

Open Nuclear Network's Factsheet

**BALLISTIC MISSILE
SUBMARINES AND
SUBMARINE-LAUNCHED
BALLISTIC MISSILES OF THE
DEMOCRATIC PEOPLE'S
REPUBLIC OF KOREA**

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This factsheet offers a brief introduction to the ballistic missile submarines of the Democratic People's Republic of Korea and the associated submarine-launched ballistic missiles.

TABLE OF CONTENTS

I. KEY TAKEAWAYS	3
II. BALLISTIC MISSILE SUBMARINES	4
A. Converted Type 033 Submarine	4
B. Experimental Ballistic Missile Submarine	8
III. OTHER SUBMARINE PROGRAMMES	8
IV. SUBMARINE-LAUNCHED BALLISTIC MISSILES	9

I. KEY TAKEAWAYS

1. The Democratic People's Republic of Korea (DPRK) operates a relatively large number of Type 033 submarines, which were imported from China or built locally with Chinese assistance (Type 033 is a Chinese variant of the Soviet Romeo class submarine). The DPRK has been developing at least one ballistic missile submarine by converting one of these Type 033 submarines.
2. Intelligence sources from the Republic of Korea (ROK) stated that the Type 033 submarine being converted into a ballistic missile submarine has reached a displacement of 3000 tons. However, as of now publicly available images could not support this assessment.
3. Despite the fact that the Type 033 submarines have become outdated, the deployment of a Type 033-based ballistic missile submarine would improve the DPRK's ability to engage in sudden nuclear attacks and increase the survivability of its mid-range ballistic missiles.
4. The DPRK has also built a smaller, experimental ballistic missile submarine, which was used to test launch a submarine-launched ballistic missile (SLBM) in 2016.
5. The DPRK has test fired and displayed four types of mid-range SLBMs. The number of flight tests is low. It is possible that the four types of SLBMs are all prototype designs representing incremental improvements.
6. ROK intelligence sources also stated that the DPRK is working on the construction of a third type of submarine, this one with a displacement of 4000 to 5000 tons. The relationship between this submarine and the DPRK's plan to build nuclear-powered submarines is also unclear at this point but, given the stated displacement, they could be related.

II. BALLISTIC MISSILE SUBMARINES

According to available open source information, the DPRK appears to have been developing at least two types of ballistic missile submarines. They are:

- A ballistic missile submarine that is most likely being converted from a Type 033 submarine. This submarine is also referred to as a Sinpo-C class submarine.¹
- A smaller, experimental ballistic missile submarine, which has been variously referred to as the Sinpo class, Sinpo-B class or Gorae class submarine.



Left: a Type 033 submarine that is thought to be in the process of being converted into a ballistic missile submarine; Right: experimental ballistic missile submarine of the DPRK.

Source: KCTV

A. Converted Type 033 Submarine

On 22 July 2019, DPRK leader Kim Jong Un inspected a Type 033 submarine² that was apparently undergoing conversion to accommodate possibly two to three SLBMs in its enlarged sail.³

During the 8th Korean Workers' Party Congress in January 2021, Kim Jong Un stated that the remodelling of a mid-sized submarine had been successful:

"The report made public with pride that the standard of the goal in the modernization of [a] medium-sized submarine was set correctly and it was remodelled experimentally to open up a bright prospect for remarkably enhancing the existing subsurface operational capabilities of our navy ..."

Source: On Report Made by Supreme Leader Kim Jong Un at Eighth Congress of WPK, KCNA, 9 January 2021

Kim's statement on the modernization and remodelling of a mid-sized submarine appears to refer to the converted Type 033 submarine discussed above. According to available information, the Type 033 submarine inspected by Kim Jong Un in July 2019 is the only submarine known to have

¹ The United Nations, S/2020/151, paragraph 196 and footnote 196.

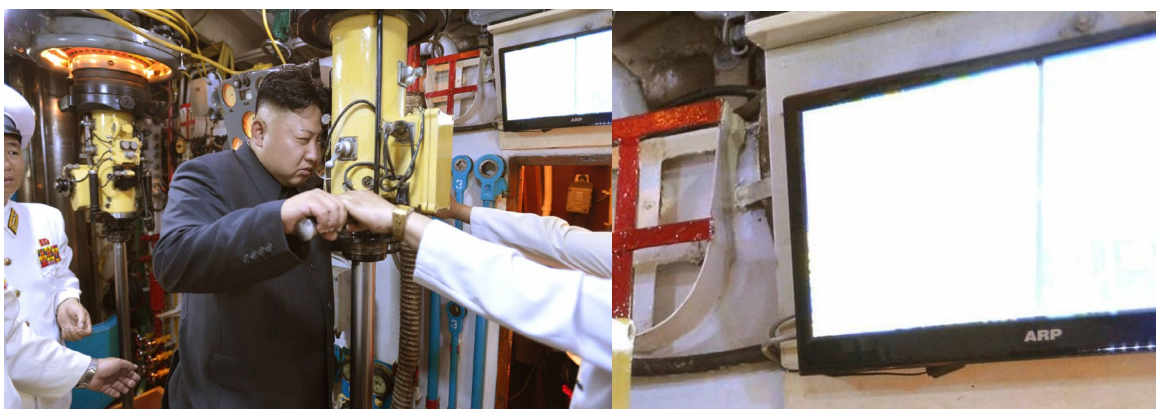
² "Supreme Leader Kim Jong Un Inspects Newly Built Submarine," KCNA, 23 July 2019. The submarine was referred to as "the Korean-style powerful submarine"

³ "북한, 3천급 잠수함 건조 끝냈다"...한미 정보당국 평가 [Korea-US intelligence agencies' assessment: North Korea has finished building a 3000-ton submarine], Yonhap News Agency, 11 April 2021, available at: <https://www.yna.co.kr/view/AKR20210409079751504>

undergone significant remodelling.

“The DPRK is estimated to possess around 21 Type 033 submarines, 12 of which were assembled in the DPRK with Chinese assistance. In February 1973, China’s Jiangnan Shipyard shipped out the first batch of submarine parts to the DPRK. In 1976, the first three of these submarines were completed. The twelfth such submarine was completed in 1979. Under this military assistance project (referred to in China as Project Number 13), 107 North Koreans were trained at Jiangnan Shipyard for six months in 1973, while 244 Chinese technicians and workers were sent to the DPRK to provide guidance between 1973 and 1978.”

Source: 安野 [An Ye], 中国江南造船厂援外军事项目回顾 [Reviewing military assistance of the Jiangnan Shipyard], *Naval & Merchant Ships*, 2006⁴



Left: Kim Jong Un inside a Type 033 submarine. The presence of an LCD screen (enlarged in the right hand photo) indicates that this Type 033 submarine had been upgraded.

Source: KCNA, 16 June 2014

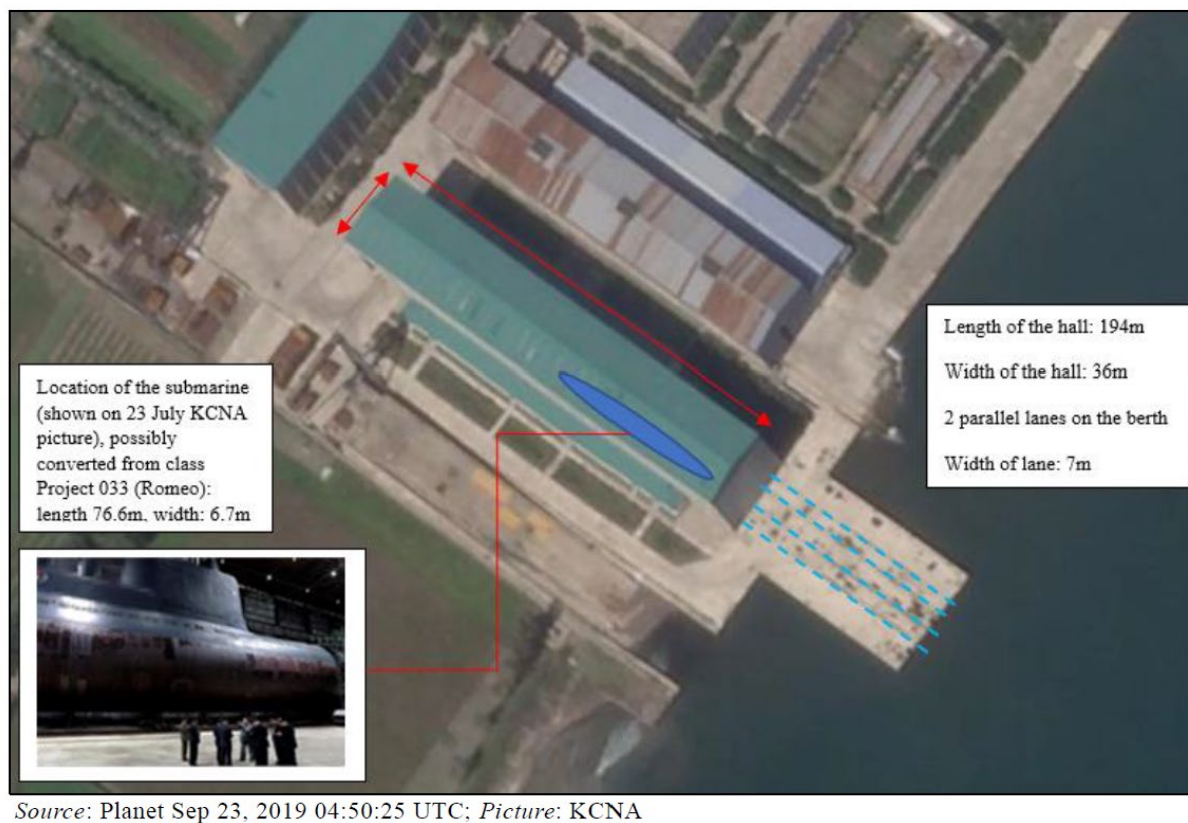
Currently, the operational status of the Type 033 submarine fleet is unclear, although some have reportedly played a part in military drills in recent years (e.g. 2014 and 2017).⁵ In August 2020, the UN Panel of Experts reported that a construction hall at the Sinpo South Shipyard was large enough to concurrently convert three Type 033 submarines into possible ballistic missile submarines.⁶

⁴ 安野 (An Ye), 中国江南造船厂援外军事项目回顾 [Reviewing military assistance of the Jiangnan Shipyard], *Naval & Merchant Ships*, 2006, available at: <http://mil.news.sina.com.cn/p/2006-01-23/0725346203.html> The *Naval and Merchant Ships* is a monthly publication under the supervision of the China State Shipbuilding Corporation.

⁵ Kim Jong Un Inspects KPA Naval Unit 167, KCNA, 16 June 2014; Kim Jong Un Supervises Combined Fire Demonstration of KPA Services, KCNA, 26 April 2017.

⁶ The United Nations, S/2020/151, Annex 60.

Figure 60.1: Sinpo South shipyards – new hall new berth (40° 1'20.76"N 128° 9'46.55"E) and location of the possible ballistic missile submarine (SSB) presented on the 23 July 2019 by KCNA



Source: *The United Nations, S/2020/151, Annex 60*

According to the Yonhap News Agency, military and intelligence authorities of the ROK assessed that the Type 033-based ballistic missile submarine has reached a displacement of 3000 tons.⁷

However, the dimensions of the DPRK's "3000 ton" ballistic submarine as assessed by the ROK authorities (~80 meters long and ~7 meters wide) are in accordance with a standard Type 033 submarine, which has a submerged displacement of only 1830 tons.⁸ According to available photos released by the DPRK State media, the DPRK did not cut and subsequently insert any new sections into the Type 033 submarine. Thus, it remains to be seen if a Type 033 submarine could reach 3000 tons of displacement by enlarging its sail alone.

As a point of reference, the Soviet Golf class ballistic submarines, with a submerged displacement of 3000 tons,⁹ are considerably larger than the Type 033 submarines (see photo below).¹⁰

⁷ "북한, 3천급 잠수함 건조 끝냈다"... 한미 정보당국 평가 [ROK-US intelligence agencies: North Korea has finished building a 3000-ton submarine], Yonhap News Agency. 11 April 2021. Available at: <https://www.yna.co.kr/view/AKR20210409079751504>

⁸ *Jane's Fighting Ships*, Coulsdon, 2009, pp. 453

⁹ Oleg Bukharin, Frank Von Hippel, *Russian Strategic Nuclear Forces*, Cambridge, MA, 2001, p.28

¹⁰ *Jane's Fighting Ships*, Coulsdon, 2009, pp. 453



A Type 033 submarine (left) and a Golf class submarine (right) in a dry dock in China.¹¹ The Golf class submarine (~98 meters long, 8.2 meters wide, ~3000 tons submerged displacement¹²) is considerably larger than the Type 033 submarine (76 meters long, 6.7 meters wide, ~1800 tons submerged displacement¹³).

Source: top81.cn

¹¹ The Golf class submarine in this photo was built by China with Soviet assistance in the 1960s. See: 出征从无声息: 中国最神秘的“长城200号”潜艇 [Stealthy Activities: the most mysterious “Great Wall 200” submarine], Science Daily, 25 January 2011, available at: <https://news.qq.com/a/20110125/000696.htm>. The Golf class submarine was named “Great Wall 200” by the Chinese Navy.

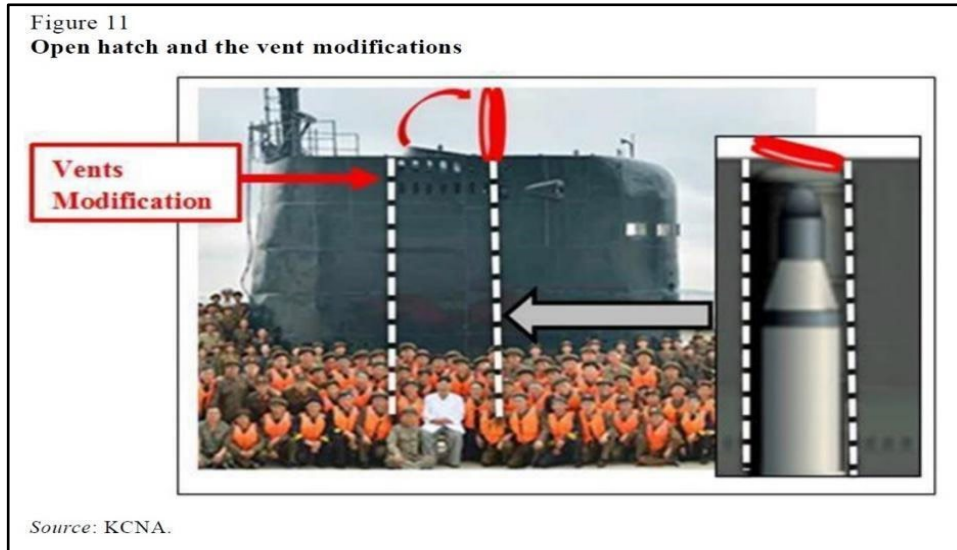
¹² Oleg Bukharin, Frank Von Hippel, *Russian Strategic Nuclear Forces*, Cambridge, MA, 2001, p. 288

¹³ *Jane’s Fighting Ships*, Coulsdon, 2009, p. 453

B. Experimental Ballistic Missile Submarine

A smaller, experimental ballistic missile submarine was used by the DPRK for a test launch of the SLBM Pukguksong-1 in 2016.¹⁴ It first appeared in commercial satellite images in late 2014. This submarine is often referred to as “Sinpo-B class,” “Gorae class” or “Sinpo class.”

Measurement with help of satellite images shows that this submarine is approximately 65 meters long and approximately 6 meters wide.



The experimental submarine is estimated to have only one launch tube.

Source: The United Nations, S/2017/150, p. 21

¹⁴ The United Nations, S/2017/150, p. 21

III. OTHER SUBMARINE PROGRAMMES

During the 8th Korean Workers' Party Congress in January 2021, Kim Jong Un also stated that the design of a nuclear-powered submarine was in the final stage. He went on to imply that this submarine might be able to accommodate SLBMs with intercontinental range:

"The report made public with pride ... that the design of [a] new nuclear-powered submarine was researched and was in the stage of final examination...

And the tasks were brought up to ... push ahead with the development of solid-fuel engine-propelled inter-continental underwater and ground ballistic rockets as scheduled, and possess a nuclear-powered submarine and an underwater-launch nuclear strategic weapon which will be of great importance in raising the long-range nuclear striking capability..."

Source: On Report Made by Supreme Leader Kim Jong Un at Eighth Congress of WPK, KCNA, 9 January 2021

As regards Kim's reference to a "nuclear-powered submarine", there is no other publicly available information. Reportedly, the ROK government has assessed that the DPRK has likely been developing a new, larger submarine with a displacement of 4000 to 5000 tons.¹⁵ There is little information regarding a DPRK submarine of such size. However, if the reports are true, the displacement could correspond to the size of a nuclear-powered submarine.¹⁶ It remains to be seen whether the "4000-5000 tons submarine" is the aforementioned "nuclear-powered submarine" of the DPRK.

¹⁵ “북한, 3천급 잠수함 건조 끝냈다... 한미 정보당국 평가” [ROK-US intelligence agencies' assessment: North Korea has finished building a 3000-ton submarine], Yonhap News Agency, 11 April 2021, available at: <https://www.yna.co.kr/view/AKR20210409079751504>; another media report also referred to a mid-large size submarine besides the modified Type 033 submarine. See: Sangmi Cha, *North Korea building two submarines, one capable of firing ballistic missiles - lawmaker*, Reuters, 3 November 2020, available at: <https://www.reuters.com/article/us-northkorea-missiles-idUSKBN27J0MC>

¹⁶ For reference, the French Rubis class nuclear-powered submarine, the smallest nuclear submarine ever built, has a displacement of only 2600 tons, while the Chinese Type 091 nuclear-powered submarine has an estimated displacement of over 5000 tons. A few types of big conventional submarines have also reached displacement of 4000 tons or above. For example, the Japanese Oyashio class and Soryu class submarines have reached a submerged displacement of 4000 tons.

IV. SUBMARINE-LAUNCHED BALLISTIC MISSILES

As of this writing, all known SLBMs of the DPRK belong to the Pukguksong series of solid fuel, two stage, mid-range ballistic missiles:

Designation	Date of full range tests	Reported trajectory/ range estimate	Remarks
Pukguksong-1	24 Aug. 2016	Test: 500 km range with a lofted trajectory Estimated capability: over 1000 km with a regular trajectory ¹⁷	Launched from the experimental ballistic submarine
Pukguksong-2	12 Feb. 2017 21 May 2017	Test: 550 km apogee, 500 km range in lofted trajectory ¹⁸ Test: 560 km apogee, more than 500 km range in lofted trajectory ¹⁹	Launched from tracked mobile launchers; considered to be a land-based version of the Pukguksong-1
Pukguksong-3	2 Oct. 2019	Test: 910 km apogee, 450 km range ²⁰ Estimated capability: from 1700 to 2500 km with a regular trajectory ²¹	Launched from a submersible barge
Pukguksong-4	No publicly known tests		First displayed in the October 2020 parade
Pukguksong-5	No publicly known tests		First displayed in the January 2021 parade

¹⁷ N.K. leader calls SLBM launch success, boasts of nuke attack capacity, Yonhap News Agency, 25 August 2016, available at: <https://en.yna.co.kr/view/AEN20160824009552315>

¹⁸ N. Korea test-fires modified Musudan missile: JCS, Yonhap News Agency, 12 February 2017, available at: <https://en.yna.co.kr/view/AEN20170212000655315>; N. Korea's recent missile launch signals more provocations in future: Seoul, Yonhap News Agency, 13 February 2017, available at: <https://en.yna.co.kr/view/AEN20170213005500315>

¹⁹ N. Korea test-fires another missile: S. Korea, Yonhap News Agency, 21 May 2017, available at: <https://en.yna.co.kr/view/AEN20170521003054315>

²⁰ N. Korea presumed to have fired 1 SLBM-type missile: JCS, Yonhap News Agency, 2 October 2019, available at: <https://en.yna.co.kr/view/AEN20191002001257325>

²¹ The United Nations, S/2020/151, p227

As can be seen from the table, there have only been a few flight tests of the Pukguksong series ballistic missiles. It is uncommon for a State to develop four types of SLBMs within several years. It is possible that the Pukguksong-1, 3, 4 and 5 represent an incremental improvement that would eventually lead to one standardized mid-range SLBM.



From left to right: Pukguksong-1, 2 and 3 launched in 2016, 2017 and 2019, respectively. The Pukguksong-1 and Pukguksong-2 have eight grid fins. The Pukguksong-3 has a rounded fairing presumably to improve underwater stability and has no visible grid fins.

Source: KCNA, KCTV



Pukguksong-4 (left) and Pukguksong-5 (right) in October 2020 and January 2021 parades, respectively. The Pukguksong-4 has a fairing similar to that of the Pukguksong-3. The Pukguksong-5 is longer than the Pukguksong-4 and also has a longer fairing.

Source: KCNA

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One Earth Future's Open Nuclear Network programme is a non-aligned, non-governmental entity that seeks to increase security for all States by ensuring that nuclear decision makers have access to high quality, shareable open source information which enables them to make the best decisions in the face of escalating conflict.

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