Congressional Research Service
Informing the legislative debate since 1914

IN FOCUS

August 2, 2018

# North Korea's Nuclear and Ballistic Missile Programs

## Overview

North Korea has made rapid advancements in its nuclear weapons and ballistic missile programs. Since Kim Jong-un came to power in 2012, North Korea has conducted over 80 ballistic missile test launches. In 2016, North Korea conducted two nuclear weapons tests and 26 ballistic missile flight tests on a variety of platforms. In 2017, North Korea test launched 18 ballistic missiles (with five failures), including two launches in July and another in November that many ascribe as ICBM tests (intercontinental ballistic missiles). It conducted a nuclear test on September 3.

Since the June 2018 Singapore Summit between President Trump and North Korean Leader Kim Jong-Un, reports have surfaced showing the dismantlement of a rocket engine test stand at the Sohae satellite launch complex. Although the test stand could be rebuilt, some observers see this as a positive development toward denuclearization while others have suggested the stand was no longer needed for liquid-fuel engines, as North Korea may be opting instead to test and deploy solid rocket motors for their missiles. There have also been reports that North Korea may now be producing liquid-fueled ICBMs at another facility outside the North Korean capital, but other experts point out developments there are not yet clear.

Despite the absence of any missile launch activity or nuclear tests in 2018 to date, previous tests and official North Korean statements suggest that North Korea is striving to build a credible regional nuclear warfighting capability that might evade regional ballistic missile defenses. Such an approach likely reinforces their deterrent and coercive diplomacy strategy—lending more credibility as it demonstrates capability—but it also raises serious questions about crisis stability and escalation control. Congress may further examine these advances' possible effects on U.S. policy.

## Nuclear Tests

On September 3, 2017, North Korea announced that it had tested a hydrogen bomb (or two-stage thermonuclear warhead) that it said it was perfecting for delivery on an intercontinental ballistic missile. North Korea has tested a nuclear explosive device five other times since 2006. According to U.S. and international estimates, each test produced underground blasts that were progressively higher in magnitude and estimated yield. According to the North Korean test announcement, the country had achieved "perfect success in the test of a hydrogen bomb for intercontinental ballistic missile (ICBM)." In early 2018, North Korea announced that it had achieved its goals and would no longer conduct nuclear tests and would close down its test site. However, fissile material production and related facilities have not been shuttered.

## Nuclear Material Production

North Korea continues to produce fissile material (plutonium and highly enriched uranium) for weapons. North Korea restarted its plutonium production facilities after it withdrew from a nuclear agreement in 2009, and is operating at least one centrifuge enrichment plant at its Yongbyon nuclear complex. U.S. officials have said that it is likely other clandestine enrichment facilities exist. Open-source reports, citing U.S. government sources, in July 2018 identified one such site at Kangson.

There is no public U.S. Intelligence Community (IC) consensus of North Korea's fissile material stockpiles. News reports in August 2017 said that one component of the IC, the U.S. Defense Intelligence Agency (DIA), had estimated a stockpile of up to 60 nuclear warheads. Nongovernmental open source estimates are based on material production activities at the Yongbyon site as well as past stockpile estimates. Some experts believe that North Korea could have potentially produced enough material for 13-21 nuclear weapons, and that North Korea could now potentially produce enough nuclear material for an additional 7 warheads per year.

## Doctrine

North Korean statements, taken at face value, appear to describe North Korea's nuclear arsenal as a deterrent to the U.S. "nuclear war threats." In his 2017 New Year's address, North Korean leader Kim Jong Un stated that the North had "achieved the status of a nuclear power," and promised to continue to "build up our self-defense capability, the pivot of which is the nuclear forces, and the capability for preemptive strike ... to defend peace and security of our state." Kim also said at the 2016 Workers' Party Congress that North Korea "will not use a nuclear weapon unless its sovereignty is encroached upon by an aggressive hostile force with nukes." The statement also said that the "nuclear weapons of the DPRK can be used only by a final order of the Supreme Commander of the Korean People's Army (Kim Jong Un) to repel invasion or attack from a hostile nuclear weapons state and make retaliatory strikes."

The U.S. intelligence community has characterized the purpose of North Korean nuclear weapons as intended for "deterrence, international prestige, and coercive diplomacy." In its most recent assessment to Congress, the DNI said in March 2018 that "Pyongyang's commitment to possessing nuclear weapons and fielding capable long-range missiles, all while repeatedly stating that nuclear weapons are the basis for its survival, suggests that the regime does not intend to negotiate them away." The North Korean leader pledged to work toward "complete denuclearization of the Korean Peninsula" in the U.S.-DPRK Singapore Summit statement.

## Warheads and Delivery Systems

According to the U.S. intelligence community, the prime objective of North Korea's nuclear weapons program is to develop a nuclear warhead that is "miniaturized," or sufficiently lighter and smaller to be mounted on long-range ballistic missiles. Miniaturization likely would require a series of nuclear and missile tests. One of the most acute near-term threats to other nations may be from the medium-range Nodong missile, which could reach all of the Korean Peninsula and some of mainland Japan. Outside the intelligence community, U.S. officials have articulated conflicting assessments of North Korea's ability to produce a nuclear warhead for its intercontinental-range missiles. A Pentagon spokesman said in March 2016 that North Korea had not shown such capability, while Admiral William Gortney in April 2016 affirmed a South Korean assessment that North Korea could weaponize a medium-range Nodong missile. The intelligence community believes that North Korea has an ICBM capability, but that it has not been tested and that neither North Korea nor the United States knows whether that capability will work.

A December 2015 Department of Defense (DOD) report, as well as the intelligence community's 2018 worldwide threat assessment, said that "North Korea is committed to developing a long-range nuclear-armed missile that is capable of posing a direct threat to the United States." The DOD report outlined two hypothetical ICBMs on which North Korea could mount a nuclear warhead and deliver to the continental United States: the KN-08 and the Taepodong-2, which was the base rocket for the Unha-2 space launch vehicle. North Korea has paraded what are widely considered mock-ups or engineering models of the KN-08 and KN-14 ICBMs. In 2016, the intelligence community assessed that "North Korea has already taken initial steps toward fielding this [ICBM] system, although the system has not been flight-tested." In July 2017, the DPRK conducted what most have now assessed as two ICBM tests.

In December 2012, North Korea launched an Unha-3 to deliver a satellite into space. The DOD noted that although this space launch vehicle "contributes heavily to North Korea's long-range ballistic missile development," the country did not test a reentry vehicle (RV), and absent an effective RV, "North Korea cannot deliver a weapon to target from an ICBM." North Korea launched the Unha-3 again in February 2016, placing a satellite into earth orbit. Some observers assert that the Unha-3 could be used as an ICBM, but no other country has deployed a space launch vehicle as a nuclear-armed ICBM or developed an ICBM from the technology base of a space launch program alone. Recent static engine tests of a large rocket engine in late 2016 and early 2017 suggest to some progress in their ICBM program, and to others progress in developing a larger space launch vehicle.

North Korea has increased ballistic missile testing in recent years and tested with even greater frequency in 2016. These tests demonstrate growing success and, coupled with increased operational training exercises, suggest a pattern designed to strengthen the credibility of North Korea's regional nuclear deterrent strategy.

North Korea has demonstrated limited but growing success in its medium-range ballistic missile (MRBM) program and its submarine-launched ballistic missile (SLBM) test program. Moreover, North Korea appears to be making some progress in moving slowly toward solid rocket motors for its ballistic missiles. Solid fuel is a chemically more stable option that also allows for reduced reaction and reload times. Successful tests of the Pukguksong-2 (KN-15) solid fuel MRBM in 2017 led North Korea to announce it would now mass produce those missiles.

Furthermore, mobile ballistic missiles, which North Korea is developing, and other measures also reduce U.S. detection abilities. These things together suggest that their test program may be more than just for show or to make a political statement—that it may be intended to increase the reliability, effectiveness, and survivability of their ballistic missile force.

A recent focus in North Korea's ballistic missile test program appears to be directed at developing a capability to defeat or degrade the effectiveness of missile defenses, such as Patriot, Aegis BMD, and THAAD, all of which are or will be deployed in the region. Some of the 2016 missile tests were lofted to much higher altitudes and shorter ranges than an optimal ballistic trajectory. On reentry, a warhead from such a launch would come in at a much steeper angle of attack and at much faster speed to its intended target, making it potentially more difficult to intercept with missile defenses. North Korea has demonstrated in 2017 the ability to launch a salvo attack with more than one missile launched in relatively short order. This is consistent with a possible goal of being able to conduct large ballistic missile attacks with large raid sizes, a capability that could make it more challenging for a missile defense system to destroy each incoming warhead. Finally, North Korea's progress with SLBMs might suggest an effort to counter land-based THAAD missile defenses by launching attacks from positions at sea that are outside the THAAD system's radar field of view, but not necessarily outside the capabilities of Aegis BMD systems deployed in the region.

Taken together, North Korea's progress in nuclear testing, its declared standardization of warhead designs and potential to put those warheads on MRBMs, increased confidence in the reliability of its short-range missile, and efforts seemingly designed to degrade regional ballistic missile defense systems suggest that North Korea may be building a credible regional nuclear warfighting and ICBM nuclear deterrent capability. For many, this has now become a game changer in the U.S.-DPRK relationship.

**Steven A. Hildreth**, shildreth@crs.loc.gov, 7-7635
**Mary Beth D. Nikitin**, mnikitin@crs.loc.gov, 7-7745

**IF10472**