COMMENTARY

Missile Woes

Why North Korea's New (Monster) ICBM May Signal Significant Shortcomings in North Korea's Nuclear Deterrent

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On 10 October 2020, in a novel nighttime military parade, North Korea unveiled its newest weapon: a massive, road-mobile, liquid-fueled intercontinental ballistic missile (ICBM) larger than any other previously showcased by the secretive nation. The missile, unofficially dubbed the "Hwasong-16" by international observers and simply dubbed as a "monster" by other observers, is indeed monstrous in size. It is estimated to be between 4 and 5 meters (approximately 12–15 feet) longer than the Hwasong-15, and up to half a meter wider.[1] If these estimates are true, then the Hwasong-16 is doubtlessly the largest road-mobile ICBM ever developed.[2]

Speculation as to the desired use of this missile varies, but many speculate that Pyongyang developed the Hwasong-16 as a delivery platform for multiple reentry vehicle (MRV) or multiple independently targetable reentry vehicle (MIRV) nuclear warheads. If this is true, then it would also indicate a major advance for North Korea's missile development, warhead miniaturization, and nuclear deterrent as a whole. This, however, is not the only conclusion that can be drawn by the appearance of this new weapon. This new missile may be a sign of North Korean advancement, but it may also be a sign of its shortcomings. Just as the Hwasong-16 can represent the bleeding edge of North Korean missile and nuclear technology, a few key aspects of the apparent need for the Hwasong-16 may provide insight into a nuclear program that is not advancing rapidly, but is, perhaps, somewhat stalled.

The first suspicion comes from the physical configuration of the missile. The Hwasong-16, if deployed, will be the largest road-mobile ICBM ever fielded—but there is a reason other countries that field road-mobile ICBMs, such as Russia and China, have not fielded anything larger. Road-mobile ICBMs are meant to be mobile and use mobility and camouflage to obtain a degree of stealth and survivability that silo-based ICBMs often do not have. In terms of practicality, having a larger missile, however, can severely compromise these capabilities. A larger missile is both harder to move and harder to conceal in that its great size and weight limits both the roads it can use (of particular concern in a country such as North Korea, which has few well paved roads) and the locations from which it can be launched.

Moreover, there are even more significant issues associated with a very large road-mobile missile: the fuel type. The Hwasong-16 is believed to be liquid-

fueled—which adds additional, compromising difficulties in the operation of the missile. Liquid-fueled missiles, unlike solid-fuel missiles, typically cannot be stored with fuel already loaded and cannot be launched immediately. The liquid propellants must be loaded into the missile just prior to launch. With a missile as large as the Hwasong-16, this process of erecting and fueling could take hours—making the missile a prime target for interdiction. By comparison, Russia, China, India, and Pakistan all almost exclusively field road-mobile missiles with solid-fuel propellants. This allows for faster launch times and avoids the issue of lengthy fueling periods prior to launch. In this context, the enormous weight, size, and liquid-fueled nature of Hwasong-16, even if operationally fielded and assuming that it operates as expected, will make it a heavily flawed nuclear deterrent.

Despite such shortcomings, Pyongyang's pursuit of the Hwasong-16 may allude to its attempt at a MIRV-capable missile, or may reflect a much more troubled weapons development program, particularly regarding the miniaturization of nuclear warheads. Though North Korea is believed to have achieved the technology necessary for miniaturizing a nuclear weapon, they have not yet demonstrated this capability.

Since the Hwasong-15 could already theoretically strike the entirety of the continental US with a sizable payload, the main purpose of a new missile would logically be to deliver greater payload capacity at the same distance—possibly for MIRV warheads. This is a plausible purpose for the Hwasong-16, but it is fraught with practicality issues. If North Korea desires to MIRV its warheads, it is far more practical to simply continue the miniaturization process until the warhead(s) can fit on the missile. This is more than possible as, for example, the US Minuteman III ICBM is at least 3-4 meters shorter and roughly half a meter thinner than the Hwasong-15 but has been tested with up to seven MIRV warheads, though it was only ever operationally deployed with up to three.[3]

The fact that Pyongyang chose to build an entirely new missile rather than miniaturize warheads to MIRV the Hwasong-15 suggest that there may be some difficulties with the miniaturization process. Instead of reflecting a desire to achieve MRV or MIRV, the Hwasong-16 may reflect a major, and possibly insurmountable (for the time being) obstacle in terms of warhead miniaturization—such that, instead of fitting more miniaturized warheads on the Hwasong-15, Pyongyang found it more practical to instead develop the monstrous and impractical Hwasong-16.

In fact, there is evidence to suggest that North Korea has run into problems with its warhead miniaturization. North Korea has conducted at least six nuclear tests to date. The fourth and fifth tests in 2016 were declared to have been of thermonuclear devices, while the sixth test in 2017 was said to be a "miniaturized" nuclear device. This is according to official statements by the KCNA, but the number sug-

gests otherwise. First, the fourth and fifth nuclear tests had estimated yields of 10–15 kilotons and 20–30 kilotons, respectively. While the North claims to have tested "hydrogen bombs," the estimated yields are far, far below the expected yield of true hydrogen bombs. Such hydrogen weapons are expected to have yields in excess of 100 kilotons, and possibly *far* larger. It is very possible that these tests were either not true hydrogen bombs or were only partially successful tests.

The sixth test was their largest test, with an estimated yield of over 100 kilotons. While this yield is more in line with that of past hydrogen bomb tests, there is doubt as to whether the device tested is a weaponized design. A successful thermonuclear test does not necessarily indicate a weaponized design. For example, the first US thermonuclear test device—codenamed "Mike"—was not a weaponized design and served more as a "proof of concept" for a sustained thermonuclear reaction. While the first Soviet device, RDS-6, was far less unwieldy than the Mike device, it was still a crude and flawed weapon that could only be delivered by air and had no hope of ever fitting on most missiles—to include the Hwasong-16. It is very possible that, despite a successful test, North Korea does not yet actually possess a deliverable weaponized design—whether that be a bomb deliverable by air, or a warhead able to fit on their current missiles.

This possibility seems more likely with the arrival of the Hwasong-16. Given the very large, estimated payload capacity of the missile, the inherent issues of its design and size, and the likelihood that its primary development occurred during the development and/or testing phase of the Hwasong-15, the arrival of the Hwasong-16 may indicate a key shortcoming in North Korea's ability to marry a sufficiently miniaturized warhead(s) to a missile—at least for the time being. If a missile the size of the Hwasong-16 is *needed* to mount multiple warheads, it seems likely that North Korea's current warhead design(s) are rather large. This is, again, compared to the US Minuteman III ICBM, which is significantly smaller than the Hwasong-16, but features truly miniaturized, MIRV warheads. A missile the size of the Hwasong-16 is simply not *inherently* necessary to achieve MIRV status.

This issue may go beyond MIRV status and may even also include their ability to fit even a single warhead to one of their larger ICBMs. If North Korean warheads are indeed that large, the implication is that such warheads are *very* unlikely to fit on North Korea's SCUD missile variants. In other words, it is *possible* that Pyongyang has a stockpile of nuclear weapons, but only a limited number of practical delivery platforms—hence the need for the Hwasong-16. There is historical precedent for this as the Titan II—a US silo-based, liquid-fueled ICBM far larger than the Hwasong-16—was designed to carry just one large warhead, despite its incredible size and range.[4] This is not to say that this is the *likely* state of North Korea's nuclear weapons program, but rather that it is *possible*.

In addition to the issue of warhead miniaturization in creating an ICBM-based nuclear deterrent, reentry vehicle (RV) design is of equal importance. After all, it does not matter how sophisticated a warhead is if it cannot survive reentry into the atmosphere. RVs reentering the Earth's atmosphere from space typically travel at high hypersonic speeds and must endure enormous amounts of heat, pressure, and structural strain. No doubt, RV design could further complicate warhead design as the warhead must be able to fit within the RV, the entire system must then fit onto the missile, and then altogether be able to survive reentry and still detonate as intended. For all North Korea's tests and apparent advancements with this technology, they have not definitively demonstrated the ability to reliably succeed at any of these steps and, while it is possible to speculate that they *may* have the capability to fit a miniaturized warhead into an RV, they absolutely have not demonstrated their capability on the final step: reentry and detonation.

When North Korea tested the Hwasong-14 and Hwasong-15 ICBMs, results regarding RV performance were not entirely optimal. Analysis suggests that the Hwasong-14 RVs did not survive reentry, and that the Hwasong-15 RV may or may not have.[5] At this point, Pyongyang's ability to produce operational warheads capable of surviving reentry and detonating as expected is inconclusive at best. It is also worth noting that these ICBM tests may not have featured high-fidelity RV testing (testing of what is an actual, operational RV, sans nuclear and/or high explosive material) and may have been focused primarily on testing the missile, and not the warhead. In other words, the true status of North Korea's RV technology is not clear, and it either has a spotty track record, or has not been fully tested at all. Either way, North Korea simply has not demonstrated this capability.

Conclusion

While the development and larger, more sophisticated missiles such as the Hwasong-16 indicate potentially significant advancements, and while Pyongyang would certainly like for international observers to believe that they have made great advancements, the evidence presented could go either way. It could either indicate great advancements—as Pyongyang claims—or it could indicate significant obstacles and shortcomings somewhat commiserate with a cessation in testing. Given the undeniable impracticality of fielding a missile as large as the Hwasong-16 as opposed to further miniaturizing warhead technology, the chances of there being a "warhead gap"—so to speak—seem somewhat more plausible. This gap, if it exists, could be due to issues with miniaturization or issues with RV design, or a mixture of both.

Due to the nature of the issue, the true state of North Korea's nuclear and missile development remains obscure. What is clear is that North Korea's nuclear and missile development is far from over—and the main question is exactly *how* far from

over it is. Given the presence of both a new ICBM and a new submarine-launched ballistic missile, it is fair to suspect that Pyongyang may want to conduct new tests at some point. If there is also a warhead gap, then Pyongyang may want to conduct new nuclear tests as well. Only time will reveal what North Korean plans are, but it is ultimately worth noting that there is a stark difference between detonating a nuclear device under a mountain and developing a nuclear warhead that can fit on and be delivered by an ICBM as well as survive atmospheric reentry and detonate as intended. Proficiency in the first case does not necessarily translate to proficiency in the final case. At the very least, North Korea must still demonstrate that its warheads can reliably survive reentry—and this is impossible to do without further testing.

North Korea is currently observing a self-imposed moratorium on ICBM and nuclear testing. While this is a good start for negotiations, there is a genuine fear that North Korea has stopped testing simply because it no longer needs to test. Whether or not this is true—and whether there is truly a warhead gap—is something that time will tell. If tests resume in earnest, then it will be clear that North Korea has more work to do. ✪

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Notes

1. Vann H. van Diepen and Michael Elleman, "North Korea Unveils Two New Strategic Missiles in October 10 Parade," *38 North*, 10 October 2020, https://www.38north.org/.
2. Van Diepen and Elleman, "North Korea Unveils Two New Strategic Missiles."
3. The Minuteman III has been tested with up to seven warheads but only ever deployed with up to three.
4. Missile Defense Project, "Titan II," *Missile Threat*, Center for Strategic and International Studies, 15 June 2018, https://missilethreat.csis.org/.
5. James Acton, Jeffrey Lewis, and David Wright, "Video Analysis of the Reentry of North Korea's July 28, 2017 Missile Test," Carnegie Endowment for International Peace, 9 November 2018, https://carnegieendowment.org/; and Ankit Panda, "The Hwasong-15: The Anatomy of North Korea's New ICBM," *The Diplomat*, 6 December 2017, https://thediplomat.com/.