



North Korea's 2016 Nuclear Test

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The technical nature of North Korea's January 6, 2016 nuclear test remains largely a mystery. Its announcement that the test involved an H-Bomb needs to be treated carefully. However, its claim should not be discounted completely, since it has been investigating thermonuclear materials and concepts for some time.

First, it is likely that this was not a test of what in the popular literature is interpreted as an H-Bomb, namely a two-stage fission-fusion weapon developed by the major nuclear-weapon states capable of obtaining explosive yields of hundreds or thousands of kilotons. First, the explosive yield of the test did not match the expected yield of the H-Bomb. If North Korea had indeed tested this type of H-bomb, the device's yield would be expected to be many tens of kilotons, at least. However, the need to contain the underground explosion and prevent radioactive releases from its test site may have led North Korea to limit the yield of this test device. Thus, if it tested an H-bomb, it is possible that it did not test the device at its full potential yield. Nonetheless, the explosive yield of a two-stage H-Bomb test would have been expected to be far higher than reported so far.

Second, the development of a two-stage thermonuclear weapon is very challenging. It is assessed as beyond North Korea's capabilities at this stage.

On balance, it is not believed that North Korea tested a two-stage H-bomb.

What could it have tested? On one side, North Korea may be bluffing about this test, meaning it tested a fission implosion device similar to the ones it previously detonated. This possibility should be carefully considered. On the other, another thermonuclear weapon design, also developed by the major nuclear-weapon states, should also be considered, namely a one-stage thermonuclear device. This design is easier to achieve than a two-stage H-bomb and can achieve very high explosive yields. There are many types of such weapons. Several are very complicated, involving plutonium, large amounts of weapon-grade uranium, and thermonuclear materials, and can achieve explosive yields of hundreds of kilotons. However, relatively simple variants exist that can achieve many tens of kilotons.

South Africa researched one type of one-stage thermonuclear device during its nuclear weapons program. This design was seen as a straightforward, achievable way to a thermonuclear weapon and the much higher explosive yields these weapons generate. Its design focused on a conceptually simple approach, although achieving it in practice would have proven difficult. It involved a fission weapon with a lithium, deuterium, tritium solid tablet placed at its center. With this method, the yield can be

enhanced or boosted many fold. South Africa investigated boosting the yield of its weapons in this manner from about 10-15 kilotons to about 60-100 kilotons.

It is unclear if North Korea tested such a device. Its work to date suggests an interest and capability to obtain tritium, the hardest of the three thermonuclear-related elements to obtain. Nonetheless, the yield of a North Korean test of a one-stage thermonuclear device would also be expected to have been larger than reported so far. Also, despite its conceptual simplicity, a one-stage thermonuclear weapon poses several challenges, particularly the development of the solid lithium, deuterium, tritium tablet. One should be skeptical that North Korea has succeeded in any such endeavor with this test

However, even at relatively low yields, North Korea may have tested aspects of such a one-stage design, namely the ignition of the thermonuclear material in a predominately fission nuclear explosion. Moreover, success in developing simple thermonuclear devices is likely a matter of time and a relatively small number of additional tests.

While awaiting success, North Korea can bluff. It can claim that it now knows how to achieve high yields with thermonuclear concepts. It is difficult to prove it does not.

A priority must be to find ways to both further pressure North Korea to limit its nuclear weapons capabilities and engage it diplomatically to halt and eventually end its nuclear weapons program. Recently, U.S. and Chinese efforts have failed to either increase pressure or achieve negotiations. Whether a lame duck U.S. administration or a reluctant China can limit North Korea's growing nuclear capabilities remains to be seen. In this environment of North Korean advancements and little prospect of negotiations, as it did in the case of Iran several years ago, Congress should act. It should pass bipartisan financial and secondary sanctions legislation that increases the costs on North Korea and on those suppliers who support or turn a blind eye to its nuclear weapons endeavors. After establishing a new, more effective level of pressure, negotiations may have a better chance of bearing fruit.