

Brief on DPRK ICBM launch on 18 November 2022

Tianran Xu

- The DPRK launched an intercontinental ballistic missile (ICBM) on 18 November 2022. The reported apogee and top speed of Mach 22 corresponds to an ICBM with a ~15,000 km range. This is the DPRK's fifth apparently successful ICBM launch (Table 1).
- The ICBM type is yet to be confirmed, but it could be the first successful Hwasong-17 launch after several possible partial or failed flight tests this year.¹
- The launch came one day after DPRK Foreign Minister Choe Son Hui stated that the DPRK will take "fiercer... military counteraction" if the USA strengthens its extended deterrence to the ROK and Japan.²
- Choe's press statement and the ICBM launch came in the wake of the ASEAN summit last week. On the sidelines of the summit, the US, ROK and Japanese leaders agreed to strengthen security cooperation and Washington renewed its commitment to bolster extended deterrence in the region. During the US-China and ROK-China G20 summit meetings on 14 to 15 November 2022, both the US and ROK presidents voiced concern about the DPRK's recent military activities. However, the Chinese Foreign Ministry readouts of these meetings did not mention the DPRK issue.
- As an immediate response, the ROK and USA held a joint air strike drill simulating attacks on mobile missile launchers.³ ROK president Yoon Suk Yeol ordered the strengthening of (unspecified) extended deterrence measures after the ICBM test.⁴

¹ Tianran Xu, Strong Indicators of DPRK's Next Satellite/ICBM Launch, Open Nuclear Network, 14 March 2022, available at: <https://opennuclear.org/en-gb/node/1624>; Song Sang-ho and Kang Yoon-seung, N. Korea seems to have failed in suspected ballistic missile launch: S. Korean military, Yonhap News Agency, 16 March 2022, available at: <https://en.yna.co.kr/view/AEN20220316003653325>; Song Sang-ho, N. Korea fires 1 ballistic missile toward East Sea: S. Korean military, Yonhap News Agency, 4 May 2022, available at, <https://en.yna.co.kr/view/AEN20220504005152325?input=tw>; Song Sang-ho and Kang Yoon-seung, N. Korea fires 3 ballistic missiles, including 1 suspected ICBM: S. Korean military, Yonhap News Agency, 25 May 2022, available at: <https://en.yna.co.kr/view/AEN20220525000755325>; N. Korea fires one ICBM toward East Sea: S. Korean military, Yonhap News Agency, 18 November 2022, available at: <https://en.yna.co.kr/view/AEN20221104001655325?section=nk/nk>

² Press Statement of DPRK FM, KCNA, 17 November 2022, available at: <http://kcna.kp/en/article/q/07733144f2a1cdcb2d26358a2bf670f9.kcmsf>

³ S. Korea's F-35A stealth jets hold guided bomb strike drills targeting N. Korea's missile launchers, Yonhap News Agency, 18 November 2022, available at: <https://en.yna.co.kr/view/AEN20221118007351325?input=tw>

⁴ Lee Haye-ah, Yoon orders execution of strengthened extended deterrence measures after N.K. missile launch, Yonhap News Agency, 18 November 2022, available at: <https://en.yna.co.kr/view/AEN20221118003852315?section=nk/nk>

- The DPRK’s latest ICBM launch is in line with the Korean People’s Army (KPA) General Staff “report” on 7 November, which stated that “the more persistently the enemies’ provocative military moves continue, the more thoroughly and mercilessly the KPA will counter them. This is the principle and direction of action of the DPRK’s armed forces in the future, too.”⁵ Chinese leader Xi Jinping’s lack of clear response to the ROK president’s request for China to play a “more active and constructive role” in the DPRK issue, together with the omission of the DPRK in the Chinese Foreign Ministry 14 November daily briefing, may have provided Kim Jong Un with an opening to conduct the latest ICBM test.⁶
- Since late September, the DPRK has conducted two major missile launch campaigns, coinciding with joint and individual military drills of the ROK, US, and Japan.⁷ ONN will continue to track the situation and produce further analysis as needed.

ICBM tests conducted by the DPRK*

	Date	Apogee	Distance	Flight time
Hwasong-14	4 July 2017	2802 km	933 km	39 minutes
Hwasong-14	28 July 2017	3725 km	998 km	47 minutes
Hwasong-15	29 November 2017	4475 km	950 km	53 minutes
Hwasong-15**	24 March 2022	6249 km	1,090 km	68 minutes
Unknown ICBM***	18 November 2022	~6000/6100 km	1,000 km	69 minutes

*Possible partial or failed tests of the Hwasong-17 ICBM, conducted on 27 February, 5 March, 16 March, 4 May, 25 May, 3 November 2022, are not included in this table.

**The DPRK claimed the missile to be a Hwasong-17. However, the ROK and the US assessed it to be a Hwasong-15 and alleged that the DPRK used previously unseen footage of a failed Hwasong-17 launch to disguise the launch.

***According to data released by the ROK and Japan. The data for the other four ICBM launches were released by the DPRK and they are in general agreement with data released by the ROK.

⁵ Report of General Staff of KPA on Its Military Operations Corresponding to U.S.-South Korea Combined Air Drill, Rodong Sinmun, 7 November 2022, available at:

<http://www.rodong.rep.kp/en/index.php?MTJAMjAyMi0xMS0wNy1IMDA2QDE1ODFAQDBAMQ==>

⁶ Shin Ji-hye, Yoon-Xi summit reveals gap in approach to North Korea, Korea Herald, 16 November 2022,

available at: <https://www.koreaherald.com/view.php?ud=20221116000607>; Foreign Ministry Spokesperson Mao Ning’s Regular Press Conference, Foreign Ministry of the People’s Republic of China, 14 November 2022, available at:

https://www.fmprc.gov.cn/mfa_eng/xwfw_665399/s2510_665401/2511_665403/202211/t20221114_10974542.html

⁷ Tianran Xu, Katsuhisa Furukawa, Elin Bergner, Kristiana Nitisa, Escalating Tensions on the Korean Peninsula, Open Nuclear Network, 11 November 2022, available at:

https://opennuclear.org/publication/escalating-tensions-korean-peninsula?language_content_entity=en

Updates, 21 November 2022

The DPRK released an official report on the 18 November 2022 intercontinental ballistic missile (ICBM), confirming that it was a Hwasong-17 and stating that the missile flew 999.2 km with an apogee of 6,040.9 km over ~68.9 minutes. This is consistent with the ROK assessment.⁸ Based on newly released information, ONN has made the following observations:

- A comparison between the Hwasong-17 18 November 2022 launch photos (released on 19 November 2022) and 24 March 2022 (Figure 1) indicates that ~7.5% of propellant volume from the first stage has been moved to the second stage, which leads to an increase in second stage propellant volume by ~40%. Small adjustments have also been made accordingly to the positions of retro rockets (small solid-propellant rockets to push away the first stage after stage separation). The reasons behind the change in propellant volumes are not immediately clear; however, they could include factors such as higher propellant consumption rate caused by an increase in thrust of the second stage engine(s) or an increase in the number of second stage engine(s).

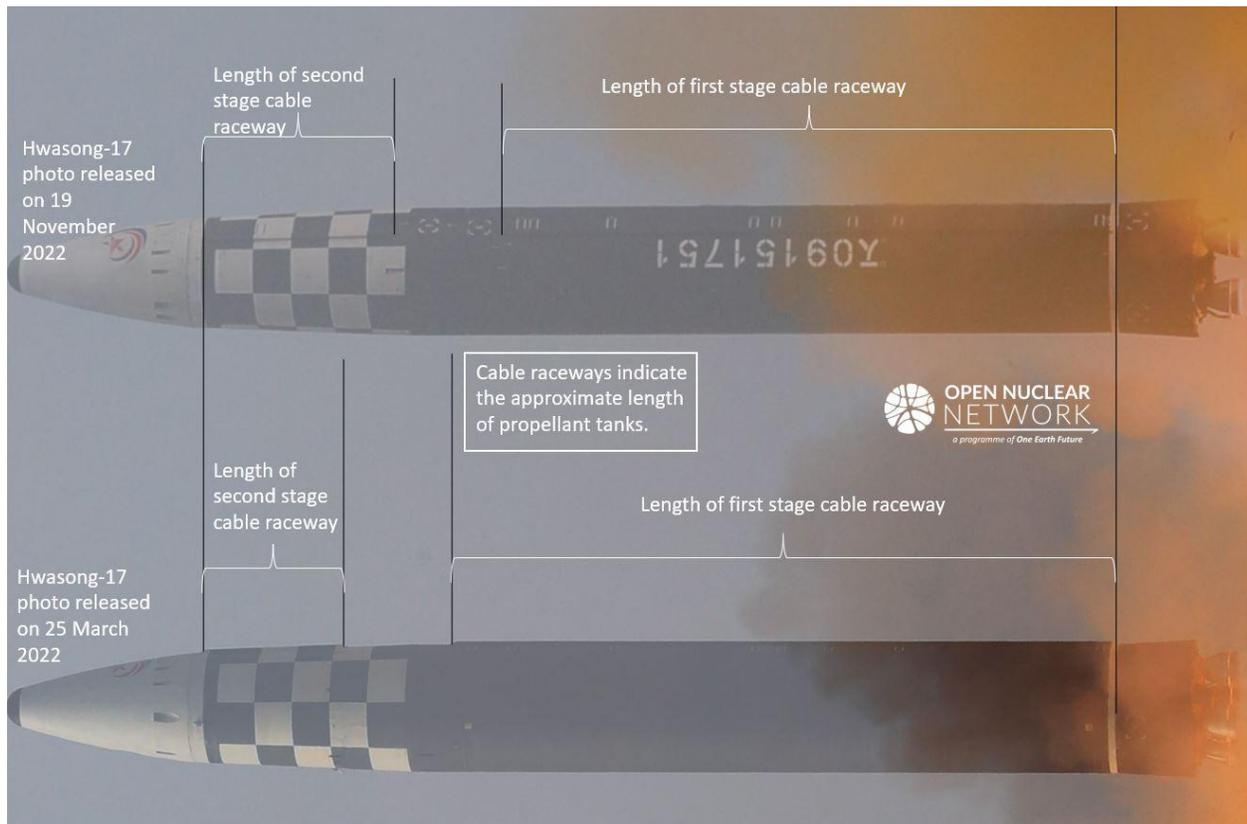


Figure 1. Differences between the two Hwasong-17 prototypes. Images: KCNA

⁸ S. Korean military says no info on N. Korea's Hwasong-17 ICBM deployment, Yonhap News Agency, 21 November 2022, available at: <https://en.yna.co.kr/view/AEN20221121004200325?section=nk/nk>

- Other small modifications are also visible in the video released on 19 November 2022 by KCTV, such as a slightly different arrangement of fairing removal rockets (small solid-propellant rockets that push the aerodynamic fairing away from the second stage once the ICBM reaches a certain altitude, Figure 2) and the addition of eight suspected small solid-propellant rockets on the second stage (Figure 2).



Figure 2. Inside red box: fairing removal rockets; Inside yellow box: possible nozzles of eight small rockets whose role may be to help ensure a smooth separation of the warhead after second stage burnout. Image: KCTV

- The 18 November 2022 launch is the first apparently successful launch of the Hwasong-17 ICBM after six suspected partial or failed flight tests (Table 2).⁹ In comparison, the flight tests of Hwasong-14 and Hwasong-15 ICBMs, which share the same engine technologies with the Hwasong-17 (Figure 3), were conducted without known failures. The extraordinary size of the Hwasong-17 and associated complexities may have been a contributing factor behind the unsuccessful flight tests.

Date	Launch location	Flight path	Remarks
27	Sunan,	300 km distance, 600 km	Possibly a partial flight as the

⁹ Tianran Xu, "Strong Indicators of DPRK's Next Satellite/ICBM Launch," Open Nuclear Network, 14 March 2022, available at: <https://openuclear.org/en-gb/node/1624>; Song Sang-ho and Kang Yoon-seung, "N. Korea seems to have failed in suspected ballistic missile launch: S. Korean military," Yonhap News Agency, 16 March 2022, available at: <https://en.yna.co.kr/view/AEN20220316003653325>; Song Sang-ho, "N. Korea fires 1 ballistic missile toward East Sea: S. Korean military," Yonhap News Agency, 4 May 2022, available at, <https://en.yna.co.kr/view/AEN20220504005153325>; Song Sang-ho and Kang Yoon-seung, "N. Korea fires 3 ballistic missiles, including 1 suspected ICBM: S. Korean military," Yonhap News Agency, 25 May 2022, available at: <https://en.yna.co.kr/view/AEN20220525000755325>; "N. Korea fires one ICBM toward East Sea: S. Korean military," Yonhap News Agency, 18 November 2022, available at: <https://en.yna.co.kr/view/AEN20221104001655325?section=nk/nk>

February 2022	Pyongyang	apogee	US Department of Defense announced that the tests conducted on 27 February and 5 March 2022 involved a new ICBM.
5 March 2022	Sunan, Pyongyang	300 km distance, 550 km apogee	Possibly a partial flight as the US Department of Defense announced that the tests conducted on 27 February and 5 March 2022 involved a new ICBM.
16 March 2022	Sunan, Pyongyang	Missile seems to have exploded at an altitude of 20 km.	ROK military assessed that the missile may be the same as the one flight tested on 27 February and 5 March.
4 May 2022	Sunan, Pyongyang	470 km distance, 780 km apogee, max speed Mach 11	During a parliamentary hearing, Defense Minister nominee Lee Jong-sup said the latest launch might have involved an ICBM or a shorter-range one.
25 May 2022	Sunan, Pyongyang	360 km distance, 540 km altitude	ROK military assessed that the missile may have been a Hwasong-17.
3 November 2022	Sunan, Pyongyang	760 km distance, 1,920 km altitude, max speed Mach 15. Missile apparently failed after stage separation.	ROK assessed the missile to be a Hwasong-17.

Table 2. Suspected incomplete flight tests of Hwasong-17.

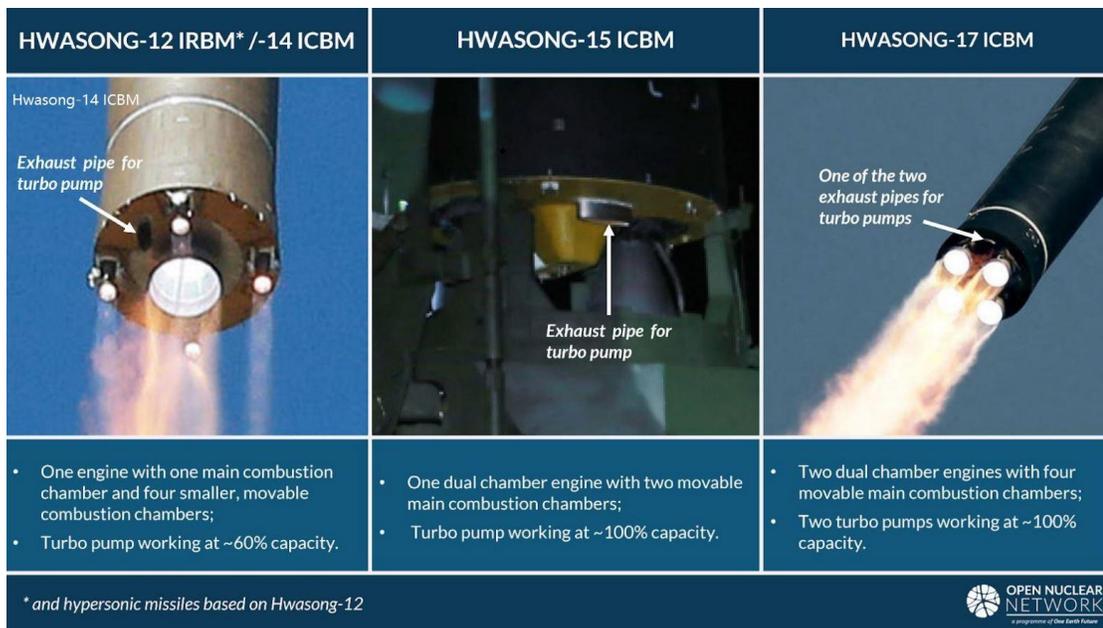


Figure 3. Common engine technologies shared by the DPRK’s new generation of liquid-propellant ballistic missiles. Images: KCNA, annotated by ONN

- These observations suggest that the Hwasong-17 ICBM has undergone modifications to improve performance and/or reliability. It is possible that more Hwasong-17 launches are planned in the future in order to fully consolidate the design of the missile.¹⁰ The DPRK may also test space launch vehicles that are based on the Hwasong-17 in the future.
- To date, all ICBM tests of the DPRK have been carried out in highly lofted trajectories. It is uncertain if the DPRK has gathered enough data to become confident that the warhead would function properly with normal re-entry angle into the atmosphere, or if the DPRK plans to conduct flight tests under more realistic conditions in the future. During his summit with Chinese leader Xi Jinping on 14 November 2022, US President Joe Biden reportedly stated that China “had an obligation to attempt to make it clear to North Korea that they should not engage in long range nuclear tests.”¹¹ What “long-range nuclear tests” entails in this context, however, is unclear.
- Both Hwasong-15 and Hwasong-17 are large, liquid-propellant ballistic missiles. Their tolerance to unideal road conditions and long-duration road trips is unclear. It is possible that these ICBMs remain highly dependent on their home bases and could only operate within a small radius of their bases, making their movement easy to monitor by foreign military intelligence agencies.

¹⁰ S. Korean military says no info on N. Korea's Hwasong-17 ICBM deployment, Yonhap News Agency, 21 November 2022, available at: <https://en.yna.co.kr/view/AEN20221121004200325?section=nk/nk>

¹¹ Biden says U.S. will have to take “defensive” steps if N. Korea conducts nuclear test, Yonhap News Agency, 15 November 2022, available at: <https://en.yna.co.kr/view/AEN20221114009751325>

- The DPRK has used old images in their recent reports covering missile launch events, making it more difficult to identify confidently what projectiles were launched.¹² Additionally, it degrades the credibility of the DPRK's official account on its missile launches, including that of intermediate and intercontinental range. For example, the ROK alleged that the DPRK successfully launched a Hwasong-15 ICBM on 24 March 2022 and disguised the launch as that of a Hwasong-17 by using previously unpublished Hwasong-17 videos and photos.¹³ Similarly, the DPRK released photos on 4 November 2022 showing what appears to be a Hwasong-15 or its variant¹⁴ being launched on the previous day (Figure 4). However, the ROK insisted that the missile launched on 3 November 2022 was a failed Hwasong-17 (Table 2).



Figure 4. Hwasong-15 (or its variant¹⁵) photos released on 4 November 2022 by the DPRK.
Images: KCNA

¹² Tianran Xu, Katsuhisa Furukawa, Elin Bergner, Kristiana Nitisa, "Escalating Tensions on the Korean Peninsula," Open Nuclear Network, 11 November 2022, available at:

https://opennuclear.org/publication/escalating-tensions-korean-peninsula?language_content_entity=en

¹³ Kim Soo-yeon and Chae Yun-hwan (8th LD) N. Korea's ICBM launch apparently failed; more SRBM shots follow allies' decision to extend air drills, Yonhap News Agency, 3 November 2022, available at:

<https://en.yna.co.kr/view/AEN20221005004361325?section=nk/nk>

¹⁴ Tianran Xu, Katsuhisa Furukawa, Elin Bergner, Kristiana Nitisa, Escalating Tensions on the Korean Peninsula, Open Nuclear Network, 11 November 2022, available at:

https://opennuclear.org/publication/escalating-tensions-korean-peninsula?language_content_entity=en

¹⁵ Tianran Xu, Katsuhisa Furukawa, Elin Bergner, Kristiana Nitisa, Escalating Tensions on the Korean Peninsula, Open Nuclear Network, 11 November 2022, available at:

https://opennuclear.org/publication/escalating-tensions-korean-peninsula?language_content_entity=en