

## UNCATEGORIZED

# How I Learned to Keep Worrying Even if North Korea Didn't Test an H-Bomb

North Korea probably didn't detonate the kind of weapon it claimed this week. But that doesn't mean the regime is failing to achieve its nuclear ambitions.

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January 8, 2016



South Korean officials examine seismic data indicating an underground test in North Korea.

After North Korea proclaimed on Wednesday that it had successfully detonated its first hydrogen bomb, the rest of the world quickly decided it was not true. [The White House pointed out](#) that the estimated 3.4-to seven kiloton blast couldn't be from a full-blown H-bomb—the smallest previous explosion of such a bomb having yielded [about 30 kilotons](#)—and explained the explosion as merely the result of a weapon in which a small amount of fusion fuel is used to boost a fission reaction. But it would be a mistake to write off this week's news as merely the latest in a series of essentially incompetent nuclear efforts by Pyongyang.

It is probably true that North Korea did not detonate an H-bomb and instead pulled off what is known as a boosted fusion weapon, which is less dangerous. However, a boosted fusion weapon

*isn't* an inconsequential step forward. The evidence suggests that North Korea is not merely stumbling through a recapitulation of the way the United States and the Soviet Union developed nuclear weapons 60-odd years ago. Instead it could be skipping some of the early development steps that those countries took and is using fewer tests to get close to having nuclear weapons that are sufficiently minaturized to be delivered by missiles.

To understand why, it's necessary to review a little nuclear history. In Edward Teller and Stanislaw Ulam's classic H-bomb design—first tested in 1952 with [the 82-ton Ivy Mike](#) device—a process called *staged fusion* plays out. A fission-powered *primary* explosion (caused when the nucleus of an atom is split apart) triggers a *secondary* fusion explosion (in which atomic nuclei are slammed together). The secondary explosion is compressed by [X-rays](#) coming from the primary fission reaction which in turn triggers a second fission reaction massively greater than a single-stage fission (or atomic) bomb could produce.

By contrast, boosted fission weapons—designed by the U.S., the Soviet Union, and the U.K. on their way to full-blown H-bombs—improve on simple fission devices (like those dropped on Hiroshima and Nagasaki) by introducing fusion fuel. (Typically, this is a deuterium-tritium gas mixture or a shell of lithium-6 deuteride, as in the [Layer Cake](#) or [Alarm Clock](#) designs.) But while fusion is a part of the process in boosted fusion weapons, it adds only a small amount of energy at the end, as the increased rate of fusion means that far more fuel undergoes fission before the core explodes.

Nevertheless, says physicist [Ferenc Dalnoki-Veress](#) at the Middlebury Institute of International Studies at Monterey, if North Korea has developed such a weapon it would represent “a huge jump in [their] understanding” of how to significantly reduce the weight of a bomb. And where most commentators have emphasized the small scale of Wednesday's underground explosion, Dalnoki-Veress says that's not necessarily a bug, but might be a feature designed to “waste as little tritium as possible.”

For these reasons, [Jeffrey Lewis](#), another arms expert at the Middlebury Institute, adds that “boosting is an essential capability and nothing to laugh at.” For several years Lewis has maintained that North Korea's nuclear program is not suffering from technical incompetence—as some analysts determined based on the small yields detected in its nuclear tests in 2006 and 2009. Rather, he believes, “the North Koreans tried to go directly to miniaturized devices.”

The conventional assumptions about North Korea's 2006 test, in particular—which produced a yield of less than one kiloton—was that it resulted from an inability to reproduce a simple fission device like those dropped on Hiroshima and Nagasaki. Yet, as Lewis notes, that assumption makes little sense: “No country ever built a simple fission device and discovered it didn't work.” Indeed, no tests were conducted for the Little Boy design used on Hiroshima; detonation was

considered easy enough that the device was only fully assembled over the target so that it could not accidentally blow up in flight. Furthermore, Lewis points out, the word both from defectors from North Korea and the regime itself is that Pyongyang is aiming for minaturized, missile-deliverable thermonuclear weapons. In this case, Lewis suggests, we should believe Pyongyang.