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The New Arms Race

Are new treaties needed to control modern nuclear weapons?

By Jonathan Broder

Xinhua/Lan Hongguang via Getty Images

Intercontinental nuclear missiles are displayed during a military parade in Beijing in October 2019 to celebrate the founding of the People's Republic of China. Nonproliferation advocates say China is racing to catch up to Russia and the United States in a global arms race.

THE ISSUES

Russia recently announced the deployment of its Avangard boost-glide vehicle, which rides a powerful rocket into orbit just above Earth's atmosphere. From there, the vehicle, armed with a nuclear warhead, can strike anywhere on the planet within 15 minutes, moving toward its target at more than 20 times the speed of sound, according to Russian military officials.[1]

With its ability to steer around air and missile defenses at hypersonic speeds, the Avangard is "practically invulnerable," Russian President Vladimir Putin has said.[2] And it is just one of half a dozen new nuclear weapons delivery systems being developed by Moscow. Meanwhile, China has deployed its own hypersonic delivery vehicle.

The United States is years behind Moscow and Beijing in developing nuclear-capable hypersonic missiles but is working hard to modernize its nuclear arsenal, including the missiles, bombers and submarines that deliver the weapons, senior defense officials say. The modernization could cost up to $1.2 trillion over the next three decades, according to a Congressional Budget Office study.[3]

"We have lost our technical advantage in hypersonics," said Gen. Paul Selva, then-vice chairman of the Joint Chiefs of Staff. But, he added: "We haven't lost the hypersonics fight."[4]

Arms control advocates say the competition to develop more advanced nuclear weapons and faster delivery systems signals a

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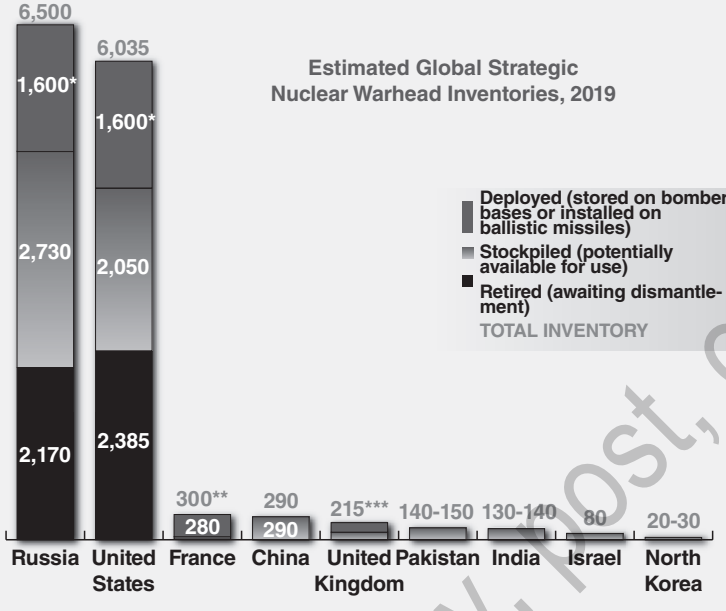
U.S., Russia Have Most of the World's Nuclear Weapons

Although the world's nuclear arsenals have declined significantly since the 1980s, about 90 percent of the nearly 14,000 strategic nuclear weapons that still exist are controlled by Russia and the United States. The two countries have 6,500 and 6,035 weapons, respectively, far more than any of the other seven nuclear-armed nations. About a third of the U.S. and Russian weapons are retired and awaiting dismantlement; the rest are either deployed or available for use.



* These figures exceed the 1,550 allowed in New START because they include bombs stored on bomber bases, which the START cap does not cover.

** France has 280 warheads deployed and 20 stockpiled.

*** The U.K. has 120 warheads deployed and 95 stockpiled.

Source: Hans M. Kristensen and Matt Korda, "Status of World Nuclear Forces," Federation of American Scientists, May 2019, https://tinyurl.com/junbna7

dangerous, new three-way arms race among the United States, Russia and China, sparked after Washington and Moscow withdrew from several key arms control treaties in recent years. (*See Box.*) In this new age of hypersonic nuclear weapons, cyber warfare and the growing militarization of space, U.S. defense hawks argue such accords are outdated and no longer serve the nation's interest. And amid the new, great-power contest, they insist the best way to deter an apocalyptic nuclear war is to be fully ready and willing to fight one, unconstrained by obsolete treaties. Some now even contend that a limited nuclear war can be won.

The crumbling of the international arms control architecture also comes as two new strategic competitors—Iran and North Korea—are asserting themselves in ways that further heighten nuclear risks, experts say. With denuclearization talks between the Trump administration and North Korea stalled, the North's leader, Kim Jong Un, recently declared he no longer feels bound by his self-imposed moratorium on nuclear and long-range missile testing. Analysts say that while his message has left the door open for diplomacy, it also could set the stage for another angry confrontation with President Trump, who threatened North Korea with "fire and fury" in previous face-offs.[5]

In addition, after a U.S. drone in January killed Iran's top military commander, Tehran announced it was resuming its enriched uranium production, signaling what many analysts regard as the death knell of a landmark 2015 international agreement to curb Iran's nuclear weapons program.[6]

"The risk that the world will stumble its way into nuclear war is higher today than it's been since the end of the Cold War," says Thomas Countryman, a former assistant secretary of State for international security and nonproliferation.

Such nuclear alarm bells represent a sharp turnabout from a few years ago, when the threat of nuclear war was successfully managed through a matrix of arms control agreements between the United States and Russia, which together hold more than 90 percent of the world's nearly 14,000 nuclear weapons, according to the Arms Control Association, a Washington-based advocacy organization.[7] (*See Graphic.*)

By imposing transparency, predictability and limits on each side's nuclear forces, those agreements created what officials have called a state of "strategic stability"

ATTA KENARE/AFP via Getty Images

Mourners accompany the coffin of Iran's top military commander, Gen. Qassem Soleimani, killed by a U.S. drone strike in January 2020. Iran responded by vowing to resume enriching uranium, taking another step back from a landmark 2015 international agreement to curb its nuclear program.

between the superpower rivals that minimized the chances of a nuclear war. The treaties also helped to whittle down the U.S. and Soviet (later Russian) nuclear arsenals from their Cold War highs of tens of thousands of weapons each to their current levels of no more than 6,500 nuclear warheads each.[8]

However, in the wake of new threats, mutual allegations of cheating and a deep antipathy toward arms control in hawkish U.S. and Russian defense circles, Washington and Moscow in recent decades have withdrawn from two landmark arms control treaties, and Russia has ended a third:

- **The 1972 Anti-Ballistic Missile Treaty**, which reduced the number of anti-missile batteries each side could maintain against incoming nuclear missiles. In 2002, President George W. Bush withdrew from the treaty, concerned it prevented the United States from fielding adequate defenses in Europe against a missile attack by rogue actors such as Iraq's Saddam Hussein.

- **The 1987 Intermediate-Range Nuclear Forces Treaty**, which banned all nuclear-capable U.S. and Soviet missiles with ranges between 300 and 3,400 miles. Trump abandoned the treaty in August 2019, accusing Russia of covertly violating the pact, a charge Russia denied.

- **The 2000 Plutonium Management and Disposition Agreement**, which required the two countries to destroy their surplus military stockpiles of plutonium to prevent terrorists from acquiring the material used to make the explosive core in a hydrogen bomb. The treaty collapsed in 2016 when Russia pulled out, charging U.S. violations, which Washington denied.

In addition, in May 2018 Trump withdrew the United States from the 2015 nuclear agreement between Iran and six world powers, under which the Islamic Republic curtailed its nuclear program in return for relief from nuclear-related sanctions. Trump then imposed harsh economic sanctions that he said would force Iran to accept a more stringent accord, but Tehran has pushed back by resuming uranium enrichment.

Analysts warn that Tehran could produce bomb-grade nuclear fuel, triggering a U.S. or Israeli attack to destroy Iran's nuclear infrastructure. To prevent that, says Jeffrey Lewis, a nuclear nonproliferation expert at the Middlebury Institute of International Studies at Monterey, Calif., Trump might try to destroy Iran's underground facilities using a tactical, or low-yield, nuclear weapon with about a third of the explosive power of the atomic bomb the United States dropped on Hiroshima, Japan, in 1945.

That leaves only one major bilateral strategic arms control agreement still in force: the Obama-era New START. It allows the United States and Russia each to deploy, or install in the field, no more than 1,550 so-called strategic warheads—large, high-yield weapons that can destroy entire cities—on 700 missiles or other delivery systems. The treaty does not include weapons stored at bomber bases as part of the cap.

New START expires in February 2021 unless the two sides agree to extend it for up to five years. Putin has agreed to the extension, which he says would cover the Avangard and a new, heavy intercontinental ballistic missile (ICBM) Russia is developing.[9] (An ICBM is a guided missile with a range of at least 3,400 miles.)

A chorus of U.S. lawmakers, former military commanders and arms control experts have urged Trump to follow suit. But Trump says he prefers to pursue a broader arms control treaty that would cover small tactical nuclear weapons, which are designed for battlefield use, as well as China's growing nuclear

arsenal. Administration officials say they will soon open nuclear arms control talks with Moscow.[10]

Arms control advocates have applauded Trump's ambitions but say there is not enough time to negotiate a full-fledged replacement treaty before New START expires. And Beijing, whose nuclear arsenal is far smaller than U.S. and Russian stockpiles, says it wants no part of any treaty that would limit its nuclear forces.

"It is critical to conduct a strategic stability dialogue with China, pursue transparency and confidence-building measures, and lay the groundwork for future arms control measures," retired Adm. Michael Mullen, a former chairman of the Joint Chiefs of Staff, told the House Foreign Affairs Committee in December. "But it would be an unconscionable mistake to sacrifice [New START's] . . . mutual restraints with Russia to the pursuit of an unlikely near-term arms control agreement with China."

The Trump administration also has indicated it wants to pull out of the 1992 Open Skies Treaty, which allows its 34 signatories to conduct short-notice, unarmed, reconnaissance flights over the territories of partner countries to collect data on military forces and activities. Arms control proponents say the treaty provides an important layer of verification regarding Russian military activities, but some administration officials and Republican lawmakers say it facilitates Russian spying, costs millions of dollars and does not serve U.S. interests.

Nuclear weapons experts say the demise of so many foundational arms control treaties has stoked ongoing nuclear buildups by smaller nuclear powers, such as China, North Korea, India, Pakistan and Israel, an undeclared nuclear power. In addition, aspiring powers such as Turkey and Saudi Arabia now openly declare their intentions to join the nuclear weapons club.

"If the U.S. and Russia are reinvesting in their strategic arsenals and re-emphasizing nuclear weapons in their national security strategies, they're telegraphing to the rest of the world that this is where they think security lies," says Alexandra Bell, a former senior State Department arms control adviser. "Then you have smaller powers saying they need nuclear weapons too."

Amid these developments, here are several key questions that experts, military leaders and security officials are asking as they ponder the future of arms control:

Should the United States allow New START to expire?

Not long after his 2016 election victory, Donald Trump raised questions about his commitment to New START, tweeting that the United States "must greatly strengthen and expand its nuclear capability until such time as the world comes to its senses regarding nukes." Asked if that meant a new arms race with Russia, Trump reportedly responded: "Let it be an arms race. We will outmatch them at every pass and outlast them all."[11]

Since then, Trump has called New START a bad deal negotiated by Obama, noting that it failed to cover the thousands of tactical nuclear weapons Russia has amassed over the years, dwarfing the much smaller U.S. arsenal of such weapons. Nor, Trump said, does it include China, which is expanding its conventional and nuclear forces—including hypersonic delivery missiles—unbound by any arms control treaties.

Though Putin has said he's ready to extend the treaty without preconditions or negotiations, Trump has made no such commitment. Last March, he ordered the State Department to draft negotiating positions for a new, tripartite arms control treaty with Moscow and Beijing, according to senior U.S. officials. In February, the White House said it would soon begin bilateral nuclear arms control negotiations with Moscow.[12]

"We have not ruled out an extension of New START, but our priority is to promote arms control that goes beyond the confines of a narrow, bilateral approach by incorporating other countries—including China—and a broader range of weapons," Undersecretary of State for Political Affairs David Hale told the Senate Foreign Relations Committee in December.[13]

In theory, say independent arms control experts, Trump is right to seek controls over tactical nuclear weapons. Under orders from President George H.W. Bush, the Pentagon eliminated many of its tactical nuclear weapons after the Soviet Union collapsed in 1991, leaving the United States with around 1,000 tactical weapons today compared to Russia's 2,000, according to Hans Kristensen, director of the Nuclear Information Project at the Federation of American Scientists, which tracks nuclear arsenals worldwide.

These experts also agree Trump is right to be concerned about China's unrestrained nuclear weapons program.

The Pentagon's top two experts on China's military say the Asian giant is on track to double its roughly 300 strategic warheads in the next 10 years, fueled by a stockpile of enriched uranium and plutonium that exceeds the country's civilian nuclear power needs.

In addition, say these officials, China is also developing its own hypersonic missiles as well as new intermediate- and long-range missiles with higher accuracy than older versions, stealthy long-range bombers and advanced missile-firing submarines. As a result, they estimate, China could attain nuclear parity with the United States and Russia within one or two decades.

But with China unwilling to consider a three-way treaty with Washington and Moscow, Trump administration aides are struggling to attract Beijing to a treaty that Moscow and domestic critics would approve, says Countryman, the former State Department arms control chief. So far, Trump's aides have suggested three possible approaches, none of which is acceptable to all parties, says Countryman, who is currently board chair of the Washington-based Arms Control Association advocacy group.

In one, China would increase its deployed nuclear arsenal fivefold to 1,550 warheads—the same as the United States and Russia—but this is a nonstarter for Washington and Moscow, Countryman says. Another approach would require the United States and Russia to reduce their nuclear arsenals fivefold to the size of China's, which neither the Pentagon nor the Kremlin is prepared to do. Under a third option, the United States and Russia would agree to freeze their nuclear arsenals at the New START ceiling of 1,550 warheads while China would agree to keep its arsenal at 300 warheads, a proposal China rejects.

"If there's a more creative idea, it has escaped me," Countryman says. "And it has escaped the administration officials who have been discussing how to realize the president's strategy for nine months now, when in fact, no such strategy is possible."

Some critics suspect Trump's tripartite treaty strategy is a ploy, designed to distract arms control advocates while New START expires, which would appease defense hawks who never liked the treaty in the first place.

"Trump and the hawks don't want to have limits on the United States' ability to increase its nuclear force," says Joseph Cirincione, president of the Ploughshares Fund, a foundation dedicated to nuclear nonproliferation, arms control and disarmament. "It's mostly about their belief that China could rapidly expand its arsenal, so they feel we have to be in a position to match it. Their view is that they

Glossary of Nuclear Weapons Terminology

Nuclear weapon—A bomb that releases enormous amounts of explosive energy as a result of either nuclear fission, a reaction that occurs when the nucleus of an atom is split into two or more fragments, or nuclear fusion, which occurs when two or more atomic nuclei fuse to form a heavier nucleus.

Atomic bomb—A type of nuclear weapon that draws its explosive power from the sudden release of large amounts of atomic energy through fission. The United States is the only country to have detonated atomic bombs in wartime, in Hiroshima and Nagasaki, Japan, in 1945.

Hydrogen (thermonuclear) bomb—About 1,000 times more powerful than an atomic bomb; draws its explosive force from a fusion reaction.

Strategic nuclear weapon or warhead—Large, high-yield weapons that can destroy entire cities.

Tactical nuclear weapons—Low-yield devices with about a third of the explosive power of the atomic bomb used in Hiroshima; designed for battlefield use; can take the form of artillery shells, bombs or short-range missiles.

Deployed—Mounted on a missile or ready to be loaded onto a long-range bomber.

Ballistic missiles—Rocket-powered delivery vehicles that travel in a ballistic (free fall) trajectory.

Intercontinental ballistic missile (ICBM)—A ballistic missile that can travel more than 3,400 miles.

Delivery vehicle—A land-based or submarine-launched ballistic or cruise missile or long-range bomber that can deliver one or more warheads to a target.

Hypersonic—Many times faster than the speed of sound.

Sources: "Glossary," Nuclear Threat Initiative, https://tinyurl.com/ukzwvml; "Glossary of Terms," Nuclear Reduction/Disarmament Initiative, https://tinyurl.com/vu6oe9s; "How does stealth technology work?" HowStuffWorks, April 1, 2000, https://tinyurl.com/ybnglspb; and "NATO/Russia Unclassified," North Atlantic Treaty Organization, 2007, https://tinyurl.com/tuvoj72

protect American national security through American military might, not by pieces of paper like the New START treaty. They see that treaty as an arms control trap and its expiration next year as an opportunity to get out of it. And if that means an arms race, fine."

Defense hawks say China's rise as a military power with advanced hypersonic nuclear weapons has rendered New START obsolete. "Technology has moved," said Secretary of State Mike Pompeo.[14]

"If you want to pursue arms control, you can't do it an in old-fashioned, outmoded, Cold War-era style," said then-National Security Adviser John Bolton in June 2019. "So to extend [New START] for five years and not take these new delivery system threats into account would be malpractice," he said, referring to hypersonic missile systems. He also cited the absence of limits on tactical nuclear weapons as another flaw in New START.[15]

Although Bolton left the administration last September, the president still agrees with Bolton's criticism of New START, White House officials say.

Arms control experts argue that the need to address the threats from Chinese and Russian tactical nuclear weapons should not blind Trump to the benefits that an extended New START would bring to U.S. national security.

Rose Gottemoeller, the chief U.S. negotiator for New START, told lawmakers in December that since the treaty entered into force in 2011, it has established strategic weapons parity between the United States and Russia, providing Americans with a stable and predictable security environment. Extending the treaty for another five years, she argued, would preserve that predictability while the Pentagon modernizes its nuclear forces. It would also give the United States time to negotiate a new treaty that includes China, she said.

"Without the treaty, things could change drastically and quickly," Gottemoeller told the House Foreign Affairs Committee in December, 2019. "There is no faster way for the Russians to outrun us than to deploy more nuclear warheads on their missiles."[16]

Is a limited nuclear war a viable option?

In a striking illustration of the return to Cold War thinking, Russian and U.S. military planners now believe it is possible to wage limited nuclear war without it escalating into a nuclear apocalypse.

In such a war, each side would use low-yield, or tactical, weapons on the battlefield. Depending on its size and radiation yield, a single tactical nuclear weapon could kill thousands of troops and contaminate its blast radius for decades.

Since the start of the Cold War in the 1940s, U.S. and Soviet military leaders envisioned using smaller nuclear weapons to halt a major armored thrust by the other side in Europe, or to block the enemy's advance through a strategic mountain pass. Nowadays, they are regarded as effective weapons against military or nuclear installations buried deep underground, or to save one's forces from a conventional defeat while discouraging the enemy from waging further hostilities.

Moreover, say U.S. military experts, Russia has adopted an "escalate-to-de-escalate" strategy, believing that using such tactical nuclear weapons on the battlefield would quickly de-escalate a military confrontation with U.S. and NATO forces, because Washington would balk at a full-scale nuclear response that would lead to global annihilation.

In response, the United States has begun producing more tactical nuclear warheads for its cruise missiles and submarine-launched ballistic missiles so it can deter the threat of any tactical nuclear strike and retaliate proportionally should one be used against U.S. or allied forces. The Pentagon refers to such deterrence as "escalation dominance."

The National Nuclear Security Administration, the federal agency responsible for the effectiveness of the U.S. nuclear weapons stockpile, said new tactical warheads have been rolling off a production line in Texas since this past January. And in February, the Pentagon announced it has equipped the Navy's Trident ballistic missiles with a new tactical warhead, the W76-2, which has less than a third of the destructive power of other U.S. nuclear weapons.[17]

The Pentagon's 100-page "2018 Nuclear Posture Review" outlined the buildup of tactical nuclear weapons as a key element of the Trump administration's nuclear policy: "Expanding flexible U.S. nuclear options now, to include low-yield options, is important for the preservation of credible deterrence against regional aggression. It will . . . help ensure that potential adversaries perceive no possible advantage in limited nuclear escalation, making nuclear employment less likely."[18]

But the Trump nuclear doctrine is controversial. The Ploughshares Fund's Cirincione warns that it would blur the line between the use of conventional and nuclear weapons and expand the circumstances in which the U.S. military would go nuclear. For example, the administration's nuclear review says the United States could use nuclear weapons in response to "significant non-nuclear strategic attacks," such as a crippling cyberstrike on the nation's power grid or other essential infrastructure.[19]

Another Pentagon document, titled simply "Nuclear Operations," outlined a broad range of additional scenarios in which the U.S. military might use nuclear weapons.

The document said integrating nuclear weapons with conventional and special operations "is essential to the success of any mission or operation." Furthermore, it said, "The spectrum of nuclear warfare may range from tactical application, to limited regional use, to global employment by friendly forces and/or enemies. . . . Employment of nuclear weapons can radically alter or accelerate the course of a campaign. A nuclear weapon could be brought into the campaign as a result of perceived failure in a conventional campaign, potential loss of control or regime, or to escalate the conflict to sue for peace on more favorable terms."[20]

Further expanding the potential use of nuclear weapons in conventional combat, the Pentagon document said field commanders "can nominate potential targets to consider for nuclear options that would support [the commander's] objectives in ongoing operations."[21]

Arms control advocates, including former senior Defense officials, said the U.S. and Russian embrace of a limited nuclear war doctrine represents a highly dangerous throwback to the Cold War years.

"Anybody that thinks you can use a tactical weapon and not have a profound risk of escalation all the way to an all-out nuclear war is risking the world on a pretty naive assumption," says Sam Nunn, a former chairman of the Senate Armed Services Committee and co-founder of the Nuclear Threat Initiative, a research organization that educates policymakers on the dangers of nuclear weapons. "It's very high risk," he says.

But Elbridge Colby, a former senior Defense Department official, cautioned that with the return of great-power competition, Russia and China have developed strategies to defeat the United States in a military confrontation and that tactical nuclear weapons are a key part of their strategies.[22] He supports the U.S. production of tactical nuclear weapons, which could help defeat a Russian or Chinese attack "without provoking a nuclear apocalypse," he said, adding that demonstrating such a capability to U.S. adversaries "is the best way to avoid ever having to put it into practice."[23]

Another proponent of the limited nuclear war doctrine, Keir Lieber, a nuclear arms expert at Georgetown University, says if deterrence fails and the use of a nuclear weapon is required, a tactical weapon diminishes the chances of a full-scale nuclear exchange in certain cases. He paints a possible scenario in which Russia overruns the former Soviet republic of Estonia and explodes a low-yield nuclear weapon to get NATO forces to sue for peace. That would prompt the Western alliance to retaliate with its own tactical nuclear weapon, he says.

"Is it going to stop there?" he asks. "I don't know why one would assume that it will continue to escalate from there."

In response to the emerging doctrine of limited nuclear war, researchers at The Lab—part of Princeton University's Program on Science and Global Security, which studies nuclear arms control, nonproliferation and disarmament—recently used extensive data on U.S. and Russian nuclear forces, war plans and targets to produce a four-minute video showing how the limited use of nuclear weapons could quickly escalate into a full-scale nuclear war, killing or wounding more than 90 million people in a few hours.[24]

Underscoring the difficulty of limiting a nuclear exchange to tactical weapons, Nunn and other skeptics note that U.S. and Russian leaders would not know whether an incoming missile is carrying a tactical nuclear warhead or a city-destroying strategic weapon, raising the chances of a full-blown nuclear exchange.

"Hey all you nuclear powers out there. We're just going to trust that you recognize this is just a little nuclear weapon and won't retaliate with all you've got," tweeted Melissa Hanham, an expert on nuclear weapons at One Earth Future, a Washington-based foundation that advocates arms control. "Remember! The U.S. only intends to nuke you 'a little bit.'"[25]

Is a denuclearization agreement with North Korea possible?

In June 2017, Trump upended decades of American policy and diplomatic norms by meeting with North

Richard Atrero de Guzman/NurPhoto via Getty Images

Japanese schoolchildren take cover under their desks during a drill in 2017 to prepare for a possible North Korean missile attack. Even though President Trump became the first sitting U.S. president to meet with a North Korean leader in 2017, progress between the United States and North Korea on a denuclearization agreement has stalled.

Korean dictator Kim Jong Un in Singapore to discuss the denuclearization of the communist country in return for sanctions relief and U.S. economic aid.

Until then, successive administrations had held low-level negotiations with North Korean officials, offering food and other forms of assistance in a bid to get Pyongyang to curtail its fledgling nuclear program. Several times the talks produced agreements, but eventually they all collapsed amid mutual misunderstandings, charges of cheating and deep distrust left over from the 1950-53 Korean War.

To his credit, many arms control advocates say, Trump shattered that diplomatic model. In Singapore, he became the first sitting U.S. president to meet with a North Korean leader, convinced that their personal rapport could pave the way for an historic denuclearization agreement. "We fell in love," Trump said of his new relationship with Kim.[26]

At the end of that summit, the two leaders pledged to "work toward the complete denuclearization of the Korean Peninsula."[27] As a confidence-building measure, Trump scaled back joint military exercises with South Korea, and Kim reciprocated by declaring a moratorium on North Korea's nuclear and ballistic missile tests. Commentators noted that after a year in which the two leaders had publicly hurled insults and threats at each other, the simple act of talking had changed perceptions on both sides and made conflict less likely.

But the Singapore talks, and subsequent summits in 2018—in Hanoi in February and in the Demilitarized Zone (DMZ) between North and South Korea in June 2019—failed to translate their personal rapport into any meaningful progress. The biggest hurdle, arms control experts say, has been the inability of U.S. and North Korean officials to agree on how the denuclearization process should proceed.

The Trump administration says North Korea must first abandon its nuclear weapons program before Washington provides any sanctions relief, while Pyongyang insists on a gradual process, in which Washington lifts some sanctions in return for each concrete step Pyongyang takes toward denuclearization.

John D. Maurer, an expert in nuclear weapons and geopolitics at the conservative American Enterprise Institute think tank, says the failure of the Hanoi and DMZ meetings publicly embarrassed Kim, who had raised hopes at home that his diplomacy with Trump would result in economic relief. Meanwhile, Trump continued to tout his summit diplomacy with Kim as one of his signature foreign policy achievements.

Kim's loss of face prompted North Korea's warning on Dec. 1, 2019, that unless Washington made further concessions by year's end, Pyongyang would adopt a more confrontational posture.

Trump ignored the deadline. And on New Year's Day, Kim told his ruling Workers Party Central Committee that he no longer felt constrained by the testing moratorium, he would not surrender North Korea's nuclear weapons and North Korea would achieve economic prosperity on its own.

Despite Kim's tough tone, analysts say his speech left the door open for further negotiations by not declaring an end to diplomacy or the resumption of nuclear and long-range missile tests. Going forward, several experts said, Pyongyang's next moves would be based on Trump's ability to win a second presidential term in the November election.

"Donald Trump happens to be the first sitting U.S. president to view North Korea as a source of political victory, for domestic purposes," said Go Myong-Hyun, a research fellow and expert on North Korea at the Seoul-based Asan Institute for Policy Studies think tank. As the election approaches, Go said, North Korea likely will view Trump's habit of boasting to his base about his accomplishments as a source of leverage in future negotiations.[28]

But "if they calculate that President Trump won't be re-elected next year, then their approach is going to fundamentally change," Go said. North Korea could test

another nuclear bomb, he said, resume missile tests or take other provocative steps that would effectively end the diplomatic dialogue that Trump and Kim began.[29]

Some Democrats say a deal with Pyongyang is still possible, but only if Trump agrees to embrace a step-by-step approach to North Korea's denuclearization. In a letter to Trump in late December, eight senior Democrats on the Senate Foreign Relations Committee urged him to consider an interim agreement under which North Korea would freeze and roll back some of its nuclear weapons programs in return for some sanctions relief as a first step in executing a "serious diplomatic plan before it is too late."[30]

"While such an interim agreement would of course only be a first step in a longer process, it would nonetheless be an important effort to create the sort of real and durable diplomatic process that is necessary to achieve the complete denuclearization of North Korea," the senators wrote.[31]

Some analysts believe the prospects are dim for a North Korean denuclearization agreement with any U.S. administration, in part because of Pyongyang's deep ideological antipathy toward, and distrust of, the United States. But perhaps the biggest obstacle to North Korea's denuclearization, says Maurer, is Washington's record of eliminating troublesome foreign leaders, such as Iraq's Saddam Hussein and Libyan leader Moammar Gadhafi.

"The North Korean leadership has to look at anything the U.S. government says about cooperation with extreme skepticism," Maurer says. "From their perspective, the United States goes around the world, killing off all the people on its naughty list. And who's at the top of that list today? Kim Jong Un."

Thus, he argues, Kim's nuclear weapons are not just a tool to win sanctions relief from the United States, they are his insurance that he will not end up like Saddam or Gadhafi.

BACKGROUND

Nuclear Age Dawns

The nuclear age dawned with a blinding flash on Aug. 6, 1945, when an American B-29 Superfortress dropped an atomic bomb on the Japanese port city of Hiroshima.

The explosion leveled the entire city, instantly killing 80,000 people. Three days later, the United States dropped a second nuclear bomb on Nagasaki, another port city, killing another 40,000 people. Tens of thousands of wounded would die later from severe burns and radiation poisoning. On Aug. 15, Japanese Emperor Hirohito, citing the immense power of "a new and most cruel bomb," surrendered unconditionally, ending World War II.[32]

Galerie Bilderwelt/Getty Images

The atomic bomb dropped by the United States on Hiroshima in 1945 leveled the Japanese port city. Today's hydrogen weapons are about 1,000 times more powerful than the atomic bomb.

After years of bloody fighting in Europe and the Pacific, the war's end unleashed scenes of jubilation across the United States. But the bomb's enormous destructive power also forced a moral reckoning among some of the physicists who created it. One of them, J. Robert Oppenheimer, said that as he watched the fiery mushroom cloud rise over the New Mexico desert during the bomb's first test, he remembered a sentence from the Hindu scripture, the Bhagavad-Gita: "I am become death, the destroyer of worlds."[33]

Such moral qualms drove the earliest debates in Washington over controlling the spread of nuclear weapons know-how. One group in the Truman administration worried that America's monopoly over nuclear weapons would spark a dangerous arms race with the Soviet Union, which was competing with the United States in a budding Cold War for global influence. This group proposed sharing the nation's nuclear secrets with Moscow to establish a parity that would stabilize relations. Another group opposed giving up America's strategic advantage over the Soviets.[34]

In 1946, the United States proposed that the newly formed United Nations establish an international agency to control the proliferation of nuclear weapons, but preserve Washington's status as the world's only nuclear power. The Soviets, already on their way to developing

CHRONOLOGY

1939-1949 *The nuclear age dawns, and the U.S.-Soviet arms race ensues.*

1939 With Nazi Germany's discovery of nuclear fission, physicist Albert Einstein warns President Franklin D. Roosevelt of the potential for a new type of "extremely powerful bombs"; Roosevelt institutes the Manhattan Project to explore the feasibility of atomic weapons.

1945 The United States drops atomic bombs on the Japanese cities of Hiroshima and Nagasaki, ending World War II.

1949 The Soviet Union explodes an atomic bomb, marking the beginning of the U.S.-Soviet nuclear arms race.

1950-1963 *Cold War competition eventually leads to arms control efforts.*

1952-53 The United States detonates the world's first hydrogen bomb, far more powerful than the atomic bomb used at Hiroshima. . . . Britain becomes a nuclear power.

1957 The arms race moves into space after the Soviets launch the satellite *Sputnik*.

1960 France tests an atomic bomb.

1962 The Cuban missile crisis brings the U.S. and the Soviet Union to the brink of nuclear war.

1963 Washington and Moscow establish a hotline and sign the Limited Test Ban Treaty, banning nuclear weapons testing in the atmosphere, underwater and outer space but allowing underground tests.

1964-1979 *Major arms control agreements advance despite Cold War tensions.*

1964 China becomes the fifth nuclear-armed nation.

1968 The United Nations adopts the Treaty on the Non-Proliferation of Nuclear Weapons, which recognizes the five nuclear-armed countries; all other signatories commit to use nuclear power only for peaceful purposes.

1972 The United States and the Soviet Union sign SALT I agreement, freezing the number of long-range ballistic missiles at 1972 levels, and the Anti-Ballistic Missile (ABM) Treaty, which limits each side to a single anti-missile battery with 100 missiles and launchers.

1979 U.S. and Soviet leaders sign SALT II, limiting each country to 1,320 long-range missiles with multiple nuclear warheads, but the Senate fails to ratify it after the Soviets invade Afghanistan; both countries honor the treaty's limits anyway.

1980-1993 *Arms control progresses; the Soviet Union collapses.*

1987 President Ronald Reagan and Soviet leader Mikhail Gorbachev sign the Intermediate-Range Nuclear Forces (INF) Treaty, eliminating all ballistic missiles with a range of 300 to 3,400 miles.

1991 Gorbachev and President George H.W. Bush sign START I, capping each country's arsenal at 6,000 deployed nuclear warheads and 1,600 deployed long-range delivery systems. . . . After the Soviet Union collapses, the Cooperative Threat Reduction Program secures Soviet nuclear weapons and fissile material held in former satellite states.

1993 U.S. and Russia sign START II, limiting each side to 3,500 deployed strategic nuclear warheads.

2000-2015 *Cracks appear in arms control, but other agreements follow.*

2002 President George W. Bush withdraws from ABM Treaty, citing alleged threats from rogue nations such as Iraq; in response, Russia withdraws from START II. . . . Iraq is later found not to be building nuclear weapons.

2010 Obama and Russian President Dmitry Medvedev sign New START, further reducing their respective deployed nuclear arsenals to 1,550 warheads and 700 delivery systems.

2015 Iran signs agreement with six world powers, promising to curtail its nuclear program in exchange for relief from U.N. economic sanctions.

2016-Present *Trump administration begins abandoning arms control agreements.*

2016 Donald Trump wins the presidency, calls Iran nuclear agreement and New START "bad deals."

2018 Russian President Vladimir Putin unveils nuclear weapons delivery systems that can travel more than 20 times the speed of sound; Trump withdraws from Iran nuclear deal, imposes unilateral sanctions on Tehran. . . . Trump says he prefers a new arms reduction treaty that includes China instead of a five-year extension of New START. . . . Trump meets North Korean President Kim Jong Un in Singapore; they agree to work toward denuclearization of the Korean Peninsula; Kim voluntarily freezes nuclear and missile testing.

2019 Trump and Kim fail to agree on how negotiations should proceed. . . . Trump withdraws from INF Treaty, citing alleged Russian violations. . . . Iran restarts part of its nuclear program.

2020 In a New Year's Day speech, Kim declares he is no longer bound by his freeze on nuclear and missile testing. . . . After U.S. drone kills Iran's top military commander, Tehran announces it will fully resume uranium enrichment, signaling the de facto collapse of the Iran nuclear deal (January).

their own atomic bomb, rejected the proposal, and the United States spurned a Soviet counterproposal to ban all nuclear weapons.[35]

The Soviets successfully tested a nuclear bomb in September 1949, sparking the arms race some had feared. Oppenheimer spoke out publicly against U.S. efforts to develop a hydrogen bomb, which would be far more destructive than the atomic bombs used in Japan, angering many in the administration.

Coming at the height of the so-called Red Scare stirred up by Sen. Joseph McCarthy, R-Wisc., Oppenheimer's objections led to an FBI investigation that revealed the physicist had sympathized with communism when he was a young professor at the University of California, Berkeley. At a hearing to rule on the revocation of Oppenheimer's security clearance, Edward Teller, another prominent nuclear physicist, portrayed him as a security risk. Stripped of his clearance, Oppenheimer continued to lecture widely on the dangers of nuclear weapons, but he had no impact on the burgeoning arms race.[36]

Over the next two decades, the Americans and Soviets developed immensely destructive hydrogen bombs, along with neutron bombs, which leave structures standing but kill people with high levels of radiation; intercontinental ballistic missiles capable of carrying multiple nuclear warheads; and a vast arsenal of small, tactical nuclear weapons for battlefield use, such as nuclear landmines, artillery shells and torpedoes. With the Soviet's successful 1957 launch of *Sputnik*, the first artificial Earth satellite, the two countries extended their rivalry into outer space. During that period, Britain, France and China also became nuclear weapons states.

In 1962, the Cold War rivalry between the superpowers reached a crisis when U.S. intelligence discovered the Soviets had deployed nuclear-armed missiles in Cuba, 90 miles from the U.S. mainland. In response, President John F. Kennedy deployed a naval blockade around Cuba to prevent additional Soviet missiles from reaching the island. He also demanded that Moscow remove the existing missiles, warning he was prepared to use military force to neutralize the Soviet threat.[37]

Over the next 13 days, a tense standoff ensued that brought the two countries to the brink of nuclear war. "I thought it was the last Saturday I would ever see," Robert McNamara, Kennedy's Defense secretary, later told Cold War historian Martin Walker.[38]

Eventually, Kennedy and Soviet leader Nikita Khrushchev resolved the crisis peacefully. Kennedy agreed to Khrushchev's proposal to remove the missiles in return for a U.S. pledge not to invade Cuba. Privately, Kennedy also agreed to remove U.S. missiles from Turkey, which the Soviets saw as a threat.[39]

Experts Say Nuclear Terrorism Threat Is Overstated

"Countries won't give nuclear weapons to terrorists."

Ever since the 9/11 terrorist attacks in the United States in 2001, Western leaders, lawmakers and national security officials have feared that terrorists would obtain a nuclear weapon, or the fissile material to make one, and use it to attack Western capitals or regional rivals.

After 9/11, President George W. Bush explained the need to invade Iraq by lumping it with Iran and North Korea in his 2002 State of the Union speech, calling them "an axis of evil" that threatened world peace. "By seeking weapons of mass destruction, these regimes pose a grave and growing danger," he said. "They could provide these arms to terrorists, giving them the means to match their hatred."[1]

President Barack Obama echoed Bush's concerns when he told a 2016 White House summit on nuclear security: "There is no doubt that if these madmen ever got their hands on a nuclear bomb or nuclear material, they most certainly would use it to kill as many innocent people as possible."[2]

And former CIA Director R. James Woolsey (1993-95) famously said in 1994, "Terrorists don't want a seat at the table, they want to destroy the table and everyone sitting at it."[3]

But some terrorism experts say those assumptions are based on cartoonish perceptions of anti-American regimes and terrorists as single-minded, suicidal fanatics. Counterterrorism officials could better avoid catastrophe by approaching such threats with an eye toward terrorists' strategic priorities, they say, and not simplistic assumptions that detonation is their primary goal.

Moreover, they note, citing detailed studies and empirical data, the likelihood of a government providing a nuclear bomb or fissile material to a terrorist group is vastly overstated.

"Countries won't give nuclear weapons to terrorists," says Keir Lieber, an expert on nuclear weapons and geopolitics at Georgetown University. And "it is implausible that terrorists could develop a nuclear weapon on their own."

Even a state sponsor of terrorism would avoid giving a nuclear weapon to a proxy terrorist group, according to Lieber and Daryl G. Press, an associate professor of government at Dartmouth College and an expert on nuclear deterrence. "Nuclear weapons are the most powerful weapons a state can acquire," the two wrote in a 2013 article in the journal *International Security.* "Handing that power to an actor over which the state has less than complete control would be an enormous, epochal decision—one unlikely to be taken by regimes that are typically obsessed with power and their own survival."[4]

In addition, they argued, forensic examination of the radioactive isotopes that remain after a nuclear blast would reveal the uranium mines, reactors and enrichment facilities where the bomb originated, exposing the state sponsor to

Decades later, former advisers to Khrushchev disclosed that 43,000 Soviet soldiers had secretly amassed on the island to defend the missiles against a U.S. invasion, according to a new history of nuclear warfare by *Slate* defense reporter Fred Kaplan. In his review of the book for *The Washington Post*, author Evan Thomas noted that those troops were armed with tactical nuclear weapons.[40]

Arms Control Treaties

Shaken by the missile crisis, Washington and Moscow agreed the following year to establish a communications hotline between their leaders to mitigate the risk of accidental nuclear warfare. The two countries also signed the Limited Test Ban Treaty, which forbade most nuclear test explosions.[41]

Another major arms control effort occurred in 1968 with the signing of the U.N.-sponsored Nuclear Non-Proliferation Treaty. It recognized the five existing nuclear-weapons states—the United States, the Soviet Union, Britain, France and China—and required their pledge to work toward nuclear disarmament. The treaty also obligated non-nuclear states not to acquire nuclear

retaliation. Plus, they added, a state sponsor would worry that terrorists might use such a weapon in an unexpected way or provoke a response that would end the sponsor's regime.[5]

However, there is still some cause for concern, experts say. If a terrorist group obtained a nuclear weapon, its leaders would more likely be guided by strategic considerations, such as potential rewards, rather than sheer rage. Knowing the impact a nuclear blast and the ensuing retaliation would have on public opinion, the group's leaders would seriously consider other options than detonation, they say. But that could still create some painful dilemmas for the terrorists' targets.

For instance, a group could engage in nuclear blackmail, declaring that it has a nuclear weapon and threatening to use it unless the group's conditions were met.

Joseph Cirincione, president of the Ploughshares Fund, a foundation that advocates for nuclear disarmament, paints a frightening nuclear blackmail scenario in which a terrorist group somehow obtains two nuclear bombs, places one in Washington and one in New York City and threatens to destroy the nation's capital unless the United States withdraws its forces from the Middle East. Then, to prove the group's capability, it could detonate the bomb in New York or off the coast.

"What does a U.S. president do" in such a situation? Cirincione asks. "There is no good response."

Christopher McIntosh and Ian Storey, terrorism experts at Bard College, say a nuclear-armed terrorist group also could announce that it has a nuclear weapon but present no demands, instilling fear among its enemies, "without committing the organization to a definite strategic path," they wrote.[6]

Or a terrorist group could simply suggest—but not confirm—that it has a nuclear weapon, a strategic posture used by Israel for 50 years, according to Avner Cohen, author of the 1999 book *Israel and the Bomb.*

McIntosh and Storey say a terrorist group also could keep its nuclear capability a secret until it decides conditions are right to unveil it and issue demands.

But numerous studies have shown that terrorist groups try to avoid stepping over a line that will draw catastrophic damage to their organizations and communities. For example, after a border attack in 2006 by the Iranian-backed military group Hezbollah that killed several Israeli soldiers, Israel launched a full-scale war that killed or wounded some 5,600 people, displaced another million and destroyed much of Lebanon's civilian infrastructure.

Many Lebanese blamed Hezbollah for their suffering, causing Hassan Nasrallah, the group's leader, to declare that, had he known Israel's response would be so devastating, he would never have ordered the attack.

—Jonathan Broder

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[1] "Text of President Bush's 2002 State of the Union Address," *The Washington Post*, Jan. 29, 2002, https://tinyurl.com/rq8zyq4.

[2] David Smith, "Barack Obama at nuclear summit: 'madmen' threaten global security," *The Guardian*, April 1, 2016, https://tinyurl.com/t4o9r3e.

[3] Nicholas Lemann, "What Terrorists Want," *The New Yorker*, Oct. 22, 2001, https://tinyurl.com/qmgejrz.

[4] Keir A. Lieber and Daryl G. Press, "Why States Won't Give Nuclear Weapons to Terrorists," *International Security*, Vol. 38, No. 1, Summer 2013, https://tinyurl.com/uwua7p8.

[5] *Ibid.*

[6] Christopher McIntosh and Ian Storey, "Would terrorists set off a nuclear weapon if they had one? We shouldn't assume so," *Bulletin of the Atomic Scientists*, Nov. 20, 2019, https://tinyurl.com/s3h69no.

weapons but guaranteed them the right to civilian nuclear power, subject to certain safeguards. Eventually, 187 countries signed on, making the treaty one of the pillars of a global arms control architecture. (Israel, India and Pakistan refused to sign and later became nuclear weapons states. Cuba and South Sudan have refused to join the treaty but do not have nuclear weapons.)[42]

In 1972, President Richard M. Nixon, long an anti-communist hawk, traveled to China, fostering a rapprochement that upended the balance of power between Washington and Moscow. Worried about a new Sino-American alliance, Moscow quickly reached two major arms control agreements with Washington that same year.

The first, the Strategic Arms Limitation Treaty, or SALT I, froze the number of each country's long-range ballistic missile launchers and submarine-launched ballistic missiles at existing levels. The second accord, the Anti-Ballistic Missile (ABM) Treaty restricted the number of anti-missile batteries each side could deploy.[43]

The Erosion of Arms Control Will Extend to Outer Space

China and Russia are developing missiles that can destroy satellites.

If the United States and Russia allow the New START arms control pact to expire next year, the subsequent end of all remaining limits on their nuclear arsenals will affect not only strategic stability on Earth but also in outer space, experts say.

The expiration will eliminate prohibitions on interfering with each other's intelligence satellites and other methods for verifying treaty compliance, warns a new study by Aerospace Corp.'s Center for Space Policy and Strategy, a research center that analyzes space programs for the U.S. military.[1]

"This will mark a significant change in the strategic context within which U.S. national security space forces operate," the study said. "U.S. space forces' resources will be taxed, and the stability of the space domain will face new risks."[2]

The study came out weeks after President Trump, authorized by Congress, announced creation of the U.S. Space Force, the military's sixth branch, which aims to defend the United States and its satellites and spacecraft from hostile forces. With New START due to expire in February 2021 and no sign from Trump that he will activate the treaty's five-year extension provision, the study details some of the challenges the Space Force and intelligence agencies will face in a post-New START world.

Michael Gleason, a senior strategic space analyst and co-author of the study, told reporters at a Jan. 15 news conference that on-site inspections conducted by U.S. and Russian officials as part of the treaty's verification provisions will end. Thus, he said, there will be greater demand—and costs—for U.S. satellite surveillance of Russia's nuclear forces.

Gleason also warned that after decades during which the United States and Russia left each other's reconnaissance and military satellites alone, the Pentagon should be prepared for the possibility that Russia may try to challenge U.S. satellite overflights of its territory by interfering with them.

According to a U.S. intelligence analysis of open-source documents, Russia is developing a satellite system called Burevestnik, believed to be designed to disrupt and destroy other countries' satellites. The documents suggest the Burevestnik will be a co-orbital satellite, or one that is deployed in an orbit similar to its target, capable of assessing the functions of Russian satellites as well as inspecting or killing an adversary's satellites.[3]

U.S. intelligence officials also have cited Russia's extensive testing of its PL-19 Nudol anti-satellite missile, which is fired from a mobile launcher and targets enemy satellites in low-Earth orbit, 250 miles above the planet.[4] The Pentagon's "2019 Missile Defense Review" cited such anti-satellite missiles as one of several Russian threats, including laser weapons.

Russia is developing a diverse suite of anti-satellite capabilities, including ground-launched missiles and laser weapons, "and continues to launch 'experimental' satellites that conduct sophisticated on-orbit activities to advance counterspace capabilities," the report said.[5]

U.S. officials acknowledge the Pentagon is developing anti-satellite capabilities, but details remain classified.

Meanwhile, studies published last April focus on counterspace activities by China, which in 2007 stunned the U.S. defense community by firing a missile that destroyed one of its own defunct weather satellites, creating a large field of space debris that continues to pose risks to the International Space Station and other satellites.[6] China demonstrated further technological advances in space last

But the budding detente quickly dissipated after Washington and Moscow lined up on opposing sides of the 1973 Arab-Israeli War. After two weeks of fierce fighting, Israeli forces had blunted a Syrian attack on the Golan Heights and advanced to within artillery range of Damascus while Israeli tanks had crossed the Suez Canal and surrounded Egypt's Third Army. With Moscow threatening to intervene with nuclear weapons to save its beleaguered Arab clients, Nixon placed U.S. nuclear forces on a midlevel alert, once again bringing the two superpowers to the precipice of nuclear war. Eventually, a battlefield ceasefire defused the crisis.

year when it became the first country to land a probe on the dark side of the moon.[7]

The April studies—one conducted by the Center for Strategic and International Studies (CSIS), an independent Washington think tank, and the other by the Secure World Foundation, a research organization that promotes the peaceful uses of space—noted that China continues to test the ability of its SJ-17 satellite to maneuver close to another to inspect, repair or monitor its functions. China also appears to have deployed mobile jammers on Mischief Reef in the South China Sea's Spratly Islands that can disrupt other countries' ground-to-space communications, according to the CSIS study.[8]

Both studies say China is developing at least three types of missiles capable of hitting satellites orbiting between 250 miles and 22,236 miles above Earth. The Secure World Foundation study says one of the three anti-satellite missiles is probably operational and may already have been deployed on mobile Chinese launchers.[9]

"China is clearly investing in its counter-space capabilities," the CSIS study says. "Evidence confirms that in 2018 alone, China tested technologies in three of the four counter-space weapon categories."[10]

The four categories include kinetic weapons, such as missiles and killer satellites, designed to smash into or explode next to a satellite; nonkinetic weapons, such as lasers, high-powered microwaves or electromagnetic pulses that can blind or disable satellites; electronic weapons that can jam satellite communications or trick them with fake signals; and cyber-weapons that target the data from satellites.[11]

"The big changes to Chinese doctrine and space organization happened a few years ago when they created their Strategic Support Force," said Brian Weeden, director of program planning at the Secure World Foundation and co-editor of its study. "This is a new military organization that combines space, electronic warfare and cyber capabilities."[12]

Military technology experts say China probably began building up its counterspace capabilities when the U.S. military started relying heavily on its constellation of communications, surveillance and intelligence-gathering satellites at the outset of its wars in Afghanistan and Iraq.

But with New START's expiration looming, Russia is the most immediate concern, the Aerospace study stressed. Urging the Trump administration to begin planning for the day after the treaty expires, the study suggested either a negotiated understanding or a formal agreement with Moscow not to interfere with one another's satellites.

"No alternative future foresees the existing status quo surviving after New START expires," the study said.

—Jonathan Broder

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[1] Michael P. Gleason and Luc H. Riesbeck, "Noninterference With National Technical Means: The Status Quo Will Not Survive," Center for Space Policy and Strategy, Aerospace Corp., January 2020, https://tinyurl.com/uqgs2v9.

[2] *Ibid.*

[3] "Russia develops co-orbital anti-satellite capability," *Jane's Intelligence Review*, 2018, https://tinyurl.com/uycd8mo.

[4] "Russian Space Wars: U.S. Intelligence Claims Kremlin Made Seventh Test of Nudol ASAT Missile," Spacewatch.global, 2019, https://tinyurl.com/s7pwx7b.

[5] "2019 Missile Defense Review," Office of the Secretary of Defense, Department of Defense, January 2019, https://tinyurl.com/y9hkqfnj.

[6] Michael Safi and Hannah Devlin, "'A terrible thing': India's destruction of satellite threatens ISS, says NASA," *The Guardian*, April 2, 2019, https://tinyurl.com/yyuezl8l.

[7] Trefor Moss, "China Lands Probe on the 'Dark Side' of the Moon," *The Wall Street Journal*, Jan. 3, 2019, https://tinyurl.com/yborl7kj.

[8] Todd Harrison *et al.*, "Space Threat Assessment 2019," Center for Strategic and International Studies, April 2019, https://tinyurl.com/vwo77oh.

[9] Brian Weeden and Victoria Samson, "Global Counterspace Capabilities: An Open Source Assessment," Secure World Foundation, April 2019, https://tinyurl.com/qmnndgj.

[10] Harrison *et al.*, *op. cit.*

[11] *Ibid.*

[12] Kelsey D. Atherton, "The chicken-and-egg debate about new threats in space," C4ISRNET, April 8, 2019, https://tinyurl.com/t9m5wjq.

A year later, Nixon resigned over the Watergate scandal. U.S.-Soviet Arms control talks resumed, and in June 1979, President Jimmy Carter and Soviet General Secretary Leonid Brezhnev signed the SALT II accords, further limiting the number of each side's nuclear warheads and ICBMs. But six months later, the Soviets invaded Afghanistan, prompting Carter to ask the Senate to delay consideration of the treaty. Although the Senate never ratified SALT II, both sides honored it, underscoring the value each placed on its controls.[44]

President Ronald Reagan made arms control a priority with his bold 1981 "zero-option" proposal, which

called for the removal of all U.S. and Soviet intermediate-range nuclear missiles from Europe. He followed up the following year with a proposal to reduce the number of each side's strategic nuclear warheads.[45]

In 1983, Reagan introduced a plan for a space-based missile shield against Soviet nuclear attack. Some experts questioned the effectiveness of the initiative, which they nicknamed "Star Wars." But the program alarmed the Soviets, who feared they were falling behind the Americans in both defense technology and spending.[46]

That same year, Mikhail Gorbachev became the Soviet Communist Party's general secretary and introduced greater openness along with economic and political reforms, transformative policies that set the stage for more cooperation on arms control.

In 1986, Reagan and Gorbachev met in Reykjavík, Iceland, for what arms control experts have called one of the most extraordinary U.S.-Soviet summits ever held. The two leaders nearly agreed to complete nuclear disarmament within 10 years. Gorbachev's demand to limit tests for Reagan's space missiles killed the deal, but experts say their talks paved the way for later arms control agreements.[47]

One was the Intermediate-Range Nuclear Forces, or INF, Treaty, which Reagan and Gorbachev signed in December 1987. It banned all intermediate-range nuclear missiles, an arms control milestone, experts say, because it was the first agreement to abolish an entire class of nuclear arms, as opposed to limiting their number.[48]

On Nov. 9, 1989, the Berlin Wall fell, marking the beginning of the end of the Cold War and greater progress on arms control. In July 1991, Gorbachev and President George H.W. Bush signed the Strategic Arms Reduction Treaty (START I), which limited the United States and the Soviet Union each to deploy 6,000 warheads and 1,600 delivery vehicles.[49]

After the Soviet Union collapsed in late 1991, Bush signed bipartisan legislation creating the Cooperative Threat Reduction Program. The brainchild of Democratic Sen. Nunn of Georgia and Republican Sen. Richard Lugar of Indiana, the legislation provided financial and technical assistance to former Soviet republics to dismantle thousands of nuclear weapons, remove their stockpiles of plutonium and highly enriched uranium needed to make such weapons, and provide their nuclear scientists with civilian jobs.[50]

In 1993, Russia and the United States signed START II, banning the use of multiple nuclear warheads deployed on ICBMs. Although the U.S. Senate and the Russian Duma, or parliament, ratified the agreement, it never went into effect because of unresolved differences in other areas of arms control.[51]

Cracks Appear

Those differences opened the first cracks in the arms control edifice. In June 2002, President George W. Bush, the son of the former president, withdrew from the Anti-Ballistic Missile Treaty Nixon had signed 30 years earlier, arguing that it limited U.S. ability to deploy missile defenses against rogue states. Russia's new president, Vladimir Putin, strongly opposed the move, and in response, he also pulled out of the treaty, preventing it from taking effect.[52]

Tensions between Washington and Moscow escalated in 2007 when Bush announced plans to base anti-missile batteries in Poland and the Czech Republic, former Soviet-controlled Warsaw Pact countries that joined NATO after the Soviet Union's demise. Bush maintained the missiles were needed to defend NATO allies against Iran's missiles. But Putin saw them as anti-missile systems that could potentially be turned against Russia, blunting its nuclear arsenal.

U.S.-Russia relations improved after President Barack Obama took office in 2009. Eager to enhance cooperation, Obama announced he would scrap Bush's plan for the Eastern European anti-missile sites and rely instead on the anti-missile systems aboard U.S. Navy warships.

The following year, Obama and Russian President Dmitry Medvedev signed New START, capping each country's deployed nuclear warheads at 1,550 and its long-range delivery systems at 700. Like the previous U.S.-Russia treaties, New START included extensive verification procedures, providing transparency for both sides.[53]

In 2012, in another major nonproliferation effort, the United States and five other world powers began negotiating with Iran to halt its nuclear program, which

many experts suspected was close to developing a nuclear bomb. In 2015, Tehran agreed to curtail its nuclear program in return for relief from international sanctions that had hobbled Iran's economy.

Israel and its supporters in Congress condemned the deal, arguing that once key provisions expired after 10 years, Iran would be free to resume its weapons development. In his 2016 campaign for the presidency, Republican nominee Trump echoed those allegations, vowing if elected to withdraw from the Iran deal and negotiate a tougher accord permanently halting Iran's nuclear and ballistic missile programs and ending its support for proxy military forces across the Middle East.

After winning the 2016 election, Trump turned his attention to North Korea, which was testing its nuclear weapons and long-range ballistic missiles capable of reaching the United States. Trump and North Korean leader Kim taunted each other with personal insults and threats.

In early 2018, the Pentagon released its updated "Nuclear Posture Review," detailing the administration's plans to modernize the nation's nuclear arsenal and presenting limited tactical nuclear war as a viable battlefield strategy.[54]

On May 8, that year, Trump made good on his promise to withdraw from the Iran deal. Six months later, he reimposed crippling sanctions on the Islamic Republic and gave its leaders a stark choice: sign a tougher accord or watch Iran's economy collapse. A defiant Iran refused and slowly reactivated its nuclear program.

In June of that year, Trump stunned arms control advocates and defense hawks by becoming the first sitting U.S. president to meet with a North Korean leader. Gambling that their personal diplomacy could sweep away decades of hostility and distrust, Trump and Kim held talks in Singapore and agreed to begin negotiations toward denuclearization of the Korean Peninsula.[55]

Meeting Kim for a second time in Hanoi in February 2019, Trump abruptly walked out of their summit after rejecting what U.S. officials said was the North Korean leader's demand for relief from all U.S. sanctions in return for dismantling his main nuclear facility at Yongbyon. North Korea said it had asked for a partial lifting of sanctions.[56]

Last August, the two leaders met a third time, in the Demilitarized Zone between the two Koreas, and Trump even stepped briefly into North Korean territory—another first for a U.S. president. But their differences remained over how negotiations should proceed. North Korea experts say Kim wanted a step-by-step process in which the United States would reward North Korea's gradual denuclearization with gradual sanctions relief and the removal of U.S. nuclear forces from the region. On the advice of his hawkish advisers, Trump insisted North Korea first surrender all of its nuclear and ballistic missile programs before the United States would provide any sanctions relief.

Arms control withered further last August when Trump withdrew from the Intermediate-Range Nuclear Forces Treaty with Russia. Like Obama before him, he accused Russia of covertly developing and deploying a banned intermediate-range cruise missile that could threaten both Europe and Asia, a charge Russia denied. Congress later authorized $10 million for tactical nuclear warheads to be mounted on intermediate-range ballistic missiles capable of reaching Russia after being launched from submarines in the region.[57]

The Defense and Energy appropriations bills signed into law in December provided the Trump administration with $30.8 billion to maintain and modernize the military's nuclear arsenal and to pay for new nuclear-armed missiles, missile-launching submarines and long-range bombers.[58]

In what arms control advocates considered a hopeful sign, Putin announced late last year that he was ready to extend New START until 2026. Trump, however, refused to commit to its extension, citing his preference for a treaty that would include China.

In the end, 2019 came to a close with the future of New START, North Korea's denuclearization and Iran's nuclear program under clouds of uncertainty.

CURRENT SITUATION

Korean Diplomacy Fizzles

Many analysts believe North Korean leader Kim is embarking upon a defiant path for 2020 with his year-end policy speech announcing he no longer feels bound by his self-imposed moratorium on missile tests. Kim cited

President Trump's failure to reciprocate with any relief from sanctions that have hobbled North Korea's economy.

"If the U.S. persists in its hostile policy toward the DPRK, there will never be the denuclearization on the Korean Peninsula, and the DPRK will steadily develop necessary and prerequisite strategic weapons for the security of the state until the U.S. rolls back its hostile policy," Kim said, using the initials of his country's official name, the Democratic People's Republic of Korea.[59]

Nevertheless, Trump continues to believe his personal rapport with Kim holds the promise for an historic agreement that would see the communist nation give up its nuclear weapons.

"Look, he likes me, I like him, we get along," Trump said about his relationship with Kim while speaking to reporters on New Year's Eve at his Mar-a-Lago resort. "But he did sign a contract, he did sign an agreement talking about denuclearization. . . . I think he's a man of his word, so we're going to find out."[60]

In his speech, Kim appeared to leave the door open to further diplomacy by saying the nuclear tests would resume if Washington refused to drop its demands that North Korea first fully denuclearize. Further complicating any future negotiations is North Korea's definition of denuclearization, which includes the removal of all U.S. nuclear forces from South Korea.

Since then, there has been no sign that Trump has softened his position. But Trump sent Kim birthday greetings in early January in a gesture that analysts said was aimed at defusing tensions and preparing the ground for another summit. In a response, carried by the official Korean Central News Agency, North Korean Foreign Ministry adviser Kim Kye Gwan said it would be "stupid" to expect that Kim's personal relationship with Trump would be enough to restart negotiations.[61]

Talks will resume, he said, when Washington agrees to the proposal Kim put forward at his Hanoi summit with Trump last June: That North Korea would dismantle its principal nuclear facility at Yongbyon in exchange for the partial lifting of U.N. sanctions on North Korea. "There is no need for us to be present in such talks, in which there is only unilateral pressure," Kim Kye Gwan said, "and we have no desire to barter something for other things at the talks, like traders."[62]

On Capitol Hill, the eight Democratic senators who wrote to Trump in December urged him to come up with a comprehensive strategy to advance denuclearization talks, including a "phased process to verifiably dismantle the Yongbyon nuclear complex and other nuclear facilities."[63]

But Kori Schake, who has served in senior policy positions at the Pentagon, State Department and National Security Council in both Democratic and Republican administrations, says the prospects for any progress toward North Korea's denuclearization appear slim. "The Trump administration doesn't appear to think that agreements require any compromise from them," says Schake. "Most negotiations work better when your position isn't 'Give me everything first, and then I'll give you something.' They're not invested in a process that builds confidence as it builds momentum."

According to several independent experts who closely follow North Korean issues, the administration's position has thwarted Stephen Biegun, Trump's top North Korea negotiator, who has been unable to persuade Trump and Secretary of State Mike Pompeo to adopt a step-by-step negotiating process.

In an appearance on ABC's *This Week* just before the new year, Robert O'Brien, Trump's fourth national security adviser, echoed the president's hard line, warning the United States will respond if North Korea resumes nuclear weapons and long-range ballistic missile tests.

JOE KLAMAR/AFP via Getty Images

U.S. President Barack Obama and Russian President Dmitry Medvedev shake hands after signing the New Strategic Arms Reduction Treaty (New START) in 2010 in Prague. The pact committed the two nations to major nuclear arms cuts.

AT ISSUE

Is limited nuclear war a viable battlefield option?

YES

John D. Maurer
Jeane Kirkpatrick Fellow, American Enterprise Institute

Written for *CQ Researcher*, February 2020

The most viable way to prevent a limited nuclear war is to be ready to fight one. As such, the United States must modernize its arsenal of tactical or so-called low-yield nuclear weapons, whose explosive power can range from the equivalent of 20 tons of TNT to as high as a Hiroshima-sized bomb, which was 16,000 tons. Fielding such weapons will ensure that U.S. leaders have options short of all-out war to respond to nuclear provocation and will signal to adversaries that they cannot hope to escalate their way out of a losing conventional battle. By closing off options for escalation, low-yield U.S. weapons will help deter adversaries from embarking on militarized crises in the first place. Furthermore, improving and expanding U.S. low-yield capabilities will create an incentive for rivals to take seriously proposals to eliminate such weapons.

Those who oppose the United States developing tactical nuclear weapons argue that they are destabilizing because the collateral damage they cause is small enough that decision-makers might be tempted to use them in a crisis. But nuclear war is only likely to occur against the backdrop of a major conventional war between the great powers. If one of those powers fears defeat on the conventional battlefield, it will face strong pressures to use nuclear weapons to stave off that loss.

The escalatory pressure emerges not from the character of the nuclear weapons themselves but from the looming threat of conventional military humiliation. If the losing great power has low-yield weapons that it can use without fear of reprisal, nuclear war is all but assured. Only the threat of a proportional nuclear response would deter adversaries from using such weapons to stave off defeat.

Modernizing the U.S. low-yield nuclear arsenal also provides the clearest path to eliminating tactical nuclear weapons entirely. Rivals such as Russia and China already maintain large numbers of these weapons and have no incentive to dismantle them if the United States does not have a similar capability to trade away in negotiations. Critics of low-yield nuclear weapons who are serious about eliminating their escalatory potential should support U.S. nuclear modernization as a first step toward bringing adversaries to the bargaining table.

The United States cannot abide a world in which adversaries such as Russia and China have low-yield weapons, while the United States does not. As our adversaries engage in increasingly threatening behavior toward U.S. allies, the United States needs a nuclear arsenal that will ensure deterrence—not just on good days, but also on the worst days.

NO

Joseph Cirincione
President, Ploughshares Fund

Written for *CQ Researcher*, February 2020

We refuse to learn from history. Almost 40 years ago, Defense Secretary Robert McNamara wrote: "It is inconceivable to me, as it has been to others who have studied the matter, that 'limited' nuclear wars would remain limited—any decision to use nuclear weapons would imply a high probability of the same cataclysmic consequences as a total nuclear exchange." McNamara concluded, along with his British colleagues, that "under no circumstances" would they have recommended "that NATO initiate the use of nuclear weapons."

But that is precisely what a new generation of Dr. Strangeloves recommends today. They have embraced the Cold War theory of "escalation dominance" and favor new, more usable nuclear weapons to fight even conventional conflicts. They argue that if the United States has greater military force on every rung of the "escalatory ladder," it can convince an enemy to surrender early in a conflict.

But that attractive theoretical concept has little relationship to any conceivable conflict scenario, in which even a militarily inferior adversary has multiple ways of escalating a conflict. For example, the United States is militarily superior to Iran, but with a few mines and speedy patrol boats, Tehran could close the Strait of Hormuz, crippling oil flows and plunging the world economy into recession.

Yet, Iran is precisely where some in Washington favor using nuclear weapons. A 2017 Pentagon war game used U.S.-based bombers to drop a low-yield nuclear weapon on Iran. But because it would take a 10-hour flight to deliver this weapon, the Trump administration has just deployed—with congressional approval—a low-yield nuclear warhead that can be launched from submarines off Iran's coast. This Hiroshima-sized bomb could explode within 15 minutes of launch.

Supporters justify this scenario by arguing it offers "multiple options" and "maximum flexibility," providing military solutions to even the most difficult political problems. Most serious analysts recognized long ago that this strategy leads to disaster.

"A nuclear weapon is a nuclear weapon," warned former Secretary of State George Shultz. "You use a small one, then you go to a bigger one."

Iran does not have nuclear weapons, but Russia and China do. The first use of nuclear weapons against those countries would not be the last. Commanders can have no confidence that they can control or contain a limited nuclear war. Rather than being a strategy for victory, it guarantees defeat for all sides.

"We will take action, as we do in these situations," O'Brien said. "If Kim Jong Un takes that approach, we will be extraordinarily disappointed, and we will demonstrate that disappointment." He declined to provide any specifics but said the administration has many "tools in its tool kit" to respond to any such tests.[64]

Other White House officials say Trump is not looking for another confrontation with Kim in an election year. If the tests resume, they say, Trump is likely to press the United Nations to tighten sanctions against North Korea—a strategy that previous administrations have used to little effect.

Nuclear weapons experts say in the year and a half since the Singapore summit, Kim has built up his missile stores and produced enough bomb-grade nuclear fuel for about 38 warheads—double an earlier estimate issued by U.S. intelligence analysts.

Pressure for New START

Meanwhile, lawmakers are stepping up pressure on the Trump administration to extend New START, introducing bipartisan legislation in both chambers that would strengthen a requirement to assess the costs and implications of allowing the treaty to expire next February.

With Trump still unwilling to commit to the pact's extension in order to explore including China, the House and Senate bills would require the administration to provide intelligence estimates on how much Russian and Chinese nuclear forces could expand if New START expires. Lawmakers also want to know how much it would cost for U.S. intelligence to ascertain such developments without an extension of New START's verification provisions.

The bills echo a provision in the new fiscal 2020 National Defense Authorization Act, which requires the administration to estimate how large Russia's tactical nuclear arsenal and China's nuclear modernization program will grow if New START is allowed to lapse.[65]

Congressional aides say the legislation reflects serious concerns on Capitol Hill that the administration has not sufficiently analyzed the strategic implications of allowing New START to expire. Moreover, lawmakers from both parties and arms control experts say they are unaware of any concerted administration effort to formulate a negotiating strategy for China.

Countryman, the former assistant secretary of State for international security and nonproliferation, notes that while Trump announced his plan for a tripartite arms control treaty last May, the State Department only invited China to begin what it called a bilateral "strategic security dialogue" in December. "After saying they wanted to negotiate with China, it took them nine months to officially communicate that," he says.

State Department officials will not say whether China has responded to its invitation, but Beijing repeatedly has said it has no interest in three-way nuclear arms reduction talks, because the Russian and U.S. arsenals are already 20 times the size of China's.

In February 2020, national security adviser Robert O'Brien said the Trump administration would soon open nuclear arms control negotiations with Russia. His remarks came 10 months after Secretary of State Mike Pompeo told lawmakers the administration was at the "very beginning of conversations about renewing" New START, indicating it had made no serious diplomatic efforts in the interim.[66]

With the administration struggling to deal with North Korea and Iran, some arms control experts suggest it may not have the bandwidth to focus on Trump's trilateral treaty proposal. The State Department's Office of Strategic Stability and Deterrence Affairs, responsible for negotiating arms control treaties, reportedly has gone from having 14 staffers when Trump took office in 2017 to four. The State Department's top two arms control officials were among those who left, says Bell, the former State Department arms control adviser, and neither has been replaced. The State Department has not commented on the report.

"We simply don't have enough people doing this," says Bell, now the senior policy director at the Council for a Livable World, a Washington-based organization that advocates for nuclear disarmament. "To create these kinds of agreements, you need patience and high-level, disciplined attention paid to those goals. It's hard to see that forthcoming from this administration."

And without the robust verification procedures allowed by New START, it would cost billions of dollars to create new intelligence programs to determine the disposition of Russia's nuclear arsenal, with no guarantees that such programs would succeed, say former arms control

officials. The treaty's expiration also would remove any restrictions on the numbers of new hypersonic nuclear weapons Russia could deploy, experts say.

"It is hard to overstate, from my perspective as a senior military leader, how much we benefit from the knowledge and predictability the treaty provides about Russia's nuclear forces and operational practices," Mullen, the former Joint Chiefs chairman, told the House Foreign Affairs Committee in December 2019. "Without the treaty and its verification provisions, we'd be flying blind."[67]

OUTLOOK

Grim Future

The Ploughshares Fund's Cirincione says the future of arms control looks grim. "It's on life support," he says, citing the steady erosion of treaties that once formed the pillars of the arms control architecture.

The United Nations will conduct its five-year review of the nuclear Non-Proliferation Treaty in April and May of 2020, providing a comprehensive assessment of arms control, nonproliferation efforts and progress toward disarmament. Arms control experts expect poor report cards for the United States, Russia and China regarding their commitments to nuclear disarmament.

Arms control experts predict that the review will cite the development of new hypersonic nuclear weapons, cyberwarfare capabilities and the militarization of space as troubling technological advances that will only make nuclear disarmament more difficult. The review is also expected to raise concerns over the collapse of the Intermediate Nuclear Forces Treaty, the stalemate in U.S.-North Korean negotiations, President Trump's withdrawal from the Iran nuclear deal and the possible lapse of the New START and Open Skies treaties.

Meanwhile, the Council for a Livable World's Bell says U.S. investments in both new missiles and missile defenses and the Pentagon's buildup of tactical nuclear weapons are foreboding signs. "This looks like a recommitment to the concept of nuclear war fighting," she says.

Nunn, of the Nuclear Threat Initiative, says a key factor for the future of arms control is sustained communication between the United States and Russia over maintaining strategic stability. Although Putin and Trump have agreed to hold such talks, few meetings between their military representatives have taken place. "When we're not having a military-to-military dialogue, arms control is eroded," Nunn says.

The American Enterprise Institute's Maurer believes arms control will probably remain dormant for the next 10 to 30 years—the time it will take for the United States to fully modernize its nuclear weapons and delivery systems. At that point, he predicts, Russia and China will make arms control a priority because the technical superiority of America's arsenal will leave them vulnerable.

"Once our capabilities mature, that's when we'll see the Russians and the Chinese become interested in arms control negotiations," Maurer said. "We saw this during the Cold War. The Russians were always the most eager for arms control talks when we had a big military program coming down the pipeline, whether it was our missile defense system in the 1970s that resulted in the ABM Treaty, or our Pershing II and Trident missiles in the 1980s that led to the INF and START treaties."

But Nunn fears that kind of thinking is an enormous gamble.

"We've gone 75 years without a nuclear explosion," he says. "To think we're going to go another 50 years without an awful lot of cooperation between the nuclear powers is pretty naive. We've become accustomed to thinking that because it hasn't happened, it won't happen. But that defies both the odds and history."

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