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# DIARY

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**PART B**



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International  
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INSTITUTE



# DIRTY R-NEWS



## Why There Should Be No Deal Making with Iran

Source: <https://theparadise.ng/why-there-should-be-no-deal-making-with-iran/>

Dec 24 – There have been increasing geopolitical swirls around the JCPOA (Joint Comprehensive Plan of Action) also known as the “Iran Deal”. A video was released in which US president Joe Biden said that the JCPOA is “dead” but that he would not announce it publicly. At the same time, outlets like Reuters are reporting that the US is leaving the door open for a different Iran deal. This is consistent with the Biden video which seems to indicate at the end that Joe Biden feels that diplomacy is necessary to prevent a nuclear Islamic Republic.

The major problem with the Biden administration and the major European powers is that their entire approach to negotiation with the Islamic Republic is flawed. The deal does not prevent the Islamic Republic from getting nuclear weapons, it guarantees that they would get nuclear weapons along with the ballistic missiles to launch them off.

While the original JCPOA was a terrible deal for everyone but the regime, an issue I have written about before, the very notion of negotiating with the regime is counterproductive.

There is a very good reason for the popular phrase “you don’t negotiate with terrorists”. The Islamic Republic is the top global supporter of terrorism. In their own words, they are Islamist Jihadists with the stated goal of world domination that directly finance listed terrorist groups like Hamas and Hezbollah. Also, their own IRGC has committed terrorist attacks in Argentina, and Germany, and shot down the flight PS752.

No reasonable person should expect that the mullahs would ever abide by the terms of the deal. In fact, the Israelis managed to obtain proof that the regime was in violation of the original deal.

The Islamic Republic wants nuclear weapons, and there is nothing we can say to them that will change that. If we want to prevent them from gaining nuclear capabilities we have to make it more difficult for them to enrich uranium. This means economic and political sanctions, sabotage of their nuclear program, and listing the IRGC as a terrorist organization and punishing anyone who directly or indirectly aids them.

Any deal with the regime would provide economic funds to the regime, and therefore would give them the resources that make building a bomb far easier. The last time the Obama administration dumped billions of dollars on the regime it resulted in disaster. None of the money went to improving the lives of the people inside Iran, instead, it went to terrorist organizations like Hezbollah and rebel groups like the Houthis in Yemen, which in turn turned the country into a hellscape of a civil war.

To re-enter a new deal with the Islamic Republic would be a horrible betrayal of the people in Iran fighting the regime on the streets, the families in Lebanon blown up in the Hezbollah Beirut explosion, Israelis under Islamic Republic rocket fire, Yemenis hoping for peace, the victims of PS752 and all others who value humans rights around the globe.

Einstein once said that the definition of insanity is to try the same thing over and over and expect a different result. The first Iran deal was a disaster, another one would be the same.

**EDITOR’S COMMENT:** Just a word on sanctions: Sanctions resemble protests – a lot of noise but no results. Sanctions against Iran, N. Korea, or Qatar did not work since involved countries discover self-preservation and autonomy along with ways to bypass the restrictions. Pragmatism might be an alternative way to solve problems based on common interest, not submission.

## How Russia could strike with nuclear force and what might happen next

By Graham Shear

Source: <https://www.newsanyway.com/2022/12/24/how-russia-could-strike-with-nuclear-force-and-what-might-happen-next/>

Dec 25 – Russian President Vladimir Putin has made a lot of very unsettling nuclear threats since the start of Russia’s unprovoked war in Ukraine, and concerns are growing as his forces lose ground that he could resort to the unthinkable and order the use of weapons of mass destruction — a nightmare scenario.

Putin made a subtle reference to nuclear weapons and vowed to defend Russia’s “territorial integrity” in September. He also stated that this was not a bluff. Putin has continued to make threats to Russia’s nuclear arsenal throughout the years.

The use of a tactical nuke would be a deliberate act — made “in cold blood,” an expert said — that requires a multi-step process that US spy agencies may detect; so far, US officials have said they’ve seen no signs of it.

Russia has the most tactical nukes in the world. While they may only be effective in destroying a few armored vehicles, they can still kill tens or thousands if used to attack a city. Unlike ICBMs, whose explosive power is often measured in megatons (or ICBMs), tactical nukes are not ready for immediate





use. They are aging weapons with questionable reliability and must be removed from storage before being used. Even so, even one tactical nuke could cause a chain reaction of escalation that could lead to a nuclear catastrophe. In October, President Joe Biden suggested that the risk of nuclear “Armageddon,” as the US has privately told Russia, is the highest since the 1962 Cuban Missile Crisis. [“catastrophic consequences”](#) if nuclear weapons are used. Putin hasn’t said “we’re going to launch nukes,” but he wants the dialogue between the US and Europe be, “The longer this war continues, the greater the risk of nuclear weapons being used,”” John Erath senior policy director at the Center for Arms Control and Non-Proliferation. [told the Associated Press](#) December

While Russia watchers suspect Putin of lying to stop Western support for Kyiv’s, many top nuclear experts agree that Putin’s threats should not be dismissed.



### Russia’s strategic nuclear weapons and its tactical nuclear weapons

Putin, who has made vague threats, has not stated whether or not he will use a nuclear weapon. However, experts in nuclear weapons and military warfare have indicated that Putin is more likely, if he does, to use a tactical nuke weapon in Ukraine than a strategically nuclear weapon, although the latter is still an option.

Tactical and non strategic nuclear weapons are designed for smaller strikes and use at a shorter range on the battlefield, while strategic weapons have higher explosive yields that can be used against targets farther away from the frontlines.

Russia has the largest stockpile of nuclear weapons in the world, with 5,997 warheads. However, approximately 1,500 of these are still active, according to the Federation of American Scientists’ latest assessment.

Russia is estimated to have approximately 1,912 tactical nuclear weapons. It also has a fully operational nuclear trio, which gives it the ability to deliver nuclear nukes to their intended targets via land and air.

The explosive yield of a tactical weapon nuclear weapon ranges from 10 to 100 kilotons (a Kiloton is a unit that measures the explosive force of 1,000 tons TNT). Russia has low-yield nuclear weapons that are below one kiloton.

These weapons are still extremely powerful. The atomic bomb dropped by the US on Nagasaki in World War II had an explosive output of only 21 kilotons and still killed approximately 74,000 people. There are also tactical nuclear weapons that can be more powerful than four times.

During a recent webinar hosted at his organization, Daryl Kimball, executive Director of the Arms Control Association (ACA), stated that tactical nuclear weapons are “devastating and indiscriminately killing machines”.

### Show your resolve by going nuclear

Pavel Podvig is a senior researcher at UN Institute for Disarmament Research and does not believe that Russia is at this stage, despite Putin’s rhetoric. Russia could alienate its remaining allies and maintain its status as an international terrorist.





“There is a consensus among people that the battlefield use nuclear weapons is not possible,” Podvig stated to Insider from Geneva. “This isn’t that kind of war.”

The forces of Ukraine are dispersed so there is no chance to strike thousands of soldiers. Podvig stated that a tactical nuclear weapon could destroy a dozen tanks at most. It would be a logistical nightmare for a military which struggled to feed its troops at the beginning.

“You must coordinate. He said that you need to deal with all contamination. It’s not an easy task.

Even if the intent of such a strike were to simply demonstrate Russia’s resolve and willingness to escalate, Podvig does not think it would achieve that with a battlefield nuke — it could in fact be read as Moscow being hesitant. “It would have to shock,” Podvig said if the Kremlin was looking for an effective demonstration.

“It won’t be enough to just have an explosion over Black Sea somewhere in order to deliver the shock. You really would have to kill a lot of people — we are talking about tens, maybe hundreds of thousands of people,” he said. “And that would be done in cold blood.”

Putin’s home could be undermined by the destruction caused by a nuclear bomb. This conflict was sold to his people on the basis of [shared history with Ukraine](#). He could cause a backlash if he were to supervise, using nuclear force, the destruction or mass killing of Ukrainians. He has described them as “one people” along with Russians. These sentiments have not prevented other wartime atrocities.

### Putin can decide whether or not to use a nuclear weapon.

In 2020, Russia released the “Basic Principles of State Policy of Russia on Nuclear Deterrence,” a document that outlines its nuclear doctrine. According to the document, the Russian president decides whether or not to use nuclear weapons.

According to the Congressional Research Service, “The Russian President is Supreme Commander in Chief of Russian Armed Forces and he has authority to direct nuclear weapons use.”

In other words, Putin can decide if Russia uses a nuclear weapon, but it is not as easy as pressing a button to let one go.

It’s possible that Putin’s orders for a nuclear strike could be rescinded at any time. There is no way to know if anyone would be willing to stand up against Putin’s leader, whose opponents are known for ending up in prison or dying violently.

The whole process begins with a decision made by Putin, Hans M. Kristensen (director of the Nuclear Information Project at Federation of American Scientists), explained during the ACA webinar. He said, “But of course, just like in the United States the military must cooperate.”

Kristensen stated that “I don’t think there’s a red button on his desk that he can press and then suddenly, the nuclear weapons begin flying.” He also said that it would likely “take longer” to use a tactical rather than a strategic nuclear weapon, given that these weapons aren’t immediately available.

Russia’s non-strategic nuclear nukes are “in Central Storage” and would need to be taken out of their bunker first, and then transported to the launch units to fire them. Kristensen said that it is “reasonable to suppose” that Western intelligence would detect if this is happening given the many steps involved. According to recent reports, US intelligence has not seen any indication that Putin is preparing for nuclear weapons.

Some of these nukes may not be reliable due to their age or storage time.

Pavel Baev (a military researcher who worked previously for the Soviet defense minister) stated that most of the warheads stored there were very old. [told the Guardian](#) October “It is difficult to determine how suitable they will be as many of them have past their expiration date.”

### Putin’s nuclear calculation

The document was released by Russia in 2020. [four scenarios](#) This could lead to the use nuclear weapons: The use of nuclear weapons against Russia or its allies or conventional aggression that threatens Russia’s existence, the use or attempted use of weapons of mass destruction or nuclear weapons, the use or attempted use of nukes, or the use or attempted use of them, as well as the use or attempted use of ballistic missiles heading for Russia or its allies. An attack on the government or military that compromises Russia’s nuclear response capability could also be possible.

Putin’s threats to Ukraine suggest that he may, although the risk remains low and ignore Russia’s nuclear doctrine, and use a weapon to mass destruction to send a serious message to Ukraine’s Western allies.

Although there is still some debate about whether Putin would use a nuclear weapon, there is widespread agreement that the Ukraine war has increased the risk of a nuclear disaster to a level never seen in decades.

Kristensen stated during the ACA webinar that he believes that Russia is unlikely to use nuclear weapons in Ukraine. He said that in order for this to happen, things must “escalate substantially” to a “direct clash with Russia”



“That being said, they’ve certainly rattled and threatened something that seems like a scenario beyond what Russia’s declaratory policies are,” he said. He also said that Russia could use a nuclear weapon to attack the Iskander short-range missile.

The risks of Putin using a nuclear weapon in short-term are “still very low,” Andrea Kendall Taylor, a former senior intelligence officer who conducted strategic analysis on Russia for National Intelligence Council (2015-2018), stated. [told Insider in late September](#). But Kendall-Taylor also emphasized that Putin’s decision to annex four Ukrainian territories — declaring territories on the front lines of the war as part of Russia — “increased those risks.”

“I worry now that the Ukrainians will reclaim territory Russia has annexed and that this could lead to a deterioration in our security. [Putin]Russian claims, given the fact that he now is so invested in this, that there is a greater risk of him using a tactical nuke in Ukraine,” she stated. She also said that the fate of Russia’s use of a nuclear weapon in Ukraine is “directly connected to Russia’s fate on the battlefield.”

If Putin were to use a tactical nuke weapon in Ukraine, it would be likely to “in hopes that shocking Ukraine into surrendering or the West to cut off aid to Ukraine.” [according to an assessment from the Institute for the Study of War](#). ISW stated that it was unlikely that such attacks would force Ukraine or West to surrender.

### Response to the Unthinkable

One of the most pressing issues surrounding Russia’s potential use of a nuke weapon is how the West, specifically NATO, would react.

Ukraine is not considered a nuclear power. But multiple countries in NATO, a 30-member military alliance that has supported Ukraine in its fight against Russia, have nuclear arsenals of their own — including the US.

Together, the US and Russia have roughly 90% of all world’s nuclear warheads. During the Cold War, both countries were at risk of nuclear war, sometimes by accident, but they managed to avoid a disaster.

Although the Biden administration has warned Russia that there could be severe consequences if they use nuclear weapons, it has not provided any details. Experts recommend that the United States not go nuclear as a response.

“I do not believe that the United States and its allies should put on the table a nuclear response. We must remain on the side for a firm military response but one that is conventional in nature,” Rose Gottemoeller (ex-deputy secretary general of NATO and State Department senior official for arms control, nonproliferation and nonproliferation) said during ACA’s webinar. Gottemoeller suggested that the response could target the origin of Russia’s nuke attack. However, the US could also consider employing offensive cyber capability first.

Gottemoeller stated that “any such attack would have to be carefully designed to respond to what would constitute an egregious attack against a Ukrainian target using nuclear weapons,” adding that she wanted to “underline and really emphasize that none of these options are desirable to NATO and the United States of America.”

## The 2022 nuclear year in review: A global nuclear order in shambles

By François Diaz-Maurin

Source: <https://thebulletin.org/2022/12/the-2022-nuclear-year-in-review-a-global-nuclear-order-in-shambles/>

Dec 26 – **It is hard to find a year filled with more concerns about nuclear risk than 2022.** There surely was 1986 and the Chernobyl reactor accident. There was also 1962 and the Cuban Missile Crisis. And, of course, there was 1945 and the atomic bombings of Hiroshima and Nagasaki.

But this year, all sorts of nuclear risks coincided.

Russia, losing on the ground, [contemplated](#) the use of nuclear weapons in its war against Ukraine—recklessly threatening the [nuclear taboo](#), a 77-year tradition of non-use. Also in Ukraine, nuclear reactors and nuclear facilities [became targets](#) of military attacks.

Elsewhere, North Korea [test-launched](#) more ballistic missiles than it ever had in a single year and even seems to be preparing for a nuclear test. Iran resumed construction of its underground nuclear complex, disconnected IAEA surveillance cameras, and accelerated its uranium enrichment program, leaving it [only months away](#) from possibly testing a nuclear explosive or deploying a crude nuclear warhead on a ballistic missile, if it wishes to do so. In response, Saudi Arabia [took further steps](#) toward enriching uranium, also refusing IAEA inspections that would ensure the Kingdom does not conduct covert nuclear weapons-related activities. Despite all these concerns, efforts of nuclear non-proliferation and disarmament failed to achieve any meaningful result this year.

Participants in the first meeting of states parties of the Treaty on the Prohibition of Nuclear Weapons (TPNW), also known as the ban treaty, [could not agree](#) on calling out Russia’s nuclear threats and rhetoric in its war against Ukraine. The long-awaited review conference of the parties to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) ended without an agreement after Russia refused to sign off on an outcome document that referred to the control of the Zaporizhzhia nuclear power plant in Ukraine. The





international community, so far, [seems incapable](#) of finding ways to better protect nuclear facilities from attacks, even as the odds of a nuclear accident in Ukraine increase as the war drags on.

In August, the [EU-mediated talks](#) between the United States and Iran failed to revive the 2015 agreement limiting Tehran's nuclear program, known as the Joint Comprehensive Plan of Action (JCPOA), which former President Trump abandoned in 2018. In the United States, the much-anticipated Biden administration's Nuclear Posture Review (NPR) was finally released in October, only to deceive experts. The NPR has been invariably accused, at best, of [maintaining](#) the nuclear status quo and of [passing on its chance](#) to reduce the role of nuclear weapons in the US security strategy, if not of being a [major step backward](#).

Finally, in late November, hopes that on-site inspections under the New Strategic Arms Reduction Treaty (New START) could [resume](#) soon were cold-showered after Russia postponed a meeting of the Bilateral Consultative Commission (BCC), the treaty's implementing body, planned to be held the next day in Cairo, Egypt. New START is the only bilateral nuclear arms control treaty between the United States and Russia, the world's two largest nuclear arsenals. It is set to expire in 2026.

2022 will certainly appear in textbooks as the year when the global nuclear order was [unprecedentedly shaken](#), if not [irreparably destroyed](#).

But it was not all dark on the nuclear front. The year ended with a huge scientific achievement with direct implications for nuclear security and nuclear energy when the US Energy Department and the National Nuclear Security Administration (NNSA) announced researchers had achieved fusion ignition at Lawrence Livermore National Laboratory's National Ignition Facility in California. The success of the fusion ignition experiment validates the modeling codes that are used under NNSA's Science Based Stockpile Stewardship Program to verify that modernized nuclear weapons work as designed, which confirms that nuclear weapon testing is no longer needed.

This year was also marked by the passing of important figures for nuclear nonproliferation and arms control: Former US Defense Secretary [Ash Carter](#), who directed the US efforts to secure nuclear weapons in the former Soviet states in the 1990s; former president of the Soviet Union, [Mikhail Gorbachev](#), whose role was decisive in halting the nuclear arms race in the 1980s and ending the Cold War; [Michael Krepon](#), who co-founded the Stimson Center and whose prolific writing helped shape the debate on arms controls for a generation of scholars; and [Mike Moore](#), who served as editor in chief of the *Bulletin* at the dawn of the post-Cold War era. Each worked tirelessly to reduce the role of nuclear weapons in security strategies.

**Here are seven *Bulletin's* nuclear stories that marked 2022—and that you should read.**

### [A hurting stalemate? The risks of nuclear weapon use in the Ukraine crisis](#)

**By Francesca Giovannini**

Early in the war, as Western countries were still grappling with the new reality of war in Europe, Francesca Giovannini, executive director of the Managing the Atom project at Harvard Kennedy School's Belfer Center, explored a previously unthinkable scenario that might actually happen in Ukraine—the use of nuclear weapons.

### [A Ukrainian expert assesses the possible impact of a military attack on the Zaporizhzhia nuclear power plant](#)

**By François Diaz-Maurin**

In an interview with the *Bulletin*, Valeriia Hesse, a Ukrainian non-proliferation and international security expert, discusses the possible impact on the Zaporizhzhia nuclear power plant of a deliberate or accidental heavy artillery shelling or missile strike. These are new risks faced by nuclear facilities in wartime.

### [Nowhere to hide: How a nuclear war would kill you—and almost everyone else.](#)

**By François Diaz-Maurin**

In October, as Russian military leaders were considering the use of nuclear weapons, the *Bulletin* published a feature story reminding the world about the dire consequences of nuclear war. What would start with one tactical nuclear strike or a tit-for-tat nuclear exchange between two countries could escalate to an all-out nuclear war with global consequences. Two years after any nuclear war—small or large—famine alone could be more than 10 times as deadly as the hundreds of bomb blasts involved in the war itself. This story was *Bulletin's* most read of the year.

### [Nuclear Notebook: The long view—strategic arms control after the New START Treaty](#)

**By Jessica Rogers, Matt Korda, and Hans M. Kristensen**

In November, nuclear experts Hans M. Kristensen and Matt Korda teamed with treaty lawyer and policy analyst Jessica Rogers. Together they examined the issue of strategic arms control after the New START Treaty between the United States and Russia expires in February 2026.



### [Nuclear tragedy in the Marshall Islands](#)

By Sally Clark

In this personal essay, Sally Clark, a former Peace Corps volunteer, recalls her discovery of the bewildering toll on the Marshallese and the environment caused by the 67 nuclear weapons tests the United States conducted between 1946 and 1958 at the Bikini and Eniwetok atolls—and asks for an apology and justice.

### [Molten salt reactors were trouble in the 1960s—and they remain trouble today](#)

By M.V. Ramana

Molten salt nuclear reactors—based on a 1960s Oak Ridge National Lab experiment—are all the rage among some of today's nuclear power enthusiasts. But is the molten salt experiment of decades past worthy of emulation? Perhaps not, argues M.V. Ramana, a nuclear expert and professor at the University of British Columbia.

### [The Energy Department's fusion breakthrough: It's not really about generating electricity](#)

By John Mecklin

The Energy Department and fusion enthusiasts may trumpet this year's ignition achievement at Lawrence Livermore National Laboratory's National Ignition Facility (NIF) as a breakthrough in fusion energy. But it's not. It's about nuclear weapons. *Bulletin's* editor-in-chief John Mecklin spoke with Bob Rosner, a physicist at the University of Chicago and a former director of the Argonne National Laboratory, to get a balanced view of what the NIF breakthrough does and does not mean.

**François Diaz-Maurin** is the associate editor for nuclear affairs at the Bulletin of the Atomic Scientists. Previously, Diaz-Maurin was a MacArthur Foundation Nuclear Security Visiting Scholar at the Center for International Security and Cooperation (CISAC), Stanford University, and a European Commission's Marie Skłodowska-Curie Fellow. He has been a scientific advisor to members of the European Parliament on nuclear issues, and he is a founding member of the Emerging Leaders in Environmental and Energy Policy network (ELEEP) of the Atlantic Council, Washington D.C. and the Ecologic Institute, Berlin. Prior to joining academia, Diaz-Maurin spent four years as a research engineer in the nuclear industry in Paris, France and Boston, MA. There, he worked on the safety design of new reactors and of a treatment plant to vitrify Hanford's tank waste from WWII and Cold War nuclear weapons production. Diaz-Maurin received multi-disciplinary training in civil engineering (B.Sc./M.Sc., University of Rennes 1, 2004/2007, both with distinction), environmental and sustainability sciences (Ph.D., Universitat Autònoma de Barcelona, 2013, summa cum laude and "Extraordinary Ph.D." Award), and nuclear materials, geochemistry of radionuclides and nuclear security (postdoctoral training, Stanford University, 2017–2019).

## A hypothetical scenario

### [Source](#)

On December 17, 2022, Channel 2 (Iran) aired a report about Iran's plan of action in the event of an Israeli airstrike against its nuclear facilities. Younes Shadlou, an official from the state broadcasting agency (IRIB), said that if Israeli jets strike Iran, the base from which they took off would likely be destroyed before they make it back to Israel. He said that in the first phase of Iran's response, the IRGC Aerospace Force's tactical missiles *Dezful* and *Khaybar Crusher* missiles would target Israel's "nuclear warhead production site" in Dimona and that in the second phase, Iran's *Sejjil* missiles would raze Tel Aviv to the ground. He also said that these plans are a response to a joint U.S.-Israel exercise simulating an attack on Iran's nuclear facilities.

**Younes Shadlou:** "A few days ago, the Zionist regime conducted another joint exercise with the U.S. to simulate an attack on Iran's nuclear

MEMRI @MEMRIReports

#ICYMI: Iranian TV Report about How Iran Would Respond to an Israeli Attack on Its Nuclear Facilities: Dimona Will Be Practically Destroyed, Tel Aviv Will Be Razed to the Ground #Iran #JCPOA #Israel

Channel 2 (Iran)  
December 17, 2022

TRANSLATED BY  
MEMRI TV

A few days ago, the Zionist regime conducted another joint exercise with the U.S.

13.8K views 0:03 / 2:20

5:02 PM · Dec 26, 2022



facilities, like the Natanz uranium enrichment site. Let's assume that Israeli jets manage to reach the Natanz nuclear site in one piece, and let's assume that they manage to bomb this site and damage it. "Even if they manage to leave Iran's sky safely, it will take them at least an hour to return to their main base in the occupied lands. The question is whether there would be any base left for



them to land at. "This is what the first few minutes of an Iranian response will look like. In less than seven minutes, the tactical missiles of the IRGC's Aerospace Force – like the solid-fueled Dezful and the newest Khaybar Crusher missiles – will destroy their targets with great accuracy, if they are launched from a place like Natanz. "One of their designated targets is located here: Israel's nuclear warhead production site in Dimona. Obviously, this is a simulation of the [attack]. When the first wave of the attack reaches its target, the IRGC strategic missiles will be fueled in underground silos, and the missile bases will be ready for the second wave of the attack. These missiles, like the Sejil, strike their targets at velocities greater than ten times the speed of sound, and they carry a one-ton payload. "When, in the second wave, the Dimona nuclear site will be practically destroyed, Tel Aviv will be razed to the ground."

**Speaker:** "But the Zionist regime is not big enough to be considered among the enemies of the Iranian people."

**Shadlou:** "This is why the Supreme Commander of the Armed Forces [Khamenei] warned this regime 11 years ago."

**Supreme Leader Ali Khamenei:** "If they make even the slightest mistake, the Islamic Republic will raze Tel Aviv and Haifa to the ground."

**Shadlou:** "Younes Shadlou, the Broadcast Authority's news agency."

**EDITOR'S COMMENT:** Scary scenario indeed! But might be not so catastrophic if there is a coalition attack that will fill the gaps of a single-nation attack? For example, you do not have to destroy the underground silos just their entrances or you can refuel while lying and land in another country if airfields are damaged. Many countries in the region are not very happy with a nuclear Iran even if they do not really like Israel. Keep also in mind that Israel's first blow might not be conventional but nuclear followed by airstrikes and a missile barrage.

## North Korea's weapons programme defies COVID outbreak, reaches uncharted territory

Source: <https://finance.yahoo.com/news/north-koreas-weapons-programme-defies-120400867.html>

Dec 27 – North Korea forged ahead with its missile programme in 2022 and took steps toward resuming testing of nuclear bombs, as world events including the COVID pandemic and war fractured the already tenuous international pressure against it. The country acknowledged its first COVID-19 outbreak in May,



prolonging already stringent border closures and other anti-pandemic measures, blocking international engagement and causing economic woes, but doing little to slow its weapons tests.

The true extent of COVID there remains unconfirmed amid a lack of testing and independent monitoring.

This year provided the clearest evidence yet that North Korea now regards itself as a permanent nuclear weapons power and that Pyongyang has no intention of engaging the United States in denuclearisation talks, said Evans Revere, a former U.S. diplomat.

"We are in dangerous and uncharted territory when it comes to the North Korean threat," he said. "The possibility of denuclearising North Korea has all but disappeared."

North Korea resumed testing intercontinental ballistic missiles (ICBMs) for the first time since 2017, successfully launching the massive new Hwasong-17, which is believed to have the range to strike anywhere in the United States.

Pyongyang rolled out a series of increasingly capable short-range missiles as well, in what it says is a strategy to deploy tactical nuclear weapons. North Korea also made preparations to reopen its shuttered nuclear test site, raising the prospect of a new nuclear bomb test for the first time since 2017.

With the world distracted by the pandemic and the war in Ukraine, and rising competition between Washington and Beijing, the testing seems aimed at making real strides in enhancing the country's military power, analysts said.

"North Korea could at least pretend that it was open to dialogue, but this hasn't been the case," said Ramon Pacheco Pardo, a Korea expert at King's College London. "I think that the Kim regime simply wants to improve its capabilities, no matter the consequences."

### Why it matters?

North Korea has for years been banned from conducting nuclear tests and ballistic missile launches by the United Nations Security Council, which had strengthened sanctions on Pyongyang.

In May, however, China and Russia vetoed a U.S.-led push to impose more U.N. sanctions on North Korea, publicly splitting the council for the first time since it started punishing Pyongyang in 2006.

The United States and its allies in South Korea and Japan have since turned to displays of military force, including joint drills and deployments of U.S. aircraft carriers and long-range bombers, in a so-far futile effort to deter Pyongyang's testing.

North Korea's missile tests have allowed it to refine and in some cases operationally deploy new capabilities that enable the rapid and first use of nuclear weapons in the event of both conventional and nuclear attacks, said Duyeon Kim, of the U.S.-based Center for a New American Security. "Tactical nuclear weapons are dangerous because they can start a war whether it's by miscalculation, retaliation, or preemption, and the threshold for nuclear-weapons use would be even lower," she said.

### What does it mean for 2023?

As North Korea opens up to trade and travel again it will likely continue to side with China and Russia and be less concerned with engagement with the United States and South Korea, Pacheco Pardo said. If it's true that Pyongyang expects the pandemic to last through 2024, then next year may see continued tensions. "We may see more weapons tests, chest-thumping posturing, and threats until it feels virus-safe to return to negotiations and readily armed with even more political leverage to extract big concessions or indefinite recognition as a nuclear power," Duyeon Kim said.

## The UN has said nuclear war is 'back within the realm of possibility.' Here are the places in the US most likely to be hit in a nuclear attack

By Alex Lockie, Abbie Shull, and Sonam Sheth

Source: <https://www.businessinsider.com/likely-us-nuclear-targets-2017-5>

Dec 27 – The UN secretary-general said that nuclear war is "[back within the realm of possibility](#)" following Russia's warning earlier this year it was putting its nuclear forces on alert amid its war in Ukraine, which threatens to draw NATO into direct combat with Russia. Since then, nuclear threats have continued to raise concerns a nuclear weapon could be used in a conflict for the first time in decades.

Much of the focus as of late has been on the risk of Russian President Vladimir Putin using a nuclear weapon in Ukraine in a desperate move to change his army's fortunes on the battlefield, but the Russian leader has also directed warnings at the US and NATO.

In December, Putin also suggested that Russia [may abandon](#) its "no first use" military doctrine, which says Russia would only use nuclear weapons as a last resort.





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"They [the US] have it in their strategy, in the documents it is spelled out – a preventive blow," Putin said at a news conference in Kyrgyzstan. "We don't. We, on the other hand, have formulated a retaliatory strike in our strategy."

"So if we're talking about this disarming strike, then maybe think about adopting the best practices of our American partners and their ideas for ensuring their security," he added. "We're just thinking about it."

While the risk of tensions between the US and Russia escalating to open conflict and nuclear war is low, the threat exists.

In 2017, Russian state media detailed how Moscow would annihilate US cities and areas after a nuclear treaty collapsed and put the Cold War rivals back in targeting mode — a shocking threat even by the Russian regime's extreme standards.

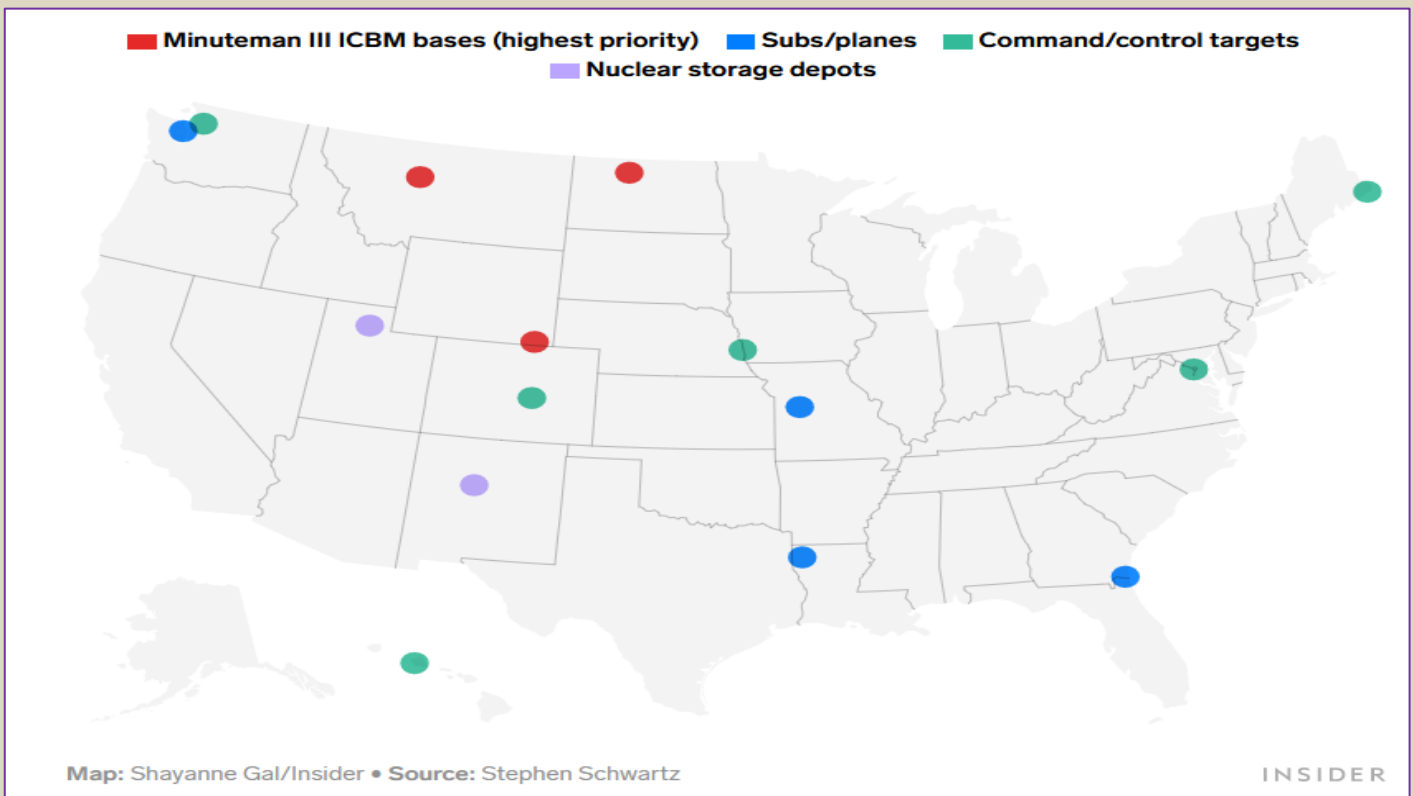
Hyping up a then-new hypersonic nuclear-capable missile, Russian state TV said the Pentagon, Camp David, Jim Creek Naval Radio Station in Washington, Fort Ritchie in Maryland, and McClellan Air Force Base in California, would be targets, according to Reuters. But the latter two have been closed for over two decades, making them strange choices for targets.

With most everything from Russia or its heavily censored media, it's best to take its claims with a grain of salt. Instead of taking Russia's word for it when it comes to nuclear targets, Insider got an expert opinion on where Moscow would likely try to strike.

Since the Cold War, the US and Russia have drawn up plans on how to best wage nuclear war against each other, and while large population centers with huge cultural impact may seem like obvious choices, strategists believe a nuclear attack will focus on countering the enemy's nuclear forces — destroying them before they can counter-attack.

According to Stephen Schwartz, the author of "[Atomic Audit: The Costs and Consequences of US Nuclear Weapons Since 1940](#)," as the Cold War progressed and improvements in nuclear weapons and intelligence-collection technologies enabled greater precision in where those weapons were aimed, the emphasis in targeting shifted from cities to nuclear stockpiles and nuclear war-related infrastructure.

This interactive map shows the essential points Russia would have to attack to wipe out the US's nuclear forces, according to Schwartz:



The map represents targets for an all-out attack on the US's fixed nuclear infrastructure, weapons, and command-and-control centers, but even a massive strike like this wouldn't guarantee anything.

"It's exceedingly unlikely that such an attack would be fully successful," Schwartz told Insider. "There's an enormous amount of variables in pulling off an attack like this flawlessly, and it would have to be flawless. If even a handful of weapons escape, the stuff you missed will be coming back at you."

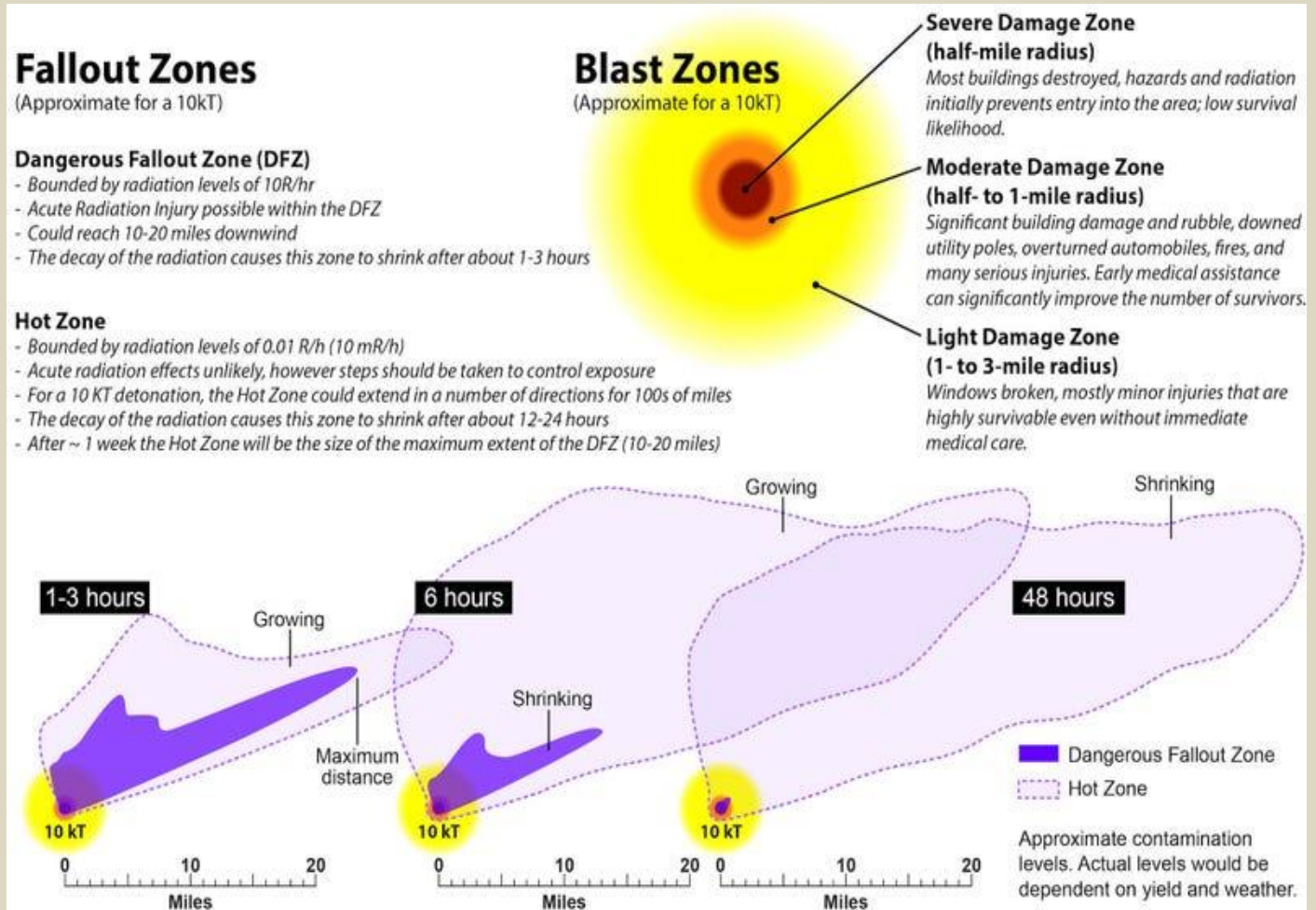
Even if every single US intercontinental ballistic missile silo, stockpiled nuclear weapon, and nuclear-capable bomber were flattened, US nuclear submarines could — and would — retaliate.

According to Schwartz, at any given time, the US has four to five nuclear-armed submarines "on hard alert, in their patrol areas, awaiting orders for launch."



Even high-ranking officials in the US military don't know where the silent submarines are, and there's no way Russia could chase them all down before they fired back, which Schwartz said could be done in as little as 5 to 15 minutes.

But a strike on a relatively sparsely populated area could still lead to death and destruction across the US, depending on how the wind blew. That's because of fallout.



Dangerous radioactive fallout zones shrink rapidly after a nuclear explosion. Brooke Buddemeier/Lawrence Livermore National Laboratory – enlarge the page to read

The US has strategically positioned the bulk of its nuclear forces, which double as nuclear targets, far from population centers. But if you happen to live next to an ICBM silo, fear not.

There's a "0.0% chance" that Russia could hope to survive an act of nuclear aggression against the US, according to Schwartz. So while we all live under a nuclear "sword of Damocles," Schwartz added, people in big cities like New York and Los Angeles most likely shouldn't worry about being struck by a nuclear weapon.

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### 3 Scenarios for How Putin Could Actually Use Nukes

By Gregg Herken, Avner Cohen and George M. Moore

Source: <https://www.politico.com/news/magazine/2022/05/16/scenarios-putin-nukes-00032505>

2022 – We know that Russian President Vladimir Putin is thinking about using nuclear weapons. He has twice warned the West not to intervene in Ukraine or face “consequences that you have never encountered in your history.” Recently, Moscow again threatened “unpredictable consequences” if the U.S. continued sending advanced armaments to Ukraine. CIA Director William Burns has said that “none of us can take lightly” the prospect that Putin might resort to the use of tactical nuclear weapons.

While any use of a nuclear weapon is unthinkable to most of the world, under current Russian military doctrine — usually described in shorthand as “escalate to deescalate” — Putin could choose a nuclear “demonstration” as a warning to halt further American military aid to the Ukrainians. In other words, for the Russian leader, detonation of a tactical nuclear weapon by Russia is entirely thinkable. And so the West needs to do some thinking, too.

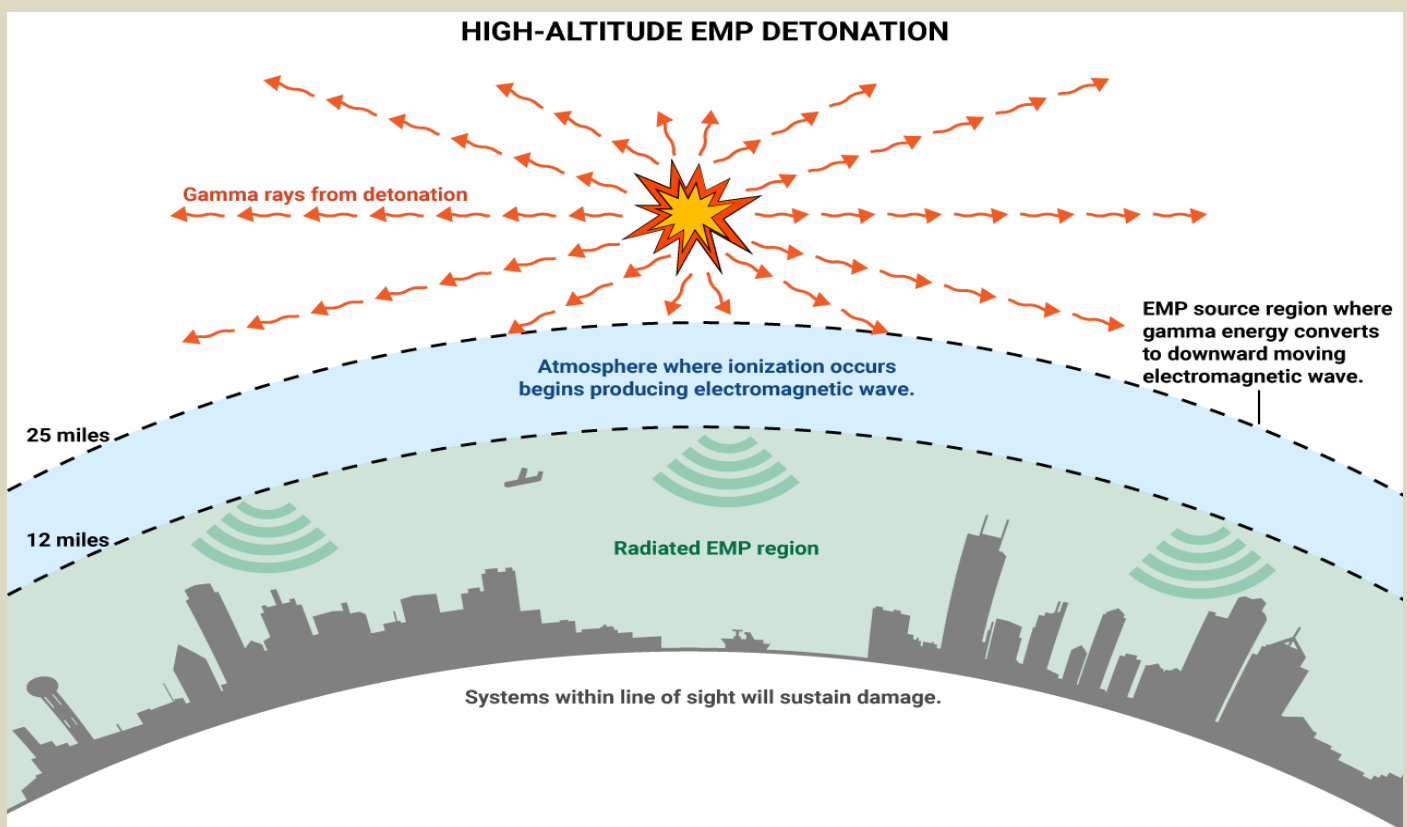
Tactical nuclear weapons are often called “battlefield” or “theater” weapons to distinguish them from much more powerful strategic nuclear weapons, but they are far more destructive than conventional weapons. During the Cold War, tactical nuclear weapons had yields ranging from tens or hundreds of tons of TNT to thousands of tons. These weapons came in many forms: gravity bombs, short-range missile warheads, anti-aircraft missiles, air-to-air and air-to-ground missiles, anti-ship and anti-submarine torpedoes and even demolition devices or mines. Reportedly, the smallest tactical weapon in the Russian nuclear arsenal has a yield of about one-third the size of Hiroshima or Nagasaki bombs, or equivalent to about 5,000 tons of TNT.

There are a few ways that such a tactical nuclear weapon could be used to fire the kind of “warning shot” envisioned in Russian military doctrine. These options come with increasing degrees of risk for the U.S., Ukraine and its allies, and for Russia.

Here are three scenarios.

#### Scenario 1: Remote atmospheric test

Least provocative would be Putin’s resumption of above-ground nuclear testing — by detonating a low-yield nuclear warhead high above Novaya Zemlya, the old Soviet test site in the Arctic, for example. While both the actual damage on the ground and radioactive



Source: Congressional Commission to Assess the Threat of Electromagnetic Pulse to the United States of America

Graphic redesign by Geopolitical Futures

fallout would be negligible, the psychological effect could be enormous: It would be the first nuclear



explosion by a superpower since nuclear testing ended in 1992, and the first bomb detonated in the atmosphere by either the U.S. or Russia after such tests were outlawed by treaty in 1963. It would also be a potent reminder that Putin has tactical nuclear weapons in abundance — about 2,000 by last count — and is prepared to use them.

### Scenario 2: Atmospheric detonation above Ukraine

A more provocative demonstration would be an ultra-high-altitude explosion of a more powerful weapon over Ukraine itself. In a 1962 test, the U.S. detonated a 1.4-megaton H-bomb in the mid-Pacific, 250 miles above the Earth. The resulting electromagnetic pulse unexpectedly knocked out streetlights and disrupted telephone service in Hawaii, 900 miles distant. A similarly powerful explosion above Kyiv would not only be visually spectacular but would likely plunge the capital into prolonged darkness and silence by shorting out computers, cellphones and other electronics. EMP effects might also extend into NATO member countries. But the extent of damage from the pulse is unpredictable, and Russian communications could also be affected.

### Scenario 3: Ground explosion in Ukraine

Most dangerous — and, for that reason, perhaps least likely — would be using a tactical nuclear weapon to achieve a concrete military objective such as disrupting the delivery of weapons to Ukrainians fighting in a city like Mariupol. Alternatively, Putin might detonate a tactical nuclear warhead against military or logistics targets in sparsely populated western Ukraine — in the agricultural lands between Lviv and Kyiv, for instance — after warning people in the target area to evacuate. But even the smallest nuclear weapon would set fires over a wide area if detonated in the air. Depending on the height of the explosion, it could also spread lingering radioactive fallout, possibly extending into NATO member countries and Russia itself.

If, instead of a demonstration in a remote area, Putin were to attack a Ukrainian city with a weapon one-third the Hiroshima yield, the resulting casualties and destruction of property could approach that seen in Japan, since the corresponding radii of damage would be about 70 percent of that seen in those atomic bombings.

While none of the above scenarios is currently likely, neither are they far-fetched. Barring scenarios of an imminent Russian defeat, another humiliation like the loss of the Russian flagship Moskva or growing domestic discontent in Russia at a stalemated war — Putin has no logical reason to initiate the use of nuclear weapons.

But wars are very unpredictable, and there are ample precedents in history where a nuclear demonstration has been considered, beginning with the United States.

In May 1945, weeks before the successful test of the first atomic bomb in New Mexico, former [President Harry Truman's advisers considered](#), briefly, the option of a harmless but spectacular demonstration of the revolutionary new weapon as an alternative to its military use, in hopes of compelling Japan to surrender. For practical reasons — there were too few bombs in the U.S. nuclear arsenal, and some feared a dud — the demonstration option was never presented to Truman.

But the warning shot idea would surface again and be taken more seriously. During the 1961 Berlin crisis, former President John Kennedy was presented with the option of firing a nuclear-tipped missile at Novaya Zemlya to show American resolve. Israel has also considered a nuclear demonstration; prior to the Six-Day War, in May 1967, Shimon Peres proposed detonating a nuclear device over the Sinai desert to head off the conflict. Six years later, the Israelis again briefly entertained the notion of a high-altitude nuclear warning shot to force an end to 1973's Yom Kippur War. In 1981, with the Cold War again heating up, Secretary of State Alexander Haig — a former NATO supreme allied commander — let slip that “there are contingency plans in the NATO doctrine to fire a nuclear weapon for demonstrative purposes ...”

There is little doubt that a nuclear demonstration is an option that has been considered in the Kremlin. This opens the question of what would be the best U.S. or NATO response. It's our view that if Putin fires a nuclear warning shot in the Ukraine war, President Joe Biden should resist pressure to respond in kind and avoid any options that could lead to an escalating nuclear exchange. Instead, the president should rally the nations of the world in a universal condemnation of Putin for breaking the nuclear taboo and taking the most dangerous first step toward a nuclear war. The U.S. and NATO could also respond by use of non-kinetic means like cyber warfare. For Biden, regardless of what Putin decides, engaging Russian forces in direct combat should only be a last resort.

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## Putin's nuclear threats may hint at an electromagnetic pulse strike

By Roger Pardo-Maurer

Source: <https://www.ft.com/content/d6ecbf62-f26d-401f-936b-e5bd85f25c06>



A test of Russia's Zircon hypersonic cruise missile in the Barents Sea. A nuclear electromagnetic pulse could be deployed by such a missile to disable electrical circuits in Ukraine © Russian Defence Ministry/Reuters

Nov 2022 – So far, Russia's threats of escalation against Ukraine have been largely interpreted as a veiled reference to the use of traditional nuclear weapons. But there is another tool which Vladimir Putin may be considering: a tactical electromagnetic pulse, or EMP, strike. These weapons — designed to create a powerful pulse of energy which short-circuits electrical equipment such as computers, generators, satellites, radios, radar receivers and even traffic lights — could disable Ukraine's military and civilian infrastructure at a stroke and leave the country without light, heat, communications or transport. EMP attacks have been amply explained, and even clamoured for, on Russian state TV talk shows. A Russian colonel has demonstrated on air, with maps and charts, how such a blast over the Baltic Sea might work. It may well be that Putin and his generals have been warning us about this possibility all along, with their enigmatic threats to unleash unspecified "military-technical measures". A tactical nuclear weapon used to create an explosion would most likely be ineffective against the mobile, dispersed combination of guerrilla and conventional warfare that Ukrainians are deploying to reclaim their territory. But the use of a nuclear weapon for electromagnetic warfare is a different matter. The signature of this type of attack would not be a fireball and mushroom cloud but a weird electric blue medusa orb pulsing directly overhead, followed by silence. At that altitude, the sound will not carry. A relatively small nuclear EMP, easily deployed at high altitude by Russia's hypersonic Zircon cruise missiles, might not destroy any buildings or kill anybody. But it could permanently disable electrical circuits over thousands of square miles of Ukrainian territory. Virtually all the defence equipment deployed by Nato allies to Ukraine — such as radios, GPS navigation, and aerial drones — are dependent on electronics, if not for operations, then for deployment, maintenance and integration. The lingering electromagnetic effects of a strike could destroy 90 per cent of the satellites over the afflicted zone within three months. However, it is likely that Russian information operations on the ground would also be affected. The US and its allies are by no means oblivious to the dangers of an EMP, and most military equipment has a degree of inbuilt defence against this eventuality. But a strike would create a new battlespace that negates the superiority of our information systems. We have not war-gamed this properly. In Kherson, for instance, a tactical EMP could disable the systems that operate the region's dams, clog highways and bridges with miles of disabled vehicles and leave the civilian population struggling for food and heat. In the aftermath of a successful EMP strike, Ukraine would have to pause fighting to restock its ruined arsenal. Putin could meanwhile rebuild and resupply his forces and seize the newly depopulated areas during a spring



offensive. What is perhaps most concerning is that Russia and Nato have such different approaches to these weapons. Under Russian military doctrine, EMP strikes are a branch of information, cyber and electronic warfare rather than nuclear warfare. This lowers the bar and may render EMPs even more tempting to Putin's beleaguered generals. So, what next? First, we must warn Russia that an EMP strike against Ukraine — even if it is localised — would cross the nuclear threshold and trigger a collective defence response from NATO. The unpredictable effects of spillover on the earth's atmosphere, the environment, satellites and downwind populations should suffice as a rationale for invoking Article Five (the alliance's collective defence clause). Second, we should help the Ukrainian military prepare. An EMP strike is survivable. We should support them in conducting live EMP drills with the participation of the civilian authorities. The Ukrainian people need to be educated about how to mitigate and overcome such an attack, including by stocking up on analogue radios, flashlights and batteries. Preparation, fortitude, ingenuity and self-reliance are already qualities with which Ukrainians have distinguished themselves in this war. Finally, we must rethink our objectives. If Putin is indeed contemplating the use of a tactical EMP, then what is at stake is not just Ukraine's liberty but the very future of warfare. If we yield to the Kremlin's nuclear blackmail, there is a risk that other countries will follow its lead: China and North Korea already have EMP capabilities. The situation in Ukraine offers a keyhole glimpse to a potentially more dangerous and uncertain future. We cannot afford to lose this fight.

**Roger Pardo-Maurer** is a US Army Special Forces veteran who served in Iraq and Afghanistan and a former deputy assistant secretary of defence.

## High Altitude Electromagnetic Pulse (HEMP) and High Power Microwave (HPM) Devices: Threat Assessments

August 20, 2004 – July 21, 2008 RL32544

Source [full report]: <https://www.everycrsreport.com/reports/RL32544.html>

Electromagnetic Pulse (EMP) is an instantaneous, intense energy field that can overload or disrupt at a distance numerous electrical systems and high technology microcircuits, which are especially sensitive to power surges. A large scale EMP effect can be produced by a single nuclear explosion detonated high in the atmosphere. This method is referred to as High-Altitude EMP (HEMP). A similar, smaller-scale EMP effect can be created using non-nuclear devices with powerful batteries or reactive chemicals. This method is called High Power Microwave (HPM). Several nations, including reported sponsors of terrorism, may currently have a capability to use EMP as a weapon for cyber warfare or cyber terrorism to disrupt communications and other parts of the U.S. critical infrastructure. Also, some equipment and weapons used by the U.S. military may be vulnerable to the effects of EMP.

The threat of an EMP attack against the United States is hard to assess, but some observers indicate that it is growing along with worldwide access to newer technologies and the proliferation of nuclear weapons. In the past, the threat of mutually assured destruction provided a lasting deterrent against the exchange of multiple high-yield nuclear warheads. However, now even a single, low-yield nuclear explosion high above the United States, or over a battlefield, can produce a large-scale EMP effect that could result in a widespread loss of electronics, but no direct fatalities, and may not necessarily evoke a large nuclear retaliatory strike by the U.S. military. This, coupled with published articles discussing the vulnerability of U.S. critical infrastructure control systems, and some U.S. military battlefield systems to the effects of EMP, may create a new incentive for other countries to rapidly develop or acquire a nuclear capability. Policy issues raised by this threat include (1) what is the United States doing to protect civilian critical infrastructure systems against the threat of EMP, (2) could the U.S. military be affected if an EMP attack is directed against the U.S. civilian infrastructure, (3) are other nations now encouraged by U.S. vulnerabilities to develop or acquire nuclear weapons, and (4) how likely are terrorist organizations to launch a smaller-scale EMP attack against the United States?

This report will be updated as events warrant.

**EMP effects on the power grid:** Very low-frequency pulses **can** cause electrical current to flow in the miles-long, elevated transmission lines that carry electrical power across the country. Those pulses **can** also penetrate the ground and create currents in buried pipes. Do **EMP's** Penetrate far into ground earth? In an **underground** shelter, it is recommended to leave all devices you want protected either: 1: unplugged with antennas disconnected, and hooked to an external ground system that hooks to an 8 foot Copper pole that goes through the bunker floor. Or. 2: in a Faraday cage.





## China used EMP weapon to destroy large drone at 1,500 meters

Source: <https://www.china-arms.com/2021/09/china-emp-weapon-destroy-large-drone/>



Sept 2021 – A group of Chinese engineers used a new EMP-style weapon to shoot down a large unmanned aircraft flying at 1,500 meters, the South China Morning Post said Aug. 31, demonstrating for the first time China's ability to develop such new weapons. The National Interest quoted the news as saying that while the details of where and when the test was conducted are unknown, it may be China's first public experiment with an electromagnetic pulse weapon.

The paper in question does not detail the date and location of the test, nor the distance between the EMP weapon and the target, except to describe that a drone was shot down by an EMP weapon while flying at a height of 1,500 meters, Chinese media reported, citing the British newspaper Daily Mail. This is the first time China has tested this technology in its efforts to catch up with the United States.

According to the presentation, the EMP weapon used in the test was clustered into a narrow beam, which means it has a longer range. Researchers found that the drone did not fall immediately after the EMP weapon was fired, but swayed from side to side. The researchers believe that the EMP weapon may have caused the drone's flight control system to malfunction, sending the wrong control commands to the drone.

The Daily Mail said the United States had demonstrated an EMP weapon, the Tactical High Power Microwave Operational Reactor, in 2019, which shot down 50 drones at once, demonstrating its ability to protect a military base from drone attacks.

According to the data, the maximum range of EMP weapons can reach 10 kilometers, it generates high-intensity electromagnetic pulse energy to attack electronic information systems by radiation, which can instantly destroy radar, computers and other electronic equipment in a specific area, to paralyze the command and control and combat systems. In recent years, with the increasing maturity of related technologies, EMP weapons in the narrow sense are developing towards higher power, wider spectrum and smaller devices, showing great potential for application in anti-stealth weapons, anti-drones and anti-aircraft carriers.

In view of the perceived power of EMP munitions, the U.S. has warned other countries not to develop and use EMP weapons, but it was an early adopter of EMP weapons in actual combat. The Gulf War in 1991, NATO's air strikes against Yugoslavia in 1999, and the attack on Baghdad TV in 2003 were all traces of US military electromagnetic pulse munitions.



Another source said that although the world's reported EMP weapon power block is currently 20GW, Chinese experts said that the most powerful EMP weapons in the United States can reach 80GW, and China's EMP weapons are designed based on their American counterparts.

## 15 Countries That Have Nuclear Weapons Or Nuclear Power Technology

Source: <https://www.yahoo.com/now/15-countries-nuclear-weapons-nuclear-210233341.html>

Jan 03 – In this article, we discuss the 15 countries that have nuclear weapons or nuclear power technology. To skip the detailed history and progression of nuclear weapons and technology, you can go directly to [5 Countries That Have Nuclear Weapons](#).

### History

It was the German scientist Werner Heisenberg that discovered the possibility of nuclear fission chain reactions and the [possibility of the nuclear bomb](#). The [first nuclear reactor](#) was built by Enrico Fermi and his colleagues in 1942. It was a breakthrough moment in the history of science and technology and global energy needs. However, the nuclear fission reaction discovery was made during World War II, and the initial use of nuclear power was through weapons of mass destruction.

German scientists started working on their nuclear program in 1939. However, the American scientists despite starting late in 1942, created the bomb first. The United States nuclear weapons program was called [Project Manhattan](#) and it was initiated in 1942. At its peak, the project had employed 130,000 workers and the US had spent over \$2.2 billion on it. Shortly after conducting the first test on July 16, 1945, the US dropped its first bomb on Hiroshima, Japan on August 6, 1945. Three days later the United States dropped another bomb on Nagasaki, Japan, which led to Japan's surrender to the United States, thus ending World War II. These two bombs combined resulted in almost 200,000 casualties.

Soon after the US, the Soviet Union conducted its first successful nuclear test in 1949. Since then, a nuclear stalemate known as the [Cold War](#) took place between the two Super Powers till the dissolution of the Soviet Union in 1991. During this period, the world came close to a nuclear war once in 1962. The event is known as the Cuban Missile Crisis. The crisis was initiated when the US discovered USSR installed nuclear weapons in Cuba.

### Treaty on the Non-Proliferation of Nuclear Weapons

The [Treaty on the Non-Proliferation of Nuclear Weapons](#) was a global act enforced in 1970. The objective of the treaty was to limit the number of global nuclear weapons and eventually disband them. The treaty also promotes energy generation through nuclear power and 191 countries have ratified it so far. According to the treaty, only five countries are recognized as nuclear-weapon states. Despite that, four other countries have their own nuclear weapons as of 2022.

Further down the line, the United States and Russia signed the [New START Treaty](#) in 2010 in Prague. The treaty limits the deployment of strategic nuclear warheads by both countries to 1,550. The countries were supposed to meet the central limits by 2018. However, the treaty has been extended to 2026.

As of 2022, nine countries have nuclear weapons and a combined stockpile of [12,700](#) warheads. Russia and the United States control over 90% of them. The global nuclear weapons stockpile reached its peak at over 70,000 warheads in 1986. Over 40,000 of them belonged to the Soviet Union.

### Nuclear Use for Peaceful Purposes

Apart from weapons of mass destruction, nuclear energy can be used in several industrial sectors including energy, healthcare, agriculture, food preservation, industry, and research. As of 2022, [30 countries](#) are generating electricity through nuclear power. According to the [International Atomic Energy Agency](#), global electrical capacity through nuclear power technology is expected to grow by more than 100% by 2050 to 873 gigawatts net electrical (GWe). Nuclear energy is one of the significant resources in the global race against [climate change](#) as it provides clean energy. Since 1950, nuclear energy has been helpful in avoiding more than [20%](#) of global carbon emissions.

### Economic POV of Nuclear Energy

According to the Nuclear Energy Institute, the average cost of generating 1 megawatt-hour of electricity through nuclear power was \$29.13, which was 38.9% less than the 2012 costs. Furthermore, the US nuclear industry generates approximately \$60 billion in revenue per annum and has created more than 100,000 jobs. On top of that, the nuclear industry pays \$2.2 billion in taxes each year.





Although a German [study](#) by DIW Berlin suggests, due to high-construction costs and intensive labor, each 1000 MW nuclear reactor incurs a loss of €4.8 billion. The study took the construction of 674 nuclear power plants built since 1951 into consideration.

Nuclear energy programs might be expensive and uneconomical for countries. However, the maintenance of nuclear bombs and production of their delivery vehicles/devices cost a fortune and bring good luck to the [defense companies](#). To put things into perspective, The B-52H Stratofortress bomber created by The Boeing Company (NYSE:BA) costs around \$42.9 million each. Moreover, Minuteman III missile and silo costs around \$33.5 million each. The submarine-based delivery costs the most and one Ohio-class Trident submarine costs \$1.9 billion. The submarine is produced by General Dynamics Corporation (NYSE:GD). These figures are estimated in 1996 dollars as the most accurate [atomic audit](#) was published in 1998. The global nuclear weapons spending was estimated at [\\$82.4 billion](#) in 2021.

The Boeing Company (NYSE:BA), Honeywell International Inc. (NASDAQ:HON), Lockheed Martin Corporation (NYSE:LMT), and Northrop Grumman Corporation (NYSE:NOC) are some of the big players that are involved in nuclear weapon production. In 2021, \$26.54 billion of The Boeing Company (NYSE:BA)'s \$62.286 revenue came from the company's defense, space & security segment. Moreover, the global nuclear power plant equipment market generates a sizable revenue for the handful of companies in the market. The market size was worth \$32.44 billion in 2021 and is expected to reach \$38.82 billion by 2030. Furthermore, the Uranium ETFs have shown significant growth in the September quarter of 2022, with Global X Uranium ETF and Uranium Miners ETF growing by [30% and 43%](#), respectively. Companies like Cameco Corporation (NYSE:CCJ) and Exelon Corporation (NASDAQ:EXC) are currently [dominating](#) the nuclear energy market.

### Our Methodology

After thorough research, we compiled a list of 15 countries with nuclear weapons or nuclear power technology. Countries are listed according to the number of nuclear warheads they have, including the countries with the US shared nuclear weapons as a part of the [NATO Nuclear Deterrence](#) policy. Iran and South Korea make it to the list due to their capability and aspiration towards achieving nuclear weapon technology, along with their fast pace of developing nuclear power technology. The data on the number of warheads was taken from the data collected by the [Federation of American Scientists](#).

## 15 Countries That Have Nuclear Weapons Or Nuclear Power Technology

### 15. Iran

#### Number of Nuclear Warheads in 2022: N/A

Iran has always been considered a country on the verge of developing nuclear weapons, which is why it has been imposed with billions of dollars of sanctions. In 2015, Iran became a part of the nuclear deal with the global powers including the US and was known as the [Joint Comprehensive Plan of Action](#). According to the deal, Iran agreed to knock down its nuclear weapons program and allow comprehensive inspections in return for sanctions relief. However, Iran restarted its nuclear weapons activities after former US President Donald Trump withdrew from the deal.

Iran has caches of [enriched uranium](#) which can be further enriched to make nuclear weapons. Since Iran limited International Atomic Energy Agency's inspection, it is still unknown how much nuclear weapons material Iran has. Nonetheless, the estimates point to enough material to develop five warheads in one year. In spite of that, Iran has denied its plans to develop nuclear weapons and claims that its program is for peaceful purposes only.

Currently, Iran's Bushehr nuclear plant produces 2% of the country's electricity and it is believed that the country has [several underground facilities](#). Earlier in September, the head of the Atomic Energy Organization of Iran, Mohammad Eslami said that the country is planning a [\\$50 billion](#) nuclear energy project that is expected to generate 10,000 megawatts of electricity.

### 14. South Korea

#### Number of Nuclear Warheads in 2022: N/A

South Korea does not have any nuclear weapons or weapons-grade nuclear material. However, the country is one of the top producers of nuclear energy. It has 25 nuclear reactors that produce over [24,000 MW](#) of electricity. Additionally, three more reactors are under construction that will produce over 4,000 megawatts of electricity.

South Korea is also an exporter of its nuclear energy technology. South Korea's first export deal was the Barakah nuclear project in UAE. South Korean state-owned Korea Electric Power Corp won the [\\$40 billion](#) deal in 2009. As of September 2022, 3 units of the [Barakah power plant](#) are operational and the last one is in the final commissioning stages.

Korea was one of the hosts of nuclear warheads between 1958 to 1991. At one time there were almost [950 US nuclear warheads](#) in South Korea. South Korean people are especially in the favor of their country acquiring nuclear weapons. According to a poll, [71%](#) of South Koreans want their country to develop nuclear weapons.



### 13. Netherlands

#### **Number of Nuclear Warheads in 2022: 10-20 (Shared by the US)**

the Netherlands, as a NATO member holds [10-20 nonstrategic US warheads](#) according to the NATO [nuclear-sharing policy](#). The country doesn't possess any nuclear weapons of its own. The Netherlands has held US nuclear weapons [since 1960](#).

The Netherlands generates a [small amount of nuclear energy](#) from its sole nuclear reactor. The government is planning to build [two new reactors](#), to be completed by 2035. The new units are expected to generate 13% of the country's electricity.

### 12. Belgium

#### **Number of Nuclear Warheads in 2022: 10-20 (Shared by the US)**

Belgium does not have any nuclear weapons of its own, but it does host US nuclear warheads as a NATO member country. Currently, it is estimated that Belgium has 10-20 U.S. non-strategic gravity B-61 warheads in its Brogel air base.

Belgium has been using nuclear energy for power generation since 1974. As of 2022, the country has [6 nuclear reactors](#) that generate over half of the country's electricity. Belgium wants to eradicate nuclear power generation in its country and is expected to get rid of it by 2035. In 2021, 50.8% of the country's total electricity generation was nuclear-powered.

### 11. Germany

#### **Number of Nuclear Warheads: 15 (Shared by the US)**

Germany has [15 nuclear warheads](#) shared by the United States as part of the NATO Nuclear Deterrence strategy. In 1954, Germany was [prohibited](#) to develop or possess any kind of weapons of mass destruction and is an [advocate](#) of global nuclear stockpile reduction and supports initiatives such as the Treaty on the Prohibition of Nuclear Weapons. Nevertheless, it has not yet ratified the treaty as the country believes that it would go against NATO's nuclear deterrence policy. In Germany, the public leans more toward returning the US nuclear weapons and staying off of them.

In Germany, political movements had already started against the [dangers of nuclear weapons and energy](#), and the movements were primed in 1998. Germany's last nuclear reactor was constructed in 2002. As of October 2022, Germany has 3 operable nuclear reactors that generate around 6% of the country's total electricity and 30 reactors have been shut down.

Germany used to generate around 25% of its electricity from nuclear power until 2011. After the [Fukushima nuclear meltdown](#), the country decided to phase out its nuclear energy programs quickly as possible. Germany had planned to shut down all of its nuclear power plants by 2022. However, due to the energy supply deficit created by the Russian invasion of Ukraine, the country is planning to let its last three units [remain open till April 2023](#).

### 10. Turkey

#### **Number of Nuclear Warheads in 2022: 50**

Turkey has ratified the Treaty on the Non-Proliferation of Nuclear Weapons, yet it hosts around [50](#) US-shared nuclear weapons. Turkey's energy needs are largely dependent on imports, which is why the country is leaning towards nuclear power generation.

As of 2022, there are four nuclear reactors under construction in Turkey with a capacity of almost [4500 MWe](#). The country's first nuclear unit is expected to be operable [by 2023](#).

### 9. North Korea

#### **Number of Nuclear Warheads in 2022: 40 - 50**

North Korea signed the Treaty on the Non-Proliferation of Nuclear Weapons, but it [withdrew](#) from the treaty in 2003. The country conducted its first nuclear test in October 2006 at the Punggye-ri site. The weapon had an estimated 1 kiloton yield. However, the weapon tests North Korea conducted in 2017 had a yield of over [140 kilotonnes](#). It is estimated that North Korea's Hwasong-17 has a range of over 15000 kilometers or 9320 miles. The general consensus is that North Korea has a stockpile of 20 warheads, but it is believed that the country might have 40 - 50 nuclear warheads.

Since 2018, North Korea had no operational nuclear reactors to generate power. Nevertheless, the country has seemingly restarted its previous [5MW](#) nuclear reactor located in the Yongbyon complex in 2021.

### 8. Israel

#### **Number of Nuclear Warheads in 2022: 90**

Israel has never [accepted or denied](#) the claims that the country possesses nuclear weapons. However, it has been acknowledged by sources that it indeed has nuclear weapons. It is estimated that Israel has a stockpile of 90 nuclear warheads. In 1979, a double flash of light was detected by the [Vela satellites](#)





controlled by the United States on Prince Edward Island of South Africa. It is believed that it was a nuclear test [conducted by Israel and South Africa](#).

Furthermore, In 1986, The Israeli nuclear technician and whistleblower [Mordechai Vanunu](#) revealed information about Israel's nuclear weapons program. He was later brought back to Israel and sentenced to 18 years in prison.

As of 2022, Israel has [no nuclear power plants](#), but the country is considering construction and generating nuclear energy.

#### 7. India

##### **Number of Nuclear Warheads in 2022: 160**

Operation Smiling Buddha made India the sixth country to possess a nuclear weapon. The country's nuclear program started pre-partition in [1944](#) and launched its first nuclear test on May 18, 1974. The test was mostly kept a secret as India knew the consequences of being the first country outside the five permanent members recognized under the Treaty on the Non-Proliferation of Nuclear Weapons. There was a severe backlash from the international community after the test. The United States immediately blocked aid toward India and imposed several sanctions. As of 2022, India has a stockpile of 160 nuclear weapons.

As of 2022, India has [22 nuclear reactors](#) that generate over 6.7 Gigawatt of electricity. It is planning to build additional 11 reactors which are expected to have a capacity of generating 8.7 GWe. Nuclear power is India's fifth largest source of power generation.

#### 6. Pakistan

##### **Number of Nuclear Warheads in 2022: 165**

To acquire nuclear energy, Pakistan started to acquire knowledge and created institutions to gain advancement in [nuclear technology](#) for scientific and industrial use. By 1964, the country created the Pakistan Atomic Energy Commission and the Pakistan Institute for Nuclear Science and Technology. In 1974, Pakistani scientist Dr. Abdul Qadeer Khan came to Pakistan with designs for Uranium enrichment technology, which is believed to be stolen. During the same time, former Pakistan Prime Minister Zulfikar Ali Bhutto had signed a secret agreement with China's Mao Zedong to get help in developing nuclear weapons.

By 1985, Pakistan had [achieved](#) weapons-grade uranium advancement and successfully conducted its first test on May 28, 1998. Between May 28 and 30, the country conducted six successful tests. As of 2022, Pakistan has approximately 165 nuclear warheads.

Around [8%](#) of electricity in Pakistan is generated through nuclear energy. In May 2021, Pakistan's [sixth nuclear power plant](#) started its operations and it was built with the help of China. The country is working towards its green energy goal through nuclear operations and plans to construct [32](#) new plants by 2050.

#### 5. United Kingdom

##### **Number of Nuclear Warheads in 2022: 225**

The United Kingdom was one of the first countries to recognize the power of nuclear weapons and made [major contributions](#) to the US Manhattan Project. However, in 1946, [The McMahon Bill](#), restricted all other countries including the UK from accessing nuclear knowledge, the country started its own project named HER or High Explosive Research. The United Kingdom launched its [first successful nuclear test](#) on October 3, 1952, on the Monte Bello Islands in Western Australia. The device was called "Hurricane" and it had a yield of 25 kilotonnes. The country is estimated to have 225 nuclear warheads.

The United Kingdom operates around [9 nuclear reactors](#) that produce around 5.9 GigaWatt of electricity. In 2005, the country listed [20](#) reactors to be decommissioned.

#### 4. France

##### **Number of Nuclear Warheads in 2022: 290**

The codename for the first French nuclear test was Gerboise Bleue. [17](#) test detonations took place between 1960 and 1966 in the Algerian Sahara, with four of them being atmospheric detonations. During the Cold War, it is believed that France was a [nuclear supplier](#) to Israel, India, South Africa, Iran, and Iraq before it signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). At the moment, it is estimated that France has a nuclear arsenal of around 290 warheads.

France has been generating electricity through nuclear energy since 1970. [70%](#) of the electricity in France is generated through nuclear power. However, the government is working toward reducing it to 50% by 2035. As of December 2022, the country has 56 operating reactors, 1 is under construction, and 14 have been shut down.

Additionally, France is the world's biggest net exporter of electricity and generates around €3 billion per annum from it. The country provides 15% of all of Europe's electric power through exports.

#### 3. China

##### **Number of Nuclear Warheads in 2022: 350 – 400**



China's [first nuclear test](#) took place on October 16, 1964. It was called Project 596. According to some sources, China has 350 warheads. However, Pentagon disagrees and believes that the country has a stockpile of over 400 warheads and is projected to take this number up to 1,500 by 2035. Nevertheless, China is one of the countries that advocates the complete [dismantling](#) of nuclear weapons by all countries.

China is working fast towards its '[carbon neutrality by 2060](#)' goal and nuclear-powered electricity generation is one of the steps that the country is taking toward it. Currently, nuclear power generates [3%](#) of the country's electricity. Currently, China has plans to build 150 new reactors, worth [\\$440 billion](#) by 2035, and [17](#) of them are already under construction.

For its nuclear power generation program, China has made a deal with Kazakhstan, which is the largest Uranium producer in the world.

## 2. United States

### **Number of Nuclear Warheads in 2022: 5428**

The United States was the first country to create a nuclear bomb and is the only country that has dropped nuclear bombs during a war. The country's nuclear project was called the "[Manhattan Project](#)" and it was established in 1942. USA's first nuclear test was conducted on July 16, 1945, a few miles south of Socorro, New Mexico. On July 6th, 1945, the US dropped its first nuclear bomb on Hiroshima and the second one was dropped on August 9 on Nagasaki. The first one was a Uranium bomb while the second one was a Plutonium bomb.

It is estimated that the United States has [5428 nuclear warheads](#) and 1720 of them have been retired. Moreover, 1644 of them have been deployed and 1964 remain undeployed. Between 1965 and 1967, four countries had a total of over 40,000 nuclear weapons, and over [31,000](#) of them were held by the US.

The US generated 19% of its electricity from nuclear power plants and has 93 commercial reactors under operation. However, 25 reactors in the country are in their decommissioning phase. Currently, the USA is planning to construct another [eight](#) reactors.

## 1. Russia

### **Number of Nuclear Warheads in 2022: 5977**

Russia was the second country to test its nuclear weapons a few years after the United States dropped bombs on Hiroshima and Nagasaki in August 1945. It is one of the five states recognized under the Treaty on the Non-Proliferation of Nuclear Weapons (NPT). Russia performed its first nuclear bomb test on August 29, 1949. They called the project "[First Lightning](#)."

According to sources, Russia has 5977 nuclear warheads and 1500 of them have been retired or awaiting dismantlement. Moreover, 2889 warheads are undeployed and 1588 are deployed on heavy bomber bases, land-based intercontinental ballistic missiles, and submarine-launched ballistic missiles. On top of that, Russia has [2000](#) nonstrategic, low-yield nuclear weapons that are not subjected to any treaty. The highest number of nuclear warheads held by Russia was 40,159 in 1986.

Russia is the sixth largest Uranium producer in the world and mined 2,635 tonnes of the radioactive element in 2021. It had the largest Uranium enrichment capacity by 2018. Moreover, Russia has [38 nuclear reactors](#) in the country and 15 nuclear reactors operating in [11](#) other countries.

## **Ex-Israeli Military Intel Chief: We Cannot Have the Nuclear Bomb Precedes the Fall of Iran's Regime**

Source: <https://www.haaretz.com/israel-news/2023-01-02/ty-article-magazine/.premium/if-the-bomb-precedes-the-fall-of-irans-regime-theres-an-existential-threat-to-israel/00000185-720a-d464-a197-f67b36570000>

Jan 03 – Less than a year after his retirement from the Israel Defense Forces, ex-Military Intelligence chief Tamir Hayman is concerned. The last three Israeli prime ministers all vehemently opposed the nuclear agreement between Iran and six world powers, but never succeeding in presenting an effective alternative. The two main tenets of Israeli strategy – a call to impose harsh economic sanctions on Tehran, and a consolidation of military deterrence on the part of the United States – have failed to prove themselves thus far.

"The [new government](#) must understand that the present strategy isn't working," Hayman says in an interview. The head of the Institute for National Security Studies is convinced that the political leadership is fully aware of the gravity of the threat represented by an Iranian nuclear arsenal – but is demonstrating complacency in dealing with it.

Hayman believes that the concept of 'nuclear terrorism' will return to the agenda if and when Iran gains the capability to make nuclear bombs.

"When it comes to the [Iranian nuclear program](#), I find tremendous confusion and a lack of strategic consistency that I can't understand," he says. "When I look at the present situation, there are two ticking





clocks: that of the life of the regime in Iran; and that of the bomb. If the regime falls before the bomb is ready, we have won big. In the annals of history, it will be written that all the steps that led to the weakening of the regime – including ex-President [Donald Trump's exit from the nuclear deal in 2018](#), increased sanctions and Israeli support against the agreement – were a 'masterpiece' of long-term strategy. But if the clock of the bomb precedes the fall of the regime, we're entering a situation in which, for the first time, there's a potential existential threat to the State of Israel."

Hayman believes that the concept of "nuclear terrorism" will return to the agenda if and when Iran gains the capability to make nuclear bombs. "The threat of a dirty bomb in the hands of Hezbollah or Palestinian terror organizations – and in general the dissemination of nuclear technologies – is a very, very complex thing," he says. "And then you wonder: What is the State of Israel doing about it? Until [the nuclear agreement](#) [which was signed in 2015 by Iran and the P5+1, which included the U.S., Russia, Britain and China], the strategy was delay. The idea is that we're buying time by means of clandestine operations and other activities. We're buying time and preparing an offensive operational alternative, which we will use if Iran crosses a certain threshold."



Technicians working at the Arak heavy water reactor in Iran, in 2019. Credit: Atomic Energy Organization of Iran

Hayman argues that the use of significant economic sanctions, from the time the United States withdrew from the agreement in May 2018, has not succeeded in denting Iran's nuclear ambitions. "Iran's diplomatic and economic isolation is not really isolation. It has economic support from both Russia and China. They don't see themselves as economically isolated."

At the same time, the Israeli effort to bring the U.S. administration on board to present a significant military threat has come to naught. "Anyone who has read the latest [U.S.] [National Security Strategy report](#) realizes that the Americans do not intend to activate a military force in order to bring down the [Iranian] regime. They wrote that openly, it's no secret. Anyone who is familiar with global geopolitics understands that the United States isn't interested in starting a new war in the Middle East. The present strategy, which is based on those pillars [sanctions and deterrence], has collapsed. It is nonexistent."

Unlike recent prime ministers Benjamin Netanyahu, Naftali Bennett and Yair Lapid, Hayman believes the United States should not have withdrawn from the nuclear agreement in 2018, in spite of its shortcomings. Instead, it should have been re-signed last year – as long as it was relevant – in order to buy some quiet. By his estimate, Iran would have complied with the original agreement until its final expiration in 2030.





“I thought it was the best way to gain time,” he says. “I don’t believe the Iranians for a moment. At some point they would want to exploit the first opportunity to entrench their regime, and achieve nuclear capabilities to make that possible. I thought the time we would buy would give us complete flexibility to operate with whatever strategy we wanted – whether militarily or the wait-and-see approach.”

In the years following the signing of the original agreement, Iran complied with its conditions. Hayman says that if the talks over its renewal during the past year had borne fruit, there’s a good chance the sides would have honored the new agreement for the next seven years.

“That’s a lot of time in terms of the Middle East,” he notes. “And then we wouldn’t have reached the situation that I think we’ve reached: of Iran being a nuclear threshold state while the world is busy with other things. Ultimately, we’ll be forced to do the only thing that can be done – to attack.”

***Are you saying that none of the steps Israel is adopting today are helping halt the nuclear program?***

“At the moment, we’re seeing an accumulation of capabilities that may lead us to a situation in which Iran goes nuclear. And I see nothing practical that we’re doing to stop that.”

***What can Israel do?***

“We could have made a deal. But that’s already crying over spilt milk. It’s not relevant now. The United States won’t sign a nuclear agreement with Iran because it means tremendous weakness with regards to Europe, China and Russia. The leader of Iran [Ayatollah Ali Khamenei] won’t sign. I think he’s pleased with the situation as it is now, in which he’s enjoying all the advantages without being humiliated. Why should he sign? That’s why he is piling up difficulties.”

Hayman believes Israel already has the operational ability to attack Iran, but that the price of any such attack would be dramatic.

“It’s very important to say this: it’s not an attack on a nuclear reactor. It’s not ‘Tammuz in Flames’ [Shlomo Nakdimon’s book detailing the 1981 [destruction of the Osirak nuclear reactor in Iraq](#)] or Deir el-Zour [the [Syrian nuclear reactor destroyed in 2007](#)]. The Iranian nuclear project was built on the lessons of our attacks. Out of their understanding that we are determined to attack, they developed a different plan: decentralized over dozens of sites – fortified, dug in, protected – so that any such attack could be seen as no less than a war against Iran, which could spill over into a regional war. Hezbollah would be in the story. In the minds of the Iranians, that’s quite a deterrent and cools Israeli ardor to do such a thing, as the significance is well known. Hezbollah’s ability in terms of rockets and missiles is familiar to every Israeli citizen.”

He says that, in the final analysis, a significant military operation is likely to achieve the opposite intended effect of securing quiet.

“I’ll give you another theory,” Hayman continues. “The Iranian leader can say: ‘Okay, they attacked us only because we didn’t have a bomb. The fact that I wasted time and told them ‘Don’t go for a bomb but only for the threshold state’ led to a situation where someone on the other side dared to attack us. Nobody attacks a nuclear power.’”

***In other words, such an operation could increase the Iranian leader’s desire to acquire a nuclear bomb?***

“Yes. Let’s say that he survives the war. He licks his wounds and then tells his people: ‘I have a new strategy. Now we’re going for a Manhattan Project – building a nuclear bomb as fast as possible, based on the lessons we learned in the past.’”

Hayman believes that Iran currently prefers to be a nuclear threshold state, and that if it’s ultimately interested in a bomb, it can always produce one. “Any war against nuclear weaponry is a battle for time. History proves that a regime that decides to go nuclear will do so. We’re playing for time. We keep postponing it. But an attack can turn the Iranian strategy from vagueness to a display of power in terms of nuclear capability.”

***What can be done under these circumstances?***

“There’s one thing that must be acknowledged: that your present strategy has failed. It will lead us to the worst possible place.”

***About whom are you saying this?***

“Israel. The new government has to say to itself, or publicly: ‘The present strategy isn’t working, because it’s based on a hope that the regime will fall.’ That’s a wish; you don’t build a strategy on that. This self-realization is very important. Because then you say to yourself: ‘If what I’m doing now isn’t good, I have to do something else.’ That’s extremely important because it pushes you toward strategic thinking, toward systemic thinking, toward ingenious thinking.”

Israeli right-wingers believe that Israel has to operate on two axes: the axis of agreement and the axis of assault – and to ensure that Iran recognizes achievements that will make it want to sign a new treaty. Hayman believes “we can offer a very tempting deal to the Iranians.”

***A deal that includes threats? A deterrent agreement?***

“You say to them: ‘I’m ready to give you such and such by lifting the sanctions, and I demand such and such from you in restraining the nuclear project. The negotiations with Iran won’t take an hour or two, but rather a year or two. Maybe three or four. But the world will come back to the Iranians; they’ll have to respond to the new initiative.’”

***And during this time, they’ll continue to enrich uranium? They’ll advance their missile program?***

“They’ll probably do what they’re doing now. That won’t change.”



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Hayman thinks there is a formula for an effective Israeli assault that wouldn't lead to regional war. "We have to present a very complicated equation that says, 'I want an assault that won't lead to a regional escalation. That will deter the Iranians from advancing their nuclear project and will be effective.'" That, he adds, would require support from the United States – support that is contingent on how Israel operates in other arenas.

"If we play with the administration on other things, we can pay in Iran," he says. "We have to be very careful in the Palestinian arena, in the world of human rights, in areas of shared values with the United States – because that's likely to expose us to specific conditions in return for U.S. support."

Hayman refuses to expand on the features of such a military plan, but says the system is familiar with it and that preparing it takes time.



A technician working at the Uranium Conversion Facility just outside the city of Isfahan, Iran, in 2007. Iran has dozens of nuclear facilities across the country. Credit: Vahid Salemi/AP

### ***In the short term, we don't have attack capabilities?***

"We do, but it would look like war. We have unequivocal capabilities, and they're very effective. But that would lead us to two developments that may not be certain but are dangerous: a regional war; and an acceleration of the Iranian desire to go for a bomb on the day after the attack."

### ***Why does Iran insist on developing a nuclear program?***

"The Iranians want only one thing: to preserve the regime. They want the [Islamic] revolution to remain forever. They're certain that in the long term, everyone in the Middle East will speak Farsi; all that's necessary is for the regime not to fall."

Hayman says that along with the militia groups created by Tehran in order to keep the enemy away from its borders, it has learned a valuable history lesson: to the effect that whoever has nuclear capabilities survives.

As he sees it, though, Iran is not currently trying to get nuclear weapons. "In order to convey that you're a nuclear power, you need the vagueness of [a nuclear threshold state](#) and a little more than that," he explains. "The Iranians aren't stupid. They know that if they cross a certain threshold too soon, they're likely to have the entire world against them. I don't see a situation where they'll conduct a nuclear test."

### ***And a situation where they attack Israel?***





“That’s an excellent question, because that has changed. In the past, Israel was the ‘Little Satan’ and the United States was the ‘Great Satan.’ In Iranian eyes, the United States is the evil empire because of the aggressive liberal Christian values and its desire to dominate the Middle East and to bring down the regime. In recent years, that has changed. We’ve placed ourselves at the heart of the Iranian threat, and the United States is the backdrop. That happened due to the operations we conducted in the [‘war between the wars’](#) [a term describing IDF policy in recent years against Tehran], and due to the direct fighting. That’s a development of the past four or five years.”

Hayman believes [that the protests on the streets of Iran](#), triggered by the death of Mahsa Amini in mid-September for allegedly wearing a headscarf improperly, don’t endanger the regime for the time being. However, he says that the generation currently leading the country doesn’t have a subsequent generation to follow it. “We can reasonably assume that this will ultimately lead to regime change or its downfall. But that’s not something on which we can build a strategy,” he says. “You have to be aware of your capabilities. Even if we were to decide that we want to do that – to bring down or destabilize the regime in a country with 85 million inhabitants – we have to be aware of the limits of power: the size and the fact that the regime arose in a coup. It’s a paranoid regime. It will do anything in order not to fall in a coup.” Whatever the case, he sums up, Iran is not galloping toward a nuclear bomb – at least at this point – but is instead satisfied with the status of being a nuclear threshold state in order to deter its neighbors. “If they were galloping toward a bomb,” Hayman says, “we might have behaved differently.”

## Cold War estimates of deaths in nuclear conflict

By William Burr

Source: <https://thebulletin.org/2023/01/cold-war-estimates-of-deaths-in-nuclear-conflict/>



Mass grave markers in Hiroshima, photographed by Lieutenant Wayne Miller in September 1945. (US Navy / National Archives)





Jan 04 – Apprehension about Russia’s war against Ukraine has produced speculation about the possibility of limited Russian nuclear strikes against targets in that country. Especially worrisome is the danger of a local conflict escalating quickly into a major nuclear exchange between Russia and the United States and other NATO countries. However unlikely that prospect, a large-scale nuclear war involving countries with strategic nuclear forces could cause [huge numbers of fatalities](#) and injuries in addition to the losses produced by climactic impacts. A [recent study](#) in the journal *Nature* projects a catastrophic 5 billion deaths.

Once nuclear weapons became a significant element in US military force structures and planning, beginning in the late 1940s, government agencies began estimating nuclear war fatalities. Over the years, fatality estimates—usually classified top secret—were embedded in nuclear war plans, strategic force requirements, strategic balance assessments, and arms control decisions. The estimates, which often left out important effects of nuclear detonations, sometimes conveyed the shifting “balance of strength” between the two superpowers. The magnitude of these numbers sometimes shocked US officials, who eventually sought options intended to make nuclear war less catastrophic.

While a considerable number of important estimates from the 1950s, 1960s, and 1970s have been declassified, government agencies have refused to declassify other fatality numbers, and estimates from the 1980s and beyond remain unavailable. With the war in Ukraine once again raising the prospect of a nuclear war, accurate estimates of such a war’s human impacts are more important than ever. But it is not even clear whether the US government continues to make such estimates.

### Cold War calculations

[Casualty estimates](#) were part of the war planning effort from the beginning, a recognizable element of ascertaining the impact of nuclear strikes on a given country or set of targets. Estimates made during the late 1940s [projected](#) millions of deaths from atomic bombings. By the mid-1950s, with thermonuclear weapons becoming available, deaths in scores of millions became certain. These hydrogen bombs were “area weapons” that could destroy large cities and their surroundings, or large areas around military targets. With thermonuclear weapons becoming integral to the US arsenal, government officials drew a frightening picture of their effects. In 1959, David Z. Beckler, executive director of President Dwight D. Eisenhower’s Science Advisory Committee, declared that the radioactive fallout from an all-out US-Soviet nuclear war would cause “[enormous](#)” numbers of casualties, but they “would represent only a small portion of the total casualties from all causes (blast, thermal radiation, fire, and local fallout).”

The work of the National Security Council’s highly secret Net Evaluation Subcommittee supported Beckler’s conclusions. As part of its effort to gauge the overall impact of nuclear strikes on each side, the subcommittee prepared casualty estimates. In its [1958 report](#), the subcommittee imagined a devastating Soviet attack in 1961 involving the detonation on the United States of 553 nuclear weapons with a total yield exceeding 2,000 megatons—more than 130,000 times as powerful as the atomic bomb dropped on Hiroshima, which had an estimated yield of 15 kilotons. An estimated 50 million Americans would die, with nine million sick or injured, out of a pre-attack population of 179 million. The US retaliatory attack would include every city in the “Sino-Soviet” bloc with a population of over 25,000. It would completely destroy “command facilities” in Moscow, Beijing, and Pyongyang and kill 71 million people at once; 30 days later, a total of 196 million people would be dead (out of a population of 952 million people in the bloc). According to the report, the US counterattack “would virtually eliminate [the Soviet Union] as a world power.” As devastating as this picture was, the report nevertheless found that at the end of the nuclear exchange, “[t]he balance of strength would be on the side of the United States.” That confidence would erode as the Soviet Union’s capability to inflict deaths and destruction increased during the 1960s.

### Military planning

Estimating of deaths and destruction went hand in hand with US nuclear planning. As the Cold War developed, and atomic weapons became a bigger part of the US arsenal, military planners and civilian authorities began preparing for the possibility of a confrontation. For that worst case, a failure of deterrence in which war was imminent and civilian authorities were ready to authorize nuclear weapons use, military officials developed plans to use these weapons—either in retaliation or preemptively—to destroy the adversary’s key military and industrial installations. In that context, Soviet nuclear weapons sites (delivery systems and stockpiles) became prime targets, as did civilian and military headquarters and key industrial facilities.

Beginning in the late 1940s and early 1950s, target planners developed methodologies to estimate requisite levels of destruction for targets. Usually, explosive [blast effects](#) were the chief metric for measuring destruction.

To obtain the desired outcome, target planners assigned warheads and delivery systems, and collaborated with military commanders to develop tactics for optimizing destruction. By 1960, war planning was centralized at the Joint Strategic Target Planning Staff, located at the headquarters of the Strategic Air Command in Nebraska. The planning staff had responsibility for preparing the Single Integrated Operational Plan, the US warfighting strategy for the use of nuclear weapons.



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A [1961 report](#) by the Joint Chiefs of Staff exemplified the potentially catastrophic impacts of the operational plan's targeting. The report included estimates of casualties associated with a military conflict over West Berlin. According to numbers drawn from the war plan, a full-force attack on the Soviet Union's major cities, government control centers, and nuclear threat targets would kill some 50 percent of its total population—some 108 million out of its then-population of 217 million. If the smaller alert force (with bombers on 15-minute to two-hour alert) was used, total Soviet casualties would be 37 percent, or about 80 million.

The total estimated deaths, including Chinese, from a full-force attack, 212 million, were fewer than the estimate of 275 million that the Joint Chiefs provided to the Kennedy White House in 1961, [as disclosed](#) in jaw-dropping detail by Daniel Ellsberg. The revelation of these startling numbers was important, but the documentary record is elusive. (Significant Pentagon records from the early 1960s remain unprocessed at the National Archives, so the document may be found someday.)

Estimates of fatalities were also built into decision making on strategic and defensive force levels. For example, in 1962, Secretary of Defense Robert McNamara explained to President Kennedy why he [rejected](#) Air Force proposals for a first-strike capability. McNamara observed that the latest estimates showed that in a projected 1968 nuclear conflict a strategic strike by the Air Force's proposed force would leave 100 surviving Soviet intercontinental ballistic missiles. If the Soviets targeted those missiles against US cities, "they could inflict roughly 50 million direct fatalities in the United States, even with fallout protection." That was not an "acceptable" level of damage." Kennedy let McNamara's recommendation stand.

### Shifts in strategic balance

Over the years, fatality estimates reflected the changing strategic balance. During the 1950s and the early 1960s, estimated Soviet fatalities were proportionately higher than US fatalities. As Soviet strategic forces caught up in their lethality, however, estimated US fatalities markedly increased, and optimism about a "balance of strength" favoring a post-nuclear-war United States faded.

Exemplifying the catastrophic scale of destruction and the growing numbers of estimated US fatalities was a 1967 interagency [report](#) describing the comparative vulnerabilities of the United States and the Soviet Union. According to the report, in 1964 the Soviets could kill 48 million Americans in a preemptive attack; by 1968, with greater numbers of intercontinental ballistic missiles in place, they would be able to kill 91 million.

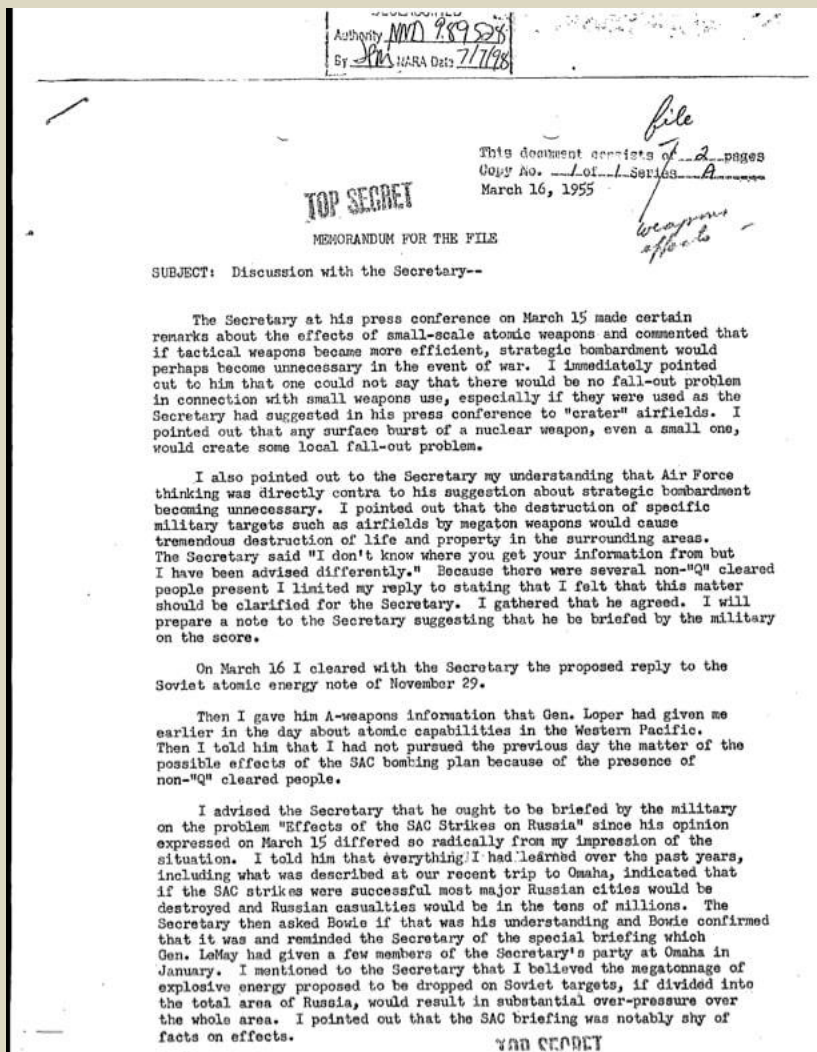
By contrast, Soviet fatalities remained relatively constant during the decade, because the United States already had large strategic forces by 1964. In a US retaliatory attack on Soviet cities in 1964, some 77 million would be killed, the report estimated. Under the same circumstances, 81 million would be killed in 1967.

### A "political-psychological" burden

While all the estimates were conjectural, some admittedly were underestimates. The authors of a 1969 [study](#) prepared for strategic arms control talks estimated scores of millions of fatalities on both sides but acknowledged that they "underestimat[ed] the resulting fatalities." They based their appraisals on fatalities caused by explosive [blast damage](#) and did not include impacts such as radiation and mass fires, which were certain to cause many more deaths. When Secretary of State John Foster Dulles was briefed in 1955 on the destruction that thermonuclear weapons would inflict, he was initially [incredulous](#). Dulles had to be re-briefed before he accepted the analysis.

When Secretary of State John Foster Dulles was briefed on the effects of thermonuclear weapons in 1955, he initially doubted they would cause millions of fatalities. Gerard C. Smith, who was Dulles' special assistant on atomic energy matters, set him straight. Source: National Archives

The prospect that decisions to use nuclear weapons would cause tremendous death and ruin troubled US officials. As





Deputy Secretary of State Elliot Richardson put it years later, there was a [“political-psychological”](#) issue: “the imbalance between [the] ability to inflict fatalities and [the] reluctance to accept or cause large numbers of deaths.” Well before then, US presidents and their advisers had become strongly averse to nuclear weapons use, with the [“nuclear taboo”](#) stigmatizing these weapons because of the terrible and disproportionate dangers that their combat use would cause.

Huge casualty estimates and the enormous scale of nuclear strikes influenced President Richard Nixon to seek alternatives to apocalyptic attacks, eventually leading to a 1974 [directive](#) calling for options to control escalation and limit the scope and intensity of destructiveness. During the following years, the Defense Department tried to break down the operational plan into smaller attack options (Major, Regional, and Selective) to give the president and command authorities less destructive and possibly more credible options. But into the 1980s the options developed by the planning staff continued to require large numbers of nuclear weapons, despite attempts by presidents to scale back the plans.

Presidents Carter and Reagan successively levied explicit requirements for reduced “collateral damage”—civilian casualties—in their targeting policy directives ([Presidential Directive 59](#) and [National Security Decision Directive 13](#), respectively). While target planners prepared still-classified studies on collateral damage, their impact is unknown. It was not until the late 1980s, when the Cold War was winding down, that the White House and Pentagon officials [induced target planners](#) to produce attack options that could reduce

deaths and destruction. What planners actually did—for example, whether they adjusted target planning to reduce “collateral” damage to civilians—is highly secret. In any event, it’s unclear whether any estimates of casualties were produced.

A Presidential Review Memorandum issued during the Carter administration acknowledged that a major nuclear exchange between the United States and Russia would be so devastating that it could never have a “winner.” Source: Jimmy Carter Presidential Library

### Secrets and risks

The horrifying scale of fatalities estimated during the 1950s through the 1970s were classified for years, only becoming available through archival releases during the 1990s and later. With rare exceptions, nuclear casualty estimates from the 1980s or later years are unavailable. Indeed, in some instances, the Defense Department has refused to declassify estimates in reports from the 1960s and 1970s.

While non-governmental organizations such as International Physicians for the Prevention of Nuclear War and Physicians for Social Responsibility have produced [casualty estimates](#), the degree to which official projections continued into the post-Cold War period is unclear. In 2013, the Obama

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against Soviet forces in the Far East after planned redeployments of US air and naval forces to the European theater upon NATO mobilization. It assumes that conflict does not break out between North and South Korea. The ability of NATO to protect the flow of Middle Eastern oil is not considered on the assumption that, in the event of oil SLOC interdiction, NATO would depend upon existing PDL stockpiles until forces could be freed from other theaters to counter this additional threat.

While the war in Central Europe is, of course, the conflict of greatest importance, the outcome of the worldwide conflict influences foreign support (resources and bases) necessary for US prosecution of the war, the stance adopted by the PRC, and negotiations to terminate hostilities. The overall ability of US and Allied forces to prevail against Soviet forces outside of Europe is uncertain. US advantages are based primarily upon control of critical maritime choke points, access to bases in Japan (including the Ryukyus) and South Korea, and the ability to threaten the territory of the USSR itself through naval and air attack. These advantages are offset by the difficulty of establishing effective anti-air and anti-submarine barriers in the face of intense Soviet opposition. Although essential military shipping to Japan could probably be maintained, the possibility exists that the USSR could cut the economic and resupply LOC's to Japan, endangering Japan's continued support of US military operations. This would make the US task in the Pacific considerably more difficult.

There is always a possibility that the PRC, North Korea, Vietnam, or other nations might take aggressive actions during or in the aftermath of a conventional war between the US and the USSR. Both sides, however, have multiple deterrents to such actions, ranging from threats (on the low end) to using nuclear weapons (on the high end). It would appear that these measures are adequate in FY 1978 to discourage any such peripheral activities.

The major problems for the US are the need to disengage forces under the current “swing” strategy (which requires redeployment of significant US naval and some air forces from the Pacific to the European/Atlantic theater upon mobilization), the limited Japanese defense capabilities, and the strong Soviet forces available in the Far East. Soviet problems include the need to maintain substantial forces opposite the PRC, the difficulty of sustaining extended naval operations in the Pacific and the vulnerability of isolated areas to US air and naval attack. Major uncertainties for both sides are the nature and impact of Soviet measures to deny Persian Gulf oil to the West, Soviet naval deployments prior to hostilities, Japanese strength and determination, and the actions of third parties during the conflict, primarily the PRC, but including North Korea and Vietnam.

#### US-USSR Nuclear Conflict

The results of a major nuclear exchange between the United States and the Soviet Union are that both nations would suffer very high levels of damage and neither could conceivably be described as a “winner.” Further,

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administration began to apply to nuclear targeting [international rules](#) of war presented in the 1977 Protocol I to the Geneva Conventions, such as proportionality and civilian-military target distinctions. The adoption of those rules in 2013 may have led to estimates of fatalities under more restrictive targeting options, but that is also unclear.

The dangers of superpower war and nuclear confrontation declined when the Cold War ended, and both the United States and the former Soviet Union/Russia made significant cuts in their strategic forces. In recent years, with tensions increasing and the future of Ukraine and Taiwan in dispute, risks have risen again.

Adding to the danger is the Indo-Pakistan nuclear arms race. Both countries have engaged in risky [confrontations](#) with significant escalatory potential; the [perils](#) of a nuclear conflict between India and Pakistan are [grave](#), and the overall impact would be [disastrous](#). The recent catastrophic flooding of Pakistan, made all the worse by climate change, may influence that country's security priorities. The war against Ukraine presents a newer danger. It can only be hoped that the leaders of nuclear weapon states avoid steps that would make Cold War nuclear casualty estimates more than historical curiosities.

**William Burr** is a senior analyst at George Washington University's [National Security Archive](#), where he directs its Nuclear Documentation Project. He is co-author, with Jeffrey Kimball, of [Nixon's Nuclear Specter: The Secret Alert of 1969, Madman Diplomacy, and the Vietnam War](#).

## The war in Ukraine: Nuclear war scenarios and normal accident theory

By Lasha Tchantouridze

Research paper / November 29, 2022

Source: <http://www.securityscience.edu.rs/index.php/journal-security-science/article/view/86/57>

### Abstract

Russia started its nuclear war threats with the commencement of its war in Ukraine. In the current case of the war in Ukraine, the most critical question is whether the Russian Federation, the aggressor in this war, would use nuclear weapons. The purpose of this brief paper is to examine the scenarios that are available to Russia to carry out its threat. The theoretical framework employed here is that of Normal Accident Theory (NAT), one of the most prominent theories of catastrophe. Normal Accident Theory explains how Moscow's use of nuclear weapons can trigger a global catastrophe that could bring the international system down. There are scenarios according to which the decisions that may result in the destruction of the international system may cascade fast, and there are scenarios in which such cascading events may be avoided or delayed.



**Lasha Tchantouridze, PhD** is a Professor, Director of the graduate programs in Diplomacy and International Relations, Norwich University – the Military College of Vermont, Northfield, VT 05641, U.S.A.

## North Korea: What we can expect from Kim Jong-un in 2023

Source: <https://www.bbc.com/news/world-asia-64123657>

Jan 03 – North Korea had a record-busting 2022. It fired more missiles than ever before in a single year. In fact, a quarter of all missiles North Korea has ever launched hit the skies in 2022. It was also the year that Kim Jong-un declared that North Korea had become a nuclear weapons state and that its weapons were here to stay.

This has raised tensions on the Korean peninsula to their highest since 2017, when then US President Donald Trump threatened North Korea with "fire and fury".

So, what comes next?

### Nuclear weapons development

In 2022, North Korea made significant progress on its weapons. It began the year by testing short-range missiles designed to hit South Korea, followed by mid-range ones that can target Japan.

By the end of the year it had successfully tested its most powerful intercontinental ballistic missile to date - the Hwasong 17, which in theory is capable of reaching anywhere on the US mainland.

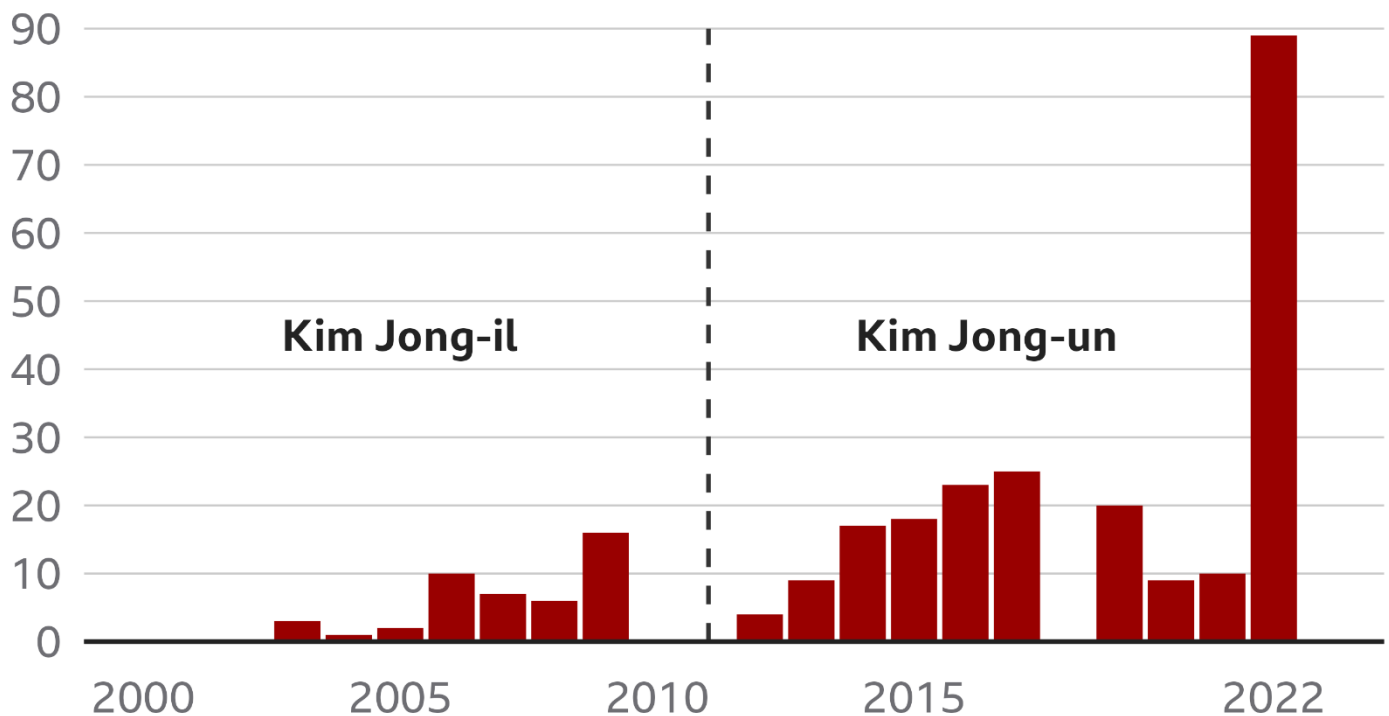


Mr Kim also lowered his threshold for using nuclear weapons. After announcing in September that North Korea had become an irreversible nuclear weapons state, he revealed that these weapons were no longer designed just to prevent war, but that they could be used pre-emptively and offensively, to win a war.

As the year drew to a close, he gathered the members of his ruling Workers' Party, to set out his goals for 2023.

## North Korea missile launches peak in 2022

Number of missiles launched by North Korean forces, by year



Source: South Korean and Japanese defence ministries (data to 2 Jan 2023) **B B C**

Top of his list is to "exponentially increase" the production of nuclear weapons. This must include, he said, the mass production of smaller, tactical nuclear weapons, which could be used to fight a war against South Korea.

This is the most serious development, according to Ankit Panda, a nuclear weapons expert at the Carnegie Endowment for International Peace.



[North Korea launched its most powerful ICBM to date in late 2022 – Image source, KCNA](#)

To make tactical nuclear weapons, North Korea first must produce a miniaturised nuclear bomb, which can be loaded onto a small missile. The world is yet to see proof that Pyongyang has been able to do this. The intelligence community spent most of 2022 waiting for it to test such a device, but the test never came - 2023 may well be the year.

Other items on Mr Kim's new year list are a spy satellite, which

he claims will be launched into orbit this spring, and a sturdier solid-fuelled ICBM, which could be fired at the US with less warning than his current model.



We can therefore assume 2023 will have a distinctly 2022 feel, with Pyongyang continuing to aggressively test, refine and expand its nuclear arsenal, in defiance of UN sanctions.

Indeed, less than three hours into the new year it had already conducted its first missile test.

But, Mr Panda says, "most missile launches in the coming year may not be tests, but training exercises, as North Korea now prepares to use its missiles in a possible conflict".

### Any talking?

With such an extensive list of goals to work through, it is unlikely the North Korean leader will choose this year to return to talks with the US. The last round of denuclearisation negotiations collapsed in 2019, and ever since Mr Kim has shown no sign of wanting to talk. One line of thinking is that he is waiting until he has maximum leverage. Not until he has proven beyond doubt that North Korea is capable of inflicting destruction on the US and South Korea, will he return to the table, to negotiate on his terms.

Instead, over the past year, North Korea has drawn closer to China and Russia. It could well be in the process of fundamentally changing its foreign policy, said Rachel Minyoung Lee, who worked as a North Korea analyst for the US government for 20 years, and is now with the Open Nuclear Network.

"If North Korea no longer views the US as necessary for its security and survival, it will profoundly impact the shape and form of future nuclear negotiations," she said.

### Tensions on the peninsula

In the meantime, a volatile situation is developing on the Korean peninsula.

For every perceived "provocation" by the North, South Korea - and sometimes the United States - retaliates.

This began in May 2022, with the arrival of a new South Korean president, who promised to be tougher on North Korea. President Yoon Suk-yeol is guided by the belief that the best way to stop the North is to respond with military strength.

He re-started large-scale joint military exercises with the United States, against which the North protested and launched more missiles. This set off a tit-for-tat cycle of military action, which has involved both sides flying warplanes near to their border, and firing artillery into the sea.

Last week, the situation escalated, when the North unexpectedly flew five drones into South Korean airspace. The South failed to shoot them down, exposing a weak spot in its defences and triggering concern among ordinary South Koreans, who are usually unfazed by the North's activities.

The president vowed the South would retaliate and punish the North for every provocation.

Chad O'Carroll, CEO of Korea Risk Group, an analysis service which monitors North Korea, predicts that in 2023, this could likely lead to a direct confrontation between the two Koreas, which could even result in deaths.

"Responses by either the North or South could escalate to the point where we see the exchange of actual fire, intentional or otherwise," he said. One mistake or miscalculation and the situation could spiral.

"Responses by either the North or South could escalate to the point where we see the exchange of actual fire, intentional or otherwise," he said. One mistake or miscalculation and the situation could spiral.



### Inside North Korea

Just as pressing a question is what does 2023 hold for the people of North Korea?

They have been subjected to three years of strict pandemic-related border closures. Even trade was suspended in an attempt to keep the coronavirus out, which humanitarian organisations believe has led to severe shortages of food and medicine. Last year, in a rare admission, Mr Kim spoke of a "food crisis". Then in May 2022, North Korea admitted its first outbreak of the virus, but mere months later claimed to have defeated it. So will 2023 be the year it finally reopens its border with China, and allows people and supplies back in? China's reopening brings hope. North Korea is reportedly vaccinating people living along the border in preparation, but given its precarious healthcare, Ms Lee is cautious.

"Barring an emergency, such as its economy on the brink of collapse, it is unlikely North Korea will fully reopen its borders until the pandemic can be considered over globally, particularly in neighbouring China," she said.





One more development to watch for is clues about who will lead North Korea after Mr Kim. His succession plan is unknown, but [last year he publicly revealed one of his children](#) for the first time - a girl, thought to be his daughter Kim Chu-ae. She has been pictured now at three military events, with more photos released on New Year's Day, leading some to speculate whether she is the chosen one.

Of course, North Korea is anything but predictable, and 2023 looks set to be as unpredictable and unstable a year as the last.

# Watch the 2023 Doomsday Clock announcement.

January 24 | 10 AM EST



By John Pope

Source: <https://thebulletin.org/2023/01/watch-the-2023-doomsday-clock-announcement-on-jan-24/>

Jan 09 – The **Bulletin of the Atomic Scientists** will host a live virtual news conference at 10:00 a.m. EST/1500 GMT on Tuesday, January 24, 2023, to announce whether the time on the iconic Doomsday Clock will change. Watch the announcement live on [our website](#) or on our [Facebook page](#).

Speakers for the Doomsday Clock announcement will include:

- [Mary Robinson](#), first woman president of Ireland, former UN High Commissioner for Human Rights, advocate for gender equality, women's participation in peace-building, human dignity and climate justice, and Chair, The Elders;
- [Elbegdorj Tsakhia](#), former president and prime minister of Mongolia, international campaigner on nuclear disarmament and non-proliferation, climate change and democracy, and member, The Elders;
- [Rachel Bronson](#), PhD, president and CEO, Bulletin of the Atomic Scientists;
- [Sivan Kartha](#), PhD, senior scientist, Stockholm Environmental Institute, lead author for the IPCC Sixth Assessment Report, and member, Science and Security Board (SASB), Bulletin of the Atomic Scientists;
- [Suzet McKinney](#), DrPH, Principal and Director of Life Sciences, Sterling Bay, and member, Science and Security Board (SASB), Bulletin of the Atomic Scientists; and
- [Steve Fetter](#), PhD, dean of the graduate school and professor of public policy, University of Maryland, fellow, American Physical Society, member, National Academy of Sciences Committee on International Security and Arms Control, and member, Science and Security Board (SASB), Bulletin of the Atomic Scientists.

Read the [2022 Doomsday Clock Statement](#). Follow us on [Twitter](#), [Facebook](#), and [Instagram](#) and [sign up for email updates](#). Look for the hashtag #DoomsdayClock on Jan. 24.

**John Pope** is the chief audience officer of the Bulletin of the Atomic Scientists. He oversees the digital and communications team that strives to deepen the Bulletin's relationship with its existing audiences and expand that audience. Before joining the Bulletin, John was the director of the Peace and Security team at ReThink Media. In this role he and his team advised and assisted leading national security experts,

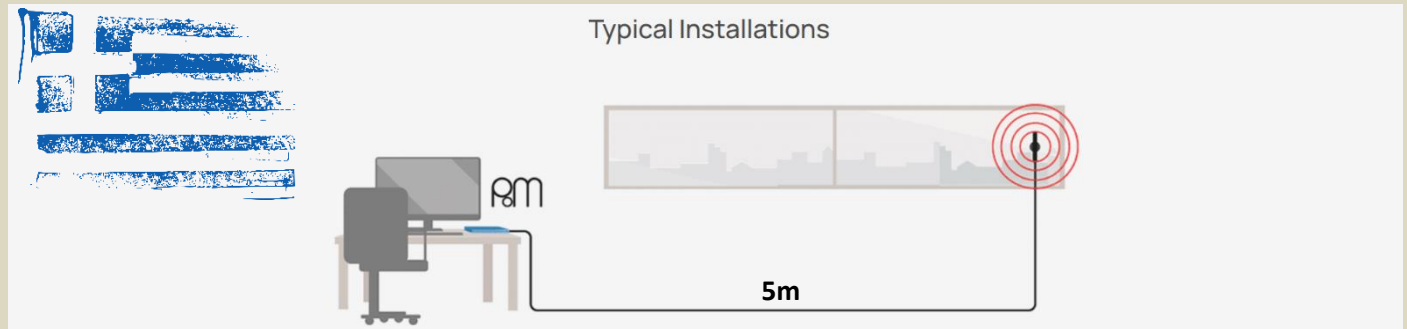


organizations, and community advocates on their strategic communications and media outreach. Previously, John has worked at a variety of government, nonprofit, and political roles. Pope is based out of Washington, D.C. and has lived there off and on since he attended American University where he earned a BA in international studies and MA in international communication.

## PoM shield

Source: <https://www.pomshield.com/>

The PoM shield is a soft enclosure which virtually eliminates the EMFs emitted by mobile phones while diverting them to a remote antenna, far from the phone and far from you. With the PoM shield you can leave your phone next to you, and even use it for voice calls, and at the same time be away from potentially stressing electromagnetic radiation. While studies about mobile phone EMFs remain inconclusive, you can now address a common concern for you and your loved ones by reducing your exposure, a precautionary measure suggested by virtually all related international organisations. The PoM shield has been scientifically developed based on the fundamental laws of electromagnetism and operates as a true Faraday cage. It can be used on any bedside furniture, in the office or living room, or wherever there is a need for a period of rest away from the influence of the mobile phone *and eliminate 99% or more of your EMF exposure*. At the same time it is a stylish accessory made of high quality fabrics, a wonderful addition to any home or working environment. It is extremely easy to install and use in a few minutes. To shield your phone just place it in the PoM and move the soft cover on top of it.



## Uranium in cargo sparked alert at Heathrow Airport

Source: <https://www.bbc.com/news/uk-64231557>

Jan 11 – Police are investigating after metal contaminated with uranium was found at London's Heathrow Airport last month. Officers of the Metropolitan Police's Counter Terrorism Command responded to the security alert which was triggered on 29 December.

[The Sun, which first reported the news](#), said the uranium came from Pakistan.

One line of inquiry is whether it was the result of "poor handling" in the country, the BBC was told. Police say there was no threat to the public.

It was found in a shipment of scrap metal, a source said. Alarms were triggered at Heathrow after specialist scanners detected the substance as it was ferried to a freight shed owned by handling firm Swissport, the Sun said. The shipment's intended destination is not clear. No-one has been arrested. The Metropolitan Police



said: "We can confirm officers from the Met's Counter Terrorism Command were contacted by Border Force colleagues at Heathrow after a very small amount of contaminated material was identified after routine screening within a package incoming to the UK."

Commander Richard Smith from the force's counter terrorism team separately told the BBC: "Although our investigation remains ongoing, from our inquiries so far, it does not appear to be linked to any direct threat.

"As the public would expect, however, we will continue to follow up on all available lines of inquiry to ensure this is definitely the case." Strict protocols must be followed in order to fly dangerous cargo, including uranium, being loaded onto the base of units in the cargo hold and ensuring a minimum distance is kept between the nuclear material and cabin above.

Uranium is an element which occurs naturally. It can have nuclear-related uses once it has been refined, or enriched. This is achieved by the use of centrifuges - machines which spin at supersonic speeds.

Low-enriched uranium can be used to produce fuel for commercial nuclear power plants.

Highly enriched uranium has a purity of 20% or more and is used in research reactors. Weapons-grade uranium is 90% enriched or more.

**EDITOR'S COMMENT:** The undeclared nuclear material can be used in a dirty bomb. [UPDATE 16/1: A man in his 60s has been arrested after counter-terrorism officers searched an address in Cheshire on Saturday, on suspicion of an offence under section 9 of the Terrorism Act 2006, which covers the making and possession of radioactive devices.]

## How to Respond to a North Korean Nuclear Test

By Daniel Sneider

Source: <https://nationalinterest.org/feature/how-respond-north-korean-nuclear-test-206084>

Jan 06 – North Korean leader Kim Jong-un marked the new year with a pointed display of military might unmistakably aimed at the United States, South Korea, and Japan. At the year-end Korean Workers' party plenum, Kim [vowed](#) to "exponentially increase" the production of nuclear weapons, along with developing "another new intercontinental ballistic missile (ICBM) system." North Korean state media carried [photos](#) of Kim and his daughter strolling down rows of intermediate-range missiles and mobile transporters, weapons that can hit Japan and U.S. bases there and in Guam. And the year was capped with the test of a new nuclear-capable multiple rocket launcher [system](#), designed to carry out tactical nuclear strikes against South Korea.

North Korea's rising crescendo of missile testing and [preparations](#) for an imminent seventh test of a nuclear warhead have alarmed the governments of the region and the United States. Some observers depict these launches as political theater, acts of either angry defiance or a desperate cry for attention and an invitation to negotiation.

The tests and the statements emitting from Kim and his regime do not, however, represent a departure from previous actions. Rather, it is a continuation of North Korea's long-established effort to possess a nuclear weapons capability that can survive a U.S. strike, overcome existing missile defense systems, and reach key targets in South Korea, Japan, the Western Pacific, and possibly the continental U.S.

The testing program carried out over the last two years reflects a set of weapon system goals laid out by Kim in January 2021 at the 8<sup>th</sup> Congress of the Korean Workers' Party. In his speech to the Congress, Kim called for the development of intercontinental ballistic missiles, submarine-launched missiles, miniaturized nuclear weapons, multiple-warhead missiles, and a range of other missile delivery and weapons systems. This military program was [declared](#) essential "as long as there is imperialism on this planet."

The missile and nuclear programs are certainly driven by North Korea's sense of weakness and vulnerability. But they also are a manifestation of a still deeply held goal of reunifying the Korean peninsula under North Korean leadership. The current belligerent posture is aimed in part at driving wedges between the South Korean populace and its security ally.

"The North Koreans all along have been trying to intimidate the United States, albeit for different ends at different times," observed David Straub, a former senior State Department official with extensive experience in Korea. Straub continues:

For two decades now, as we all know, the North Koreans have been trying to get the United States and, through us, the rest of the world to accept them as a nuclear weapons state. In other words, to remove sanctions against them, and otherwise normalize relations with them, while they maintain and continue to develop nuclear weapons, less for deterrence than for eventually dominating the peninsula. Having not yet succeeded in that fundamental goal, they continue now to try to intimidate the U.S. ever more directly to get us to tire and give up and leave South Korea.





In recent years, this goal has become, if anything, more attainable in the minds of the North Korean regime. It has watched the United States retreat from Afghanistan, fail in Iraq and Syria, and come tantalizingly close to withdrawing from South Korea under the Trump administration.

The Biden administration has reversed that trend, recommitting to the centrality of security alliances with [South Korea](#) and Japan, bolstered by the return of conservative leadership in Seoul. But in the mind of Kim and his senior officials, that may be only a temporary state of affairs. The North Korean leadership must be encouraged by the calls from former U.S. officials and other experts to formally accept Pyongyang's status as a nuclear weapons state, a key goal of its diplomacy. And the war in Ukraine has placed [China](#) and Russia more fully on North Korea's side than at any other time in the past three decades.

Under these circumstances, any negotiation with North Korea will yield, at best, a temporary freeze in its testing. And that would almost certainly only follow the completion of tests that accomplish the current missile and nuclear development goals of the regime. Washington should always be prepared to offer the familiar exchange of verifiable denuclearization in visible, if phased, steps for full diplomatic recognition, a peace treaty to end the Korean War, and large-scale economic engagement. But all negotiations to that end have faltered for the same reason—it is simply not in the interests of North Korea.

That leaves only one viable response, and it is the one the Biden administration is clearly pursuing with the support of both South Korea and Japan: a strategy of deterrence and containment, drawing upon the lessons of the Cold War.

### Bolstering Deterrence

A seventh nuclear test by North Korea, accompanied by more advances in missile technology, requires a significant and escalatory bolstering of that deterrence strategy. Containment, which in general encompasses all forms of sanctions and economic pressure, is unlikely to be intensified, given the decision of both China and Russia to effectively end their participation in the sanctions measures established under United Nations Security Council resolutions.

We must, then, rely on deterrence. And in many respects, our deterrence architecture in the region is insufficient. In practice, it should convince our adversary that the potential use of its nuclear capability to attack the United States or its allies in a crisis or in a time of war, or even kinetic provocations short of war, would risk its own survival. It is not clear, however, that Kim and his generals have reached that judgment.

**There are several ways in which deterrence can be far more convincing for the Pyongyang regime**, and even raise the cost of continuing missile and nuclear system development to an unacceptable level. All of them involve a demonstrable tightening of trilateral security cooperation between the United States, Japan, and South Korea, which would get the prompt attention not only of Pyongyang but also of its backers in Beijing and Moscow.

**First**, there is the deployment of U.S. strategic assets to the region to communicate a readiness to carry out retaliatory strikes in response to any use of nuclear weapons by North Korea. This is a well-established signaling device, usually carried out by temporary stationing of strategic aircraft—B-2 and B-52 bombers, for example—at forward bases in Guam. The movement of naval forces, such as carrier battle groups, has been used for the same goal.

More potent, however, would be more permanent stationing of dual-capable systems in the region. These could include Ohio-class attack submarines, which are not presently equipped with nuclear weapons. Forward deployment of a second carrier in Japan should also be considered, as well as the stationing of a second tactical fighter wing at Misawa Air Base in northern Japan, which has the capacity to absorb additional forces and lies within easy strike range of North Korea.

The deployment of U.S. land-based ballistic and cruise missile systems is an even more robust choice, though perhaps last on the escalation ladder. Japan's [decision](#) to acquire Tomahawk cruise missiles to create a long-range strike capability accomplishes some of the same goals. But to be effective, it would have to be combined in a de facto joint operating command that can draw on U.S. reconnaissance, surveillance, and other intelligence capabilities.

**Second**, is to move in a serious fashion toward the creation of a combined trilateral air and missile defense command. The recent trilateral [statement](#) issued in Cambodia by the United States, Japan, and South Korea called for exchanges of missile launch data and other intelligence. In principle, that already is possible and does take place between South Korea and the joint U.S.-Japan air defense command at Yokota air base. A trilateral command would combine the U.S.-Japan structure and U.S.-South Korea missile defense coordination under the Combined Forces Command. [Joint exercises](#) toward that end have already begun to be held.

**Third**, and by far the most ambitious, is the creation of [NATO-like](#) joint commands that would include nuclear forces, even in a sharing arrangement. This is a step that may be beyond the current political consensus in both Japan and South Korea. But the revival of extended deterrence consultative dialogues between the United States and South Korea and Japan offers a framework to move toward a multilateral, NATO-style nuclear planning dialogue that can identify specific tasks that each ally may perform to assist the United States in times of crisis. This should be accompanied by regular meetings of a trilateral extended deterrence coordinating group at the senior official level.



These steps would create credibility for America's extended deterrence guarantee, which does not presently exist. And it would make a powerful statement to North Korea—and its allies—of the consequences of nuclear threats.

These moves will demonstrate that the international community will never accept North Korea as a nuclear weapons state.

In the long term, the Kim family's massive investment in acquiring its nuclear and missile capability will be an almost total loss. The regime must understand that it can't employ nuclear weapons without bringing disaster on itself, nor can it use them as effective blackmail. Barring that, nuclear weapons are worse than useless: they can't feed a single North Korean and, in fact, take food out of their mouths. No regime is forever, and North Korea's problems are fundamental, acute, and unresolvable. With determination and some luck, we should be able to deter North Korea until the situation changes for the better.

In many respects, our deterrence architecture in the region is insufficient.

**Daniel Sneider** is a Lecturer in East Asian Studies and International Policy at Stanford University and former Associate Director of Stanford's Asia-Pacific Research Center. He is a non-resident Distinguished Fellow at the Korea Economic Institute. A former foreign correspondent, Sneider writes regularly on East Asia and security issues in publications such as *Toyo Keizai*, *East Asia Forum*, and *KEI's Peninsula blog*.

**EDITOR'S COMMENT:** All three proposals in this article reminded me the well-known joke of the US ship and the lighthouse:



Two radio operators, one of them aboard a U.S. Navy ship, had the following exchange:

Radio 1: Please divert your course 15 degrees to the north to avoid a collision.

Radio 2: Recommend you divert YOUR course 15 degrees.

Radio 1: This is the captain of a U.S. Navy ship. I say again, divert your course.

Radio 2: No, I say again, divert YOUR course.

Radio 1: This is an aircraft carrier of the U.S. Navy. We are a large warship. Divert your course now!

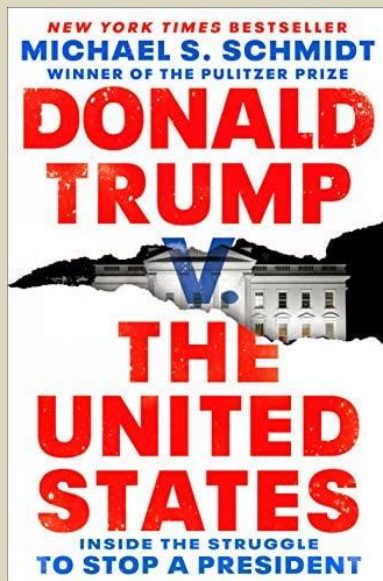
Radio 2: This is a lighthouse. Your call.



## Trump discussed using a nuclear weapon on North Korea in 2017 and blaming it on someone else, book says

Source: <https://news.yahoo.com/trump-discussed-using-nuclear-weapon-133040269.html>

Jan 12 — Behind closed doors in 2017, President Donald Trump discussed the idea of using a nuclear weapon against North Korea and suggested he could blame a U.S. strike against the communist regime on another country, according to a new section of a book that details key events of his administration.



Trump's alleged comments, reported for the first time in a new afterword to a book by New York Times Washington correspondent Michael Schmidt, came [as tensions between the U.S. and North Korea's Kim Jong-un escalated](#), alarming then-White House chief of staff John Kelly. The new section of "**Donald Trump v. the United States**," obtained by NBC News ahead of its publication in paperback Tuesday, offers an extensive examination of Kelly's life and tenure as Trump's chief of staff from July 2017 to January 2019. Kelly previously was Trump's secretary of homeland security. For the account, Schmidt cites in part dozens of interviews on background with former Trump administration officials and others who worked with Kelly. Eight days after Kelly arrived at the White House as chief of staff, Trump warned that North Korea would be "met with fire and fury and frankly power, the likes of which this world has never seen before." When [Trump delivered his first speech to the U.N. General Assembly](#) in September 2017, he threatened to "totally destroy North Korea" if Kim, whom he referred to as "Rocket Man," continued his military threats.

Later that month, Trump continued to goad North Korea through his tweets. But Kelly was more concerned about what Trump was saying privately, Schmidt reports.

"What scared Kelly even more than the tweets was the fact that behind closed doors in the Oval Office, Trump continued to talk as if he wanted to go to war. He cavalierly discussed the idea of using a nuclear



weapon against North Korea, saying that if he took such an action, the administration could blame someone else for it to absolve itself of responsibility," according to the new section of the book.

Kelly tried to use reason to explain to Trump why that would not work, Schmidt continues.

"It'd be tough to not have the finger pointed at us," Kelly told the president, according to the afterword.

Kelly brought the military's top leaders to the White House to brief Trump about how war between the U.S. and North Korea could easily break out, as well as the enormous consequences of such a conflict. But the argument about how many people could be killed had "no impact on Trump," Schmidt writes.

Kelly then tried to point out that there would be economic repercussions, but the argument held Trump's attention for only so long, according to the afterword.

Then, Trump "would turn back to the possibility of war, including at one point raising to Kelly the possibility of launching a preemptive military attack against North Korea," Schmidt said.

Kelly warned that Trump would need congressional approval for a pre-emptive strike, which "baffled and annoyed" Trump, according to the afterword.

Trump [tweeted](#) in early January 2018: "North Korean Leader Kim Jong Un just stated that the 'Nuclear Button is on his desk at all times.' Will someone from his depleted and food starved regime please inform him that I too have a Nuclear Button, but it is a much bigger & more powerful one than his, and my Button works!"

Schmidt also writes that it was well-known among senior U.S. officials for several decades that North Korea sought to spy on U.S. decision-makers. So White House aides were alarmed "that Trump would repeatedly talk on unclassified phones, with friends and confidants outside the government, about how he wanted to use military force against North Korea."

Schmidt writes that there is no indication North Korea had a source in the White House, but he said it "was well within the realm of American intelligence assessment" that it could have been listening to Trump's calls.

"Kelly would have to remind Trump that he could not share classified information with his friends," Schmidt writes.

According to the new section, Kelly came up with a plan he believes ultimately prompted Trump to dial back the rhetoric in spring 2018: appealing directly to Trump's "narcissism."

Kelly convinced the president he could prove he was the "greatest salesman in the world" by trying to strike a diplomatic relationship, Schmidt writes, thereby preventing a nuclear conflict that Kelly and [other top military leaders](#) saw as a more immediate threat than most realized at the time.

The situation with North Korea consumed Kelly almost immediately upon his taking the job at the White House, which he had not actually committed to do before Trump tweeted that the post was his, according to the new section.

"Holy s--- — oh, I gotta call Karen," Kelly said, referring to his wife, according to the afterword.

"Three days later, on Monday morning, Kelly met with his aides in a large conference room at a Department of Homeland Security office building a few blocks from the White House. Kelly was solemn. 'This is a great job,' he said, referring to the cabinet position he was leaving. 'That's not a great job. But the president has asked me to do it.'"

**EDITOR'S COMMENT:** A quiz for you: How many nuclear weapons Luxemburg has? And the Maldives?

## Unbelievable (if true)

The Iranian leaders do not consider the concept of MAD (Mutually Assured Destruction) as a deterrent. Several Iranian leaders have publicly said that "25 million martyrs would be an acceptable price for eliminating the Zionist regime", meaning that they're willing to trade 25 million Iranians for less than 10 million Israelis (although no one knows how much "collateral damage" there will be among Palestinians, Jordanians, Lebanese, and Syrians).

## A New Way to Assess Radiation Damage in Reactors

By David L. Chandler

Source: <https://www.homelandsecuritynewswire.com/dr20230112-a-new-way-to-assess-radiation-damage-in-reactors>

Jan 12 – A new method could greatly reduce the time and expense needed for certain important safety checks in nuclear power reactors. The approach could save money and increase total power output in the short run, and it might increase plants' safe operating lifetimes in the long run.

One of the most effective ways to control greenhouse gas emissions, many analysts argue, is to prolong the lifetimes of existing nuclear power plants. But extending these plants beyond their originally permitted





operating lifetimes requires monitoring the condition of many of their critical components to ensure that damage from heat and radiation has not led, and will not lead, to unsafe cracking or embrittlement.

Today, testing of a reactor's stainless steel components — which make up much of the plumbing systems that prevent heat buildup, as well as many other parts — requires removing test pieces, known as coupons, of the same kind of steel that are left adjacent to the actual components so they experience the same conditions. Or, it requires the removal of a tiny piece of the actual operating component. Both approaches are done during costly shutdowns of the reactor, prolonging these scheduled outages and costing millions of dollars per day.

Now, researchers at MIT and elsewhere have come up with a new, inexpensive, hands-off test that can produce similar information about the condition of these reactor components, with far less time required during a shutdown. The [findings](#) are reported today in the journal *Acta Materiala* in a paper by MIT professor of nuclear science and engineering Michael Short; Saleem Al Dajani '19 SM '20, who did his master's work at MIT on this project and is now a doctoral student at the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia; and 13 others at MIT and other institutions.

The test involves aiming laser beams at the stainless steel material, which generates surface acoustic waves (SAWs) on the surface. Another set of laser beams is then used to detect and measure the frequencies of these SAWs. Tests on material aged identically to nuclear power plants showed that the waves produced a distinctive double-peaked spectral signature when the material was degraded.

Short and Al Dajani embarked on the process in 2018, looking for a more rapid way to detect a specific kind of degradation, called spinodal decomposition, that can take place in austenitic stainless steel, which is used for components such as the 2- to 3-foot wide pipes that carry coolant water to and from the reactor core. This process can lead to embrittlement, cracking, and potential failure in the event of an emergency.

While spinodal decomposition is not the only type of degradation that can occur in reactor components, it is a primary concern for the lifetime and sustainability of nuclear reactors, Short says.

"We were looking for a signal that can link material embrittlement with properties we can measure, that can be used to estimate lifetimes of structural materials," Al Dajani says.

They decided to try a technique Short and his students and collaborators had expanded upon, called transient grating spectroscopy, or TGS, on samples of reactor materials known to have experienced spinodal decomposition as a result of their reactor-like thermal aging history. The method uses laser beams to stimulate, and then measure, SAWs on a material. The idea was that the decomposition should slow down the rate of heat flow through the material, that slowdown would be detectable by the TGS method. However, it turns out there was no such slowdown. "We went in with a hypothesis about what we would see, and we were wrong," Short says.

That's often the way things work out in science, he says. "You go in guns blazing, looking for a certain thing, for a great reason, and you turn out to be wrong. But if you look carefully, you find other patterns in the data that reveal what nature actually has to say."

Instead, what showed up in the data was that, while a material would usually produce a single frequency peak for the material's SAWs, in the degraded samples there was a splitting into two peaks.

"It was a very clear pattern in the data," Short recalls. "We just didn't expect it, but it was right there screaming at us in the measurements."

Cast austenitic stainless steels like those used in reactor components are what's known as duplex steels, actually a mixture of two different crystal structures in the same material by design. But while one of the two types is quite impervious to spinodal decomposition, the other is quite vulnerable to it. When the material starts to degrade, the difference shows up in the different frequency responses of the material, which is what the team found in their data.

That finding was a total surprise, though. "Some of my current and former students didn't believe it was happening," Short says. "We were unable to convince our own team this was happening, with the initial statistics we had." So, they went back and carried out further tests, which continued to strengthen the significance of the results. They reached a point where the confidence level was 99.9 percent that spinodal decomposition was indeed coincident with the wave peak separation.

"Our discussions with those who opposed our initial hypotheses ended up taking our work to the next level," Al Dajani says.

The tests they did used large lab-based lasers and optical systems, so the next step, which the researchers are hard at work on, is miniaturizing the whole system into something that can be an easily portable test kit to use to check reactor components on-site, reducing the length of shutdowns. "We're making great strides, but we still have some way to go," he says.

But when they achieve that next step, he says, it could make a significant difference. "Every day that your nuclear plant goes down, for a typical gigawatt-scale reactor, you lose about \$2 million a day in lost electricity," Al Dajani says, "so shortening outages is a huge thing in the industry right now." He adds that the team's goal was to find ways to enable existing plants to operate longer: "Let them be down for less time and be as safe or safer than they are right now — not cutting corners, but using smart science to get us the same information with far less effort." And that's what this new technique seems to offer.



Short hopes that this could help to enable the extension of power plant operating licenses for some additional decades without compromising safety, by enabling frequent, simple and inexpensive testing of the key components. Existing, large-scale plants “generate just shy of a billion dollars in carbon-free electricity per plant each year,” he says, whereas bringing a new plant online can take more than a decade. “To bridge that gap, keeping our current nukes online is the single biggest thing we can do to fight climate change.”

David L. Chandler writes about energy, engineering, and materials science for the MIT News Office.

## Heathrow nuclear shipment?

By Amjed Jaaved

Source: <https://modern diplomacy.eu/2023/01/15/heathrow-nuclear-shipment/>

Jan 15 – Last month, during routine scanning of cargo at the Heathrow Airport, the British police came across a “very small quantity of uranium “package. The undeclared material was discovered on a passenger flight on December 29, 2022. The Indian news agencies and Daily Mail Online reported “it was destined for an Iranian business with premises in the UK (David Barret, Home Affairs Editor for the Daily Mail and Brittany Chain for Mail Online, Published January 10, 2023). Being “not of weapon grade” the uranium was incapable of being used for improvising a “dirty bomb” (a radiation dispersal device). However, some news agencies and uncanny experts tried to whip up “dirty bomb” scare out of the incident. Hamish De Bretton-Gordon, former commander of the UK’s nuclear defence regiment lent credence to the unfounded scare. He said: ‘Uranium can give off very high levels of poisonous radiation. It could be used in a dirty bomb. Indian news agencies and the Daily Mail Online, in their reports, magnified “a very small quantity” into “several kilograms” of uranium. It was claimed that the package “originated” in Pakistan though it was headed for an Iranian business in Britain.

### 9 Fast Facts About Uranium

**Atomic Number** 92

**Found in nature:**

- Uranium-238
- Uranium-235
- Uranium-234

Named for the planet **Uranus**.

**Can be mined 3 ways:**

- open pit
- underground, in-situ leaching
- borehole mining (high-pressure water jets)

Discovered by Martin Heinrich Klaproth in 1789.



**Boiling Point:** about 3,818°C

Only Uranium-235 can sustain a chain reaction of nuclear fission

Uranium compounds were once used to color glass and ceramics

Occurs in these types of deposits: unconformity-related, Olympic Dam, sandstone, quartz-pebble conglomerate, surficial, vein, volcanic, caldera-related, intrusive, metasomatite

98.43	111.3
U	
Uranium	
92	
13.61	17.22

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British Police Commander, Richard Smith clarified: ‘I want to reassure the public that the amount of contaminated material was extremely small and has been assessed by experts as posing no threat to the public. ‘Although our investigation remains ongoing, from our inquiries so far, it does not appear to be linked to any direct threat.

‘As the public would expect, however, we will continue to follow up on all available lines of enquiry to ensure this is definitely the case.





'However, it does highlight the excellent capability we and our partners have in place to monitor our ports and borders in order to keep the public safe from any potential threats to their safety and security that might be coming into the UK.' 'The material has been identified as being contaminated with uranium.'

### Distortion

It is unfortunate that India in cahoots with some foreign media is always in the forefront to exploit such incidents and portray Pakistan as a nuclear rogue. For instance, *Time* magazine, in its article 'Merchant of Menace', reported some uranium hexa-fluoride cylinders were missing from the Kahuta Research Laboratories (February 15, 2005). Pakistan's information minister and foreign-office spokesman both refuted the allegation. The information minister told Geo TV channel, "We have checked all the records and no cylinder is missing from the KRL". Masood Khan (foreign office) told reporters, "The story is a rehash of several past stories". May read N-Terror Threat the News International, August 27, 2009

India's own record is dismal. Let us reminisce a few incidents It is not understood why loss of radioactive material from Indian labs is always out of the magazine's focus \_ According to international media reports (February 25, 2004), India itself reported 25 cases of "missing" or "stolen" radio-active material from its labs to the International Atomic Energy Agency (IAEA). Fifty-two per cent of the cases were attributed to "theft" and 48% to "missing mystery". India claimed to have recovered lost material in twelve of total 25 cases. She however admitted that 13 remaining cases remained mysterious.

### Pot calling kettle black:India's radio-active bazaar

India has a sprawling civil and military nuclear programme that spreads over several states. In an article in *The Diplomat*, Sitara Noor highlighted shortcomings in safety and security of India's nuclear facilities (*India's radio-active bazaar: Recurring incidents involving theft and sale of nuclear materials demonstrate why India must develop an independent nuclear regulatory body.*) [thediplomat.com/2022/03/India](http://thediplomat.com/2022/03/India)'s radio-active bazaar [Accessed 14 January 2023].

She says: '*While global markets are taking a dip due to economic recession, India's illicit uranium market seems to be flourishing. In February, eight people including two Indian officials were apprehended in Nepal for illegally possessing and attempting to sell "uranium like substance". The material was reportedly smuggled from India. This was not just one-off incident \_ theft and sale of nuclear and radioactive material in India is a recurring phenomenon. Earlier in May 2021, reports of the seizure of 7 kilograms of highly radio-active uranium worth 210 million Indian rupees from a scrap dealer raised serious concern about India's nuclear security capabilities. Over the past two decades over 200 kilograms of nuclear and radio-active materials has reportedly disappeared from Indian facilities. Frequent incidents of loss and theft of nuclear and radio-active materials in India indicate the failure of the nuclear security systems at multiple levels. First there seems to be a gap in the material accounting and control systems to ensure that not even an iota of material is left unaccounted. Second, the nature of incidents in India hints at the involvement of insiders\_ someone working at the nuclear facilities or mining sites working independently or colluding with an outsider. This indicates the serious risk of insider threat and a failure of the personnel reliability program. Third, the recurrence of nuclear security lapses with such impunity indicates serious issues with nuclear security culture in India...*

### Is Dirty bomb a hoax?

Opinion about the effects of a dirty bomb is divided.

A report by Henry Stimson Center, Washington (followed by several other reports) laments "...Nuclear and radiological terrorism remains a frightening possibility in India and Pakistan, and the source material for nuclear terrorism could come from illicit transactions of poorly protected materials originating outside the region, as well as material from within the region used for military or civilian purposes".

This report was provided to the US Senate Foreign Relations Committee to facilitate the Cooperative Threat Reduction Program on nuclear proliferation in South Asia.

The report concludes that "although India and Pakistan have established regulatory bodies to deal with the safety and security of their nuclear materials,' these may not be sufficient to protect against every potential threat".

Another report, authored by Kishore Kuchibhotla, Ph.D (Biophysics) from Harvard, and Matthew McKinzie, a nuclear physicist serving as a staff scientist with USA's Nuclear Program at the Natural Resources Defense Council, argues that "...three other types of events could prompt unintended escalation in South Asia: a terrorist use of RDDs (radiological dispersal devices); a terrorist detonation of a nuclear weapon; and the accidental explosion of nuclear arms — for example at military bases in either India or Pakistan... The report points out that while nuclear weapons themselves are closely guarded, all sorts of radioactive material could be found in research laboratories and hospitals that could provide the basic materials for the making of a dirty bomb....

Nearly 10,000 radioactive sources are used throughout India of which about 400 are particularly worrisome..." The report predicts that "...dirty bomb detonation in Karachi, New Delhi, Mumbai and Islamabad" could result in "casualties that at the very minimum would number in the tens of thousands". It



is eerie to note that *The Time* (Pentagon) correspondent Mark Thompson asserts in his article *what is a 'Dirty Bomb*, "It's unlikely to kill 10,000 people".)

It appears that the concern about the "dirty bombs" is overblown. History of terrorism reflects that "terrorists" are interested in symbolic targets (which could yield widespread publicity), not in mass killing (*vide* Verindre Grover's *Encyclopaedia of International Terrorism*).

A "dirty bomb" is not known to have been tested by any country or detonated by any "terrorist" anywhere in the world. So, its composition and scope of its destructive power is shrouded in mystery. However, it is generally believed to "consist of a bomb made of conventional explosives such as TNT, salted with radioactive material".

Contrary to the "dirty bombs", fall-out of the tested A-bombs is well recorded. The major powers declared moratoriums on nuclear-bombs testing only in 1992. The pre-1992-period test scoreboard of the USA, former Soviet Union, France, and Britain is an explosion every 18 days, 21 days, 61 days, and 331 days (R Venkataraman *Nuclear Explosion and its Aftermath*).

### CBW

It is much easier and cheaper to make a chemical or biological bomb than a "dirty bomb" (It is believed that the chemical bombs used by Saddam's Iraq against Iran were made with Indian know-how). Though a "dirty bomb" has never been used by any "terrorist", a bio/chemical bomb was actually used by Japan's former doomsday-cult *Guru Shoko Asahara*. The Guru stands sentenced to death "for masterminding the deadly 1995 nerve/chemical gas (*sarin*) attack on the Tokyo subway and a string of other crimes that killed 27 people".

The cult's quest for biological weapons was overshadowed by its chemical attack capability. The cult members were trying to develop botulinum toxin by utilising toxin of green Mamba snake and poisonous mushroom spores,

Regarding use of chemical/biological weapons by "terrorists", Professor Ramesh Chandra points out in his *Global Terrorism* (volume 1, page 27), "The US government indicates that these weapons are well within the reach of terrorists. According to the Central Intelligence Agency, 'Terrorist interest in chemical and biological weapons is not surprising, given the relative ease with which some of these weapons can be produced in simple laboratories... Although popular fiction and national attention have focused on terrorist use of nuclear weapons, chemical and biological weapons are more likely choices for such groups'".

Not only sarin, but also several other chemical agents like mustard, tabun, soman and VX are capable of dual use as pesticides and as a chemical weapon. Chandra (op. cit., page 30) points out, "chemical warfare agents 'can quite literally be manufactured in a kitchen or basement in quantities sufficient for mass-casualty attacks'. Experts agree that it is more difficult to manufacture Sarin gas, used by the "terrorists" in Japan, than mustard, tabun, soman, et al. To some experts, an effective bio-terrorism facility could be built at \$ 200,000 to 2 million.

Biological weapons, too, are easier to manufacture than "dirty bombs". Viruses could cause smallpox, Venezuelan equine encephalitis and hemorrhagic fevers like Ebola. The threat of biological weapons is obvious from the fact that: (1) The charges for anthrax, Q fever (*Coxiella burnetti*) and Venezuelan equine encephalomyelitis cultures from a leading US culture collection are about \$ 45, \$ 80, and \$81 respectively. Besides, nature abounds with microscopic killers. *Bacillus anthracis* resides in hides and carcasses of wild or domesticated animals and plagues in prairie dogs, chipmunks, black rats, deer mouse and coyotes. Chandra (op cit) states that "The cost estimates for a bio-terrorism facility vary quite widely from \$ 200,000 to \$ 2 million... Instructions for how to mass produce, purify, and concentrate microbes can be found in textbooks and scientific journals".

### Concluding reflections

The Heathrow nuclear material is now seen as 'deadly' but the UK-based media agency reported that the uranium was 'not weapons-grade' – and so could not be used to manufacture a thermo-nuclear weapon, as per sources.

It appears that disproportionate emphasis on mythical "dirty bombs" vis-à-vis chemical / bio- bombs is meant to press and exploit non-major or nuclear-threshold states. "Dirty" or clean bomb attacks by "terrorists" need to be understood and explained within the broader frame of "terrorism". The US authorities have recorded over 175 cases worldwide of nuclear materials (not bombs) being smuggled out of former Soviet Union territories and other countries. The Federation of American Scientists, nevertheless, admits that "radiological attacks could result in some deaths but not hundreds of thousands of casualties that could be caused by a crude nuclear weapon". The US scientist concluded, "Significant quantities of radioactive material have been lost or stolen from US facilities during the past few years. Radiological materials are stored in thousands of facilities around the US, many of which may not be adequately protected against theft by determined terrorists". Materials like Iridium-192, Cobalt 60 (Gamma emitter), Cesium-137 (Gamma emitter), Americium (Alpha emitter) and even plutonium could still be stolen from over 21,000 laboratories, food irradiation plants, oil drilling facilities and medical centres in the USA. But, it is not an easy job to make an effective "dirty bomb".





It appears that “dirty bomb” is a hoax to exploit nouveau-nuclear or nuclear-threshold nations. It could be a weapon of mass disruption, but not a weapon of mass destruction. Real threat emanates from chemical or bio-weapons.

**Mr. Amjed Jaaved** has been contributing free-lance for over five decades. His contributions stand published in the leading dailies at home and abroad (Nepal, Bangladesh, et. al.). He is author of seven e-books including *Terrorism, Jihad, Nukes and other Issues in Focus* (ISBN: 9781301505944). He holds degrees in economics, business administration, and law.

## GammaPix Pro

Source: <https://www.imageinsightinc.com/radioactivity-detection>

GammaPix Pro provides a low-cost alternative for First Responders to a Personal Radioactivity Detector (PRD). The app works with an unmodified smartphone or tablet camera to detect potentially harmful gamma radiation. The app automatically measures and reports radioactivity levels to a Command Center to help protect the community from radioactivity accidents (such as occurred in Fukushima, Japan) or a terrorist attack by a *Dirty Bomb* or a quietly placed *Radiation Exposure Device (RED)*.

Organizations have the choice of a secure, cloud-based data collection and analysis Command Center, or they may host their own, local GammaPix Command Center server. With the Data Portability option, GammaPix Pro software can instead direct data to any 3rd-Party Common Operating Picture data dashboard.

GammaPix radioactivity detection software works because of the inherent sensitivity of digital cameras to ionizing gamma radiation. Software detects the telltale signatures created when gamma rays interact with the camera's image chip.

Validated at national labs, and twice designated a Qualified Anti-Terrorism Technology (QATT) under the U.S. Department of Homeland Security-administered SAFETY Act, GammaPix software is a proven technology.



### GammaPix Professional™ app features:

- Real-time plots show radioactivity history
- choice of front or back camera
- Unattended mode for periodic radioactivity measurement and reporting
- Automatic warning of elevated radioactivity
- Measures 2mR/hr in under 1 minute
- Hands free operation using audible signals for radioactivity levels
- Emergency response dose measurement
- Device functions controllable from Command Center
- View other First responder data using Connect function
- Radioactivity history on map or list



GAMMAPIX

Extraordinary Capability  
from Ordinary Devices






Bright signatures for gamma ray hits on a 10sec exposure from an iPhone close to a small radioactive source

## Nuclear Notebook: United States nuclear weapons, 2023

By Hans M. Kristensen and Matt Korda

Bulletin of the Atomic Scientists, 79:1, 28-52

Source: <https://thebulletin.org/premium/2023-01/nuclear-notebook-united-states-nuclear-weapons-2023/>

*The Nuclear Notebook is researched and written by Hans M. Kristensen, director of the Nuclear Information Project with the Federation of American Scientists, and Matt Korda, a senior research associate with the project. The Nuclear Notebook column has been published in the Bulletin of the Atomic Scientists since 1987. This issue examines the status of the US nuclear arsenal. The US nuclear arsenal*



remained roughly unchanged in the last year, with the Department of Defense maintaining an estimated stockpile of approximately 3,708 warheads. Of these, only about 1,770 warheads are deployed, while approximately 1,938 are held in reserve. Additionally, approximately 1,536 retired warheads are awaiting dismantlement, giving a total inventory of approximately 5,244 nuclear warheads. Of the approximately 1,770 warheads that are deployed, 400 are on land-based intercontinental ballistic missiles, roughly 970 are on submarine-launched ballistic missiles, 300 are at bomber bases in the United States, and 100 tactical bombs are at European bases.

**Table 1.** United States nuclear forces, 2023.

Type/Designation	No.	Year deployed	Warheads x yield (kilotons)	Warheads (total available) <sup>a</sup>
<b>ICBMs</b>				
LGM-30G Minuteman III				
Mk12A	200	1979	1–3 W78 x 335 (MIRV)	600 <sup>b</sup>
Mk21/SERV	200	2006 <sup>c</sup>	1 W87 x 300	200 <sup>d</sup>
<b>Total</b>	<b>400<sup>e</sup></b>			<b>800<sup>f</sup></b>
<b>SLBMs</b>				
UGM-133A Trident II D5/LE	<b>14/280<sup>g</sup></b>			
Mk4A		2008 <sup>h</sup>	1–8 W76-1 x 90 (MIRV)	1,511 <sup>i</sup>
Mk4A		2019	1–2 W76-2 x 8 (MIRV) <sup>j</sup>	25 <sup>k</sup>
Mk5		1990	1–8 W88 x 455 (MIRV)	384
<b>Total</b>	<b>14/280</b>			<b>1,920<sup>l</sup></b>
<b>Bombers</b>				
B-52H Stratofortress	87/46 <sup>m</sup>	1961	ALCM/W80-1 x 5–150	500
B-2A Spirit	20/20	1994	B61-7 x 10–360/-11 x 400 B83-1 x low-1,200	288
<b>Total</b>	<b>107/66<sup>n</sup></b>			<b>788<sup>o</sup></b>
<b>Total strategic forces</b>				<b>3,508</b>
<b>Nonstrategic forces</b>				
F-15E, F-16C/D, DCA	n/a	1979	1–5 B61-3/-4 bombs x 0.3–170 <sup>p</sup>	200
<b>Total</b>				<b>200<sup>q</sup></b>
<b>Total stockpile</b>				<b>3,708</b>
Deployed				1,770 <sup>r</sup>
Reserve (hedge and spares)				1,938
<b>Retired, awaiting dismantlement</b>				<b>1,536</b>
<b>Total Inventory</b>				<b>5,244</b>

ALCM: air-launched cruise missile; DCA: dual-capable aircraft; ICBM: intercontinental ballistic missile; LGM: silo-launched ground-attack missile; MIRV: multiple independently targetable reentry vehicle; SERV: security-enhanced reentry vehicle; SLBM: submarine-launched ballistic missile.

<sup>a</sup>Lists total warheads available. Only a portion of these are deployed with launchers. See individual endnotes for details.

<sup>b</sup>Roughly 200 of these are deployed on 200 Minuteman IIIs equipped with the Mk-12A reentry vehicle. The rest are in central storage.

<sup>c</sup>The W87 was initially deployed on the MX/Peacekeeper in 1986 but first transferred to the Minuteman in 2006.

<sup>d</sup>The 200 Mk21-equipped ICBMs can each carry one W87. The estimated remaining 340 W87s are in storage. Excess W87 pits are planned for use in the W78 Replacement Program, previously designated IW-1 but now called W87-1.

<sup>e</sup>Another 50 ICBMs are in storage for potential deployment in 50 empty silos.

<sup>f</sup>Of these ICBM warheads, 400 are deployed on operational missiles and the rest are in long-term storage.

<sup>g</sup>The first figure is the total number of nuclear-powered ballistic missile submarines (SSBNs) in the US fleet; the second is the maximum number of missiles that they can carry. All 14 SSBNs have now completed their mid-life reactor refueling overhauls and could potentially carry 280 missiles, but 2–4 are undergoing repairs at any given time and the Pentagon has stated that no more than 240 SLBMs will be deployed. The life-extended Trident II D5LE is replacing the original missile.

<sup>h</sup>The W76-1 is a life-extended version of the W76-0 that was first deployed in 1978.

<sup>i</sup>All W76-0 warheads are thought to have now been replaced on ballistic missile submarines by W76-1 warheads, but some are still in storage, and more have been retired and are awaiting dismantlement.

<sup>j</sup>The W76-2 is a single-stage low-yield modification of the W76-1 with an estimated yield of 8 kilotons.

<sup>k</sup>Assumes two SLBMs, each with one W76-2, available for each deployable SSBN.

<sup>l</sup>Of these SLBM warheads, approximately 1,000 are deployed on missiles loaded in ballistic missile submarine launchers.

<sup>m</sup>Of the 87 B-52s, 76 are in the active inventory. Of those, 46 are nuclear-capable, of which less than 40 are normally deployed.

<sup>n</sup>The first figure is the total aircraft inventory, including those used for training, testing, and back-up; the second is the portion of the primary-mission aircraft inventory estimated to be tasked with nuclear missions. The United States has a total of 66 nuclear-capable bombers (46 B-52s and 20 B-2s), but normally only about 50 nuclear bombers are deployed, with the remaining aircraft in overhaul.

<sup>o</sup>Of these bomber weapons, up to 300 are deployed at bomber bases. These include an estimated 200 ALCMs at Minot Air Force Base and approximately 100 bombs at Whiteman Air Force Base. The remaining weapons are in long-term storage. B-52H aircraft are no longer tasked with delivering gravity bombs.

<sup>p</sup>The F-15E can carry up to 5 B61s. Some tactical B61s in Europe are available for NATO DCAs (F-16MLU, PA-200). The maximum yield of the B61-3 is 170 kilotons, while the maximum yield of the B61-4 is 50 kilotons.

<sup>q</sup>An estimated 100 B61-3 and –4 bombs are deployed in Europe, of which about 60 are earmarked for use by NATO aircraft. The remaining 100 bombs are in central storage in the United States as backup and contingency missions in the Indo-Pacific region. The new B61-12 gravity bomb is in production and will begin replacing the older versions in Europe and the United States from early-2023.

<sup>r</sup>Deployed warheads include approximately 1,370 on ballistic missiles (400 on ICBMs and 970 on SLBMs), 300 weapons at heavy bomber bases, and 100 nonstrategic bombs deployed in Europe.

Jan 16 – At the beginning of 2023, the US Department of Defense maintained an estimated stockpile of approximately 3,708 nuclear warheads for delivery by ballistic missiles and aircraft. Most of the warheads in the stockpile are not deployed but rather stored for potential upload onto missiles and aircraft as necessary. We estimate that approximately 1,770 warheads are currently deployed, of which roughly 1,370





strategic warheads are deployed on ballistic missiles and another 300 at strategic bomber bases in the United States. An additional 100 tactical bombs are deployed at air bases in Europe. The remaining warheads — approximately 1,938 — are in storage as a so-called hedge against technical or geopolitical surprises. Several hundred of those warheads are scheduled to be retired before 2030. (See [Table 1](#).) In addition to the warheads in the Department of Defense stockpile, approximately 1,536 retired — but still intact — warheads are stored under the custody of the Department of Energy and are awaiting dismantlement, giving a total US inventory of an estimated 5,244 warheads. Between 2010 and 2018, the US government publicly disclosed the size of the nuclear weapons stockpile; however, in 2019 and 2020, the Trump administration rejected requests from the Federation of American Scientists to declassify the latest stockpile numbers (Aftergood 2019; Kristensen 2019a, 2020d). In 2021, the Biden administration restored the United States' previous transparency levels by declassifying both numbers for the entire history of the US nuclear arsenal until September 2020 —including the missing years of the Trump administration. This effort revealed that the United States' nuclear stockpile consisted of 3,750 warheads in September 2020 — only 72 warheads fewer than the last number made available in September 2017 before the Trump administration reduced the US government's transparency efforts (US State Department 2021a). We estimate that the stockpile will continue to decline over the next decade-and-a-half as modernization programs consolidate the remaining warheads. The Biden administration's declassification also revealed that the pace of warhead dismantlement has slowed significantly in recent years. While the United States dismantled on average more than 1,000 warheads per year during the 1990s, in 2020 it dismantled only 184 warheads (US State Department 2021a). According to the Department of Energy, "[d]ismantlement rates are affected by many factors, including appropriated program funding, logistics, legislation, policy, directives, weapon system complexity, and the availability of qualified personnel, equipment, and facilities" (US Department of Energy 2022, 2–15). The Department of Energy's 2022 Stockpile Stewardship and Management Plan indicated that the United States is currently "on pace to completely dismantle the weapons that were retired at the end of FY 2008 by the end of FY 2022" (US Department of Energy 2022, 2–15).

In the past, the Obama and Biden administrations often declassified the warhead stockpile and dismantlement numbers around the time of major arms control conferences. That did not happen in 2022, however, and the Biden administration has so far not acted on requests from the Federation of American Scientists to disclose the numbers for 2021 or 2022. A decision to no longer declassify these numbers would not only contradict the Biden administration's own practice from 2020, but also represent a return to Trump-era levels of nuclear opacity. Such increased nuclear secrecy undermines US calls for Russia and China to increase transparency of their nuclear forces.

The US nuclear weapons are thought to be stored at an estimated 24 geographical locations in 11 US states and five European countries (Kristensen and Korda 2019, 124). The location with the most nuclear weapons by far is the large Kirtland Underground Munitions and Maintenance Storage Complex (KUMMSC) south of Albuquerque, New Mexico. Most of the weapons in this location are retired weapons awaiting dismantlement at the Pantex Plant in Texas. The state with the second-largest inventory is Washington, which is home to the Strategic Weapons Facility Pacific and the ballistic missile submarines at Naval Submarine Base Kitsap. The submarines operating from this base carry more deployed nuclear weapons than any other base in the United States.

### Implementing the New START treaty

The United States appears to be in compliance with the New Strategic Arms Reduction Treaty (New START) limits. The most recent data exchange, on September 1, 2022, indicated that the United States deployed 659 strategic launchers with 1,420 attributed warheads (US State Department 2022a). This is a decrease of six deployed strategic launchers and an increase of 31 attributed warheads over the past 12 months. However, these changes do not reflect actual changes in the US arsenal but are caused by normal fluctuations from launchers moving in and out of maintenance. The United States has not reduced its total inventory of strategic launchers since 2017 (Kristensen 2020a).

The warhead numbers reported by the US State Department differ from the estimates presented in this Nuclear Notebook, though there are reasons for this. The New START counting rules artificially attribute one warhead to each deployed bomber, even though US bombers do not carry nuclear weapons under normal circumstances. Also, this Nuclear Notebook counts weapons stored at bomber bases that can quickly be loaded onto the aircraft, as well as nonstrategic nuclear weapons in Europe. This provides a more realistic picture of the status of US nuclear forces than the treaty's artificial counting routes.

Since the treaty entered into force in February 2011, the biannual aggregate data show the United States has cut a total of 324 strategic launchers, 223 deployed launchers, and 380 deployed strategic warheads from its inventory (US State Department 2011). The warhead reduction represents approximately 11 percent of the 3,708 warheads remaining in the US stockpile, and approximately 8 percent of the total US arsenal of 5,428 stockpiled and retired warheads awaiting dismantlement. The 2022 Nuclear Posture Review (NPR) states that the "[t]he United States will field and maintain strategic nuclear delivery systems and deployed weapons in compliance with New START Treaty central limits as long as the Treaty remains in force" (US Department of Defense 2022b, 20). In 2021, the United States and Russia extended the treaty by mutual agreement, until February 2026.





The United States is currently 41 launchers and 130 warheads below the treaty limit for deployed strategic weapons but has 119 deployed launchers more than Russia — a significant gap that is just under the size of an entire US Air Force intercontinental ballistic missile (ICBM) wing. It is notable that Russia has not sought to reduce this gap by deploying more strategic launchers. Instead, the Russian launcher deficit has increased since February 2018.

If New START expired without a follow-on treaty in place, both the United States and Russia could upload several hundred extra warheads onto their launchers. This means that the treaty has proven useful thus far in keeping a lid on both countries' deployed strategic forces. Additionally, both countries would lose a critical node of transparency into each other's nuclear forces. As of December 8, 2022, the United States and Russia had completed a combined 328 on-site inspections and exchanged 25,017 notifications (US State Department 2022b).

On-site inspections between the two countries have been paused since early 2020 due to COVID-19, and on August 8, 2022, Russia announced that it was “temporarily withdrawing its facilities subject to inspections” because of what it claimed was unfair behavior by the United States (Russian Federation Ministry of Foreign Affairs 2022). Moreover, only one day before a long-awaited meeting of the Bilateral Consultative Commission, Russia delayed the meeting because of US arms supplies to Ukraine (Dixon 2022).

### The Nuclear Posture Review and nuclear modernization

The classified version of the Biden administration's Nuclear Posture Review (NPR) was released to Congress in March 2022; however, its public release was delayed until October 2022 due to the Russian invasion of Ukraine (US Department of Defense 2022a). The 2022 NPR is much shorter than the previous four NPRs and, unlike them, embedded into the National Defense Strategy document alongside the Missile Defense Review (US Department of Defense 2022b).

The 2022 NPR's conclusions are broadly consistent with the Trump administration's 2018 NPR (albeit with minor adjustments), which in turn followed the broad outlines of the Obama administration's 2010 NPR to modernize the entire nuclear weapons arsenal. Just like previous NPRs, the Biden administration's NPR rejected policies of nuclear “no-first-use” or “sole purpose,” instead preferring to leave the option open for nuclear weapons to be used under “extreme circumstances to defend the vital interests of the United States or its allies and partners” (US Department of Defense 2022b, 9). However, the 2022 NPR notes that the United States “retain[s] the goal of moving toward a sole purpose declaration and [it] will work with [its] Allies and partners to identify concrete steps that would allow [it] to do so” (US Department of Defense 2022b, 9).

The 2022 NPR offers slightly modified language relative to the 2018 NPR on the role of nuclear weapons in US military strategy. The three stated roles are: 1) “Deter strategic attack;” 2) “Assure Allies and partners;” and 3) “Achieve U.S. objectives if deterrence fails” (US Department of Defense 2022b, 7). “Deterring strategic attacks” is a different formulation than the “deterrence of nuclear and non-nuclear attack” language in the 2018 NPR, but the new NPR makes it clear that “strategic” also accounts for existing and emerging non-nuclear attacks (US Department of Defense 2022b, 8).

Additionally, the 2022 NPR states: “‘Hedging against an uncertain future’ is no longer a stated role for nuclear weapons” (US Department of Defense 2022b, 7). This likely does not mean an actual reduction in the role of nuclear weapons but, rather, a roll-back of Trump administration language to that of the Obama administration. Rather than a role for nuclear weapons, “hedging against an uncertain future” is more about managing the weapons production complex. (For a detailed analysis of the 2022 NPR, see Kristensen and Korda 2022).

The most significant change between the Biden and Trump NPRs was the walking back of two Trump-era commitments — specifically, canceling the new sea-launched cruise missile and retiring the B83-1 gravity bomb.

In 2018, the Trump administration proposed two new supplemental capabilities to “enhance the flexibility and range of its tailored deterrence options” (US Department of Defense 2018, 34). The first of these new capabilities included modifying “a small number” of the existing W76-1 90-kiloton two-stage thermonuclear warheads to single-stage warheads by “turning off” the secondary stage (a technical term representing a part of the warhead) to limit the yield to what the primary (another technical term) can produce (an estimated 8 kilotons). This new warhead (W76-2), the 2018 NPR claimed, would be necessary to “help counter any mistaken perception of an exploitable ‘gap’ in US regional deterrence capabilities” (US Department of Defense 2018, XXII). The W76-2 was first deployed in the Atlantic Ocean in late 2019 onboard a nuclear-powered ballistic missile submarine (SSBN), the *USS Tennessee* (SSBN-734) (Arkin and Kristensen 2020). In December 2019, Undersecretary of Defense for Policy John Rood told reporters that the low-yield Trident warhead was “very stabilizing” and was in no way supporting the concept of early use of low-yield nuclear weapons (Kreisher 2019), even though the NPR explicitly stated the weapon is being acquired to provide “a prompt response option” (US Department of Defense 2018).

The Biden NPR agreed “that the W76-2 [warhead] currently provides an important means to deter limited nuclear use;” however, the review left the door open for the weapon to be removed in the future, noting that “[i]ts deterrence value will be re-evaluated as the F-35A [aircraft] and LRSO [air-launched cruise missile] are fielded, and in light of the security environment and plausible deterrence scenarios we could



face in the future” (US Department of Defense 2022b, 20). This passage suggests that the W76-2 warhead could potentially be removed from service closer to the end of the decade.

The second supplemental capability proposed by the Trump administration was a new nuclear-armed sea-launched cruise missile (SLCM-N) to “provide a needed nonstrategic regional presence, an assured response capability, and an Intermediate-Range Nuclear Forces (INF) Treaty-compliant response to Russia’s continuing Treaty violation.” The Trump NPR asserted that the new SLCM-N “may provide the necessary incentive for Russia to negotiate seriously a reduction of its nonstrategic nuclear weapons, just as the prior Western deployment of Intermediate-Range Nuclear Forces in Europe led to the 1987 INF Treaty” (US Department of Defense 2018, 55). However, this has not proved to be the case. Furthermore, the logic behind this argument is flawed: The US arsenal already includes nearly 1,000 gravity bombs and air-launched cruise missiles, combined, with low-yield warhead options (Kristensen 2017a). Moreover, US Strategic Command has already strengthened strategic bombers’ support of NATO in response to Russia’s more provocative and aggressive behavior (see below): 46 B-52 bombers are currently equipped with the AGM-86B air-launched cruise missile and both the B-52 and the new B-21 bombers will receive the new AGM-181 Long-Range Standoff Weapon (LRSO), which will have essentially the same capabilities as the sea-launched cruise missile proposed by the 2018 NPR.

Furthermore, the US Navy used to have a nuclear sea-launched cruise missile (the TLAM-N) but completed retirement of the system by 2013 because it was redundant and no longer needed. All other nonstrategic nuclear weapons — with the exception of gravity bombs for fighter bombers — have also been retired because there was no longer any military need for them, despite Russia’s larger nonstrategic nuclear weapons arsenal. The suggestion that a US sea-launched cruise missile could motivate Russia to return to compliance with the INF Treaty is flawed because Russia embarked upon its current violation of the treaty at a time when the TLAM-N was still in the US arsenal, and because the Trump administration since withdrew the United States from the INF Treaty.

Instead, Russia’s decisions about the size and composition of its nonstrategic arsenal appear to be driven by the US military’s superiority in conventional forces, not by the US nonstrategic nuclear arsenal or by the yield of a particular weapon. The pursuit by the United States of a new nuclear sea-launched cruise missile to “provide a needed nonstrategic regional presence” in Europe and Asia could reinforce Russia’s reliance on nonstrategic nuclear weapons. It could also potentially trigger Chinese interest in such a capability — especially if combined with the parallel expansion of US long-range conventional strike capabilities, including the development of new conventional INF-range missiles. Moreover, the development of a nuclear sea-launched cruise missile would violate the United States’ pledge made in the 1992 Presidential Nuclear Initiative not to develop any new types of nuclear sea-launched cruise missiles (Koch 2012, 40).

One final argument against the sea-launched cruise missile is that nuclear-capable vessels triggered frequent and serious political disputes during the Cold War when they visited foreign ports in countries that did not allow nuclear weapons on their territory. In the case of New Zealand, diplomatic relations have only recently — some 30 years later — recovered from those disputes. Reconstitution of a nuclear sea-launched cruise missile would reintroduce this foreign relations irritant and needlessly complicate relations with key allied countries in Europe and Northeast Asia.

The Biden administration’s Nuclear Posture Review echoes many of these arguments, concluding that the “SLCM-N was no longer necessary given the deterrence contribution of the W76-2, uncertainty regarding whether SLCM-N on its own would provide leverage to negotiate arms control limits on Russia’s NSNW, and the estimated cost of SLCM-N in light of other nuclear modernization programs and defense priorities” (US Department of Defense 2022b, 20). The Biden administration used even stronger language against the SLCM-N in an October 2022 statement suggesting that “the SLCM-N, which would not be delivered before the 2030s, is unnecessary and potentially detrimental to other priorities” (US Office of Management and Budget 2022). In its statement, the administration noted that “[f]urther investment in developing SLCM-N would divert resources and focus from higher modernization priorities for the U.S. nuclear enterprise and infrastructure, which is already stretched to capacity after decades of deferred investments. It would also impose operational challenges on the Navy” (US Office of Management and Budget 2022). This is because to carry nuclear weapons onboard, Navy crews would require specialized training and would need to adopt strict security protocols that could operationally hinder these multipurpose vessels (Woolf 2022). Additionally, deployed nuclear sea-launched cruise missiles would take the place of more flexible conventional munitions for vessels on patrol, thus incurring a substantial opportunity cost (Moulton 2022).

Despite the Biden NPR’s conclusions, however, the SLCM-N may ultimately be funded through congressional intervention. The FY 2023 National Defense Authorization Act authorized \$25 million in continued funding for the SLCM-N, even though the Biden administration’s FY 2023 budget request recommended zeroing out the system’s funding entirely (US House of Representatives 2022; US Senate 2022). It remains to be seen whether the \$25 million for the SLCM-N will ultimately be appropriated.

The Biden administration’s NPR also continues retirement of the B83-1 gravity bomb — the last nuclear weapon with a megaton-level yield in the US nuclear arsenal — “due to increasing limitations on its capabilities and rising maintenance costs” (US Department of Defense 2022b, 20). The Trump administration had put on hold previous plans to retire the B83-1 (US Department of Defense 2018). The Biden NPR appears to hint at an eventual replacement weapon “for improved defeat” of hard and deeply



buried targets; however, this new weapon is not identified in the review (US Department of Defense 2022b, 20). It is possible, but unknown at this point, that this language concerns the future replacement of the B61-11 nuclear earth-penetrator gravity bomb.

The complete nuclear modernization (and maintenance) program will continue well beyond 2039 and, based on the Congressional Budget Office's estimate, will cost \$1.2 trillion over the next three decades. Notably, although the estimate accounts for inflation (Congressional Budget Office 2017), other estimates forecast that the total cost will be closer to \$1.7 trillion (Arms Control Association 2017). Whatever the actual price tag will be, it is likely to increase over time, resulting in increased competition with conventional modernization programs planned for the same period. The Trump NPR belittled concerns about affordability issues in the nuclear modernization program and instead labeled it "an affordable priority," pointing out that the total cost is only a small portion of the overall defense budget (US Department of Defense 2018, XI). There is little doubt, however, that limited resources, competing nuclear and conventional modernization programs, tax cuts, and the rapidly growing US budget deficit will present significant challenges to the overall nuclear modernization program.

The National Nuclear Security Administration (NNSA) and the Department of Defense have also proposed developing several other new nuclear warheads, including the W93 navy warhead. The NNSA's Stockpile Stewardship and Management Plan (SSMP) of December 2020 doubled the number of new nuclear warhead projects for the next 20 years compared to its 2019 plan (National Nuclear Security Administration (NNSA) 2020b).

### Nuclear planning and nuclear exercises

In addition to the Nuclear Posture Review, the nuclear arsenal and the role it plays is shaped by plans and exercises that create the strike plans and practice how to carry them out. The changes in the Trump administration's NPR triggered new guidance from the White House and the Department of Defense that replaced the Obama administration's guidance from 2013 (Kristensen 2013). The first of these was a new Nuclear Employment Guidance document signed by President Trump in April 2019, which in turn was implemented by the Nuclear Weapons Employment Planning and Posture Guidance signed by the Defense Secretary (US Department of Defense 2020, 1). The changes in these documents were sufficient to trigger a change in the strategic war plan known as OPLAN 8010-12, the nuclear employment portion of what was previously known as the Single Integrated Operations Plan (SIOP). The last update entered into effect on April 30, 2019 (US Strategic Command 2019).

OPLAN 8010-12 consists of "a family of plans" directed against four identified adversaries: Russia, China, North Korea, and Iran. Known as "Strategic Deterrence and Force Employment," OPLAN 8010-12 first entered into effect in July 2012 in response to Operations Order Global Citadel signed by the defense secretary. The plan is flexible enough to absorb normal changes to the posture as they emerge, including those flowing from the NPR. Several updates have been made since 2012, but more substantial updates will trigger the publication of what is considered a "change." The April 2019 change refocused the plan toward "great power competition," incorporated a new cyber plan, and reportedly blurred the line between nuclear and conventional attacks by "fully incorporat[ing] non-nuclear weapons as an equal player" (Arkin and Ambinder 2022a, 2022b).

OPLAN 8010-12 also "emphasizes escalation control designed to end hostilities and resolve the conflict at the lowest practicable level" by developing "readily executable and adaptively planned response options to de-escalate, defend against, or defeat hostile adversary actions" (US Strategic Command 2012). These passages are notable, not least of which because the Trump administration's NPR criticized Russia for an alleged willingness to use nuclear weapons in a similar manner, as part of a so-called escalate-to-deescalate strategy.

The 2020 Nuclear Employment Strategy, which reads more like an academic article than a strategy document, reiterates this objective: "If deterrence fails, the United States will strive to end any conflict at the lowest level of damage possible and on the best achievable terms for the United States, and its allies, and partners. One of the means of achieving this is to respond in a manner intended to restore deterrence. To this end, elements of US nuclear forces are intended to provide limited, flexible, and graduated response options. Such options demonstrate the resolve, and the restraint, necessary for changing an adversary's decision calculus regarding further escalation" (US Department of Defense 2020, 2). This objective is not just directed at nuclear attacks, as the 2018 NPR called for "expanding" US nuclear options against "non-nuclear strategic attacks."

OPLAN 8010-12 is a whole-of-government plan that includes the full spectrum of national power to affect potential adversaries. This integration of nuclear and conventional kinetic and non-kinetic strategic capabilities into one overall plan is a significant change from the strategic war plan of the Cold War that was almost entirely nuclear. In 2017, former US Strategic Command commander Gen. John Hyten explained the scope of modern strategic planning:

"I'll just say that the plans that we have right now, one of the things that surprised me most when I took command on November 3 was the flexible options that are in all the plans today. So we actually have very flexible options in our plans. So if something bad happens in the world and there's a response and I'm on the phone with the Secretary of Defense and the President and the entire staff, which is the Attorney General, Secretary of State, and everybody, I actually have a series of very flexible options from conventional all the way up to large-scale nuke that I can advise the president on to give him options on what he would want to do." "So,





I'm very comfortable today with the flexibility of our response options. Whether the President of the United States and his team believes that that gives him enough flexibility is his call. So we'll look at that in the Nuclear Posture Review. But I've said publicly in the past that our plans now are very flexible."

"And the reason I was surprised when I got to [Strategic Command] about the flexibility, is because the last time I executed or was involved in the execution of the nuclear plan was about 20 years ago, and there was no flexibility in the plan. It was big, it was huge, it was massively destructive, and that's all there. We now have conventional responses all the way up to the nuclear responses, and I think that's a very healthy thing (Hyten 2017)."

The 2022 National Defense Strategy and Nuclear Posture Review reaffirm the importance of flexibility, integration, and tailored plans (US Department of Defense 2022f). To practice and fine-tune these plans, the armed forces conducted several nuclear-related exercises in 2021 and early 2022. These included Strategic Command's Global Lightning exercises in March 2021 and January 2022, which is a command-and-control and battle staff exercise designed to assess joint operational readiness across all Strategic Command's mission areas. To that end, a Global Lightning exercise typically links to several other exercises. In 2021, Global Lightning was integrated with US European Command and US Space Command, and it involved the deployment of B-52 bombers from Barksdale and Minot Air Force Bases (US Strategic Command 2021a; Kristensen 2021a). In 2022, Global Lightning was integrated with US Indo-Pacific Command (US Strategic Command 2022a).

In September 2022, Air Force Global Strike Command conducted exercise Prairie Vigilance, an annual nuclear bomber exercise at Minot Air Force Base in North Dakota, which practiced the 5th Bomb Wing's B-52 strategic readiness and nuclear generation operations (US Air Force 2022a). The exercise was followed in November 2022 by exercise Spirit Vigilance at Whiteman Air Force Base in Missouri, which practiced the capability of the 509th and 301st bomb wings to "rapidly generate and deploy" B-2 stealth-bombers to demonstrate they are ready to carry out their mission of "executing nuclear operations and global strike, anytime, anywhere." The exercise included an "Elephant Walk" of eight B-2 bombers on the runway at the same time (US Air Force 2022j). The Vigilance exercises normally lead up to Strategic Command's annual week-long Global Thunder large-scale exercise toward the end of the year, which "provides training opportunities that exercise all US Strategic Command mission areas, with a specific focus on nuclear readiness" (US Strategic Command 2021b). This year's Global Thunder exercise was delayed but will probably happen in early-2023.

These exercises coincide with steadily increasing US bomber operations in Europe since Russia's invasion of Ukraine in 2014 and again in 2022. Before that, one or two bombers would deploy for an exercise or airshow. But since then, the number of deployments and bombers has increased, and the mission changed. Very quickly after the Russian annexation of Crimea, the US Strategic Command increased the role of nuclear bombers in support of the US European Command (Breedlove 2015), which, in 2016, put into effect a new standing war plan for the first time since the Cold War (Scapparotti 2017). Before 2018, the bomber operations were called the Bomber Assurance and Deterrence missions but have been redesigned as Bomber Task Force missions to bring a stronger offensive capability to the forward bases. Whereas the mission of Bomber Assurance and Deterrence was to train with allies and have a visible presence to deter Russia, the mission of the Bomber Task Force is to move a fully combat-ready bomber force into the European theater. "It's no longer just to go partner with our NATO allies or to go over and have a visible presence of American air power," according to the commander of the 2nd Bomb Wing. "That's part of it, but we are also there to drop weapons if called to do so" (Wrightsmann 2019). These changes are evident in the types of increasingly provocative bombers operations over Europe, in some cases very close to the Russian border (Kristensen 2022a).

These changes are important indications of how US strategy has changed in response to deteriorating East-West relations and the new "great power competition" and "strategic competition" strategy promoted by the Trump and Biden administrations, respectively. They also illustrate a growing integration of nuclear and conventional capabilities, as reflected in the new strategic war plan. The deployment of four B-52s to Royal Air Force Fairford in Gloucestershire, England in March 2019, for example, included two nuclear-capable aircraft and two that have been converted to conventional-only missions. NATO's official announcement of the exercise said that the B-52 bombers "can carry both conventional and nuclear weapons" when, in fact, nearly half of them — 41 out of 87 — cannot because they have been denuclearized under the New START treaty. These types of exercises have continued following Russia's invasion of Ukraine: In August 2022, two B-52s — one version that is nuclear-capable and one that is denuclearized — overflew Sweden, the first overflight since it applied for NATO membership in May 2022 (Kristensen 2022b). And on September 21, 2022 — the very same day Russian President Vladimir Putin threatened to use nuclear weapons to defend newly annexed regions of Ukraine — the four B-52s in Europe took off from the RAF Fairford station and returned to the United States (two of them via northern Sweden) at the same time their Wing at Minot AFB was in the middle of the Prairie Vigilance nuclear exercise. The close integration of nuclear and conventional bombers into the same task force can have significant implications for crisis stability, misunderstandings, and the risk of nuclear escalation because it could result in misperceptions about what is being signaled and result in overreactions.

Additionally, since 2019, US bombers have been practicing what is known as an "agile combat employment" strategy by which all bombers "hopscotch" to a larger number of widely dispersed smaller



airfields — including airfields in Canada — in the event of a crisis. This strategy is intended to increase the number of airmports for a potential adversary seeking to destroy the US bomber force, therefore raising the ante for an adversary to attempt such a strike and increasing the force's survivability if it does (Arkin and Ambinder 2022a). Over the past year, the Strategic Air Command executed 127 Bomber Task Force missions (US Strategic Command 2022b, 14).

### Land-based ballistic missiles

The US Air Force operates a force of 400 silo-based Minuteman III ICBMs split across three wings: the 90th Missile Wing at F. E. Warren Air Force Base in Colorado, Nebraska, and Wyoming; the 91st Missile Wing at Minot Air Force Base in North Dakota; and the 341st Missile Wing at Malmstrom Air Force Base in Montana. In addition to the 400 silos with missiles, another 50 silos are kept “warm” to load stored missiles if necessary. Each wing has three squadrons, each with 50 Minuteman III silos collectively controlled by five launch control centers.

The 400 ICBMs as deployed carry one warhead each, either a 300-kiloton W87/Mk21 or a 335-kiloton W78/Mk12A. ICBMs equipped with the W78/Mk12A, however, could theoretically be upgraded to carry two or three independently targetable warheads each, for a total of 800 warheads available for the ICBM force. The US Air Force occasionally test-launches Minuteman III missiles with unarmed multiple reentry vehicles (MIRVs) to maintain and announce the capability to reequip the Minuteman III missiles with reentry vehicles. The most recent such test occurred on September 7, 2022, when a Minuteman III equipped with three reentry vehicles was launched approximately 4,200 miles (6,759 kilometers) to the US ICBM testing ground at the Kwajalein Atoll in the Marshall Islands (US Air Force 2022b).

The Minuteman III missiles completed a multibillion-dollar, decade-long modernization program in 2015 to extend their service life until 2030. Although the United States did not officially deploy a new ICBM, the upgraded Minuteman III missiles “are basically new missiles except for the shell,” according to Air Force personnel (Pampe 2012).

An ongoing US Air Force modernization program involves upgrades to the Mk21 reentry vehicles' arming, fuzing, and firing unit at a cost of slightly over a billion dollars in total. The publicly stated purpose of this refurbishment is to extend the vehicles' service lives, but the effort appears to also involve adding a “burst height compensation” to enhance the targeting effectiveness of the warheads (Postol 2014). A total of 693 fuze replacements were initially planned; however, the new fuzes will also reportedly be deployed on the Minuteman III's replacement missile, which means that the fuze modernization program is likely to expand significantly to accommodate those new missiles (Woolf 2021, 15–16). The fuze integration program is expected to begin full-rate production in FY 2024 (Reilly 2021). The effort complements a similar fuze upgrade underway to the Navy's W76-1/Mk4A warhead. The enhanced targeting capability might also allow for lowering the yield on future warhead designs.

It is possible to do a second life-extension of the Minuteman III missile. In March 2019, Air Force's Deputy Chief of Staff for Strategic Deterrence and Nuclear Integration, Lt. Gen. Richard M. Clark, noted in his testimony to the House Subcommittee on Strategic Forces that there was one last opportunity to extend the life of missiles before the Minuteman III would have to be retired and replaced (Clark 2019). A July 2022 environmental impact assessment revealed that the Air Force did consider such a life extension as well as three other options, including deploying a “[s]mall ICBM [...] with lower procurement costs and enhanced accuracy;” working with “a private spacecraft company” to deploy commercial launch vehicles equipped with nuclear-capable reentry vehicles; and converting the existing Trident II D5 sea-launched ballistic missile (SLBM) to be deployed in land-based silos. However, the Air Force ultimately eliminated all four of these options because they did not meet all its “selection standards,” which included criteria such as sustainability, performance, safety, riskiness, and capacity for integration into existing or proposed infrastructure (US Air Force 2022e). Instead, the Air Force opted to purchase a whole new generation of ICBMs. This new ICBM design was known until April 2022 by its programmatic name — the Ground-Based Strategic Deterrent (GBSD) — before it was officially named the LGM-35A Sentinel (US Air Force 2022c).

In response to public and congressional pressure, in 2022 the Department of Defense tasked a non-governmental think tank — the Carnegie Endowment for International Peace — to consider the relative risks and benefits of a variety of options for the future of the ICBM force. The report's authors questioned the Pentagon's process and lack of transparency regarding its decision to pursue the Sentinel option over other potential deployment and basing options:

“[T]he lack of classified information, technical and construction expertise, and time precluded us from conducting a detailed assessment of the feasibility or cost of alternative ICBM options. [...] The information and argumentation we received [from the Department of Defense] were plausible, but given the limitations of the study we could not be confident in the fullness and conclusiveness of what we were presented. Much has changed since the 2014 [Analysis of Alternatives]; perhaps there were options then that ought to have been given greater consideration but instead were ruled out (Dalton et al. 2022, 4).”

The report's authors concluded that “[u]ltimately, whether or not it is possible to further life-extend Minuteman III to some intermediate date, if a presidential determination deems capabilities beyond those of Minuteman III are necessary, and that GBSD will provide those capabilities, then it is clear to us that



there is no ICBM alternative other than GBSD” (Dalton et al. 2022, 7). However, it is unclear why an enhancement of ICBM capabilities would be necessary for the United States. For instance, any such enhancements would not mitigate the inherent challenges associated with launch-on-warning, risky territorial overflights, or silo vulnerabilities to environmental catastrophes or conventional counterforce strikes (Korda 2021). Additionally, even if adversarial missile defenses improved significantly, the ability to evade missile defenses lies with the payload — not the missile itself. By the time an adversary’s interceptor would be able to engage a US ICBM in its midcourse phase of flight, the ICBM would already have shed its boosters, deployed its penetration aids, and be guided solely by its reentry vehicle — which can be independently upgraded as necessary. For this reason, it is not readily apparent why the US Air Force would require its ICBMs to have capabilities beyond the current generation of Minuteman III missiles.

The development of the Sentinel has been characterized by a series of controversial industry contracts, including the awarding of a \$13.3 billion sole-source contract to Northrop Grumman to complete the engineering and manufacturing development stage (For a more detailed summary of the Sentinel’s procurement timeline, see Korda 2021).

According to the Air Force’s latest milestone requirements published in 2020, the Air Force must deploy 20 new Sentinel missiles with legacy reentry vehicles and warheads to achieve initial operating capability, scheduled in fiscal year 2029 (Sirota 2020). The plan is to buy 659 missiles — 400 of which would be deployed, while the remainder will be used for test launches and as spares — at a price between \$93.1 billion and \$95.8 billion, increased from a preliminary \$85 billion Pentagon estimate in 2016 (Capaccio 2020). These amounts do not include the costs for the new Sentinel warhead — the W87-1 — which is projected to cost up to \$14.8 billion (Government Accountability Office 2020).

The Air Force announced the new Sentinel missile will meet existing user requirements but will have the adaptability and flexibility to be upgraded through 2075 (US Air Force 2016). The new missile is expected to have a greater range than the Minuteman III. Still, it is unlikely that it will have enough range to target countries like China, North Korea, and Iran without overflying Russia. In June 2021, program officials announced that the first Sentinel prototype would conduct its first flight by the end of 2023 (Bartolomei 2021).

The Sentinel missile will be able to carry one or possibly up to two warheads. The Air Force initially planned to equip the Sentinel with life-extended versions of the existing W78 and W77 warheads. The modified W78 was known as Interoperable Warhead 1. But in 2018, the Air Force and NNSA canceled the W78 upgrade and instead proposed a W78 Replacement Program known as the W87-1. The new warhead will use a W77-like plutonium pit along with “a well-tested IHE [Insensitive High Explosive] primary design” (US Department of Energy 2018b). The new warhead will be incorporated into a modified version of the Mk21 reentry vehicle and designated as the W87-1/Mk4A.

To produce the new W87-1 warhead in time to meet the Sentinel’s planned deployment schedule, the NNSA has set an extremely ambitious production rate of at least 80 plutonium pits per year by 2030. However, due to the agency’s consistent inability to meet project deadlines and its lack of a latent large-scale plutonium production capability, the 80-pit requirement was always considered unlikely to be achieved by independent auditors and analysts (Government Accountability Office 2020; Institute for Defense Analyses 2019). In May 2021, the Acting Administrator of the NNSA, Jill Hruby, announced to Congress what independent analysts had long predicted — that the security administration’s goal of producing up to 80 pits by 2030 was not realistic and would not be achieved (Demarest 2021). This was later confirmed by NNSA’s Jill Hruby in early 2022 (Demarest 2022). Moreover, the planned Savannah River Site facility that will be tasked with producing a large percentage of the United States’ new plutonium pits has faced substantial delays. The facility was originally proposed to be operational in 2030; however, in 2021 the date was pushed to between 2032 and



2035 (National Nuclear Security Administration (NNSA) 2021c). In October 2022, however, US officials noted that the project is now not expected to reach operational capability until mid-2025 (South Carolina Legislature 2022).

[Sailors remove ordnance from an F/A-18E Super Hornet aboard the USS Nimitz in the U.S. 7th Fleet area of operations, Jan. 6, 2023. US Navy photo by Mass Communication Specialist 2nd Class Justin McTaggart](#)

These developments could mean that despite completing its March 2021 requirements review for the W87-1 — a key milestone that allows the program to progress into the next stage of its development — the program will face delays and new delivery systems will be initially deployed with

legacy warheads (Sirota 2021; US Air Force 2020a).

In October 2019, Lockheed Martin was awarded a \$138 million contract to integrate the Mk21 reentry vehicle into the Sentinel, beating out rivals Boeing, Raytheon, Northrop Grumman, and Orbital ATK (which Northrop Grumman now owns and has been renamed to Northrop Grumman Innovation Systems) (Lockheed Martin 2019). Because the W87-1/Mk21A will be bulkier than the current W78/Mk12A, the





Sentinel's payload section would have to be wider to accommodate multiple warheads. Also, Northrop Grumman's Sentinel illustration shows a missile that is different than the existing Minuteman III, with a wider upper body and payload section (Kristensen 2019b). The Air Force test-launched its new Mk21A reentry vehicle on a Minotaur II+ rocket booster in July 2022, and the test was intended to "demonstrat[e] preliminary design concepts and relevant payload technologies in operationally realistic environments;" however, the rocket exploded 11 seconds after launch (US Space Force 2022; US Air Force 2022h). An investigative review board has been convened; however, the cause of the explosion has not yet been publicly released.

The Air Force faces a tight construction schedule for the deployment of the Sentinel. Each launch facility is expected to take seven months to upgrade, while each missile alert facility will take approximately 12 months. The Air Force intends to upgrade all 150 launch facilities and eight of 15 missile alert facilities for each of the three ICBM bases; the remaining seven missile alert facilities at each base will be dismantled (US Air Force 2020b). Since each missile alert facility is currently responsible for a group of 10 launch facilities, this reduction could indicate that each missile alert facility could be responsible for up to 18 or 19 launch facilities once the Sentinel becomes operational. This could have implications for the future vulnerability of the Sentinel's command-and-control system (Korda 2020). Once these upgrades begin, potentially as early as 2023, the Air Force must finish converting one launch facility per week for nine years to complete the new missile's deployment by 2036 (Mehta 2020). It is expected that construction and deployment will begin at F. E. Warren Air Force Base between 2023 and 2031, followed by Malmstrom between 2025 and 2033, and finally Minot between 2027 and 2036.

As the Sentinel missile gets deployed, the Minuteman III missiles will be removed from their silos and temporarily stored at their respective host bases — either F. E. Warren, Malmstrom, or Minot — before being transported to Hill Air Force Base, the Utah Test and Training Range, or Camp Navajo. The rocket motors will eventually be destroyed at the Utah Test and Training Range, while non-motor components will ultimately be decommissioned at Hill Air Force Base. To that end, five new storage igloos and 11 new storage igloos will be constructed at Hill Air Force Base and Utah Test and Training Range, respectively (US Air Force 2020b). New training, storage, and maintenance facilities will also be constructed at the three ICBM bases, which will also receive upgrades to their Weapons Storage Areas. The first base to receive this upgrade is F. E. Warren, where a groundbreaking ceremony for the new Weapons Storage and Maintenance Facility (also called the Weapons Generation Facility) was held in May 2019. Substantial construction began in spring 2020 and was scheduled to be completed in September 2022 (Kristensen 2020b; US Air Force 2019d). Commercial satellite imagery indicates that construction has made considerable progress as of November 2022, although completion could not be confirmed.

In May 2021, the US Congressional Budget Office estimated that the cost of acquiring and maintaining the Sentinel would total approximately \$82 billion over the 2021–2030 period — approximately \$20 billion more than the Congressional Budget Office had previously estimated for the 2019–2028 period (Congressional Budget Office 2021, 2019).

The Air Force conducts several Minuteman III flight-tests each year. These are long-planned tests, and the Air Force consistently states that they are not scheduled in response to any external events.

The first test of the past year was supposed to take place in March 2022; however, it was postponed and ultimately canceled due to the Russian invasion of Ukraine and the associated heightened nuclear tensions (US Department of Defense 2022c; Stewart and Ali 2022). A Pentagon spokesperson stated that this postponement was intended "to demonstrate that we have no intention of engaging in any actions that can be misunderstood or misconstrued" (US Department of Defense 2022c).

The second scheduled test of 2022 was also postponed for approximately two weeks in August, to avoid escalating tensions with China during a multi-day live-fire Chinese military exercise. The exercise was conducted in response to a visit to Taiwan by House of Representatives Speaker Nancy Pelosi (Gordon and Youssef 2022). The missile test was eventually conducted on August 16 (US Air Force 2022f).

The third scheduled test of 2022 was conducted on September 7, when a team of airmen derived from all three ICBM bases launched a Minuteman III from Vandenberg Air Force Base to the Reagan Test Site on Kwajalein Atoll in the Western Pacific traveling approximately 4,200 miles (6,759 kilometers). The test-launched Minuteman III was equipped with three undisclosed test reentry vehicles (US Air Force 2022g).

### **Nuclear-powered ballistic missile submarines**

The US Navy operates a fleet of 14 Ohio-class ballistic missile submarines (SSBNs), of which eight operate in the Pacific from their base near Bangor, Washington, and six operate in the Atlantic from their base at Kings Bay, Georgia. In the past, two of the 14 submarines would be in reactor refueling overhaul (a lengthy refitting process typically carried out about midway through their operating lifespan) at any given time. As the last refueling was completed in 2022, all 14 boats could now potentially be deployed until 2027 when the first Ohio-class submarine is expected to retire (US Navy 2019). But because operational submarines undergo minor repairs at times, the actual number of at sea at any given time is closer to eight or 10. Four or five of those are thought to be on "hard alert" in their designated patrol areas, while another four or five boats could be brought to alert status in hours or days.



Each submarine can carry up to 20 Trident II D5 sea-launched ballistic missiles (SLBMs), a number reduced from 24 to meet the limits of New START. The 14 SSBNs could potentially carry up to 280 such missiles but the United States has stated that it will not deploy more than 240. Since 2017, the Navy has been replacing the original Trident II D5 with a life-extended and upgraded version known as Trident II D5LE (LE stands for “life-extended”). The D5LE, which has a range of more than 12,000 km (7,456 miles), is equipped with the new Mk6 guidance system designed to “provide flexibility to support new missions” and make the missile “more accurate,” according to the Navy and Draper Laboratory (Naval Surface Warfare Center 2008; Draper Laboratory 2006). The D5LE upgrade will continue until all boats have been upgraded and will also replace existing Trident SLBMs on British ballistic missile submarines. The D5LE will also arm the new US Columbia-class and British Dreadnought-class ballistic missile submarines when they enter service.

Instead of building a new ballistic missile, like the Air Force wants to do with the Sentinel land-based ballistic missile, the Navy plans to do a second life-extension of the Trident II D5 to ensure it can operate through 2084 (Eckstein 2019). In 2021, the Director of the Navy’s Strategic Systems Program testified to Congress that the D5LE2, as the second life-extended missile is known, is scheduled to enter service on the ninth Columbia-class SSBN, following which it will be back-fitted to the remaining eight boats (Wolfe 2021a). The Navy also announced in 2021 that it would acquire an additional 108 Trident missiles to be used for deployment and testing (Wolfe 2021b).

Each Trident SLBM can carry up to eight nuclear warheads, but they normally carry an average of four or five warheads, for an average load-out of approximately 90 warheads per submarine. The payloads of the different missiles on a submarine are thought to vary significantly to provide maximum targeting flexibility, but all deployed submarines are thought to carry the same combination. Normally, around 950 warheads are deployed on the operational ballistic missile submarines, although the number can be lower due to maintenance of individual submarines. Overall, SSBN-based warheads account for approximately 70 percent of all warheads attributed to the United States’ deployed strategic launchers under New START.

Three warhead types are deployed on US SLBMs: the 90-kiloton enhanced W76-1, the 8-kiloton W76-2, and the 455-kiloton W88. The W76-1 is a refurbished version of the W76-0, which is being retired, apparently with slightly lower yield but with enhanced safety features added. The NNSA completed production of the W76-1 in January 2019, a massive decade-long production of an estimated 1,600 warheads (US Department of Energy 2019a). The Mk4A reentry body that carries the W76-1 is equipped with a new arming, fuzing, and firing unit with better targeting effectiveness than the old Mk4/W76 system (Kristensen, McKinzie, and Postol 2017).

The other SLBM warhead, the higher-yield W88, is currently undergoing a life-extension program that modernizes the arming, fuzing, and firing components, addresses nuclear safety concerns by replacing the conventional high explosives with insensitive high explosives, and will ultimately support future life-extension options (US Department of Energy 2022, 2–12). The first production unit for the W88 Alt 370 was completed on July 1, 2021 (NNSA 2021a). Mass production was expected to be authorized by the end of 2022; however, the process appears to have been delayed (Leone 2022a).

The 2022 NPR decided to retain the low-yield W76-2 warhead for now but left open the possibility that it might potentially be retired in the future. The warhead was proposed by the 2018 NPR first deployed on the *USS Tennessee* (SSBN-734) in the Atlantic in late-2019. The W76-2 only uses the warhead fission primary to produce a yield of about 8 kilotons. We estimate that no more than 25 were ultimately produced, and that one or two of the 20 missiles on each SSBN is armed with one or two W76-2 warheads, while the remainder of the SLBMs will be filled with either the 90-kiloton W76-1 or the 455-kiloton W88 (Arkin and Kristensen 2020).

The United States is also planning to build a new SLBM warhead — the W93 — which will be housed in the Navy’s proposed Mk7 aeroshell (reentry body). According to the Department of Energy, “[a]ll of its key nuclear components will be based on currently deployed and previously tested nuclear designs, as well as extensive stockpile component and materials experience. It will not require additional nuclear explosive testing to be certified” (US Department of Energy 2022, 1–7). The W93 appears intended to initially supplement, rather than replace, the W76-1 and W88. A second new warhead is planned to replace those warheads. The completion of the W93’s first production unit is tentatively scheduled for 2034–2036 (US Department of Energy 2022, 2–10).

The US sea-based nuclear weapons program also provides substantial support to the United Kingdom’s nuclear deterrent. The missiles carried on the Royal Navy ballistic missile submarines are from the same pool of missiles carried on US ballistic missile submarines. The warhead uses the Mk4A reentry body and is thought to be a slightly modified version of the W76-1 (Kristensen 2011a); the UK government calls it the Trident Holbrook (UK Ministry of Defence 2015). The Royal Navy also plans to use the new Mk7 for the replacement warhead it plans to deploy on its new Dreadnought submarines in the future. Despite a significant lobbying effort on the part of the United Kingdom, including an unprecedented letter to the US Congress from the UK Minister of Defense asking it to support the W93 warhead, the program’s status has not yet been settled (Borger 2020).

Since the first deterrent patrol in 1960, US ballistic missile submarines have conducted nearly 4,250 deterrent patrols at sea. During the past 15 years, operations have changed significantly, with the annual number of deterrent patrols having declined by more than half, from 64 patrols in 1999 to 30-to-36 annual patrols in recent years. Most submarines now conduct what are called “modified alerts,” which mix deterrent patrol with exercises and occasional port visits (Kristensen 2018). While most ballistic missile



submarine patrols last 77 days on average, they can be shorter or, occasionally, last significantly longer. In October 2021, for example, the *USS Alabama* (SSBN-731) completed a 132-day patrol, and in June 2014, the *USS Pennsylvania* (SSBN-735) returned to its Kitsap Naval Submarine Base in Washington after a 140-day deterrent patrol — the longest patrol ever by an Ohio-class ballistic missile submarine (US Strategic Command 2021c). In the Cold War years, nearly all deterrent patrols took place in the Atlantic Ocean. In contrast, more than 60 percent of deterrent patrols today normally take place in the Pacific, reflecting increased nuclear war planning against China and North Korea (Kristensen 2018).

Ballistic missile submarines normally do not visit foreign ports during patrols, but there are exceptions. Over a four-year period in the late 1970s and early 1980s, US submarines routinely conducted port visits to South Korea (Kristensen 2011b). Occasional visits to Europe, the Caribbean, and Pacific ports continued during the 1980s and 1990s. After Russia's invasion of Ukraine in 2014, the Navy started to conduct one or two foreign port visits per year. A US Navy visit to Scotland in 2015 was considered a warning to Russia and was described as a plan to make ballistic missile submarines more visible (Melia 2015). In 2016, a highly publicized visit to Guam in the Western Pacific — the first visit to the US island by a ballistic missile submarine since 1988 — was a clear warning to North Korea. Port visits by US submarines have continued every year since, except in 2020, to locations including Scotland, Alaska, Guam, and Gibraltar. In October 2022, US Central Command released photos indicating that the *USS West Virginia* (SSBN-736) was operating at an undisclosed location in international waters in the Arabian Sea — a highly rare public disclosure of a ballistic missile submarine's operating area (US Central Command 2022).

Design of the next generation of ballistic missile submarines, known as the Columbia-class, is well under way. This new class is scheduled to begin replacing the current Ohio-class ballistic missile submarines in the late 2020s. The Columbia-class will be 2,000 tons heavier than the Ohio-class but will be equipped with 16 missile tubes rather than 20 for its predecessor. The Columbia-class submarine program, which is expected to account for approximately one-fifth of the budget of Navy's entire shipbuilding program from the mid-2020s to the mid-2030s, is now projected to cost \$112 billion — an increase of \$3.4 billion from the Government Accountability Office's previous assessment in 2021 (Government Accountability Office 2022, 179–180). The lead boat in a new class is generally budgeted at a significantly higher amount than the rest of the boats, as the Navy has a longstanding practice to incorporate the entire fleet's design detail and non-recurring engineering costs into the cost of the lead boat. As a result, the Navy's fiscal 2022 budget submission estimated the procurement cost of the first Columbia-class SSBN — the *USS District of Columbia* (SSBN-826) — at approximately \$15 billion, followed by \$9.3 billion for the second boat (Congressional Research Service 2022, 9). A \$5.1 billion development contract was awarded to General Dynamics Electric Boat in September 2017, and construction of the first boat began on October 1, 2020 — the first day of FY 2021.

Certain elements of construction have been delayed due to the COVID-19 pandemic; the Columbia-class submarine program officer noted in June 2020 that missile tube production had already been delayed by “about a couple of months” due to the pandemic (Eckstein 2020). Additionally, the Government Accountability Office noted that “[a]s of August 2021, the shipbuilder completed less construction than planned due to errors and quality problems that resulted in rework, as well as late supplier materials, among other things” (Government Accountability Office 2022, 180).

According to the Congressional Research Service, “[u]ntil such time that the Navy can find ways to generate additional margin inside the program's schedule, the program appears to be in a situation where many things need to go right, and few things can go wrong, between now and 2031 for the lead boat to be ready for its first patrol in 2031” (Congressional Research Service 2022, 15). Such constraints mean that it is very likely the program will suffer delays.

The Columbia-class submarines are expected to be significantly quieter than the current Ohio-class fleet. This is because a new electric-drive propulsion train will turn each boat's propeller with an electric motor instead of louder, mechanical gears. Additionally, the components of an electric-drive propulsion train can be distributed around the boat, increasing the system's resilience, and lowering the chances that a single weapon could disable the entire drive system (Congressional Research Service 2000, 20). The Navy has never built a nuclear-powered submarine with electric-drive propulsion before, which could create technical delays for a program that is already on a very tight production schedule (Congressional Research Service 2022, 12).

In October 2019, the Columbia-class submarine program manager noted in a presentation that final ship designs for the new class of submarines had been completed on September 6th of that year, apparently a year ahead of schedule (Bartolomei 2019). The Navy's revised schedule now indicates that the Ohio-class boats will begin going offline in fiscal 2027, around the same time that the first Columbia-class boat is scheduled to be delivered in October 2027. Sea trials are expected to last approximately three years, and the first Columbia deterrence patrol is scheduled for 2031 (Congressional Research Service 2022, 8). The Columbia-class submarine deliveries will coincide with the Ohio-class boats being taken out of service, and the Navy projects that they will go from 14 boats to 13 in 2027, 12 in 2029, 11 in 2030, and 10 in 2037, before eventually climbing back to 11 in 2041 and the full complement of 12 boats in 2042 (US Navy 2019; Rucker 2019). The lead boat of the new Columbia-class submarine fleet will be designated the *USS District of Columbia* (SSBN-826), and the second boat will be designated the *USS Wisconsin* (SSBN-827). The rest of the Columbia-class submarine





fleet has not yet been named (US Navy 2020). The keel for the lead boat was laid down in June 2022 (US Navy 2022).

Compared with the previous year's six test launches, four Trident II D5LEs had been test-launched as of November 2022. Four launches were conducted from the *USS Kentucky* (SSBN-737) in June 2022 as part of a commander's evaluation test. These launches marked the 185th through 188th successful test launches of the Trident II system since its introduction into the US arsenal in 1989 (US Strategic Command 2022c).

In 2022, the Navy completed the last of its refueling overhauls — a multi-year operation that takes place around the 20-year mark for each SSBN. The overhaul consists of extensive structural repairs and the refueling of the boat's nuclear reactor. These efforts enable the submarine to operate for another 20 years. The Navy first completed the *USS Ohio's* (SSBN-726) engineering refueling overhaul in December 2005, and has since completed 16 additional overhauls, completing the *USS Wyoming's* (SSBN-742) engineering refueling overhaul in October 2020 (US Department of Defense Inspector General 2018; Naval Sea Systems Command 2020). The final ballistic missile submarine to undergo an engineering refueling overhaul was the *USS Louisiana* (SSBN-743), which began the overhaul process in August 2019 and completed it in mid-2022 (Naval Sea Systems Command 2021; Defense Visual Information Distribution Service 2022b). Following the completion of its overhaul, the *USS Louisiana* is expected to relocate from the maintenance facility to its permanent homeport at Naval Base Kitsap (Defense Visual Information Distribution Service 2022b). It will then conduct a Demonstration and Shakedown Operation (DASO-32) to test the boat's readiness.

The Columbia-class SSBNs will not require nuclear refueling; as a result, their midlife maintenance operations will take significantly less time than their Ohio-class predecessors (Congressional Research Service 2022, 5).

### Strategic bombers

The US Air Force currently operates a fleet of 20 B-2A bombers (all of which are nuclear-capable) and 87 B-52H bombers (46 of which are nuclear-capable). A third strategic bomber, the B-1B, is not nuclear-capable. Of these bombers, we estimate that approximately 60 (18 B-2As and 42 B-52Hs) are assigned nuclear missions under US nuclear war plans, although the number of fully operational bombers at any given time is lower. The New START data from September 2021, for example, only counted 45 deployed nuclear bombers (11 B-2As and 34 B-52Hs) (US State Department 2021b). The bombers are organized into nine bomb squadrons in five bomb wings at three bases: Minot Air Force Base in North Dakota, Barksdale Air Force Base in Louisiana, and Whiteman Air Force Base in Missouri. The new

B-21 bomber program will result in an increase in the number of nuclear bomber bases (Kristensen 2017b).

[Captain Jonathan Acker, 20th Bomb Squadron navigator, inspects an MK-62 Naval Quickstrike Mine under a B-52H Stratofortress at Barksdale Air Force Base, Louisiana on August 1, 2022. US Air Force photo by Senior Airman Jonathan E. Ramos](#)



Each B-2 can carry up to 16 nuclear bombs (the B61-7, B61-11, and B83-1 gravity bombs), and each B-52 H can carry up to 20 air-launched cruise missiles (the AGM-86B). B-52H bombers are no longer assigned gravity bombs (Kristensen 2017c). An estimated 788 nuclear weapons, including approximately 500 air-

launched cruise missiles, are assigned to the bombers, but only about 300 weapons are thought to be deployed at bomber bases. The estimated remaining 488 bomber weapons are thought to be in central storage at the large Kirtland Underground Munitions Maintenance and Storage Complex outside Albuquerque, New Mexico.

The United States is modernizing its nuclear bomber force by upgrading nuclear command-and-control capabilities on existing bombers, developing improved nuclear weapons (the B61-12 and the new AGM-181 Long-Range Standoff Weapon (LRSO), and designing a new heavy bomber (the B-21 Raider).

Upgrades to the nuclear command-and-control systems that the bombers use to plan and conduct nuclear strikes include the Global Aircrew Strategic Network Terminal. This is a new, high-altitude, electromagnetic pulse-hardened network of fixed and mobile nuclear command-and-control terminals. This network provides wing command posts, task forces, munitions support squadrons, and mobile support teams with



survivable ground-based communications to receive launch orders and disseminate them to bomber, tanker, and reconnaissance air crews. First delivery of the Global Aircrew Strategic Network Terminals, which the Air Force describes as “the largest upgrade to its nuclear command, control and communication systems in more than 30 years,” was expected in May 2020. However, it appears that this was delayed until January 2022 when Barksdale Air Force Base first received the system (US Air Force 2022d).

Another command-and-control upgrade involves a program known as Family of Advanced Beyond Line-of-Sight Terminals, which replaces existing terminals designed to communicate with the MILSTAR military satellite constellation operated by the US Space Force. These new, extremely high frequency terminals are designed to communicate with several satellite constellations, including advanced extremely high frequency satellites. The 37 ground stations and nearly 50 airborne terminals of the Family of Advanced Beyond Line-of-Sight Terminals will provide protected high-data rate communication for nuclear and conventional forces, including for what is officially called “presidential national voice conferencing.” According to the Air Force (US Air Force 2019b), the Family of Advanced Beyond Line-of-Sight Terminals “will provide this new, highly secure, state-of-the-art capability for [Department of Defense] platforms to include strategic platforms and airborne/ground command posts via MILSTAR, [advanced extremely high frequency], and enhanced polar system satellites. [It] will also support the critical command and control ... of the MILSTAR, [advanced extremely high frequency], and enhanced polar system satellite constellations.”

The heavy bombers are also being upgraded with improved nuclear weapons. This effort includes development of the first guided, standoff nuclear gravity bomb, known as the B61-12, which is ultimately intended to replace all existing gravity bombs. The bomb will use a modified version of the warhead used in the current B61-4 gravity bomb. B61-12 integration drop tests have already been conducted from the B-2 bomber. (The B61-12 will also be integrated onto US-and allied-operated tactical aircraft, including the F-15E, the F-16C/D, the F-16MLU, and the PA-200 Tornado.) Approximately 480 B61-12 bombs, which appear to have some limited earth-penetration capability, are expected to cost a total of roughly \$10 billion (Kristensen and McKinzie 2016). The First Production Unit was initially scheduled for March 2020; however, in September 2019 a NNSA official confirmed that the B61-12 (as well as the upgraded W88 warhead for the Trident II SLBM) would likely face production delays due to concerns over the longevity of its commercial off-the-shelf subcomponents (Gould and Mehta 2019). The First Production Unit prototype of the B61-12 was completed by NNSA on August 25, 2020, at its Pantex Plant in Amarillo, Texas (National Nuclear Security Administration (NNSA) 2020a). The actual First Production Unit was completed only in November 2021, and NNSA confirmed in October 2022 that full-scale production had begun (NNSA 2022).

The Air Force is also developing a new nuclear air-launched cruise missile known as the AGM-181 Long-Range Standoff Weapon (LRSO). It will replace the AGM-86B air-launched cruise missile in 2030 and will carry the W80-4 nuclear warhead, a modified version of the W80-1 used in the current air-launched cruise missile. In February 2019, the US Nuclear Weapons Council authorized the development engineering phase (Phase 6.3) for the W80-4. The production engineering stage (Phase 6.4) was initially planned for December 2021, but was substantially delayed (US Department of Energy 2019b). In mid-2022, the NNSA announced that the W80-4's First Production Unit is now scheduled for delivery before the end of FY 2027, instead of FY 2025 as originally planned. Production is scheduled to be completed in FY 2031 (Leone 2022b).

A solicitation invitation to defense contractors in 2015 listed three potential options for the LRSO engine: first, a derivative subsonic engine that improves on current engine technology by up to 5 percent; second, an advanced subsonic engine that improves on current technology by 15 percent to 20 percent; and third, a supersonic engine (US Air Force 2015). In August 2017, the Air Force awarded 5-year contracts of \$900 million each to Lockheed Martin and Raytheon to develop design options for the missile. After reviewing the designs, the Air Force, in December 2019, cleared the two companies to continue development of the missile (Sirota 2019). The Air Force originally planned to down-select to a single contractor in FY 2022 during the awarding of the engineering and manufacturing development contract; however, in April 2020, the Air Force selected Raytheon Technologies as the prime contractor for the LRSO (US Air Force 2020c). This was a relatively surprising move, as selecting a single-source contractor at this early stage could ultimately result in higher program costs. In July 2021, Raytheon Technologies was awarded up to \$2 billion to proceed with the engineering and manufacturing development stage of the LRSO, in order to prepare for full-rate production beginning in 2027 (Insinna 2021).

In March 2019, the Air Force awarded Boeing a \$250 million contract to integrate the future LRSO onto the B-52Hs, a process that is expected to be completed by the beginning of 2025 (Hughes 2019). Development and production are projected to reach at least \$4.6 billion for the missile (US Air Force 2019a) with another \$10 billion for the warhead (US Department of Energy 2018a).

The missile itself is expected to be entirely new, with significantly improved military capabilities compared with the air-launched cruise missile, including longer range, greater accuracy, and enhanced stealth (Young 2016). This violates the 2010 White House pledge (White House 2010) that the “United States will not ... pursue ... new capabilities for nuclear weapons,” though the 2018 NPR and 2022 NPR eliminated such constraints.

Supporters of the LRSO argue that a nuclear cruise missile is needed to enable bombers to strike targets from well outside the range of the modern and future air-defense systems of potential adversaries. Proponents also argue that these missiles are needed to provide US leaders with flexible strike options in





limited regional scenarios. However, critics argue that conventional cruise missiles, such as the extended-range version of the Joint Air-to-Surface Standoff Missile, can currently provide standoff strike capability, and that other nuclear weapons would be sufficient to hold the targets at risk. In fact, the conventional Extended-Range Joint Air-to-Surface Standoff Missile is now an integral part of US Strategic Command's annual strategic exercises.

Unlike the current air-launched cruise missile, which is only carried by the B-52H bomber, the LRSO will be integrated on both the B-52H and new B-21 bombers. Northrop Grumman continues to develop the next-generation B-21 Raider heavy bomber, after its preliminary design review received Air Force's approval in early 2017. In early 2022, the Air Force announced that six B-21 bombers were currently in production, and the first assembled bomber was taken to conduct its calibration tests in early March 2022 (Tirpak 2022a). The B-21 was previously scheduled to make its first flight no earlier than 2022 from its production facility in Palmdale, California, to Edwards Air Force Base about 30 miles (48 kilometers) up north (Wolfe 2020); however, this has since been delayed until 2023 (Tirpak 2022b). The B-21 is expected to enter service in the mid-2020s to gradually replace the B-1B and B-2 bombers during the 2030s (Tirpak 2022b). It is expected that the Air Force will procure at least 100 (possibly as many as 145) of the new bombers, with the latest service costs estimated at approximately \$203 billion for the entire 30-year operational program, at an estimated cost of \$550 million per plane (Capaccio 2021; Tirpak 2020). Further details about the B-21 program are still shrouded in secrecy, but in December 2022 the Air Force revealed the bomber during an official unveiling ceremony at Northrop Grumman's production facilities (US Air Force 2022i). The design of the new B-21 bomber is very similar to the B-2's but appears to be slightly smaller with a reduced weapons capability. The B-21 will be capable of delivering both the B61-12 guided nuclear gravity bomb and the future AGM-181 LRSO, as well as a wide range of non-nuclear weapons, including the Joint Air-to-Surface Standoff (JASSM) cruise missile.

The Air Force announced in March 2019 that the B-21 bombers will first be deployed at Ellsworth Air Force Base (South Dakota), followed by Whiteman Air Force Base (Missouri) and Dyess Air Force Base (Texas) "as they become available" (US Air Force 2019c). Construction at Ellsworth AFB began in 2022, and the base's new Weapons Generating Facility, which will store and maintain nuclear bombs and cruise missiles, is scheduled to be completed by February 2026 (Tirpak 2022c). Ellsworth AFB is currently expected to host two B-21 squadrons (one operational squadron and one training squadron). However, according to South Dakota Senator Mike Rounds, a second operational squadron might eventually be stationed at Ellsworth Air Force Base as well in the future (News Center 1 2022).

The conversion of the non-nuclear B-1 host bases to receive the nuclear B-21 bomber will increase the overall number of bomber bases with nuclear weapons storage facilities from two bases today (Minot AFB and Whiteman AFB) to five bases by the 2030s (Barksdale AFB will also regain nuclear storage capability) (Kristensen 2020c).

### Nonstrategic nuclear weapons

The United States has only one type of nonstrategic nuclear weapon in its stockpile: the B61 gravity bomb. The weapon currently exists in two versions: the B61-3 and the B61-4 with yields varying from 0.3 kilotons up to 170 and 50 kilotons, respectively. A third version, the B61-10, was retired in September 2016. Approximately 200 such tactical B61 bombs are currently stockpiled. About 100 of these (versions -3 and -4) are thought to be deployed at six bases in five European countries: Aviano and Ghedi in Italy; Büchel in Germany; Incirlik in Turkey; Kleine Brogel in Belgium; and Volkel in the Netherlands. This number has declined since 2009 partly due to reduction of operational storage capacity at Aviano and Incirlik (Kristensen 2015, 2019c). A seventh country — Greece — has a contingency nuclear strike mission and accompanying reserve squadron, but it does not host any nuclear weapons (Kristensen 2022c). The other 100 B61 bombs stored in the United States are for backup and potential use by US fighter-bombers in support of allies outside Europe, including Northeast Asia. The fighter-bombers include F-15Es from the 391st Fighter Squadron of the 366th Fighter Wing at Mountain Home in Idaho (Carkhuff 2021).

The Belgian, Dutch, German, and Italian air forces are currently assigned an active nuclear strike role with US nuclear weapons. Under normal circumstances, the nuclear weapons are kept under the control of US Air Force personnel; their use in war must be authorized by the US president. A 2022 NATO factsheet states that "a nuclear mission can only be undertaken after explicit political approval is given by NATO's Nuclear Planning Group (NPG) and authorisation is received from the US President and UK prime minister" (NATO 2022a). However, it is unclear why the UK Prime Minister would have to authorize employment of US nuclear weapons, and unless NATO territory had been attacked with nuclear weapons first, it seems unlikely that the entire NPG would be able to agree on approving the employment of non-strategic nuclear weapons from bases in Europe.

The Belgian and Dutch air forces currently use the F-16 aircraft for the nuclear missions, although both countries are in the process of obtaining the F-35A to eventually replace their F-16s. The Italian Air Force uses the PA-200 Tornado for the nuclear mission but is in the process of acquiring the F-35A. Like the Tornados, the nuclear F-35As will be based at Ghedi Air Base, which is currently being upgraded. Germany also uses the PA-200 Tornado for the nuclear mission; however, it is planning to retire its Tornados by 2030, and would require a new dual-capable aircraft if it intended to remain part of NATO's nuclear sharing mission. After previously





leaning toward purchasing Boeing's F/A-18E/F Super Hornet, the German government announced in March 2022 that it would instead purchase 35 Lockheed Martin F-35A aircraft to fulfill its nuclear mission (US Department of Defense 2022d).

At least until 2010, Turkey was still using F-16s for the nuclear mission, although it is possible that Turkey's role has since been reduced to a contingency mission. In 2019, the Trump administration also halted delivery of F-35As to Turkey — some of which were intended to take over the nuclear mission — because of its plans to acquire the Russian S-400 air-defense system (DeYoung, Fahim, and Demirjian 2019). Legislators and analysts raised concerns about the security of the nuclear weapons at the Incirlik base during the failed coup attempt in Turkey in July 2016; the chairman of the Senate Foreign Relations Subcommittee for Europe stated in September 2020 that “our presence, quite honestly, in Turkey is certainly threatened,” and further noted that “we don't know what's going to happen to Incirlik” (Gehrke 2020). Despite rumors in late 2017 that the weapons had been “quietly removed” (Hammond 2017), the *New York Times* reported in 2019 that US officials had reviewed emergency nuclear weapons evacuation plans for Incirlik, indicating that there were still weapons present at the base (Sanger 2019). This has been further reinforced by ongoing infrastructure work at nuclear weapon storage sites in Turkey (US Department of Defense 2022e). The number of nuclear weapons at Incirlik appear to have been reduced, however, from up to 50 to perhaps 20. If the United States decided to withdraw the remaining nuclear weapons from Incirlik, it could probably do so with a single C-17 transport aircraft from the 4th Airlift Squadron at Joint Base Lewis-McChord in Washington — the only unit in the Air Force that is qualified to airlift nuclear weapons.

NATO Member States that do not host nuclear weapons can still participate in the nuclear mission as part of conventional supporting operations, known as Support of Nuclear Operations With Conventional Air Tactics, or SNOWCAT.

NATO is working on a broad modernization of the nuclear posture in Europe that involves upgrading bombs, aircraft, and the weapons storage system (Kristensen 2022c). The B61-12 is estimated to be 12 feet long, weighing approximately 825 pounds, and is designed to be air-launched in either ballistic or gravity drop modes (Baker 2020). The B61-12 will use the nuclear explosive package of the B61-4, which has a maximum yield of approximately 50 kilotons and several lower-yield options. However, it will be equipped with a guided tail kit to increase accuracy and standoff capability, which will allow strike planners to select lower yields for existing targets to reduce collateral damage. The increased accuracy of the B61-12 will give the tactical bombs in Europe the same military capability as strategic bombs used by the bombers in the United States. Although the B61-12 has not been designed as a designated earth-penetrator, it does appear to have some limited earth-penetration capability. This increases its ability to hold at risk underground targets (Kristensen and McKinzie 2016). Until their purchased new F-35A aircraft are ready, Italy and Germany will continue to fly the PA-200 whereas Belgium and the Netherlands will continue to fly the F-16MLU. But because of their age and logarithmic systems, these aircraft will not be able to benefit from the increased accuracy provided by the B61-12's new digital guided tail kit. Instead, it will deliver the bomb as a “dumb” bomb akin to the current B61-3s and B61-4s.

In March 2020, the F-15E became the first aircraft to be certified to operate the B61-12 bomb after completing the last in a series of six compatibility tests at Nellis Air Force Base and the Tonopah Test Range (Baker 2020). In addition to the F-15E aircraft, the integration of the B61-12 on B-2, F-16, and PA-200 aircraft is well under way. In October 2021, the F-35A completed two drop tests of the B61-12 Joint Test Assembly, thus completing the final stage of its nuclear design certification process (US Air Force 2021b).

The new B61-12 bomb began full-scale production in the fall of 2022 and is expected to be completed by 2026 (Sandia National Laboratories 2022). It is expected to complete certification with the F-35A aircraft before January 2023, followed by training of the nuclear fighter-wings in Europe later in 2023 (Defense Visual Information Distribution Service 2022a). Once deployment to Europe begins, the B61-3/4 bombs currently deployed in Europe will be returned to the United States. A report that delivery of the B61-12 to Europe had been pushed up to December 2022 (Bender, McLeary, and Banco 2022) was denied by the Department of Defense (Johnson 2022).

NATO is life-extending the weapons storage security system, which involves upgrading command and control, as well as security, at the six active bases (Aviano, Büchel, Ghedi, Kleine Brogel, Incirlik, and Volkel) and one training base (Ramstein). Specifically, these upgrades include the installation of double-fence security perimeters, modernizing the weapon storage and security systems and the alarm communication and display systems, and the operation of new secure transportation and maintenance system trucks (Kristensen 2021b). Security upgrades now appear to have been completed at Aviano, Incirlik, and Volkel, and are underway at Ghedi, Kleine Brogel, and Büchel. Additionally, it appears that an air base in the United Kingdom — believed to be RAF Lakenheath — has been quietly added to the list of bases receiving nuclear weapon storage site upgrades (US Department of Defense 2022e). The upgrade comes as RAF Lakenheath is preparing to become the first US Air Force base in Europe equipped with the nuclear-capable F-35A Lightning aircraft. This development does not necessarily indicate that the United Kingdom will once again host US nuclear weapons (the last US nuclear weapons were withdrawn from UK soil in 2008), especially given that NATO Secretary General Jens Stoltenberg stated as recently as December 2021 that “we have no plans of stationing any nuclear weapons in any other countries than we already have ...” (NATO 2021). However, the upgrade could be intended to give NATO the option to redistribute its nuclear weapons in times of heightened tensions, or to potentially move them out of Turkey in the future.



In addition to the modernization of weapons, aircraft, and bases, NATO also appears to be increasing the profile of the dual-capable aircraft posture. In June 2020, for example, the 31st Fighter Wing at Aviano Air Base conducted the first “elephant walk” ever to display all aircraft in a single visual show of force of its capability to “deter and defeat any adversary who threatens US or NATO interests” (US Air Force 2020d). Additionally, NATO’s annual Steadfast Noon nuclear force exercise includes participation from many NATO members every year. In 2022, the exercise involved the participation of 14 countries — including fourth-generation F-16s and F-15Es as well as fifth-generation F-35A and F-22 from NATO host countries, as well as US B-52 long-range bombers from Minot Air Base — centered at Kleine Brogel Air Force Base in Belgium (NATO 2022b; Kristensen 2022c).

A new non-strategic nuclear weapon, the sea-launched cruise missile (SLCM-N) proposed by the Trump administration’s Nuclear Posture Review in 2018, was canceled by the Biden administration’s 2022 Nuclear Posture Review (this weapon is discussed in greater detail in a previous section, see “The Nuclear Posture Review and nuclear modernization”).

► Extensive bibliography is available at the source’s URL.

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**EDITOR’S COMMENT:** What is the reasoning for having all these nuclear weapons if not intend to use them? Nuclear nations cannot even dictate other nations to behave according to their will – e.g., Turkey; Ukraine; Iran, Taiwan. Unless they keep them for that moment that they will decide that Planet Earth is not worthing anymore!

## How to Survive a Tactical Nuclear Bomb? Defense Experts Explain

By Robert K. Niven, Chi-King Lee, Damith Mohotti, and Paul Hazell

Source: <https://www.homelandsecuritynewswire.com/dr20230117-how-to-survive-a-tactical-nuclear-bomb-defense-experts-explain>

Jan 17 – There has been widespread discussion of Russia’s [threat](#) to use tactical nuclear weapons in its war on Ukraine. Russia is estimated to have thousands of tactical nuclear weapons – possibly the world’s [largest stockpile](#) – which could be deployed at any time. The use of nuclear weapons is also embedded in Russian [military doctrine](#). Ukrainian President Volodymyr Zelenskyy has [appealed to](#) the rest of the world to take the threat seriously.

In this article we examine what would happen during a tactical nuclear bomb explosion, including the three stages of ignition, blast and radioactive fallout – and how one might be able to survive this.

### Ignition

You see a sudden flash in the sky, as bright as (or even brighter than) the sun. You quickly turn your face away and run for cover. The brightness suddenly vanishes, but returns again a short while later and continues – the distinctive double flash caused by competition between the fireball and shock wave. It gets incredibly hot and bright, and you shield your eyes to avoid retina burns. The intense thermal radiation also causes skin burns, possibly through your clothing. Wearing pale-colored clothing or being indoors will help. You’ve also received substantial doses of invisible nuclear radiation: gamma rays, X-rays and neutrons. You find cover to shield the worst of the heat and radiation. You’ve now survived the first seconds of a nuclear detonation, hopefully a “tactical” bomb smaller than that at Hiroshima (which was the equivalent of 15 kilotons of TNT). The fact you’ve lived this long means you’re on the periphery, not at ground zero. But to survive the next few seconds, there’s a few things you’ll need to do.

### The Blast Wave

Next will come the blast wave. This consists of an [overpressure shock wave](#) followed by an outward blast wind, often with reverse winds returning to ground zero.



This will destroy or damage all built structures within a certain radius from the epicenter, depending on the yield and height of the burst. For example, a 15 kiloton bomb would have a fireball radius of about 100 meters and cause [complete destruction](#) up to 1.6 kilometers around the epicenter.

A one kiloton bomb – similar to the 2020 ammonium nitrate explosion in the Lebanese capital Beirut – would have a fireball radius of about 50 meters, with severe damage to about 400 meters.

The shock wave travels faster than the speed of sound (about 343 meters per second). So if you're one kilometer away from the epicenter, you have less than three seconds to find cover. If you're five kilometers away, you have less than 15 seconds.

You'll need to shield yourself from the thermal and nuclear radiation, as you could die if exposed. However, you must find somewhere safe – you don't want to be crushed in a building destroyed by the blast wave.

Get indoors, and preferably into a reinforced [bunker or basement](#). If you're in a brick or concrete house with no basement, find a strong part of the building. In Australia, this would be a small bathroom at ground level, or a laundry with brick walls.

The incoming shock wave will reflect off the internal walls, superimposing with the original to double the pressure. Avoid the explosion side of the building and make sure to lie down rather than stand.

If there is no reinforced room, you can lie under a sturdy table or next to (not under) a bed or sofa. You may be crushed under a bed or sofa if a concrete slab crashes down.

Keep away from doors, tall furniture and windows, as they will probably shatter. If the walls come down, you'll have a chance of surviving in a pocket in the rubble. If you're in an apartment building, run to the fire staircase in the structural core of the building.

Avoid timber, fiber cement or prefabricated structures (which includes most modern housing in Australia) as these probably won't survive. And open your jaw as the blast comes through, so your eardrums get the pressure wave on both sides.

### Radioactive Fallout

The third stage is the fallout: a cloud of toxic radioactive particles from the bomb will be uplifted during the blast and deposited by the wind, contaminating everything in its path. This will continue for hours after the explosion, or possibly days.

In comparable British-Australian bomb tests [at Maralinga](#), the fallout was clearly preserved in the desert along one kilometer-wide tracks, extending 5–25 kilometers out from ground zero.

You must protect yourself from the fallout or you'll have a short life.

If you're in a stable structure such as a basement or fire staircase, you can shelter in place for a few days, if necessary. If your building is destroyed, you'll need to move to a nearby intact structure.

Block all the doors, windows and air gaps. You can drink water from intact pipes and eat from sealed cans.

For outdoor movement, any PPE available should be used – especially a P2 mask, or even a dust mask. While tactical nukes are designed to destroy personnel or infrastructure, they still allow troop movement under cover of the blast. The radiological hazard is significant, but should be survivable.

A radiological weapon, on the other hand, will deliberately increase the radiation dose to the point of it being lethal.

Once you've found shelter, you'll need to decontaminate. This will require a thorough scrub of the skin, nails and hair, and a change into clean clothing. But any severe burns should be tended to first.

Hopefully by now the national authorities will have stepped in for rescue and medical treatment.

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## How to Shelter from a Nuclear Explosion

Source: <https://www.homelandsecuritynewswire.com/dr20230117-how-to-shelter-from-a-nuclear-explosion>

Jan 17 – There is no good place to be when a nuclear bomb goes off. Anything too close is instantly vaporized, and radiation can pose a serious health threat even at a distance. In between, there is another danger: the blast wave generated by the explosion, which can produce airspeeds strong enough to lift people into the air and cause serious injury.

In [Physics of Fluids](#), by [AIP Publishing](#), researchers from the University of Nicosia simulated an atomic bomb explosion from a typical intercontinental ballistic missile and the resulting blast wave to see how it would affect people sheltering indoors.

In the moderate damage zone, the blast wave is enough to topple some buildings and injure people caught outdoors. However, sturdier buildings, such as concrete structures, can remain standing.





The team used advanced computer modeling to study how a nuclear blast wave speeds through a standing structure. Their simulated structure featured rooms, windows, doorways, and corridors and allowed them to calculate the speed of the air following the blast wave and determine the best and worst places to be.

“Before our study, the danger to people inside a concrete-reinforced building that withstands the blast wave was unclear,” said author Dimitris Drikakis. “Our study shows that high airspeeds remain a considerable hazard and can still result in severe injuries or even fatalities.”

According to their results, simply being in a sturdy building is not enough to avoid risk. The tight spaces can increase airspeed, and the involvement of the blast wave causes air to reflect off walls and bend around corners. In the worst cases, this can produce a force equivalent to 18 times a human’s body weight.

“The most dangerous critical indoor locations to avoid are the windows, the corridors, and the doors,” said author Ioannis Kokkinakis. “People should stay away from these locations and immediately take shelter. Even in the front room facing the explosion, one can be safe from the high airspeeds if positioned at the corners of the wall facing the blast.” The authors stress that the time between the explosion and the arrival of the blast wave is only a few seconds, so quickly getting to a safe place is critical.

“Additionally, there will be increased radiation levels, unsafe buildings, damaged power and gas lines, and fires,” said Drikakis. “People should be concerned about all the above and seek immediate emergency assistance.”

While the authors hope that their advice will never need to be followed, they believe that understanding the effects of a nuclear explosion can help prevent injuries and guide rescue efforts.

## The US has a new nuclear proliferation problem: South Korea

By Lauren Sukin

Source: <https://thebulletin.org/2023/01/the-us-has-a-new-nuclear-proliferation-problem-south-korea/>

Jan 19 – Last week, Seoul officially put its nuclear option on the table, for the first time since 1991. South Korean President Yoon Suk-yeol [declared](#) the country would consider building its own arsenal of nuclear weapons if the threat it faces from nuclear-armed North Korea continues to grow.

It will.

North Korea [launched](#) over 90 missiles in 2022. Those tests accompanied a major revision in North Korea’s nuclear strategy, which now [allows](#) the preemptive use of nuclear weapons in the early stages of a crisis. Experts expect North Korea’s ramped-up nuclear aggression will continue into the new year. Many even expect Pyongyang to conduct a new nuclear test, which would be the country’s first since 2017 and a watershed event against a backdrop of global turmoil.

South Korea faces strong strategic reasons to continue developing its own nuclear arsenal. While the United States has tried to keep a lid on South Korea’s nuclear ambitions, few traditional nonproliferation or counterproliferation policies are well-poised to reverse the current nuclearization of the North. It’s time for a new approach.

### South Korean nuclear ambitions

South Korea faces an increasingly capable nuclear adversary in its northern neighbor. North Korea’s nuclear arsenal, first tested in 2006, has grown rapidly. The country now hosts [dozens](#) of nuclear weapons and continues to diversify its arsenal, building more sophisticated delivery capabilities, which include intercontinental missiles capable of reaching the United States. North Korea makes [dozens of threats](#) (usually against the United States) every month, many of them nuclear in nature. North Korea has been exceptionally belligerent lately, [testing](#) more nuclear-capable missiles in the past year than it did in the previous five years combined. South Korea has a complicated relationship with its western neighbor, too. South Korea relies heavily on China for trade, but Seoul’s strong military alliance with the United States contributes to Chinese views of encirclement. So far, South Korea has walked a tightrope between its biggest military partner and biggest trade partner. But that won’t last. Most South Koreans [consider](#) that China will be their country’s biggest threat in the next 10 years.

South Korea has a troubled security environment, and the US security guarantee to South Korea is intended to make sure those threats don’t materialize. The guarantee offers reassurance that Seoul will be protected against any adversary. The guarantee is one of the United States’ strongest. The two countries boast significant military cooperation. The US military currently stations approximately 28,500 servicemembers in South Korea, regularly participates in [large-scale military exercises](#) with South Korean forces, and, under current policy, would fight under joint command with South Korean forces if a war were to break out.

But even with all this, the security guarantee doesn’t seem to be enough to keep down the bubble of proliferation advocates. Policymakers in South Korea have long called for a return of US tactical nuclear weapons, and a handful of more conservative politicians have occasionally suggested that the state would



be better off with its own nuclear arsenal. Increasingly, this conversation has gone mainstream. The debate was even a key talking point and part of the conservative party platform in the last South Korean presidential election.

For years now, most South Koreans have [supported](#) the idea of the country building its own nuclear weapons. By 2022, such support had grown to over 70 percent. Russia's continued use of nuclear threats in the Ukraine war may bring that number even higher, as nuclear anxiety grows. South Koreans are keenly aware that the United States and its allies have been effectively deterred by Russia's nuclear arsenal, and they worry that a similar situation could repeat itself in Asia. Public support for South Korea building its own nuclear weapons has no doubt contributed to the policy's rise out of the fringe and into the spotlight.

### Is the US security guarantee enough?

If South Korea is so concerned about nuclear threats from North Korea, a solution is to get reassurance that the United States will come to its aid in a fight against Pyongyang—or so the logic goes. But it isn't that simple.

The United States and South Korea already have a tight-knit relationship, and faith in the US security guarantee is already high: At least 6 in 10 South Koreans are confident that the United States will [fight with them](#) against North Korea, if need be.

US politicians have regularly emphasized the criticality of the US-South Korean relationship, and the recent Biden administration's Nuclear Posture Review made some usually heavy-handed promises in South Korea's defense, even [stating](#) that "any nuclear attack by North Korea against the United States or its Allies and partners is unacceptable and will result in the end of that regime. There is no scenario in which the Kim regime could employ nuclear weapons and survive."

But perhaps, a very credible security guarantee is just not enough—or perhaps it is even part of the problem. My research [finds](#) that, even when South Koreans have faith in the US alliance, many still don't see it as a reliable solution to their perceived nuclear risks. In surveys, the more South Koreans believe the United States would use its nuclear weapons to defend them, the more they shy away from the US alliance and prefer that their own government build independent nuclear capabilities.

Although counterintuitive at first sight, the rationale is simple: Why would South Koreans trust the United States to be adequately cautious with its nuclear weapons—refraining from using them unless absolutely necessary? After all, the previous US president promised to rain down "fire and fury" on the Peninsula.

South Koreans have significantly higher levels of trust in their own government's ability to make responsible nuclear choices than they do in an ally. Moreover, most South Koreans believe that their continued alliance with the United States will end up dragging Seoul into a nuclear war it otherwise could have avoided.

And understandably, South Koreans [don't want](#) a nuclear war.

Any nuclear use on the Korean Peninsula—even if only North Korea were targeted—would likely have devastating environmental and health effects throughout the Peninsula. And Seoul is less than 200 kilometers (124 miles) from Pyongyang. Even in the event that North Korea invaded South Korea, most South Koreans still [say](#) in polls that they would prefer not to use nuclear weapons unless North Korea had already used them first.

Logically, South Koreans can't take it for granted that this preference will be reflected in US policy. The US nuclear doctrine makes it clear that the United States carves out the right to "nuclear first use," a tactic that involves launching nuclear weapons at an opponent before they have the chance to launch their own. Given that North Korea's missiles can now reach the US homeland, any warfighting strategy for the United States is likely to prioritize destroying these assets—and a first strike would be the easiest way to accomplish that goal. For this reason, a credible US nuclear security guarantee alone won't alleviate South Korea's nuclear anxieties.

### Build or borrow?

President Yoon was quick to note that, even now, South Korea has options other than building its own nuclear arsenal. One of these is to request that the United States re-deploy some of its tactical nuclear weapons in South Korea. The United States withdrew its South Korea-based arsenal of approximately 100 nuclear weapons in 1991 to move past the Cold War. No US nuclear weapons have been stationed in the country since.

The re-deployment of these weapons, however, would do little to resolve the core issues of the current crisis—and maybe quite the opposite. Deployed US nuclear weapons in South Korea would heighten North Korea's fears that the United States is preparing for the decapitation strategy it so boldly announced in its recent National Defense Strategy. There is also a moral hazard: Having nearby US nuclear weapons may embolden some in South Korea to push back harder against North Korea's threats, making tensions even worse.

Moreover, unless these weapons were operated under South Korean command—a contingency that is extremely unlikely—issues around transparency, cooperation, and trust in US nuclear planning would still remain.

Re-deploying nuclear weapons would certainly be a signal of US interest in defending South Korea, but what's needed now is a combination of commitment and caution. Forthright communication about when and why nuclear weapons would be used, combined with clear indicators about how nuclear use will be avoided is more important for the United States than simply showing it has the muscles. Those have been



on display for decades already. Redeployment of US tactical nuclear weapons would also leave South Korea vulnerable to many of the same risks as they would incur by building their own arsenal. In this sense, even opting for US redeployment over nuclear proliferation—although it may put less strain on the alliance in the short term—remains dangerous.

The redeployment of tactical nuclear weapons would not resolve the domestic political pressures at play in South Korea. Polling from the Chicago Council on Global Affairs [finds](#) that two-thirds of South Koreans would prefer for their government to build its own nuclear weapons than to accept the re-deployment of US tactical nuclear weapons, while below 10 percent prefer US weapons over South Korean ones. Outright opposition to US tactical nuclear weapons is also strong—at 40 percent, compared to just 26 percent opposed to South Korea building its own nuclear weapons. These figures suggest that a different strategy is called for, one that recognizes the need for more South Korean agency in the nuclear planning process.

### Can stopgaps succeed?

If neither cementing the guarantee nor redeploying tactical nuclear weapons is the answer, what can the United States do instead? One option can be to fight back against South Korea's urge to build nuclear weapons with tried-and-tested nonproliferation policies. Nonproliferation leverages both carrots—security guarantees intended to protect a vulnerable country from nuclear threats—and sticks—sanctions and other punishments intended to dissuade this country from building nuclear weapons. Understandably, the US approach with its allies generally prioritizes carrots, but that may not continue to work with South Korea.

Could, therefore, counterproliferation strategies succeed?

Well, they did in the 1970s. When former South Korean President Park Chung-Hee embarked on a covert nuclear weapons acquisition program, the United States responded by threatening to scale back its support for South Korea and to reduce its military presence there. The pressure from Washington was a key component of Park's decision to end the program—although domestic politics and concerns about the country's international reputation also contributed to that decision.

But what worked in the past may not work today. In the 1970s, South Korea didn't face nuclear threats as obvious as those it faces in 2023. The withdrawal now of US forces would be much more likely to convince Seoul that the only way to stop North Korea is to deter Pyongyang on its own. Studies of South Korean public opinion show that support for nuclear proliferation remains relatively high, even when it is well understood by the public that building nuclear weapons would have a significant cost to the quality of South Korea's alliance with the United States. Threatening to walk away, then, might just leave the United States looking regretfully over its shoulder. Other counterproliferation policies have had mixed results. Experts [argue](#) that the threat of sanctions can often dissuade countries not to pursue nuclear weapons. However, once sanctions are imposed, they do little to reverse existing programs. Instead, targeted countries adapt, and the isolation that sanctions produce can cement the perceived need for stronger, more independent military forces. South Korea may already be past the point at which sanctions would be useful. [Multiple studies](#) have found that South Koreans who support nuclear proliferation are [not deterred](#) by the threat of sanctions. Instead, South Koreans already anticipate that proliferation would result in significant sanctions—yet they would support the policy anyway.

The expectation that proliferation would result in sanctions is probably correct. A South Korean nuclear weapons program would almost certainly violate the obligations to nuclear nonproliferation and the peaceful, civilian use of transferred nuclear technologies that Seoul agreed to when it signed a nuclear cooperation agreement with the United States. This agreement, which remains in force until 2040, currently bans uranium enrichment in South Korea, at least without prior approval, as well as some types of plutonium reprocessing. Those capabilities would be needed for a robust nuclear weapons program. Violating its nuclear cooperation agreement with the United States could therefore trigger sanctions against Seoul. It would even legally enable the United States to demand that technology transferred under the agreement be returned. This is unlikely to be sufficient to stop a South Korean nuclear program if Seoul committed to one, but it does emphasize that the United States—if it so chose—could levy very heavy costs.

The United States can also advance nonproliferation through leading by example. Making it clear to South Korea that the global nonproliferation regime is critical—and that a South Korean withdrawal from the Non-Proliferation Treaty would be unacceptable—could help dissuade Seoul. After all, the country is highly concerned with its hard-earned international reputation, and unilaterally leaving a major international treaty would be no small step.

The United States can also commit itself to policies that prioritize restraint and arms control. Demonstrating its ability to embrace a more cautious attitude towards the use of nuclear weapons may diminish some of the concerns about Washington's willingness to escalate to nuclear use, and it would model valuable norms in the nuclear space—norms that could perhaps even help balance against the behavior of other nuclear countries.

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## The New North Korean Threat

By Sue Mi Terry

Source: <https://www.foreignaffairs.com/north-korea/new-north-korean-threat>

Jan 19 – Among the more overlooked geopolitical developments in 2022 was North Korea's nuclear weapons program. During the year, it logged nearly 100 missile tests, a record for the country; several of them involved weapons of extraordinary range and potency. In November, the regime launched a Hwasong-17, an intercontinental ballistic missile that can carry multiple warheads and is capable of reaching the United States. A month later, North Korean leader Kim Jong Un personally oversaw the test of a powerful solid-fuel rocket engine—a crucial new capability for the country because solid-fuel rockets can be fired more quickly than liquid-fuel ones and are harder to detect and preempt.

Yet despite these developments, North Korea has not been a major focus for the United States in recent years. Although the country has posed a growing threat since 2006, when it first tested an atomic bomb, international efforts to slow down or stop its nuclear program have flagged. The last attempt by the United States to end the nuclear weapons program failed at the 2019 summit meeting in Hanoi between Kim and Donald Trump, and the Biden administration has not come up with any new ideas on how to achieve this. This is partly because the United States and its Western allies have been preoccupied by other pressing concerns, such as the [war in Ukraine](#). But the West has also become, to some extent, inured to the North Korean threat.

This lack of attention is dangerous. Along with the accelerating number of tests, there are numerous other indications that Pyongyang's efforts to build weapons of mass destruction (WMD) have been rapidly expanding and evolving. Developments over the past few months in particular suggest that the nuclear program is entering a new and more dangerous phase. The risk that a miscalculation by Pyongyang could lead to a conflict is growing, particularly given its lack of communication with Washington. All of these developments make clear the urgent need for the United States and its allies to enhance deterrence of the North Korean regime.

North Korea's pursuit of solid-fuel missiles provides a startling indication of its current aims. All three ICBMs North Korea has tested so far—the Hwasong-14, Hwasong-15, and Hwasong-17—are liquid fueled. This is in accordance with the five-year plan set forth by the regime in January 2021 at its Eighth Party Congress, where it announced that it would soon be unveiling solid-fuel ICBMs that could be launched from both the sea and land. Pyongyang now appears to be making rapid progress toward that goal. Already, a series of new short-range ballistic missiles it has tested in recent years use solid fuel. It is now foreseeable that North Korea will conduct more solid-fuel engine tests on larger missiles. These include likely tests of a Pukguksong submarine-launched ballistic missile or a new solid-propellant ICBM. Kim's sister Kim Yo Jong recently warned that the latter may be tested on a full-range trajectory toward the United States rather than on a lofted trajectory into the Sea of Japan, the destination of its previous ICBM tests. In the coming months, [North Korea](#) could also unveil multiple independently targetable reentry vehicle (MIRV) technology, which will allow its missiles to frustrate U.S. missile defenses. The recently tested Hwasong-17 is designed to carry multiple warheads and could thus theoretically strike Manhattan and Washington at the same time.

North Korea is the only country that has threatened first use of nuclear weapons so explicitly.

As if these missile tests weren't alarming enough, there are many indications that Pyongyang will soon conduct its seventh nuclear test. Such a test could be used to showcase a more compact tactical nuclear warhead for battlefield use—a weapon that would increase the threat North Korea poses to Japan and South Korea as well as to U.S. forces stationed in both countries. Satellite imagery has made clear, for example, that the Punggye-ri testing site, located in mountainous terrain north of Pyongyang and close to the border with China, is ready for such a detonation at any time. Testing a tactical nuclear warhead would also be consistent with Kim's announced weapons development goals.

North Korea has already demonstrated its ability to deploy tactical nuclear weapons over the past year. In September and October, it conducted a series of tests of short-range missiles, with one simulating the launch of a nuclear missile from an underwater silo and another rehearsing the launch of nuclear warheads that could target airports in South Korea. But the regime has yet to demonstrate that it has developed a smaller warhead that could arm these missiles. It will need to do that soon if Kim intends to deploy this capability within his announced five-year timeline.

In addition to rapidly enhancing North Korea's WMD arsenal, [Kim](#) has also been lowering the threshold for its use. In September, North Korea announced five conditions under which it would launch a preemptive strike. Notably, these included not only when a nuclear attack on the country is imminent but also when its leaders believe that preparations may be underway for a nonnuclear strike on the North Korean leadership, a North Korean nuclear command structure, or important North Korean strategic targets. Pyongyang has also said it could use a nuclear weapon if it determines that it has no other way to prevent the expansion of a conventional war into one that would threaten the regime's survival. Kim is clearly signaling that if a conventional, preemptive strike against the North is launched or



even appears to be imminent, he reserves the right to respond with nuclear weapons. North Korea is the only country in the world that has threatened the first use of nuclear weapons so explicitly.

Along with its new policy for preemptive WMD use, the Kim regime has sought to cement its nuclear power status by declaring in September that it “will never give up” its nuclear weapons and that its weapons program is “irreversible” and “nonnegotiable.” In effect, Kim is asserting that North Korea will never again discuss denuclearization with the United States, even as it expands its nuclear forces and threatens a preemptive strike. This amounts to a destabilizing triple whammy.

### Unconventional Threats

Although the United States and its close allies in [Asia](#) have watched Kim’s accelerating WMD program with growing concern, they have not yet mounted a response that can deter the North from its current path. Part of the issue is that Western policymakers and observers are not as concerned as they should be about recent developments. Some North Korea watchers, for example, have posited that the program is for defensive purposes only and that Pyongyang’s testing spree is simply a way to modernize its arsenal, allowing the regime to use it as leverage in future negotiations to win sanctions relief and other concessions. In this reading, the aim of the new first strike policy is merely to deter the United States from contemplating an attack on the regime. The logic of this argument is that Kim is not suicidal and knows that if he launches a first strike on the United States, it could lead to full-scale conflict and his own demise, as well as that of his regime.

Such reasoning, however, overlooks more unsettling possibilities. For a start, Kim may believe that through nuclear saber-rattling, he can achieve one of his main strategic goals, which is undermining the U.S.-South Korean alliance. He may calculate that even if he uses nuclear weapons preemptively against the South or U.S. bases in the region, the United States will not retaliate as long as his long-range ICBM force threatens the U.S. mainland. He may figure that Washington—particularly under a future isolationist president—will be unlikely to defend [South Korea](#) if by doing so it risks the incineration of American cities.

Moreover, even if Kim intends to avoid rather than initiate a conflict, his growing WMD program could lead to war. History provides ample examples—from [World War I](#) to the [Cuban missile crisis](#)—of situations in which a series of miscalculations led to or could have led to a catastrophic conflict. Imagine what would happen if a North Korean missile aimed at South Korean territorial waters were to strike South Korean fishing vessels, killing South Korean sailors. South Korean President [Yoon Suk-yeol](#) could order a limited retaliatory strike, precipitating further escalation into a wider conflict. This is hardly a far-fetched scenario: In 2010, tensions between the two countries dramatically ramped up after the North sank the South Korean naval corvette *Cheonan* and shelled South Korea’s Yeonpyong Island. Although Lee Myung-bak, then South Korea’s president, showed restraint under U.S. pressure after the attack on the *Cheonan*, the country’s forces responded with artillery fire after the shelling of the island. A future such confrontation could easily spiral out of control, especially in view of North Korea’s new first-strike policy.

## 71 percent of South Koreans now support acquiring nuclear weapons.

Nuclear and missile threats are not the only threats from the North the United States and its Asian allies need to be concerned about. The U.S. secretary of homeland security, Alejandro Mayorkas, said in October that North Korea has stolen as much as \$1 billion worth of cryptocurrency and hard currency in the past two years to fund its nuclear program. To make up for the economic cost of international sanctions and the closing of the North’s border with China during the [COVID-19](#) pandemic, the regime appears to have ratcheted up cyberthefts. In the future, North Korean hackers could use their cybersecurity capabilities for attacks as well as theft. Drones are yet another concern: on December 26, the North violated South Korean airspace by flying surveillance drones across the border for the first time in five years. Some of the drones entered the northern end of the 2.3-mile no-fly zone surrounding the presidential office in Seoul. That incursion prompted the South to scramble jets, fire warning shots, and fly its own drones into North Korean airspace.

These developments are causing South Korea and Japan to reconsider their existing policies toward North Korea, given their vulnerability as nonnuclear states facing a nuclear-armed rogue regime. Until now, they have relied on a robust conventional defense posture while counting on the United States to use its nuclear umbrella to shield them from nuclear attack. In December, however, Yoon described what he called a “serious threat” from the North that could lead to a dangerous miscalculation and spark a wider conflict and stepped up his call for closer security cooperation with the United States and Japan. In early January, he said that South Korea needed to strengthen its defense capabilities and suggested that the United States should expand its “extended deterrence,” including joint exercises and planning involving U.S. nuclear assets, and initiate a more active information exchange.

In late December, South Korea’s National Assembly approved a 4.4 percent hike in defense spending for 2023, bringing Seoul’s total defense budget next year to about \$45 billion. The increase includes funding for new preemptive strike capabilities and a \$440 million plan to counter the North’s drones. President



Yoon went even further in January, stating that if the North's nuclear threat continued to grow, South Korea would consider starting its own nuclear weapons program or ask the United States to redeploy nuclear weapons on the Korean Peninsula. Yoon's comments mark the first time since the United States withdrew its nuclear weapons from the South in 1991 that a South Korean president has publicly mentioned arming the country with nuclear weapons, an option that a large majority of South Koreans—71 percent, according to recent polls—support.

Meanwhile, [Japan](#) has made an unprecedented change in its own National Security Strategy in response to the increased threats from both North Korea and China. Under the plan unveiled by Japanese Prime Minister Fumio Kishida in mid-December, Japan will increase its defense spending by a whopping 26.3 percent this year and more than 50 percent over the next five years, shattering its decades-old doctrine of limiting defense spending to one percent of GDP. Japan also plans to acquire long-range counterstrike capabilities it has long shunned, including several hundred U.S.-made Tomahawk cruise missiles that could reach targets in both China and North Korea.

### A Stronger Umbrella

Although the new approaches in Seoul and Tokyo are important steps for countering the North Korean threat, it is vitally important that both countries cooperate more closely with the United States. This could involve more joint military exercises like the ones held by South Korea, Japan, and the United States in October and November; computer simulations of a North Korean attack and drills; deeper intelligence sharing; and robust planning for the employment of the extended U.S. nuclear umbrella. The United States and South Korea should create a consultative group, bringing in both high-level security officials and unofficial observers to build greater support for sustained security cooperation and examine options for improving crisis management.

Washington should also take steps to strengthen its own security umbrella in the region. The [United States](#) should reaffirm its treaty-based collective defense commitments to both Japan and South Korea while also bolstering its regional deterrence and defense capabilities in a number of ways. These include augmenting missile defenses and rotating more nuclear-capable U.S. weapons systems into South Korea, such as B-52s and F-35s. As the Biden administration's 2022 Nuclear Posture Review states, the United States will need to work more closely with South Korea and Japan to ensure "an effective mix of capabilities, concepts, deployments, exercises, and tailored options to deter and, if necessary, respond to coercion and aggression."

But enhancing deterrence against North Korea is only one part of the puzzle. Working with Japan, South Korea, and other allies, the United States also needs to make it more difficult for Kim to access the hard currency he needs to fund his WMD program. Given its escalating tensions with Beijing, the [Biden administration](#) cannot count on China to enforce tough sanctions. By working with its allies, however, the United States can do more to disrupt North Korean cyber-heists. If the West is able to cut off more of Kim's sources of revenue, it will not only create a significant barrier to his WMD program. It is also possible that such financial pressure could ultimately force Kim to the negotiating table because it would threaten his ability to dole out the favors needed to buy off the North Korean elite. North Korea's WMD program is growing at an alarming rate. South Korea and the United States must address the situation before it becomes destabilizing and the strategic balance tilts in favor of North Korea, at which point it will be far more difficult for the West to respond. Such a robust, coordinated effort will require deepening and expanding the U.S.–South Korean alliance and bringing South Korea into closer cooperation with Japan, Washington's other major ally in the region. Putting this approach into play will require overcoming political opposition in South Korea and Japan and greater attention in Washington, where the focus is understandably on the war in Ukraine. But the security imperative is clear and pressing.

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## Why are South Koreans losing faith in America's nuclear umbrella?

By **Paula Hancocks** (CNN)

Source: [https://thefranklinnewspost.com/partners/cnn/why-are-south-koreans-losing-faith-in-americas-nuclear-umbrella/article\\_de624d1f-5358-56f6-9e33-4f390178487d.html](https://thefranklinnewspost.com/partners/cnn/why-are-south-koreans-losing-faith-in-americas-nuclear-umbrella/article_de624d1f-5358-56f6-9e33-4f390178487d.html)

Jan 21 – They have them, so we need them.

That is the fundamental argument for South Koreans who want their country to develop its own nuclear weapons. It's about the need to protect themselves from an aggressive northern neighbor that is already [a nuclear power in all but name](#) and whose leader Kim Jong Un has vowed an ["exponential increase"](#) in his arsenal.





The counter-argument, which has long stopped Seoul from pursuing the bomb, lies in the likely consequences. Developing nukes would not only upset the country's relationship with the United States, it would likely invite sanctions that could strangle Seoul's access to nuclear power. And that is to say nothing of the regional [arms race](#) it would almost inevitably provoke.

But which side of the argument South Koreans find themselves on appears to be changing.

Ten years ago, calling for South Korean nuclear weapons was a fringe idea that garnered little serious coverage. Today it has become a mainstream discussion.

Recent opinion polls show a majority of South Koreans support their country having its own nuclear weapons program; a string of prominent academics who once shunned the idea have switched sides; even President Yoon Suk Yeol has floated the idea.

So, what's changed?

### Old question, new answer

For supporters, Seoul developing its own nukes would finally answer the age-old question: "Would Washington risk San Francisco for Seoul in the event of nuclear war?"

At present, South Korea comes under Washington's Extended Deterrence Strategy, which includes the nuclear umbrella, meaning the US is obligated to come to its aid in the event of attack.

For some, that is enough reassurance. But the details of exactly what form that "aid" might take aren't entirely clear. As that age-old question points out, faced with the possibility of a retaliatory nuclear strike on US soil, Washington would have a compelling reason to limit its involvement.

Perhaps better not to ask the question then. As Cheong Seong-chang of the Sejong Institute puts it, "If South Korea has nuclear weapons, we can respond ourselves to North Korea's attack, so there is no reason for the United States to get involved."

There are other reasons for South Koreans to question their decades-old leap of faith in US protection, too. Looming large among them is [Donald Trump](#). The former US president, citing the expense involved, made no secret of his desire to pull 28,500 US troops out of South Korea and questioned why the US had to protect the country. Given Trump has already announced his presidential bid for the 2024 election that's an issue that still plays heavy on people's minds.

"The US simply isn't perceived to be as reliable as it once was," Ankit Panda of Carnegie Endowment for Peace said. "Even if the Biden administration behaves like a traditional US administration and offers all the right reassurance signals to South Korea... policy makers will have to keep in the back of their mind the possibility of the US once again electing an administration that would have a different approach for South Korea."

But the loss of faith goes beyond Trump.

More recently, President Yoon Suk Yeol floated the idea of US tactical nuclear weapons being redeployed to the peninsula or South Korea possessing "its own nuclear capabilities" if the North Korean threat intensifies. Washington's rejection of both ideas has been conspicuous. When Yoon said this month that Seoul and Washington were discussing joint nuclear exercises President Joe Biden was asked the same day whether such discussions were indeed underway. He responded simply, "No."

Following Yoon's comments, US Defense Department Press Secretary Brig. Gen. Pat Ryder reiterated the US' commitment to the Extended Deterrence Strategy, saying that "to date, (the strategy) has worked and it has worked very well."

In a Chosun Ilbo newspaper interview published on January 2, Yoon said of these guarantees, "it's difficult to convince our people with just that." But in another interview, with The Wall Street Journal on the sidelines of Davos last week, Yoon walked those comments back saying, "I'm fully confident about the US' extended deterrence."

An inconsistent message rarely soothes concerns on either side of the argument.

### A middle ground?

On Thursday, US think-tank, the Center for Strategic and International Studies (CSIS), suggested what might seem a middle ground -- the creation of "a framework for joint nuclear planning" that could "help to develop stronger bonds of trust between the allies in the current environment." It said this framework could be "similar to a NATO planning group for nuclear weapons use, with planning conducted bilaterally and trilaterally (with Japan) and control remaining in the hands of the United States."

But the CSIS made clear it did not support "the deployment of US tactical nuclear weapons to the peninsula or condoning South Korea purchasing its own nuclear weapons."

Other experts too, like Professor Jeffrey Lewis, a nuclear non-proliferation expert at Middlebury Institute in California, see joint planning and exercises as "more realistic options than either nuclear weapons or nuclear sharing."

For some in Yoon's conservative party that is simply not enough. They see a nuclear-weapons-free South Korea being threatened by a nuclear-armed North Korea and want nothing less than US nukes redeployed to the Korean Peninsula.

They seem destined to be disappointed. Washington moved its tactical weapons out of South Korea in 1991 after decades of deployment and there are no signs it will consider reversing that decision.



"Putting US nukes back on the peninsula makes no military sense," said Bruce Klingner of Heritage Foundation. "They currently are on very hard to find, very hard to target weapons platforms and to take weapons off of them and put them into a bunker in South Korea, which is a very enticing target for North Korea, what you've done is you've degraded your capabilities."

### Nuclear fallout

That leaves many South Koreans seeing just one option -- and some are losing patience.

Cheong, a recent convert to South Korea acquiring the bomb, believes the Extended Deterrence Strategy has already reached its limit in dealing with North Korea and only a nuclear-armed South Korea can avert a war.

"Of course, North Korea does not want South Korea's nuclear armament. Now they can ignore the South Korean military," Cheong said. "But they must be nervous, (because if South Korea decides to pursue the bomb) it has the nuclear material to make more than 4,000 nuclear weapons."

Still, it's not just fear of upsetting the relationship with the US that holds Seoul back from such a course. If South Korea were to leave the Nuclear Non-Proliferation Treaty (NPT) the effect on its domestic nuclear power system would likely be swift and devastating.

"First of all, the nuclear suppliers group would cut off fissile material to South Korea, which is reliant for all of its fissile material on outside suppliers. It could lead to international sanctions," Klingner said.

Then there is the [regional arms race](#) it would likely provoke, with neighboring China making clear it will not tolerate such a build up.

"Probably China is going to be unhappy and it'll basically stop at nothing to prevent South Korea from going nuclear," said professor Andrei Lankov, long time North Korea expert from Kookmin University.

Given the likely fallout, Seoul might do better to take comfort in the guarantees already on offer from the US.

"The 28,500 US troops on the peninsula have a very real tripwire effect. In the event of a breakout of hostilities between the two Koreas, it is simply unavoidable for the US not to get involved. We have skin in the game," Panda said.

Finally, there are also those cautioning that even if South Korea did acquire nuclear weapons, its problems would hardly disappear.

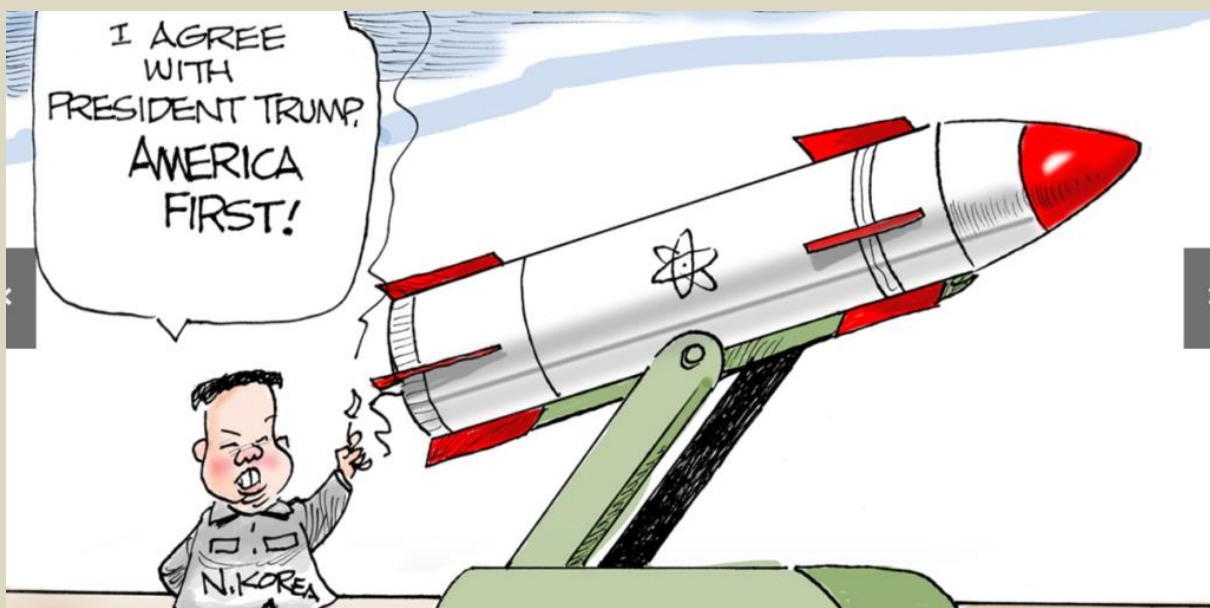
"So the funny thing about nuclear weapons is that your weapons don't offset their weapons," said Lewis at Middlebury Institute.

"Look at Israel. Israel is nuclear armed and is terrified of Iran getting nuclear weapons, so Israel's nuclear weapons don't in any fundamental way offset the threat they feel from Iran's nuclear weapons."

## 300 nuclear missiles are heading your way. You must respond. What now?

Source: <https://www.ft.com/content/06b22337-e862-43e5-8440-d9c225e0c18d>

**EDITOR'S COMMENT:** What a stupid question uploaded in a serious website! You cry out, "what the f\*ck" and make your cross or whatever your religion dictates. End of story!





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# **EXPLOSIVE NEWS**



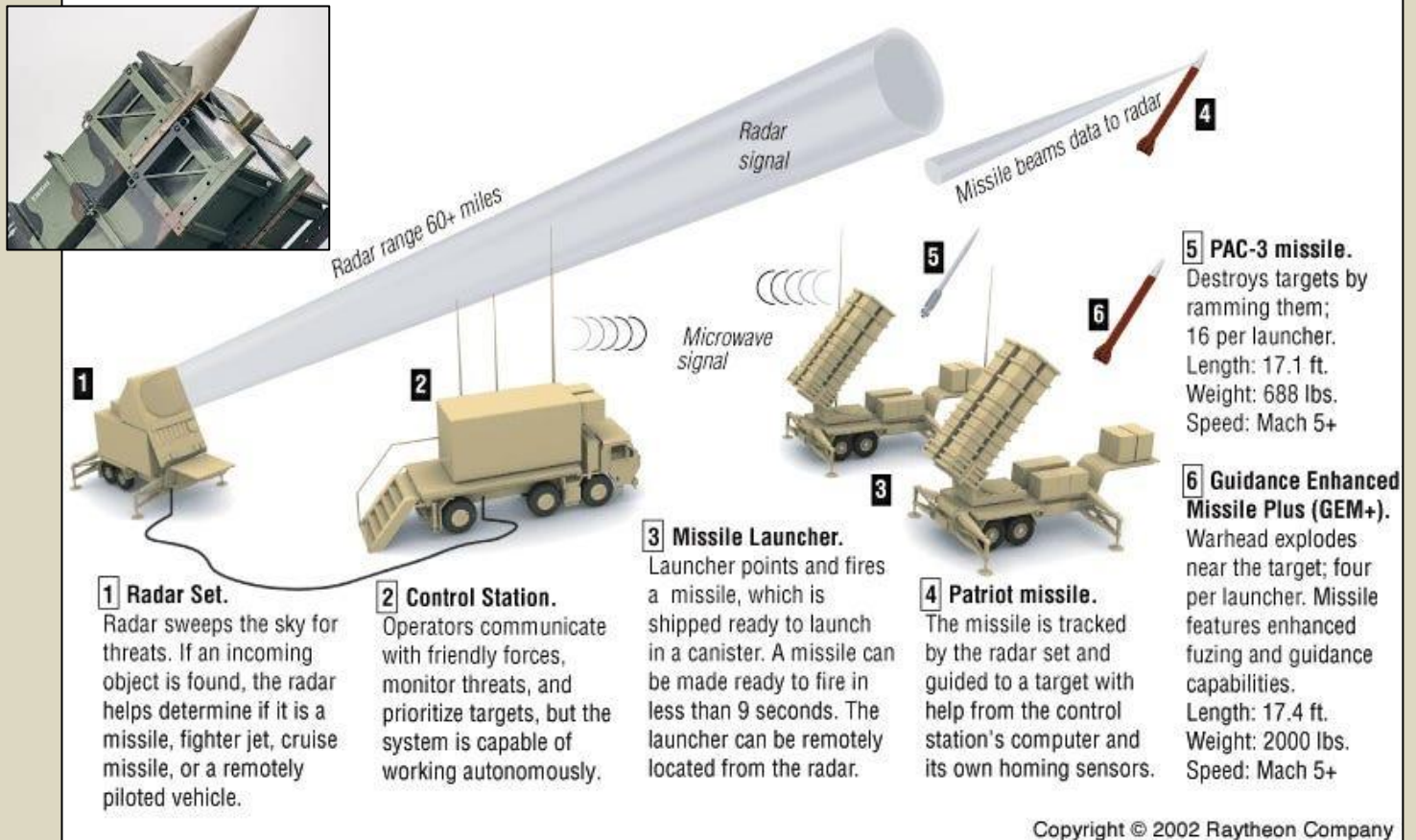
## What the Patriot Missile System Can -- and Can't -- Do for Ukraine

By Amos Chapple

Source: <https://www.homelandsecuritynewswire.com/dr20221224-what-the-patriot-missile-system-can-and-cant-do-for-ukraine>

Dec 24 – During his visit to Washington on December 21, Ukrainian President Volodymyr Zelenskiy singled out the inclusion of a Patriot missile system announced in a massive new military aid package. The weapon, he said, was “the strongest element” of the \$1.8 billion tranche and would stop attacks on his country’s critical infrastructure.

### Patriot Air & Missile Defense System: How Patriot Works



The Patriot missile system was first developed in the 1960s under the acronym SAM-D, and was initially designed as an anti-aircraft weapon.

By the 1980s the Patriot was redesigned to target incoming enemy missiles. Today, the latest iterations of the antimissile system can track incoming targets from up to 100 kilometers away and destroy them within 40 kilometers from the launcher. The latest Patriot missiles employ high-precision “hit-to-kill” targeting in which the missile explodes on impact, rather than in the vicinity of an enemy projectile.

A Patriot battery consists of an entire convoy that includes radar and control-station vehicles as well as a “power plant” truck fitted with generators, and the missile launch stations. Around 90 people are required to operate a battery but once set up, a Patriot system can function with a skeleton crew of three people.

The weapon has been touted as the “gold standard” for air defense, but previous iterations of the Patriot have suffered catastrophic failures in combat.

In 2018, Patriots [were filmed misfiring](#) amid a Huthi rebel missile attack on Riyadh, Saudi Arabia. One of those Patriot missiles [curled off-target](#) and slammed into a civilian area seconds after launch. In 1991, during the Gulf War, a software glitch led to a Patriot missile battery [failing to spot](#) an Iraqi Scud missile streaking toward a U.S. military base, also in Saudi Arabia.

Twenty-eight U.S. soldiers were killed by the incoming Scud.

Ukraine has long called for the supply of Patriots to bolster a sometimes-overwhelmed array of antimissile defenses that have included Soviet-designed systems, as well as [old U.S. HAWK](#) air-defense missiles.



But some experts say the real-world impact of the Patriot system will be limited due to the relatively small protective “dome” it provides, and its high cost of around \$4 million per missile. Iranian-made “suicide drones” that Russia has launched at Ukrainian cities are estimated to cost as little as \$20,000-\$50,000 each.

A military official familiar with the Patriot system [told Time](#) that one battery could protect a single facility like a military base, or a suburb of a city, but not a whole metropolis like Kyiv. The unnamed official said that a single Patriot battery “would not change the course of the war.”

Another expert [told CNN](#) the system could be used selectively to go after powerful Russian weapons — such as Kalibr cruise missiles — thus freeing up other, less-expensive air defenses to target smaller attack drones.

It is unknown when the Patriot battery will be deployed to Ukraine. Operators will reportedly be trained for use of the weapon in Germany, a process that usually takes “months.”

The Kremlin reacted to earlier reports the weapon would be provided to Ukraine by saying the Patriot system would be a “definite” target for Russia once set up inside Ukraine.

[Amos Chapple](#) is a New Zealand-born photographer and picture researcher with a particular interest in the former U.S.S.R.

## One careful step at a time through Lebanon’s minefields

Source: <https://www.bbc.com/news/world-middle-east-63949280>



Staff working with the Mines Advisory Group (MAG) have destroyed 10,000 landmines this year alone

Dec 27 – A visit to a minefield starts with some crucial safety notes. And they will save your life - when you are just steps away from deadly buried explosives, you need to pay attention.

Red-painted sticks dug into the ground mean danger. Tread any further and you risk stepping right onto a mine. White sticks are the sign of a safe, cleared channel. Black sticks show where an anti-tank mine used to lie, with the explosives inside now burnt away.

Wearing protective gear is vital. That means a helmet with a visor that wraps around your face from ear to ear and covers well below the chin. Protective body armour drops almost to your knees, shielding your vital organs and arteries from the impact of any accidental blast.

In the heat of the Lebanese summer, it is stifling. Deminers start their work as soon as the sun rises, to catch the coolest temperatures. Every hour they take 10 minutes to rest. As the noon sun hits its highest





## ICI C<sup>2</sup>BRNE DIARY – January 2023

point they are almost finished for the day. It is too dangerous to work when the conditions mean you might lose concentration. Even a momentary slip can be fatal.

It was 25 years ago this month, on 3 December 1997, that the Ottawa treaty was signed. It's better known as the Mine Ban Treaty - the international agreement that banned antipersonnel landmines - and it is widely considered to be one of the world's most successful disarmament treaties. To date, 164 countries have agreed to be bound by it.

Just weeks before the treaty was signed, the Mines Advisory Group (MAG) won the Nobel Peace Prize for their mine action efforts around the world. They have been working here in Lebanon since 2001. The demining operation is huge and continues almost daily. This year alone they will clear two million square metres of land and destroy around 10,000 landmines.

As well as dealing with both cluster munitions in the Bekaa Valley and improvised explosive devices (IEDs) left by the Islamic State group (IS) in the north-east of the country, the main work involves demining the frontier between Lebanon and Israel.

The so-called Blue Line was drawn by the United Nations in 2000, designed to physically mark the withdrawal of Israeli forces from the south of Lebanon. In some parts it is a high wall, in others little more than a metal fence that you can see right through. Below the surface is a 120km (75 mile) minefield designed to form an impenetrable barrier. Around 400,000 mines were laid there, some of them barely a metre apart.

In the village of Arab Ellouaizi, the barrier that marks the end of Lebanon and the start of Israel sits right at the edge of the mined area. A metre or two beyond it an Israeli military tower rises behind the grey concrete blocks. The hills in the distance are swathed in mist.

This heavily-mined land is a dangerous problem for the large number of refugees who have come to Lebanon from Syria. They want to live on the land, and cultivate it, but they don't know the risks.



Suaad Hoteit began clearing mines four years ago, and even met her fiancé as they worked together in the minefield

Three quarters of Arab Ellouaizi's population are Syrian refugees trying to carve out a living hundreds of miles from home. And that's why there's another vital reason - apart from safety - to clear this area. Agriculture is the main work in the south, and farmers are desperate to have the land cleaned up so they can use it. Lebanon's crippling financial crisis, coupled with the food shortage caused by the war in Ukraine, means ever more farming is an urgent priority.

Abu Ghassan Awada has a crop of peppers that are plump and ready to harvest. Above them, peach trees reach up over our heads. He remembers the sound of explosions at night when goats, sheep and foxes strayed onto the mines. It meant that for years, he couldn't farm his land. "I used to just be a worker, hired by other people. But now I can hire people to work on my own plot," he says. He still takes time to maintain





and fix the metal fence that marks out the edge of his farm. Beyond it, just metres away, the land is still an active minefield. He knows not to stray towards it.

Some of MAG's longest-serving staff have been part of the team for decades. A large cedar tree poster in the doorway of their headquarters shows their names and faces. Hiba Ghandour is MAG's programme manager in Lebanon. She's also passionate about making sure as many women as men are involved in the demining work. "When we're announcing the jobs we have to fill, even adding a photo of a woman doing the job makes sure we can reach everybody," she explains.



Demining has been helped by new technologies, such as the so-called "rubble crusher", in which mines sometimes detonate inside

One of those women is Suaad Hoteit. She started the job four years ago, and even met her fiancé as they worked together in the minefield. Deftly pulling her helmet onto her head, she describes the day's work. "I take my detector, then I go to the field and start searching. When I find a mine, I call the supervisor to check it. And at the end of the day, I make an explosion."

I'm surprised by the matter-of-fact way she talks about something so dangerous. "It's four years now, so it's a daily routine," she smiles. "In the first year of being here, I was so scared. Now I understand the danger. And I work here because I want to show people that women can do anything. We are strong and independent."

The type of landmines Suaad is searching for still regularly injure and kill people in 60 different countries. Worldwide, there are around 15 casualties every day. Haidar Maarouf Haidar was one of them. He wears a special white elastic support on his right hand, and peels it off carefully as he recalls the day when he detonated a mine while planting trees in his garden. The moment is still clear in his memory, even though it happened two years ago. "Suddenly something exploded and I heard a sound, as if I was in a dream. I didn't know what had happened. One moment I was leaning on the ground and the next suddenly something went off. I was knocked unconscious and when I woke up I couldn't see my fingers. They were gone."

Haidar turns his hand to show me what remains of the fingers - just four stumps twisting away from the palm. "My psychological state has changed, that's the first thing. I was a daily worker, I used to do everything with my hands, breaking stones and lumber with them. My body was active. Now if I use my hands, it feels like an electric current in them. My leg injuries make it difficult to walk. My life has totally changed, I can't do any work anymore except raising my children."

After so much pain the finish line is now in sight - in Lebanon at least. As we stand together in the Arab Ellouaizi minefield, MAG's Hiba Ghandour wants to point out how far they have come. "Overall in Lebanon we've cleared 80% of the contaminated land. We just need to keep going, and it's the support of our international donors that makes it possible."

Countries like the US, France, Norway, the Netherlands and Japan are at the forefront of mine action funding. The help is vital, but the amount of money pledged is decreasing. In Lebanon alone it has fallen from \$19.7m (£16m) in 2019 to an anticipated \$12.1m in 2023.



## ICI C<sup>2</sup>BRNE DIARY – January 2023

It is hard to predict how long it will take to clear the remaining 20% of contaminated Lebanese land. Fluctuating funding is one reason. But new technologies play a big part in the timescale, too. In the last year a new machine - called a rubble crusher - has drastically speeded-up the process of destroying mines. It swallows up both the earth and its hidden devices, breaking them to pieces before they explode. Sometimes they detonate inside the machine, and the thick armour-plating contains the blast. It doesn't replace human deminers, because it can only work on flat terrain. But it definitely makes the job quicker.

Some of the bigger munitions - the anti-tank mines - are also being dealt with in a new and special way. The demining teams are now so close to the politically-sensitive boundary between Lebanon and Israel that blowing up the large mines risk physically damaging it. That would not be good for the fragile relations between the two countries. So now, special sticks of thermite are inserted into the mines in the ground where they lie. The intense heat burns away the explosives without creating a huge blast.

Within sight of the fierce flames Mohammed Atris caresses the fresh green shoots that cover his land. For decades the ground he owns has been unusable, loaded with mines. Even walking on it was out of the question. "I felt sad, depressed and frustrated," he tells me. "I can't describe the feeling of being unable to use the land that we grew on earlier in our lives before it was mined and made unfit for farming. It was awful."

The vegetables he is tending were planted just six weeks ago, only 24 hours after the land was declared clear and handed back to him. "I couldn't wait. To all of those who made this happen, we thank you for your efforts."

Crouching to pull up his new crops, he gently wipes the soil from their roots and breaks into a beaming smile.

## World War Two: Thousands of bombs still left unexploded

Source: <https://www.bbc.com/news/uk-wales-64005022>

Dec 27 – There are potentially thousands of unexploded World War Two bombs around Wales, with emergency services still dealing with up to 20 callouts a year.

With the coastal towns of Cardiff and Swansea key German targets, many are thought to be in these areas.

At the start of the war, the authorities were "utterly unprepared" how to deal with unexploded bombs, according to historian Steve Day.

A bomb disposal officer was expected to live for two months.

Mr Day said this was consistent with a "farical approach" at the start of the conflict, with kit typically comprising of a hammer and chisel, ball of string, and maybe a stethoscope if they were lucky.

He added: "The running joke was 'join the Army and see the world, join the bomb disposal squad and see the next world'."

It was an issue my family are all too aware of because on 21 February 1941, my then 15-year-old grandfather, Les Prior, was on traffic duty on Swansea's Castle Street.

As part of the Home Guard, his role was to direct cars away from the area while bomb disposal experts tried to defuse a massive unexploded device dropped [during the Three Night Blitz](#) on the town.

At about 17:00 he recalled a "whoosh of air" which blew him flat on his face and destroyed the street's shopfronts.

Being several hundred yards away from the blast, he was thankfully uninjured, but seven sappers from the Royal Engineers were not so lucky.

In 1941, Wales became a major battleground, not only because of the industrial targets along the Bristol Channel, but because of the undefended route it offered to the north-west of England.

"Cardiff, and particularly Swansea were key targets in their own right, especially given the oil refinery at Llandarcy, but the gaps in Welsh air defences made us a back door to attack the far more important prizes of Liverpool on the North Atlantic shipping route," Mr Day said.

"There were no gun emplacements in the gaps between Pembroke, Swansea and Cardiff."

Because of this, more than 80 years later, the sight of Ministry of Defence (MoD) vehicles rushing to emergencies are still a common sight on Welsh roads.

This is because about 10% of all German bombs dropped on Wales failed to detonate.







As soon as UK authorities learnt how to deal with a certain type of bomb, a new one was developed (Image source, Steve Day)

Given that there were 743 air raids over Wales, each containing between five and 30,000 devices, many thousands are potentially still lying undetonated, Mr Day believes.

The author and historian from Swansea has charted the different ways they have been tackled over the decades in his book *Danger UXB WW2 Wales*.

"At the start of the war, we were utterly unprepared for how to deal with unexploded bombs," he said.

"There were various plans for ARP (air raid precautions) and police to chart them falling, and for volunteers to collect them for disposal in a safe place, but it quickly became apparent that this wasn't going to happen."

MoD worker Mr Day said responsibility was soon switched to the armed forces, with each of The Army, RAF and Royal Navy taking charge of drops in their own areas of command.

Before the first attack had even hit Wales, an early example of bombs used by the Luftwaffe had been sent to RAF Sullom Voe on the Shetland Islands for inspection.

But a lot of time and effort was spent for nothing, with Mr Day adding: "The Germans had actually registered the copyright for the Type 15 fuse with the Patent Office in Newport in 1932."

"All the British would have needed to do was to inspect the plans, and they could have saved themselves several months of research."

He said that unexploded bombs are not always where you would expect them to be, near their intended targets.

"Having carried out a bombing raid on Liverpool, German bombers would rush back over mid Wales pursued by night fighters and would just drop whatever bombs they were still carrying, in order to gain height and speed," Mr Day added.

"That means bomb disposal teams are often called out across many parts of what was rural Wales to unearth high explosives in what were just fields during World War Two."

By 1941, The Luftwaffe had worked out that British bomb disposal experts had figured out how to short-circuit Type 15 fuses.

They then used the Type 17, which contained a mechanical clock, set to go off anything from a minute to several days after landing.

But Mr Day said these were "ingeniously countered" with either pumped-in sugar based viscous fluid to gum up the clockwork mechanism, or a magnet known as "the clock stopper" which would disrupt its iron parts.

### Biggest loss of life

Germany again responded with anti-tamper fuses, which would immediately explode when anyone tried to remove them, he said.

One of these one tonne (1,000kg) bombs killed seven men in the single biggest loss of life for bomb disposal during the entire war.

Mr Day explained: "They were using a process called 'trepanning', whereby you bore into the side of the bomb with a steam drill and then force steam into the bomb casing to allow the liquid TNT to flow out."

"However, like many other cases, this bomb was embedded deeply in the road, and as they tried to lift it out with whatever materials came to hand - planks or even doors from nearby bombsites - the bomb went off and killed all those around."

Mr Day said many of the same methods and techniques of bomb disposal from World War Two are still used to this day, although robots carry out a lot of the most dangerous roles.

From a high in the 1950s of about 80 unexploded bombs a year, even now in Wales it is not uncommon to receive around 20 callouts.





## In a Ukraine workshop, the quest to build the perfect grenade

By Thomas Gibbons-Neff and Natalia Yermak (The New York Times)

Source: <https://www.japantimes.co.jp/news/2023/01/08/world/ukraine-grenade/>

Jan 08 – An array of mostly unremarkable items stretched across two wooden tables on the far side of a cramped workshop in eastern Ukraine: double-sided tape, gloves, Allen wrenches, a soldering iron, 3D-printed plastic, ball bearings, a digital scale. Next to them was a German DM51 fragmentation grenade.



A private in the Ukrainian army attaches a grenade to a DJI Mavic 3 drone before remote-piloting it on a mission over Russian front-line positions near Pokrovske, Ukraine, in August. | DAVID GUTTENFELDER / THE NEW YORK TIMES

They were all important ingredients for Ukrainian troops trying to piece together a puzzle: How do you create a grenade that weighs next to nothing but can be dropped from a drone and destroy a roughly 40-ton Russian tank?

“War is an economy. It’s money,” said Graf, a stout, bearded Ukrainian soldier in charge of his unit’s drone team. “And if you have a drone for \$3,000 (¥396,326) and a grenade for \$200, and you destroy a tank that costs \$3 million, it’s very interesting.”

Since Russia launched [a full-scale invasion of Ukraine](#) nearly a year ago, technological advancements on the battlefield have mostly centered on both countries’ increased use of small, remotely operated drones and their growing importance in almost every aspect of the war — including reconnaissance, correcting artillery fire and so-called kamikaze attacks.

Now Graf and his team, who have become experts at killing Russian troops with munitions dropped from the air, are trying to raise the drones’ effectiveness to the next level: by using them to deliver what they consider the perfect grenade.





The challenge is building that grenade.

“It’s our main goal,” Graf said last month from his headquarters in the city of Sloviansk. He was surrounded by the various components needed to turn a flying toy into a lethal battlefield tool. Like other Ukrainian soldiers during the war, he identified himself to reporters only by his military call sign.

The tinkering in Graf’s workroom is another example of how Ukraine’s military has adapted as the war progresses, creating advantages in the face of the Russian army’s superiority in troop numbers and long-range weaponry.

The grenade, Graf said, should weigh around 1.1 pounds (0.5 kilograms), the maximum weight a DJI Mavic 3 drone can carry without its flight being significantly disrupted.



[A fighter with a unit in Ukraine’s National Guard modifies grenades to be used as bombs that can attach to small drones, at a workshop outside Sloviansk in August. | DAVID GUTTENFELDER / THE NEW YORK TIMES](#)

To get the grenade closer to the desired weight, his team has been using a 3D printer to try to make a lightweight casing that can hold the explosives needed to penetrate a tank’s armor. The painstaking task involves experimenting with grenades of differing designs, clasped in a vise in their workroom, and operating around the explosive mechanisms to fine-tune them.

The grenade should be able to penetrate the hull of an armored personnel carrier or tank — something not currently possible with a munition weighing around 1 pound, Graf said. For now, their best grenade is the German-supplied DM51, an explosive that, with stabilizing fins attached, weighs near their imposed threshold.

But the DM51 is manufactured to kill people and is not effective against a tank.

“Every day, we study; we make some experiments with grenades, with bombs, with drones, and make our work better,” Graf added. To Graf and the legions of Ukrainian drone operators and armorers, the quest for an enhanced grenade is part of a broader drone arms race with Russia. Like Graf’s team, the Russian military is also trying to make its small unmanned vehicles deadlier, to varying levels of success.

The Chinese-made Mavic 3 drone has turned into the ubiquitous backbone of Ukraine’s drone forces. It is small, portable, has a decent battery life and range and can quickly be outfitted to drop grenades. Russian forces use it, too.



The Russians' bigger military drones, including the self-exploding Shahed-136, which is made in Iran and frequently launched at Ukraine's infrastructure, are used differently from the small Mavics that are deployed against concentrations of troops and trenches. The Mavics are quadcopters; they can hover like a helicopter directly over their target before dropping their lethal cargo.

Ukraine has stayed ahead in the drones arm race in much the same way as it has succeeded on the battlefield: Lower-level commanders have more leeway in how and when to use them, and drone units such as Graf's have less bureaucracy to navigate to test and deploy their weapons.

"The Ukrainian drone effort is more streamlined and works directly with the military," said Samuel Bendett, a specialist on Russian drones and other weapons at CNA, a research and analysis organization in Arlington, Virginia. "The Russians are only getting there now."

That means that Graf and his comrades' inventions can quickly be shared with other drone units in chat groups before being used in the field, with little oversight.

Russia, Bendett said, has taken a more industrial approach to the drone arms race, preferring munitions that are mass-produced, though some Russian volunteer groups are making progress in testing and sending drones to the front line. The only drawback for the Russians: navigating Moscow's Soviet-era bureaucracy to get the right equipment into their soldiers' hands, Bendett said.

"There's a lot of this back-and-forth," he said. "One side has a tech breakthrough, and the other side catches up."

Tucked away on one of the shelves in Graf's workshop was evidence of Moscow's industrialized attempts to compete with Ukraine: a factory-produced Russian OFSP — a small, roughly 40-millimeter grenade meant to be dropped by an Orlan-10, a reconnaissance drone that sounds like a lawn mower. The grenade had a manufacture date of March 2022 stenciled onto its side.

"They are just dropping a default modification of this grenade," said Iliya, one of Graf's drone engineers and armorers. "We are dropping everything that we can find." The main thing to consider, he said, "is the weight of a grenade that the drone can move."

Another obstacle that Ukrainian drone operators face is having to modify the weapons to work in ways that they were not originally built to.

The challenges are twofold: [Inundated with munitions from countries such as France, Germany and the United States](#), Ukrainian troops need to learn the intricacies of each device before jury-rigging the explosives.

That process is complicated, too. Some small grenades like the M433, which is made and supplied by the United States — and is sometimes called the Golden Egg because of its size, shape and color — have the kind of shaped-charge warhead that can punch through armor plate. But they are meant to be fired only from hand-held grenade launchers, not dropped by drones.

So Ukrainian soldiers must carefully place the grenade into a vise grip, pry off the cartridge case that contains the propellant used to fire it and then begin the even more delicate work of teasing off the aluminum cup over the grenade's nose. With pliers and other hand tools, the soldiers must gently probe and manipulate the fuze's inner mechanisms to disable both of its safety features. If successful, they are left with a grenade that could easily explode if mishandled.

And before it can be sent on a mission against Russian troops, the explosive has to be carefully mounted onto the drone.

Graf said that no one on his team had been killed while working on the grenades but that the process was perilous for troops on the front line. There are "many, many dead guys because they don't understand how these things work," he said.

Despite the risks, Graf and his team continue to tinker in their workshop teeming with different kinds of explosives, edging ever closer to the elusive tank-killing grenade. Currently, they have a munition that they say can penetrate Russian armor, but it is around a half-pound too heavy. "We make grenades from the trash," joked Graf. "But if you can destroy a tank from a Mavic, you're the best at this war."

## Was That Explosion Chemical or Nuclear?

Source: <https://www.homelandsecuritynewswire.com/dr20230112-was-that-explosion-chemical-or-nuclear>

Jan 12 – If an underground explosion occurs anywhere in the world, there is a good chance that a seismologist can pinpoint it. However, they won't necessarily be able to tell you what kind of explosion had occurred—whether it is chemical or nuclear in nature. New research from Pacific Northwest National Laboratory (PNNL) scientists makes detecting nuclear explosions easier.

"To a seismologist, chemical and nuclear explosions look identical," said Harry Miley, Laboratory Fellow and physicist in the National Security Directorate at PNNL. "Radionuclide detection technologies, like the PNNL-developed Xenon International and Radionuclide Aerosol Sampler/Analyzer, known as RASA, can discriminate between the two by detecting radioactive atoms that are created in nuclear explosions. However, we have very little scientific understanding of the geologic containment of these atoms following an explosion."





When an underground explosion occurs, gases travel through fractures in the ground and escape into the atmosphere. Instruments such as Xenon International and RASA can then detect radionuclide gases, but their chemical signatures may be greatly affected by rock damage that the gases must pass through.

Earth scientist Hunter Knox and computational scientist Tim Johnson at the Earth Systems Science Division at PNNL showed up in Miley's office one day proposing to investigate the effects of rock damage patterns on gas flow paths. The results, recently published in *Pure and Applied Geophysics*, have been transformational for understanding subsurface gas flow.

Hidden within the exit paths taken by these post-explosion gases are clues to their origin. Monitors around the globe can detect tiny amounts of radionuclides in the atmosphere but cannot differentiate between a radioactive isotope from an explosion or from other activities, such as the production of medical isotopes.

"This research helps us with timing – if a nuclear explosion occurs, when should we expect to detect the radioactive gases it produces? Coupling this information with seismologic data and radionuclide detection can reduce uncertainty in determining if an explosion is chemical or nuclear in nature," said Johnson.

Ultimately, this research augments existing global nuclear non-proliferation efforts to keep citizens safe.

### A New Way to Image Rock Fractures

Knox knows geophysics well: she's studied everything from volcanic eruptions to ice quakes to underground explosions. More often than not, you can find her at a remote field site, designing sensor networks to monitor and characterize the subsurface and man-made events. Her work on the Subsurface Technology and Engineering Research (SubTER) program in her previous tenure at Sandia National Laboratories (SNL) sparked her interest in the intersection between underground explosions and fracture imaging. On the SubTER program, Knox met Johnson, who is best known for his work in electrical resistivity tomography (ERT), a technique that uses electrical currents to image sub-surface structures. Johnson developed E4D-RT, a software that can generate time-lapse 3D images using geophysical measurements. While previous work used simulations to predict rock fracture patterns, Knox and Johnson realized that their combined expertise could allow them to directly image the fractures from underground explosions.

"ERT has not been used much for characterizing rock damage or gas flow patterns," said Knox. "Our research lays the groundwork for this emerging use."

The PNNL damage imaging research team collaborated with explosive research experts at SNL, to conduct three underground chemical explosions at Blue Canyon Dome, which is located on the Energetic Materials Research and Testing Center in Socorro, New Mexico. The research team used ERT to image the test site before and after detonating the subsurface explosions. They also explored the use of common tracers—such as water, hot compressed air, and nitrogen—for enhancing timelapse tomographic imaging. Together, these results can be used to simulate and predict the transport of gases following an underground nuclear explosion.

While more research needs to be done, this work demonstrates the use of ERT as an emerging capability for monitoring the effects of underground explosions. "Seeing the ERT images is like flipping to the back of the book," said Miley.

## Dog walker finds 'nail bomb' in Hull Park as experts carry out explosion

Source: <https://www.hulldailymail.co.uk/news/hull-east-yorkshire-news/dog-walker-finds-nail-bomb-8010884>

Jan 09 – A dog walker has spoken of his shock after he found an unexploded 'nail bomb' near a children's play area in a Hull park. Joe Smith, who lives on Rosmead Street nearby, was astounded when he found what he described as a '[nail bomb](#)' in Rosmead Street Park at 7.30pm on Saturday, 7 January. He came across the suspicious item as he walked home through the park with his dog.

He described it as a tube with batteries and nail wires. Once he saw the [bomb](#) he immediately went home to alert [Humberside Police](#) and he was at the park when the bomb disposal experts detonated it.

Joe said: "I saw it and thought 'oh my God it's a bomb'. I came home and rang the police straight away but they didn't get to the park until around 9.20pm.

"It was a tube with batteries and nail wires coming out of it with white powder on top. It was a nail bomb. I don't know how it got there.

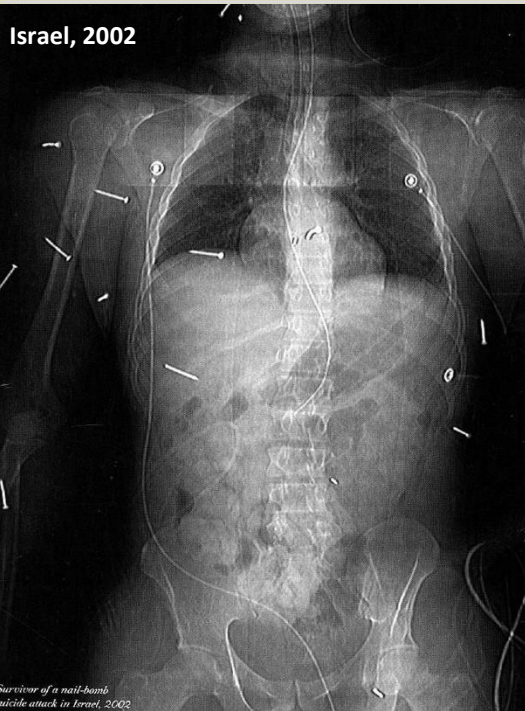
"The [police officer](#) picked it up without gloves on. I was there when they exploded it. It sounded loud and it was a big bang.

"There were two armed police, four coppers, an ambulance and a fire engine. I'd never seen this many coppers before."

The site of the bomb is close to a children's rope climbing frame in the park. A small amount of damage has been left at the site by the explosion.

Humberside Police said its officers were called to reports of a "suspicious item" near Rosmead Street. Residents on Rosmead Street were evacuated as a precaution and the area was cordoned off while the Explosive Ordnance Disposal (EOD) assessed the situation.





A spokesperson for Humberside Police said: "Officers responded to reports of a suspicious item that had been discovered near to Rosmead Street, Hull, at around 9.20pm on Saturday 7 January. Colleagues from the Explosive Ordnance Disposal (EOD) unit were called to assess the situation and the area was cordoned off and some residents were evacuated as a precaution whilst the EOD carried out its duties.

"The EOD detonated the item which was deemed not to be a viable device." It is believed that all residents returned home safely. The area is no longer cordoned off and the park is open as usual.

**A nail bomb** is an anti-personnel explosive device containing nails to increase its effectiveness at harming victims. The nails act as shrapnel, leading almost certainly to more injury in inhabited areas than the explosives alone would. A nail bomb is also a type of flechette weapon. Such weapons use bits of shrapnel (steel balls, nail heads, screws, needles, broken razors, darts and other small metal objects) to create a larger radius of destruction. Nail bombs are often used by terrorists, including suicide bombers since they cause larger numbers of casualties when detonated in crowded places. Nail bombs can be detected by electromagnetic sensors and standard metal detectors.



Copy of CAT scan released by London's Great Ormond Street Children's Hospital, showing the head of a 23-month-old child who was injured in nail bomb explosion in Brixton, South London, in 1999. Photo / AP

### Description

The nail bomb is an anti-personnel (AP) explosive device enhanced with nails to increase its fragmentation and effectiveness at harming victims. The nails act as fragmentation, leading almost certainly to greater loss of life and injury in areas than the explosives alone would. Such weapons use bits of fragmentation (steel balls, nail heads, screws, needles, broken razors, darts and bits of metal) to create a larger radius of destruction. Nail bombs are often used by terrorists, including suicide bombers since they cause larger numbers of casualties when detonated in crowded places. The Hyde Park and Regent's Park bombings were carried out on the 20th of July 1982 in London, England. Members of the Provisional Irish Republican Army (PIRA) detonated two improvised





**ICI C<sup>2</sup>BRNE DIARY – January 2023**

explosive devices during British military ceremonies in Hyde Park and Regent's Park, both in central London. At 10:43 am, a nail bomb exploded in the boot of a blue Morris Marina parked on South Carriage Drive in Hyde Park. The 1999 London Nail Bombings were a series of bomb explosions in London, England. Over three successive weekends between the 17th and the 30th of April 1999, homemade nail bombs were detonated respectively in Brixton, south London, Brick Lane in the East End and in The Admiral Duncan pub in Soho in the West End. Additional images and technical information are available to CAT-UXO members.





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# CYBER NEWS





## Top Security Trends For 2023

Source: <https://i-hls.com/archives/112190>

Dec 22 – Many advancements and developments have happened over the course of 2022, many now asking what will happen in 2023? What will be the top trends for security technology this next upcoming year? Forbes writes that these following topics may lead 2023 into a safer year:

- ❖ The increasing role of AI – In order to cope with the influx of data from video evidence, 911 call information, etc., first responder agencies will need to be able to manage and sort the data and produce actionable insights. AI should continue helping alleviate administrative tasks such as writing incident reports. Smart video search with keywords is another example.
- ❖ Real-Time Video – The increasing public safety trend of video from drones, body-worn cameras and in-car camera systems can create a more robust situational awareness for first responders, providing them with the insight they need to make well-informed decisions.
- ❖ Call centers upgrade – Many call centers lack adequately secured means to receive streaming video, recordings and images from mobile phones. According to the FCC, “many states and localities will be properly upgrading their 911 call centers in the next year” to help incorporate the everyday citizen in the emergency response workflow.
- ❖ User experience is important especially when every second matters – Few first responders have the time or attention to search for a button or replace a dying battery while handling an incident. “As technology advances, incorporating design thinking to facilitate a better user experience will be crucial to alleviate mental stress and cognitive load” from public safety professionals.
- ❖ Evaluating new technology – When implementing new technology in public safety, the rule is “more complexity is not the answer”. Also, keep in mind that technologies like AI should never negate the human-decision making process.

## Needed Now More Than Ever

Source: <https://i-hls.com/archives/103046>

Dec 21 – Cyber security is often associated with protecting data, but hackers are increasingly targeting physical devices. A technology under development makes digital chips more resilient to security attacks. The University of Arkansas researchers project focuses on protecting integrated circuit (IC) chips, which are critical components in modern electronics. The chips can be found in a wide variety of devices, including computers, vehicles and even refrigerators. As devices are increasingly interconnected via the “Internet of Things,” designers are intensifying efforts to protect the hardware from outside threats.

Threats to hardware can be categorized into three broad areas — compromising confidentiality, integrity or availability. “For attacks targeting confidentiality, sensitive information stored on the electronic device may be leaked out to attackers; for those targeting integrity, the device may produce wrong data or make wrong decisions; for those targeting availability, the device may malfunction or stop working,” said Jia Di, professor of computer science and computer engineering from the University of Arkansas.

According to DARPA, “as Internet-of-Things devices rapidly increase in popularity and deployment, economic attackers and nation-states alike are shifting their attention to the vulnerabilities of digital integrated circuit chips. Threats to IC chips are well known, and despite various measures designed to mitigate them, hardware developers have largely been slow to implement security solutions due to limited expertise, high cost and complexity, and lack of security-oriented design tools integrated with supporting semiconductor intellectual property.”

## Russian hackers targeted U.S. nuclear scientists

By James Pearson and Christopher Bing

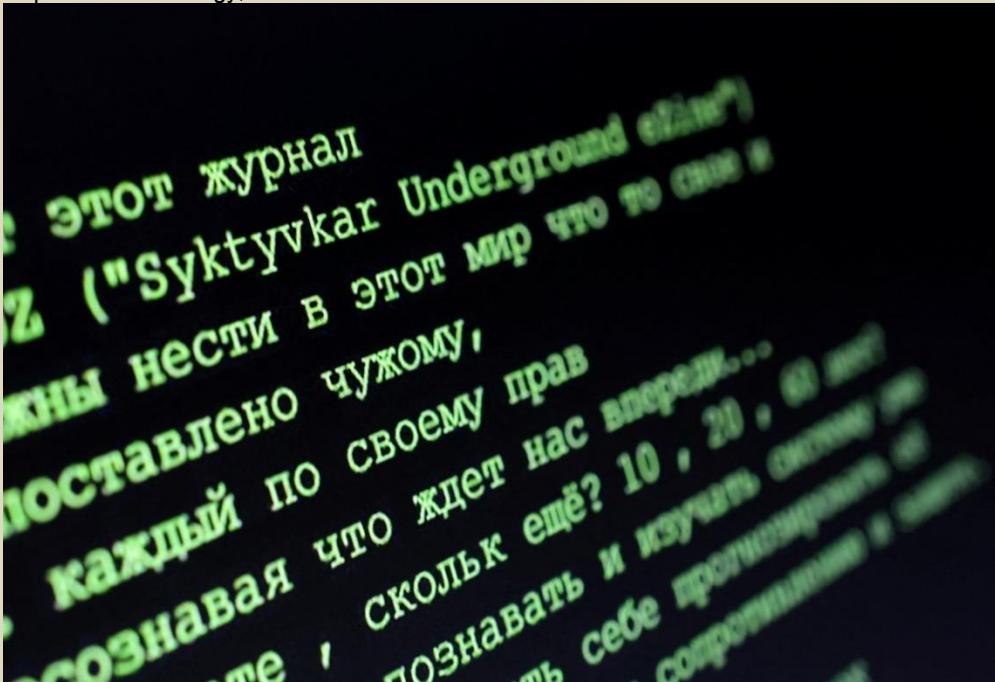
Source: <https://www.reuters.com/world/europe/russian-hackers-targeted-us-nuclear-scientists-2023-01-06/>

Jan 06 - A Russian hacking team known as Cold River targeted three nuclear research laboratories in the United States this past summer, according to internet records reviewed by Reuters and five cyber security experts.

Between August and September, as President Vladimir Putin indicated Russia would be [willing to use nuclear weapons](#) to defend its territory, Cold River targeted the Brookhaven (BNL), Argonne (ANL) and Lawrence Livermore National Laboratories (LLNL), according to internet records that showed the hackers creating fake login pages for each institution and emailing nuclear scientists in a bid to make them reveal their passwords.



Reuters was unable to determine why the labs were targeted or if any attempted intrusion was successful. A BNL spokesperson declined to comment. LLNL did not respond to a request for comment. An ANL spokesperson referred questions to the U.S. Department of Energy, which declined to comment.



Russian hacking underground newsletter is seen in this illustration taken, December 19, 2022 REUTERS/Dado Ruvic/Illustration

Cold River has escalated its hacking campaign against Kyiv's allies since the invasion of Ukraine, according to cybersecurity researchers and western government officials. The digital blitz against the U.S. labs occurred as U.N. experts entered Russian-controlled Ukrainian territory to inspect Europe's biggest atomic power plant and assess the risk of what both sides said could be a devastating radiation disaster amid heavy shelling nearby.

Cold River, which first appeared on the radar of intelligence professionals after targeting Britain's foreign office in 2016, has been involved in dozens of other high-profile hacking incidents in recent years, according to interviews with nine cybersecurity firms. Reuters traced email accounts used in its hacking operations between 2015 and 2020 to an IT worker in the Russian city of Syktyvkar. "This is one of the most important hacking groups you've never heard of," said Adam Meyers, senior vice president of intelligence at U.S. cybersecurity firm CrowdStrike. "They are involved in directly supporting Kremlin information operations."

Russia's Federal Security Service (FSB), the domestic security agency that also conducts espionage campaigns for Moscow, and Russia's embassy in Washington did not respond to emailed requests for comment.

Western officials say the Russian government is a global leader in hacking and uses cyber-espionage to spy on foreign governments and industries to seek a competitive advantage. However, Moscow has consistently denied that it carries out hacking operations.

Reuters showed its findings to five industry experts who confirmed the involvement of Cold River in the attempted nuclear labs hacks, based on shared digital fingerprints that researchers have historically tied to the group.

The U.S. National Security Agency (NSA) declined to comment on Cold River's activities. Britain's Global Communications Headquarters (GCHQ), its NSA equivalent, did not comment. The foreign office declined to comment.

### 'Intelligence collection'

In May, Cold River broke into and [leaked emails belonging to the former head of Britain's MI6 spy service](#). That was just one of several 'hack and leak' operations last year by Russia-linked hackers in which confidential communications were made public in Britain, Poland and Latvia, according to cybersecurity experts and Eastern European security officials.

In another recent espionage operation targeting critics of Moscow, Cold River registered domain names designed to imitate at least three European NGOs investigating war crimes, according to French cybersecurity firm SEKOIA.IO.

The NGO-related hacking attempts occurred just before and after the October 18 launch of a report by a U.N. independent commission of enquiry that found Russian forces were responsible for the "vast majority" of human rights violations in the early weeks of the Ukraine war, which Russia has called a special military operation.

[In a blog post](#), SEKOIA.IO said that, based on its targeting of the NGOs, Cold River was seeking to contribute to "Russian intelligence collection about identified war crime-related evidence and/or international justice procedures." Reuters was unable independently to confirm why Cold River targeted the NGOs.

The Commission for International Justice and Accountability (CIJA), a nonprofit founded by a veteran war crimes investigator, said it had been repeatedly targeted by Russian-backed hackers in the past eight years without success. The other two NGOs, the International Center of Nonviolent Conflict and the Centre for Humanitarian Dialogue, did not respond to requests for comment.





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Russia's embassy in Washington did not return a request seeking comment about the attempted hack against CIJA. Cold River has employed tactics such as tricking people into entering their usernames and passwords on fake websites to gain access to their computer systems, security researchers told Reuters. To do this, Cold River has used a variety of email accounts to register domain names such as "goo-link.online" and "online365-office.com" which at a glance look similar to legitimate services operated by firms like Google and Microsoft, the security researchers said.

### Deep ties to Russia

Cold River made several missteps in recent years that allowed cybersecurity analysts to pinpoint the exact location and identity of one of its members, providing the clearest indication yet of the group's Russian origin, according to experts from Internet giant Google, British defense contractor BAE, and U.S. intelligence firm Nisos.

Multiple personal email addresses used to set up Cold River missions belong to Andrey Korinets, a 35-year-old IT worker and bodybuilder in Syktyvkar, [about 1,600 km \(1,000 miles\) northeast of Moscow](#). Usage of these accounts left a trail of digital evidence from different hacks back to Korinets' online life, including social media accounts and personal websites.

Billy Leonard, a Security Engineer on Google's Threat Analysis Group who investigates nation state hacking, said Korinets was involved. "Google has tied this individual to the Russian hacking group Cold River and their early operations," he said.

Vincas Ciziunas, a security researcher at Nisos who also connected Korinets' email addresses to Cold River activity, said the IT worker appeared to be a "central figure" in the Syktyvkar hacking community, historically. Ciziunas [discovered a series](#) of Russian language internet forums, including an eZine, where Korinets had discussed hacking, and shared those posts with Reuters.

Korinets confirmed that he owned the relevant email accounts in an interview with Reuters but he denied any knowledge of Cold River. He said his only experience with hacking came years ago when he was fined by a Russian court over a computer crime committed during a business dispute with a former customer.

Reuters was able separately to confirm Korinets' links to Cold River by using data compiled through cybersecurity research platforms Constella Intelligence and DomainTools, which help identify the owners of websites: the data showed that Korinets' email addresses registered numerous websites used in Cold River hacking campaigns between 2015 and 2020.

It is unclear whether Korinets has been involved in hacking operations since 2020. He offered no explanation of why these email addresses were used and did not respond to further phone calls and emailed questions.



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**DRONE NEWS**





OCEANS 2017 – Anchorage, Alaska, USA | 18-21 September 2017

## GammaEx project: A solution for CBRN remote sensing using Unmanned Aerial Vehicles in maritime environments

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## Turkey Uses Missiles with German Parts Against U.S. Allies, Breaking Export Agreement

By Seth J. Frantzman

Source: <https://www.meforum.org/63932/turkey-uses-missiles-with-german-parts-against-us>

Dec 08 – A new investigation has focused on [Turkey's use of missiles](#) as part of its operations in Syria.

These missiles are fired from Turkish drones. Conflict Armament Research, a European Union-funded organization that helps trace munitions and other items in conflict, has done important work over the years documenting weapons in other countries of the region. The new report concludes that "missile components documented by CAR's investigators in [northeast Syria](#) show how commercial products manufactured in the EU have been diverted for use in missile production." What this means is that items such as electromagnetic brakes have been sent to Turkey and used in missiles, when they were intended for civilian use.



The MAM-L air-to-surface missiles used by killer drones are from German licensed production.

"According to information provided to CAR by the commercial exporter, electromagnetic brakes documented at 10 of the 17 missile strike sites in northeast Syria had ostensibly been sold for use in ambulances in

Türkiye [sic]. The end-user repeatedly stated, in verbal and written form between 2018 and 2020, [that] the brakes were intended for medical use. However, as CAR's findings demonstrate, the brakes were subsequently incorporated into missiles and used for military purposes in northeast Syria."

This report is important because it is one of the few examples where an investigation has been carried out about Turkey's use of drone strikes in Syria. Ankara launched several invasions of Syria beginning in 2016. These reached a peak in 2018 when Turkey invaded Afrin and again in the fall of 2019 when it also invaded an area called Serekaniya.

Ankara targeted Kurdish forces and the invasions forced hundreds of thousands of Kurds and other minorities to flee their homes. After the October 2019 invasion, Turkey used drones to [strike at people in eastern Syria](#). Most of these strikes are carried out against the US-backed Syrian Democratic Forces, the main group fighting ISIS. Ankara claims it is fighting "terrorists."

### What did the report focus on?

The CAR report is focused primarily on the issue of munitions and components of the munitions. The report is based on pieces recovered from missiles apparently fired from drones. The report notes that, "in some instances, missiles have impacted up to 50 km. into northeast Syria. In addition to the UN Commission of



Inquiry, other non-governmental sources have identified several strikes against civilian vehicles and populated areas that resulted in reported civilian casualties."

[TURKEY ARMS its drones](#), mostly the Bayraktar series, with the smart micro munition (MAM in Turkish) missile system. This missile has reportedly been exported to a number of countries, including Azerbaijan, Burkina Faso, Djibouti, Ethiopia, Kazakhstan, Kyrgyzstan, Libya, Morocco, Niger, Pakistan, Qatar and others. The CAR research looked at pieces of missiles found across eastern Syria, including areas near Kobane, as well as a dozen strikes around Qamishli.

The report includes interesting details about the various types of MAM missiles. These have ranges of between 8 and 30 km. and have different sizes. The missile has unique fins and fixed wings, and its manufacturer uses a "two-backed, two-screw configuration to attach the four rear fins."

[Bayraktar is equipped with cameras from German company Hensoldt](#)

On some of the wreckage, a plate showing the lot number and production date of the munition have been found. The report notes that there is no evidence the companies involved in exports of products that may have ended up on the missiles were involved in wrongdoing.

The issue of exports of Western items that have ended up on things like Turkish missiles or Iranian drones is sensitive. In recent months there has been growing evidence that Iran used dozens of products made in the West on its drones, now being exported to Russia. Many Western countries are now focused on how civilian items end up on weapons.

The CAR report found gyroscopes on the missile remains used as part of their inertial sensor suite, the report says. These were made by a company based in the US; circuit boards from a Chinese company were also found. The most disturbing finding of the report is that a German manufacturer of brakes had exported them with guarantees from Turkey that they would be "used on blood analyzing machines fitted to ambulances."

CAR notified the company about the presence of its products in missiles. The company did everything it could to make sure the brakes were used for civilian purposes. The Turkish company importing the brakes even signed an end-user agreement saying these items would not be used in military activity or for human rights violations.

While this discovery is important, it likely won't affect the use of the [missiles on drones by Ankara](#), which will likely continue to be able to manufacture the missiles. However, the discovery shows how items were misdirected for use in military products and sheds light on Turkey's drone war in eastern Syria. Not enough of a spotlight has been put on how Turkey uses drones in Syria and how it also harms civilians. A small tip of the iceberg of Ankara's role in eastern Syria has now received a spotlight due to this report.



**Seth Frantzman** is a Ginsburg-Milstein Writing Fellow at the Middle East Forum and senior Middle East correspondent at the Jerusalem Post.

## Homeland: Increasing Domestic Terrorism Concerns

By Dr. Robert J. Bunker

Source: <https://www.hstoday.us/featured/weaponized-aerial-drones-and-the-homeland-increasing-domestic-terrorism-concerns/>

Dec 29 – The ongoing threat and reality of domestic terrorism incidents have been on our minds for many years now. The release of the most recent [Summary of Terrorism Threat to the United States](#) (DHS National Terrorism Advisory System Bulletin) – with its concerns over holiday gatherings, the 1/6 (Capitol attack) anniversary, violence directed at the LGBTQI+ community, and similar potentialities – further reinforces this fact. While the use of firearms, IEDs, and even vehicular overruns represent common terrorist tactics, heightened recognition now exists about weaponized drone use. While Ukrainian and Russian weaponized (aerial) drone operations have been in the news and in social media posts for many months, the use of such devices by overseas terrorists pre-dates this by a few decades.

Initial vulnerability concerns within our nation were widely identified in various media as a result of [the White House drone breach](#) event of January 2015. While various perceptions of the threat, as well as prior and latter terrorism plots have transpired, it was not until summer 2020 when [a recognized terrorist drone](#)





[attack](#) (albeit unsuccessful) against a Pennsylvania electricity substation took place that this became a domestic reality with the perpetrator remaining unknown.[1] This short piece will briefly highlight the dangers that weaponized drones utilized by terrorists (and/or extremists) represent and then, more importantly, provide an initial overview of the increasing domestic terrorism concerns that exist related to them.



The 11th Armored Cavalry Regiment and the Threat Systems Management Office push a swarm of 40 drones through the town during the battle of Razish, National Training Center on May 8, 2019. This exercise was the first of many held at the National Training Center. (U.S. Army Photo by Pv2 James Newsome)

### ***Weaponized Drones and the Homeland***

Drone weaponization can be both primary (as in the actual being a weapon) and/or auxiliary to facilitate other weaponry or operational and/or tactical action enhancement. Both forms of drone weaponization – primarily on commercial platforms – can be utilized by terrorists and extremists and generally involve the following capabilities:

- *Carrying an IED*: Single use drones with an IED secured to them are the norm for initial drone weaponization by a threat group. Primitive IEDs as well as military-grade grenades and even RPG warheads (whose safety features have been bypassed) may be utilized.
- *Dropping IED Bomblets*: The gaining of a stand-off aerial bombardment capability via IED bomblets is typically representative of a maturing group capability. Additionally, an increase from singular to multi-bomblet payloads may take place.
- *Carrying a Firearm*: While firearms (typically pistols but including submachine guns and semi-automatic rifles) have been used to weaponize drones, this has been done for commercial marketing, hobbyist, and military purposes. No terrorist (or even cartel) group has yet to place a firearm on a drone but no technical hurdle exists to inhibit such capability being gained.
- *Intelligence, Surveillance, and Reconnaissance (ISR)*: The ISR capability of drones (which may include nighttime infrared capacity) has been fully recognized by Jihadi terrorist groups and is increasingly being recognized by other threat entities, including the Mexican cartels. The Islamic State pioneered the use of a C<sup>2</sup> element – flying an ISR drone overhead – to coordinate with suicide bombers (driving armored VBIEDs) in order to guide them to their intended targets in Iraq and Syria.
- *Propaganda/Livestreaming/First-Person Perspective*: The video footage communicated via the link between the drone and its operator can be utilized in a number of ways. Normally, it is utilized later in terrorist videos and released online on various social media platforms for narrative



shaping and propaganda purposes. In some rare instances, it would be livestreamed (though this is more an active shooter with a GoPro-type camera technique) and may even provide a first-person shooter (FPS) type of experience if the weaponized drone is carrying an IED for point-detonation purposes.

While some drones may utilize only one capability during an attack and may work in tandem with another drone, these capabilities are not always mutually exclusive. A single weaponized drone could engage in ISR and locate a target, engage that target with an IED, and also capture the attack on video, which is subsequently released on social media for terrorist propaganda purposes. Additionally, more exotic drone payload capabilities exist. These are only limited by drone carrying weight and terrorist imagination. They can include incendiaries, cutting tools, directed energy, jamming, message banners, power disablers (such as copper wire or carbon fibers), ad infinitum. Terrorist use of weaponized drones can include anti-personnel, anti-vehicular, anti-materiel, and anti-infrastructure targeting with the intention of generating terror to achieve fear and anxiety within a specific population (such as state, community, or ethnic grouping). However, some terrorist groups, such as the Islamic State, may readily blur the line between disruptive (terrorist) and destructive (military) targeting activities. Mass public events such as parades and sporting events are of great concern with regard to weaponized drone targeting as are fuel storage facilities.



Recovered Islamic State IED drone (RPG warhead), Deir ez Zour, Syria - Source: Social media & Al-Masdar News (Pro-Syrian government), December 2016

### ***Increasing Domestic Terrorism Concerns***

A useful way of gauging domestic threat potentials vis-à-vis a specific type of weaponry (and technology) utilization is to view via a basic typology of four terrorism group clusters (*Jihadi, Left Fringe, Right Fringe, and Wild Card Threats*). I've recently used this cluster approach in my university terrorism seminar teaching, and it provides pretty good coverage of the basic threats our homeland presently faces. This approach recognizes that terrorist group clusters exist in their own 'reality bubbles' (constructed group narratives and worldviews) which define and pattern how they engage in terrorist activities, how they are organized, and how they generally operate. While intra-cluster variations exist (even more so with the Wild Cards), the clusters adequately cover most of the weaponry use potentials:

#### ***Jihadi Terrorism Threats***

The Jihadi cluster – initially represented by al-Qaeda, then the Islamic State – has since 9/11 (until more recently) been perceived as the No. 1 terrorist threat to the homeland. Both of these entities have utilized weaponized drones overseas, with the Islamic State's use in Iraq and Syria conducted on a wartime scale with a well-developed offensive drone program up and running during the 2014-2017 period. The foreign use of weaponized drones is, in contrast to al-Qaeda *Open Source Jihad* (OSJ) and Islamic State *Just Terror Tactics* (JTT) terrorism, meant for radicalized affinity and Soldier of Allah (SOA) use in Europe and the





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United States, [which is devoid of weaponized drone use tactics](#). Still, a number of Jihadi weaponized drone use plots directed at the West have taken place. An early plot linked to al-Qaeda was foiled in the U.S. [in Columbus, Ohio](#), in August 2007, with a follow-on incident stopped in February 2008 [in Ashland, Maryland](#). Additionally, a plot linked to the Islamic State was later broken up [in Spain in May 2020](#).

### Left Fringe Terrorism Threats

This threat cluster includes groups such as the Earth Liberation Front (ELF), the Animal Liberation Front (ALF), and the more violent anarchist (including some of those using more extremist BlackBloc tactics) and Antifa (Anti-Fascist) members. The fringe left has sporadically been using drones for their propaganda value since 2011, with [an initial OccupyCopter flight in San Francisco](#) in late November and subsequent [use in New York](#) later in December. Antifa has more recently also been [using drones for ISR use](#) directed toward at least one neo-Nazi gathering – that of the Aryan Freedom Network (AFN) – in Texas in October 2022. However, no actual drone weaponization attempts (beyond auxiliary type use) have been noted among the extremist left fringe. However, a marked increase in anarchist-type violence potential is of concern given the cache of IEDs, gasoline, and road flares recently seized in from [a protester road barricade near Atlanta](#).



Source OccupySF 6 Dec 2011 Posting on YouTube

### Right Fringe Terrorism Threats

With expanding numbers and activities and the watershed Jan. 6 event, right wing extremists – including the Proud Boys, Oath Keepers, Boogaloo Bois, and associated white supremacists and neo-Nazis – have now achieved the mantle of the recognized No. 1 terrorist threat to the homeland. Putin regime support of some of these groups, such as [The Base and Atomwaffen Division](#), have only served to further heighten this threat. These groups, however, tend to focus on the use of firearms and basic IEDs in their operational planning, although during the Capitol breach the Oath Keepers attempted – yet failed – [to launch a drone for ISR support](#). Additionally, in November 2022, [a drone was used to help spread neo-Nazi propaganda](#) in Florida via the NatSoc Florida (NSF) group. This suggests



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that the right-wing fringe is beginning to recognize and experiment with weaponized drone potentials, though currently only in an auxiliary and limited capacity.

### *Wild Card Terrorism Threats*

This threat cluster, in some ways, can be viewed as the nonpolitical and criminal leftovers and includes cultists, nihilist school shooters, alien conspirators, and various gangs and cartel groups. These threats should not be totally discounted, however, and we yet may see these actors engage in socially impacting (creating fear in a community) and/or criminally motivated terrorism. Of these groups, the Mexican cartels stand out from the others with weaponized drone use proliferating since [the first reported](#) incident in Valtierra, Guanajuato, in October 2017. Multiple cartels have subsequently utilized such weaponry, with the *Cártel de Jalisco Nueva Generación* (CJNG) recognized as the leader in its use (including ISR and propaganda) and technical development. Recently, in October 2022, [over 90 aerial bomblets](#) were recovered from a suspected CJNG cache in Buenavista Tomatlán, Michoacán. To date, weaponized drone use has remained in Mexico; however, one incident did take place [in Tecate, Baja California](#), in July 2018, right next to the U.S. border.



Ninety-Four Drone IED Fragmentation Bomblets. Based on the Design and Location the Cache is Suspected of Belonging to the *Cártel de Jalisco Nueva Generación* (CJNG) – Source: Guardia Nacional, 24 October 2022

### **Conclusion**

Presently, the Jihadi threat cluster vis-a-vis weaponized drone use is the most pronounced one related to domestic terrorism use potentials. However, the capacity of these groups – other than affinity 1s/2s tactical cells – to engage in any form of attack is severely limited. Still, the expectation is that such a plot would be Islamic State promoted or linked as al-Qaeda currently does not advocate ‘far enemy’ attacks on the U.S. homeland. Further, Hezbollah – while the top-tier weaponized drone utilizer (with access to Iranian military drones since the early-to-mid 2000s) – has the capacity, it does not have the intent to engage in such an attack given the severe and overwhelming blowback potentials such an event would entail.

Both the far-left and far-right fringes have now utilized weaponized drones for both auxiliary ISR and propaganda use purposes, but not as actual lethal platforms merged with IEDs. Of the two extremist clusters, the right wing fringe is more coordinated, active, and violent which makes it more of a concern (especially given ongoing Putin regime activities) regarding actual weaponized drone utilization for terrorist purposes. However, presently no Indications and Warning (I&W) exists that would suggest either the far right or far left is discussing or experimenting with direct attack IED or related weaponized drone variants.

The Mexican cartels have been gaining considerable weaponized drone use experience versus each other, the civilian militias, and even Mexican authorities but, to date, have not utilized such devices directly





on or over the U.S. border. Cartel behaviors and activities are very different within Mexico (and now various countries within Latin America) as opposed to within the United States. Like Hezbollah, the Mexican cartels and their allies do not want to incur the explicit attention and wrath of the U.S. federal government in what might become another Enrique 'Kiki' Camarena-type disaster. For this reason, the present expectation is the cartels will keep their weaponized drones away from the border itself.

As witnessed from the preceding threat clusters overview, it is at times difficult to line up 'capability and intent' related to weaponized drone use potentials domestically; some could even argue that it could be viewed as a new attack capability looking for a willing perpetrator. On the other hand, more and more homeland security professionals and scholars see future weaponized drone attacks taking place domestically as an inevitable 'no-brainer' given the rapid expansion in overseas use. While the ground truth will likely lie in the middle, the proliferation of weaponized drones to terrorist groups is ongoing, albeit at uneven and at times haphazard rates. Still, given the inevitability of what is coming, it would be prudent to prepare now as others at [Homeland Security Today](#) and other venues have suggested. The backbone of such preparation should be focused on education and training, intelligence monitoring/trending, C-UAS research and development, red teaming and field exercises, and the creation of domestic response protocols (including playbooks). Further, so as not to suffer from myopia, it must be recognized that terrorist utilization of weaponized drones may come in many forms and are not only near term aerial in nature but also exist related to [static](#), ground, and sea based systems, potentially extending into [emergent smart homes](#) and the projected internet of things (IoT).

### Notes

[1]. The incident targeting the electrical infrastructure has a right-wing extremist signature based on current I&W and trending but this is presently speculative.

### Additional Reading

Robert J. Bunker, [Terrorist and Insurgent Unmanned Aerial Vehicles: Use, Potentials, and Military Implications](#). U.S. Army, Strategic Studies Institute, 2015.

Robert J. Bunker and John P. Sullivan, Eds., [Criminal Drone Evolution: Cartel Weaponization of Aerial IEDs](#). Small Wars Journal/Xlibris, 2021.

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## Editor asks: Are Dirty Drones/Swarms a possible threat for 2023?

### Undefined claims 4.5-min flight for its "silent" ion-propulsion drone

Source: <https://newatlas.com/drones/undefined-ion-propulsion-drone/>

Sept 2022 – Florida's "silent" flying dish-rack, powered by ionic propulsion, is on track for commercial rollout in 2024, according to Undefined Technologies, which has released new outdoor flight test video. We remain curious, but unconvinced it'll be viable.

The "Silent Ventus" drone doesn't use propellers to fly. Instead, its entire broad structure creates two stacked grids of electrodes, designed to create high-voltage electric fields that can ionize the oxygen and nitrogen molecules in the air, freeing electrons to give them a positive charge, and then propelling these downward to create an "ionic wind" that can produce thrust.

It's not new; ionic propulsion has been used in space, and as we pointed out when we [first saw the Silent Ventus drone project](#), for a few very small-scale terrestrial projects as well, one of which was used to levitate Orville the mouse in 2003. Undefined says its "Air Tantrum" technology yields "higher levels of thrust, up to 150% compared to current ion thruster technologies."

The company first showed off its tech in 2020, claiming a 25-second flight, but showing only a few wobbly seconds in a ["test lab" video](#) that looked suspiciously like it was filmed in a small box, despite the loud



protestations of prominent height markers up each wall. The company subsequently said that this test drone made about 90 dB of noise – a lot closer to "hairdryer" than "silent."



Rendered image of the "Silent Ventus" cargo drone Undefined Technologies eventually hopes to bring to market – Undefined Technologies

Earlier this year, it claimed a two-and-a-half-minute indoor flight, at a reduced noise level of 85 decibels, and [released a 39-second video as proof](#).

Now, the company says it's flown a prototype for a solid four and a half minutes, documented in true Undefined fashion with one minute, 17 seconds of edited video, as embedded below. It says it achieved a noise level below 75 dB, whatever the video might sound like, and it's calling for further investment toward a cargo delivery drone product it says will fly for 15 minutes and make less than 70 dB by the end of 2023.

#### [Ion Propulsion Drone Proves Its Commercial Viability](#)

"This 4+ min flight required advances in the chemical composition of the batteries that can now provide us with higher energy densities," says Undefined's Lead Aerospace Engineer Thomas Benda Jr. in a press release. "This improvement is part of our efforts to target lighter weights."

It's unclear whether hitting 15 minutes of endurance (as per the roadmap) will require further advances in battery chemistry, or whether this company has other tricks up its sleeve. And it's unclear what kind of endurance can be expected from a delivery version of the aircraft carrying a useful payload. It's also





undefined exactly how far from the drone Undefined is taking its noise readings; even the [Joby S4 eVTOL air taxi stays under 65 dB](#) when the measurement's taken 100 m (330 ft) from the vertipad.

Undefined says its "silent" 70-dB drones will cause far fewer noise complaints in urban cargo delivery services than propeller-forced designs – although established drone delivery company Wing has already fielded complaints about its drones, which were [recorded at 69 dB at a 15-m \(50-ft\) distance](#) back in 2019.



With no moving parts in its propulsion system, this thing flies on ionized air alone – Undefined Technologies

We have other reservations. We don't know how Undefined can control yaw with its design, absent the typical torque reactions from rotating propellers – although it sure seems capable of spinning in [the company's render video](#). The

necessarily large airframes required would appear to present quite a sail for a decent breeze to catch, which might make these things a liability in anything but ideal weather.

They're clearly a fair bit larger than prop-based multicopters, even without a payload, and they're also more fragile, making them harder to transport and store. Every time we've seen one fly, it's looked wobbly, and every time we've seen one land, it's come down hard enough to shake the propulsion racks about like Jell-O.

I'm not gonna lie, I'm also put off by lily-gilding press release headlines like, "Ion propulsion drone proves its commercial viability," and [presentations that spend seven minutes hyping up the problem](#), but only two giving a vague outline of the solution, along with precious little technical detail. Each insignificant on its own, all these little things add up to a certain whiff that makes me uncomfortable.

Still, it's undeniably cool to see these things flying on electric wind alone, and for all the uncertainties and issues we've got, it sure does seem that these guys have built an ion-drive drone prototype capable of flying outdoors and well above the tree-line. We'd want to see the thing in person and do plenty of due diligence before throwing any investment money down, but whether or not this thing makes it to wide-scale commercial use, it's definitely a neat curiosity.

## Russia Increases Use of Kamikaze Drones in Ukraine

By Christoph Hasselbach (editor @ DW)

Source: <https://www.homelandsecuritynewswire.com/dr20230104-russia-increases-use-of-kamikaze-drones-in-ukraine>

Jan 04 – Mostly, they come at night. Residents in Ukrainian cities are hearing the explosions from Russian kamikaze [drones](#) with great frequency.

But the term "kamikaze" is actually somewhat misleading in this context. Kamikaze attacks were suicide missions carried out during World War II by young Japanese pilots who would crash their aircraft into Allied ships to create as much damage as possible. The death of the pilot was an intrinsic part of the entire concept.

Drones on the other hand, don't have human pilots. The term "single-use" would be more fitting, because unlike Turkish Bayraktar drones, which return after bombing attacks or reconnaissance flights, so-called kamikaze drones are destroyed during attacks.

The kamikaze drone model most commonly deployed in Ukraine is the Shahed-136. It's manufactured in Iran, though both Russia and Iran dispute the purchase of them. The Shahed-136 is around 3.5 meters (11.5 feet) long with delta wings that extend 2.5 meters. The drone can carry 50 kilograms (110 pounds) of explosives. It relies on a gasoline-powered rear propeller for propulsion. It's rather loud, and its top speed of 200 kilometers per hour (124 miles per hour) is relatively low. It has a range, however, of up to 2,000 kilometers (1,243 miles). Even if the actual range of the drone is actually a bit lower than its Iranian manufacturers claim, it's still



significantly further than other kamikaze drones. The Shahed-136 drones can reach every Ukrainian city from Russia.

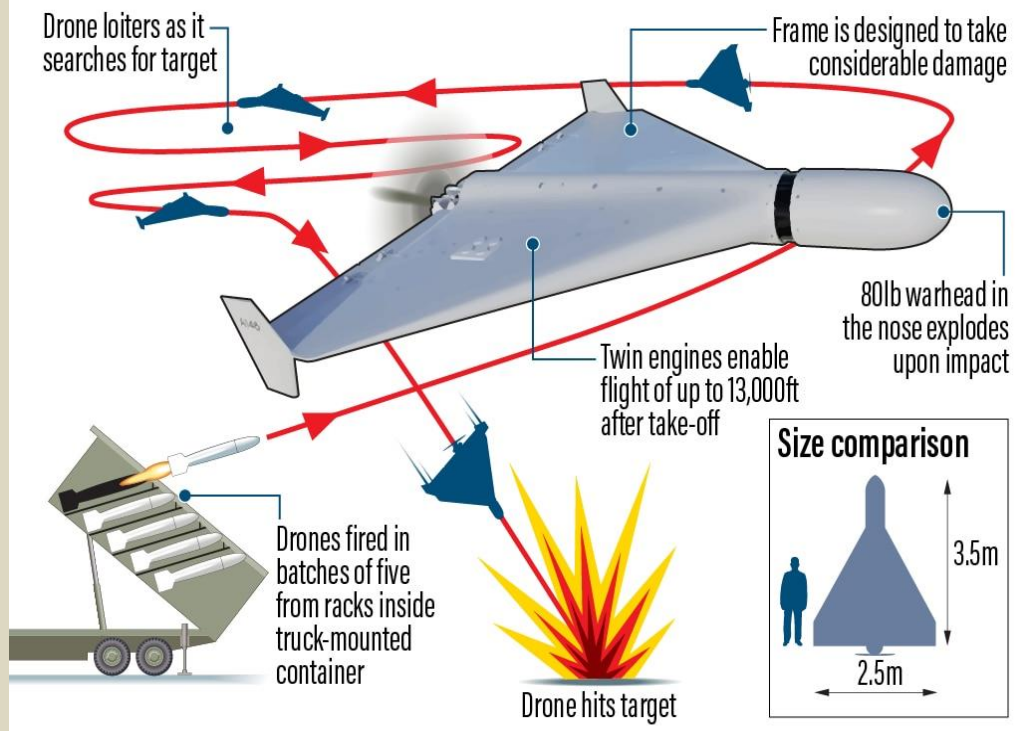


KUB-BLA, a type of lethal drone known as a “loitering munition” sold by [ZALA Aero](#), a subsidiary of the Russian arms company Kalashnikov. With a wingspan of 1.2 meters, the sleek white drone resembles a small pilotless fighter jet. It is fired from a portable launch, can travel up to 130 kilometers per hour for 30 minutes, and deliberately crashes into a target, detonating a 3-kilo explosive.

**U.S. Switchblade versus Iran’s Shahed**

The Shahed-136 is built very simply. Unlike with the American-made Switchblade kamikaze drones, a target has to be entered into the Shahed-136 in advance. The drone flies toward it on its own, and the target can’t be altered retroactively. From then on, the drone operates completely autonomously.

**HESA SHAHED 136 ALSO KNOWN AS GERAN-2**





Kamikaze drones are often referred to as “loitering munitions” because they loiter around target areas for some time and attack only once a target is located. Unlike the Shahed-136, other drones like the Switchblade can hover above a particular area before an operator on the ground assigns it a target. The targets can even be mobile. The drone then flies toward the target upon command and is itself destroyed during the attack.

### **A Difficult Balance: Is Shooting Down Kamikaze Drones Worth It?**

The Shahed-136 doesn't stand a chance against modern aerial defense technology. Military experts also maintain that it isn't suited for deployment on the front lines.

But that doesn't seem to be the goal of the Russian military in their [war on Ukraine](#) anyway. The use of the kamikaze drones clearly has another purpose: destroying civil infrastructure and residential buildings to spread fear among the population.

Priced at around \$20,000 (€18,900) each, the Shahed kamikaze drones are relatively cheap. Because their parts are also easy to come by, it raises the question of whether deploying a modern missile defense system against them makes sense when each individual missile costs several times more than a kamikaze drone does.

To complicate matters more, Russia has been deploying entire swarms of the Shahed drones. Even if some of them are shot down, others still reach their targets. Even worse, fighting off the drones ties up Ukraine's military and aerial defense, taking them away from the front where they are needed. That also seems to be part of Russia's strategy.

Western military experts believe that the kamikaze drones serve as a substitute for the much more expensive cruise missiles that are increasingly in short supply in Russia.

The simple, cheap kamikaze drones don't play a significant role on the battlefield. Russia is apparently using them for their psychological impact, in the hopes of wearing down Ukraine's civilian population.

**EDITOR'S COMMENT:** The Shahed-136 looks very similar to the Kalashnikov KUB-BLA (and vice versa).

## **Drone Advances in Ukraine Could Bring Dawn of Killer Robots**

Source: <https://www.voanews.com/a/drone-advances-in-ukraine-could-bring-dawn-of-killer-robots/6902931.html>



Jan 03 – Drone advances in Ukraine have accelerated a long-anticipated technology trend that could soon bring the world's first fully autonomous fighting robots to the battlefield, inaugurating a new age of warfare. The longer the war lasts, the more likely it becomes that drones will be used to identify, select and attack



targets without help from humans, according to military analysts, combatants and artificial intelligence researchers.

That would mark a revolution in military technology as profound as the introduction of the machine gun. Ukraine already has semi-autonomous attack drones and counter-drone weapons endowed with AI. Russia also claims to possess AI weaponry, though the claims are unproven. But there are no confirmed instances of a nation putting into combat robots that have killed entirely on their own.

Experts say it may be only a matter of time before either Russia or Ukraine, or both, deploy them. The sense of inevitability extends to activists, who have tried for years to ban killer drones but now believe they must settle for trying to restrict the weapons' offensive use.

Ukraine's digital transformation minister, Mykhailo Fedorov, agrees that fully autonomous killer drones are "a logical and inevitable next step" in weapons development. He said Ukraine has been doing "a lot of R&D in this direction."

"I think that the potential for this is great in the next six months," Fedorov told The Associated Press in a recent interview.

Ukrainian Lt. Col. Yaroslav Honchar, co-founder of the combat drone innovation nonprofit Aerorozvidka, said in a recent interview near the front that human war fighters simply cannot process information and make decisions as quickly as machines.

Ukrainian military leaders currently prohibit the use of fully independent lethal weapons, although that could change, he said.

"We have not crossed this line yet – and I say 'yet' because I don't know what will happen in the future," said Honchar, whose group has spearheaded drone innovation in Ukraine, converting cheap commercial drones into lethal weapons.

Russia could obtain autonomous AI from Iran or elsewhere. The long-range Shahed-136 exploding drones supplied by Iran have crippled Ukrainian power plants and terrorized civilians but are not especially smart. Iran has other drones in its evolving arsenal that it says feature AI.

Without a great deal of trouble, Ukraine could make its semi-autonomous weaponized drones fully independent in order to better survive battlefield jamming, their Western manufacturers say.

Those drones include the U.S.-made Switchblade 600 and the Polish Warmate, which both currently require a human to choose targets over a live video feed. AI finishes the job. The drones, technically known as "loitering munitions," can hover for minutes over a target, awaiting a clean shot.



FILE - This image provided by the U.S. Marine Corps, shows a Switchblade drone system being used as part of a training exercise at Marine Corps Air Ground Combat Center Twentynine Palms, California, Sept. 24, 2021.

"The technology to achieve a fully autonomous mission with Switchblade pretty much exists today," said Wahid Nawabi, CEO of AeroVironment, its maker. That will require a policy change — to remove the human from the decision-making loop — that he estimates is three years away.

Drones can already recognize targets such as armored vehicles using cataloged images. But there is disagreement over whether the technology is reliable enough to ensure that the machines don't err and take the lives of noncombatants.





## ICI C<sup>2</sup>BRNE DIARY – January 2023

The AP asked the defense ministries of Ukraine and Russia if they have used autonomous weapons offensively – and whether they would agree not to use them if the other side similarly agreed. Neither responded.

If either side were to go on the attack with full AI, it might not even be a first.

An inconclusive U.N. report last year suggested that killer robots debuted in Libya's internecine conflict in 2020, when Turkish-made Kargu-2 drones in full-automatic mode killed an unspecified number of combatants.

A spokesman for STM, the manufacturer, said the report was based on "speculative, unverified" information and "should not be taken seriously." He told the AP the Kargu-2 cannot attack a target until the operator tells it to do so.

Honchar thinks Russia, whose attacks on Ukrainian civilians have shown little regard for international law, would have used killer autonomous drones by now if the Kremlin had them.

"I don't think they'd have any scruples," agreed Adam Bartosiewicz, vice president of WB Group, which makes the Warmate.



FILE - A Ukrainian soldier watches a drone feed from an underground command center in Bakhmut, Donetsk region, Ukraine, Dec. 25, 2022.

AI is a priority for Russia. President Vladimir Putin said in 2017 that whoever dominates that technology will rule the world. In a December 21 speech, he expressed confidence in the Russian arms industry's ability to embed AI in war machines, stressing that "the most effective weapons systems are those that operate quickly and practically in an automatic mode." Russian officials already claim their Lancet drone can operate with full autonomy.

An effort to lay international ground rules for military drones has so far been fruitless. Nine years of informal United Nations talks in Geneva made little headway, with major powers including the United States and Russia opposing a ban. The last session, in December, ended with no new round scheduled.

Toby Walsh, an Australian academic who campaigns against killer robots, hopes to achieve a consensus on some limits, including a ban on systems that use facial recognition and other data to identify or attack individuals or categories of people.

"If we are not careful, they are going to proliferate much more easily than nuclear weapons," said Walsh, author of *Machines Behaving Badly*. "If you can get a robot to kill one person, you can get it to kill a thousand."

Multiple countries, and every branch of the U.S. military, are developing drones that can attack in deadly synchronized swarms, according to Zachary Kallenborn, a George Mason University weapons innovation analyst.

So will future wars become a fight to the last drone?

That's what Putin predicted in a 2017 televised chat with engineering students: "When one party's drones are destroyed by drones of another, it will have no other choice but to surrender."



## Iran Building Drone Aircraft Carrier from Converted Merchant Ship, Photos Show

Source: <https://news.usni.org/2023/01/03/iran-building-drone-aircraft-carrier-from-converted-merchant-ship-photos-show>



November image circulating on Iranian social media showing *Shahid Mahdavi* in Bandar Abbas. H I Sutton Photo Illustration

Jan 03 – In a dry dock near the entrance to the Persian Gulf, Iran's sectarian naval force is converting a former merchant container ship into a drone aircraft carrier, according to satellite and open source photos published last week by USNI News contributor H I Sutton.

Iranian Revolutionary Guard Corps Navy ship *Shahid Mahdavi* is a former Iranian-flagged container ship that is getting converted into a warship to carry both helicopter and fixed-wing unmanned aerial vehicles at the Iran Shipbuilding & Offshore Industries Complex Co (ISOICO) at Bandar Abbas near the Strait of Hormuz, according to November photos Sutton published on Monday. *Shahid Mahdavi* has been in the dry dock since at least May undergoing the conversion from a merchant vessel to a warship, [reported The Maritime Executive](#). The new photos show the deck of the merchant ship removed ahead of the installation of a surface to launch aircraft. "The conversion adds a large cantilever flight deck on the port side. It is currently unclear whether an overhang will be added to the starboard side also," [wrote Sutton](#).



"The fact that the superstructure spans the original deck means that a traditional aircraft carrier layout is not possible. The angles on the added flight deck are also not traditional. Possibly this hints at a flight deck running across from port to starboard ahead of the superstructure."





Social media photos of *Shahid Mahdavi* suggesting the construction of an angled flight deck. H I Sutton Photo IllustrationIran has developed a variety of aerial drones, including the Shahed 136 explosive-tipped drone that has been responsible for a string of merchant ship attacks in the Middle East. The photos line up with Iran’s expressed use for the ship in the local press, Behnam Ben Taleblu, an Iran expert at the Foundation for the Defense of Democracies, told USNI News on Tuesday. “Iranian media had talked about it being used to store drones to grow the long-range strike capabilities of the country,” he told USNI News. “The world should be looking at how Iran plans to use merchant vessels and tankers to grow its long-range strike capabilities.” Taking a page from the U.S. expeditionary sea base model, the Iranian Navy and the IRGCN have converted merchant ships that the Iranians have been unable to use due to international sanctions.



May image circulating on Iranian social media showing *Shahid Mahdavi*.

Perhaps best known of the converted merchant ships is the IRINS *Makran*, a former petrochemical tanker Iran turned into a warship. Last year, *Makran* and Iranian Navy frigate IRINS *Sahand* deployed to the Atlantic for four months, traveling as far north as the Baltic Sea to represent Tehran in a Russian Navy fleet review. *Shahid Mahdavi* could be launched as early as this year, Sutton wrote. A second drone carrier, *Shahid Bagheri*, is slated to join *Shahid Mahdavi*.

**EDITOR’S COMMENT:** An excellent idea, especially for the Greek Navy since we have the biggest commercial fleet worldwide and one of the most aggressive neighbors around the globe.

## What Killer Robots Mean for the Future of War

By Jonathan Erskine and Miranda Mowbray

Source: <https://www.homelandsecuritynewswire.com/dr20230110-what-killer-robots-mean-for-the-future-of-war>

Jan 10 – Already we have seen how so-called neutral AI have made [sexist algorithms](#) and [inept content moderation systems](#), largely because their creators did not understand the technology. But in war, these kinds of misunderstandings could kill civilians or wreck negotiations.

For example, a target recognition algorithm could be trained to identify tanks from satellite imagery. But what if all of the images used to train the system featured soldiers in formation around the tank? It might mistake a civilian vehicle passing through a military blockade for a target.



### Why Do We Need Autonomous Weapons?

Civilians in many countries (such as [Vietnam](#), [Afghanistan](#) and [Yemen](#)) have suffered because of the way global superpowers build and use increasingly advanced weapons. Many people would argue they have done more harm than good, most recently pointing to the [Russian invasion of Ukraine](#) early in 2022.



[people by accident](#). But the risk is seen as acceptable in international politics because the Iron Dome generally has a reliable history of protecting civilian lives.

There are AI enabled weapons designed to attack people too, from [robot sentries](#) to [loitering kamikaze drones](#) used in the Ukraine war. LAWs are already here. So, if we want to influence the use of LAWs, we need to understand the history of modern weapons.

### The Rules of War

International agreements, such as the [Geneva conventions](#) establish conduct for the treatment of prisoners of war and civilians during conflict. They are one of the few tools we have to control how wars are fought. Unfortunately, the use of chemical weapons by the US in Vietnam, and by Russia in Afghanistan, are proof these measures aren't always successful.

Worse is when key players refuse to sign up. The [International Campaign to Ban Landmines \(ICBL\)](#) has been lobbying politicians since 1992 to ban mines and cluster munitions (which randomly scatter small bombs over a wide area). In 1997 the [Ottawa treaty](#) included a ban of these weapons, which 122 countries signed. But the US, China and Russia didn't buy in.

Landmines have injured and killed at least 5,000 soldiers and civilians per year since 2015 and as many as 9,440 people in 2017. The [Landmine and Cluster Munition Monitor 2022 report](#) said:

Casualties...have been disturbingly high for the past seven years, following more than a decade of historic reductions. The year 2021 was no exception. This trend is largely the result of increased conflict and contamination by improvised mines observed since 2015. Civilians represented most of the victims recorded, half of whom were children.

Despite the best efforts of the ICBL, there is evidence both [Russia](#) and [Ukraine](#) (a member of the Ottawa treaty) are using landmines during the Russian invasion of Ukraine. Ukraine has also relied on drones to guide artillery strikes, or more recently for ["kamikaze attacks" on Russian infrastructure](#).

### Our Future

But what about more advanced AI enabled weapons? The [Campaign to Stop Killer Robots](#) lists nine key problems with LAWs, focusing on the lack of accountability, and the inherent dehumanization of killing that comes with it.

While this criticism is valid, a full ban of LAWs is unrealistic for two reasons. First, much like mines, Pandora's box has already been opened. Also the lines between autonomous weapons, LAWs and killer robots are so blurred it's difficult to distinguish between them. Military leaders would always be able to find a loophole in the wording of a ban and sneak killer robots into service as defensive autonomous weapons. They might even do so unknowingly.

In the other camp are people who say a country must be able to defend itself, which means keeping up with other nations' military technology. AI can already outsmart humans at [chess and poker](#). It outperforms humans in the real world too. For example Microsoft claims its speech recognition software has an error rate of 1% compared to the human error rate of around 6%. So it is hardly surprising that armies are slowly handing algorithms the reins.

But how do we avoid adding killer robots to the long list of things we wish we had never invented? First of all: know thy enemy.

### What Are Lethal Autonomous Weapons (LAWs)?

The US [Department of Defense](#) defines an autonomous weapon system as: "A weapon system that, once activated, can select and engage targets without further intervention by a human operator." Many combat systems already fit this criteria. The computers on drones and modern missiles have algorithms that can [detect targets](#) and fire at them with far more precision than a human operator. Israel's Iron Dome is one of several active defense systems that can engage targets without human supervision.

While designed for missile defense, the Iron Dome [could kill](#)





We will almost certainly see more AI enabled weapons in the future. But this doesn't mean we have to look the other way. More specific and nuanced prohibitions would help keep our politicians, data scientists and engineers accountable.

For example, by banning:

- ❖ black box AI: systems where the user has no information about the algorithm beyond inputs and outputs
- ❖ unreliable AI: systems that have been poorly tested (such as in the military blockade example mentioned previously).

And you don't have to be an expert in AI to have a view on LAWs. Stay aware of new military AI developments. When you read or hear about AI being used in combat, ask yourself: is it justified? Is it preserving civilian life? If not, engage with the communities that are working to control these systems. Together, we stand a chance at preventing AI from doing more harm than good.

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## Imagining a Killer Robot's First Words: Engineering State-in-the-Loop Legal Responsibility for Fully Autonomous Weapons Systems

By Jessica "Zhanna" Malekos Smith

Source: <https://ksr.hkspublications.org/2018/07/12/imagining-a-killer-robots-first-words-engineering-state-in-the-loop-legal-responsibility-for-fully-autonomous-weapons-systems/>



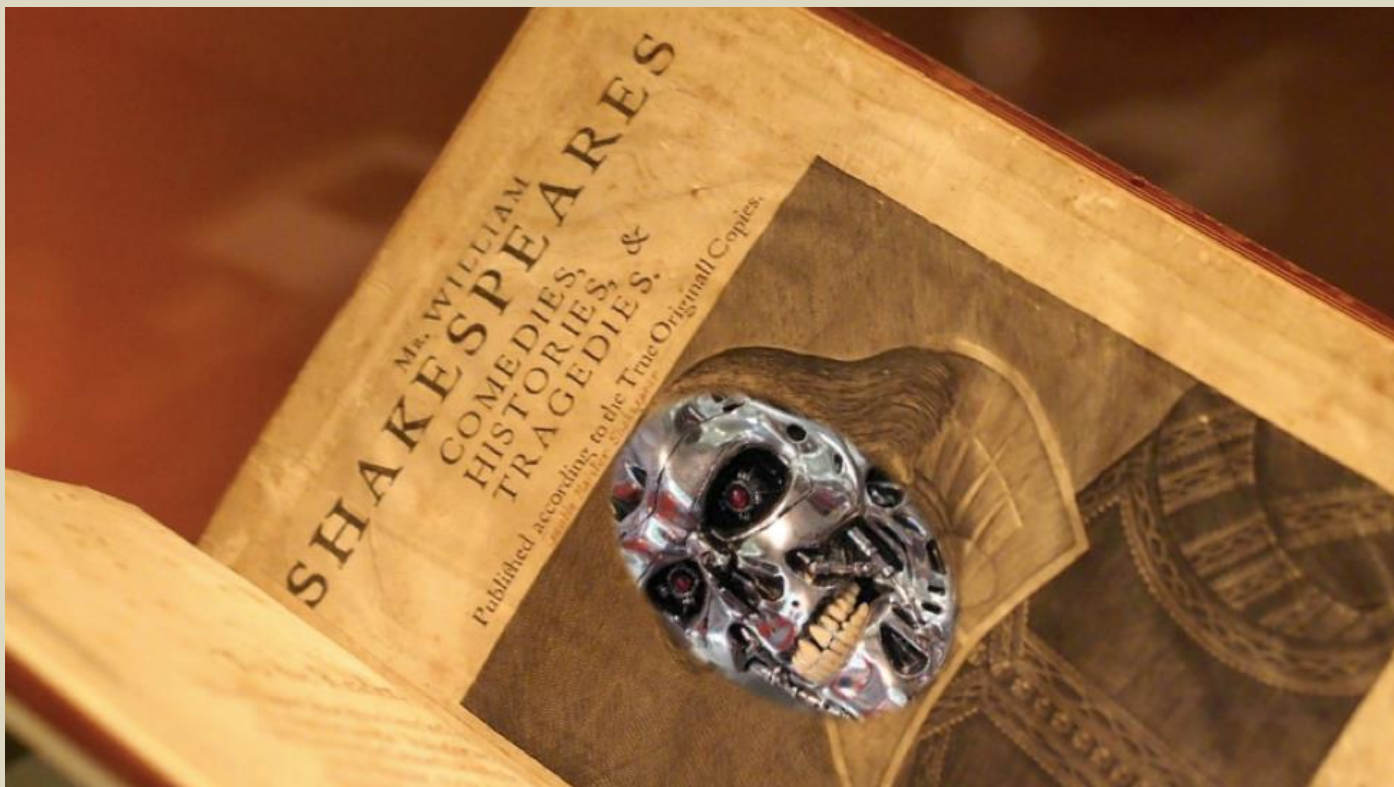
2018 – As the U.S., the U.K., Russia, China, South Korea, and Israel begin developing fully autonomous weapons (FAW) systems, the issue of state responsibility for such systems remains undeveloped. In fact, the term “state responsibility” did not even appear in the [United Nation's Group of Governmental Experts Chair's summary of the latest discussions](#) on lethal autonomous weapons systems. To better strategize how to mitigate state conflict arising from this technology, policymakers should be preparing for FAWs now, by establishing a legal framework of State-in-the-Loop responsibility.

There is a clear and demonstrable need for developing state accountability principles for FAWs. In fact, the NGO coalition [Campaign to Stop Killer Robots](#) advocates a total ban on “killer robots” in part because there is no accountability:

“Without accountability, [military personnel, programmers, manufacturers, and other parties involved with FAWs] would have less incentive to ensure robots did not endanger civilians[,] and victims would be left unsatisfied that someone was punished for the harm they experienced.” A legal framework can help allay those concerns and would signal international commitment to the principles of the law of armed conflict.



The advantages of engineering a legal framework of State-in-the-Loop responsibility are twofold: (1) It would promote compliance with the *jus in bello* (law of war) principles of distinction, proportionality, necessity, and reducing unnecessary suffering; and (2) it would protect the flame of technological innovation and enterprise—a flame that might very well be extinguished under an outright ban. The next UN Group of Governmental Experts (UN GGE) meeting on lethal autonomous weapons systems will take place in Geneva in August 2018. This is a ripe opportunity for a discussion of implementing a State-in-the-Loop legal framework. And naturally, because this article champions the call for legal action, one can jokingly imagine why a “killer robot’s” first words might be: [“The first thing we do, let’s kill all the lawyers.”](#)



### Shakespeare jokes aside, what are FAWs?

By definition, [fully autonomous weapons](#) systems do not depend on human input to function, but instead operate under control algorithms designed by system operators. In [Human Rights Watch's report \*Losing Humanity: The Case Against Killer Robots\*](#), unmanned robotic weapons are categorized according to three different levels of interface between human and machine: (1) [Human-in-the-Loop](#) weapons, which are “[r]obots that can select targets and deliver force only with a human command”; (2) [Human-on-the-Loop](#) weapons, which are “[r]obots that can select targets and deliver force under the oversight of a human operator who can override the robots’ actions,” and (3) Human-out-of-the-Loop weapons, which are FAWs.

### State-in-the-Loop responsibility for FAWs

While liability for the physical harm caused by an FAW may extend to parties involved in its development, design, integration, and deployment, the state employing the technology should ultimately be held responsible. Lending support to this concept is [the Martens Clause of 1899](#). This clause promotes imposing legal and political responsibility on states when the rules and customs surrounding armed conflict are undergoing development. Even in transition periods, like this current period in which we are developing FAWs, the principles of international humanitarian law still protect individuals.

The [Tallinn Manual on the International Law Applicable to Cyber Operations](#) also lends guidance here in how it reinforces the concept of state responsibility in cyberspace. I propose that the UN GGE overlay the *Tallinn Manual's* articulation of state responsibility with FAWs. If the *Tallinn Manual's* criteria for state responsibility for cyber warfare were co-opted to apply to FAWs, states would be responsible for the acts committed by FAWs under the following two conditions:

1. When the act of an FAW in question is attributable to the State under international law; and
2. When the FAW's act constitutes a breach of an international legal obligation applicable to the States.

An example of this would be if an FAW were to malfunction and harm, or kill, innocent civilians in a foreign combat environment (i.e., a breach of an international legal obligation), then (1) the act would be attributed





to the state employing the technology, and (2) the state would be held accountable for breaching an international legal obligation to not harm innocent civilians.

FAWs necessitate more State-in-the-Loop accountability and oversight because of the heightened risk that these weapons could potentially engage in the indiscriminate killing or wounding of civilians. Simply put, the more we remove the human operator from performing oversight of weapons systems, the more we should “loop in” the state to bear ultimate responsibility.

In November 2017, the [125 state parties to the 1980 Convention on Certain Conventional Weapons \(CCW\)](#) met for their annual meeting in Geneva and continued their discussion from 2016 on how to regulate lethal autonomous weapons. Although the CCW does not explicitly address FAW technology, the argument can be made that it still encompasses FAWs by restricting the use of weapons that may cause unnecessary suffering and indiscriminately kill or wound civilians. While the [2017 assembly of UN GGE did not reach a consensus](#) on regulating FAWs, the next UN GGE meeting is scheduled to take place in [August 2018](#). If the opportunity is seized, this forum could be a fruitful opening discussion on State-in-the-Loop responsibility. Attendees of the meeting should strive to chart a global policy that overlays the doctrine of state responsibility with FAWs. This kind of responsibility strikes the right balance between promoting responsibility and protecting innovation.

### Another option: An outright ban on FAWs?

American inventor [Thomas Edison](#) famously remarked, “Many inventions are not suitable for the people at large because of their carelessness. Before a thing can be marketed to the masses, it must be made practically fool-proof.” Are FAWs “suitable” for states to use, or will they lead to unnecessary suffering, in violation of *jus in bello*? Human Rights Watch posits that humans are better equipped to make value-based judgment decisions because [“robots would not be restrained by human emotions and the capacity for compassion, which can provide an important check on the killing of civilians.”](#) But [Michael Schmitt](#), a professor of law at the U.S. Naval War College, offers a counter-argument to this by reasoning that although “human perception of human activity can enhance identification in some circumstances, human-operated systems already frequently engage targets without the benefit of the emotional sensitivity cited by [Human Rights Watch].” While the proponents of a total ban on FAWs may have good intentions, a broad mandate to prohibit this technology is not advisable because it fails to take into consideration the national security benefits that would be discarded. According to robotics expert [Peter Singer](#), in military contexts robots are better suited for the [“three D’s—tasks that are dull, dirty, or dangerous.”](#) Using FAWs to accomplish tasks involving Singer’s three D’s can help save the lives of military personnel and civilians, by reducing their exposure to [certain deadly risks](#). Ultimately, the support for employing FAWs must be conditioned on their potential to mitigate suffering in war and the international community’s ability to abide by state responsibility.

Lastly, on a philosophical level, another concern about FAWs is that they lack empathy and [cannot reason like human beings](#) in evaluating whether it is ethical and legal to take a life. FAWs’ decision-making processes are not [encumbered with fear, anxiety, or pain](#); however, human operators of unmanned aerial combat vehicles (i.e., drones) routinely grapple with ethical uncertainties both during and after targeting operations. For example, in his memoir, [Drone Warrior, Brett Velicovich](#) writes vividly about “second guesses” that crept up in his mind after each operation. Do “second guesses” indicate a higher capacity for moral reasoning? Even if so, this kind of critique of artificial intelligence (AI) may only capture the current state of technology. The story of AI is just beginning, and robots may prove to have the same emotional capacity as humans. We cannot afford to become “robotic” in our approach to addressing state responsibility. Now is the time for responsibly engineering international legal guidelines for fully autonomous weapons.

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## Drones scatter one million mangrove seeds in Abu Dhabi

Source: <https://www.thenationalnews.com/climate/environment/2023/01/12/drones-scatter-one-million-mangrove-seeds-in-abu-dhabi/>

Jan 12 – Drones have dispersed one million mangrove seeds in Abu Dhabi, the [Environment Agency — Abu Dhabi](#) (EAD) said. The seed-firing drones took to the skies as a part of the first phase of a drone mangrove plantation project that supports the [Abu Dhabi Mangrove Initiative](#).

The dispersal was carried out recently over several days at different locations around Al Mirfa in Al Dhafra region. According to EAD estimates, the seeds dropped by drones will have a 48 percent success rate — which means 48 per cent of the seeds are expected to take root and grow into trees.





According to EAD estimates, the seeds will have a 48 percent success rate. Photo: EAD

Abu Dhabi's plans to establish the emirate as a hub for research and innovation to [support the conservation of mangroves](#), and focus on their importance for carbon sequestration to combat climate change. The initiative also supports the UAE's [Ministry of Climate Change and Environment](#)'s target, announced during [COP26 in Glasgow](#) in 2021, to plant 100 million mangroves by 2030.

The UAE is home to more than a dozen mangrove sites and plans to expand and develop their presence across the Emirates.

The use of [drone technology to plant mangroves](#) has several advantages, as the environmental footprint is low.

It is not labour intensive, and there is no need to transport saplings. It is also cost-effective as it reduces the overall price of mangrove planting, eliminates the need for mangrove nurseries and associated costs, and can reach remote and difficult areas.

The project is also running a trial on incorporating machine learning for future monitoring phases.

Dr Shaikha Salem Al Dhaheri, secretary general of EAD, said: "Despite the fact that the world's mangroves are declining due to natural and human challenges they are facing, Abu Dhabi has a different story to tell as the plantation of mangroves has continued in the UAE at large and in Abu Dhabi in particular, in a slow but steady manner. "A prime example is our latest project of planting one million mangrove seeds via drone technology. This project is one of a number of programmes run by the Abu Dhabi Mangrove Initiative in support of the UAE's pledge to plant 100 million mangroves in 2030. "The success rate for this year's planting looks great so far, and based on the data this year, we will do a refilling of areas for the future success of the project.

"This project is a continuation of our efforts to mitigate the disastrous effects of [climate change](#) as mangroves have proven to be very efficient at carbon sequestration, thus reducing the levels of carbon dioxide entering the atmosphere."

The drones are engineered to drop seedlings from the air, monitor the growth of mangrove saplings, map the habitat and create 3D imaging. Data has shown that the growth of the seed in situ using drones has a success rate that remains stable over three years, the EAD said. In the past 10 years, EAD and its partners,





from both the government and private sector, have planted more than 15 million mangroves along the coast of Abu Dhabi.

### What are mangroves?



► Read also: EU-funded [HYDROUSA](#) project

Mangroves are woody plants that inhabit the intertidal zones of tropical and subtropical coasts around the world. They are highly recognisable from their visible root systems which can give them the strange impression of being planted upside-down. This unique appearance is the result of adaptations developed to survive in harsh environments, including high temperatures, high salinity and intense UV exposure. Mangroves are estimated to cover more than 150 square kilometres of the UAE's coastline, acting as a "green lung" for big cities such as Abu Dhabi and Dubai, while also providing a wildlife habitat and recreation grounds for humans. Mangrove peat absorbs excess water during heavy rain, he said, making flooding less likely, and mangroves reduce coastal erosion, with research showing that mangrove loss has made coasts more vulnerable.

### Must see movie





## Laser-charged Chinese drone can stay in the air indefinitely

Source: <https://newatlas.com/drones/laser-charged-chinese-drone/>



Jan 12 – Researchers at Northwestern Polytechnical University in Xianyang, China, have demonstrated a drone that never needs to land, thanks to a remote charging system that delivers power via an adaptive, target-tracking laser on the ground.

The system uses a photoelectric converter on the bottom of the drone to capture energy from the laser. These kinds of systems do a pretty decent job of wireless power transmission, although the efficiency isn't great. At the transmission end, power-to-laser efficiency can be between 50-85%, depending on how fancy your laser is, and at the receiving end you're likely losing around 50% of your energy again.

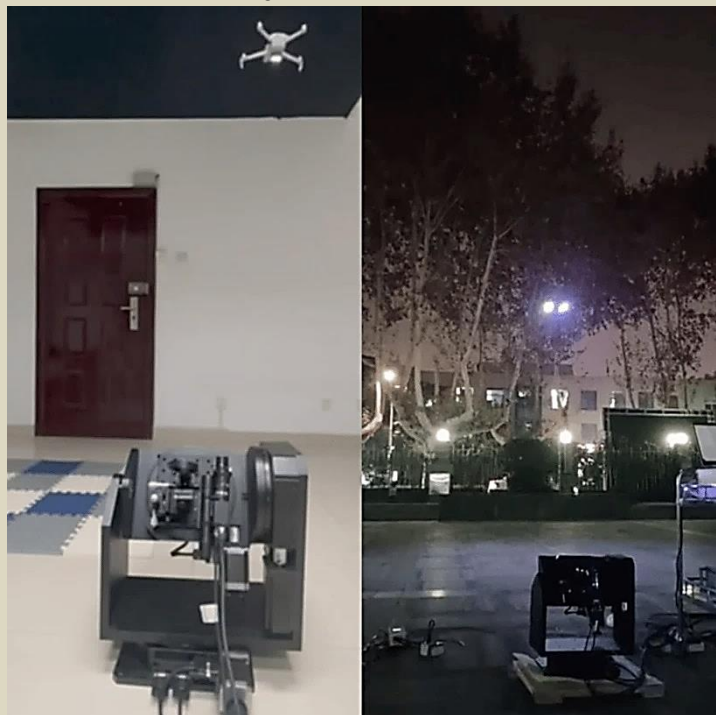
But electricity is cheap, and if you're plugged into the mains, these losses are acceptable if it means your surveillance drone never needs to come down.

Washington-based company [PowerLight](#), formerly known as LaserMotive, demonstrated a similar [wireless drone charging system](#) back in 2012, keeping a large drone airborne for 48 hours in a wind tunnel and powering one of Lockheed Martin's Stalker drones outdoors from ranges up to 600 m (1,970 ft).

The NPU team developed an "intelligent visual tracking algorithm" to keep its beam targeted on the drone, as well as an adaptive beam shaping system that can compensate for changes in atmospheric density. It also designed a method of identifying obstacles and rapidly adjusting the power of the beam to a safe level. They tested it with a small quadcopter, and demonstrated it working indoors with the lights on and off, and outdoors at night, with video showing the drone reaching altitudes around maybe 10 m (33 ft).

[A ground-based gimbal tracks and targets the drone as it flies. The NPU team tested it indoors and outdoors, in daylight, artificial light and low light – Northwestern Polytechnical University / China Daily](#)

The long-range capability of laser systems suggests this kind of system could open the door to higher-altitude drone operations, which could effectively create persistent airborne platforms capable of acting a little like low-altitude satellites – although where multicopter-style platforms are concerned, their use will likely remain weather-dependent.





## ICI C<sup>2</sup>BRNE DIARY – January 2023

You'd expect there to be some regulatory pushback, as well, given that these devices will point lasers into the sky. NPU did not disclose the laser's power output, the range of the system or its efficiency, citing the device's military potential. But this is clearly an early-stage lab prototype.

PowerLight, on the other hand, seems much closer to commercialization, and the company says it's [working on long-range, lightweight and compact wireless laser power transmission](#) with functional safety shutdown systems and the capability to work regardless of weather conditions.



The ability to charge electric aircraft in flight could be a huge boon to sectors like the emerging eVTOL industry – Northwestern Polytechnical University / China Daily

Military applications aside, it's interesting to consider how wireless power might affect other electric aircraft – particularly power-hungry eVTOL air taxis, for which battery density and range are among the chief bugbears. A citywide grid of laser chargers supplying energy as these things fly overhead could help these things make more commercial sense – but there's a long way to go before this kind of thing's legally approved and ready for urban use.

## Γρύπας (Gryps /Griffin\*) – Soon over the Aegean Sea

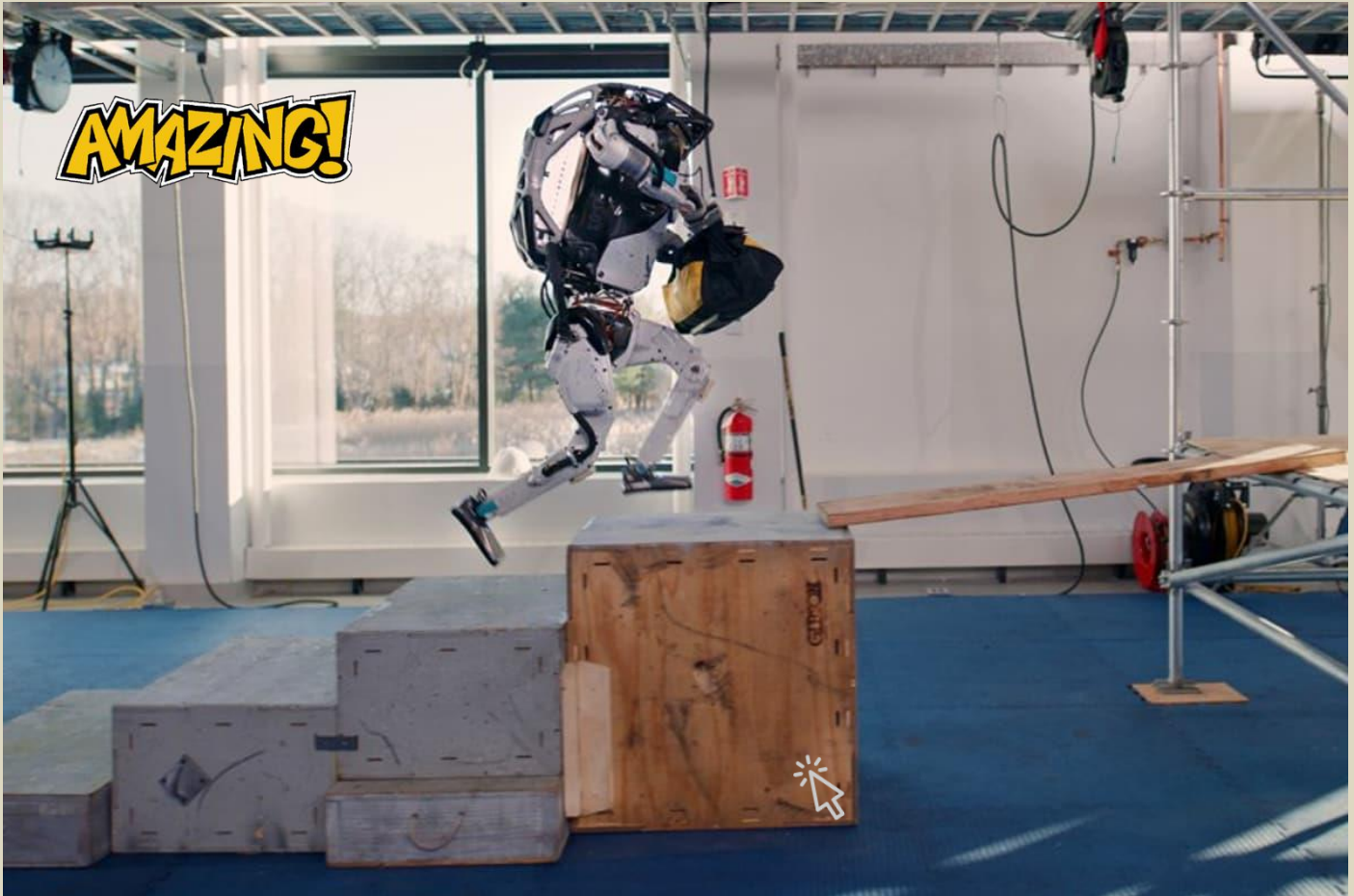


\* Greek mythology: a legendary creature with the body, tail, and back legs of a lion; the head and wings of an eagle; and sometimes an eagle's talons as its front feet.



### Atlas robot takes a major leap in perception and object manipulation

Boston Dynamics continues to astound us with progress on Atlas, its humanoid robot. In a new video, Atlas goes to work on a construction site, showing off some fascinating new abilities, spiced up with some acrobatics that'd get most of us sacked. [Read more](#)







# AI - NEWS



## Who is Loab?

# Not Everything We Call an AI Is Actually Artificial Intelligence. Here's What to Know

By George Siemens

Source: <https://www.sciencealert.com/not-everything-we-call-an-ai-is-actually-artificial-intelligence-heres-what-to-know>



(Boris SV/Moment/Getty Images)

Dec 25 – In August 1955, a group of scientists made a funding request for US\$13,500 to host a summer workshop at Dartmouth College, New Hampshire. The field they proposed to explore was [artificial intelligence](#) (AI).

While the funding request was humble, [the conjecture of the researchers was not](#): "Every aspect of learning or any other feature of intelligence can, in principle, be so precisely described that a machine can be made to simulate it".

Since these humble beginnings, movies and media have romanticized AI or cast it as a villain. Yet, for most people, AI has remained as a point of discussion and not part of a conscious lived experience.

### AI has arrived in our lives

Late last month, AI, [in the form of ChatGPT](#), broke free from the sci-fi speculations and research labs and onto the desktops and phones of the general public.

It's what's known as a "generative AI" – suddenly, a cleverly worded prompt can produce an essay or put together a recipe and shopping list, or create a poem in the style of Elvis Presley.

While ChatGPT has been the most dramatic entrant in a year of generative AI success, similar systems have shown even wider potential to create new content, with text-to-image prompts used to create vibrant images that [have even won art competitions](#).

AI may not yet have a living [consciousness](#) or a theory of mind popular in sci-fi movies and novels, but it is getting closer to at least disrupting what we think artificial intelligence systems can do.

Researchers working closely with these systems have swooned under [the prospect of sentience](#), as in the case with Google's large language model (LLM) LaMDA. An LLM is a model that has been trained to process and generate natural language.

Generative AI has also produced worries about plagiarism, exploitation of original content used to create models, [ethics of information manipulation](#) and abuse of trust, and even ["the end of programming"](#).

At the center of all this is the question that has been growing in urgency since the Dartmouth summer workshop: Does AI differ from human intelligence?

### What does 'AI' actually mean?

To qualify as AI, a system must exhibit some level of learning and adapting. For this reason, decision-making systems, automation, and statistics are not AI. AI is broadly defined in two categories: artificial narrow intelligence (ANI) and artificial general intelligence (AGI). To date, AGI does not exist.





The key challenge for creating a general AI is to adequately model the world with all the entirety of knowledge, in a consistent and useful manner. That's a massive undertaking, to say the least.

Most of what we know as AI today has narrow intelligence – where a particular system addresses a particular problem. Unlike human intelligence, such narrow AI intelligence is effective only in the area in which it has been trained: fraud detection, facial recognition, or social recommendations, for example.

AGI, however, would function as humans do. For now, the most notable example of trying to achieve this is the use of neural networks and "deep learning" trained on vast amounts of data.

Neural networks are inspired by the way human brains work. Unlike most [machine learning](#) models that run calculations on the training data, neural networks work by feeding each data point one by one through an interconnected network, each time adjusting the parameters.

As more and more data are fed through the network, the parameters stabilize; the final outcome is the "trained" neural network, which can then produce the desired output on new data – for example, recognizing whether an image contains a cat or a dog.

The significant leap forward in AI today is driven by technological improvements in the way we can train large neural networks, readjusting vast numbers of parameters in each run thanks to the capabilities of large cloud-computing infrastructures. For example, GPT-3 (the AI system that powers ChatGPT) is a large neural network [with 175 billion parameters](#).

### What does AI need to work?

AI needs three things to be successful.

First, it needs high-quality, unbiased data, and lots of it. Researchers building neural networks use the large data sets that have come about as society has digitized.

Co-Pilot, for augmenting human programmers, draws its data from billions of lines of code shared on GitHub. ChatGPT and other large language models use the billions of websites and text documents stored online.

Text-to-image tools, such as Stable Diffusion, DALLÉ-2, and Midjourney, use image-text pairs from data sets such as [LAION-5B](#). AI models will continue to evolve in sophistication and impact as we digitize more of our lives and provide them with alternative data sources, such as simulated data or data from game settings like [Minecraft](#).

AI also needs computational infrastructure for effective training. As computers become more powerful, models that now require intensive efforts and large-scale computing may, in the near future, be handled locally. Stable Diffusion, for example, can already be run on local computers rather than cloud environments.

The third need for AI is improved models and algorithms. Data-driven systems continue to make rapid progress in [domain after domain](#) once thought to be the territory of human cognition.

However, as the world around us constantly changes, AI systems need to be constantly retrained using new data. Without this crucial step, AI systems will produce answers that are factually incorrect or do not take into account new information that's emerged since they were trained.

Neural networks aren't the only approach to AI. Another prominent camp in artificial intelligence research is [symbolic AI](#) – instead of digesting huge data sets, it relies on rules and knowledge similar to the human process of forming internal symbolic representations of particular phenomena.

But the balance of power has heavily tilted toward data-driven approaches over the last decade, with the "founding fathers" of modern deep learning [recently being awarded the Turing Prize](#), the equivalent of the Nobel Prize in computer science.

Data, computation, and algorithms form the foundation of the future of AI. All indicators are that rapid progress will be made in all three categories in the foreseeable future.

**George Siemens** is a Co-Director, Professor, Centre for Change and Complexity in Learning @ University of South Australia.

## Opinion: Is no career safe anymore?

By Peter Bergen

Source: <https://edition.cnn.com/2022/12/26/opinions/writing-artificial-intelligence-ai-chatgpt-professor-bergen/index.html>

Dec 26 – It's long been clear that artificial intelligence (AI) can one day replace many humans working in fields such as customer service, insurance underwriting and manufacturing. Yet, I have long been complacent about my career as a writer. After all, what AI tool could replace the workings of the human brain?

For the past several days, I have been hearing about the AI chatbot ChatGPT. Users of the tool claim to be able to write coherent [essays and op-eds](#) in seconds. So, I signed up to give it a try and asked it to





perform a task that I had hitherto believed required at least some level of skill. I asked ChatGPT to “Write an op-ed in the style of Peter Bergen.”

**Within two seconds, the tool spat out this op-ed:**

*The country is more secure, but the war on terror is far from over.*

*As President Joe Biden marks 100 days in office, he can point to some consequential achievements in national security. The United States has made dramatic progress in winding down its two longest wars, in Afghanistan and Iraq, and the U.S. is more secure than it was four years ago, when Donald Trump took office.*

*But the war on terror is far from over. Al-Qaeda remains a threat to the United States and its allies, while the Islamic State continues to be a menace in the Middle East, Africa and South Asia.*

*The Biden Administration has taken some steps to address these threats, including authorizing the first military strikes against al-Qaeda and Islamic State targets in Syria and Yemen, and deploying special operations forces to Syria to help combat the Islamic State.*

*But much more needs to be done to protect the U.S. and its allies from terrorist threats. The Biden Administration should expand its efforts to counter violent extremism, not just in the Middle East, but in the United States as well.*

*The U.S. should also strengthen its partnerships with countries in the region, such as Jordan and Egypt, that are key to regional stability and counterterrorism efforts. Working with these countries to build up their capacity to counter terrorist threats will pay dividends in the long run.*

*Finally, the Biden Administration should make a concerted effort to re-engage with Iran, the region’s most powerful state. This could help to reduce the risk of future conflicts, while also opening the door to greater cooperation in the fight against terrorism and other transnational threats.*

*The war on terror is far from over, but the Biden Administration is taking the right steps to protect the United States and its allies from terrorist threats. With the right strategy and the right partners, the U.S. can continue to make progress in combating this global scourge.*

The op-ed made a clear overall argument that the “war on terror” wasn’t over, buttressing that argument with multiple sub-arguments with concrete policy proposals for the Biden administration to act on, such as reengaging with Iran.

But the op-ed made some factual errors, including a dated reference about when the Biden administration had assumed office, which I attributed to the fact that, [according to OpenAI](#), the company behind ChatGPT, its “default models’ training data cuts off in 2021, so they may not have knowledge of current events.”

The ChatGPT-generated op-ed also suggested that the Biden administration was the first to authorize [US strikes](#) against al-Qaeda in Yemen and [ISIS in Syria](#), policies that had in fact [started in previous administrations](#), and the single strike against al-Qaeda in Yemen during the Biden administration was reported to have been [a “suspected” US strike](#), not a confirmed strike.

The op-ed also asserted that the Iraq War was one of the two [longest American wars](#) which is debatable since the [Vietnam War](#) lasted more than 10 years, while the Iraq War lasted from 2003 to the withdrawal of all US troops in 2012. (American troops did [go back into Iraq](#) in 2014 to fight ISIS and thousands [remain there](#).)

I also work as a college professor at Arizona State University and AI tools like ChatGPT also raise some interesting questions about the role of student papers that make up such a core part of American college educations.

I asked the tool a simple historical question: “What was the role of women in the French Revolution?” And in a second it replied:

*Women played a crucial role in the French Revolution, both in the context of the political upheaval and the social transformation that it brought about.*

*Women were active participants in the storming of the Bastille and the overthrow of the monarchy. Women also took part in the political debates of the time, forming political clubs and writing pamphlets to advocate for their rights. They also participated in the revolutionary festivals and marches, as well as the violence of the Reign of Terror.*

*The Revolution also saw the emergence of a new type of woman, the ‘citizeness’, who was educated and politically active. Ultimately, the Revolution brought about some changes in the status of women, such as the right to divorce and the right to own property, but these gains were short-lived.*

While this short essay wasn’t exactly like the work of leading historians of the French Revolution, such as Richard Cobb or Simon Schama, and it overplayed the role of women in the violence of the “Reign of Terror,” it does suggest a future in which college students will likely be able to submit long and complicated papers that are entirely generated by AI. And then what does it mean to be educated at a liberal arts college? And why go to all the bother and expense? So, I head into 2023 with a sobering realization. My career as a CNN op-ed writer, which began in earnest over a decade ago, may not exactly be over yet since AI generated op-eds make factual errors – just as humans do, though those are typically caught during the fact checking process.





Yet my writing career could still go the way of the grocery checkout jobs eliminated by automation. AI tools will keep getting smarter, and distinguishing an AI-written op-ed from a “real” human op-ed will get harder over time, just as AI-generated college papers will become harder to distinguish from those written by actual students. As a writer and professor, that makes for a dystopian future. (I promise this sentiment was not generated by AI.)

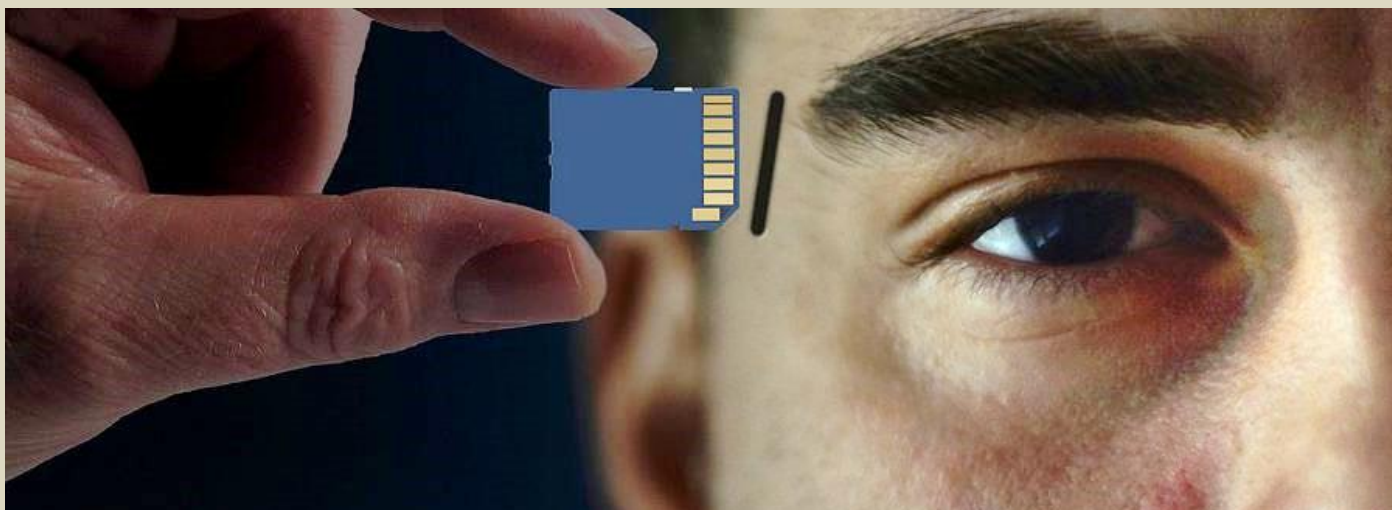
Peter Bergen is CNN’s national security analyst, a vice president at New America and a professor of practice at Arizona State University. Bergen is the author of “The Cost of Chaos: The Trump Administration and the World.”

**Chilling AI predicts what the FACE OF GOD could look like in creepy images – and it may not match what you would think**

Disproportionate confidence on artificial intelligence (NightCafe<sup>1</sup> Creator)?

**Adversarial AI – Who Monitors Artificial Intelligence?**

Source: <https://i-hls.com/archives/117502>



Dec 28 – Today, more and more systems are enveloping us in our daily lives. From autonomous cars to charging your phone, all these actions create information and access for AI to utilize. Everywhere we go we are being identified. At the airport, on the road, at supermarkets and more via identification cameras and other technologies.

As opposed to script-based systems, identification systems are built on artificial intelligence. These AI systems gather millions and millions of photographs and create a template for recognition. Each combination of pixels will be worth a value, given a meaning. However, the accuracy of these systems is never 100% and mistakes are bound to happen. In fact, many already have.

Now imagine if that same information was poisoned and the damage it can cause. If a hacker would get access to such a database and be able to change even a few small pixels, the system would be poised and will retrieve false results. Even if no hacker was involved, most developers buy the photographs that the AI system utilizes, since no one can physically take a million pictures. If is enough for one of these bought photographs to be poisoned or false for the algorithm to return with inaccurate results and predictions.

<sup>1</sup> The system was invented by Angus Russell and takes its name from the famous Vincent Van Gogh painting the “The Night Cafe”. It uses machine learning and a neural network to put together pictures based on the prompts offered to it by humans.



The Israeli company [DeepKeep](#) has developed an effective solution – an anti-virus to artificial intelligence. A system which detects anomalies, carries out examinations and even brings back reports regarding any vulnerabilities the AI engine might have. The DeepKeep MLProtect platform provides tools to harden AI models and fortify them against attacks. By implementing defense methods such as AI firewall, detectors, pre-processing, and post-processing algorithms, the company creates a layer of protection which is much needed for the AI and ML systems of today. From the beginning of an AI system’s lifecycle all the way to complex pipelines, DeepKeep provides services to the HLS, automotive, fintech and insurtech industries, as well as many more. Furthermore, the first operational Adversarial AI system will soon be available to their customers. The startup is a graduate of the [INNOFENSE](#) Innovation Center operated by iHLS in collaboration with IMoD. a unique acceleration program that removes entrance barriers to the technological ecosystem turning startups into mature, leading companies while connecting them with relevant investors, which is designed to strengthen the links between the civilian and defense markets via the collaborative development of the technologies, thus advancing and improving their integration in both markets.

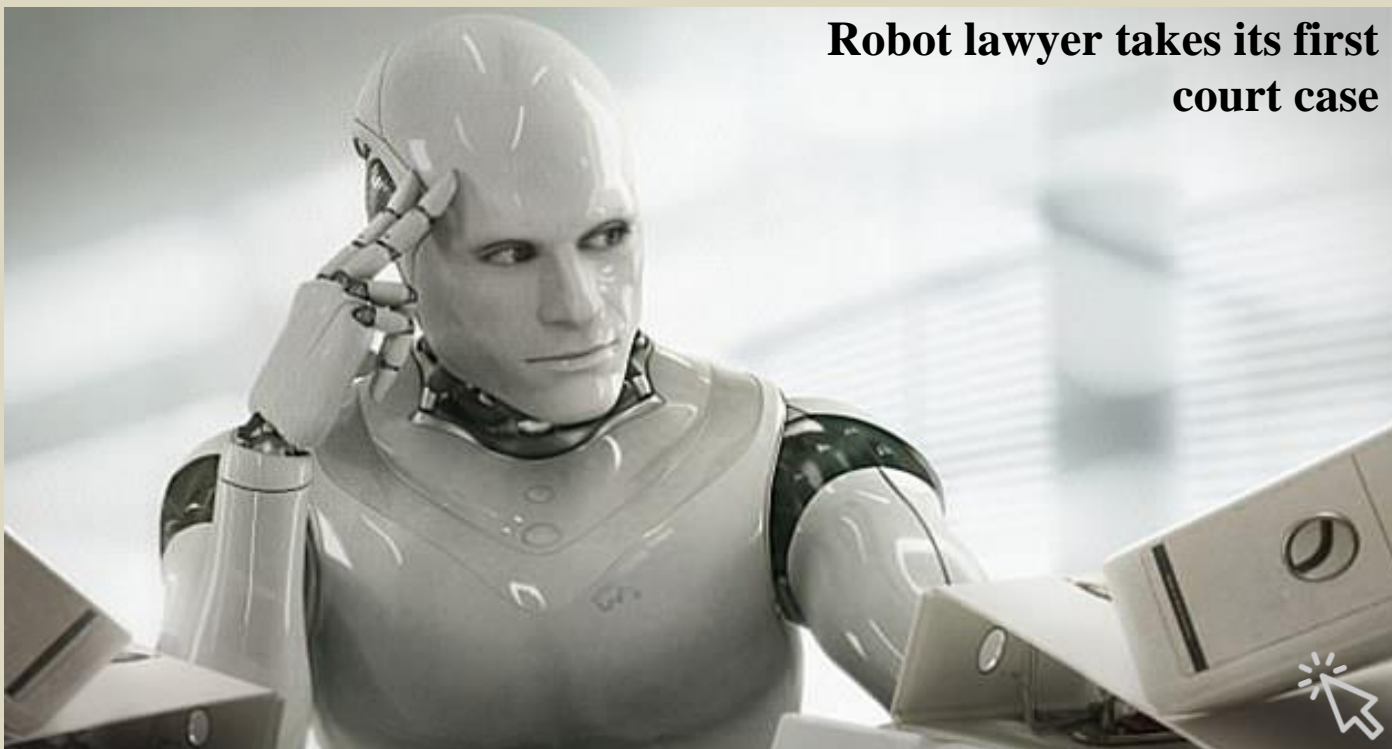
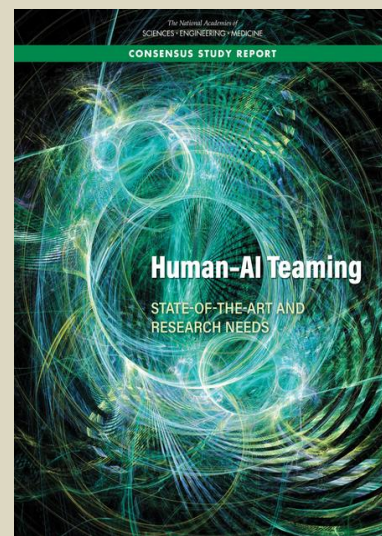
●► For further information and inquiry, feel free to contact DeepKeep on their website at [deepkeep.ai](https://deepkeep.ai)

### Human-AI Teaming – State-of-the-Art and Research Needs

Source: <https://nap.nationalacademies.org/catalog/26355/human-ai-teaming-state-of-the-art-and-research-needs>

2022 – Although artificial intelligence (AI) has many potential benefits, it has also been shown to suffer from a number of challenges for successful performance in complex real-world environments such as military operations, including brittleness, perceptual limitations, hidden biases, and lack of a model of causation important for understanding and predicting future events. These limitations mean that AI will remain inadequate for operating on its own in many complex and novel situations for the foreseeable future, and that AI will need to be carefully managed by humans to achieve their desired utility.

Human-AI Teaming: State-of-the-Art and Research Needs examines the factors that are relevant to the design and implementation of AI systems with respect to human operations. This report provides an overview of the state of research on human-AI teaming to determine gaps and future research priorities and explores critical human-systems integration issues for achieving optimal performance.





## AI And Security – Higher Level of Safety

Source: <https://i-hls.com/archives/113731>

Jan 06 – As new technologies and capabilities have emerged in recent years, artificial intelligence and security have become intertwined, leading to a high level of safety. Artificial intelligence gives machines human-like intelligence, autonomy, and judgment, but it is also an area under rapid development, and it is already being used for security and commercial purposes. The application of artificial intelligence to border control technology allows countries to protect their citizens and soldiers. Advances in machine learning algorithms, the rapid growth of digital information, and the intensification of computer capabilities are currently driving this technology into various advanced protection systems. Analyticsinsight.net notes recent developments in the field of AI are relevant to national security. In addition to defense options, artificial intelligence can also do mission tasks, logistics, cyber, control unmanned systems, and coordinate weapons systems. In the past, there was the belief that artificial intelligence would replace soldiers during battle, however, today it's clear that technology actually assists soldiers in their many missions.

The ability of artificial intelligence to improve military performance makes artificial intelligence a transformative national security technology, similar to nuclear weapons, aircraft, computers and biotechnology. Currently, artificial intelligence is used to automate the development of weapon systems, and to predict the failures of helicopter engines with greater accuracy.

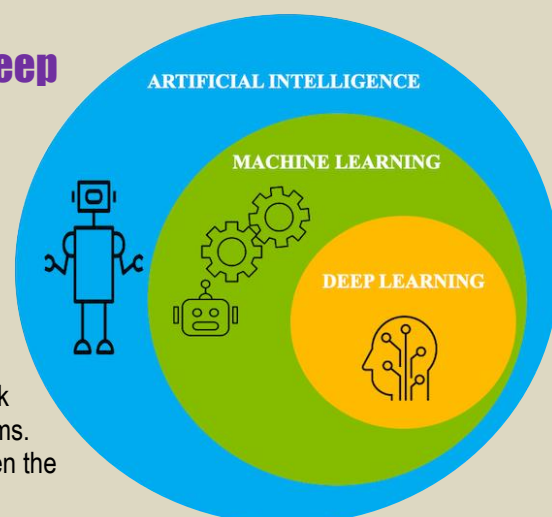
Furthermore, intelligence agencies may benefit from advances in artificial intelligence, which along with machine learning can enable accurate analysis of images, sound recordings, foreign languages, and other forms of data.

## MIT Review Addresses Cyber Threats Within Deep Learning

Source: <https://i-hls.com/archives/115205>

Jan 12 – Cybercrime is on the rise, and that isn't a notion that can be disproven. During the first quarter of 2022 there were 404 publicly reported data breaches in the US alone and a rise of 13% in a single year, a dangerous acceleration despite the technological progress in the field of cyber security. It is no surprise that many companies and organizations have opted to search for the most advanced methods of protecting themselves against cyber threats. MIT scientists and leading network defenders urge these companies to explore deep learning as a way to secure systems. The ability of deep learning to mimic the human brain might be able to outsmart even the world's fastest and most dangerous cyber threats.

MIT Technology Review has published a research paper regarding deep learning and malware prevention in hopes that it will encourage organizations to turn to innovation in their fight against cybercrime. According to cybernews.com, deep learning is the most advanced form of AI technology that uses neural networks to instinctively and autonomously anticipate and prevent unknown malware and zero-day attacks. Deep learning is also praised in the MIT paper for addressing the limitations of machine learning by circumventing the need for highly skilled and experienced data scientists to feed a solution data sets manually. "A deep learning model, specifically developed for cybersecurity, can absorb and process vast volumes of raw data to fully train the system. Once trained, these neural networks become autonomous and do not require constant human intervention. This combination of a raw data-based learning methodology and larger data sets means that deep learning is eventually able to accurately identify much more complex patterns than machine learning, at much faster speeds," the paper reads. Furthermore, deep learning has the ability to predict the threat of adversarial AI by tricking the AI models and feeding them deceptive data. As such, it is far more challenging for threat actors to create malware that can understand and exploit how the system works. Deep learning mimics the human brain's functionality but with much greater speed and accuracy, and therefore can indicate intrusion by threat actors or malware much more effectively than any human employee and other cyber security methods.



## The Dangers of Artificial Intelligence: Understanding the Potential Risks

Source: <https://www.lihpao.com/how-could-ai-be-dangerous/>

Jan 13 – Artificial intelligence (AI) has become increasingly popular in recent years due to its potential to revolutionize various industries. AI is defined as "the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages". With its many applications, AI is seen as a powerful





tool that can help humanity solve some of its most pressing problems. However, there are also potential dangers associated with AI that must be taken into account.

### Autonomous Weapons Systems

One of the most worrying potential dangers of AI is the development of autonomous weapons systems. Autonomous weapons are weapons that can select and engage targets without any human intervention. These weapons could be used to launch devastating attacks on large populations, leading to mass destruction and loss of life. Furthermore, there is no way to ensure accountability for these weapons, as they are not operated by humans who can be held responsible for their actions.

### Malicious AI Attacks

Another potential danger of AI is malicious AI attacks. If left unchecked, AI could be used to launch cyber-attacks on networks and systems, potentially leading to massive data breaches and other forms of digital disruption. These attacks could be used to manipulate markets and economies, or even cause physical damage to infrastructure.

### Surveillance

AI can also be used to monitor and control citizens. Governments have already implemented facial recognition systems powered by AI, which can be used to track people's movements and activities. This poses a serious threat to civil liberties, as it allows governments to gain unprecedented levels of control over their citizens.

### Job Loss

AI could also lead to job loss, as it is capable of replacing human workers in certain industries. This could lead to economic instability, as workers are unable to find new jobs and are pushed into poverty. This could have a devastating effect on the global economy, as well as on individuals.

### Loss of Privacy

AI algorithms can also be used to predict and target individuals with ads and services. This means that companies can gain access to vast amounts of personal data, which can then be used to profile users and manipulate them into buying certain products or services. This poses a significant threat to privacy and could lead to a loss of autonomy for individuals.

### Dangerous Algorithms

AI algorithms can also produce biased results that could lead to discrimination. For example, AI-powered facial recognition systems have been shown to be more accurate when identifying white faces than black faces, leading to potential racial profiling. Additionally, AI algorithms can be used to make decisions about loan applications, job applications, and other important matters, which could lead to unfair outcomes based on race, gender, or other factors.

### Conclusion

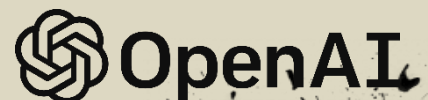
Although AI has the potential to revolutionize many industries and help solve some of the world's most pressing problems, it also carries a number of potential dangers. Autonomous weapons systems could lead to mass destruction, malicious AI attacks could cause digital disruption, AI-powered surveillance could threaten civil liberties, job loss could lead to economic instability, and dangerous algorithms could lead to discrimination. To mitigate these risks, it is important to conduct further research and development into AI, as well as to create regulations and guidelines to ensure that AI is used responsibly.

## The Genius Strategy That Made OpenAI The Hottest Startup in Tech

Source: <https://www.sciencealert.com/the-genius-strategy-that-made-openai-the-hottest-startup-in-tech>

Jan 16 – The hottest startup in Silicon Valley right now is OpenAI, the Microsoft-backed developer of [ChatGPT](#), a much-hyped chatbot that can write a poem, college essay, or even a line of software code.

Tesla tycoon [Elon Musk was an early investor in OpenAI](#) and Microsoft is reported to be in talks to up an initial investment of \$1 billion to \$10 billion in a goal to challenge Google's world-dominating search engine.







If agreed, the cash injection by the Windows-maker would value OpenAI at a whopping \$29 billion, making it a rare tech-world success when major players such as Amazon, Meta, and Twitter are cutting costs and laying off staff.

"Microsoft is clearly being aggressive on this front and not going to be left behind on what could be a potential game-changing AI investment," said analyst Dan Ives of Wedbush Securities.

Before the release of ChatGPT, OpenAI had wowed tech geeks with [Dall-E 2](#), software that creates digital images with a simple instruction.

Microsoft, which makes no secret of its AI ambitions, has integrated Dall-E 2 into several of its applications and now, [according to a report](#) in Bloomberg, the tech giant wants to graft ChatGPT to its Bing search engine to take on Google.

Since ChatGPT was introduced in November, the prowess of this chatbot has aroused the curiosity and fascination of internet users. It is capable of formulating detailed and human-like answers on a wide range of subjects in a few seconds, raising fears that it is vulnerable to misuse by school cheats or for disinformation.

### 'Not cheap'

The dizzying success is due in part to OpenAI's clever marketing strategy in which it made its research accessible to non-experts, said AI specialist Robb Wilson, founder of OneReach.ai, a software company.

"Having this technology available to technologists was one thing. Offering it in a chat user interface and allowing non-developers to start playing with it ignited a conversation," he said.

Founded in late 2015, OpenAI is led by Sam Altman, a 37-year-old entrepreneur and former president of [startup incubator Y Combinator](#).

The company has counted on the financial support of prestigious contributors from the start, including LinkedIn co-founder Reid Hoffman, investor Peter Thiel, and Musk.

The multi-billionaire served on OpenAI's board until 2018, but left to focus on Tesla, the electric vehicle company.

The startup also relies on a team of computer scientists and researchers led by Ilya Sutskever, a former Google executive who specializes in [machine learning](#).

OpenAI, which did not respond to AFP's inquiries, had about 200 employees by 2021, according to a query made directly on ChatGPT.

For now, despite the excitement generated by ChatGPT, the company has yet to find a path to financial independence.

Founded as a nonprofit, the startup became a "capped for-profit" company in 2019 to attract more investors and this week co-founder [Greg Brockman said](#) that a paid version of ChatGPT was in the works.

The search for funding seems necessary for a company with exorbitant expenses.

In a Twitter exchange with Musk in early December, [Altman acknowledged](#) that each conversation on ChatGPT costs OpenAI several US cents.

According to estimates by Tom Goldstein, an associate professor in the University of Maryland's computer science department, the company is shelling out \$100,000 a day for its bot, or about \$3 million a month.

Partnering with Microsoft, which provides the startup with its remote computing services, could cut costs, but "either way, it's not cheap," Goldstein said.

"Some say it's wasteful to pour these kinds of resources... into a demo," he added.



# Ares\*, the brother of Sarisa is coming soon over Greek skies



\*Ares is the Greek god of war and courage. He is one of the Twelve Olympians, and the son of Zeus and Hera.





## DJI creates drone tour of Foster + Partners-designed skyscrapers HQ

Source: <https://www.youtube.com/watch?v=jdBKMOwwSGA>



**DJI Avata: After this video, the Slaughterbots are becoming more close to reality ...**



## Virtual Reality Training Revolution Is Here

By Peter Johnson

Source: <https://www.domesticpreparedness.com/preparedness/virtual-reality-training-revolution-is-here/>

Jan 18 – The *click-through, good-enough* training, ubiquitous in many organizations, is not good enough anymore. A [Harvard Business Review](#) article titled “[Where Companies Go Wrong with Learning and Development](#)” (L&D) discovered that only 12% of employees applied training from L&D programs to their



work. The same article explains that hundreds of billions of dollars are spent annually on these training programs that offer little meaningful results. With honest reflection from those within leadership, management, public safety, emergency response, and threat mitigation positions would admit most of the training has not been working. The next generation of training is already here, and there is significant evidence that it will change training standards across industries.

More important than cost savings alone, virtual reality training effectively improves skills and knowledge when conducting safety-focused training.

### Aligning Adult Learning and Virtual Reality

Virtual reality (VR) and augmented reality (AR) technology are often used in the social media [metaverse](#), a virtual world shared by many users. However, early adopters are discovering the benefits of VR/AR for training purposes. VR training allows individuals to practice and develop skills to respond to real-life situations in a simulated, safe environment. One major advantage of VR training is the time it saves. Traditional training methods can be time-consuming, requiring people to travel to a training location and spend hours in a classroom. VR training, on the other hand, can be done from anywhere at any time and typically takes less overall training time. This time savings leads to cost savings, as it reduces the need for travel expenses and lost productivity due to time away from work.

More important than cost savings alone, VR training effectively improves skills and knowledge when conducting safety-focused training. Research highlighting the benefits of VR training was published in an article by [Education Sciences](#) in 2021, “Establishment of Virtual-Reality Based Safety Education and Training Systems for Safety Engagement.” The researcher concluded, “from a cognitive perspective, VR-based safety education can increase learning outcomes because it is more advantageous for acquiring knowledge.” These findings on the benefits of VR training are echoed across cultures, economies, and industries.

In an ever-changing world, the ability to uptake knowledge faster will be one of the keys to providing meaningful threat mitigation, which is accomplished by using the [Adult Learning Theory](#) developed by Malcolm Knowles. He emphasizes the importance of self-realization and experiential learning in adult-focused education. The theory suggests that adults are more motivated to learn when they see the relevance and value of the material to their own lives. This concept of self-realization should intuitively resonate with educators, leaders, and public safety alike.

Combining the benefits of VR training with the Adult Learning Theory training principles can be conducted with the trainee’s internal motivation at the core. VR training is, by nature, hands-on and interactive, which creates an ideal environment for adults to practice and apply their skills while allowing them to take an active role in their own learning. VR training can effectively engage and motivate adult learners by allowing learners to self-direct their learning and connect to their own experiences. VR technological advances have placed the tools necessary to develop, deploy, and engage meaningful training at a previously unseen scale.



### Closing Staffing and Liability Gaps

The conversation becomes even clearer when analyzing the need for next-generation training from a staffing and business perspective. Finding qualified candidates for even entry-level positions has been a relatively constant challenge. When candidates are willing to do good work, the balancing act of investing in training versus retaining current employees remains omnipresent within an organization. On the one





hand, there is concern about pouring money into training an employee that will leave. On the other hand, a valid concern of not training employees and risking significant ramifications is present.

As with active shooter/threat training, most organizations cannot or will not invest a few hundred dollars for an in-person quality course, historically leaving these same organizations with a *good enough* training option. With the advent of VR training, however, organizations can now provide faster and better training at a fraction of the price compared to traditional in-person training courses. These courses can also be perfectly repeatable, like a video game being played countless times after development.



Tram/Subway Scenario Scene (Source: Johnson, 2022).

*Lastly, liability is an ongoing concern. In the worst-case scenario of an active threat attack, an organization's training can be audited to ensure it was conducted and that the team members learned the material enough to claim the organization acted reasonably to mitigate the recognizable hazard. Advancements in VR make it possible to prove what someone learned in training. With the continuing development of VR immersive environments and leveraging nearly endless data points to capture (e.g., eye movement, facial expression, observational focus, reaction time, etc.), organizations can determine what training worked and, by contrast, which fell short of the training objectives. With these systems in place, teams can respond to legal or Freedom of Information requests with confidence in their training standards.*

It is easy for anyone to get lost in the noise of the news cycles and forget the human element behind what the public safety and emergency response community is committed to protecting. The author was reminded of this concept while conducting an interview regarding VR in Tampa, Florida, with [Channel 8 WFLA](#). The host, Gayle Guyardo, recounted how her two daughters were recently in an active shooter lockdown situation at their school. As Guyardo described the terrifying feelings from her daughters' frantic text messages and the ensuing rush of parents approaching the school, one could not help but see why the profession of protecting others is so critical. Thankfully for Guyardo and her family, this incident was resolved without anyone getting hurt. However, leaders and practitioners must look beyond the status quo to seek meaningful training solutions for the people who count on them. These training opportunities expand well beyond active shooter/threat training, including emergency management, medical response, search and rescue, "red teaming" exercises, and more. VR technology is already reshaping the training landscape, and it is time to lean into the next generation of training.

**Peter Johnson's** experience has been gained from military, law enforcement, and federal counter-terrorism while serving in the Federal Air Marshal Service. Now an entrepreneur, he has grown a successful national training company that trains police departments, SWAT teams, corporations, and non-profits in active threat response/mitigation along with terrorist planning cycle disruption through his company Archway Defense. He continues to conduct public speaking on workplace violence along with threat mitigation for organizations around the country. Since 2019, he co-founded a VR Development company, Deep Attic, and leads curriculum development of their disruption technology platform for active threat and security training.

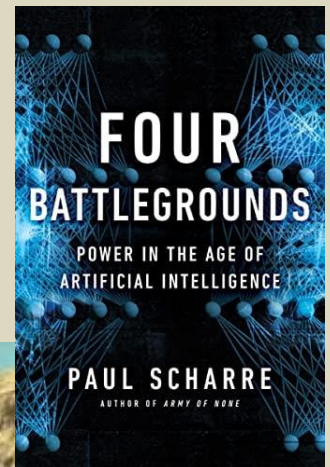


## US Marines Defeat DARPA Robot by Hiding Under a Cardboard Box

Source: <https://www.extremetech.com/extreme/342413-us-marines-defeat-darpa-robot-by-hiding-under-a-cardboard-box>

Jan 19 – Army veteran, former Pentagon policy analyst, and author Paul Scharre is gearing up to release a new book called *Four Battlegrounds: Power in the Age of Artificial Intelligence*. Despite the fact that the book isn't scheduled to hit shelves until Feb. 28, Twitter users are already sharing excerpts via social media. This includes *The Economist's* defense editor, Shashank Joshi, who shared a particularly laughable passage on Twitter.

In the excerpt, Scharre [describes](#) a week during which DARPA calibrated its robot's human recognition algorithm alongside a group of US Marines. The Marines and a team of DARPA engineers spent six days walking around the robot, training it to identify the moving human form. On the seventh day, the engineers placed the robot at the center of a traffic circle and devised a little game: The Marines had to approach the robot from a distance and touch the robot without being detected.



Solid Snake using a cardboard box as a disguise in Metal Gear Solid.

DARPA was quickly humbled. Scharre writes that all eight Marines were able to defeat the robot using techniques that could have come straight out of a Looney Tunes episode. Two of the Marines somersaulted toward the center of the traffic circle, thus using a form of movement the robot hadn't been trained to identify. Another pair shuffled toward the robot under a cardboard box. One Marine even stripped a nearby fir tree and was able to reach the robot by walking "like a fir tree" (the meaning of which Twitter users are still working to figure out).

While it's funny to imagine a team of Marines using Metal Gear Solid's cardboard box strategy to defeat what's likely a very expensive robot, the incident detailed in Scharre's book fortifies something we already know: AI is only as useful as the data we give it. Similar to the way [AI becomes biased](#) once it's fed biased data, algorithms can be [as ignorant as their foundational data is flat](#). Without being shown what a somersaulting human or a human under a box looks like in action, a robot won't be able to discern that image from all the surrounding noise, no matter how s





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# **EMERGENCY RESPONSE**





# Study shows how machine learning could predict rare disastrous events, like earthquakes or pandemics

Brown University

Source: <https://www.sciencedaily.com/releases/2022/12/221219123859.htm>

Dec 19 – When it comes to predicting disasters brought on by extreme events (think earthquakes, pandemics or "rogue waves" that could destroy coastal structures), computational modeling faces an almost insurmountable challenge: Statistically speaking, these events are so rare that there's just not enough data on them to use predictive models to accurately forecast when they'll happen next.

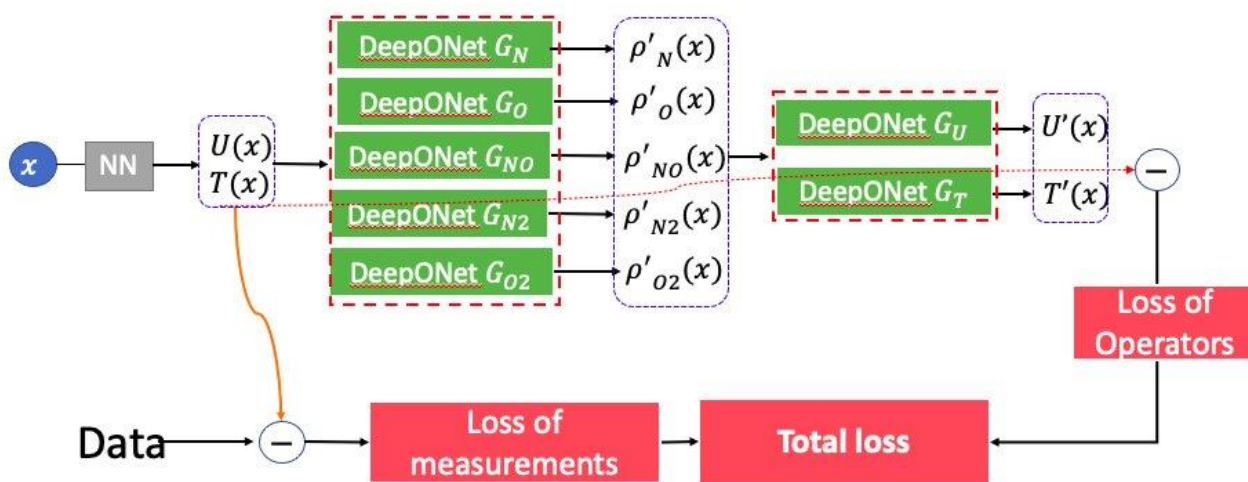
But a team of researchers from Brown University and Massachusetts Institute of Technology say it doesn't have to be that way. In a new study in *Nature Computational Science*, the scientists describe how they combined statistical algorithms -- which need less data to make accurate, efficient predictions -- with a powerful machine learning technique developed at Brown and trained it to predict scenarios, probabilities and sometimes even the timeline of rare events despite the lack of historical record on them.

Doing so, the research team found that this new framework can provide a way to circumvent the need for massive amounts of data that are traditionally needed for these kinds of computations, instead essentially boiling down the grand challenge of predicting rare events to a matter of quality over quantity.

"You have to realize that these are stochastic events," said (Greek) George Karniadakis, a professor of applied mathematics and engineering at Brown and a study author. "An outburst of pandemic like COVID-19, environmental disaster in the Gulf of Mexico, an earthquake, huge wildfires in California, a 30-meter wave that capsizes a ship -- these are rare events and because they are rare, we don't have a lot of historical data. We don't have enough samples from the past to predict them further into the future. The question that we tackle in the paper is: What is the best possible data that we can use to minimize the number of data points we need?"

The researchers found the answer in a sequential sampling technique called active learning. These types of statistical algorithms are not only able to analyze data input into them, but more importantly, they can learn from the information to label new relevant data points that are equally or even more important to the outcome that's being calculated. At the most basic level, they allow more to be done with less.

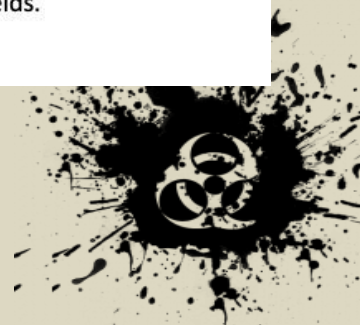
That's critical to the machine learning model the researchers used in the study. Called **DeepOnet**, the model is a type of artificial



DeepOnet can be pretrained offline and used for online predictions in a **plug-and-play mode** by assimilating streaming data fast. Here we show an application from a Multiphysics problem in hypersonics in the Mach Number range 8 to 10, where there is non-equilibrium chemistry since the air is dissociated under these conditions. Only very few new data for the velocity  $U(x)$  and the temperature  $T(x)$  are provided while all the Multiphysics is encapsulated in the pretrained DeepOnets for five different species and two fluid mechanics fields.

Reference: <https://arxiv.org/abs/2011.03349>

neural network, which uses interconnected nodes in successive layers that roughly mimic the connections made by neurons in the human brain. DeepOnet is known as a deep neural operator. It's more advanced





and powerful than typical artificial neural networks because it's actually two neural networks in one, processing data in two parallel networks. This allows it to analyze giant sets of data and scenarios at breakneck speed to spit out equally massive sets of probabilities once it learns what it's looking for. The bottleneck with this powerful tool, especially as it relates to rare events, is that deep neural operators need tons of data to be trained to make calculations that are effective and accurate.

In the paper, the research team shows that combined with active learning techniques, the DeepOnet model can get trained on what parameters or precursors to look for that lead up to the disastrous event someone is analyzing, even when there are not many data points.

"The thrust is not to take every possible data and put it into the system, but to proactively look for events that will signify the rare events," Karniadakis said. "We may not have many examples of the real event, but we may have those precursors. Through mathematics, we identify them, which together with real events will help us to train this data-hungry operator."

In the paper, the researchers apply the approach to pinpointing parameters and different ranges of probabilities for dangerous spikes during a pandemic, finding and predicting rogue waves, and estimating when a ship will crack in half due to stress. For example, with rogue waves -- ones that are greater than twice the size of surrounding waves -- the researchers found they could discover and quantify when rogue waves will form by looking at probable wave conditions that nonlinearly interact over time, leading to waves sometimes three times their original size.

The researchers found their new method outperformed more traditional modeling efforts, and they believe it presents a framework that can efficiently discover and predict all kinds of rare events.

In the paper, the research team outlines how scientists should design future experiments so that they can minimize costs and increase the forecasting accuracy. Karniadakis, for example, is already working with environmental scientists to use the novel method to forecast climate events, such as hurricanes.

The study was led by Ethan Pickering and Themistoklis Sapsis from MIT. DeepOnet was introduced in 2019 by Karniadakis and other Brown researchers. They are currently seeking a patent for the technology. The study was supported with funding from the Defense Advanced Research Projects Agency, the Air Force Research Laboratory, and the Office of Naval Research.

**Journal Reference:** Ethan Pickering, Stephen Guth, George Em Karniadakis, Themistoklis P. Sapsis. **Discovering and forecasting extreme events via active learning in neural operators.** *Nature Computational Science*, 2022; 2 (12): 823 DOI: [10.1038/s43588-022-00376-0](https://doi.org/10.1038/s43588-022-00376-0)

## Building Design for Safety and Resilience – First Steps

By Paul Marshall

Source: <https://www.domesticpreparedness.com/resilience/building-design-for-safety-and-resilience-first-steps/>



Jan 11 – There is a need for more resilience as it applies to emergency preparedness in the design, construction, and renovation of the built environment. Conventional design of buildings by architects and engineers meets the code and aligns with the owner's or developer's programmatic requirements. **However, unless the program specifically calls for safety, security, or environmentally resilient design, these elements are not usually included as a focus in the design.** This does not mean that traditionally designed buildings are not safe or cannot withstand the effects of weather or seismic instability. Given that architects and engineers are professionally responsible for the health, safety, and welfare of the general public, they are required to produce buildings that meet code. However, the current conventional design of a code-compliant commercial structure does not always require additional thought to potential threats outside the envelope of the building. Put another way, a building will be accepted as a successful building and will likely serve the owner as a good investment if it:

- Keeps the occupants cool in the summer,
- Keeps the occupants warm in the winter,
- Meets all required structural and energy codes,
- Has a properly designed exterior that keeps out the regionally appropriate weather, and
- Meets the owner's aesthetic and programmatic requirements.

This process can be improved by including an all-hazards approach to building design that considers not only the function of the building during normal operation but also the safety of the occupants and the surrounding community by considering the possible threats to the building from any regionally specific threats.

### All-Hazards Design Process

The most important step in an all-hazards approach for a resilient facility is to consult the area's Threat and Hazard Identification and Risk Assessment (THIRA). This resource should identify all known and



possible threats to consider during design. Consult the Homeland Security [Comprehensive Preparedness Guide \(CPG\) 201](#) for details on the THIRA and related information. Once the threats and hazards are identified, a stakeholder group should be assembled to include all relevant parties from the owner's team as well as local providers such as fire, law enforcement, emergency medical services, emergency management, utility providers, and if relevant, outside agencies. By utilizing an integrated team at the outset of the design process, gaps in planning can be avoided that, if not identified, could produce catastrophic results.

Acknowledging that financial pressure is always a concern in decision-making, there must be a method to prioritize the threats and the appropriate response in design and construction. These threats are typically represented in a risk matrix from low-impact/low-frequency to high-impact/high-frequency. For example, a building designed for the Gulf Coast might classify a hurricane as a high-impact/medium-frequency event. In contrast, a nuclear power plant might classify a meltdown as a high-impact/low-frequency event. Both conditions require appropriate planning to mitigate potential impact but having the impact/frequency matrix allows for thoughtful prioritization of risk and allocation of resources.

“By utilizing an integrated team at the outset of the design process, gaps in planning can be avoided that, if not identified, could produce catastrophic results.”

**EDITOR'S COMMENT:** Usually, in the “all hazards” approach the issue of CBRN threats is omitted especially regarding the decontamination facility that needs to be close to the Emergency Department of the hospital. In addition, when the hospital has no fenced perimeter, mass casualties able to walk will flood the hospital and via various entrances or even windows will try to enter the hospital seeking medical assistance from the medical personnel thus contaminating the entire building and people (including patients). Ground doors should have locks and glasses should have treated to withstand vandalism. This might be an extra cost but in case of a real CBRN incident will pay back. In general, Architects and civil engineers should work together with CBRN experts but this is not happening worldwide. The usual excuse is that the state will take care of the contaminated people so they will arrive at the hospital “clean”. **SO WRONG!**

### Codes and Prescriptive Design

Although building codes have progressed a long way since their inception, they are, by nature, a retroactive measure. Building codes, historically, have been enacted in response to failure. They have not been universally proactive despite calls for various restrictions to be put in place. Since building codes are part of a municipality's jurisdictional power and are not arbitrarily applied, there may be resistance to adopting a code that could place unnecessary financial hardship on public or private development.

An example of a new code enhancement is the requirement in recent building codes for a storm shelter in K-12 schools or similar functions. The shelter must safely hold the entire building population for a duration outlined in the code (such as 90 minutes for a tornadic event). However, a similarly vulnerable population, such as sleeping students in university residence halls, does not have the same code requirement and could potentially be viewed as a financial hardship for some owners.

### CPTED

The approach to this, primarily relating to safety and security, is known as Crime Prevention Through Environmental Design (CPTED). The tactics and techniques of CPTED are beyond the scope of this article, but the four primary principles of CPTED are:

- *Natural Surveillance* – allows for visibility by legitimate occupants to their surroundings;
- *Natural Access Control* – access onto the property;
- *Territorial Reinforcement* – identifiable features to clearly designate property boundaries; and
- *Management and Maintenance* – upkeep of the property to demonstrate diligent ownership.

These principles are intended to inform the design and construction of buildings in a way that creates safe spaces. Critical attention must be given to avoid creating fortress-like buildings that are visually unappealing and uncomfortable to occupy. This same advice applies to buildings that are resilient to disaster.

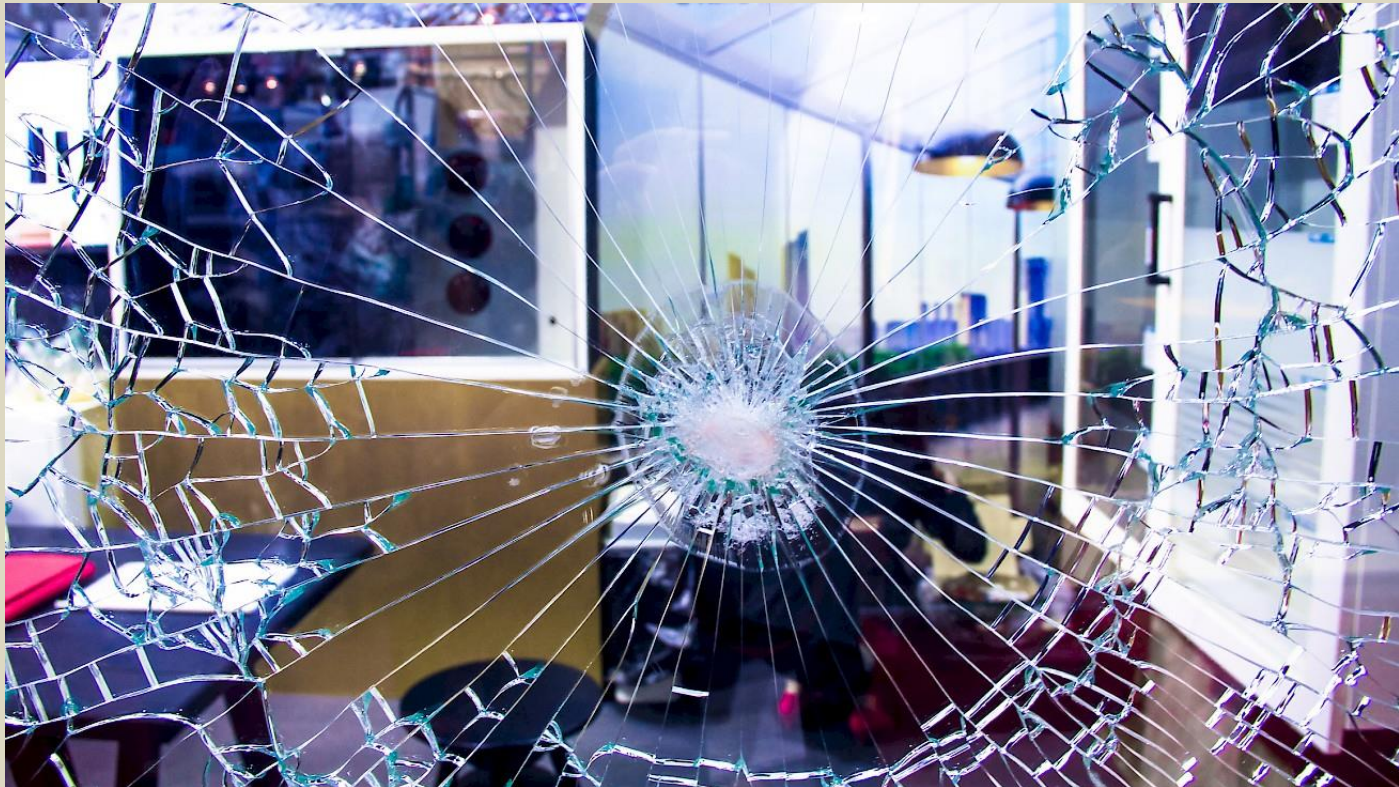
### Concentric Layers

Another concept from security design that applies equally to facility resilience is the principle of concentric layers of protection. Like when resisting criminal intrusion, multiple layers of damage can be inflicted by human-caused or natural disasters. The analogy of an onion is often used to describe this concept. By placing multiple layers of protection around sensitive or critical areas, these areas are shielded from threats. In relation to weather, this applies to building materials and construction methods to create sheltered spaces within these facilities. Having multiple layers eliminates the need to depend on one layer to provide total security because there is a redundant layer in case the outer layer is compromised. Suppose the design or programmatic requirement demands the reduced effectiveness of one of these layers (such as an all-glass wall looking into a large assembly space instead of a solid wall).





In that case, the other combined layers of security must compensate for this shortfall to provide the same net level of protection to the occupants.



#### ***Practical Approach to Operation***

Even the most effective design process in the world cannot overcome the element of human error. Daily operations of a facility must be considered to produce a facility that can be effectively and efficiently maintained in the manner intended. An example relating to school security might be the placement and operation of exterior doors relative to the HVAC system. If a building is not designed for proper humidity and temperature control, daily users are likely to prop open a door to get fresh air, thereby producing a serious security vulnerability. In the case of emergency management of a building, numerous quality-of-life considerations must be considered for both operation and process. The following is an abbreviated list of examples:

- Establish familiar relationships with all local emergency service providers and allow them to tour the facility regularly to maintain familiarity.
- Consider a comprehensive building identification system that provides exterior signage identifying window and door locations. These should use reflective letters of sufficient height to be seen by emergency vehicles responding to the facility.
- Provide multiple locations to shut down outdoor air intakes and ventilation dampers if the THIRA shows proximity to possible sources of chemical risk like highway, rail, or industrial plant use.
- Locate outdoor air intakes out of reach of unauthorized personnel to avoid introducing toxic substances into the airstream. A rooftop location is preferred.
- Locate emergency generators, if they are part of the program, at least 25 feet from the building, parking lots, or any occupied structure. If generators cannot be separated from the public in this way, an explosion-proof enclosure may be utilized. These types of enclosures must not allow unauthorized personnel to enter them or hide contraband out of sight within the enclosure.
- Ensure that appropriate public address capability is provided throughout the facility to complement the fire alarm system. If possible, consider multiple means of mass communication for all facility and grounds occupants, regardless of whether they are assigned users. Geofencing for emergency SMS messaging may be considered.
- Ensure that the facility has adequate shelter-in-place capacity for the maximum occupant capacity. The event duration must be identified and considered when determining the space needed. For example, standing room is sufficient for most emergencies, but shelter-in-place for longer-duration events such as a hurricane may demand more square footage.
- Identify if the facility needs backup power to maintain functional operation. A warehouse has very different power requirements than a hospital, for example.



- Conduct proactive maintenance and functional checks of all critical systems.

### *Blast Resistive Design Strategies*

Although blast damage would typically be seen as a high-impact/low-frequency event, some building uses may make them a credible target for terrorist activity. If so, the Federal Emergency Management Agency's Risk Management Series Primer for Design of Commercial Buildings to Mitigate Terrorist Attacks ([FEMA 427](#)) should be consulted for detailed considerations of blast resistive design strategies. The exterior shape of the building can have significant effects on the ability to withstand explosive forces as well as high winds and airborne projectiles. Whenever possible, locate buildings with a setback from uncontrolled vehicle thoroughfares to minimize risk from vehicle ingress.

### *Conclusion*

Although descriptions of the above concepts and strategies for an all-hazards design process are not an exhaustive coverage of the topic, they illustrate the strategic view necessary to produce more resilient facilities.

**Paul Marshall** is a licensed architect, Eagle Scout, and former United States Marine. He has been actively involved in the design and construction of secure and resilient facilities for over 20 years. He has designed facilities and consulted for multiple defense contracting corporations, the Department of Defense, and other federal agencies. Since 2011, he has specialized in higher education architecture and facilities. He is a graduate of the FEMA basic academy and is in the 2023 cohort of the National Emergency Management Advanced Academy (NEMAA). As part of NEMAA, he is currently researching the intersection between facility design and construction, resiliency strategies, and public administration.

## Preparing to Be Prepared

By Peter Dizikes

Source: <https://www.homelandsecuritynewswire.com/dr20230119-preparing-to-be-prepared>

Jan 19 – The Kobe earthquake of 1995 devastated one of Japan's major cities, leaving over 6,000 people dead while destroying or making unusable hundreds of thousands of structures. It toppled elevated freeway segments, wrecked mass transit systems, and damaged the city's port capacity.

"It was a shock to a highly engineered, urban city to have undergone that much destruction," says Miho Mazereeuw, an associate professor at MIT who specializes in disaster resilience.

Even in a country like Japan, with advanced engineering, and policies in place to update safety codes, natural forces can overwhelm the built environment.

"There's nothing that's ever guaranteed safe," says Mazereeuw, an associate professor of architecture and urbanism in MIT's Department of Architecture and director of the Urban Risk Lab. "We [think that] through technology and engineering we can solve things and fight nature. Whereas it's really that we're living with nature. We're part of this natural ecosystem."

That's why Mazereeuw's work on disaster resilience focuses on plans, people, and policies, well as technology and design to prepare for the future. In the Urban Risk Lab, which Mazereeuw founded, several projects are based on the design of physical objects, spaces, and software platforms, but many others involve community-level efforts, so that local governments have workable procedures in case of emergency.

"What we can do for ourselves and each other is have plans in place so that if something does happen, the level of chaos and fear can be reduced and we can all be there to help each other through," Mazereeuw says. When it comes to disaster preparedness, she adds, "Definitely a lot of it is on the built environment side of things, but a lot of it is also social, making sure that in our communities, we know who would need help, and we have those kinds of relationships beforehand."

The Kobe earthquake was a highly influential event for Mazereeuw. She has researched the response to it and has a book coming out about natural disasters, policies, and design in Japan. Beyond that, the Kobe event helped reinforce her sense that when it comes to disaster preparedness, progress can be made many ways. For her research, teaching, and innovative work at the Urban Risk Lab, Mazereeuw was granted tenure at MIT last year.

### **Two Cultures Grappling with Nature**

Mazereeuw has one Dutch parent and one Japanese parent, and both cultures helped produce her interest in managing natural forces. On her Dutch side, many family friends were involved with local government and water management — practically an existential issue in a country that sits largely below sea level.





Mazereeuw's parents, however, were living in Japan in 1995. And while they happened to be away while the Kobe earthquake hit, her Japanese links helped spur her interest in studying the event and its aftermath.

"I think that was a wake-up call for me, too, about how we need to plan and design cities to reduce the impact of chaos at the time of disasters," Mazereeuw says. Mazereeuw earned her undergraduate degree from Wesleyan University, majoring in earth and environmental sciences and in studio art. After working in an architectural office in Tokyo, she decided to attend graduate school, receiving her dual masters from Harvard University's Graduate School of Design, with a thesis about Kobe and disaster readiness. She then worked in architecture offices, including the Office of Metropolitan Architecture in Rotterdam, but returned to academia to work on climate change and disaster resilience.

Mazereeuw's book, "Design Before Disaster," explores this subject in depth, from urban planning to coastal-safety strategies to community-based design frameworks, and is forthcoming from the University of Virginia Press.

Since joining the MIT faculty, Mazereeuw has also devoted significant time to the launch and growth of the Urban Risk Lab, an interdisciplinary group working on an array of disaster-preparedness efforts. One such project has seen lab members work with local officials from many places — including Massachusetts, California, Georgia, and Puerto Rico — to add to their own disaster-preparedness planning. A plan developed by local officials with community input, Mazereeuw suggests, will likely function better than one produced by, say, consultants from outside a community, as she has seen happen many times: "A report on a dusty shelf isn't actionable," she says. "This way it's a decision-making process by the people involved."

In a project based on physical design, the Urban Risk Lab has also been working with the U.S. Federal Emergency Management Agency on an effort to produce temporary postdisaster housing for the OCONUS region (Alaska, Hawaii, and other U.S. overseas territories). The lab's design, called SEED (Shelter for Emergency Expansion Design), features a house that is compact enough to be shipped anywhere and unfolds on-site, while being sturdy enough to withstand follow-up events such as hurricanes, and durable enough to be incorporated into longer-term housing designs.

"We felt it had to be really, really good quality, so it would be a resource, rather than something temporary that disintegrates after five years," Mazereeuw says. "It's built to be a small safety shelter but also could be part of a permanent house."

### A Grand Challenge, and a Plethora of Projects

Mazereeuw is also a co-lead of one of the [five multiyear projects](#) selected in 2022 to move forward as part of MIT's Climate Grand Challenges competition. Along with Kerry Emanuel and Paul O'Gorman, of MIT's Department of Earth, Atmospheric and Planetary Sciences, Mazereeuw will help direct a project advancing climate modeling by quantifying the risk of extreme weather events for specific locations. The idea is to help vulnerable urban centers and other communities prepare for such events.

The Urban Risk Lab has many other kinds of projects in its portfolio, following Mazereeuw's own interest in conceptualizing disaster preparedness broadly. In collaboration with officials in Japan, and with support from Google, lab members worked on interactive, real-time flood-mapping software, in which residents can help officials know where local flooding has reached emergency levels. The researchers also created an AI module to prioritize the information.

"Residents really have the most localized information, which you can't get from a satellite," Mazereeuw says. "They're also the ones who learn about it first, so they have a lot of information that emergency managers can use for their response. The program is really meant to be a conduit between the efforts of emergency managers and residents, so that information flow can go in both directions." Lab members in the past have also [mapped the porosity](#) of the MIT campus, another effort that used firsthand knowledge. Additionally, lab members are currently engaging with a university in Chile to design tsunami response strategies; developing a community mapping toolkit for resilience planning in Thailand and Vietnam; and working with Mass Audubon to design interactive furniture for children to learn about ecology. "Everything is tied together with this interest in raising awareness and engaging people," Mazereeuw says. That also describes Mazereeuw's attitude about participation in the Urban Risk Lab, a highly cross-disciplinary place with members who have gravitated to it from around MIT.

"Our lab is extremely interdisciplinary," Mazereeuw says. "We have students coming in from all over, from different parts of campus. We have computer science and engineering students coming into the lab and staying to get their graduate degrees alongside many architecture and planning students." The lab also has five full-time researchers — Aditya Barve, Larisa Ovalles, Mayank Ojha, Eakapob Huangthanapan, and Saeko Baird — who lead their own projects and research groups.

What those lab members have in common is a willingness to think proactively about reducing disaster impacts. Being prepared for those events itself requires preparation.

Even in the design world, Mazereeuw says, "People are reactive. Because something has happened, that's when they go in to help. But I think we can have a larger impact by anticipating and designing for these issues beforehand."

[Peter Dizikes](#) is the social sciences, business, and humanities writer at the MIT News Office.



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