



Unprecedented Nuclear Strikes of the Invincible Army: A Realistic Assessment of North Korea's Operational Nuclear Capability

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by Peter Hayes and Scott Bruce

September 22, 2011

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I. Introduction

Peter Hayes, Professor, RMIT University and Executive Director of the Nautilus Institute and Scott Bruce, Director of the Nautilus Institute, San Francisco assess that North Korea's options for a nuclear strike are severely constrained—so much so that the only credible use of the DPRK's nuclear arsenal is to detonate a bomb within North Korea itself to slow down or to stop an invasion in the context of an all-out war with the United States and South Korea. They conclude that, "At this stage, North Korea's outrageous nuclear threats against targets outside its borders are not backed up by

actual capabilities. Countering the North's rhetorical threat with more nuclear extended deterrence raises tensions instead of addressing the underlying problem of nuclear insecurity. Ultimately, the only way forward is to re-engage the North, and identify pathways that create confidence and reduce the mutual perception of the threat of massive destruction, whether by conventional or nuclear weapons."

The views expressed in this report are those of the author and do not necessarily reflect the official policy or position of the Nautilus Institute. Readers should note that Nautilus seeks a diversity of views and opinions on significant topics in order to identify common ground.

II. Report by Peter Hayes and Scott Bruce

- "Unprecedented Nuclear Strikes of the Invincible Army: A Realistic Assessment of North Korea's Operational Nuclear Capability"

By Peter Hayes and Scott Bruce

North Korea's KCNA news often threatens to launch "unprecedented nuclear strikes." In reality, the North Korean nuclear program has limited offensive capability. [1] Just how limited is a matter of dispute between well informed observers and analysts. South Korea's Defense Minister Kim Kwan-jin, for example noted recently that it was "possible" that North Korea had miniaturized a nuclear warhead as there had been, in his opinion, "enough time for them to have succeeded in miniaturization." [2] He based his statement on how long it took other states to miniaturize a nuclear warhead, not on an assessment of North Korea's actual nuclear capability. Thus, in the absence of data, North Korea is attributed with capacities that it may—or may not—have. Additionally, even if North Korea has miniaturized a nuclear warhead from a big, heavy and crude nuclear explosive device, the DPRK lacks an effective delivery mechanism and therefore has a limited ability to offensively use nuclear weapons.

We assess that the North is capable of operationally using nuclear weapons, but its options for a nuclear strike are severely constrained. We conclude that the only credible use of the DPRK's nuclear arsenal is to detonate a bomb within North Korea itself to slow down or to stop an invasion in the context of an all-out war. [3] Aside from this nuclear-use scenario, conventional weapons predominate in realistic evaluations of deterrence and war-fighting in the Korean Peninsula.

North Korean Declaratory Nuclear Posture

The stated purpose of the North Korean nuclear program has changed over the last decade. [4] North Korean statements that once described the nuclear program as a tool to secure the state against outside aggression, now describe it as a stabilizing force in the region. During and after the collapse of the Agreed Framework in 2002, KCNA statements described the nuclear program as a substitute for a security guarantee from the United States. If North Korea's security concerns were addressed, they argued, there would be no need for the nuclear program. An October 2002 statement is particularly telling:

"The settlement of all problems with the DPRK, a small country, should be based on removing any threat to its sovereignty and right to existence. There may be negotiations or the use of deterrent force to be consistent with this basis, but the DPRK wants the former, as far as possible."

By 2005 this language had changed. North Korea declared itself to be in possession of nuclear weapons and began to depict its nuclear program as a regional stabilizer which prevented war by countering the US nuclear threat to the region. [6] KCNA statements even suggested that North Korea's nuclear program benefitted South Korea by raising a nuclear umbrella over the entire Korean Peninsula! [7]

By 2010 North Korea had not only openly threatened to use its nuclear weapons for the first time, [8] but made the first real declaratory statement of its nuclear posture in response to the US nuclear posture review:

"The mission of the nuclear forces of the DPRK is to deter and repel aggression and attack against the country and the nation until the denuclearization of the Korean peninsula and the world is realized. The DPRK is invariably maintaining the policy not to use nuclear weapons against non-nuclear states or threaten them with nuclear weapons as long as they do not join the act of invading or attacking us in conspiracy with nuclear weapons states." [9]

Although these statements should be taken very seriously, particularly by South Korea and Japan who are implicated in both via their alliance with the United States, we should not assume that North Korea has the operational military capability to back up this declaratory posture and the stated nuclear threats.

North Korean Technical Nuclear Capacity

When it comes to nuclear threats against the United States, South Korea, and Japan, North Korea vastly overstates its ability to strike. North Korea is estimated to have enough fissile material to produce between five and ten nuclear weapons, depending on the size of the bombs, and the state's efficiency in creating and reprocessing plutonium, and the amount used in its two tests to date. [10] This means that the use of a single nuclear weapon would exhaust 10-20 percent of the DPRK's nuclear arsenal. At this time, the DPRK has not resumed operations of the Yongbyon nuclear facility and is not producing additional plutonium. North Korea's uranium enrichment program, revealed late last year, could be used to enrich uranium for a bomb, but is currently producing low enriched uranium to fuel its under-construction pilot light water reactor—assuming that its declared intention to complete and operate such a reactor is implemented as announced. [11] The limited supply of fissile material means that North must deploy its nuclear weapons in a highly strategic manner and only for the most valuable, most certain returns.

Delivery by Air

North Korea lacks a credible delivery option for its nuclear weapons. North Korean attempts to launch satellites on booster rockets in 1998, 2006, and 2009 used much the same technology needed to launch long-range missiles. All three tests failed. [12] It takes the United States scores of tests to ensure that a new missile design works, and may be deployed with sufficient confidence that it is operationally effective. [13] North Korea needs many more tests of all the systems, independently and together, at a much higher rate than one every few years, to be confident that its missiles would not fail on the ground or in the boost phase, let alone even approach a target with sufficient accuracy to destroy it. [14] In short, the North Korea's long range missile program is not a credible threat to the United States or anyone else for that matter, and is unlikely to be one for some time.

Short and medium-range missiles have been tested but are not accurate enough to effectively target

enemy forces in a combat scenario. The DPRK's medium-range No-dong missiles cannot be counted on to hit a set target. [15] Similarly the DPRK's short range SCUD missiles are highly inaccurate, particularly the mobile SCUD C models with an unreliable guidance system. [16] The SCUD B missiles have only a 50 percent chance of landing within 1 km of their intended target, making them unsuitable for attacking military units. [17] The unreliability of North Korea's missile systems, the limited amount of fissile material, the lack of testing of the components of an integrated nuclear warhead and missile system, and the severity of any response to nuclear next-use by North Korea means that a DPRK leader is highly unlikely to rely on missiles to deliver a nuclear attack with a combined very small probability of success.

North Korea has only a few bombers capable of delivering a large, crude nuclear weapon to a target. The only nuclear-capable bombers in North Korea's arsenal are the Ilyushin Il- 28 "Beagle" and the Chinese H-5 variants. [18] The Beagle was retired by the Soviets in the 1980s, but still is in active use in North Korea. Although the Beagle is technically capable of delivering a nuclear weapon, it is hard to imagine a North Korean bomber not being shot down before it reached its intended target. In a war, a North Korea bomber flying toward the DMZ would be targeted and shot down rapidly by ROK anti-aircraft weapons. Even a bolt-out-of-the-blue surprise attack is not a credible scenario due to the Il-28's slow speed and low maximum altitude. [19] North Korea is highly unlikely to risk its limited stock of fissile material by putting it in a plane with almost no chance of actually delivering the bomb to the target.

Delivery by Sea

Delivery of a nuclear weapon by sea is a far more credible alternative than any of North Korea's air-based delivery options, but still not likely. North Korea has a variety of small boats and midget submarines capable of carrying a nuclear device to a port city in South Korea or Japan. The tactical value of a bomb deployed by boat would be a surprise attack against a port city or a military installation. The primary risks of this strategy are the possible detection. The longer the boat is deployed the greater this risk would be, especially in war or near-war time. That said, the government in South Korea is well acquainted with North Korean attempts to infiltrate its coastal waters via mini-sub. Its ability to detect these intrusions has increased significantly, particularly since the *Cheonan* incident last year. [21]

The DPRK government would be very hesitant to adopt this strategy for fear of losing control of fissile material. If the mother ship or a submarine were captured or sunk or the crew defected, the North would lose a significant part of its nuclear arsenal. Furthermore, given the risk of disruption or interception of communications, Kim Jong-il would have to delegate authority to use the weapon to the crew of the submarine, something that the North would be unlikely to do given the consequences to the regime if the vessel was intercepted. [22]

Small Chance of Success, High Risk of Retaliation

Given that any attempted attack, successful or not, would result in immediate and overwhelming retaliation against North Korea, its leaders are highly unlikely to take this risk using a delivery system with little to no chance of hitting its target. North Korea has limited fissile material, a weak and untested missile program, slow and easily detectable bombers, and a limited, but high risk, ability to deliver a weapon via boat. North Korea risking a 100% chance of overwhelming retaliation for a very small chance of a limited success (after all, even a successful North Korean nuclear surprise attack would not destroy the entire US or ROK military), is not credible. We conclude that North Korea is highly unlikely to use its nuclear arsenal to attack a foreign target.

Deployment in the field

With no feasible delivery mechanisms for external attacks, North Korea's nuclear arsenal is primarily useful militarily, if at all, for the direct territorial defense of the state. The weapons could be deployed within the DPRK (under an invasion corridor or near an air or sea landing site) in order to slow or block an invasion. These weapons would have to be deployed well in advance of any such attack, probably by trucks which could be camouflaged easily, and buried in the ground or stored in tunnels below the invasion corridors. This strategy would involve the risk of losing direct control of the weapons should war break out. It would also entail maintenance of those weapons after they were deployed to ensure that they will fire when needed, raising the risk of early identification.

One of the problems with this strategy is that US and ROK warplanners may have concluded that these will be the most likely places for deployment of a nuclear bomb and compensated for the risk of nuclear attack by plotting alternate invasion routes. Additionally, given that these weapons will be buried in or stored under the ground, it will take more than one to adequately defend a mountainous invasion corridor. In fact, it may take scores of weapons—more than the DPRK can hope to deploy for this task.

These weapons would be very difficult to re-deploy in wartime on surface transport given the risk of air-attack. With a limited number of nuclear weapons, the DPRK may not have an arsenal adequate to pre-deploy bombs at all invasion corridors and air and sea landing zones. Such an attack is more attractive than an attack delivered on an external target. In particular, attempted but failed use will not instantly invoke retaliation, especially if fired as a warning shot in a pre-war period of crisis. [\[23\]](#)

Scenarios in which a North Korean nuclear attack is plausible

North Korea has the capacity to deploy a defensive nuclear force. If the only realistic deployment of a North Korea nuclear weapon would be in or under an invasion corridor, the most realistic scenario for nuclear next use on the Korean peninsula would be in response to an attack or the imminent threat of an attack. This nuclear next-use could have one of two purposes. First, nuclear weapons could be used before an attack by US and ROK forces to send a warning of the severity of the situation to the US and South Korea in order to stall or stop a war from starting or escalating further. Second, North Korea could use nuclear weapons to directly assault US or ROK forces during an actual invasion of the DPRK.

In the first scenario, North Korea would effectively blow up a small piece of itself to indicate that any attack will involve a nuclear response, if not exchange, to delay the invasion or provoke a diplomatic response to reduce tensions. Fallout created by the nuclear blast would (depending on season) likely blow onto South Korea. Responding to the possible threat of resulting radiation to troops and civilians downwind from the blasts would evoke a firm and likely massive response by the US and the ROK. Furthermore, with better access to iodine tablets, superior equipment and training for combat under conditions of radiological and chemical threat, US and ROK forces would have a significant tactical advantage over the North Korean forces after a nuclear blast.

The second scenario would involve a direct North Korean assault against the combined forces of the ROK and US militaries in an attempted breakthrough of defensive forces. In what could become a fluid battlefield no longer defined by the Military Demarcation Line established by the Armistice, the North could attempt to lure or channel countervailing US and ROK forces into attack corridors and narrow defiles north of the DMZ where the DPRK might have a tactical advantage. However, sealing these corridors would require the use of more than one pre-emplaced nuclear weapon and the DPRK would quickly exhaust its arsenal. This strategy would have a higher risk of US or ROK forces seizing the nuclear weapons if the DPRK waited too long to detonate them, or lost communications and control over them.

Even if such detonations were successful in a tactical sense, such an attack would guarantee the demise of the North Korean state, not deter or defeat the invaders. North Korean forces, even augmented by nuclear capabilities, are outmatched by US and ROK forces. [24] North Korean use of nuclear weapons would ensure that the US and ROK dismantled the DPRK with conventional forces to demonstrate to future proliferators the consequences of using nuclear weapons, and to avoid further radiological havoc in Korea itself.

Nuclear Threat on the Korean Peninsula

It is worth noting that the US is also constrained in its use of nuclear weapons on the Korean peninsula. A US nuclear missile attack from US Air Force bases at Malmstrom, Warren, or Minot would have to overfly the Russian Far East. Russia's early warning system has deteriorated significantly since the end of the Cold War; its satellite capabilities are very limited and its land based early warning radars are located in the west of the country. [25] This means that Russia would be most likely to detect the missile when it was descending from the apogee of the missile and plunging back towards earth, a few minutes before it would hit the target. The sudden appearance of an incoming ICBM could provoke a counter-attack from Russia. Clarifying the launch of a nuclear attack on North Korea with the Russian leadership would be tantamount to the United States asking Russian permission to go to war, something the United States is not likely to do and the Russian government would be unlikely to agree to should the United States be foolish enough to ask. Thus, use of American ICBMs against the DPRK would have to be done as a *fait accompli*, risking Russian response. The same logic applies to China which is even less equipped to monitor American ICBMs in the boost phase, let alone the incoming re-entry vehicles.

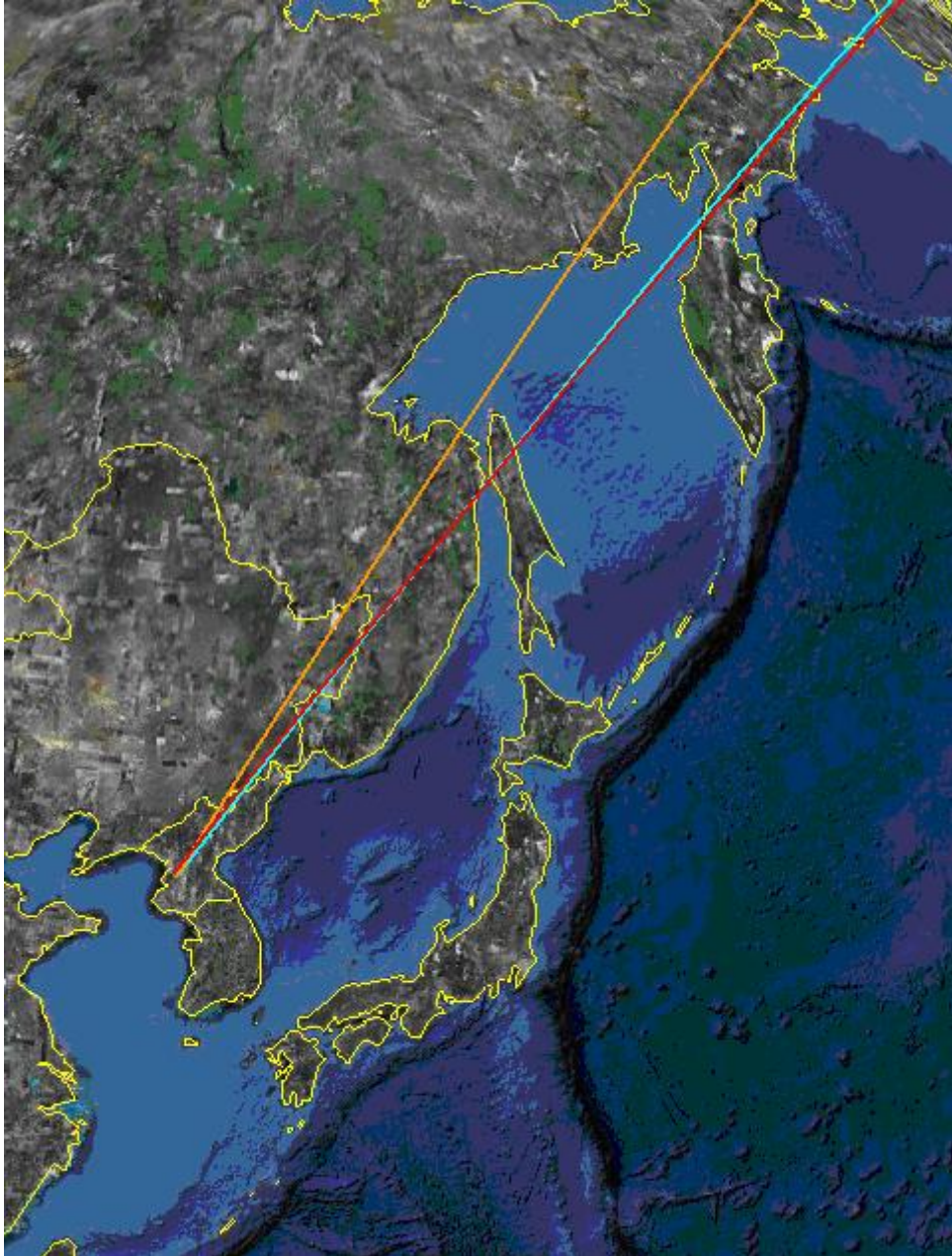


Figure 1: ICBM trajectories from Minot AFB (shown in orange), Malmstrom AFB (shown in blue), and Warren AFB (shown in red).

Given how slow they are, strategic bombers flying from the continental United States would be unlikely to be used to deliver more than a few nuclear weapons on North Korea in “real time” during a war. Moreover, they would be susceptible to technological failure, might have to overfly Japan, creating political problems, and could be intercepted by adversarial forces (and not only North Korean) in the course of a war between the United States, South Korea, and North Korea.

We conclude that a US attack on North Korea designed for military effect with many, near simultaneous nuclear strikes likely would have to come from a US submarine in the Pacific somewhere to the south and west of the lines indicated in Figure 2 if they are to avoid overlying Russia or, for that matter, Japan. [26] Submarine-fired missiles would be reliable, extremely prompt, accurate, available in a range of numbers fired in a short term, and, up to the moment of firing, could be recalled.

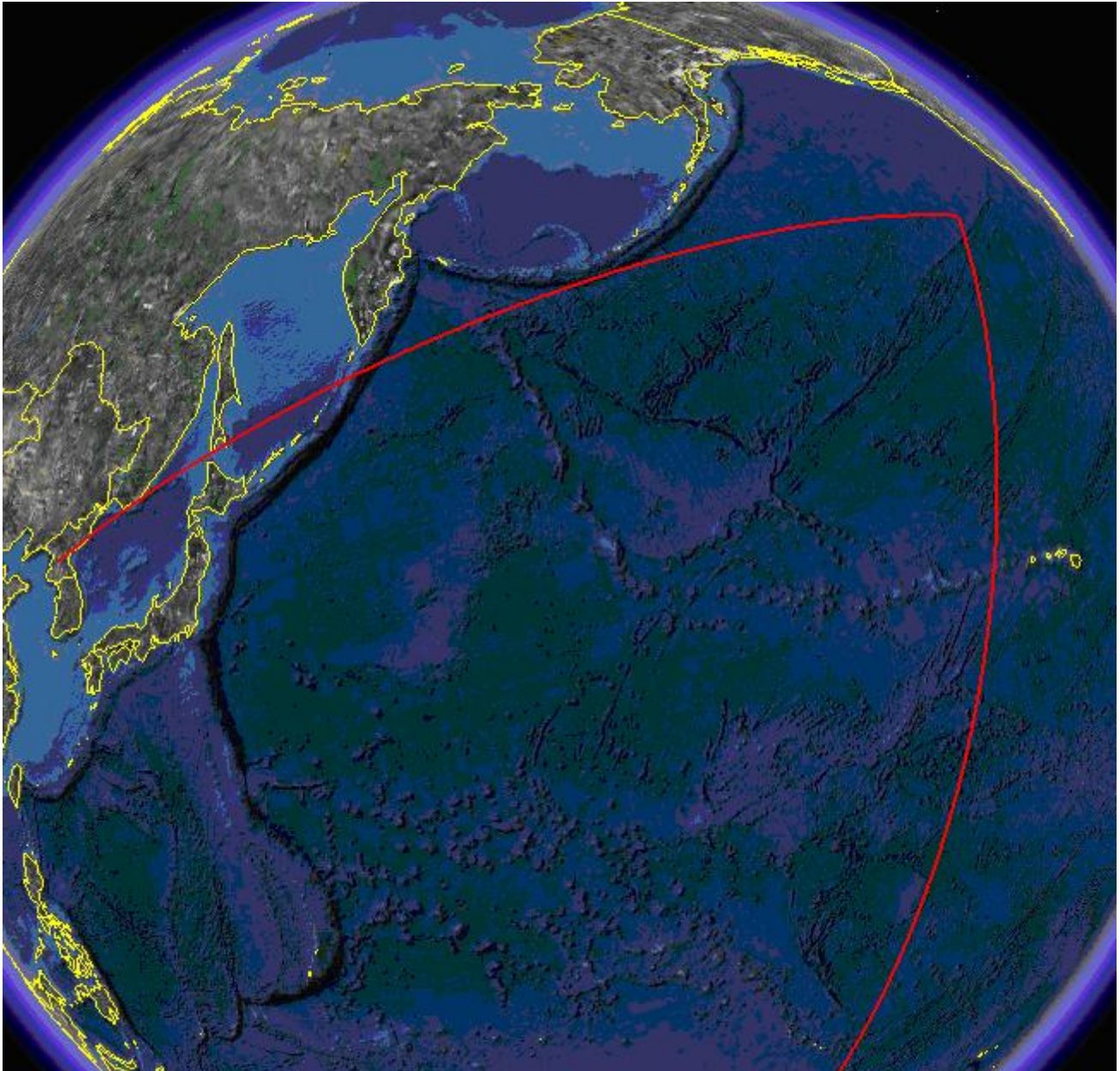


Figure 2: Area from which a Submarine Launched Ballistic Missile (SLBM) could be fired at North Korea without overflying Russia is south and west of the lines indicated above.

Such an attack, particularly if done from the western Pacific using a depressed trajectory from a submarine to shorten delivery time to target in North Korea, would be of great concern to China which would also fall in the line of fire, and could rapidly invoke Chinese intervention in the Peninsula. China's long-range phased radar arrays reportedly point northwards anticipating attack either from the United States over the North Pole, or from Russia (formerly, the Soviet Union). This means that the Chinese, like the Russians, would only be able to identify an attack from a US based ICBM at the last minute. They too would have to decide in a few minutes whether to ride out a possible nuclear strike—or respond immediately by launching a counter-strike against the United States (for example, Guam) or its allies that host US forces (such as Japan and Korea). Again, the United States would have to decide in advance to advise the Chinese (given the risk that a civilian or news reporter files an instantaneous report of missile firings from the continental United States) or again, risk their response.

Conclusion

Overall, therefore, all nuclear-armed parties to the Korean conflict are constrained in their options to use nuclear weapons. In our view, this is a good thing, but the situation is inherently unstable, and constantly tilts towards pre-emption. Admittedly, as Patrick Morgan points out, the fact that nuclear attack by either North Korea or the United States is of limited credibility, implies that there should not be reason for great concern on either side—and the less credible the weapons and their delivery systems, the more secure North Korea and the United States should be with respect to each other. [\[27\]](#)

Conversely, there are many more pathways to using nuclear weapons than can be imagined in advance of attempts to actually use them, and their existence poses the threat that a creative pathway will be found that overcomes the constraints outlined above—either by evading the constraints in an “asymmetrical” manner in the case of North Korea, or by risk-taking and the application of raw power by the United States (in overruling the veto of the other nuclear weapons states that it would likely face in attacking North Korea with nuclear weapons in most conceivable circumstances).

In this regard, nuclear weapons are the ultimate “threat devices.” Their mere existence presents an existential threat that must be attended to by those who fall under the shadow of the threat of nuclear attack. The perception of threat derives from the combination of intention, either immediate or general, with more or less credible capacity to deliver actual attacks. Thus, the very massiveness of nuclear attack, even “small” nuclear attacks, reduces their relevance to real-world deterrence. But intention also matters, and one indicator of intention is doctrine and statements of intention. Whilst the North Korean threat statements are outrageous and hyperbolic with respect to their relative and actual capacity to act on their threats, they strike fear into the minds of the populations and leaders of states that are the subject of such threats, that is, they are psychologically potent. US threats, while more clinical in nature in the language used, are just as potent, because they are backed up by far more capable technologies, and the US leadership descends from the only nuclear weapons state to have ever used nuclear weapons against human targets, lending a certain edge to perceptions of US credibility.

On the ground, in a military, operational sense, and in spite of virulent nuclear threats issued by the DPRK and a countervailing nuclear threat from the United States in the form of extended nuclear deterrence, conventional forces are the key to stability on the Korean peninsula and will remain so for the foreseeable future.

If conventional forces are the basis of military deterrence in Korea, and if nuclear forces on both sides of the DMZ are primarily psychological weapons, then US and ROK policy would be best served by reducing the nuclear threat in the region. Calls in the ROK for US tactical nuclear weapons to be redeployed or for an independent nuclear arsenal are especially unhelpful. De-emphasizing nuclear deterrence—something the North Koreans have requested in negotiations over their nuclear program—might open the door for engagement with North Korea to roll back its nuclear program. [\[28\]](#)

At this stage, North Korea’s outrageous nuclear threats against targets outside its borders are not backed up by actual capabilities. Countering the North’s rhetorical threat with more nuclear extended deterrence raises tensions instead of addressing the underlying problem of nuclear insecurity. Ultimately, the only way forward is to re-engage the North, and identify pathways that create confidence and reduce the mutual perception of the threat of massive destruction, whether by conventional or nuclear weapons.

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<https://nautilus.org/wp-content/uploads/2011/12/Wright1.pdf> page 7.
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Canberra, 1991, pp. 75-91, at: <https://nautilus.org/wp-content/uploads/2011/12/Chasing-Gravits-Rainbow-PDF1.pdf> This level of testing represents the gold standard for confidence that missiles work as “advertized”—but they still fail. See E. Grossman, “New Details Emerge About U.S. Nuclear Missile Test Failure,” *Global Security Newswire*, August 22, 2011, at http://gsn.nti.org/gsn/nw_20110822_1563.php

[14] This includes the reliability of the warhead itself, the missile, and the re-entry vehicle, all of which must work, and then work together, for a missile to be deployable with confidence. See J. Lewis, “Can North Korea Mate a ‘Simple’ Fission Weapon to the Taepo Dong 2?” April 30, 2005, at: <http://lewis.armscontrolwonk.com/archive/578/can-north-korea-mate-a-simple-fission-weapon-to-the-taepo-dong-2>

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[22] Bruce Bechtol argues (personal communication, September 15, 2011) in response to a draft of this essay that the DPRK could use a container ship, either one of its own or reflagged, to transport a nuclear weapon into a port city and detonate it. We differ on the probability that US, ROK, or Japanese authorities would allow an uninspected cargo vessel to enter a port city during a war. We believe that the DPRK using this strategy to commence a war with a first strike on a port city is not credible because it would guarantee its destruction, either by nuclear retaliation from the United States (unlikely in our view), or by massive conventional attack by the United States, South Korea, and likely the other nuclear weapons states that are also UNSC permanent members. However, we converge with his conclusion that the most realistic external delivery option would be by ship (in our case, we further limit the option to submarine). See “Planning for the Unthinkable: Countering a

North Korean Nuclear Attack and Management of Post-Attack Scenarios” at:

http://www.kida.re.kr/data/kjda/01_Bruce_Bechtol.pdf

[23] One “external” mode of ground delivery would be to attempt to move a nuclear weapon via an undiscovered tunnel reaching into South Korea under the DMZ into a shallow, subterranean firing point. As such tunnels were dug to allow troops to attack from behind US-ROK forces in South Korea, such a nuclear firing point is conceivable in a physical sense, but the strategic value is very unclear.

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[26] This diagram is true only for a spherical non-rotating Earth. The eastward spinning of Earth means that the firing point must be slightly further east than shown in this diagram as the relative positions of firing point and target will close in the half hour it would take for a missile to travel to a target. The missile’s trajectory must also compensate not only for Earth’s rotational effect, but also its oblateness and geophysical anomalies, and many other sources of possible error with respect to accuracy. To some extent, maneuverable warheads can offset the trajectory overflight problem, but Russia would be highly alarmed at indicators of multiple launches of ICBMs in an over-the-pole trajectory. See J. Constant, *Fundamentals of Strategic Weapons, Offense and Defense Systems*, Martinus Nijhoff, 1981, The Hague, pp. 167 et passim. We are grateful to Ted Postol for his technical advice in relation to the missile trajectories and possible early warning radar visibility of US missiles.

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