South Korean city of Sokcho during an infiltration mission. This vessel exhibited a number of interesting features, including the use of an advanced single-shaft dual-propeller design. The skewed blades on these propellers were designed to lower the radiated noise signatures (cavitation) from the propellers at high speeds. South Korean officials indicated that the smaller prop was believed to further reduce the noise created by the main prop.

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