



NORTH KOREA

Pyongyang's Large Hypersonic Missiles

Development, Performance and Operational Status

Executive summary

- Since September 2021, North Korea has flight-tested two types of nuclear-capable HGVs on MRBM/IRBM-class (medium/intermediate-range ballistic missile) boosters,¹ the conical-shaped² “Hwasong-16Ga”³ and the wedge-shaped Hwasong-16Na.
- On 3 October 2026, North Korea conducted a strategic missile launch drill involving the “Hwasong-16Ga,” marking the fourth known flight of the conical-shaped HGV and its first operational launch, according to North Korean state media.
- The 3 October launch was designated as an operational firing drill, rather than a test fire. This suggests that North Korea considers the system to be operational. It remains to be seen if and when the first operational launch of the Hwasong-16Na will be conducted. The deployment of North Korean HGVs would most likely accelerate the inter-Korean arms race in HGV and other missile technologies.
- Despite Kim Yo Jong’s dismissive comments on South Korea’s and Japan’s ability to track North Korean HGVs, the discrepancies in reported flight distances do not necessarily indicate wartime vulnerabilities, as these tests avoided both countries’ territories and wartime surveillance would likely involve a wider range of sensors. However, North Korean HGVs do pose a more serious challenge to the missile defence shield in the region due to their more unpredictable and evasive flight path.
- With ranges shown in these flights, it is hard to validate both HGVs as IRBM-class weapons (intermediate-range ballistic missiles, commonly categorised as those with a range between 3000 to 5500 km). However, the HGVs have fully demonstrated their potential to strike Japan if they are to be used as mid-range ballistic missiles. Full range tests are likely needed to verify the performance of both HGVs as true IRBM-class weapons. However, such tests may pose some technical and geographical challenges for North Korea to implement.

¹ The HGV on top of a single stage solid-propellant booster, referred to as the [Hwasong-11Ma-1](#), is excluded from this article.

² The conical-shaped re-entry vehicle is often referred to as a manoeuvrable re-entry vehicle instead of an HGV. It is also apparent that the wedge-shaped HGV may have better gliding characteristics than the conical-shaped re-entry vehicle thanks to the former’s more advanced aerodynamic layouts. However, this article refers to both as HGVs because the conical-shaped re-entry vehicle, according to announcements released by Japan, North Korea, and South Korea, has 1) reached hypersonic speed of Mach 5 or above; 2) demonstrated a low altitude flight profile; and 3) conducted manoeuvres during its glide phase. These three criteria are adopted by the author as the working criteria for identifying HGVs in this article.

³ The designation “Hwasong-16Ga” is used for the purpose of this article and has not been officially confirmed by North Korea. It follows North Korea’s naming convention for missile variants, as seen in the Hwasong-11Ga and Hwasong-11Na. In Korean alphabetical order, *Ga* (ㄱ) and *Na* (ㄴ) are the first two syllables, corresponding to “A” and “B” in variant designations. The conical-shaped HGV mounted on a two-stage solid-propellant booster was first tested on 14 January 2024, preceding the first test of the wedge-shaped Hwasong-16Na configuration on 2 April 2024. Accordingly, this article provisionally refers to the former as the “Hwasong-16Ga” for ease of reading.

Implications for nuclear risk

From a nuclear-risk perspective, the significance of these developments lies not only in their demonstrated technical performance but also in how their capabilities are perceived. North Korean assertions about the limitations of allied missile-tracking systems, alongside its presentation of the launch as an operational drill, may be intended to strengthen perceptions of the credibility of its nuclear deterrent. Such perceptions could influence military planning and threat assessments on both sides, even where important uncertainties about the systems' actual capabilities remain.

Further monitoring should focus on evidence of operational deployment, the frequency and characteristics of subsequent launch drills, and any additional demonstrations of longer-range or more demanding flight profiles.

Overview of Pyongyang's mid-to-intermediate range hypersonic missile tests

From September 2021 to early October 2026, North Korea has conducted seven flights of hypersonic glide vehicles (HGVs) on top of MRBM/IRBM-class boosters (Figure 1). Deviating from the use of liquid-propellant Hwasong-12-derived boosters, the HGVs tested since 2024 were positioned atop a two-stage solid-propellant booster. Detailed information on these flights is compiled in Table 1.



Figure 1. Seven flights of North Korean hypersonic glide vehicles (HGVs) on top of MRBM/IRBM-class boosters.

Images: KCNA

Date	HGV Type	Booster type	Apogee	Range	Top speed	Additional KCNA description
2021.09.28	Wedge-shaped HGV	Single-stage liquid	60 km (ROK)	Less than 200 km (ROK)	Mach 3 (ROK)	Referred to as Hwasong-8 by KCNA
2022.01.05	Conical-shaped HGV	Single-stage liquid	Below 50 km (ROK)	700 km (KCNA); less than 700 km (ROK); 500 km if following a normal ballistic arc (Japan)	Mach 6 (ROK)	The missile "made a 120 km lateral movement in the flight distance of the hypersonic gliding warhead from the initial launch azimuth to the target azimuth and precisely hit a set target 700

						km away.” (KCNA)
2022.01.11	Conical-shaped HGV	Single-stage liquid	60 km (ROK)	1000 km (KCNA); over 700 km (ROK); Less than 700 km if following a normal ballistic arc (Japan)	Mach 10 (ROK)	The missile “made glide jump flight from 600 km area before making a 240 km-long turning manoeuvre from the initial launch azimuth to the target azimuth and hitting the set target in waters 1 000 km away.” (KCNA)
2024.01.14	“Hwasong-16Ga” (Conical-shaped HGV)	Two-stage solid	50 km or higher (Japan)	1000 km (ROK); At least 500 km (Japan)	Undisclosed	“The test-fire was aimed at verifying the gliding and manoeuvring characteristics of intermediate-range hypersonic manoeuvrable controlled warhead and the reliability of newly developed multi-stage high-thrust solid-fuel engines.” (KCNA)
2024.04.02	Hwasong-16Na (Wedge-shaped HGV)	Two-stage solid	101.1 km, 2nd apogee at 72.3 km (KCNA); 100 km (Japan)	1000 km (KCNA); About 600 km (ROK); Over 650 km (Japan)	Undisclosed	“Conducted in the way of verifying the characteristics of pull-up flight orbit and cross-range maneuvering capability....” (KCNA) Referred to as the Hwasong-16Na by KCNA
2025.01.06	Hwasong-16Na (Wedge-shaped HGV)	Two-stage solid	99.8 km, 2nd apogee 42.5 km (KCNA)	1500 km (KCNA)	Mach 12 (KCNA)	ROK dismissed DPRK claims, stating that the missile

			Around 100 km (Japan) “Did not reach a second peak” (ROK)	Around 1100 km (ROK, US, Japan)		actually travelled about 1100 km and failed to execute the reported manoeuvres. Despite this, the launch represents the longest flight distance covered by a Hwasong-16Na to date.
2026.10.03	“Hwasong-16Ga” (Conical-shaped HGV)	Two-stage solid	Around 90 km (Japan)	1000 km (KCNA) 680 km (Japan) Over 700 km (ROK)	Undisclosed	Kim Yo Jong mocked the ROK and Japan’s ability to track North Korean HGVs, saying they are only able to estimate range based on the first apogee of the HGV (because the second phase of the glide was performed below the radar’s horizon). State media referred to the launch as a drill rather than a test-fire, implying the “Hwasong-16Ga” is in active service.

Table 1. Seven flights of North Korean hypersonic glide vehicles (HGVs) on top of MRBM/IRBM-class boosters.

As seen in Table 1, North Korean state media and the Japanese and South Korean governments have given different ranges for some of these tests. The discrepancy could be caused by (1) exaggerated claims by North Korean state media; (2) different tactics on releasing information; and/or (3) the inability of radars in Japan and South Korea to effectively track the HGVs when they descended below the radars’ line of sight.⁴

⁴ The Japanese authority used the expression “if the missile follows a ballistic arc” as the precondition for some of the range estimates, which supports the assumption that some radars based in Japan could not keep track of the entire flight of the HGVs. See: Table 1.

Comparing the 2022 and 2024 tests

North Korean state media has published relatively rich information regarding the flight of the conical-shaped HGV tested on 11 January 2022 (which was subsequently integrated into the missile provisionally designated the “Hwasong-16Ga” in this article), and the Hwasong-16Na tested on 2 April 2024. This information, combined with data released by Japan and South Korea, offered a basis to compare the performance of the two types of HGVs. According to North Korean announcements, the two types of HGVs have all reached a range of 1000 km during their tests.⁵ However, the following two observations suggest that the conical-shaped HGV (“Hwasong-16Ga”) was likely tested under harsher conditions:

- During the 2 April 2024 flight, the Hwasong-16Na HGV reportedly reached an apogee of around 100 km during its first phase glide, and a second apogee of over 70 km during its second phase glide. In comparison, the conical-shaped HGV only reached 60 km at its highest point during its flight on 11 January 2022 (Figure 2). Gliding in a denser atmosphere means that the conical-shaped HGV may have required a higher burnout velocity (velocity when the rocket booster burns out) to overcome greater aerodynamic drag.

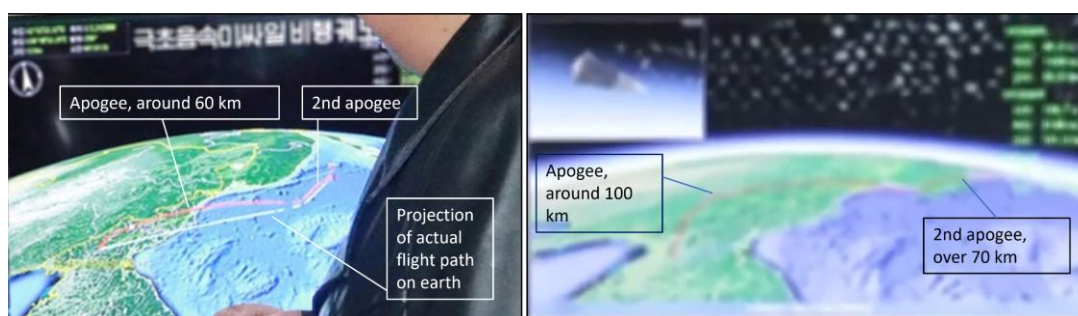


Figure 2. The conical-shaped HGV tested on 11 January 2022 (left) flew a more depressed path than the wedge-shaped HGV tested on 2 April 2024 (right). The red lines show the actual flight path.

Images: Flight paths depicted by KCNA

- Both HGVs reportedly performed a “cross-range,” or turning, manoeuvre after their first phase glide. However, according to the flight paths displayed to Kim Jong Un, the turning manoeuvre conducted by the conical-shaped HGV appeared to be considerably steeper than the one conducted by the Hwasong-16Na HGV (Figure 3). This steeper turn uses more energy than the shallower turn. Thus, to reach the same intended range, higher burnout velocity may have been required for the conical-shaped HGV.

⁵ According to South Korea, the conical-shaped HGV also reached a 1000 km range during the 14 January 2024 test. The January 2024 test is excluded in the comparison as North Korean media did not reveal substantial information on this test. See: Table 1



Figure 3. Flight paths of the 11 January 2022 test (left) and the 2 April 2024 test (right). The red straight lines represent the approximate 1000 km distance from the launch position to the impact point. The curved lines below the red straight lines represent the projection of the actual flight path on Earth.

Images: Flight paths depicted by KCNA

These two observations suggest that the conical-shaped HGV may have flown under more demanding conditions, involving greater aerodynamic drag and energy losses during its turning manoeuvre, though uncertainties regarding the actual flight profiles prevent a definitive comparison. Nevertheless, the April 2024 flight did not demonstrate a clear performance advantage for the Hwasong-16Na over the conical-shaped HGV. Thus, despite its apparently more advanced design, the Hwasong-16Na was likely still in a comparatively early phase of development as of 2024.



Figure 4. The conical-shaped HGV (left, referred to as “Hwasong-16Ga” for the purpose of this article) has a much simpler aerodynamic layout than the wedge-shaped Hwasong-16Na. Images: KCNA

The 2025 and 2026 flights

On 6 January 2025, North Korea conducted another Hwasong-16Na test flight. State media referred to the missile as “a new-type intermediate-range hypersonic ballistic missile,” and claimed that the HGV “reached its first peak at the height of 99.8 kilometers and the second peak at the height of 42.5 kilometers respectively while making a 1,500-km-long flight as scheduled at the speed amounting to 12 times of the speed of sound.”

South Korea's Joint Chiefs of Staff (JCS), however, dismissed the North Korean claim as “deception,” adding that joint US-ROK analysis concluded that the flight distance was 1100

km and the HGV failed to reach its second peak (Figure 5). Even using the JCS figures, however, the January 2025 launch represents the longest flight distance covered by a Hwasong-16Na to date.

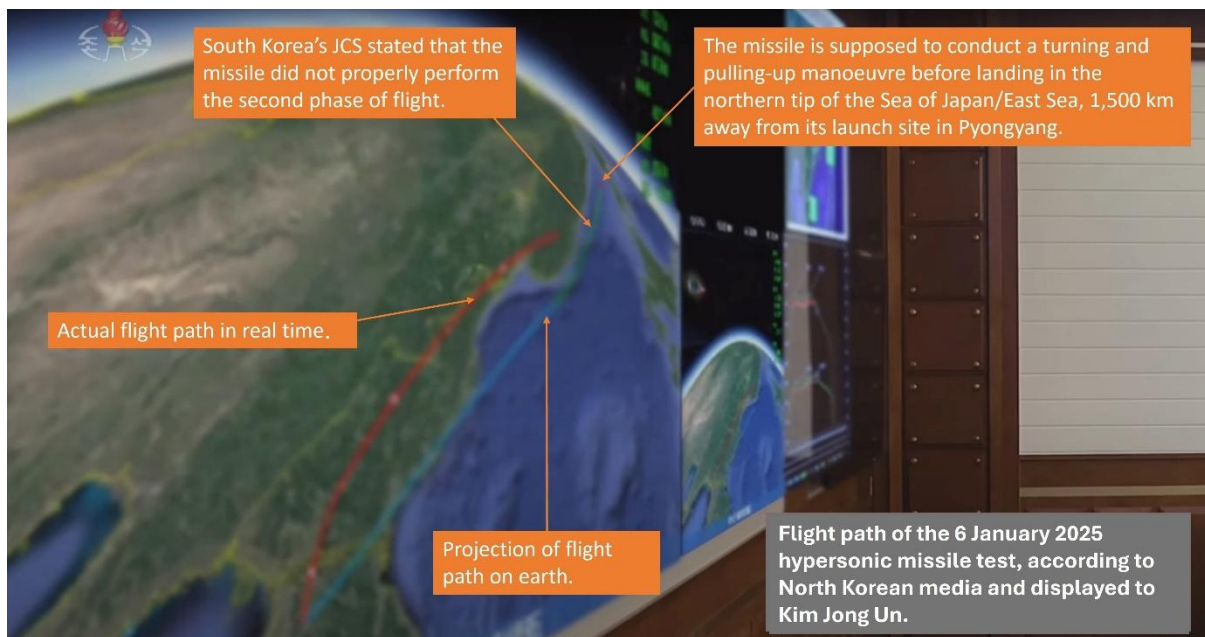


Figure 5. Although the flight distances reported by the DPRK and ROK differ, the January 2025 launch still represents the longest flight distance covered by a Hwasong-16Na to date. Image: KCTV

For the April 2024 test, North Korea claimed that it had limited the speed of the Hwasong-16Na “by means of delaying the start-up of the second-stage engine and rapidly changing the flight orbit in the active region” to limit the flight distance. However, while turning manoeuvres performed by the second stage could be observed, no clear delay of the second stage motor ignition could be discerned in the [KCNA video](#). The January 2025 test made no mention of such limits, providing a possible explanation for the 1500 km range claimed by North Korean state media.

On 3 October 2026, North Korea conducted a “strategic missile launching drill” involving the “Hwasong-16Ga,” marking the fourth known flight of the conical-shaped HGV and its first reported operational launch. Except for the paint scheme, the missile launched on 3 October appears to be identical or very similar to the one launched in January 2024 (Figure 6). North Korea claimed the 3 October launch hit the target area in the East Sea/Sea of Japan, 1000 km away from the launch site.



Figure 6. Except for the paint scheme, the hypersonic missile (referred to as “Hwasong-16Ga” for the purpose of the article) launched on 3 October (Middle, Right) appears to be identical or very similar to the one launched in January 2024 (Left).

Images: KCNA

North Korean state media is yet to reveal the appearance of the transporter-erector-launcher (TEL) of the “Hwasong-16Ga.” However, the TEL’s cabin and the protective cover for the HGV appear to be similar to that of the Hwasong-16Na (Figure 7), indicating that the two types of hypersonic missiles may share the same launch platform and two-stage solid-propellant booster.



Figure 7. The TEL’s cabin and the protective cover for the Hwasong-16Na (Top) appear to be identical or similar to that of the “Hwasong-16Ga” (Bottom).

Images: KCNA, KCTV

Dismissive comments from Kim Yo Jong

After the 3 October “Hwasong-16Ga” launch, Kim Yo Jong, Department Director of the Central Committee of the Workers’ Party of Korea and sister of North Korean leader Kim Jong Un, issued a [rare statement](#) to dismiss the tracking capabilities of South Korea and Japan:

The joint chiefs of staff of the ROK, which tracked our drill, announced that the missile flew more than 700 km, while the Japan defence ministry termed the range 680 km...We have already witnessed similar announcements four times...such figures help take a look at the limitations of the enemy's tracking capability and the special features of our missiles.

Whenever we applied the wave-like trajectory mode to missiles, the enemy failed to track the targets from their first skip points. Extension of the trajectory at the downward stage gives the numbers quite similar to the numbers of the ranges announced by the enemy.

The enemy always made such a lame excuse that there is a limit to the detection capability because of the curvature of the earth's surface, but in fact this just serves as a proof of our perfect missile capability and the most scientific "evaluation index" confirming the power and reliability of our weapon system.⁶

Discrepancies between North Korean claims and figures released by the ROK and Japanese authorities have been common. Assuming that the four instances mentioned by Kim Yo Jong refer exclusively to MRBM/IRBM-class HGVs and include the most recent launch on 3 October, Kim likely referred to the following four events (Table 2):

Date	Type	DPRK claim	ROK and Japanese claims
2022.01.11	Conical-shaped HGV on Hwasong-12-derived liquid-propellant booster	1000 km (KCNA)	Less than 700 km if following a normal ballistic arc (Japan)
2024.04.02	Hwasong-16Na (Wedge-shaped HGV on two-stage solid-propellant booster)	1000 km (KCNA)	About 600 km (ROK) Over 650 km (Japan)
2025.01.06	Hwasong-16Na (Wedge-shaped HGV on two-stage solid-propellant booster)	1500 km (KCNA)	Around 1100 km (ROK, US, Japan)
2026.10.03	“Hwasong-16Ga” (Conical-shaped HGV on two-stage solid-propellant booster)	1000 km (KCNA)	680 km (Japan) Over 700 km (ROK)

Table 2. Discrepancies between figures announced by DPRK and ROK/Japan regarding North Korean MRBM/IRBM-class HGV flights.

Such discrepancies could be caused by a number of factors, such as different tactics on releasing information and/or the inability of radars in Japan and South Korea to effectively

⁶ Kim Yo Jong also claimed that artificial intelligence had been incorporated into the missile, enabling it to alter its flight trajectory at low altitudes. According to her statement, North Korea's Missile Administration reported that the missile could be configured to follow at least four different flight trajectories, depending on its mission and target. However, North Korea provided no technical details or independently verifiable evidence to substantiate these claims.

track aeroballistic missiles and HGVs once the missiles flew below the radar's horizon. However, Kim Yo Jong's dismissive comments should not be directly translated as wartime vulnerabilities of Japan, South Korea and the United States, because (1) the flight paths of North Korea's MRBM/IRBM-class HGV tests were directed towards impact areas at sea, rather than land targets in South Korea or Japan, and therefore did not necessarily represent the trajectories of incoming missiles during an actual attack,⁷ and (2) in times of elevated tension, a wider range of sensors, including enhanced presence of air-based surveillance and forward deployed destroyers with Aegis radars, would join the missile defence network to better detect incoming threats.

On 4 October 2026, South Korea's Ministry of National Defence rejected the implication that its military could not respond to North Korea's hypersonic missile, [claiming](#) that the missile was within the detection and interception capabilities of South Korean and US defence assets.

In addition, the 1000 km range announced by the ROK for the January 2024 test is consistent with the range claimed by North Korea for the 3 October 2026 launch. This consistency could serve as circumstantial evidence supporting North Korea's claimed flight distance, while also suggesting that South Korea may have been able to track the missile's full flight under certain circumstances. However, it does not independently verify the range of the October 2026 launch or establish that the ROK's January 2024 tracking data was complete.

MRBM or IRBM-class?

It is worth noting that KCNA's [Korean-language reporting](#) on the 3 October launch referred to the missile as a “medium-range strategic missile” (중거리전략미사일), in contrast to the “medium-to-long-range” (중장거리) terminology previously used to describe both HGV configurations in 2024 and the Hwasong-16Na in 2025.⁸ KCNA's [English-language coverage](#), however, continued to use “intermediate-range,” as it had in the earlier reports. However, this difference in terminology does not necessarily indicate a difference in the missiles' intended operational ranges.

Both types of HGVs have demonstrated the potential to strike targets in Japan with a highly depressed flight. As the actual distance flown by the HGVs was reportedly achieved with loss in speed and altitude caused by a turning manoeuvre, their maximum flight range without the turning manoeuvre would surpass 1000 km (for “Hwasong-16Ga”) and 1500 km (for

⁷ In South Korea's case, the HGVs flew toward the northeast, away from the South Korean territory.

⁸ Park Soo-yoon and Hyun Hye-ran, “북, '신형 고체연료 추진 극초음속 IRBM' 시험발사 성공 주장(종합 2 보)” [North Korea claims successful test launch of new solid-fuel hypersonic IRBM], Yonhap News Agency, 15 January 2024, [북, '신형 고체연료 추진 극초음속 IRBM' 시험발사 성공 주장\(종합 2 보\) | 연합뉴스](#); Lee Sang-hyun, “북한 '신형 중장거리 극초음속미사일 시험발사 성공'” [North Korea claims successful test launch of new medium-to-long-range hypersonic missile], Yonhap News Agency, 3 April 2024, [북한 '신형 중장거리 극초음속미사일 시험발사 성공' | 연합뉴스](#); Lee Eun-jung, “북, 극초음속 IRBM 발사 확인...김정은 '누구도 대응못할 무기'” [North Korea confirms hypersonic IRBM launch; Kim Jong Un calls it a weapon no one can counter], Yonhap News Agency, 7 January 2025. [북, 극초음속 IRBM 발사 확인...김정은 '누구도 대응못할 무기' | 연합뉴스](#)

Hwasong-16Na, if the North Korean figures are correct), putting them comfortably within the range of medium-range ballistic missiles (1000 to 3000 km).

However, neither have truly demonstrated IRBM-class range (3000 to 5500 km) in their launches to date. For North Korea, IRBM-class hypersonic missiles should at least demonstrate a 3300 km range to reach US military bases in Guam.

Full-range intermediate-range hypersonic missile tests may involve a mid-course flight beyond the atmosphere (during which manoeuvres through reaction control mechanisms, such as small thrusters, are possible) and, upon reentry, a long phase of glide under active control. A highly lofted trajectory (commonly used to test North Korean intercontinental ballistic missiles) would probably not fit the requirement for such a full-range test due to the need to validate gliding performance under realistic conditions. Such a full-range intermediate-range hypersonic missile would also be more challenging than full-range Hwasong-12 IRBM tests conducted before, as the terminal phase of a Hwasong-12's flight is brief and without active control. With no forward deployment of telemetry vessels in the Pacific, it remains unclear how North Korea could track IRBM-class HGVs in a full-range test, especially during the glide phase. However, novel technological solutions, such as using space-based sensors, may facilitate such tests.