

North Korea's Nuclear Boasts Hinge on a Rare, Potent Rocket Fuel

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how the North's pursuit of the highly potent fuel would enable it to develop missiles that could strike almost anywhere in the continental United States.

In response to inquiries from The New York Times, a top North Korean official, a spokesman for the director of national intelligence, said that "based on North Korea's demonstrated science and technological capabilities — coupled with the priority Pyongyang places on missile programs — North Korea probably is capable of producing UDMH domestically." UDMH is short for unsymmetrical dimethyl hydrazine.

Some experts are skeptical that the North has succeeded in domestic production, given the great difficulty of making and using the highly poisonous fuel, which is far more technically advanced nations has led to giant explosions of missiles and factories.

In public, at least, the Trump administration has been far more focused on ordinary fuels — the oil and gas used in heat engines and power vehicles. The United States has pushed in out of those supplies to the North, but it set up last week for modest cutbacks under a United Nations resolution.

Nonetheless, on Sunday the president made a case that those sanctions were having an effect. He wrote on Twitter that he had spoken with South Korea's president, Moon Jae-in, and tossed out a new nickname for the North's leader, Kim Jong-un.

"Asked him how Rocket Man is doing," President Trump wrote. "Long gas lines forming in North Korea. The bad!"

But inside the intelligence agencies and among a few on Capitol Hill who have studied the matter, UDMH is a source of fascination and seen as a natural target for the American effort to halt Mr. Kim's missile program.

"If North Korea does not have UDMH, it ceases to exist. Besides the United States, it's as simple as that," said Senator Edward J. Markey, Democrat of Massachusetts, who sits on the Senate Foreign Relations Committee. "These are the issues that the U.S. intelligence community has to answer from which countries they receive the fuel — it's probably China — and whether North Korea has a stockpile and how big it is."

Today the chemical is made primarily by China, a few European nations and Russia, which calls it



A rocket launch was shown in Pyongyang, North Korea on Saturday. The country is using a fuel that Russia calls the devil's venom.

the devil's venom. Russia only recently resumed production of the fuel, after Western supplies were cut off over its annexation of Crimea.

But the Russians are leery of the fuel because it triggered the worst disaster of the space age, in 1960, when scores of Soviet workers and spectators died during a test firing of one of Moscow's early intercontinental ballistic missiles.

The United States no longer produces the fuel — NASA warned of its toxic and explosive dangers as early as 1966, producing a video that opens with a spectacular explosion. Long ago, the American nuclear fleet turned to more stable solid fuels, a move the North Koreans are now trying to replicate. But it may be a decades' effort, before the North masters that technology to power intercontinental missiles.

The White House and American intelligence agencies declined to answer questions about what, if anything, they were doing to cut off North Korea's supplies, citing the highly classified nature of their effort to disrupt the North Korean missile program. Those efforts have included cyberattacks authorized by President Barack Obama in 2014.

But in interviews with four senior American officials who served as the North advanced its program, none could recall any specific discussion of how to disrupt North Korea's access to the one fuel that now powers its long-range missiles. All four said that while there were wide-ranging discussions about how to penalize the North, they could not remember any that focused specifically on the propellant.

Twice — in 2002 and 2004 — the fuel was included in United Nations Security Council bans of prohibited exports. Experts say few paid attention to that fine print.

"All sorts of things banned for export to North Korea find their way in," said Van H. Van Diepen, a former State Department official who was at the center of many American efforts to control the spread of weapons of mass destruction.

But the public and involuntarily public record of American efforts to track North Korea's progress shows a growing concern dating back a decade that the North was obtaining Russian-designed engines to power its missiles, and the fuel to pour into them. A memo designated "secret" and signed in October 2008 by Condoleezza Rice, then the secretary of state, warned allies that the North had obtained an engine powered by UDMH that "represents a substantial advance in North Korea's liquid propellant technology," adding that it "allows North Korea to build even longer-range missiles."

The memo, which was included in documents later released by WikiLeaks, was evidence of early efforts to get countries that had signed the Missile Technology Control Regime to keep such technologies out of the hands of North Korea, Iran and other nations.

When Hillary Clinton succeeded Ms. Rice in 2009, she issued a similar warning. "North Korea's next goal may be to develop a mobile ICBM that would be capable of threatening targets around the world," she wrote to member states in the missile control group.

The missile launch that took place on Friday, in which the projectile was lofted over northern Japan, was from one of those mobile launchers, tested by UDMH, spy satellites showed.

The North's growing dependency on the fuel was reinforced after a military parade in late 2010, when Pyongyang unveiled an intermediate-range missile known as the Musudan. Most of its flight jets failed, some at enormous fireballs.

Federal officials, congressional aides and rocket scientists say emerging clues suggest that, over the years, Pyongyang obtained the fuel, its precursor, its secret formula and its manufacturing gear from China, the North's main

trading partner. Beijing still uses UDMH in ballistics and warheads and has long exported the toxic substance around the globe.

China has always denied aiding North Korea's missile program, and the fuel is included on a 15-year-old list of missile-related materials that Beijing has put on an export control list. But a secret report from 2008 that was included in the WikiLeaks disclosures found evidence of an "unseen track record in enforcing its missile-related export controls."

One senior administration official acknowledged that, as a matter of politics, winning a specific ban on the fuel should not be difficult. While cutting off access to oil

would raise fears of a humanitarian disaster as 25 million North Koreans freeze through the winter, the missile fuel is not a petroleum product, instead being made from a family of chemicals used on high explosives.

The question now is whether the North Koreans have developed their own capabilities to produce the fuel. Given the country's determination — and success — in proving it could launch a nuclear attack on the United States, experts believe it is just another hurdle to be surmounted.

Eckhart W. Schmidt, who has written a two-volume textbook on fuels like UDMH and toured fuel plants around the globe, said his own judgment was that North Korea could learn how to achieve industrial production "if the supply from China or Russia is cut off."

Mr. Van Diepen, the former State Department official, said that in the quarter-century that the North Koreans have worked on increasingly sophisticated missiles, they have gone through many stages of foreign assistance in obtaining the fuel, the precursors, the formula and the manufacturing gear. He said the North was likely to have achieved some ability to make the volatile fuel — even if that required in occasional tragedies.

"My guess," Mr. Van Diepen said, "is that the North Korean tolerance for casualties is probably pretty high."

Concerns that the volatile substance is made in Pyongyang.

CHARTER SCHOOLS ARE NO PLACE FOR SECRETS

WHEN FETHULLAH GÜLEN IS ALLOWED TO SIPHON MILLIONS OUT OF THE EDUCATION SYSTEM, AMERICAN SCHOOLCHILDREN ARE THE ONES WHO PAY.

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