



Updated December 13, 2021

North Korea's Nuclear Weapons and Missile Programs

Overview

North Korea continues to advance its nuclear weapons and missile programs despite UN Security Council sanctions and high-level diplomatic efforts. Recent ballistic missile tests and military parades suggest that North Korea is continuing to build a nuclear warfighting capability designed to evade regional ballistic missile defenses. Such an approach likely reinforces a deterrence and coercive diplomacy strategy—lending more credibility as it demonstrates capability—but it also raises questions about crisis stability and escalation control. Congress may choose to examine U.S. policy in light of these advances.

According to the U.S. intelligence community's 2021 annual threat assessment, North Korean leaders view nuclear weapons as “the ultimate deterrent against foreign intervention.” At the January 2021 North Korean Workers' Party Conference, North Korean leader Kim Jong-un hailed the “status of our state as a nuclear weapons state” and praised its “powerful and reliable strategic deterrent.” Kim Jong-un has said that “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.”

Nuclear Testing

North Korea is observing a self-imposed moratorium on nuclear and long-range missile testing. It has tested a nuclear explosive device six times since 2006. Each test produced underground blasts progressively higher in magnitude and estimated yield. North Korea conducted its most recent test on September 3, 2017. A North Korean press release stated it had tested a hydrogen bomb (or two-stage thermonuclear warhead) that it was perfecting for delivery on an intercontinental ballistic missile.

In April 2018, North Korea announced that it had achieved its goals, would no longer conduct nuclear tests, and would close down its Punggye-ri nuclear test site. It dynamited the entrances to two test tunnels in May 2018 prior to the first Trump-Kim summit in front of a group of journalists. In an October 2018 meeting with then-Secretary of State Mike Pompeo, Kim Jong-un “invited inspectors to visit the [test site] to confirm that it has been irreversibly dismantled,” but this has not yet occurred.

Nuclear Material Production

North Korea reportedly 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 centrifuge uranium enrichment plants at the Yongbyon nuclear complex and possibly at Kangson. An August 2021 International Atomic Energy Agency (IAEA) report says that North Korea was operating

its Radiochemical Laboratory (reprocessing) plant and its Yongbyon Experimental Light Water 5MW(e) Reactor. Spent fuel from this reactor has been reprocessed in the past to extract plutonium for weapons. During the September 2018 North-South Korea Pyongyang Summit, the North stated it would “permanently disable” the Yongbyon facilities if the United States took “corresponding measures.”

Nuclear Warheads

Fissile material production in large part determines the number and type of nuclear warheads North Korea is able to build. The 2021 DIA report says that North Korea “retains a stockpile of nuclear weapons.” Outside experts estimate that North Korea has produced enough fissile material for between 20 to 60 warheads. Another goal of a nuclear weapons program is to lower the size and weight of nuclear warhead for deployment on missiles. In July 2017, a DIA assessment and some outside observers believed North Korea had achieved the level of miniaturization required to fit a nuclear device on weapons ranging across the spectrum of its missiles, from short-range ballistic missiles (SRBM) to intercontinental ballistic missiles (ICBM). Kim Jong-un in January 2021 said that the country was able to “miniaturize, lighten and standardize nuclear weapons and to make them tactical ones.”

Delivery Vehicles

U.N. Security Council (UNSC) resolutions prohibit North Korea's development of the means of delivering conventional and nuclear payloads, in addition to the nuclear weapons themselves. UNSC resolutions ban “all ballistic missile tests” by North Korea. A ballistic missile is a projectile powered by a rocket engine until it reaches the apogee of its trajectory, at which point it falls back to earth using earth's gravity. Ballistic missiles can deliver nuclear and large conventional payloads at high speed and over great distances. They are categorized as short-range, medium-range, or long-range (intercontinental) based on the distance from the launch site to the target.

North Korea is developing nuclear weapons and delivery systems that possess certain critical features: mobility, reliability, potency, precision, and survivability. Mobile weapons have increased survivability compared with fixed launch sites and static stockpiles. Reliability, potency, precision, and in-flight maneuverability work together to maximize the impact of North Korea's limited quantity of weapons, launchers, and warheads. A key element to North Korean missile doctrine, therefore, is continued testing to develop, ensure, and demonstrate these features.

Intercontinental Ballistic Missiles

North Korea improved its ability to strike the entire continental United States with an ICBM through a series of tests in 2017. The DPRK successfully test-launched two

liquid-propellant, road-mobile ICBMs in 2017: the Hwasong-14 (U.S. designated KN-20) and Hwasong-15 (U.S. designated KN-22). North Korea displayed a larger new Hwasong ICBM at an October 2020 military parade but has not flight-tested it. The Defense Intelligence Agency assesses it is “probably designed to deliver multiple warheads.” Reliability of these systems remains uncertain. Without further testing, neither the North Koreans nor others can assess whether the missiles will function as designed. The absence of ICBM tests since the only successful launch of the Hwasong-15 in November 2017 may also suggest that the North Korean missile force possesses only a small quantity of these weapons or that it is continuing its test moratorium for nontechnical reasons.

Short- and Medium-Range Missiles

In 2019 and 2020, North Korea increased the pace of short-range ballistic missile (SRBM) test launches. There was a break in testing between March 2020 and 2021, but a March 25 test launch of a short-range system ended the pause. In September, tests of the KN-23 SRBM were launched from a new rail-mobile launcher. These test launches violate United Nations prohibitions.

North Korean SRBMs and medium-range ballistic missiles (MRBM), precision-guided multiple launch rocket systems (MLRS), and artillery pose the most acute near-term threats to other nations. Advances in these systems demonstrate the North Korean shift toward solid-propellants and satellite guidance systems; advances that could carry over to larger, more potent systems like the Hwasong series ICBMs. These developments provide the projectiles greater mobility and survivability prior to launch and greater potency and precision on target.

In the MRBM category, the KN-15 poses the greatest threat to North Korea's regional adversaries and exhibits advanced technology. Known in North Korea as the Pukguk-song-2, the KN-15 is a solid-propellant missile capable of striking mainland Japan and carrying a nuclear or conventional payload—known as dual capable. The North Koreans fire the missile from a tracked vehicle, which gives the system mobility and makes prelaunch targeting of the system difficult.

The KN-23 SRBM exemplifies the most notable advance to the North Korean inventory in the smaller category of weapons. The May 2019 tests of two KN-23 missiles revealed an atypical flight path in which the weapon flew much closer to the ground than a traditional ballistic missile. On terminal approach to its target, the KN-23 conducted a “pull-up” maneuver, intended to complicate the ability of ground-based interceptors to destroy the hostile missile in flight by increasing its speed and angle of attack to the target. The KN-23 can strike any location on the Korean peninsula with either a conventional or nuclear payload and uses a solid-propellant. A March 25, 2021, launch may have tested a variant of the KN-23, according to observers, and was called a “new-type tactical guided projectile” by official North Korean press statements.

North Korea has committed to expanding the performance of its precision guided *tactical* weapons. The newly

developed KN-24 and KN-25 pose significant threats to South Korea and U.S. assets on the peninsula. The KN-24 is a tactical system with a mobile launcher, solid propellant, and relatively large payload. The KN-24 demonstrates the guidance system and in-flight maneuverability to achieve precision strikes. Outside experts assess that the North Koreans may ultimately intend the KN-24 to serve as a dual capable system.

The KN-25 blurs the line between rocket and missile; however, it achieves the same effect as a traditional SRBM by delivering destructive effects on a precision target at significant range thanks to advanced avionics, inertial and satellite guidance systems, and aerodynamic structures. The KN-25 carries a conventional payload up to 380 km, allowing it to strike any target in South Korea. Tests in 2019 and 2020 demonstrate that a crew can launch the four rockets composing the KN-25 system at 20-second intervals. Since the KN-25 is a more economical system than traditional SRBMs, the North Koreans may seek to fire large numbers of these rockets in salvos to overwhelm the ability of an adversary's missile defense systems to successfully engage all incoming projectiles. Salvo firing projectiles gives them the greatest likelihood of accomplishing their intended effect in the face of even the most advanced missile defense systems.

The newest crop of North Korean weapons—including the Hwasong-14, Hwasong-15, KN-15, KN-23, KN-24, and KN-25—demonstrates mobility, potency, precision, and has characteristics that make the missiles difficult to defeat in flight. These traits suggest that the North Korean test program may seek to achieve more than a simple political statement, and that it may be intended to increase the reliability, effectiveness, and survivability of their ballistic missile force.

The recent advances in North Korea's ballistic missile test program appear to be directed at developing capabilities to defeat or degrade the effectiveness of missile defenses deployed in the region: Patriot, Aegis Ballistic Missile Defense (BMD), and Terminal High Altitude Area Defense (THAAD). In addition, North Korea's progress with submarine-launched ballistic missiles (SLBM) suggests an effort to counter land-based THAAD missile defenses by launching attacks from positions at sea outside the THAAD's radar field of view, although local Aegis BMD systems could likely still track these projectiles. The Pukguk-song-3 SLBM was successfully tested in late 2019. According to the 2021 DIA report, North Korea has said this SLBM, to be launched from a ballistic missile submarine, will be cold-launched, solid-fueled and “will carry a nuclear warhead.” In recent parades, North Korea unveiled longer-range SLBMs (Pukguk-song-4 and Pukguk-song-5) but has not flight-tested them.

North Korean tests have demonstrated 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.

Mary Beth D. Nikitin, Specialist in Nonproliferation

IF10472

Disclaimer

This document was prepared by the Congressional Research Service (CRS). CRS serves as nonpartisan shared staff to congressional committees and Members of Congress. It operates solely at the behest of and under the direction of Congress. Information in a CRS Report should not be relied upon for purposes other than public understanding of information that has been provided by CRS to Members of Congress in connection with CRS's institutional role. CRS Reports, as a work of the United States Government, are not subject to copyright protection in the United States. Any CRS Report may be reproduced and distributed in its entirety without permission from CRS. However, as a CRS Report may include copyrighted images or material from a third party, you may need to obtain the permission of the copyright holder if you wish to copy or otherwise use copyrighted material.