NCNK

THE NATIONAL COMMITTEE ON NORTH KOREA

ISSUE BRIEF

North Korea's Nuclear Weapons Program

DANIEL WERTZ, MATTHEW McGRATH, and SCOTT LaFOY

April 2018

ABOUT THE AUTHORS

Daniel Wertz is Program Manager at NCNK, where he has worked since 2011. Wertz manages NCNK's research and publications, and is the lead researcher and editor of North Korea in the World, an interactive website exploring North Korea's external economic and diplomatic relations. Prior to working at NCNK, Wertz was a research assistant at the U.S.-Korea Institute at the Johns Hopkins School of Advanced International Studies. Wertz received master's degrees in International and World History in a joint program from Columbia University and the London School of Economics, and a bachelor's degree in History from Wesleyan University.

Matthew McGrath contributed to a previous edition of this Issue Brief while interning at NCNK in 2015. At the time, McGrath was pursuing a graduate degree at the Johns Hopkins School of Advanced International Studies with concentrations in Korea Studies and International Economics, and a minor in Strategic Studies. Upon completion of his internship with NCNK, he also interned at the U.S. Department of the Treasury's Office of Foreign Assets Control, and the U.S. Department of State's Office of Korean Affairs.

Scott LaFoy is an independent analyst focusing on ballistic missile and nuclear balance issues in East Asia. LaFoy currently works as an analyst with the James Martin Center for Nonproliferation Studies and the Arms Control Wonk Podcast. LaFoy has worked as an analyst for NK Pro focusing on satellite imagery and North Korean strategic capabilities, and CSIS, focusing on North Korean cyber operations. LaFoy received a master's degree in Security Studies from the Georgetown University Center for Security Studies and a bachelor's degree in Government from Georgetown University.

NCNK

The National Committee on North Korea (NCNK) is a non-governmental organization of persons with significant and diverse expertise related to the Democratic People's Republic of Korea. NCNK and its members support principled engagement with North Korea as a means to promote peace and security on the Korean Peninsula and to improve the lives of the people of North Korea. NCNK also works to provide policymakers, the academic and think tank community, and the general public with substantive and balanced information about developments in North Korea. NCNK was founded by Mercy Corps, a global aid and development organization, in 2004.

CONTACT

The National Committee on North Korea
1111 19th St. NW, Suite 650
Washington, DC 20036
www.ncnk.org
info@ncnk.org
@NCNKorea

Cover Image: Korean Central News Agency

Note: This Issue Brief primarily addresses technical and strategic issues related to North Korea's nuclear weapons program. For more on the history of negotiations and diplomacy regarding the North's nuclear program, see the NCNK Issue Brief on US-DPRK Relations.[*] For more on North Korea's ballistic missile program, which has developed in tandem with the country's nuclear arsenal, see the NCNK Issue Brief on the North Korean Ballistic Missile Program.[†]

Introduction

Despite years of international condemnation, diplomacy, and pressure, North Korea has succeeded in amassing an arsenal of dozens of nuclear weapons, and is poised for further expansion of this arsenal – in terms of both size and sophistication – in the future. The country's sixth and most recent nuclear test featured a yield in the hundreds of kilotons, indicating that Pyongyang may have succeeded in developing a thermonuclear device. Many experts also believe that Pyongyang has also achieved the capability to produce nuclear warheads that are sufficiently compact to be paired atop ballistic missiles, although North Korea may not yet have mastered all of the technologies necessary to produce a long-range missile that could reliably deliver a nuclear warhead to the continental United States. Furthermore, North Korea is increasing its stockpile of fissile material through both uranium enrichment and plutonium production programs, is developing a wide array of more sophisticated delivery systems, and has begun to articulate a nuclear posture which stresses its willingness to escalate a conflict.

Pyongyang's nuclear ambitions stretch back decades. North Korea signed a civil nuclear agreement with the Soviet Union in 1959, and a few years later received assistance from Moscow in constructing a research reactor near the town of Yongbyon. Through the 1960s and 70s, as South Korea hosted U.S. tactical nuclear weapons and engaged in nascent nuclear weapons research of its own, North Korean leader Kim Il Sung repeatedly expressed an interest in acquiring nuclear weapons as a guarantor of the country's strategic autonomy.[1] Beginning in 1979, North Korea began construction of a 5 MWe experimental nuclear reactor at Yongbyon – a Magnox-type reactor which could operate on natural uranium and produce weapons-grade plutonium. Under Soviet pressure, North Korea acceded to the Non-Proliferation Treaty (NPT) in 1985, but did not allow IAEA monitors into the country until 1992, and ultimately withdrew from the agreement in 2003.

As the North Korean nuclear program came under increasing international scrutiny in the early 1990s, and Pyongyang faced economic collapse at home and the loss of its longtime allies and patrons abroad, North Korea's nuclear program became the subject of intense international diplomacy. Under Kim Jong Il, North Korea leveraged its nuclear program to help achieve some of its diplomatic and economic objectives, at times offering limited nuclear concessions in return for economic aid and the prospect of improved relations with the United States. After the succession of power to Kim Jong Un, North Korea adopted a policy of *byungjin* – or simultaneous development of the economy and nuclear weapons – and moved swiftly to develop its nuclear

[*] https://www.ncnk.org/resources/briefing-papers/all-briefing-papers/history-u.s.-dprk-relations
[†] https://www.ncnk.org/resources/briefing-papers/all-briefing-papers/north-koreas-ballistic-missile-program

weapons as well as the long-range missiles to deliver them. Increasingly, North Korea has also become selectively transparent about its nuclear program, using nuclear tests, military parades, and media releases in order to establish credibility about its claims of having a functional nuclear deterrent. Kim's recent reported offers to discuss the denuclearization of the Korean Peninsula represents a significant about-face in North Korea's approach to diplomacy over its nuclear program, but the ultimate ramifications of this maneuver remain to be seen.

The Plutonium Program

North Korea's gas-graphite 5 MWe experimental nuclear reactor at the Yongbyon nuclear complex began operating in 1986 and has served as the centerpiece of its plutonium production efforts.[2] By 1990, North Korea began operating a reprocessing plant to separate plutonium from spent fuel at the 5 MWe plant, producing up to 10 kilograms of plutonium by 1994 – possibly enough for one or two crude nuclear weapons. In the early 1990s, North Korea also began construction of two larger gas-graphite reactors: a 50 MWe reactor at Yongbyon and a 200 MWe reactor at nearby Taechon.

Plutonium production halted when operations at the 5 MWe plant and reprocessing facility, as well as construction of the larger reactors, were frozen under the 1994 Agreed Framework with the United States. However, following the collapse of this agreement in 2002, North Korea resumed operation of the 5 MWe reactor and began reprocessing spent fuel rods to produce plutonium. (Significant construction at the larger reactor sites did not resume.)[3] After operating for several years, the 5 MWe reactor was shut down and partially disabled in 2008, an action taken as a part of the Six Party Talks process. In the most visible part of this process, North Korea demolished the reactor's cooling tower in June 2008.

In April 2013, several years after the Six Party Talks collapsed, North Korea announced its intention to rebuild and restart the disabled reactor.[4] By September of that year, North Korea appears to have restarted operations, and by 2016 the U.S. Director of National Intelligence indicated that North Korea was preparing to begin reprocessing fuel from the reactor to produce plutonium.[5] The 5 MWe reactor is estimated to be capable of producing up to 6 kilograms of plutonium per year, although it is unclear whether it is operating at full capacity.[6] Satellite imagery has indicated that the reactor may be operating only sporadically, due to aging infrastructure and problems with the reactor's new cooling system; the radiochemical laboratory, where spent fuel from the reactor is reprocessed to extract plutonium, has also appeared to be operating intermittently.[7] Additionally, North Korea may be using the 5 MWe reactor, or other facilities at the Yongbyon nuclear complex, to produce isotopes necessary for thermonuclear weapons.[8]

North Korea's experimental light water reactor (ELWR) under construction at Yongbyon may provide a second route for plutonium production. Pyongyang first announced that it would construct a light-water reactor in 2009, in conjunction with its uranium enrichment plans; the following year, a team of U.S. experts was shown the 25 to 30 MWe reactor under construction.[9]

As of the time of writing, the reactor is not yet operational, but external construction appears to be complete and preliminary testing may have recently begun.[10] While Pyongyang has publicly stated that the ELWR is intended for energy production, one report speculates that if the reactor were configured for producing weapons-grade plutonium and commensurate modifications were made to Yongbyon radiochemical laboratory, North Korea could eventually produce up to about 20 kg of plutonium a year.[11]

Recent estimates of North Korea's plutonium stockpile range from 20 to 40 kilograms. These estimates vary based on uncertainties about North Korea's plutonium production prior to 1994 and after 2013, as well as a lack of information about how much plutonium may have been expended during each of North Korea's nuclear tests. If this stockpile were to be converted into plutonium-based fission devices, it would be enough for 5 to 17 bombs. However, because of North Korea's relatively constrained ability to produce plutonium relative to its production of highly-enriched uranium (HEU), as well as for technical reasons, it is possible that North Korea uses a composite core of plutonium and HEU in its nuclear weapons.[12]

Uranium Enrichment

North Korea began receiving centrifuge-related equipment and know-how from the A.Q. Khan network beginning in the mid-to-late 1990s, providing the country with a path to enrich uranium for use in nuclear weapons. [13] North Korea may also have opened a secret centrifuge research and development facility at an underground aircraft base around this time.[14] By the late 1990s, U.S. policymakers began to suspect that the DPRK was acquiring uranium enrichment technology, and the U.S. confronted North Korea about this issue during a 2002 meeting in Pyongyang. After this encounter, the U.S. delegation stated that North Korea admitted to having a uranium enrichment program, while North Korea subsequently denied any such admission or the existence of an enrichment program.[15] Even as the Six Party Talks process led to the disablement of North Korea's 5 MWe reactor in 2008, the DPRK continued to deny the existence of a highly enriched uranium program.[16]

Following its second nuclear test in 2009, North Korea announced that it would commence enriching uranium, and that "enough success has been made in developing uranium enrichment technology" to produce fuel for its experimental light-water reactor.[17] In 2010, a U.S. delegation visited a newly-built enrichment facility at Yongbyon, which it described as a "modern, small industrial-scale" facility that, unlike other North Korean nuclear facilities, was "ultra-modern and clean." The chief process engineer at the enrichment facility told the delegation that it was operational, enriching uranium to an average level of 3.5% (a low level of enrichment standard for light-water reactor fuel), and contained 2,000 centrifuges with a capacity of 8,000 kg separative work units per year.[18] Based on this output level and North Korea's historical involvement with the A.Q. Khan network, analysts believe that North Korea's centrifuge design is based on the second-generation Pakistani P2 model.[19] In 2013, satellite imagery revealed that the centrifuge facility had been expanded with a new roof covering roughly twice the area of the previous one, hypothetically allowing the building to house up to 2,000 additional centrifuges.

Given the sophistication of the Yongbyon enrichment facility and the speed with which it was constructed, many analysts suspect that the country has a second production-scale uranium enrichment facility.[20] The possibility of such a facility existing makes it difficult to estimate North Korea's production of weapons-grade uranium (WGU), and would also complicate any future efforts to freeze North Korean fissile material production or account for its nuclear stockpile. Estimates of North Korea's overall enrichment capacity and WGU stockpiles hinge on the existence and scale of such a secret facility, as well as factors such as the total number, sophistication, and operability of North Korea's centrifuges. Additionally, if North Korea is producing low-enriched uranium to power its ELWR, this would also impinge on its WGU production.

One important question about North Korea's enrichment capabilities centers on its ability to domestically produce key components for centrifuges, or to procure these components from abroad despite a tightening sanctions regime. North Korea appears to have succeeded in procuring or developing the specialized machine tools that are necessary for producing key components for centrifuges, as well as for missile engines. However, experts continue to debate the extent to which North Korea's enrichment program relies on the procurement of foreign components, and therefore whether improved sanctions enforcement and export controls could significantly impede North Korea's production of WGU.[21]

Estimates of North Korea's overall enrichment capacity and WGU stockpiles hinge on the existence and scale of such a secret facility, as well as questions regarding the number, operability, and output of its centrifuges at Yongbyon. A 2017 report by the Institute for Science and International Security estimated HEU production at Yongbyon to be between 38 and 93 kilograms per year (with a median estimate of 58 kilograms), and judged the extant stockpile produced by this facility at 115 to 276 (median 175) kilograms of weapons-grade uranium. The report estimates that if a second production-scale facility exists, North Korea's uranium stockpile would be in the range of 404 to 1071 kilograms, with a median estimate of 644 kilograms.[22] A report by a separate group of specialists, which assumes enrichment at both known and suspected facilities, estimates North Korean WGU production at approximately 150 kilograms per year, with the inventory being very roughly estimated between 200 and 450 kilograms.[23] (These reports estimate that a North Korean uranium-based fission device would use approximately 15-25 kilograms of WGU, placing their potential stockpile at between 13-30 weapons and 10-25 weapons, respectively.)

Weaponization and Tests

To date, North Korea has conducted six underground nuclear tests at its Punggye-ri testing site, demonstrating an increasing yield and claiming greater technical sophistication with each test. North Korea's most recent test was particularly large, providing credibility (but not proof) to Pyongyang's claim to have developed a two-stage thermonuclear weapon, or hydrogen bomb. While the existence, size, and usability of a North Korean hydrogen bomb remain matters of speculation, analysts have increasingly agreed that North Korea is likely able to produce fission-based weapons that are compact enough to fit atop a ballistic missile. (Although North

Korea may be able to deliver a nuclear warhead with a medium-range missile, it has not yet proven the ability to overcome the technical challenges associated with pairing a nuclear warhead to an intercontinental ballistic missile.) After North Korea's sixth nuclear test and the subsequent test of a Hwasong-15 ICBM, North Korean leader Kim Jong Un announced that North Korea "finally realized the great historic cause of completing the state nuclear force."[24]

North Korea's first two tests, which took place in 2006 and 2009, likely used plutonium-based devices and had yields of under 1 kiloton and 2-7 kilotons, respectively.[25] (For comparison, the plutonium-based weapon dropped on Nagasaki in 1945 had a yield of 21 kilotons.) One possible reason for the low yield in the first two nuclear tests is that North Korea may have tested relatively sophisticated implosion devices that only required a small amount of plutonium, seeking to quickly develop a miniaturized nuclear warhead rather than prove a more rudimentary design. In 2008, as part of a declaration of its past nuclear activities, North Korea reported that its first nuclear test used only 2 kg of plutonium; if true, this would indicate a relatively advanced weapon design, one which would be more likely to fizzle in an initial test than a more basic design.[26] Some analysts believe that North Korea could have received warhead designs from the A.Q. Khan network in addition to centrifuges.[27] Alternatively, A.Q. Khan has alleged that North Korea developed advanced warhead designs as early as 1999, although experts question the truthfulness of his testimony.[28]

The yield for North Korea's third test, in 2013, was higher – one expert estimated it to be roughly between 5 to 15 kilotons – and Pyongyang's Korea Central News Agency (KNCA) subsequently described it as a "smaller and light A-bomb unlike the previous ones, yet with great explosive power" in an apparent claim that its nuclear weapons could be miniaturized.[29] In January 2016, North Korea claimed to have successfully tested a "smaller H-bomb," marking the country's fourth nuclear test.[30] Given the low yield of the test – estimated at six kilotons – this claim was met with considerable skepticism, with analysts speculating that North Korea had either conducted an unsuccessful test of a two-stage weapon; tested a "boosted fission" weapon incorporating a small amount of fusion fuel to increase its yield; or was simply bluffing.[31] North Korea's fifth test, in September 2016, had a larger yield – estimated at between 15 to 20 kilotons – and was accompanied by a KCNA claim that it incorporated a nuclear warhead design standardized for use on ballistic missiles.[32]

As North Korea's testing program has advanced, there has been a growing consensus among analysts – supported by both leaked and on-the-record statements by the U.S., South Korean, and Japanese governments – that the country has likely succeeded in developing a warhead compact enough to fit atop a ballistic missile.[33] In March 2016, North Korean state media published a series of photos of Kim Jong Un inspecting a miniaturized nuclear warhead, in order to bolster its claims of having achieved this capability.[34] It is uncertain whether North Korea's most recent fission-based nuclear tests have used plutonium, highly enriched uranium, or a composite fuel; the use of a composite core would allow North Korea to make the most efficient use of its relatively constrained plutonium stockpile and to produce smaller, more powerful bombs, but presents a technical challenge.[35]

North Korea's sixth nuclear test, conducted in September 2017, was by far the largest, with most estimates of its yield ranging from 120 to 250 kilotons.[36] KCNA claimed that the sixth test was of an "H-bomb" meant "to be placed at the payload of the ICBM," and released images of what appeared to be a two-stage Teller-Ulam design thermonuclear weapon, compact enough to fit in a missile's re-entry vehicle.[37] The higher yield indicated that the test was of something more advanced than a pure fission device – it could have been either a boosted fission device or a true multistage thermonuclear device. The size of the device (and therefore the veracity of the images released by KCNA) also remains unknown; it is therefore uncertain whether North Korea can miniaturize advanced nuclear devices as well as simple fission bombs, as there are unique technical challenges associated with miniaturizing thermonuclear devices. Additionally, even though North Korea claimed that this device could be detonated "at high altitudes for super-powerful EMP attack," experts have expressed skepticism both at North Korea's technical capacity for such an endeavor and at the strategic value it would provide.[38]

There are no public estimates of the number of advanced nuclear devices North Korea may possess, and estimates of the overall size of the country's nuclear arsenal and fissile material stockpile vary considerably. A U.S. intelligence community assessment read to the *Washington Post* assessed that North Korea could have up to 60 nuclear devices in its arsenal, as of August 2017.[39] However, this claim has been challenged by nongovernment experts including Siegfried Hecker, who maintains that fissile material estimates limit the size of North Korea's nuclear arsenal at between 20 to 25 devices with production rate of about six or seven devices per year.[40] David Albright, in Congressional testimony, has also indicated that his full estimated range was between 18 and 53 weapons, with 23 to 39 weapons being the most statistically realistic, and with enough fissile material produced for an additional three to five weapons each year.[41] In 2015, a closed-door analysis by Chinese nuclear experts, reported on by the *Wall Street Journal*, estimated that North Korea then had 20 nuclear weapons in its arsenal, but could have 75 weapons by 2020.[42]

Nuclear Proliferation to Other Countries

As Pyongyang's nuclear arsenal has expanded, the prospect of North Korean proliferation of nuclear technology abroad has been a growing concern. The 2018 U.S. Nuclear Posture Review states that "in addition to nuclear threats enabled by North Korea's development of nuclear weapons and delivery systems, North Korea poses a 'horizontal' proliferation threat as a potential source of nuclear weapons or nuclear materials for other proliferators."[43] There are several examples of demonstrated or suspected North Korean nuclear cooperation with foreign countries, as well as a history of North Korean missile proliferation to other countries.

The best-documented case of North Korean proliferation of nuclear technology concerns Pyongyang's cooperation with Syria in the construction of the al-Kibar nuclear reactor in the early-to-mid 2000s. This reactor, built with North Korean technical assistance, had a design very similar to that of North Korea's 5 MWe reactor at Yongbyon.[44] Several North Korean scientists were reportedly present at the facility when it was destroyed by an Israeli airstrike in 2007.[45] In a prior instance of nuclear proliferation, North Korea likely collaborated with the A.Q. Khan

network to send uranium hexafluoride to Libya prior to Tripoli's 2003 decision to dismantle its WMD programs.[46]

Additionally, some analysts have speculated that North Korea may have engaged in nuclear cooperation with Iran, in light of the two countries' past collaboration on the development of ballistic missiles and a 2012 agreement between Pyongyang and Tehran to cooperate on science and technology.[47] There have been multiple media reports alleging various forms of nuclear cooperation between Iran and North Korea, but such reports have tended to rely only on anonymous sources and remain unconfirmed.[48] U.S. officials, as well as reports from the International Atomic Energy Agency and the UN Panels of Experts on Iran and North Korea sanctions, have not publicly confirmed any instances of North Korean nuclear cooperation with Iran.[49]

North Korea has denied having proliferated nuclear technology abroad, and has stated that it would not do so in the future, albeit sometimes with hedged language. In a speech to the Seventh Workers' Party Congress in 2017, Kim Jong Un said that his country would "faithfully observe our commitments to nuclear non-proliferation, which we have made before the international community, and strive for global denuclearization."[50] Previously, Pyongyang had indicated that its willingness to abide by international nonproliferation principles would be dependent on "the improvement of relations with hostile nuclear states."[51]

A separate proliferation worry is the prospect that South Korea or Japan could choose to develop their own nuclear arsenals to deter North Korean nuclear threats, which would deal a major blow to the global nonproliferation regime. Several analysts have also expressed concern over the possible proliferation (or use) of North Korean nuclear weapons arising from internal instability or a collapse scenario. In such a contingency North Korean nuclear weapons, fissile material, or nuclear scientists could escape from established chains of custody, and preventing their diversion to other states or non-state actors would be a complex and difficult task for the global community.[52]

North Korea's Nuclear Posture and Strategic Goals

Under Kim Jong Il, Pyongyang may have viewed its nuclear weapons program at least partially as a political or diplomatic tool to be leveraged at the negotiating table in order to obtain concessions or foreign assistance. However, the DPRK's line on negotiating over its nuclear program has hardened considerably in recent years. North Korea has repeatedly declared that its nuclear program is not "a bargaining chip to be exchanged for something else," and has announced its intent to expand its nuclear forces "qualitatively and quantitatively until the denuclearization of the world is realized."[53] In recent high-level meetings, however, Kim Jong Un reportedly reversed course by indicating a willingness to engage in talks about the denuclearization of the Korean Peninsula, though the long-term implications of this shift in stance remain to be seen.

In line with Kim Jong Un's *byungjin* policy, North Korea has taken measures to solidify the institutional footing of its nuclear weapons program and, in certain ways, to mimic the practices and rhetoric of established nuclear powers.[54] In 2012, North Korea revised its constitution to declare itself a "nuclear state," and also established the KPA's Strategic Rocket Command as an independent service on par with other service branches of the military. (This command was later renamed the Strategic Rocket Force and in May 2014 became the Strategic Force.)[55] North Korean media has emphasized Kim Jong Un's personal oversight of the Strategic Force, reporting frequently on him giving guidance to tests of new missile systems and to drills of apparent practice for nuclear warfighting with existing systems.[56] In late 2017 Kim Jong Un announced that the test of the Hwasong-15 ICBM and the sixth nuclear test marked the establishment of a permanent deterrent and the "completion" of the state nuclear forces.[57] Nonetheless, a number of additional North Korean missile systems appear to remain under development, and questions remain about the capabilities and reliability of the country's ICBMs.

Although North Korea has not formally declared a nuclear doctrine, as most other nuclear states have, in 2013 Pyongyang adopted a "Law on Consolidating the Position of Nuclear Weapons State," which declared the country to be "a full-fledged nuclear weapons state" and provided the outlines of its nuclear posture.[58] This law incorporates a declaratory stance on the conditions under which North Korea would use its nuclear weapons, saying that they will be employed for "deterring and repelling the aggression and attack of the enemy against the DPRK and dealing deadly retaliatory blows at the strongholds of aggression" – indicating intent for use against both military and civilian targets. The law also indicates that the DPRK considers both nuclear weapons states and their allies to be potential targets for its nuclear weapons, and does not include a "no first use" stance. It articulates a highly centralized command and control structure, stating that the country's nuclear weapons may only be used upon "a final order of the Supreme Commander of the Korean People's Army" (i.e. Kim Jong Un).[59]

Subsequent high-level North Korean statements on nuclear targeting and strategy have provided further hints into the country's doctrine and demonstrated internal consistency in some aspects of Pyongyang's nuclear rhetoric, even as these statements also contain significant areas of ambiguity or contradiction.[60] North Korea has consistently indicated that it would be willing to use nuclear weapons first in a conflict, and to use them preemptively if an attack appeared imminent. Pyongyang has also indicated that it intends to practice what Western strategists call "deterrence by denial" – the use of nuclear weapons to stymie or defeat military threats – as well as "deterrence by punishment," or the use of nuclear weapons to annihilate civilian populations in response to an attack. A 2016 KCNA statement, for example, reported on Kim Jong Un leading a missile training exercise simulating "preemptive strikes at ports and airfields in the operational theater in south Korea where the U.S. imperialists nuclear war hardware is to be hurled."[61] At least one North Korean statement has also suggested the use of a two-stage escalation ladder, saying that if it appeared that the U.S. or South Korea were preparing to strike Pyongyang, North Korea would first preemptively launch a strike to decapitate South Korea's leadership, and would target U.S. bases in Asia and the U.S. mainland in a "second striking operation" if the U.S. did not subsequently back down.[62]

Of course, Pyongyang's public signals about its nuclear posture do not necessarily match its operational stance, but may instead reflect long-term program aspirations and the more immediate desire to deter limited conventional strikes. Nonetheless, as both analysts and high-level defectors have pointed out, North Korea has both the incentive structure and military culture in place that would prioritize escalation in the face of conflict or even a limited strike.[63] In the early stages of a military conflict, North Korean leaders would likely find themselves in a "use it or lose it" scenario regarding their nuclear arsenal, and may believe that the threat (or reality) of nuclear escalation would be the only way to stave off an unwinnable conventional war. However, to fully implement a strategy of "asymmetric escalation" – threatening the use of tactical nuclear weapons in response to a conventional attack while keeping its ICBM force in reserve to maintain strategic deterrence – North Korea would first need to make further progress in enhancing the size and sophistication of its nuclear arsenal, and would furthermore have to decentralize its nuclear command-and-control systems (which would cut across the grain of the country's highly centralized leadership system).[64]

Some scholars have argued that there is cold logic to North Korea's pursuit of nuclear weapons, as having a nuclear arsenal provides the surest guarantee of regime security.[65] However, in addition to this deterrent role, North Korea's nuclear program may also be connected to other long-term strategic goals. Some analysts have argued that, for decades, North Korea's ultimate strategic goal has been to leverage its nuclear program to normalize relations with the United States, with Pyongyang seeking security guarantees and an end to what it calls the U.S. "hostile policy" of sanctions, military exercises with Seoul, and human rights criticism.[66] In North Korea's domestic context, the nuclear program has also played an important role in legitimizing the rule of Kim Jong Un, and – if one assumes that North Korea's ambitions are ultimately defensive in nature – the development of a credible nuclear deterrent could enable Pyongyang to cut back on conventional military forces in order to redirect resources into the civilian economy.[67]

More recently, there has been a growing number of Washington policy analysts – echoed by some members of the Trump administration – who have articulated a far more malevolent interpretation of Pyongyang's strategic intentions, claiming that the goal of North Korea's nuclear program is to split the U.S.-ROK alliance and ultimately force unification on Pyongyang's terms.[68] While this thesis is the subject of a vigorous debate, North Korea experts across the political spectrum have stressed that Kim Jong Un is not suicidal and would recognize the extreme risk inherent to initiating a nuclear conflict. For these reasons, these experts have argued strongly against the notion of a preventative strike against North Korea – which would be unlikely to eliminate its nuclear arsenal and could easily lead to escalation and massive casualties – and have generally advocated in favor of U.S. policies stressing deterrence, sanctions, and close coordination with allies in Seoul and Tokyo. Many have also called for enhanced diplomatic efforts to freeze or roll back North Korea's nuclear program before it fully develops a reliable ICBM capability.[69]

[1] Jonathan Pollack, *No Exit: North Korea, Nuclear Weapons, and International Security* (Routledge, 2011); Balazs Szalontai and Sergey Radchenko, "North Korea's Efforts to Acquire Nuclear Technology and Nuclear Weapons: Evidence from Russian and Hungarian Archives," Woodrow Wilson International Center for Scholars, Cold War International History Project Working Paper #53 (August 2006).

[2] North Korea's IRT-2000 research reactor, constructed in the early 1960s with Soviet assistance, may have also produced a small amount of plutonium. This reactor has been largely nonoperational since 1994, due to a lack of foreign fuel supplies, but has reportedly restarted operations a few years ago using domestically-produced HEU in order to produce tritium for thermonuclear or boosted-fission weapons. See Jared S. Dreicer, "How Much Plutonium Could Have Been Produced in the DPRK IRT Reactor?" *Science & Global Security*, Vol. 8 (2000), pp. 273-286; David Albright and Serena Kelleher Vergantini, "North Korea's IRT Reactor: Has it Restarted? Is it Safe?," Institute for Science and International Security, Imagery Brief Report, March 9, 2016, https://isis-online.org/uploads/isis-reports/documents/IRT_Reactor_March_9_2016_FINAL.pdf

[3] In 2010, a North Korean technician told U.S. scientist Siegfried Hecker that the 50 and 200 MWe reactors "have become ruined concrete structures and iron scrap." Siegfried Hecker, "A Return Trip to North Korea's Yongbyon Nuclear Complex," Stanford University Center for International Security and Cooperation, November 20, 2010, http://iis-db.stanford.edu/pubs/23035/HeckerYongbyon.pdf

[4] "DPRK to Adjust Uses of Existing Nuclear Facilities," *KCNA*, April 2, 2013.

[5] "North Korea Restarting its 5 MW Reactor," *38 North*, September 11, 2013, http://38north.org/2013/09/yongbyon091113/; "More Evidence that North Korea has Restarted its 5MWe Reactor," *38 North*, October 2, 2013, http://38north.org/2013/10/yongbyon100213/; David Albright and Robert Avagyan, "Steam Venting from Building Adjacent to 5 MWe Reactor: Likely Related to Reactor Restart," Institute for Science and International Security, September 11, 2013, http://isis-online.org/isis-reports/detail/steam-venting-from-building-adjacent-to-5mwe-reactor-likely-related-to-reac/10; James Clapper, "Worldwide Threat Assessment of the U.S. Intelligence Community," Statement for the Record at a Hearing Before the Select Committee on Intelligence of the United States Senate, *Current and Projected National Security Threats to the United States*, 114th Congress, Second Session, February 9, 2016 (Government Printing Office, 2017).

[6] Siegfried Hecker, "What to Make of North Korea's Latest Nuclear Test?" *38 North,* September 12, 2016, http://www.38north.org/2016/09/shecker091216/

[7] "North Korea's Yongbyon Facility: Probable Production of Additional Plutonium for Nuclear Weapons," *38 North*, July 14, 2017, https://www.38north.org/2017/07/yongbyon071417/; "North Korea's Yongbyon Nuclear Facility: Sporadic Operations at the 5 MWe Reactor But Construction Elsewhere Moves Forward," *38 North*, July 24, 2015, https://www.38north.org/2015/07/yongbyon072415/; David Albright, Sarah Burkhard, and Allison Lach, "On-Going Monitoring of Activities at the Yongbyon Nuclear Site," *Institute for Science and International Security,* February 13, 2018, http://isis-online.org/isis-reports/detail/on-going-monitoring-of-activities-at-the-yongbyon-nuclear-site/10

[8] Hugh Chalmers, "Producing Tritium in North Korea," *Trust & Verify*, No. 152 (January – March 2016), pp. 1-6, http://www.vertic.org/media/assets/TV/TV152.pdf

[9] "DPRK Foreign Ministry Declares Strong Counter-Measures against UNSC's 'Resolution 1874'," *KCNA*, June 13, 2009; Hecker, "A Return Trip to North Korea's Yongbyon Nuclear Complex," *op. cit.*

[10] "Jane's Discovers Likely Operational Testing at North Korean Nuclear Reactor," IHS Markit, March 16, 2018, https://ihsmarkit.com/research-analysis/Janes-Discovers-Likely-Operational-Testing-at-North-Korean-Nuclear-Reactor.html

[11] David Albright, "Future Directions in the DPRK's Nuclear Weapons Program: Three Scenarios for 2020," U.S.-Korea Institute at SAIS, February 2015, http://38north.org/wp-content/uploads/2015/02/NKNF-Future-Directions-2020-Albright-0215.pdf

[12] See Siegfried Hecker, Chaim Braun, Chris Lawrence, "North Korea's Stockpiles of Fissile Material," *Korea Observer*, 2016, Vol. 47, No. 4, pp. 721-749. http://www.iks.or.kr/rankup_module/rankup_board/attach/vol47no4/14833231665766.pdf; and David Albright, "North Korea's Nuclear Capabilities: A Fresh Look," *Institute for Science and International Security, April 22, 2017,* http://isis-online.org/uploads/isis-reports/documents/North_Korea_Talk_April_28_2017_Final.pdf. Hecker et al. estimate a North Korean inventory of 20-40 kg of plutonium, while Albright estimates 23-37 kilograms, with a median or 33. Hecker has noted that differences between his and Albright's numbers primarily come uncertainty of plutonium production prior to 1992 and how much plutonium has been expended in each nuclear test. These estimates both predate North Korea's sixth nuclear test, and the amount of plutonium used in North Korea's higher-yield weapon design is unknown.

[13] David Albright and Paul Brannan, "Taking Stock: North Korea's Uranium Enrichment Program," *Institute for Science and International Security*, October 8, 2010, http://isis-online.org/uploads/isis-reports/documents/ISIS_DPRK_UEP.pdf

[14] David Albright, "North Korea's Suspect, Former Small-Scale Enrichment Plant," *Institute for Science and International Security,* July 21, 2016, https://isis-online.org/uploads/isis-reports/documents/North_Koreas_Pilot_Enrichment_Plant_21Jul2016_Final.pdf

[15] Don Oberdorfer and Robert Carlin, *The Two Koreas*, Third Ed. (Basic Books, 2013), pp. 366-372.

[16] Testimony of Ambassador Christopher R. Hill, "The North Korean Six-Party Talks and Implementation Activities," Hearing before the Senate Committee on Armed Services, 110th Congress, 2nd Session, July 31, 2008, http://2001-2009.state.gov/p/eap/rls/rm/2008/07/107590.htm

[17] "DPRK Foreign Ministry Declares Strong Counter-Measures against UNSC's 'Resolution 1874'," *KCNA*, June 13, 2009.

[18] Hecker, "A Return Trip to North Korea's Yongbyon Nuclear Complex," *op. cit.*

[19] Siegfried Hecker, "Redefining Denuclearization in North Korea," *Bulletin of the Atomic Scientists*, December 20, 2010, http://thebulletin.org/redefining-denuclearization-north-korea-0

[20] Director of National Intelligence James R. Clapper testified before Congress in 2011 that "Based on the scale of the facility and the progress the DPRK has made in construction, it is likely that North Korea has been pursuing enrichment for an extended period of time. If so, there is clear prospect that DPRK has built other uranium enrichment related facilities in its territory, including likely R&D and centrifuge fabrication facilities, and other enrichment facilities. Analysts differ on the likelihood that other production-scale facilities may exist elsewhere in North Korea." James R. Clapper, "Statement for the Record on the Worldwide Threat Assessment of the U.S. Intelligence Community for the House Permanent Select Committee on Intelligence," February 10, 2011.

[21] Ankit Panda, "Experts Disagree on Recent North Korean Nuke Advances," *The Diplomat*, October 23, 2013, https://thediplomat.com/2013/10/experts-disagree-on-recent-north-korean-nuke-advances/; James Pearson and Hyonhee Shin, "How a Homemade Tool Helped North Korea's Missile Program," Reuters, October 12, 2017, https://www.reuters.com/article/us-northkorea-missiles-technology/how-a-homemade-tool-helped-north-koreas-missile-program-idUSKBN1CH1I4; Testimony of David Albright, Hearing before the Monetary and Trade Subcommittee of the House Committee on Financial Services, "A Legislative Proposal to Impede North Korea's Access to Financial Services," September 13, 2017.

[22] Albright, "North Korea's Nuclear Capabilities: A Fresh Look," *op. cit.*

[23] Hecker, Braun, and Lawrence, "North Korea's Stockpiles of Fissile Material," *op. cit.* See also John Bistline et al, "A Bayesian Model to Assess the Size of North Korea's Uranium Enrichment Program," Science & Global Security, Vol. 23, No. 2 (2015), pp. 71-100.

[24] Kim Jong Un, "Kim Jong Un's 2018 New Year's Address," *KCNA,* January 1, 2018, https://www.ncnk.org/node/1427; Seungmock Oh, "DPRK Media Highlights Rallies Celebrating Completion of State Nuclear Force," *NK News,* December 11, 2017,

https://www.nknews.org/2017/12/dprk-media-highlights-rallies-celebrating-completion-of-state-nuclear-force/

[25] Frank V. Pabian and Siegfried S. Hecker, "Contemplating a Third Nuclear Test in North Korea," *Bulletin of the Atomic Scientists*, August 6, 2012, http://thebulletin.org/contemplating-third-nuclear-test-north-korea

[26] Albright and Walrond, "North Korea's Estimated Stocks of Plutonium and Weapon-Grade Uranium," Institute for Science and International Security, August 16, 2012, https://isis-online.org/uploads/isis-reports/documents/dprk_fissile_material_production_16Aug2012.pdf.

[27] See Bruce Klingner, "Going Beyond 'Strategic Patience:' Time to Get North Korean Sanctions Right," Testimony before the U.S. House of Representatives Foreign Affairs Subcommittee on Asia and the Pacific, hearing on "The Shocking Truth about North Korean Tyranny," March 26, 2014. This analysis is partially predicated on the A.Q. Khan network's sale to Libya of detailed instructions on how to produce a Chinese-designed miniaturized nuclear warhead; China had reportedly transferred the weapons design to Pakistan in the early 1980s. See Joby Warrick and Peter Slevin, "Libyan Arms Designs Traced Back to China," *Washington Post*, February 15, 2004.

[28] R. Jeffrey Smith and Joby Warrick, "Pakistani Scientist Depicts More Advanced Nuclear Program in North Korea," *Washington Post*, December 28, 2009; David Albright, "North Korean Miniaturization," *38 North*, February 13, 2013, https://www.38north.org/2013/02/albright021313/

[29] Verification Science Interview with Paul Richards, "Seismic Detective Work: CTBTO Monitoring System 'Very Effective' in Detecting North Korea's Third Nuclear Test," *CTBTO Spectrum*, No. 20 (July 2013), http://www.ctbto.org/fileadmin/user_upload/pdf/Spectrum/2013/Spectrum20_web.pdf; "KCNA Report on Successful 3rd Underground Nuclear Test," *KCNA*, February 12, 2013.

[30] "DPRK Proves Successful in H-bomb Test," Korean Central News Agency, January 6, 2016. The phrase "H-bomb" or "hydrogen bomb" traditionally refers to a multistage thermonuclear device, as opposed to a single-stage fission device, which is traditionally referred to as an "A-bomb" or "atomic bomb."

[31] Anna Fifield, "North Korea Hints it Has a Hydrogen Bomb, but Skepticism Abounds," *Washington Post*, December 10, 2015. https://www.washingtonpost.com/world/north-korea-says-its-ready-to-detonate-h-bomb-but-skepticism-abounds/2015/12/10/fe69922e-17ef-4020-8342-1b07fde0a55b_story.html; Choe Sang-hun, "South Korea Doubts North's Claim It Detonated Hydrogen Bomb," *New York Times*, January 6, 2016; David Albright, "North Korea's 2016 Nuclear Test," Institute for Science and International Security, January 6, 2016. http://isis-online.org/uploads/isis-reports/documents/North_Koreas_2016_Nuclear_Test_final_2.pdf

[32] "DPRK Succeeds in Nuclear Warhead Explosion Test," *KCNA,* September 9, 2016, https://kcnawatch.co/newstream/1473398441-386960063/dprk-succeeds-in-nuclear-warhead-explosion-test/; Hecker, "What to Make of North Korea's Latest Nuclear Test?" *38 North*, September 12, 2016, https://www.38north.org/2016/09/shecker091216/

[33] See Joby Warrick, Ellen Nakashima, and Anna Fifield, "North Korea Now Making Missile-Ready Nuclear Weapons, U.S. Analysts Say," Washington Post, August 8, 2017, https://www.washingtonpost.com/world/nationalsecurity/north-korea-now-making-missile-ready-nuclear-weapons-us-analysts-say/2017/08/08/e14b882a-7b6b-11e7- 9d08-b79f191668ed_story.html?utm_term=.5720d9e11599; Choe Sang-hun, "South Korea Says North Has Capacity to Put Nuclear Warhead on a Missile," New York Times, April 5, 2016, https://www.nytimes.com/2016/04/06/world/asia/north-korea-nuclear-warhead-rodong-missile.html

[34] Max Fisher and Jugal K. Patel, "What One Photo Tells Us About North Korea's Nuclear Program," *New York Times*, February 24, 2017, https://www.nytimes.com/interactive/2017/02/24/world/asia/north-korea-propaganda-photo.html

[35] Albright, "North Korea's Nuclear Capabilities: A Fresh Look," *op. cit.*

[36] "Large Nuclear Test in North Korea on 3 September 2017," NORSAR, September 3, 2017, https://www.norsar.no/press/latest-press-release/archive/large-nuclear-test-in-north-korea-on-3-september-2017-article1534-984.html; Pabian, Bermudez, and Liu, "North Korea's Punggye-ri Nuclear Test Site," *op. cit.*

[37] "DPRK Nuclear Weapons Institute on Successful Test of H-bomb for ICBM," *KCNA*, September 3, 2017, https://kcnawatch.co/newstream/1504452691-4220098/dprk-nuclear-weapons-institute-on-successful-test-of-h-bomb-for-icbm/; "Kim Jong Un Gives Guidance to Nuclear Weaponization," *KCNA*, September 3, 2017, https://kcnawatch.co/newstream/279611/kim-jong-un-gives-guidance-to-nuclear-weaponization/

[38] Elisabeth Eaves, "North Korean Nuclear Test Shows Steady Advance: Interview with Siegfried Hecker," *Bulletin of the Atomic Scientists*, September 7, 2017, https://thebulletin.org/north-korean-nuclear-test-shows-steady-advance-interview-siegfried-hecker11091

[39] Warrick, Nakashima, and Fifield, "North Korea now Making Missile-Ready Nuclaer Weapons, U.S. Analysts Say," *op.cit*.

[40] Eaves, "Hecker: North Korean Nuclear Test Shows Steady Advance," *op. cit.*

[41] Albright, "A Legislative Proposal."

[42] Jeremy Page and Jay Solomon, "China Warns North Korean Nuclear Threat Is Rising," *Wall Street Journal*, April 22, 2015, http://www.wsj.com/articles/china-warns-north-korean-nuclear-threat-is-rising-1429745706

[43] "2018 Nuclear Posture Review," United States Department of Defense, https://www.defense.gov/News/Special-Reports/0218_npr/

[44] David Makovsky, "The Silent Strike: How Israel Bombed a Syrian Nuclear Installation and Kept it Secret," *The New Yorker*, September 17, 2012, http://www.newyorker.com/magazine/2012/09/17/the-silent-strike

[45] "N.Koreans may have died in Israel raid in Syria: NHK," *Reuters*, April 28, 2008, http://www.reuters.com/article/2008/04/28/us-korea-north-syria-idUSL27148012008042 8

[46] Glenn Kessler, "North Korea May Have Sent Libya Nuclear Material, U.S. Tells Allies," *Washington Post*, February 2, 2005, http://www.washingtonpost.com/wp-dyn/articles/A55947-2005Feb2.html

[47] Jay Solomon, "Iran-North Korea Pact Draws Concern," *Wall Street Journal*, March 8, 2013, http://www.wsj.com/articles/SB10001424127887323628804578348640295282274

[48] See for example, Chris Green, "200 North Korean Engineers Reportedly in Iran," *Daily NK*, May 16, 2011, http://www.dailynk.com/english/m/read.php?cataId=nk00100&num=7687; "North Korea Supplied Nuclear Software to Iran: German Report," *Reuters*, August 24, 2011, http://www.reuters.com/article/2011/08/24/us-nuclear-northkorea-iran-idUSTRE77N2FZ20110824

[49] Jim Walsh, "The Iran-North Korea Strategic Alliance," Testimony before the House Committee on Foreign Affairs, July 28, 2015, http://docs.house.gov/meetings/FA/FA18/20150728/103824/HHRG-114-FA18-Wstate-WalshJ-20150728.pdf

[50] "Supreme Leader Kim Jong Un's Report to the Seventh Congress of the Workers' Party of Korea on the Work of the Central Committee," *KCNA*, June 20, 2016, https://kcnawatch.co/newstream/1466432456-941603726/supreme-leader-kim-jong-un-s-report-to-the-seventh-congress-of-the-workers-party-of-korea-on-the-work-of-the-central-committee-full-text/

[51] "Law on Consolidating Position of Nuclear Weapons State Adopted," *KCNA*, April 1, 2013. https://kcnawatch.co/newstream/1451896124-739013370/law-on-consolidating-position-of-nuclear-weapons-state-adopted/

[52] Bruce Bennett, *Preparing for the Possibility of a North Korean Collapse* (Rand Corporation, 2013), pp. 205-223; Peter Hayes and Scott Bruce, "Winning, not Playing the Nuclear Game with North Korea," NAPSNET Policy Forum, June 2, 2009, http://nautilus.org/napsnet/napsnet-policy-forum/winning-not-playing-the-nuclear-game-with-north-korea/

[53] Laurence Norman, "North Korea Says Nuclear Program Isn't 'Bargaining Chip'," *Wall Street Journal*, September 27, 2014, http://www.wsj.com/articles/north-korea-says-nuclear-program-isnt-bargaining-chip-1411858575; "Report on Plenary Meeting of WPK Central Committee," *KCNA*, March 31, 2013.
[54] Joseph Bermudez Jr., "North Korea's Development of a Nuclear Weapons Strategy," *U.S.-Korea Institute at SAIS*, August 2015, http://38north.org/wp-content/uploads/2015/08/NKNF_Nuclear-Weapons-Strategy_Bermudez.pdf
[55] Hong Min, "Enhancement in Nuclear Weapons Development and its Military, Political, and Economic Repercussions in North Korea," Korea Institute for National Unification Online Series, No. CO 15-25, September 21, 2015, http://www.kinu.or.kr/pyxis-api/1/digital-files/b7a34768-2ad8-4dd9-b60c-b7fd08bd9062
[56] Jeffrey Lewis, "North Korea Is Practicing for Nuclear War," *Foreign Policy*, March 9, 2017, http://foreignpolicy.com/2017/03/09/north-korea-is-practicing-for-nuclear-war/
[57] Kim Jong Un, "Kim Jong Un's 2018 New Year's Address," *op. cit.*
[58] K.J. Kwon, "North Korea Proclaims Itself a Nuclear State in New Constitution," *CNN*, May 31, 2012, http://www.cnn.com/2012/05/31/world/asia/north-korea-nuclear-constitution/; "Law on Consolidating Position of Nuclear Weapons State Adopted," *KCNA*, April 1, 2013.
[59] "Law on Consolidating Position of Nuclear Weapons State Adopted," KCNA. For different perspectives on North Korea's nuclear doctrine and strategy, see Léonie Allard, Mathieu Duchâtel & François Godement, "Pre-empting Defeat: In Search of North Korea's Nuclear Doctrine," European Council on Foreign Relations Policy Brief, November 22, 2017; John K. Warden, "North Korea's Nuclear Posture: An Evolving Challenge for U.S. Deterrence," *Proliferation Papers*, Ifri, March 2017; Shane Smith, "North Korea's Evolving Nuclear Strategy," U.S.-Korea Institute at SAIS, North Korea's Nuclear Future Series, August 2015; Joseph S. Bermudez Jr., "North Korea's Development of a Nuclear Weapons Strategy," *op. cit.*; and Alexandre Mansourov, "Kim Jong Un's Nuclear Doctrine and Strategy: What Everyone Needs to Know," NAPSNET Special Reports, December 16, 2014.
[60] For example, North Korean officials and state media have made conflicting claims about whether Pyongyang would use nuclear weapons against South Korea.
[61] "Kim Jong Un Guides Drill for Ballistic Rocket Fire," *KCNA*, July 20, 2016, https://kcnawatch.co/newstream/1468968619-175725481/kim-jong-un-guides-drill-for-ballistic-rocket-fire/
[62] "Crucial Statement of KPA Supreme Command," *KCNA*, February 23, 2016, https://kcnawatch.co/newstream/1456235538-834809067/crucial-statement-of-kpa-supreme-command/
[63] Vipin Narang, "Why Kim Jong Un Wouldn't Be Irrational to Use a Nuclear Bomb First," *Washington Post*, September 8, 2017, https://www.washingtonpost.com/outlook/why-kim-jong-un-wouldnt-be-irrational-to-use-a-nuclear-bomb-first/2017/09/08/a9d36ca4-934f-11e7-aace-04b862b2b3f3_story.html?utm_term=.3e7575ea6eec; "North Korean Defector Says Even a Limited Attack by U.S. Would Trigger All-Out War," *PBS Newshour*, November 3, 2017, https://www.pbs.org/newshour/show/north-korean-defector-says-even-a-limited-attack-by-u-s-would-trigger-all-out-war
[64] See Vipin Narang and Ankit Panda, "Thinking Through Nuclear Command and Control in North Korea," *The Diplomat*, September 16, 2017, https://thediplomat.com/2017/09/thinking-through-nuclear-command-and-control-in-north-korea/
[65] Andrei Lankov, "Why Nothing Can Really Be Done About North Korea's Nuclear Program," *Asia Policy*, No. 23 (January 2017), pp. 104-110.
[66] See Leon Sigal, "Bad History Makes for Flawed Policy," *38 North*, March 27, 2018, https://www.38north.org/2018/03/lsigal032718/
[67] Mansourov, "Kim Jong Un's Nuclear Doctrine and Strategy."

[68] See Benjamin R. Young, "How Washington's View of North Korea's Reunification Plans is Shifting," *NK News*, February 28, 2018, https://www.nknews.org/2018/02/how-washingtons-view-of-north-koreas-reunification-plans-is-shifting/?c=1522186437214

[69] For a broad survey of U.S. expert opinion, see Jung H. Pak, Sue Mi Terry, and Bruce Klingner, "Bloody Nose Policy on North Korea Would Backfire: Ex-CIA Analysts," *USA Today*, February 9, 2018, https://www.usatoday.com/story/opinion/2018/02/09/korea-olympics-close-war-first-strike-disaster-jung-pak-sue-terry-bruce-klingner-column/319072002/; "The Korean Peninsula Crisis (I): In the Line of Fire and Fury," and "The Korean Peninsula Crisis (II): From Fire and Fury to Freeze-for-Freeze," International Crisis Group, Report Nos. 293 and 294, both January 23, 2018; and Patrick Cronin et. al., "Policy Roundtable: Are There Any Good Choices When It Comes to North Korea?" *Texas National Security Review*, February 7, 2018, https://tnsr.org/roundtable/policy-roundtable-good-choices-comes-north-korea/; on the risks of a preventative strike, see Kathleen J. McKinnis et al., "The North Korean Nuclear Challenge: Military Options and Issues for Congress," *Congressional Research Service,* November 6, 2017, https://fas.org/sgp/crs/nuke/R44994.pdf