

North Korea's Nuclear Threat: How to Halt Its Slow But Steady Advance

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In the first five weeks of 2016, North Korea twice defied UN Security Council resolutions designed to stem its pursuit of nuclear weapons. On January 6, it conducted its fourth underground nuclear test; on February 7, it launched a satellite into space for the second time. These two events provide a vivid reminder that North Korea continues to make progress mastering the technology needed for developing long-range ballistic missiles and arming them with nuclear warheads. U.S. leaders have long sought to formulate and implement policies that would secure a denuclearized Korean peninsula, but these efforts have not been successful. U.S. political commentary on North Korea vacillates between taking at face value the regime's exaggerated claims of technological prowess and reducing its leadership to cartoonish stereotypes. A clearer and more nuanced understanding of North Korea's motives and its nuclear and missile programs is needed to chart a path toward bending the trend lines in a more favorable direction.

HIGHLIGHTS

- With its pursuit of nuclear weapons and willingness to share critical technologies with other countries, North Korea poses one of the world's worst proliferation threats.
- Political pressure and the imposition of sanctions have not prevented North Korea from making a steady, year-by-year advance toward achieving an arsenal with dozens of nuclear-armed missiles in the coming years.
- Although North Korea has had genuine technological accomplishments in its development of nuclear weapons, it has also greatly exaggerated its own military capabilities to intimidate its potential enemies and secure the support of its own people.
 - It is not clear how successful North Korea has been in designing nuclear warheads for delivery in ballistic missiles.
 - Although North Korea deploys short- and medium-range ballistic missiles capable of carrying nuclear warheads, it does not yet have the ability to field a reliable longer-range missile.
- It is unlikely that North Korea has been able to develop a hydrogen bomb, as claimed by President Kim Jong Un.
- North Korea is many years away from having a credible sea-based, nuclear-armed ballistic missile force.
- The conventional strength of the North Korean army continues to decline relative to the forces arrayed against it.
- Negotiating a halt to North Korean nuclear and missile tests and its production of fissile material would yield real security dividends for the United States and the international community.
- Such an outcome is feasible if the United States and South Korea are willing to ease sanctions, scale back military exercises, and negotiate a peace treaty.

Background

The relationship between the United States and the Democratic People's Republic of Korea (North Korea) has been one of the most fraught in the post-World War II history of U.S. diplomacy. The bloody three-year war precipitated by North Korea's June 1950 invasion of South Korea not only poisoned prospects for developing relations between Pyongyang and Washington, it squelched any chance of early accommodation between the United States and the new communist regime in China, whose massive intervention had rescued North Korea from a decisive UN victory in the war. It also helped blind U.S. policymakers to the actual and potential rifts inside what was perceived to be a monolithic Communist bloc.

Nearly 63 years after the Korean War ended in an armistice between North Korean and Chinese combatants and the UN Command, North Korea has emerged as one of the most serious proliferation threats in the world. It possesses all three categories of weapons of mass destruction and has demonstrated a willingness to share its nuclear and missile technologies with other countries in areas of tension and conflict, such as the Middle East and South Asia. It is the only country that has repeatedly broken the 21st century's de facto moratorium on nuclear testing.

North Korea has never signed a peace treaty with the government in Seoul or with South Korea's critical ally, the United States. The sides remain antagonistic, unable to consolidate rare periods of détente or avoid numerous crises that threaten to plunge the peninsula into war again.

The authoritarian and rigid ideology of North Korea's founder, Kim Il Sung; his son, Kim Jong Il; and grandson, Kim Jong Un has isolated and impoverished the nation, opening up a huge contrast with democratic and economically successful South Korea. International efforts to pursue an effective nonproliferation policy toward North Korea have been burdened by Pyongyang's paranoid reactions to U.S. and South Korean defense efforts—reactions characterized by bombast, threats, and the occasional bloodletting. The ability of North Korean ally China to play a constructive role in conflict resolution has been inhibited by Beijing's fear of the consequences if North Korea's dynastic dictatorship were to implode.

The United States, in concert with close allies South Korea and Japan, has sought to deter North Korean military moves by retaining considerable combat forces in South Korea and the region (albeit now without nuclear weapons) and maintaining them in a high state of readiness. During the last dozen years, Washington has sought to



A public television screen in Seoul, South Korea shows breaking news on North Korea's February 7, 2016 satellite launch. The launch contravened UN Security Council demands that North Korea not conduct any launch using ballistic missile technology.

provide additional reassurance to its allies by deploying strategic and theater missile defenses against the North Korean missile threat. It has also repeatedly pushed for international sanctions to penalize North Korea for proliferating missile and nuclear technology and for other violations of international norms.

The United States has sometimes reneged on its commitments, such as the timely delivery of heavy fuel oil to North Korea that it promised under the 1994 Agreed Framework. Washington has also acquiesced in South Korea's development of missiles that are not compliant with the Missile Technology Control Regime and that could target the entire territory of North Korea. Moreover, U.S. defense officials and military leaders have openly discussed the option of pre-emptive attack against North Korea. When the Obama administration adjusted U.S. military doctrine to declare that nuclear weapons would only be used in response to nuclear attack, it excluded from this assurance countries such as North Korea and Iran, which were not in compliance with their nuclear Nonproliferation Treaty (NPT) obligations.

This year opened with a stark reminder that the international community has not been able to halt and reverse North Korea's development of nuclear weapons capabilities. In the same month that Iran satisfied conditions for reaching implementation day of its nuclear deal, North Korea conducted a fourth nuclear test, boasting that it had detonated a hydrogen bomb. As UN Security Council members debated the kind of additional sanctions that might be imposed on North Korea for defying the will of the international community on nuclear testing, Pyongyang defied UN Security Council resolutions prohibiting specified missile activities by launching a satellite with a space rocket that could facilitate development of an intercontinental-range ballistic missile.

These developments have raised questions in South Korea about the reliability of U.S. defense assurances and have led to advocacy by South Korean politicians of compensatory measures, including some calls for the development of nuclear weapons. Meanwhile, Washington's willingness to offer Seoul the U.S. Terminal High Altitude Area Defense (THAAD) system have increased suspicions in Beijing that China is the real target against which such missile defenses would be directed.

The six-party negotiating process to resolve nuclear issues has been dormant since 2008, mostly stuck over preconditions for resuming dialogue. A negotiating formula to halt and ultimately reverse North Korea's growth in nuclear capabilities will need to be built on an accurate understanding of what nuclear weapons

Figure 1: Crises involving North Korea

YEAR	EVENT	DESCRIPTION
1968	<i>The Blue House Raid</i>	North Korean Army commandos sought to assassinate South Korean President Park Chung-hee at his Blue House residence. The incident resulted in 26 deaths.
1968	<i>USS Pueblo Capture</i>	North Koreans captured the US intelligence collection ship USS Pueblo outside North Korean territorial waters. The ship's 82 crew members were tortured and starved during their 11-month captivity.
1969	<i>EC-121 Shootdown</i>	A North Korean fighter plane shot down a US Navy reconnaissance aircraft over the Sea of Japan. The shootdown resulted in 31 deaths.
1976	<i>DMZ Axe Murders</i>	North Korean soldiers killed two US Army officers with axes in the Korean Demilitarized Zone for pruning a tree that had been personally planted by DPRK Founder Kim Il Sung.
1983	<i>Rangoon Bombing</i>	North Korea was implicated in a bombing of the Martyrs' Mausoleum in Burma during the visit of South Korean President Chun Doo-hwan, which killed 21 people, including three members of Chun's cabinet.
2010	<i>ROKS Cheonan Sinking</i>	A North Korean submarine torpedoed and sank a South Korean navy ship in disputed waters off Korea's west coast. The sinking resulted in 46 deaths.
2013	<i>Nuclear Threats</i>	North Korea said it will scrap the 1953 Armistice ending the Korea War, threatening a "pre-emptive" nuclear strike against the United States and South Korea. It later announced it was on the verge of a nuclear war with South Korea, warning foreigners to leave the country.

Multiple Sources

capabilities Pyongyang now has at its disposal and what limits it might accept in the future.

Nuclear Capabilities

Although North Korea acceded to the NPT in 1985, the International Atomic Energy Agency (IAEA) was never able to certify that all of Pyongyang's nuclear activities were peaceful. By the time the Agreed Framework was negotiated in 1994, North Korea had reprocessed enough plutonium from its five-megawatt Yongbyon research reactor to supply sufficient fissile material for several nuclear weapons. Yet, implementation of the Agreed Framework and introduction of IAEA safeguards brought an abrupt halt to North Korea's access to the plutonium. For eight years, plutonium

stockpiles were kept under constant surveillance by agency inspectors. When the Agreed Framework collapsed in 2002, North Korea expelled IAEA personnel and regained access to the plutonium for use in constructing weapons.

During an unofficial 2010 visit from a U.S. delegation led by nuclear scientist Siegfried Hecker, it became evident that North Korea was proceeding on a uranium track as well, having constructed a modern, industrial-scale uranium-enrichment facility with 2,000 centrifuges. Although it is not known how much highly enriched uranium (HEU) is being produced, it is reasonable to assume that North Korea now has access to both types of fissile material used in nuclear weapons.

U.S. Director of National Intelligence James Clapper confirmed in congressional testimony on February 9 that North Korea had expanded its uranium-enrichment facility at Yongbyon and restarted its plutonium-production reactor there. Clapper assessed that North Korea “could begin to recover plutonium from the reactor’s spent fuel within a matter of weeks to months.”¹ The Institute for Science and International Security has assessed that, in addition to the plutonium reactor at Yongbyon, the gas centrifuge plant there is also likely to be operational.²

North Korea has now conducted four underground nuclear explosive tests, in 2006, 2009, 2013, and 2016. The first test had an assessed yield below one kiloton, suggesting that it did not perform as designed. Each of the subsequent tests was more powerful, but each was below 10 kilotons. The fourth test was assessed to be lower yield than the third.

Less is known about the nature of the devices tested. The first two were assessed to have probably used only plutonium, but it is not known which fissile material was used in the third and fourth tests. Pyongyang claimed the third test was a miniaturized device. Because the fourth test had a relatively low yield, experts doubt North Korean claims that it was a hydrogen bomb, a term commonly used for thermonuclear weapons deriving energy from fusion in addition to fission. It may have been a “boosted fission”

device, using deuterium-tritium gas— isotopes of hydrogen— to boost the yield of energy released from fission.

There is a wide range of estimates on the size of North Korea’s present and future stockpiles of fissile material. The periodic and sometimes reduced power operations of the Yongbyon reactor and the incomplete knowledge of the efficiency and extent of North Korea’s uranium-enrichment efforts make precise estimates difficult. The starting point is the six to eight weapons worth of plutonium known to have been held by North Korea when the IAEA still had access to the stockpile.

One of the most comprehensive nongovernmental assessments was published in March 2015 by the US-Korea Institute at SAIS. This study estimated that the weapons stockpile at that time was sufficient for 10 to 16 weapons.³ There were indications that China’s official assessment of the number of North Korean nuclear devices was still higher. Other experts, however, have argued that the US-Korea Institute estimates were too high because they did not account for the time lag between acquiring sufficient fissile material for a weapon and actually manufacturing a weapon. Whatever differences may exist in specific estimates and projections, there seems to be a consensus that North Korea’s nuclear weapons arsenal is definitely headed significantly upward in coming years.

Delivery Vehicles

North Korea continues to develop ballistic missiles and exercise its large arsenal of several hundred short- and medium-range systems, most originally derived from Soviet Scud short-range ballistic missiles. North Korea has also repeatedly displayed and paraded longer-range road-mobile systems, such as the liquid-fuel Musudan intermediate-range ballistic missile and KN-08 intercontinental ballistic missile (ICBM). U.S. intelligence assesses that “North Korea has already taken initial steps toward fielding” the KN-08,⁴ and some senior military officials have referred to the system as “operational.” Yet, neither the KN-08 nor the

Figure 2: North Korean Nuclear Tests

DATE	ESTIMATED YIELD	FISSILE MATERIAL	SEISMIC SIGNATURE MAGNITUDE	NORTH KOREAN CLAIM
2006 (October)	< 1 kiloton	Plutonium	4.7	
2009 (May)	2.4 kilotons	Plutonium	4.5	
2013 (February)	6-9 kilotons	Unknown	4.9	“miniaturized device”
2016 (January)	6-8 kilotons	Unknown	4.85	“hydrogen bomb”

Multiple Sources

Musudan has been flight-tested, suggesting that they have a long way to go before justifiably being considered an operationally deployed and reliable delivery system.

Moreover, without nuclear warheads, these low-accuracy missiles are essentially weapons of terror against civilians in urban areas and of limited utility against point targets or mobile military formations. North Korea has probably been able by now to miniaturize its nuclear devices sufficiently so that they can be used to arm its medium-range Nodong ballistic missiles,⁵ but even if they have not yet done so, it is reasonable to assume that every nuclear test brings the regime closer to such a capability.

In May 2015, North Korea opened a new vector of missile development by conspicuously conducting what it claimed was a flight test of a submarine-launched ballistic missile, dubbed Pukgeukseong-1 (KN-11 in U.S. parlance). Western experts⁶ exposed Pyongyang's characteristic embellishment of the facts by demonstrating that the test depicted was more likely a launch ejection system test from a barge rather than a missile flight test from an actual submarine. Joseph S. Bermudez Jr., subject expert for 38 North, reported that "North Korea was in the initial stages of developing a seaborne ballistic missile launch capability and that under optimal conditions this was an emerging regional threat rather than an imminent threat." Bermudez emphasized that "[i]t does not represent an emerging intercontinental threat."⁷

North Korea's fifth satellite launch attempt, on February 7, 2016, resulted in a successful placement of an "earth observation" satellite in orbit, repeating the success of a similar launch of the Unha-3 in 2012. These last two launches followed the failures of the first three announced attempts⁸ starting with the Taepodong-1 in 1998. Initial analysis indicates that the latest satellite placed in space, the Kwangmyongsong-4, had not yet begun to communicate with the ground. The 2012 satellite never stopped tumbling and was unable to carry out its announced mission.

Flights of the Unha-type space rockets, including the most recent on February 7, have prompted some observers to refer to the system as a Taepodong-2 ICBM in disguise and the satellites launched as cover for testing a military payload. Such characterizations exaggerate the military utility of these space launches.

Michael Elleman of the International Institute of Strategic Studies highlights the deficiencies of the Unha/Kwangmyongsong satellite launch vehicle as a military system.⁹ He concludes that "[t]he accumulated experience and knowledge of past and future satellite launches will not significantly contribute to the design and development of a viable and reliable long-range ballistic missile."¹⁰

Figure 3: North Korea's Long-Range Ballistic Missile/Space-Launch Vehicle Launches



The January 7, 2016 launch of the Kwangmyongsong SLV, as shown on North Korean Television (KCTV).

TAEPODONG-1 SLV

- **Date of Launch:** August 1998
- **Stages:** *Nodong 1st stage:* unknown 2nd stage; solid-fuel 3rd stage
- **Performance:** 3rd stage failed to place satellite in orbit

TAEPODONG-2 ICBM

- **Date of Launch:** July 2006
- **Stages:** *Clustered Nodong 1st stage:* unknown 2nd stage; unknown 3rd stage
- **Performance:** 1st stage failed after 42 seconds

UNHA-2 SLV

- **Date of Launch:** April 2009
- **Stages:** *Clustered Nodong 1st stage:* probable modified Scud B 2nd stage; unknown 3rd stage
- **Performance:** 3rd stage failed

UNHA-3 SLV

- **Date of Launch:** April 2012
- **Stages:** *Clustered Nodong 1st stage:* modified Scud B 2nd stage; unknown 3rd stage
- **Performance:** 1st stage failed after 90-100 seconds

UNHA-3 SLV

- **Date of Launch:** December 2012
- **Stages:** *Clustered Nodong 1st stage:* modified Scud B 2nd stage; 3rd stage similar to Iran's Safir SLV 2nd stage
- **Performance:** Successfully placed satellite in orbit

KWANGMYONGSONG SLV

- **Date of Launch:** February 2016
- **Stages:** *Clustered Nodong 1st stage:* modified Scud B 2nd stage; 3rd stage similar to Safir SLV 2nd stage
- **Performance:** Successfully placed satellite in orbit

ENDNOTES

Michael Elleman, correspondence with author

The 2015 US-Korea Institute study, which attributed “an emergency operational capability” to the “Taepodong ICBM” (a hypothetically weaponized “Unha SLV [space launch vehicle]) conceded that such weapons would be “highly vulnerable” and have “low reliability.”¹¹

Policy Implications—New Approach Needed

Ever since IAEA inspectors discovered discrepancies in information Pyongyang had provided with regard to its safeguards agreement in the early 1990s, the United States has expended considerable unilateral effort in seeking to curb the proliferation risks from North Korea. Unilateral actions, international sanctions, and other measures have indisputably complicated Pyongyang’s efforts to obtain a nuclear arsenal. Some diplomatic initiatives, such as the 1994 Agreed Statement, significantly slowed North Korea’s progress over a period of years, even though the

sanctions are a means to an end not an end themselves.

In order to enhance international support for sanctions and exploit the opportunity strengthened sanctions may offer in the coming weeks, they must be accompanied by an openness to negotiate without requiring North Korea to capitulate on the key issue in dispute as a precondition for starting talks. Fixation on the ideal U.S. solution—a denuclearized North Korea, with no space rockets or nuclear-capable ballistic missiles—will only encourage Pyongyang’s resistance and lead to further advances toward building a mature nuclear arsenal.

A Flexible Six-Party Process

The six-party mechanism for diplomatically engaging North Korea has a checkered history, but there is nothing conceptually wrong with keeping China, Japan, Russia, and the United States centrally involved in efforts to establish

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agreements themselves did not endure.

Nevertheless, although nonproliferation efforts with North Korea have not been worthless, they have clearly failed to achieve their principal objective. In the 30 years since Pyongyang acceded to the NPT, North Korea may have produced fissile material for up to 20 nuclear weapons. It has produced and deployed hundreds of missiles, which could be armed with nuclear warheads, and has been testing space rockets that help its scientists and engineers acquire some of the skills and materials needed to eventually build and deploy long-range ballistic missiles that could target the United States.

It is time to consider a new policy approach toward North Korea. If proliferation cannot be reversed under current circumstances, it could at least be stopped in its tracks. The general formula employed successfully in the Iran nuclear deal—a realistic compromise solution that addresses the highest priority needs of each party—may provide a useful template.

The United Nations seems likely to strengthen its already tough sanctions regime against North Korea. The United States, South Korea, and Japan are in the process of implementing additional unilateral measures. But

a *modus vivendi* between the two Korean governments. All of these parties are relevant. North Korea’s neighbors and past patrons, China and Russia, have political, economic, and military interests in stabilizing the Korean peninsula. In Pyongyang’s view, the United States looms as the biggest current threat to be curbed, with a powerful, hostile, and unrepentant Japan standing alongside. From Washington’s perspective, Japan and South Korea represent its strongest security anchors in the Far East and two of its closest political allies in the world.

As was the case in the P5+1 negotiations with Iran, various smaller configurations for dialogue would be possible within the larger setting, including bilateral talks between the United States and North Korea. Yet, it is not necessary to decide in advance exactly how the interlocutors would interact or to predetermine the internal dynamics of negotiations. It is useful, however, to consider now the kind of substantive compromises that the parties could see as being in their mutual interest.

Formulating a Framework for a Freeze

The pursuit of a halt to North Korea’s nuclear testing, missile testing, and fissile material production seems the

most propitious starting point for re-energized negotiations, accompanied by a U.S.-South Korean offers to consider reduced military postures and terms of a peace treaty.

- North Korea would agree to halting nuclear testing, separation of plutonium, uranium enrichment at levels above that needed for power reactors, flight testing of new missile¹² types (those that have not been flight-tested in the past), and providing nuclear or missile technologies to other countries or nonstate actors.
- In exchange for these restrictions on North Korean activities, the United States and South Korea would offer to decrease the size and frequency of joint military exercises; defer consideration of U.S. regional missile defense deployments to South Korea, such as the THAAD system, ease certain sanctions, and open negotiations on a peace treaty.

If the highest priority of the Kim Jong Un government is to remain in power, which necessarily includes deterring U.S.-South Korean invasion, this framework should be of interest in Pyongyang. With a demonstrable lowering of U.S.-South Korean military activities and willingness to negotiate a peace treaty, Kim could present a deal to his domestic audience as solidifying the regime's security by locking in its nuclear deterrent, strengthening its economy, and enhancing its prestige.

North Korea's Nascent Nuclear Deterrent

Halting further progress in North Korea's nuclear program may be less difficult than it appears, since Pyongyang probably sees its principal objective of developing a nuclear capability as having already been accomplished. The United States has taken North Korea's potential nuclear capability very seriously for some time. However inchoate, this capability constitutes a major impediment for Washington in contemplating any use of military force against North Korea.

Comparing U.S. behavior since 2002 toward North Korea, Iraq and Iran is instructive in this regard:

- President George W. Bush, who incorporated preventive war in U.S. military doctrine for the first time, chose to invade Iraq in 2003 instead of North Korea, even though the latter was the only member of the "axis of evil" known to have already possessed fissile material.
- In 2006, President Bush ignored the public plea of

Figure 4: Location of North Korea's Nuclear and Space Launch Sites



former Secretary of Defense William Perry and future secretary Ashton Carter to attack North Korea's launch facility prior to its July launch of the Taepodong-2 ICBM.¹³

- Throughout his two terms, President Obama has repeatedly declared that the option of a disarming attack on Iran would remain "on the table" even though Iran had neither fissile material nor long-range missiles. No comparable threats have been regularly issued against North Korea.

The proposed limitations would, therefore, not remove what North Korea believes it has already gained from its nascent nuclear arsenal, nor would it necessarily block permanently the country's development of a full-fledged arsenal over the longer term. Yet, it would avoid for a significant period any worsening of the nuclear threat posed by North Korea to the United States and U.S. allies.

As Jeffrey Lewis correctly observed last year, limits on North Korea's nuclear and missile programs that keep the weapons unreliable "would be an achievement."¹⁴

Looking Ahead

As more stringent sanctions take hold in coming months, the Obama administration will have leverage to begin a process, which could lead to a beneficial outcome – but only if it includes diplomatic engagement. Beginning this process in 2016 could put the new U.S. president in a position to achieve a breakthrough in containing a major proliferation threat instead of inheriting a deepening security crisis.

Halting the forward movement in North Korea's nuclear program would be a significant achievement. But even if it were considered to be an interim one, achieving a halt would position the United States well to exploit any future change in political circumstances that would allow it to realize the ultimate goal of a nuclear-free Korean peninsula.

ENDNOTES

1. Mark Landler, "North Korea Nuclear Threat Cited by James Clapper, Intelligence Chief," *The New York Times*, February 9, 2016.

2. David Albright and Serena Kelleher-Vergantini, "Update on North Korea's Reactors, Enrichment Plant, and Possible Isotope Separation Facility," *ISIS Imagery Brief*, February 1, 2016, http://www.isis-online.org/uploads/isis-reports/documents/Yongbyon_January_2016_Update_Final.pdf.

3. Joel S. Wit and Sun Young Ahn, "North Korea's Nuclear Futures: Technology and Strategy," *North Korea's Nuclear Futures Series*, 2015, p. 7, <http://38north.org/wp-content/uploads/2015/02/NKNF-NK-Nuclear-Futures-Wit-0215.pdf>.

4. James R. Clapper, "Worldwide Threat Assessment of the U.S. Intelligence Community," February 9, 2016, <http://www.dni.gov/files/>

[documents/SASC_Unclassified_2016_ATA_SFR_FINAL.pdf](http://www.dni.gov/files/documents/SASC_Unclassified_2016_ATA_SFR_FINAL.pdf) (statement for the record given before the Senate Armed Services Committee).

5. For an argument that nuclear warhead miniaturization by North Korea is plausible, see Jeffrey Lewis, "North Korea's Nuclear Weapons: The Great Miniaturization Debate," 38 North, February 5, 2015, <http://38north.org/2015/02/jlewis020515/>.

6. See Jeffrey Lewis, "DPRK SLBM Test," Arms Control Wonk, May 13, 2015, <http://www.armscontrolwonk.com/archive/207631/dprk-slbm-test/>.

7. Joseph S. Bermudez Jr., "Underwater Test-Fire of Korean-Style Powerful Strategic Submarine Ballistic Missile," 38 North, May 13, 2015, <http://38north.org/2015/05/jbermudez051315/>.

8. This number does not include the failed launch attempt of the Taepodong-2 intercontinental ballistic missile in July 2006, even though the missile's first and second stages may have been identical to the Unha Space Launch Vehicles.

9. See Michael Elleman, "North Korea's Satellite Launch Does Not Further Its Long-Range Missile Programme," *IISS Voices*, February 10, 2016, <http://www.iiss.org/en/iiss%20voices/blogsections/iiss-voices-2016-9143/february-df45/north-korea-rocket-launch-885d>.

10. Michael Elleman, "North Korea Launches Another Large Rocket: Consequences and Options," 38 North, February 10, 2016, <http://38north.org/2016/02/melleman021016/>.

11. Wit and Ahn, "North Korea's Nuclear Futures," p. 9.

12. It may be advisable to offer an exemption for space launches, provided that measures are found to verify that these activities have no direct military application.

13. Ashton B. Carter and William J. Perry, "If Necessary, Strike and Destroy; North Korea Cannot Be Allowed to Test This Missile," *The Washington Post*, June 22, 2006.

14. Lewis, "North Korea's Nuclear Weapons."