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Cost to Clean Nuclear-Contaminated Sites Up Nearly $1 Billion, Report Says

Source: https://www.voanews.com/a/cost-to-clean-nuclear-contaminated-sites-up-nearly-1-billion-report-says-/7315514.html

Coldwater Creek flows in Missouri, April 7, 2023. A new report released on Oct. 17, 2023, by the Government Accountability Office says that cleaning up 19 sites contaminated by Cold War era nuclear waste has risen $1 billion since a 2016 estimate.

Oct 17 – The estimated future cost to clean up 19 sites contaminated by nuclear waste from the Cold War era has risen by nearly $1 billion in the past seven years, according to a report released Tuesday by the U.S. Government Accountability Office.

The GAO report urges the Army Corps of Engineers to improve management practices for cleaning up contaminated sites under the Formerly Utilized Sites Remedial Action Program, or FUSRAP. The recommendations include improved planning so resources can be better shared among sites and developing more comprehensive cost estimates.

Officials say inflation is partly to blame for the cost increase, along with uncertainties about the cleanup. The report found that four sites with "complicated cleanup remedies or large amounts of contamination" are responsible for about three-fourths of the cost increase.

Two of those sites are in New York state — one near Niagara Falls and one in Lockport. The others are in Armstrong County, Pennsylvania, and in the St. Louis area.

All told, the 19 FUSRAP sites are in eight states, all in the East or Midwest.

'Committed to cleaning up'

The Department of Defense said they would work to implement the GAO's recommendations, the report stated.

"The U.S. Army Corps of Engineers remains committed to cleaning up and completing projects being executed under the Formerly Utilized Sites Remedial Action Program (FUSRAP) to protect the health and well-being of communities and the environment," a statement from the agency said. "We have received the Government Accountability Office's report and we are currently working to address their recommendations."

U.S. Representative Jamie Raskin of Maryland, a member of the House Committee on Oversight and Accountability, noted that more than two-fifths of the sites are near low-income and minority communities.

"Decades after the federal government generated large amounts of toxic nuclear waste as a result of nuclear weapons production, America's most underserved communities still bear the brunt of deadly contamination from one of the most significant environmental disasters in our nation's history," Raskin said in a statement. The Corps of Engineers reported about $2.6 billion in future costs associated with

FUSRAP, according to its fiscal year 2022 financial statement — nearly $1 billion higher than 2016 estimates. The report said yearly inflation adjustments contributed to about half of the increased cost.

Corps officials said that the rest "stems from cleanup-related uncertainties, such as sites that did not have a complete estimate in 2016 because they were still under investigation, as well as sites where the understanding of the amount and accessibility of the contamination has changed over time," the report stated.

The report noted that FUSRAP sites vary from roughly a single acre to a site made up of 2,400 acres (971 hectares).

Fighting for compensation

Contamination largely consists of low levels of uranium, thorium, radium and associated decay products. The CDC's Agency for Toxic Substances and Disease says exposure over a long period may result in anemia, cataracts and other health conditions.

But in the St. Louis area, activists have long fought for compensation for people with cancer and other serious illnesses that might be connected to nuclear contamination. Uranium was processed in St. Louis starting at the onset of World War II as America raced to develop nuclear bombs, and the waste has contaminated a creek, a landfill and other properties.

In July, reporting as part of an ongoing collaboration between *The Missouri Independent*, the nonprofit newsroom MuckRock, and The Associated Press cited thousands of pages of documents indicating decades of nonchalance and indifference about the risks posed by uranium contamination.

The government documents were obtained by outside researchers through the Freedom of Information Act and shared with the news organizations. Since the news reports, bipartisan support has emerged to compensate those in St. Louis and elsewhere whose illnesses might be tied to nuclear fallout and contamination. President Joe Biden said in August that he was "prepared to help in terms of making sure that those folks are taken care of."

This summer in Missouri, Republican Senator Josh Hawley introduced legislation to expand an existing compensation program for exposure victims. The Senate has endorsed the plan.

In the St. Louis region, the GAO report said the cost of cleaning up contaminated Coldwater Creek had increased by 130% — to more than $400 million — as the scope of the work expanded to address contamination not just in the creek itself, but in its floodplain as well.

US May Have Given Russia Green Light to Test Nuclear Weapons

Source: https://www.newsweek.com/nuclear-weapons-test-nevada-russia-green-light-1836394

Oct 20 – The United States conducted a high-explosive subsurface chemical explosion at a nuclear test site in southern Nevada this week, a move that could prompt Russia to test its own nuclear weapons.

Washington conducted the underground test on Wednesday to improve its ability to "detect low-yield nuclear explosions around the world," the U.S. Department of Energy, which maintains the country's inventory of more than 5,000 nuclear weapons, said in a press release.

The test, which was conducted in a tunnel of the Nevada National Security Site (NNSS), used chemicals, high-explosives and radiotracers to "validate new predictive explosion models," the department said.

The tests were conducted hours after members of the State Duma, Russia's lower house of parliament, voted to withdraw ratification of the Comprehensive Nuclear Test Ban Treaty, which prohibits "any nuclear weapon test explosion or any other nuclear explosion" anywhere in the world.

"These experiments advance our efforts to develop new technology in support of U.S. nuclear nonproliferation goals," Corey Hinderstein, NNSA's Deputy Administrator for Defense Nuclear Nonproliferation, said in a statement. "They will help reduce global nuclear threats by improving the detection of underground nuclear explosive tests."

The Comprehensive Nuclear Test Ban Treaty was adopted in 1996 by the United Nations General Assembly. The document was ratified by Russia but not by the United States and China.

Arms control experts have said that Moscow's withdrawal from the treaty shows that Russia, which possesses the world's largest nuclear arsenal, is ready to resume nuclear testing, but Moscow has maintained that it would not resume nuclear weapons testing unless Washington does so first.

The Kremlin has not commented on the U.S. test. *Newsweek* reached out to Russia's Foreign Ministry and the NNSA via email for comment.

Russian President Vladimir Putin first announced on October 5 that Russia may abandon the nuclear test ban treaty.

On Tuesday, Duma Speaker Vyacheslav Volodin said on his Telegram channel that Moscow was withdrawing from the treaty because of the "irresponsible attitude" of the U.S. to global security.

Monitoring nuclear weapons stockpiles with radio waves

Source: https://www.eurekalert.org/news-releases/1006280

Oct 30 – An international research team has proposed a new method for monitoring nuclear disarmament treaties. The IT security experts developed a mechanism that uses radio waves to remotely monitor whether any changes are being made in a specific room. The researchers describe how robust and secure the approach is in the journal *Nature Communications*, published online on 17 October 2023. Teams from the Max Planck Institute for Security and Privacy (MPI-SP) in Bochum, Ruhr University Bochum, the School of Public and International Affairs at Princeton University, the University of Connecticut, Harvard University, PHYSEC GmbH, and Technische Universität Berlin collaborated on the development.

The researchers approached their project from a scenario in which State A wants to ensure that there are no changes in State B's nuclear weapons stockpile – and to do so without permanent on-site monitoring. Specifically, a major threat is indicated by the removal of stored nuclear warheads to prepare them for deployment. "Our system uses two antennas to record a radio fingerprint of the room," explains Dr. Johannes Tobisch, who earned his PhD on this research field in the CASA Cluster of Excellence at Ruhr University Bochum and MPI-SP and has since moved on to work in industry. One of the antennas emits a radio signal that is reflected off the walls and objects in the room. The other antenna records the signal. The recorded signal is characteristic: if the objects were moved only minimally, this would noticeably change the radio fingerprint. Major changes, such as the removal of a stored nuclear warhead, can thus be reliably detected.

Mirrors to guarantee security

However, this method can only work if state B measures the radio fingerprint at precisely the time when state A requests it. It's therefore necessary to prevent State B from recording the radio fingerprint and sending the recording instead of a just-measured signal. "That would be like someone sticking a photo in front of a surveillance camera," illustrates Johannes Tobisch.

In this container, the researchers tested how robust and how reproducible the radio fingerprint is. The technology detects movements of the blue barrel.

For this reason, a setup with 20 rotating mirrors is initially installed in the room that is to be monitored. If the position of the mirrors changes, the radio fingerprint also changes. State A would record the radio fingerprints for different mirror positions during a one-time on-site visit and store them in a secret database. Periodically, State A could remotely request State B to send the radio fingerprint for a particular mirror position – and compare the measured data with the record in their secret database. If the data don't match, there must have been a change in the room.

"Seventy percent of the world nuclear weapons are kept in storage for military reserve or awaiting dismantlement," outlines Dr. Sebastien Philippe from Princeton University the importance of such a technique. "The presence and number of such weapons at any given site cannot be verified easily via satellite imagery or other means that are unable to see into the storage vaults. Because of the difficulties to monitor them, these 9,000 nuclear weapons are not accounted for under existing nuclear arms control agreements. This new verification technology addresses this long-standing challenge and contributes to future diplomatic efforts that would seek to limit all nuclear weapon types."

Setup in a field test

To test the idea, the researchers set up a container with movable barrels on the campus of Ruhr University Bochum, Germany, which they monitored using radio wave technology. Using this setup, they showed that radio fingerprints could be reliably reproduced for individual mirror settings. Different mirror settings also produced a variety of easily distinguishable radio fingerprints. If the researchers moved one of the barrels in the container, a few millimeters of displacement were enough to show up in the radio fingerprint.

The team also analyzed whether it's possible to decipher how mirror positions and radio fingerprints correspond to each other using machine learning. Algorithms can indeed predict radio fingerprints if they recognize a number of mirror positions and the corresponding radio signals. Finding the connection, however, takes longer the more mirrors there are in the setup. "With 20 mirrors, it would take eight weeks

for an attacker to decode the underlying mathematical function," points out Johannes Tobisch, adding: "Because of the scalability of the system, it's possible to increase the security factor even more."

"The technology combines cyber-physical security assessments, previously only possible on data and security chips, with cross-system physics in a completely new way. This enables new levels of trust, especially for the Internet of Things," says Professor Christian Zenger, head of the Secure Mobile Communication research group at Ruhr University Bochum and CEO of PHYSEC GmbH.

"This research project is an excellent example of how novel technologies at the interface between security engineering and radio technologies can be used to solve problems that are of great importance to society," says Professor Christof Paar of the Max Planck Institute in Bochum.

"At a time of heightened geopolitical tensions and with a new nuclear arms race brewing, this work is particularly timely and relevant," concludes Sébastien Philippe.

Biden's New Nuclear Bomb Compared to Bomb Dropped on Nagasaki

By Aila Slisco
Source: https://www.newsweek.com/biden-new-nuclear-bomb-compared-nagasaki-hiroshima-1840712

Nov 03 – The B61-13 nuclear gravity bomb, a new variant being developed under the administration of President Joe Biden, is far more powerful than the only two atomic bombs used in war.

The Pentagon announced last week that it was working on the B61-13, the latest in a line of nuclear weapons that were first produced in the 1960s, at the height of the Cold War.

The Biden administration says the new variant will "strengthen deterrence of adversaries and assurance of allies" by giving the president "additional options against certain harder and large-area military targets."

The B61-13 is expected to have an explosive yield similar to an older variant, the B61-7, which had a yield equivalent to 360 kilotons of TNT. In comparison, the two bombs that the U.S. dropped on Japan during World War II were significantly less powerful.

The bomb dropped on Hiroshima, "Little Boy," had an explosive yield of 15 kilotons. The B61-13, assuming it has the same yield as the B61-7, is roughly 24 times more powerful. It is around 17 times more powerful than the bomb that the bomb that hit Nagasaki, "Fat Man," which had an explosive yield of 21 kilotons.
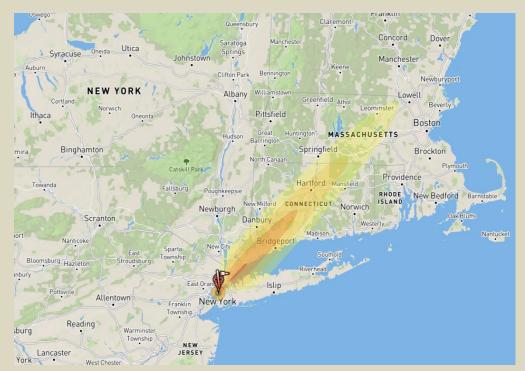
A visualization of a hypothetical B61-3 explosion over New York City—created using Nukemap, an online tool created by historian of science and nuclear technology Alex Wellerstein—shows that the new bomb, at maximum yield, would destroy a huge chunk of Manhattan and cause massive destruction miles away.

An image created by Nukemap shows the destruction of a 360-kiloton nuclear bomb on New York City. Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox./NUKEMAP/Alex Wellerstein

A fireball would vaporize people and buildings within a half-mile radius, while heavy damage would demolish buildings and likely kill everyone else within a mile. Building collapses, fires and widespread fatalities would be seen two miles out, while radiation would result in severe burns for several more miles. Additional radiation-related deaths would likely occur in the larger region.

Another visualization of the hypothetical blast shows a radioactive plume extending over New England, as far as northern Massachusetts. The simulation estimates that over 778,000 people would be killed and over 1 million injured by the bomb, demonstrating the ability of the B61-13 to wreak havoc on a densely populated area.

This image, created using Nukemap, shows a radioactive plume extending into New England from a simulated B61-13 nuclear bomb blast in New York City. Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox./ NUKEMAP/ Alex Wellerstein

The actual detonation of the Hiroshima bomb "Little Boy" resulted in an estimated death toll of 70,000 to 140,000, according to The Bulletin of the Atomic Scientists. "Fat Man," the Nagasaki bomb, despite having a higher explosive yield, killed an estimated 40,000 to 70,000 more people.

The reduced casualty count in Nagasaki is explained by the damage being mitigated to some degree by the hilly terrain of the city when compared to the relatively flat terrain of Hiroshima. Nagasaki also had a smaller population than Hiroshima.

This image, created by Nukemap, shows the World War II Nagasaki nuclear bomb "Fat Man" in a hypothetical explosion over New York City. Map data © OpenStreetMap contributors, CC-BY-SA, Imagery © Mapbox./NUKEMAP/Alex Wellerstein
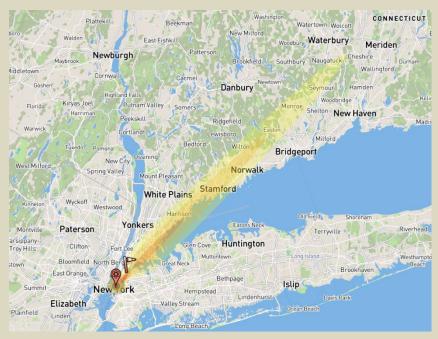
Maps of the Hiroshima and Nagasaki bombs exploding over New York were created to more accurately compare the power of the blasts to the B61-13, showing that they would also cause mass destruction, albeit at a smaller scale.

Visualizations of the Nagasaki bomb exploding in New York show that about eight city blocks in Manhattan would be entirely vaporized in a fireball. Heavy to moderate damage would occur in a radius of .78 miles, while lighter damage would be seen as far as two miles out.

"Fat Man" would cause radiation burns within a radius of at least 1.2 miles, while its radioactive plum would extend to Waterbury, Connecticut, assuming wind took the fallout northeast. The estimated death toll would be over 164,000 with over 300,000 injuries.

A visualization created by Nukemap shows the radioactive plume of a hypothetical nuclear explosion on New York City using the World War II bomb "Fat Man." MAP DATA © OPENSTREETMAP CONTRIBUTORS, CC-BY-SA, IMAGERY © MAPBOX/ NUKEMAP/ Alex Wellerstein

A map showing "Little Boy," the Hiroshima bomb, reveals that it would leave a similar trail of destruction. However, it would cause slightly less damage than "Fat Man" when hitting the same target. About seven city blocks would be vaporized, with heavy to moderate damage occurring in a radius of .7 miles.

Radiation burns from "Little Boy" would occur within a radius of 1 mile, while its radioactive plume would make it almost as far as the hypothetical plume caused by "Fat Man." The estimated death toll of the Hiroshima bomb dropping on New York would be over 133,000, with around 255,000 injuries.

This map from Nukemap shows a hypothetical explosion of the Hiroshima bomb "Little Boy" exploding over New York City. MAP DATA © OPENSTREETMAP CONTRIBUTORS, CC-BY-SA, IMAGERY © MAPBOX/ NUKEMAP/ Alex Wellerstein

While the B61-13 has the potential to cause significantly more destruction than the World War II bombs, it is far less powerful than the bomb with the largest yield in the current U.S. stockpile, the 1.2-megaton B83-1, which has been slated for retirement since last year.

The Federation of American Scientists (FAS), a group dedicated to reducing nuclear weapons, called the B61-13 "a political nuclear bomb."

In a report published just after the announcement of the bomb, the group argued that the development was likely "a political maneuver to finally get rid of the B83-1" and that "the military doesn't need an additional, more powerful gravity bomb."

Newsweek reached out for additional comment to FAS via email on Friday.

According to the Biden administration, the B61-13 will not increase the total number of nuclear weapons in the U.S. stockpile. It will instead replace some units of another newer model that is currently in production, the B61-12. At 50 kilotons, the B61-12 explosive yield is much more powerful than the World War II bombs but has a far smaller yield than its successor. The B61-12 also added the feature of a tail kit, which provides guided navigation and improves the accuracy of the weapon. The same feature is included in the B61-13.

A small victory for nuclear justice. And international cooperation

By Ivana Nikolić Hughes, and Christian Ciobanu
Source: https://thebulletin.org/2023/11/a-small-victory-for-nuclear-justice-and-international-cooperation/

A French nuclear bomb test at Mururoa Atoll, 1970. Source: Wikimedia Commons

Nov 03 – In contrast with the grandeur of the General Assembly Hall, the uplifting design of the Trusteeship Council room, and the stunning circular table in the Security Council Chamber, Conference Room 4 at the UN Headquarters is modest and unassuming. And yet, magic can happen there. When the heads of state are long gone and even the ministers have departed New York, diplomats push forward agendas to advance international cooperation on any number of international issues. They give statements, engage in debates publicly and privately, and vote for resolutions and more, often late into the night.

A kind of diplomatic magic took place last Friday night. Voting on a series of resolutions in what is referred to as the "nuclear weapons cluster" of the United Nations General Assembly's First Committee (which deals with disarmament and international security), diplomats considered for the first time a resolution entitled: "Addressing the Legacy of Nuclear Weapons: Providing Victim Assistance and Environmental Remediation to Member States Affected by the Use or Testing of Nuclear Weapons." The first such victims came into being when the United States conducted its first nuclear weapons test in New Mexico and then used nuclear weapons in attacks on Hiroshima and Nagasaki in the summer of 1945.

But nuclear explosions continued over the decades and around the world, in the form of nuclear weapon tests. The victim counts are easily in the millions.

Two of the countries affected by nuclear weapons testing, the Republics of Kazakhstan and Kiribati (from Soviet Union and United Kingdom/United States tests, respectively), brought the resolution forward and advocated broadly for its adoption. The result of their work became obvious when the voting began at roughly 6:30 p.m., and a sea of green checks began to fill the screens displaying the results. With 40 co-sponsors and many countries confirming in advance that they would vote in support of the resolution, the adoption was inevitable.

Still, it would be hard to overstate what a victory it was to have 171 countries vote in support of this resolution, with only four no votes and six abstentions. This was not only a triumph for those impacted by nuclear weapons use and testing but also for international cooperation. Especially at a time when UN resolutions seem to be supported on the basis of who likes whom (or perhaps even more so, who doesn't like whom), having 171 states stand for those who have been harmed by nuclear weapons and whose environments may still be contaminated is welcome and long overdue.

In an unlikely alliance under most other circumstances, the Democratic People's Republic of Korea (that is, North Korea), France, Russia, and the United Kingdom all voted no. Their stance is shameful, given the context of nuclear colonialism embodied by the French nuclear testing program in Algeria and French Polynesia and the United Kingdom's testing in Australia and Kiribati. Better than voting no, the other nuclear weapon possessors—China, India, Israel, Pakistan, and the United States—all abstained. (So did the Democratic Republic of the Congo, a non-nuclear weapons country that supports the nuclear ban treaty.) It was encouraging to see that the United States abstained rather than voting no alongside France and the United Kingdom.

None of the nine countries that possess nuclear weapons voted in favor of the resolution, leaving them isolated. Since they caused the harm and the contamination that are the topic of the resolution, voting yes on this resolution at the earliest opportunity could become the first step towards redeeming themselves and righting these historical wrongs. When the resolution comes up for a vote in December in the General Assembly, they should all reverse their votes and vote yes. They owe it to the victims and their descendants.

Upon adoption in the General Assembly in December, this resolution will pave the way for the long and hard process of information gathering and needs appraisal in affected states, followed by actual steps to assist victims and assess and remediate contaminated environments. Such work has already begun within the context of the Treaty on the Prohibiton of Nuclear Weapons (TPNW), but bringing these conversations into the broader sphere is critical. Future versions of the resolution can build in further binding steps.

The world cannot afford to create more victims of nuclear weapons or to contaminate more environments. In fact, indications are that all of humanity and life on the planet would become a victim in case of nuclear war using today's arsenals. Therefore, while they're deciding to come around and help victims of past nuclear weapons use and testing, the nuclear weapons countries should also recommit to nuclear disarmament in a verifiable and time-bound manner. There are lots of options for them to do so—through numerous resolutions that were also voted upon on Friday, but also through joining and/or meeting their existing obligations under key treaties, including the Nuclear Non-Proliferation Treaty, the Comprehensive Test Ban Treaty, and the TPNW. Helping existing victims is but one step. Getting rid of nuclear weapons is the only way to ensure there will be no more.

Ivana Nikolić Hughes is president of the Nuclear Age Peace Foundation and a Senior Lecturer in Chemistry at Columbia University. She is a member of the Scientific Advisory Group to the Treaty on the Prohibition of Nuclear Weapons. She holds a B.S. with Honors from Caltech and a Ph.D. from Stanford University, both in chemical engineering. Her work on ascertaining the radiological conditions in the Marshall Islands has been covered widely, including by the *Los Angeles Times*. Her writing has appeared in the *Bulletin of Atomic Scientists*, *The Hill*, *Scientific American*, *The Diplomat*, Truthout, Common Dreams, Transcend Media Service, and elsewhere. **Christian Ciobanu** is the Policy and Advocacy Coordinator of the Nuclear Age Peace Foundation and the TPNW Advisor to the Permanent Mission to the UN of the Republic of Kiribati.

Humanetics to Develop First FDA Approved Drug to Prevent Radiation Injury

Source: https://globalbiodefense.com/2023/09/06/humanetics-corporation-awarded-contract-from-department-of-defense-to-develop-first-fda-approved-drug-to-prevent-radiation/

Sep 06 – A 5-year Department of Defense contract has been awarded to Humantics Corporation to develop its drug, BIO 300, as a medical countermeasure for acute exposure to radiation.

The contract includes a base period of $20 million for activities required to gain U.S. Food and Drug Administration (FDA) Emergency Use Authorization for the use of BIO 300 under a potential military emergency. In addition, the agreement provides options for the DOD to fund all activities required to bring BIO 300 to full FDA approval.

Exposure to radiation from accidental or intentional sources can lead to acute radiation syndrome (ARS), which consists of numerous serious and life-threatening injuries. Currently, there are no FDA-approved drugs that can prevent ARS when administered prior to radiation exposure. The only available options are for treatment of the hematopoietic syndrome of ARS with certain therapeutics, all of which must be administered as soon as possible after exposure by subcutaneous injection. A significant limitation of these drugs is the requirement for special cold storage, which makes their use challenging in austere military settings.

"We are tremendously honored to collaborate with the DOD to provide this important capability. Given the current geopolitical climate, the need for prophylactic prevention of acute radiation injury is more urgent than ever for our military, first responders, and at-risk civilian populations around the globe." – *Ronald J. Zenk, Chief Executive Officer at Humanetics*

This congressionally funded agreement will be executed by the Joint Program Executive Office for Chemical, Biological, Radiological, and Nuclear Defense's (JPEO-CBRND) Joint Project Manager for Chemical, Biological, Radiological, and Nuclear Medical (JPM CBRN Medical). The JPEO-CBRND will manage the OTA agreement, overseeing the development of BIO 300, exclusively licensed to Humanetics

for advanced development and FDA licensing. BIO 300 is also in clinical development for oncology applications to protect cancer patients from unintentional side effects caused by radiation therapy.

"It is exciting to take something that showed promise with its initial research, and then license it to a third party such as Humanetics, who is equally excited to work toward FDA approval of this potential new tool as a radioprotectant. We look forward to collaborating with Humanetics on this effort." – *COL Matthew Clark, Joint Project Manager for CBRN Medical*

Humanetics recently completed a phase 1b/2a clinical trial in lung cancer patients (NCT02567799). In addition, a phase 2b trial is currently in progress evaluating BIO 300 to protect lung tissues against the long-term effects of COVID-19 (NCT04482595).

Fallout From Catastrophic Ukraine Depleted Uranium Explosion Reached England

Source: https://sputnikglobe.com/20231110/fallout-from-catastrophic-ukraine-depleted-uranium-explosion-reached-england-1114872089.html

Nov 10 – In May 2023, a powerful blast rocked the city of Khmelnitsky located in Ukraine about 200km away from the border with Poland when a Russian strike wiped out a Ukrainian ammunition depot where British-supplied depleted uranium was stored.

Dr. Christopher Busby, a physical chemist and scientific secretary of the European Committee on Radiation Risk, has stepped forward to address the naysayers who tried to discredit his warnings about the potentially dangerous consequences of the depleted uranium munitions depot explosion.

An increase in the number of uranium particles in the air following the explosion of a uranium munitions depot in Ukraine earlier this year has been detected as far away as southeast England, Dr Christopher Busby, a physical chemist and scientific secretary of Ukraine, said.

On May 19th I wrote an article for Sputnik about the Khmelnitsky explosion. I had examined gamma radiation data from detectors to the North West of the attack site, which showed increases in radiation from points in Poland near the Ukraine

border, and through Germany. I concluded that the belief that a warehouse containing Uranium weapons supplied by the UK had been hit and that the Uranium had exploded in a huge fireball, and that the particles produced by the explosion had drifted with the wind at the time across Europe.

The article produced considerable argument on the internet, with a large number of self-described fact-checkers and "experts" weighing it to say that my conclusions were nonsense. This is how the internet is controlled these days. It was written off as a "Russian Fake" (e.g., fakenews.pl)

The fact is, that although Uranium is a weak gamma emitter, through its daughter Thorium-234, there are other situations where the gamma signal will increase at detectors, principally the natural radioactive gas, radon, which can increase during rainfall and low pressure systems. A Polish lab claimed that the increased signal was from Radon, reporting the presence of the Radon daughter Bismuth 214, as if to write off the claim of a Uranium cloud passing across Poland. But I pointed out that there were no low pressure systems at the time that would explain the sudden increase in gamma. This is where the matter was left.

NATO's Uranium Rounds are 'Perfect Storm' of Toxic Pollution in 'Breadbasket' Ukraine

8 September, 13:02 GMT

Uranium in air is not measured in Europe as far as I know, and the only data that is obtainable is the Uranium in air data from the High Volume Air Samplers (HVAS) at the Atomic Weapons Establishment (AWE) at Aldermaston in Berkshire. These were set up in the early 1990s following a public enquiry into a child leukemia cluster near the site. The law requires AWE to measure Uranium (and Plutonium and Tritium) at regular intervals at positions near the factory but also far from the weapons factory. I have used these data before to identify Depleted Uranium from the Iraq wars that drifted to England.

So, to follow up the Khmelnitsky argument, I have just obtained Uranium data from the AWE using a Freedom of Information request. They sent me the data in an Excel File, and I used the graphical function if Excel to plot the data they sent. Fig 1 plots the filter levels for three of the offsite locations. The results show that I was right. In the May15th -June 15th Offsite Filters operating at the time, there is a very clear signal for the month following the explosion. I have also obtained data for the onsite locations, and these also all show the same footprint increase.

It may interest those who believe that the media is controlled, that the same thing happens with the scientific peer-review literature. I sent my paper on the increases in Uranium in air from the Ukraine war to two journals which have published my papers before, papers about the effects of Uranium. The first, *International Journal of Environmental Research and Public Health* totally refused to consider it. I then sent it to Conflict and Health, which sent it to a reviewer, but refused to publish it. This is astonishing, given that I supplied the raw data to both journals. I put the paper up on a preprints site where it received attention.

US Depleted Uranium Shells Will Poison Ukraine, Won't Change Conflict's Outcome

4 September, 15:47 GMT

The graph in Fig 1 shows that the Uranium in air in South East England went up by about 600ng/cubic metre from particles released by the Khmelnitsky explosion. What does this mean? The mean size of a Uranium particle is below 1 micron. An individual inhales about 24 cubic metre a day. So, if the particles were there for a month, or 30 days we can average the lung intake as 0.432mg. Doesn't sound much, does it? But it converts into 200 million particles per person in the area, and of course in the track of the plume in the UK. Not good, given the effects we found in Fallujah.

My study of Fallujah, published in 2010, showed that there was a huge increase in cancer and congenital malformation in babies, and general horrifying signal of genetic damage in the population after the use of Uranium weapons there in the second 2003 Iraq war. We later identified excess Uranium in the mothers of the birth defect children using hair samples and mass spectrometry, tracking the increases back to the 2003 exposures by cutting the long hair samples into sections, a kind of historic ice core way of interrogating the past.

Clearly from our studies in Iraq, the genetic and cancer health effects of Uranium particles are significant. Indeed, they are arguably the main cause of the cancer in the Hiroshima victims who were exposed to Uranium particles in the "black rain".

Israel willing to use nuclear bombs whenever is in danger: security and nuclear policy specialist

Source: https://www.tehrantimes.com/news/491201/Israel-willing-to-use-nuclear-bombs-whenever-is-in-danger-security

Nov 11 – A Middle East security and nuclear policy specialist at Princeton University says countries in the Middle East region should realize that Israel is willing to nuclear weapons whenever it feels it "is in danger".

"All countries in the region should know that Israel would use nuclear bomb whenever is in danger," Seyed Hossein Mousavian tells the Tehran Times in an exclusive interview.

Following is the text of the interview:

Question: Amihai Eliyahu, an Israeli far-right minister, has said that "one of Israel's options in the war in Gaza is to drop a nuclear bomb on the Strip." What does this dangerous threat indicate?

Answer: This statement means that:

1) Israel admitted that it had nuclear weapons – something the country has never admitted and 2) Israel is also willing to use them.

Q: The statement by Eliyahu was a bombshell that may prompt other countries in the region to go after atomic bombs. In that situation, a nuclear arms race would begin in the region. To prevent such a possibly dangerous situation, what strategies are needed to be taken?

A: Multiple actions needed.

1)The issue of the Israeli nuclear bomb should become the top agenda of the International Atomic Energy Agency (IAEA).
2) Non-nuclear weapon states signatory to the Nonproliferation Treaty (NPT) should push the UN Security Council and the IAEA to take immediate and uninterrupted action to disarm Israel.
3) The Organization of Islamic Cooperation (OIC) will hold an extraordinary Islamic summit in Saudi Arabia this week. While the priority should be the disastrous situation in Gaza, however, the 2nd agenda should be about dismantling the Israeli nuclear bomb. Moreover, OIC should demand the UN General Assembly to re-establish the "UN Special Committee Against Apartheid", which was dissolved with the end of apartheid in South Africa. The world must put an end to Israeli Apartheid.
Q: Why are most of the countries in the West silent about Eliyahu's incendiary remarks?
A: France helped Israel to master nuclear bomb about 60 years ago. Since then, the Western countries have practically supported Israeli nuclear bomb's exclusivity in the Middle East. This is a hidden Western agenda to help Israel to achieve superiority in the region and to undermine the role of Muslim countries.
Q: Some analysts claim that Eliyahu's threat was in coordination with top officials in Israel and that the criticism against him or his suspension was not authentic. What do you think?
A: Coordinated or not, the fact is that the Israeli nuclear bomb is the most important proliferation threat to the Middle East and beyond.
Q: Given such an open threat of using nuclear weapons, what is the importance of a nuclear arms-free zone in the Middle East?
A: Israel's invasion of Gaza has led to the widespread devastation of besieged Gaza, triggering a humanitarian catastrophe, killed more than 11,000 Palestinians in Gaza and wounded over 30,000 civilians, which majority of whom are children and women, created a nightmare of debris and mounting disease, with electricity, water and food scarce.
With the Gaza crisis, Israel showed that it has no limit in committing war crimes. Therefore, all countries in the region should know that Israel would use nuclear bomb whenever is in danger like the US did in Hiroshima. That's why it is vital to have a very serious collective measures to disarm Israel. Following a proposal initiated by Iran, the United Nations General Assembly (UNGA) first endorsed calls for the establishment of a NWFZ in a resolution approved in December of 1974. As part of a package of decisions that resulted in the indefinite extension of the nuclear Nonproliferation Treaty (NPT), the 1995 NPT Review Conference called for "the establishment of an effectively verifiable Middle East zone free of weapons of mass destruction, nuclear, chemical and biological, and their delivery systems." It is time to realize both UN decisions. In my book: "A Middle East Free of Weapons of Mass Destruction: A New Approach to Nonproliferation", published 2 years ago, I have explained why the matter has remained unresolved, and have outlined a comprehensive yet achievable roadmap to a Middle East free of WMD. Weapons of mass destruction pose an existential threat to global peace and security. But nowhere is it more urgent to stem their spread than in the Middle East, since Israel possesses nuclear bombs and the region is fraught with mistrust and instability and multiple crises. In this
book I have presented a practical and innovative strategy to a Middle East free of weapons of mass destruction (WMD). The book, co-authored by Emad Kiyaei, has outlined a phased approach toward disarmament in the region, prescribing confidence-building measures and verification tools to create trust among the region's governments.
Our vision also sees the realization of a WMD-free zone within a broader regional agenda for security and cooperation to advance socioeconomic and political progress.

> **EDITOR'S COMMENT:** You do not have to be a security and nuclear policy expert to say this. Besides this is the reason that a nation might have nuclear weapons; not to show them off! The use of nukes is not limited to Gaza. Since Israel is the only country in the area with a sufficient number of nuclear weapons there are a few other targets of interest that might suffer a nuclear winter.

Nuclear weapons sharing, 2023
By Hans M. Kristensen, Matt Korda, Eliana Johns, and Mackenzie Knight
Source: https://thebulletin.org/premium/2023-11/nuclear-weapons-sharing-2023/

Nov 08 – Collectively, the world's estimated 12,512 nuclear warheads belong to just nine countries. However, there are more than two dozen additional countries that participate in nuclear mission-related arrangements. While these countries do not have direct launch authority over any nuclear warheads, they play an important role in their storage, planning, delivery, and safety and use-control, and therefore merit a degree of scrutiny alongside their nuclear-armed peers.

Nuclear sharing: what it is and is not
A common misconception surrounding nuclear sharing is that it refers to one country simply handing its nuclear weapons or launch authority to another country. While there have been specific instances during
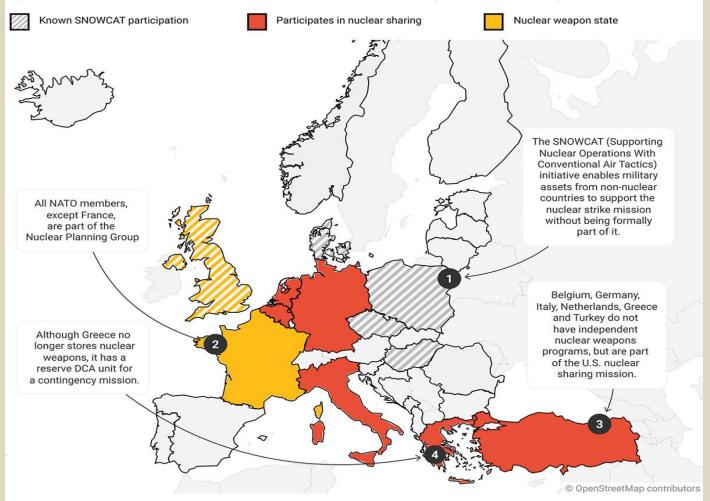
the Cold War when the United States' allies maintained a relatively high degree of control over the nuclear weapons stationed on their soil, this is no longer the case in peacetime.

Nuclear sharing, not to be confused with burden sharing, generally refers to the practice of allowing non-nuclear countries to operate specially configured launchers to employ a nuclear-armed state's nuclear weapons in time of war. The nuclear sharing mission is a subset of a much broader range of nuclear-related activities that can take several forms (see also Figure 1):

- Maintain nuclear forces to provide nuclear protection for non-nuclear countries;
- Permanently hosting another country's nuclear weapons or delivery systems;
- Providing delivery systems to be capable of employing another country's nuclear weapons;
- Providing conventional capabilities to support another country's nuclear strike mission; or
- Cooperating with another country on nuclear planning and targeting.

NATO Nuclear Arrangements

NATO countries participate in various nuclear-related arrangements. Three countries own nuclear weapons - the United States, the United Kingdom, and France. All NATO members except France participate in the Nuclear Planning Group, and a smaller number of members provide conventional support via SNOWCAT. Some European NATO member states provide dual-capable aircraft to deliver US nuclear bombs – five of these states additionally host US nuclear weapons.

Canada and the United States, though not depicted, are also members of the Nuclear Planning Group

Map: Hans Kristensen, Matt Korda, Eliana Johns, Mackenzie Knight, and Kate Kohn • Source: Federation of American Scientists • Created with Datawrapper

Figure 1. Nuclear weapons in NATO. (Map: Kate Kohn, Source: Federation of American Scientists. Created with Datawrapper).

In recent years, nuclear sharing arrangements have reentered the international spotlight. The United States is modernizing the infrastructure that supports its nuclear sharing mission in Europe and is preparing to deploy its new B61-12 gravity bombs to European air bases for delivery by US and allied aircraft. Meanwhile, following its invasion of Ukraine in 2022, Russia says it is transferring nuclear-capable

delivery systems to Belarus, training Belarusian military personnel on how to use them, and claiming to have deployed Russian nuclear weapons on Belarusian territory.

Participation in nuclear-related arrangements will increase in the coming years, as new NATO members Sweden and Finland join the Alliance's Nuclear Planning Group and potentially decide to participate in NATO's annual nuclear strike exercise, and countries like Poland and South Korea have advocated a role in the United States' nuclear mission as well.

US-NATO nuclear sharing

The governance of US nuclear weapons deployments in Europe is administered through distinct types of parallel agreements with the host or "user nation:"

- An Atomic Cooperation Agreement governs the bilateral exchange of atomic information. An example of this type of agreement is the 1958 US-UK Mutual Defense Agreement, which allows the United States and United Kingdom to exchange nuclear materials, technology, and information.
- An Atomic Stockpile Agreement is an agreement between the United States and a "user nation" governing the introduction, storage, custody, security, safety, and release of US nuclear weapons. Examples of this type of agreement include the bilateral agreements between the United States and its NATO allies that currently host US nuclear weapons.
- A Service-Level Agreement is a technical agreement between the military services of the United States and the "user nation." They serve to provide detailed instructions and processes for implementing the Atomic Stockpile Agreements. While the details of these agreements are highly classified, some of their codenames are known: Pine Cone for Belgium, Toolchest for Germany, Stone Ax for Italy, and Toy Chest for the Netherlands (Kristensen 2005).

In addition to the actual storage and maintenance of nuclear weapons, seven NATO member states (NATO 2022b)—Belgium, Germany, Italy, the Netherlands, the United States, as well as Turkey and Greece (in a reserve and contingency role) (Kristensen 2022b)—contribute "Dual-Capable Aircraft" (DCA) to NATO's nuclear mission. These aircraft could be used to deliver nuclear weapons in a conflict.

Five NATO countries currently host a total of six bases that store US nuclear bombs in underground storage vaults. Several other bases have empty storage vaults in inactive status. One of these (RAF Lakenheath in England) is being renovated to potentially store nuclear bombs in the future, if NATO decides to do so (Korda and Kristensen 2023).

Six additional NATO members—the Czech Republic, Denmark, Hungary, Poland, and two unknown countries—play a supporting role in NATO's nuclear posture through the "SNOWCAT" mission ("Support of Nuclear Operations With Conventional Air Tactics"), alongside the DCA-contributing countries.

All NATO member states—with the notable exception of France, which also has nuclear weapons of its own—participate in NATO's Nuclear Planning Group (NPG), which governs collective policy- and decision-making over NATO's nuclear mission.

Nuclear sharing during the Cold War

In July 1953, the United States committed theater nuclear weapons to NATO, with the first warheads arriving in Europe in September 1954 (Alberque 2017, 13; Burr 2020a). Following the integration of nuclear weapons into NATO strategy via the approval of Military Committee 48 (MC 48), the Eisenhower administration conducted courses and trainings for NATO senior officers on the use of atomic weapons and began considering nuclear stockpile agreements (Burr 2020a).

Concerns over the Soviet launch of the Sputnik satellite in October 1957 brought urgency to the discussions on nuclear sharing within NATO, leading to a US Joint Chiefs of Staff (JCS) proposal for NATO nuclear stockpile arrangements in December 1957 (Alberque 2017, 13–14). Under the agreement, the United States would maintain control and custody of the weapons, and the president possessed sole authority for their launch. However, the president could delegate authority to the NATO Supreme Allied Commander (SACEUR) to use the weapons in the case of war (US Congress 1961). The warheads and their delivery vehicles had to remain separate and unarmed until the United States released the warheads for launch and, once released, the weapons would be under NATO control (Alberque 2017, 14). The North Atlantic Council (NAC) agreed to the JCS proposal, which became NATO's first formal nuclear arrangement (NATO 1957).

US nuclear weapons deployed to Europe were kept under US custody and control and would only be released to the user nation in a nuclear crisis. The United States maintained at least one US "custodian" who was present at all times with the weapons and classified material, during their transport, and when loaded on aircraft or mated with delivery vehicles. Despite US custodianship, security of the nuclear weapons was the responsibility of the user nation (US Congress 1961).

In 1960, a Joint Congressional Committee on Atomic Energy investigation found that, in many cases, the aforementioned control procedures existed more in theory than in practice. In some cases, allies possessed the ability to launch the weapons on their own, particularly the weapons on Quick Reaction Alert aircraft. The committee additionally found that the JCS and Defense Department had entered into nuclear cooperation or stockpile agreements with allies outside of the recognized legal avenues without notifying Congress (Office of the Assistant to the Secretary of Defense (Atomic Energy) 1978, 74).

The committee's findings prompted President Kennedy to temporarily halt deployment of nuclear weapons to NATO allies until the security of those weapons was improved (Burr 2020b), and the recommendations led to the development of Permissive Action Links (PALs), a combination of an electronic code system and physical hardware placed on or within the weapons to prevent their unauthorized use (The White House 1962).
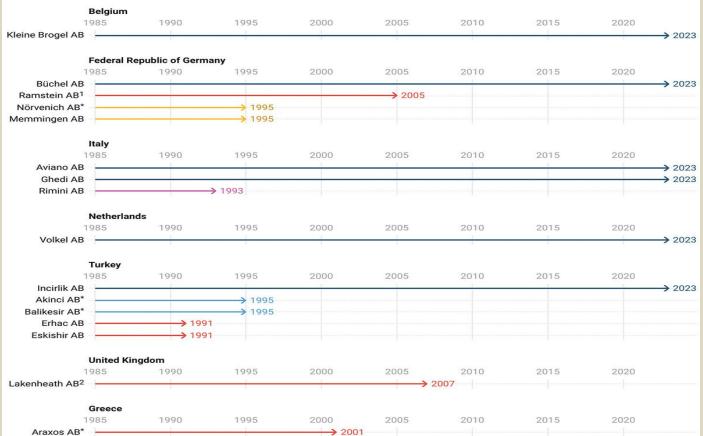
After first being introduced in 1962, American nuclear security expert Bruce Blair wrote that PALs could be easily bypassed for the next 15 years, given that it was apparently an open secret that the unlock code was set to "00000000" (Blair 2004). According to Blair, the PALs were correctly activated in 1977, and today, the most modern PALs include 6- or 12- digit electronically-coded locks, microprocessors, coded switches, and a mechanism that disables the weapon if too many incorrect attempts are made (Office of the Deputy Assistant Secretary of Defense for Nuclear Matters 2020).

At the peak in 1971, the United States deployed more than 7,000 nuclear weapons in Europe, including Belgium, Greece, Italy, the Netherlands, Turkey, the United Kingdom, and West Germany. Starting in 1991-1992, the United States withdrew all its ground-launched and naval tactical nuclear weapons from Europe, leaving 700 nuclear gravity bombs behind. The United States then consolidated many of these weapons to a smaller number of European bases; between 1985 and 1995, the number of nuclear air bases in Europe was reduced from 23 to 16 (Kristensen 1995; see also Figure 2). By 2000, there were 480 bombs left, a number that dropped to 180 around 2007.

Figure 2. US Air Force nuclear storage sites in Europe from 1985 to present (Chart: Hans Kristensen, Matt Korda, Eliana Johns, Mackenzie Knight, and Kate Kohn, Source: Federation of American Scientists. Created with Datawrapper). (Click to display full size.) – *Nuclear sharing today*
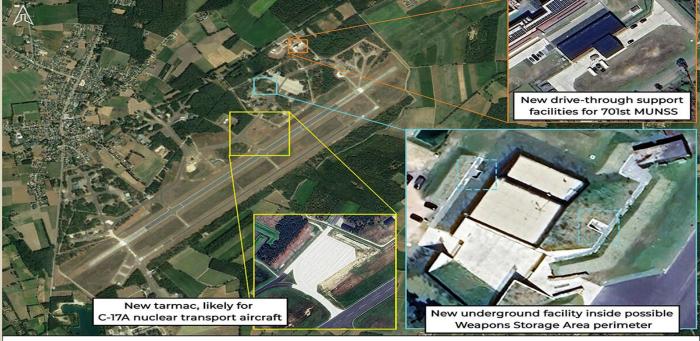
Today, approximately 100 US nuclear weapons are estimated to be stored at six bases in five countries, with one additional base (RAF Lakenheath) currently undergoing modernization to potentially store nuclear weapons in the future.

The United States is preparing to replace all legacy versions of the B61 gravity bomb deployed in Europe with the incoming B61-12, which uses a modified version of the warhead used in the current B61-4 gravity bomb. In addition to US heavy bombers, 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, the PA-200 Tornado, and the F-35A. Except for Turkey, every NATO country that hosts US nuclear weapons is purchasing the F-35A to replace their legacy aircraft. However, because of their age and logarithmic systems, these older 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, but without a parachute-retarted laydown option.

Each year, NATO practices its nuclear sharing arrangements in a two-week-long exercise known as "Steadfast Noon," hosted by a different NATO member state each year. The most recent iteration of the exercise, which was hosted by Belgium, involved 14 countries and up to 60 aircraft and practiced the employment of US nuclear weapons by NATO DCA (NATO 2022a).

—*Kleine Brogel Air Base, Belgium*

Kleine Brogel Air Base (51.1685, 5.4666) hosts an estimated 10-15 US B61 nuclear bombs for delivery by Belgian F-16MLU aircraft. A total of 11 protective aircraft shelters are equipped with a Weapons Storage and Security System (WS3) that includes an elevator-drive Weapon Storage Vault (WSV)—as well as the associated command, control, and communications software needed to unlock the weapons—that can be lowered into the concrete floor. Each WSV can hold up to four bombs, for a maximum base capacity of 44 weapons.

In recent years, certain areas within Kleine Brogel have been expanded and modernized (Figure 3). Construction has taken place within the support area for the 701st Munitions Support Squadron (MUNSS)—the US Air Force squadron responsible for the physical security and maintenance of the weapons, as well as for delivering custody of the weapons to the user country's air forces if directed to do so. This includes a new drive-through facility for nuclear weapons maintenance trucks. In addition, a large tarmac for C-17A nuclear transport aircraft has been added next to the presumed nuclear weapons area, construction of a high-security underground facility has been nearly completed, a new control tower has been added, and underground cables and the Alarm Communication & Display (AC&D) system have been upgraded, which all have been visible on satellite imagery.

Nuclear Upgrades at Kleine Brogel Air Base, Belgium
Kleine Brogel Air Base is estimated to store approximately 15 US nuclear gravity bombs.

April 2023 (51.168°, 5.467°)

New drive-through support facilities for 701st MUNSS

New underground facility inside possible Weapons Storage Area perimeter

New tarmac, likely for C-17A nuclear transport aircraft

Satellite imagery © 2023 Airbus via Google Earth

Figure 3. Nuclear upgrades as of April 2023 at Kleine Brogel Air Base, Belgium. (Credit: Airbus via Google Earth/Federation of American Scientists).

—Volkel Air Base, the Netherlands

Volkel Air Base (51.6577, 5.7016) hosts an estimated 10-15 US B61 US nuclear bombs for delivery by Dutch F-16MLU aircraft. There are 32 protective aircraft shelters at Volkel Air Base, 11 of which are equipped with WS3s for nuclear weapons storage. Each WSV can hold up to four bombs, for a maximum base capacity of 44 weapons.

Recent construction at Volkel Air Base has focused on several new additions. Most notably, over the past two years, a tarmac area with a high wall has been constructed near several aircraft shelters. This area is likely intended for use by the C-17A Globemaster III—the only transport aircraft authorized to move the US Air Force's nuclear weapons—to provide additional flexibility and facilitation for rapidly moving nuclear weapons on- and off-base (Kristensen 2023). In addition, a high-security building similar to the one being added to Kleine Brogel has been completed.

Similar security-related construction upgrades to those at other nuclear weapons bases in Europe have been visible on satellite imagery at Volkel Air Base.

—Büchel Air Base, Germany

Büchel Air Base (50.1762, 7.0640) hosts an estimated 10-15 US B61 nuclear bombs for delivery by German PA-200 Tornado aircraft. A total of 11 protective aircraft shelters at Büchel Air Base are equipped with WS3s for nuclear weapons storage. Each WSV can hold up to four bombs, for a maximum base capacity of 44 weapons.

The entire runway at Büchel Air Base has been under construction since September 2022. In the meantime, the Tactical Air Wing 33's Tornado aircraft are being hosted at Nörvenich Air Base and Spangdahlem Air Base (Sanchez-Chen 2023). There also appears to be construction taking place within the loops housing the base's protective aircraft shelters. In addition, a new walled tarmac area is being built, like the one under construction at the Kleine Brogel, Volkel, and Gherdi air bases.

Similar security-related construction upgrades to those at other nuclear weapons bases in Europe have been visible on satellite imagery at Büchel Air Base.

—Aviano Air Base, Italy

Aviano Air Base (46.0313, 12.5968) hosts an estimated 20-30 US B61 nuclear bombs for delivery by US F-16C/D aircraft. Aviano Air Base is home to the 31st Fighter Wing with its two squadrons of nuclear-capable aircraft: the 510th "Buzzards" Fighter Squadron and the 555th "Triple Nickel" Fighter Squadron.

A total of 18 underground nuclear weapons storage vaults were installed in as many protective aircraft shelters at Aviano in 1996. Of Aviano's 18 storage vaults, only 11 are estimated to be active, all of which are inside a security perimeter that was built in 2015. Each WSV can hold up to four bombs, for a maximum base capacity of 44 weapons.

A significant upgrade of the area with the active nuclear weapons shelters was completed in 2014-2015.

—Ghedi Air Base, Italy

Ghedi Air Base (45.4319, 10.2670) hosts an estimated 10-15 US B61 nuclear bombs for delivery by Italian PA-200 Tornado aircraft. There are 22 protective aircraft shelters at Ghedi Air Base, divided into two groups of 11 on the northwestern and southeastern ends of the airfield. A new double-fenced high-security perimeter was built around the northwestern shelters in 2020, suggesting that this group remains active.

Ongoing construction includes, a new tarmac and shelter area for Italy's incoming F-35A aircraft, a new drive-through support building for nuclear weapons maintenance trucks at the 704th MUNSS area, as well as a new tarmac for C-17A transport aircraft outside the nuclear weapons storage area.

—Incirlik Air Base, Turkey

Incirlik Air Base (37.0025, 35.4267) hosts an estimated 20-30 US B61 nuclear bombs for delivery by US aircraft; however, unlike at other bases, Turkey does not allow the United States to permanently base its bomber aircraft at Incirlik. As a result, US aircraft would have to fly in during a crisis to pick up the weapons, or the weapons would have to be shipped to other locations before use.

In 2015, a new security perimeter was constructed around 21 protective aircraft shelters within Incirlik Air Base, suggesting that these are currently active. Despite reports that the Pentagon has previously reviewed plans for removing US nuclear weapons from Turkey due to security concerns (Sanger 2019), the nuclear mission was heavily implied to still be in effect at Incirlik Air Base as recently as July 2023, when USAFE A10 senior leaders visited Incirlik to discuss the "surety mission" and "the role that Incirlik [Air Base] plays in strategic deterrence" (Myricks 2023). ("Surety" is a term commonly used by the Pentagon and the Department of Energy to refer to the capability to keep nuclear weapons safe, secure, and under positive control, while the A10 office is the Air Force's office for "Strategic Deterrence and Nuclear Integration.")

—Lakenheath Royal Air Force Base, United Kingdom

The United States stored nuclear weapons in the United Kingdom from 1954 until approximately 2007, when they were withdrawn from RAF Lakenheath (Kristensen 2008). Over the past two years, however, increasing evidence has suggested that the US Air Force may be upgrading RAF Lakenheath to be capable of storing nuclear bombs, if it decided to do so (Korda and Kristensen 2023).

The Air Force's fiscal year 2024 budgetary justification package, dated March 2023, notes the planned construction of a "surety dormitory" at RAF Lakenheath, approximately 100 kilometers northeast of London (US Air Force 2023). The "surety dormitory" was also briefly mentioned in the Department of Defense's testimony to Congress in March 2023, but with no accompanying explanation (Owens 2023).

This note follows the United Kingdom's addition to the Department of Defense's fiscal year 2023 budgetary documents for the NATO Security Investment Program, in which it was written that "NATO is wrapping up a thirteen-year, $384 million infrastructure investment program at storage sites in Belgium, Germany, the Netherlands, *the United Kingdom*, and Turkey to upgrade security measures, communication systems, and facilities" (Kristensen 2022a; US Department of Defense 2022, 8; emphasis added). An explicit mention of the United Kingdom had not been included in the previous year's budgetary documents (US Department of Defense 2021, 7), and it was removed in this year's documents after we reported on its inclusion the previous year (US Department of Defense 2023, 7). While it remains unclear whether the United States intends to permanently store nuclear weapons at RAF Lakenheath, the groundwork is apparently being laid for the base to receive nuclear weapons—potentially from other European bases—during a crisis.

Nuclear sharing and the Nuclear Non-Proliferation Treaty

NATO's nuclear sharing arrangements are intimately linked with the United States' and the Soviet Union's negotiations on the Nuclear Non-Proliferation Treaty (NPT) during the 1960s. Discussions on a treaty addressing nuclear proliferation began in the early 1960s and were conducted alongside discussions within NATO on "hardware" and "software" solutions (e.g. consultation, planning, training). Statements and letters between the United States and the Soviet Union were exchanged throughout 1965 and 1966 in an attempt to understand each side's position. Finally, in 1966, the Soviets clarified that they were not concerned with nuclear software arrangements in NATO, and the United States assured that it would never give up its veto over the launch of its own nuclear weapons (Alberque 2017). Articles I and II of the NPT were ultimately written jointly by the United States and the Soviet Union to satisfy NATO's existing nuclear arrangements and the Soviet Union's demand that West Germany not be given nuclear control or authority (Alberque 2017). Despite the joint agreement between the United States and the Soviet Union, over the past decade, Russia has repeatedly accused the United States and its NATO Allies of being in violation of both Articles I and II of the NPT (Uliyanov 2015).

Nuclear authorization and consultation

NATO itself has no ownership of nuclear weapons, and therefore no authority to launch them. This decision can only be made by the leaders of its nuclear-armed member states, and particularly by the United States, which retains ownership and authority over the B61 gravity bombs that are assigned to NATO DCA.

A NATO factsheet published in 2022 noted that "a nuclear mission can only be undertaken after explicit political approval is given by NATO's Nuclear Planning Group (NPG) and authorization is received from the US President and UK Prime Minister" (NATO 2022b). It is unclear, however, why the UK Prime Minister would be necessary to authorize the release of US nuclear weapons. Moreover, this degree of consultation would likely face significant challenges during an actual conflict.

Throughout the early Cold War, NATO allies continuously sought assurances from the United States that its nuclear weapons would not be used without prior consultation. For its part, the United States sought to preserve its own freedom of action, as well as its position that no president would allow a veto power over US nuclear use.

This push-and-pull dynamic eventually resulted in the 1962 Athens Guidelines, in which NATO allies acknowledged that possibilities for consultation would likely be "extremely limited" in the event of a nuclear crisis, but that the United States would work to consult with its NATO allies prior to nuclear release "if time permitted" (North Atlantic Council 1962). Channels and procedures for consultation with allies were subsequently established: A request or proposal to use nuclear weapons would be communicated to the NAC/DPC, where countries could express their views on the proposed use. However, "special weight would be given to the views of the NATO country most directly affected," meaning the country or countries providing the warheads and delivery vehicles and from whose territory the weapons would be used (Congressional Research Service 1975, 7–8).

It is difficult to imagine an actual situation wherein all NATO allies would be able to agree on nuclear use unless a NATO member had *already* been attacked with nuclear weapons. It is similarly difficult to imagine that, in the midst of a full-scale nuclear exchange, there would be time for high-level consultation. When reflecting on NATO's crisis communications infrastructure in 1989, Australian nuclear expert Des Ball once remarked: "It is difficult to envisage a decision-making process or a [Command, Control, Communications and Information] system as complex or as less capable of functioning in a timely and responsive manner than that of NATO" (Ball 1989, 306).

Russia-Belarus nuclear sharing

Shortly after its founding, the Soviet Union first deployed nuclear weapons to East Germany in 1959, and then to other Soviet republics and satellite states (Becz, Kizmus, and Várhegyi 2019, 242). In 1979, NATO
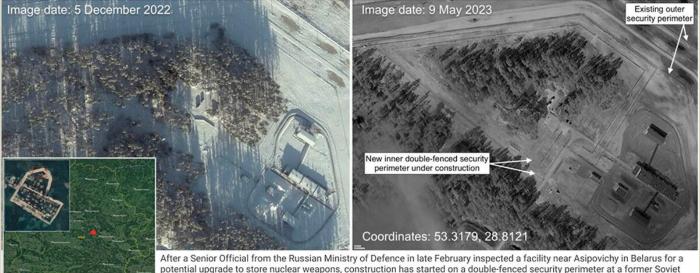
estimated that there were between 30 and 35 Soviet nuclear storage sites in Eastern Europe, at least half of which permanently housed nuclear weapons (Becz, Kizmus, and Várhegyi 2019, 12).

Following the collapse of the Soviet Union in 1991, more than 6,000 nuclear weapons were suddenly left behind on former Soviet territories: Belarus, Kazakhstan, and Ukraine in particular found themselves as owners of some of the world's largest nuclear arsenals. These three countries agreed to transfer all nuclear weapons left on their territories back to Russia and accede to the NPT as non-nuclear weapons states. The last of these nuclear weapons was transferred back to Russia in November 1996, and many of the old nuclear storage sites in these countries were mothballed, repurposed, or left abandoned (Mirovich 2019).

More than 25 years later, it appears that Russia has resumed the practice of deploying nuclear weapons abroad. In February 2022, only a few days before Russia's invasion of Ukraine, Russian President Vladimir Putin and Belarusian President Alexander Lukashenko made numerous statements about equipping Belarusian forces with the capability to employ Russian nuclear weapons, with Lukashenko stating on February 17 that he would ask Putin to set up a training center for Iskander-M ballistic missiles in Belarus (Republic of Belarus 2022). Then, on February 26, the Belarusian parliament approved a new constitution that removed a previous ban on nuclear weapons on Belarusian territory (Williams and Ljunggren 2022).

On June 25, 2022, Putin promised to "hand over a number of tactical missile systems" to Belarus, specifically noting that "they can fire ballistic and cruise missiles with conventional and nuclear warheads." He also told Lukashenko that Belarusian Su-25 aircraft "could be upgraded" to deliver Russian nuclear weapons. In that same meeting, however, Putin noted that there would be "no need" to "reciprocate" NATO's nuclear sharing posture by placing nuclear weapons in Belarus (President of Russia 2022). On December 19, 2022, Lukashenko claimed that the Russian Iskander short-range ballistic missiles were now operational and had been placed on "combat duty" in Belarus (Adamowski 2022).

In the spring of 2023, it became clear that Putin planned to reverse his position and would soon begin the process of storing nuclear weapons on Belarusian soil. In February 2023, the CIA assessed that a senior officer from the Russian Ministry of Defence inspected a facility in the vicinity of Asipovichy—near the new Iskander-M training site in Belarus—for potential upgrades. One month later, Putin publicly walked back his previous position and announced that Russia would "finish construction of a special storage facility for tactical nuclear weapons on the territory of Belarus" by July 1, 2023 (*Guardian News* 2023). Satellite imagery from around this time revealed the start of land-clearing for a new security perimeter at a former 12th GUMO unit depot east of Asipovichy (Figure 4).

Figure 4. Satellite imagery showing construction of a new security perimeter at a former 12th GUMO unit depot east of Asipovichy, Belarus. (Credit: Maxar Technologies/Federation of American Scientists). (Click to display full size.)

On March 25, 2023, Putin formally announced that Russia would deploy tactical nuclear weapons in Belarus. During his announcement, Putin pointed to the United States' deployment of tactical nuclear weapons to NATO countries as justification for establishing a Russian nuclear sharing arrangement with Belarus:

- There is nothing unusual here … firstly, the United States have been doing this for decades. They have long ago deployed their tactical nuclear weapons on the territory of their allied countries … the Americans do this with their allies, deploy on their territory, teach, by the way, their crews, their pilots to use this type of weapons if necessary. We agreed that we will do the same—without violating our obligations. (*Guardian News* 2023)

Belarusian pilots and missile crews reportedly began their training in Russia in early April 2023, and on April 14, the Belarusian Ministry of Defense published a video that appeared to show a Su-25 pilot explaining his new role in delivering "special [nuclear] munitions" following training in Russia (ASTRA 2023). The video was geolocated by the Federation of American Scientists to Lida Air Base in western Belarus (Korda, Johns, and Kristensen 2023). This two-week period constitutes an unusually fast turnaround for completing the certification process; by contrast, nuclear certification for US/NATO nuclear weapon systems can take months (Steele 2012), or even years (F-35 Joint Program 2022). The rushed training and certification process adds an additional layer of confusion to an already murky situation. Although limited perimeter construction is visible at Lida Air Base, it does not appear sufficient for nuclear weapons storage.

In May 2023, as satellite imagery suggested that the new double-fenced security perimeter at the Asipovichy depot was nearing completion (Kristensen and Korda 2023), Russia and Belarus reportedly signed documents detailing the procedures for storing Russian non-strategic nuclear weapons in a special storage facility in Belarus (*Belta* 2023c). Putin then stated in a meeting with Lukashenko in June that "on July 7–8 the preparations of the relevant facilities will be completed. We will immediately begin activities related to the deployment of the weapons in question on your territory" (TASS 2023).

On June 16, 2023, Putin stated that "the first nuclear warheads have been delivered to Belarus, but only the first batch. There will be more. By the end of the summer, by the end of this year, we will complete this work" (President of Russia 2023). Lukashenko echoed Putin's remarks by saying that "the larger part [of nuclear weapons] has already been moved to Belarus" (*Belta* 2023b). Additionally, on June 27th, a group that monitors the Belarusian railway industry reported that "nuclear weapons and related equipment" would be delivered to Belarus in two batches-one in June and one in November (BELZHD 2023b)—which would match Putin's announced delivery timeline. The group reported that the shipments would involve three departures planned from Potanino, Lozhok, and Cheboksary stations in Russia, arriving at Prudok station in Belarus—more than 200 kilometers north of the Asipovichy depot. Importantly, these departure locations in Russia are hundreds of kilometers away from known nuclear storage sites, and so could be locations of some subcomponents or security equipment rather than the warheads themselves (Moon 2023), or they could potentially be a deliberate attempt to obfuscate where the warheads would be coming from.

In early September 2023, the same group that monitors the Belarusian railway industry reported that another batch of "components of Russian tactical nuclear weapons and related equipment" had been imported into Belarus between August 26 and September 5. Unlike the first reported shipment, these transports did not go through Prudok station, but rather at the Krasnoye-Osinovka transfer point near Smolensk. The final destinations for these shipments were reported as Baranovichi and Luninets, both of which have military air bases nearby (BELZHD 2023a).

There are still several unknowns regarding how Putin intends to resolve the logistical challenges associated with deploying nuclear weapons to Belarus. Russian nuclear storage sites have typically taken years, rather than months, to upgrade (Kristensen 2018), and even a temporary site would still require extensive security infrastructure. Moreover, personnel from the 12th GUMO—the department within Russia's Ministry of Defence that is responsible for maintaining and transporting Russia's nuclear arsenal—would also be deployed to Belarus to staff the storage site (regardless of whether nuclear weapons were present or not) and would need a segregated living space. Building such facilities could take many months and would be visible on satellite imagery. In addition, a storage facility cannot receive warheads until after all specialized equipment and personnel are in place. As of writing this column, these factors remain unclear and there is no conclusive evidence for us to pinpoint where Russian nuclear warheads are being stored in Belarus, if indeed they are in the country at all.

Moreover, it remains unclear what level of influence Belarus has over Russia's nuclear deployment on its soil. Lukashenko has overly stated that he has a personal "veto" over Russia's use of nuclear weapons deployed in Belarus, stating that: "If I or our people or our state does not want something—then it means it will not happen" (Faulconbridge 2023). In addition, in June 2023, Lukashenko said that: "These are our weapons and we will use them [when it is necessary]" (*Belta* 2023a; square brackets in original quote). Despite such belligerent statements, it is extremely unlikely that Russia would grant Belarus independent launch authority over its nuclear weapons.

Other nuclear arrangements and national views

South Korea and Japan

In recent years, disagreements over burden-sharing—coupled with increased aggressive rhetoric from North Korea and unsuccessful attempts at engagement—have raised concerns in South Korea and Japan regarding the reliability of the US extended deterrent. These concerns reignited discussions in Japan and particularly in South Korea about the potential need for a NATO-style nuclear sharing arrangement, the redeployment of US tactical nuclear weapons to the region, or even an independent nuclear weapons arsenal to address regional security concerns (*Asahi Shimbun* 2022).

In South Korea in particular, public support for nuclear weapons—whether of American or South Korean origin—has risen dramatically over the past few years. A Chicago Council on Global Affairs poll released in February 2022 suggested that 71 percent of South Korean respondents supported developing their own

nuclear weapons, while 56 percent supported the deployment of US nuclear weapons in South Korea (Dalton, Friedhoff, and Kim 2022).

To demonstrate a strengthening of the US-South Korean alliance and the United States' extended deterrence commitments, South Korean President Yoon Suk-yeol met with US President Joe Biden in April 2023. The two leaders signed an agreement known as The Washington Declaration, marking the first document issued at the presidential level exclusively focused on the United States' extended deterrence pledge to South Korea (The White House 2023). The Washington Declaration established the Nuclear Consultative Group, indicating a potentially unparalleled degree of bilateral consultation concerning US nuclear policy and strategic planning. Soon after the agreement was signed, the *USS Kentucky* SSBN arrived in Busan, South Korea, marking the first SSBN visit since 1981 and the first time US nuclear weapons entered South Korea since 1991 (Shin and Smith 2023).

Poland

In June 2023, Polish Prime Minister Mateusz Morawiecki announced Poland's intention to pursue more direct participation in NATO's nuclear sharing initiatives with the United States (Łukaszewski 2023). Poland already participates in the Nuclear Planning Group as well as SNOWCAT operations. An increased Polish role could potentially entail the storage of B61 nuclear bombs in the country, or equipping Polish aircraft with the capability to deliver US nuclear weapons, or both.

However, it remains unclear whether Poland's request will ultimately be granted. In December 2021, in response to a question about whether the United States might station nuclear weapons in Poland, NATO Secretary General Jens Stoltenberg noted that "we have no plans of stationing any nuclear weapons in any other countries than we already have" (NATO 2021). Moreover, storage of nuclear weapons in Poland would be non-compliant with the NATO-Russia Founding Act, which states that NATO has "no intention, no plan, and no reason to establish nuclear weapon storage sites on the territory of [NATO members who joined the Alliance after 1997], whether through the construction of new nuclear storage facilities or the adaptation of old nuclear storage facilities" (NATO 1997). Several analysts, however, have argued that the NATO-Russia Founding Act has been essentially a "dead letter" since Russia's March 2014 annexation of Crimea in Ukraine (Deni 2017).

During a visit to Finland in September 2023, head of NATO's Nuclear Policy Directorate Jessica Cox said that there is no need to change where the nuclear weapons are deployed and that she didn't anticipate changes to the nuclear sharing arrangements, "certainly not in the short term" (Kervinen 2023).

Sweden and Finland

In May 2022, following Russia's invasion of Ukraine, both Sweden and Finland officially applied for NATO membership. Given both countries'—particularly Sweden's—history of neutrality and prioritization on nonproliferation, the contours of how both countries will interact with NATO's nuclear arrangements remains uncertain.

In April 2023, Finland's Ministry of Defence announced that it would participate in NATO's Nuclear Planning Group and "could join support functions for NATO nuclear operations outside its own territory," suggesting a possible role in SNOWCAT (Kauranen 2023). However, in November 2022, Finland's President announced that Finland will not permit the stationing of nuclear weapons on its territory (*Yle* 2022).

Like Finland, Sweden is likely to participate in the Nuclear Planning Group, although it has not yet made any public statement about its potential role in SNOWCAT. In February 2023, Swedish Minister for Foreign Affairs Tobias Billström issued a statement asserting that: "Like Norway and Denmark in their time, Sweden is joining NATO without reservations. However, like the other Nordic countries, we do not foresee having nuclear weapons on our own territory in peacetime" (Billström 2023).

Belgium and Germany

Even within existing nuclear sharing countries there has been considerable debate about whether to continue the arrangement, although this has largely stopped after Russia's invasion of Ukraine in February 2022 and the deterioration of East-West relations.

The debate over nuclear sharing in Germany and Belgium had reached new heights between 2019 and 2021. In Belgium, a national debate culminated in a highly energetic parliamentary session and a vote on the removal of US nuclear weapons from Belgian territory (Belgian Federal Parliament 2020). The resolution was rejected in a narrow majority vote (Galindo 2020).

In Germany, as a new coalition government prepared to take power, the election platforms of two of the three coalition parties included demands to remove US nuclear weapons from German soil and for Germany to accede to the Treaty on the Prohibition of Nuclear Weapons (Stelzenmüller 2021). Ultimately, the November 2021 coalition agreement concluded that Germany would retain its nuclear host status (Siebold and Wacket 2021).

The debate raised questions about whether individual soldiers could be held liable for the use of nuclear weapons. The 2008 legal guidelines for German soldiers prohibited their participation in the use of nuclear weapons, posing complications for Germany's ongoing nuclear sharing mission (German Federal Ministry

of Defence 2008). The revised guidelines, which were updated in 2018, reportedly no longer include this prohibition (Meier 2020)—presumably in order to allow German soldiers to fully participate in NATO's nuclear sharing mission.

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Detecting Nuclear Materials Using Light

Source: https://www.homelandsecuritynewswire.com/dr20231116-detecting-nuclear-materials-using-light

Nov 16 – Blueshift Optics, owned by former Sandian Joey Carlson, is working to shift the way radioactive materials are detected, using technology that he helped create while working at Sandia.

Sandia materials scientist Patrick Feng and Carlson collaborated to develop the state of the art technology known as Organic Glass Scintillators for radiation detection. Sandia recently licensed the technology to Blueshift Optics LLC, paving the way for potential commercial production.

"It has the potential to provide us with better data from nuclear physics experiments, enhance national security applications both at home and abroad and has applications in fusion energy," Carlson said.

Patrick specifically noted the applications for border security. "Agencies are trying to cast this wide net to catch nuclear smuggling, and this is one aspect of that effort," he said. "You could use this technology at a border crossing, in a handheld detector as someone enters a facility, or fly it on a drone to map an area."

Organic Glass Scintillators emit light in the presence of radiation. It's different than other technology because it can more efficiently decipher between neutron and gamma ray radiation, allowing for faster identification of potential threats. They are also simpler and less expensive to produce. "Gammas are everywhere. We are exposed to gamma radiation right now, so if you have a neutron experiment, you need to be able to distinguish them," Carlson said. "If you have neutrons, you have something special. This applies to national security, nuclear physics and fusion energy."

The duo says that this creation advances technology that was developed in the 1950s, a technology many believed had reached its peak. "This has been a breakthrough; it remained stagnant for decades in terms of the types of materials used. This is the first time something revolutionary like this has come along," Carlson said.

Patrick likens the development process to what a cook does when de-crystallizing honey. "We developed a material that behaves like window glass; we call it organic glass. When a quartz crystal is melted and supercooled, it behaves differently. It transmits light equally in all directions and is more resistant to cracking. It's like when honey is crystalized. It's still honey but possesses different physical properties because of its molecular structure."

Carlson says when all these materials work together, you have a new way of detecting radiation.

"Ionizing radiation is challenging to detect, so the scintillator transforms energy into visible light for easier detection. These scintillators are coupled with high sensitivity photo multiplier tubes or detectors which read out the signals."

The only technology that comes close to this creation is stilbene crystals, which must be grown. They are fragile, cumbersome to produce and limited in size. "You can't grow them large enough to support their use in many cases," Patrick said. "That is the key advantage in what we've developed. The manufacturing process allows us to mix organic glass with a polymer. You can pour, mold and manufacture on a large scale if needed."

The big goal now is to commercialize it with the help of Blueshift Optics, based in Oakland, California. Carlson left the Labs through the Entrepreneurial Separation to Transfer Technology program to start the business in 2020. The team sees many potential uses, including by fusion energy companies for high-level experiments. But, as Patrick emphasizes, the most significant application could be safeguarding our country. "It has many different uses to support the same goal: finding radiological material that someone is attempting to subvert or smuggle. This is crucial in supporting Sandia's mission." The team hopes it won't be long before the technology is deployed at U.S. ports and border crossings and maybe even in the hands of the U.S. armed forces.

Our materials produce a lot more light, double compared what used to be state of the art. There are fewer false positives, and you can detect rarer events with our material. You can detect them faster or from a greater distance. These are things that matter. At a border crossing, it can take 30 minutes to scan one truck. That doesn't work. We are striving to enhance national and international security and safety; that is the mission. We need practical technology and we make the practical possible," Patrick said.

Iran Now Has Enough Enriched Uranium for "Several" Nuclear Bombs: IAEA

Source: https://www.homelandsecuritynewswire.com/dr20231116-iran-now-has-enough-enriched-uranium-for-several-nuclear-bombs-iaea

Nov 16 – The latest report by the International Atomic Energy Agency (IAEA) says Iran has increased the quantity in its possession of uranium enriched to close to weapons-grade levels.

The IAEA notes that Iran has rejected the agency's request to allow the agency's inspectors designated to monitor Iran's nuclear program to do their work.

The agency's confidential quarterly report said that as of 28 October, Iran has an estimated 128.3 kilograms (282.9 pounds) of uranium enriched up to 60 percent purity, a considerable increase of the 6.7 kilograms since its September report.

AP notes that uranium enriched to 60 percent purity is only a short, technical step away from weapons-grade levels of 90 percent.

The IAEA report assesses that as of 28 October, Iran's stockpile of enriched uranium at various levels of purity was at 4,486.8 kilograms, an increase of 691.3 kilograms over the size of the stockpile noted in the September 2023 report.

In 2015, the world powers reached an agreement with Iran which removed large quantities of enriched uranium from Iran; severely restricted Iran's ability to enrich uranium by limiting the number of centrifuges Iran could operate; placed stringent limits - 3.67 percent — on the level of enrichment; limited the stockpile of low-enriched uranium to 300 kilograms; and subjected Iran to the most intrusive inspections of any country in the nuclear age.

In 2018, then-President Donald Trump unilaterally pulled the United States out of the accord without replacing it with any alternative mechanism to constrain Iran's nuclear weapons-related activities.

Trump's move allowed Iran to relaunch its nuclear weapons-related activities.

The Biden administration has said it would be willing to negotiate another nuclear deal with Iran, but talks between Iran and the United States reached a impasse in August 2022.

Iran officially denies any interest in building nuclear weapons, but the IAEA's director-general,Rafael Grossi, has warned Tehran has enough enriched uranium for "several" nuclear bombs if it made the decision to build them.

The IAEA, in a second confidential report distributed to the agency's member states, said that Irn has so far not answered the agency's request for explanation of the origin and current location of manmade uranium particles found at two locations, Varamin and Turquzabad, which Iran has failed to declare as nuclear sites.

The IAEA second report also notes that Iran has so far refused to allow more monitoring equipment, including cameras, re-installed. The equipment was removed by Iran in June 2022. In response to the IAEA's request, Iran has prohibited several of the IAEA's most experienced inspectors from monitoring the country's nuclear program.

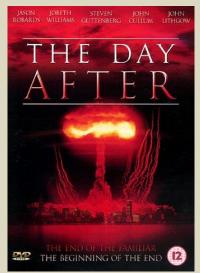## Hollywood, nuclear war, and the art of saving the world

By Emilia Javorsky

Source: https://thebulletin.org/2023/11/hollywood-nuclear-war-and-the-art-of-saving-the-world/

Nov 14 – On November 20, 1983, more than 100 million Americans tuned in to watch *The Day After,* a groundbreaking television event that would change the world. The film depicted the escalation and aftermath of an apocalyptic exchange between the United States and Soviet Union in a way that turned John W. Vessey Jr., then chairman of the Joint Chiefs of Staff, "to stone." President Reagan's memoir, *An American Life,* revealed that the movie changed his mind about nuclear policy, which in turn led him to sign the Intermediate-Range Nuclear Forces Treaty, significantly reducing Cold War arsenals.

That same year saw the release of the blockbuster techno-thriller *WarGames*, starring Matthew Broderick and Ally Sheedy. In it, a high-school student accidentally hacks into a North American Aerospace Defense Command, or NORAD, supercomputer, activates a simulation, and nearly triggers a nuclear war. After watching it, Reagan (who was a family friend of *WarGames'* writer Larry Lasker) asked Vessey if such an event could actually occur. "The problem," replied Vessey gravely, "is much worse than you think." Eighteen months later, Reagan issued the first ever presidential directive on computer security and ordered the ramping up of defenses for such critical systems. This substantially decreased vulnerability to cyber-attacks, and the accompanying risks of nuclear escalation.

These incidents reveal how storytellers and artists can not only entertain but also shift narratives and help change policy. Art plays an important role in society—it can inform, bring awareness to societal issues, and further discourse, inside and outside the government. As an example, *Guernica,* a painting completed by Pablo Picasso in 1937, depicts the horrific aftermath of a bombing by Nazi Germany and Italy. A tapestry of the painting hangs outside the United Nations Security Council Chamber and serves as a reminder of the tragedies of war. The important role of artists—whose creations can help humans better understand their world and thus make it safer—must therefore be recognized and rewarded.

To achieve their intended purpose, each piece of art uses unique means. This can be seen in the contrasting approaches of the two films that affected President Reagan. By focusing on the human stories of everyday Americans, *The Day After* lays bare the realities of living and dying through nuclear apocalypse in a heart-wrenching, almost unwatchable way. The feature centers on people rather than politicians and therefore resonates and haunts audiences in a personal way. *WarGames,* instead, uses pace and tension to excite and engage, utilizing humor, action, and romance to open audiences to the film's more serious and cautionary lesson.

"*WarGames* began as a character story about a precocious kid's journey to a mentor, a brilliant, self-exiled scientist in need of a

successor," writer Walter Parkes explained in an interview for this article. "But it was our own journey as writers which led us to the undeniable truth about the existential threat posed by nuclear weapons. We're humbled and gratified that the movie's underlying message–that for certain games, 'the only winning move is not to play'—continues to resonate."

Both films reflected growing anxiety about escalating nuclear tensions and ongoing technological change. "Timing turns out to be everything," director Nicholas Meyer said in an email. "*The Day After* arrived at a confluence of culture, politics, policy, and technology, uniquely positioning it to exert an outsize influence, which in turn allowed it to focus the world's attention for an instant on the single most urgent topic: Earth's survival. Such a confluence may never occur again," he added.

Conversely, *WarGames* was also the first major motion picture about hacking, and as such was instrumental in framing emerging narratives around information technology. By tapping into and surfacing widespread concerns and conveying them to leaders in emotive and compelling ways, the filmmakers communicated the urgency necessary to trigger critical action at the highest level.

Unfortunately, many of these catastrophic threats remain with us today. Geopolitical tensions between atomic superpowers remain as high as ever, and the *Bulletin of the Atomic Scientists'* Doomsday Clock is set to 90 seconds to midnight, the closest it's ever been to global catastrophe since its creation in 1947. *WarGames* also portrays the risk of integrating artificial intelligence into nuclear command and control systems, which would drastically increase the likelihood of accidental, world-ending escalation (as depicted in the Future of Life Institute's recent film *Artificial Escalation*).

Furthermore, with advancing development and deployment of autonomous weapons systems, *WarGames'* underlying message of "don't get humans out of the loop" is more prescient than ever. These films, however, should serve as crucial reminders to storytellers that their ability to transcend fictional narratives to exert positive change in the world is well documented.

Amnesia Atomica

Their examples should also inspire bravery. The creators of *The Day After* deliberately left ambiguous which superpower launches first, and in doing so ensured that the horrors of nuclear war remained the film's primary antagonist, resisting the temptation to tap into anti-Soviet sentiments running rampant at the time. This move was instrumental to the movie's success, but came at a cost to its creators, who faced substantial backlash. The New York Post, for example, accused Meyer of "doing Yuri Andropov's work for him." To create change around such highly charged topics, artists must be prepared to take risks.

Filmmakers' gift in this area comes with enormous responsibility. Movies and television are one of the primary mechanisms through which the public internalize catastrophic risk areas like artificial intelligence

and nuclear war. Any conversation about AI will likely mention James Cameron's *The Terminator* sooner or later (more likely sooner). It is vital that writers, directors, actors, producers, and other artists appreciate the impact their output can have, and therefore treat their subjects with the seriousness they deserve. They should consider not only how they can entertain, but also how they can explore these global threats in factual, nuanced ways that seek to advance discourse.

The recent art installation *Amnesia Atomica* and videogame *The Nuclear Biscuit,* as examples, utilize virtual reality to engage the public on nuclear war. Similarly, fiction has influenced policy by illustrating the threats and opportunities of emerging technologies. George Orwell's *1984* forewarned the use of surveillance to enable authoritarianism so powerfully that "Orwellian" is a commonly used term to describe such invasive government practices, while Philip K. Dick's *The Minority Report* is frequently cited in academic and policy discussions as a cautionary tale about the potential dangers of overreliance on technology in law enforcement. Conversely, storytelling can also be used to imagine and realize more positive visions of our technological future, from the techno-utopianism depicted in the TV series *Star Trek* to the world wide web and geostationary communications satellites envisioned by Arthur C. Clarke.

These influences should be understood and publicly acknowledged, so they may inspire the next generation of artists. *WarGames* writers Walter F. Parkes and Lawrence Lasker, and Brandon Stoddard, visionary behind *The Day After,* along with writer Edward Hume and director Nicholas Meyer—all 2023 Future of Life Award honorees—didn't receive enough recognition at the time of their achievements. But their work and its tangible impact demonstrate how storytellers and artists can shape the collective consciousness and provide instructive examples on mitigating intractable global threats.

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A radioactive threat found in the middle of America's fourth largest city raises alarm

Source: https://eu.usatoday.com/story/news/investigations/2023/11/22/radioactive-material-houston-scrap-yard/71669534007/

Nov 23 – A Houston Police Department officer driving to work last month felt the buzzing vibration alert of a cell-phone sized device provided by the federal government as part of a grant program.

The buzzing was no phone call. It was a warning, about dangerous levels of radiation, right in the midst of the fourth largest city in America.

And the detector that found it was one of 2,000 carried in Houston – and 56,000 nationwide – aimed at preventing terrorists from slipping a radiation-spewing "dirty bomb" onto American streets.

Now, budget fights in Congress and a House majority seeking major spending cuts mean the office that supplied those detectors is on the chopping block.

During a House Homeland Security Committee hearing last week, representatives questioned the work of – and funding for – huge swaths of the federal security agencies, often focusing on border security.

But testimony that day from Homeland Security Secretary Alejandro Mayorkas brought to light the work of one lesser-known arms of anti-terror work: the agency's Countering Weapons of Mass Destruction office.

He offered it as an example of where the system worked as intended, supporting a local agency to ward off disaster before it happened.

How 'hot' material ended up in a Houston scrap yard

As the detector buzzed Oct. 16, the Houston officer first suspected a false alarm. He circled his car back around to the same street. It went off again.

The detector, similar to a Geiger counter, was built to pick up gamma radiation. Soon, larger units arrived to help triangulate the radiation's source.

DHS provides some officers backpack-sized devices. The agency says they can detect material as far as a mile away. It also provides truck-sized devices that can scan for radiation near major events like the Super Bowl and Macy's Thanksgiving Day Parade.

Houston's sensors led them to a recycling yard on the city's northwest side. There, the bomb squad isolated containers the size of paint cans. Officers only needed to wear specialized protective gear when they were closest to the material, past a "turn-back line" alerted by their detectors.

The radiation was not coming from a dirty bomb. It was only harmful within a few feet. But it was real radiation.

The source was **Cesium-137**, a material used in commercial and industrial settings. It is found in medical radiation therapy devices to treat cancer. As the byproduct of nuclear fission, it's also found at the scene of nuclear reactor disasters — think Chernobyl.

In Houston, the radiation-emitting canisters had been used as flow gauges at a chemical plant. Instead of being properly stored, they had ended up at the scrap yard.

A crew carefully recovered four radioactive sources and transferred them to a U.S. Department of Energy storage facility near San Antonio. Texas authorities are investigating the chain of custody of the material to determine how it ended up in the scrap yard and how long it had been there. Owners of the yard, which police have not named, will not face penalties because they cooperated with authorities, said Sgt. James Luplow, a member of the HPD bomb squad.

"This is not a very common occurrence. We routinely encounter radioactive material, but nothing at this level," Luplow said. "It's a textbook example of having a lot of people cruising around with these detectors."

The ongoing threat of radioactive waste

Radioactive material ends up in scrap yards and causes major headaches for workers and those called to dispose of it.

In 1984, a scrap metal sale in Mexico led to one of the largest radiation disasters in U.S. history. About 600 tons of radioactive steel from Juarez ended up in 28 states. In that case, Cobalt-60 pellets caused radiation poisoning where junkyard employees became nauseated, had their fingernails turn black and suffered sterilization.

With a 30-year half-life, cesium isotopes can present a long-lasting threat if not properly disposed of at a storage facility.

Radioactive contamination of scrap materials happens far more frequently than people realize, said Jessica Bufford, a senior program officer at the non-profit global security organization Nuclear Threat Initiative.

"We're concerned that a determined adversary like a criminal group or terrorists or lone wolf actor could steal a cesium device and use it as part of a dirty bomb to cause panic," Bufford said. "It could be transported in powder form easily through water or air and spread over a large area." The material found in the Houston scrap yard was discarded waste, not a dirty bomb. But authorities say the need for detecting the radiation is the same in either scenario. "You'd be detecting bombs," said Luplow, the Houston sergeant. "But we'd much prefer to find it just in the material form, and it's a lot easier to deal with."

'No border security, no funding'

The Houston incident first came to light when Department of Homeland Security Secretary Alejandro Mayorkas testified last week in front of the House panel. Without naming the location, agency or date of the incident, Mayorkas said cryptically: "a local law enforcement officer equipped with some of the equipment we provide to detect radiological and nuclear material was wearing a device that detected abandoned material in a very unsafe location that could have caused tremendous harm to the people in the surrounding community." A DHS official referred further questions about details on the incident to Houston police.

The Countering Weapons of Mass Destruction office within DHS, created in 2018, had a five-year sunset clause and will shutter without reauthorization by Congress.

The Biden administration specifically lobbied key committees to save the DHS office and the jobs of roughly 230 employees plus 400 contractors. DHS officials want to see the office permanently funded. With a budget of $400 million a year, the staff works to detect chemical, biological, radiological and nuclear weapons.

The office works with 14 "high-risk" urban areas: New York City; Newark and Jersey City; Los Angeles and Long Beach; the Washington, D.C. area; Houston; Chicago; Atlanta; Miami; Denver; Phoenix; San Francisco; Seattle; Boston; and New Orleans.

GOP members of the House Freedom Caucus have blasted the DHS border policy under Mayorkas and have demanded the cuts as leverage for change. Rep. Chip Roy, R-Texas, and 14 other Republicans signed on to a letter seeking no DHS funding until the changes: "No border security, no funding," he wrote in a letter to colleagues.

Without approval, the office was set to shutter on Dec. 21. The current continuing resolution passed by Congress and signed by President Biden last week punts that deadline to February.

Analysis of IAEA Iran Verification and Monitoring Report — November 2023

By David Albright, Sarah Burkhard, Spencer Faragasso, and Andrea Stricker

Source: https://www.homelandsecuritynewswire.com/dr20231121-analysis-of-iaea-iran-verification-and-monitoring-report-november-2023

Nov 21 – This report summarizes and assesses information in the International Atomic Energy Agency's (IAEA's) quarterly report, dated November 13, 2023, *Verification and monitoring in the Islamic Republic of Iran in light of United Nations Security Council resolution 2231 (2015),* including Iran's compliance with the Joint Comprehensive Plan of Action (JCPOA). It also includes findings from a separate IAEA report, *NPT*

Safeguards Agreement with the Islamic Republic of Iran, dated November 15, 2023, referred to alternatively as *NPT Report* or *NPT Safeguards Report*.

Findings

● Iran's stocks of enriched uranium and its centrifuge capacity combined are sufficient to make enough weapon-grade uranium (WGU), taken as 25 kilograms (kg) of WGU, for six nuclear weapons in one month, eight in two months, ten in three months, eleven in four months, and twelve in five months. This represents a growth in Iran's breakout capabilities in months three through five, resulting from the continued growth of enriched uranium stocks. Centrifuge capacity has remained relatively constant.

● With Iran's growing experience and using only a portion of its stock of 60 percent enriched uranium, Iran could choose to produce its first quantity of 25 kg of WGU in as little as seven days, down from the Institute's previous estimate of 12 days. The shorter timeframe results from a scenario in which Iran dedicates four advanced centrifuge cascades to the task and uses a higher tails assay, causing faster production of WGU but requiring more 60 percent feed to do so. This breakout could be difficult for the IAEA to detect promptly, if Iran delayed inspectors' access.

● According to the IAEA's NPT safeguards report, after almost five years since the IAEA first detected undeclared uranium at the first site relevant to its investigation, and after many chances for Iran to provide explanations, the IAEA continues to conclude that undeclared nuclear-related activities or undeclared nuclear material were present at all four sites under investigation. The IAEA reports, "The Agency has not changed its assessment either of the undeclared nuclear-related activities at the four locations […] or of the origin of the uranium particles […] found at three of these four undeclared locations in Iran."

● The NPT safeguards report language makes clear that not only was there little Iranian cooperation over the last two and a half months, but also that Iran shows no real willingness to cooperate in the future. In a further demonstration of Iran's strategy to reduce transparency over its sensitive nuclear programs, for political reasons, Iran withdrew the designation of European inspectors with experience in enrichment technology. The Wall Street Journal reports that eight inspectors had to leave Iran.[2] The IAEA called this move "extreme and unjustified" and underscored that this "seriously affected the agency's work." Iran responded that the IAEA's complaint "is not compelling and lacks any legal basis," and said only that it was exploring possibilities to address the issue.

● The net overall enriched uranium stock, including all levels of enrichment and all chemical forms, increased by 691.2 kg from 3795.5 kg to 4486.8 kg (Uranium mass or U mass).

● Iran's stockpile of 60 percent highly enriched uranium (HEU) was 128.3 kg (U mass) or 189.8 kg uranium hexafluoride mass (hex mass) as of October 28, 2023.

● The average production rate of 60 percent HEU dropped from 4.3 kg (U mass) per month to 2.9 kg. At this rate, Iran can produce about 35 kg (U mass) annually.

● However, Iran did not downblend any 60 percent HEU during this reporting period. Thus, the 60 percent HEU stock grew at a faster average rate than during the previous period. It grew by 94 grams (U mass) per day (6.7 kg over 71 days), compared to the previous 77 grams per day (7.5 kg over 97 days). Of note, Iran doubled its production of near 60 percent HEU when it started, in November 2022, to enrich to near 60 percent HEU in two advanced centrifuge cascades at Fordow. Thus, for six months, from December 2022 to June 2023, it accumulated about double the monthly average amount compared to the previous year and might still have been able to hit its annual production target even if it had stopped producing 60 percent altogether for the subsequent six months.

● Iran continued to produce 60 percent HEU from 5 percent low enriched uranium (LEU) feed in advanced centrifuge cascades at the above-ground Pilot Fuel Enrichment Plant (PFEP) and the below-ground Fordow Fuel Enrichment Plant (FFEP); the latter includes an IR-6 centrifuge cascade that is easily modifiable to change operations. This cascade was at the center of an IAEA-detected undeclared mode of operation in January 2023. It was interconnected with another IR-6 cascade to produce HEU, and subsequently, the IAEA detected the presence of near-84 percent HEU particles at the cascade's product sampling point.

● In its May 2023 report on Iran's compliance with the Nuclear Non-Proliferation Treaty (NPT), the IAEA reported that the agency installed enrichment monitoring devices (EMD) at both the FFEP and at the PFEP to "monitor the enrichment level of the HEU being produced by Iran." These monitors are not JCPOA-related but are installed pursuant to Iran's comprehensive safeguards agreement (CSA) with the agency. IAEA Director General Rafael Grossi confirmed in a press conference that the EMD data will notify the IAEA of "another oscillation or otherwise" in the enrichment level in "real-time." The IAEA reported previously that, "The evaluation of the data collected confirmed the general good functioning of the systems." However, "adjustments and changes to operational procedures required to enable their commissioning […] are being discussed with Iran." The IAEA provides no update on the status of the EMDs in the most recent report.

● The IAEA's technical report is shorter in length and omits previously reported details, including how much of the 20 percent enriched uranium and 60 percent HEU stocks Iran keeps at the Esfahan Fuel Plate Fabrication Plant (FPFP), where Iran maintains a capability to make enriched uranium metal.

According to previous reports, Iran was storing the majority of those stocks at Esfahan. Storage of so much proliferation-sensitive material at the FPFP, which may not be as thoroughly monitored as Natanz and Fordow, requires enhanced IAEA safeguards to detect and prevent diversion to a secret enrichment plant. For example, there should be stepped-up inspector presence and remote camera surveillance.

- As of October 28, 2023, Iran had an IAEA-estimated stock of 567.1 kg of 20 percent enriched uranium (U mass and in the form of UF6), equivalent to 838.9 kg (hex mass), representing an increase of 31.3 kg from 535.8 kg (U mass). Iran also had a stock of 32.7 kg (U mass) of 20 percent uranium in other chemical forms. The average production rate of 20 percent enriched uranium at the FFEP remained steady at about 13.4 kg (U mass) or 19.9 kg (hex mass) per month. Iran's deployment of advanced centrifuges has remained fairly steady since February 2023, with about one new advanced centrifuge cascade installed during each of the three subsequent reporting periods. Iran now has almost 6300 advanced centrifuges at Natanz and Fordow, where most are deployed at the Natanz Fuel Enrichment Plant (FEP) (see Figure 1).

- Including the installed IR-1 centrifuges at the FEP and FFEP brings the total number of installed centrifuges to about 13,500. It should be noted that many of the advanced centrifuges are deployed but not enriching uranium, and the IR-1 centrifuges have a far lesser ability to enrich uranium than the advanced ones. During this reporting period, Iran installed one additional cascade of IR-4 centrifuges at the FEP, where Iran now has a total of 36 cascades of IR-1 centrifuges, 21 cascades of IR-2m centrifuges, six cascades of IR-4 centrifuges, and three cascades of IR-6 centrifuges installed. An additional six IR-4 centrifuge cascades are planned, and the installation of one IR-4 cascade was ongoing.

- Iran did not install any additional advanced centrifuge cascades at the FFEP, where it is currently operating six IR-1 centrifuge cascades and two IR-6 centrifuge cascades, although it plans to install up to 14 additional IR-6 centrifuge cascades. This lull in deployment was preceded by a spike in advanced centrifuge deployment from August 2022 to February 2023. A slowing of advanced centrifuge deployments and enrichment using those machines may be one reported term of an informal nuclear understanding with the United States, although this is unverified. It is unclear whether this means Iran is producing fewer centrifuges than expected, implying possible manufacturing difficulties, or is keeping newly produced machines in unmonitored storage instead.

- Iran's current, total operating enrichment capability is estimated to be about 19,800 separative work units (SWU) per year, where only cascades enriching uranium during this reporting period are included in the estimate. As of this reporting period, Iran was not yet using its fully installed enrichment capacity at the FEP, which, if operational, would total about 31,000 SWU/yr.

- Iran's stockpile of near 5 percent LEU increased by 267.2 kg (U mass) to 2218.1 kg (U mass) or 3281.2 kg (hex mass). Average production of near 5 percent LEU at the FEP decreased, consistent with the reporting that Iran used natural uranium as feedstock instead of up to 2 percent LEU.

- Despite the increase during this reporting period in the amount of uranium enriched between two and five percent, Iran has not prioritized stockpiling this material. For example, it has not made planned progress on the Enriched Uranium Powder Plant, a key civil facility to convert less than 5 percent enriched uranium hexafluoride into a uranium oxide powder for use in nuclear power reactor fuel. These two choices are at odds with Iran's contention that its primary goal is to accumulate 4-5 percent enriched uranium for use in nuclear power reactor fuel. Instead, Iran has used this stock extensively to produce near 20 percent and 60 percent enriched uranium, far beyond Iran's civilian needs.

- The IAEA states in the NPT safeguards report that Iran provided new data the IAEA needs to assess to see whether the agency can resolve a discrepancy in Iran's natural uranium inventory at the Uranium Conversion Facility (UCF). The IAEA previously reported a shortfall in Iran's declaration, which may indicate that Iran mixed into the UCF inventory undeclared uranium it used in the past at the Lavisan-Shian site during its early-2000s nuclear weapons program. After acknowledging a discrepancy, Iran insisted that the discrepancy is "inaccurate" and "baseless," and that "differences" are "predictable" and that "the matter is considered as resolved." The IAEA did not agree with Iran's claim.

- The IAEA reports that Iran has not started commissioning the Arak reactor, now called the Khondab Heavy Water Research Reactor (KHRR), or IR-20. Iran previously informed the IAEA that it expected to commission the reactor in 2023 and start operations in 2024, but construction efforts on the reactor continue and Iran has provided no update.

- The IAEA underscores that it has been "two years and nine months since Iran stopped provisionally applying its Additional Protocol and, therefore, since it provided updated declarations and the Agency was able to conduct complementary access to any sites and locations in Iran."

- The IAEA reports no new progress on installing new surveillance cameras at Iran's nuclear-related facilities, including centrifuge manufacturing and assembly sites. The IAEA proposed installing cameras at the Natanz centrifuge workshops, but Iran refused. The IAEA also proposed conducting consistency checks on cameras installed at the Esfahan centrifuge facility, and Iran refused. Iran also has not turned over data or footage associated with monitoring devices and cameras, as it committed in an IAEA/Iran Joint Statement from March 2023.

- The absence of monitoring and surveillance equipment, particularly since June 2022, has caused the IAEA to doubt its ability to ascertain whether Iran has diverted or may divert advanced centrifuges. A risk is that Iran could accumulate a secret stock of advanced centrifuges, deployable in the future at a clandestine enrichment plant or during a breakout at declared sites. Another risk is that Iran will establish additional centrifuge manufacturing sites unknown to the IAEA. Iran has proven its ability to secretly move manufacturing equipment to new, undeclared sites, further complicating any future verification effort and contributing to uncertainty about where Iran manufactures centrifuges.

- During the reporting period, the IAEA pressed Iran on obtaining its commitment to implement the non-voluntary Modified Code 3.1 to its CSA. Iran's ongoing refusal raises doubts about whether Iran will report the construction of a new nuclear facility, such as an enrichment plant, or provide design information to the IAEA as soon as it decides to construct such a facility. The IAEA is concerned since Iran has mentioned a desire to build new nuclear facilities. Iran is building a new facility in the mountains near Natanz that is deeply buried and could be a potential site for a new enrichment plant. Iran told the IAEA that "design information for any new facilities…will be provided in due time." The IAEA acknowledged that Iran "was no longer prepared to work with the Agency to find a mutually acceptable solution" regarding implementation of Modified Code 3.1.

- The IAEA concludes that "Iran's decision to remove all of the Agency's equipment previously installed in Iran for JCPOA-related surveillance and monitoring activities in relation to the JCPOA has [had] detrimental implications for the Agency's ability to provide assurance of the peaceful nature of Iran's nuclear program."

- Concern about Iran's installation of advanced centrifuges at an undeclared site increases as the 60 percent HEU stocks grow. Such a scenario is becoming more worrisome and viable, since a relatively small number of advanced centrifuge cascades would suffice for the rapid enrichment of the 60 percent HEU to weapon-grade. This hybrid strategy involves the diversion of safeguarded HEU and the secret manufacture and deployment of only three or four cascades of advanced centrifuges. With greater uncertainty about the number of advanced centrifuges Iran is making, there is a greater chance of Iran hiding away the requisite number of advanced centrifuges to realize this scenario.

- The IAEA reports in its NPT report that the Director General "is seriously concerned that Iran appears to have 'frozen' the implementation of the Joint Statement of 4 March 2023 for the past two reporting periods, and questions Iran's continued commitment to its implementation." Atomic Energy Organization of Iran (AEOI) chief, Mohammad Eslami, told the IAEA not to expect any new cooperation, particularly on JCPOA-related measures, while sanctions on Iran remain in effect.

- Combined with Iran's refusal to resolve outstanding safeguards violations, the IAEA has a significantly reduced ability to monitor Iran's complex and growing nuclear program, which notably has unresolved nuclear weapons dimensions. The IAEA's ability to detect diversion of nuclear materials, equipment, and other capabilities to undeclared facilities remains greatly diminished.

●▶ **Read the full report** here.

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Why North Korea may use nuclear weapons first, and why current US policy toward Pyongyang is unsustainable

By Robert E. Kelly

Source: https://thebulletin.org/2023/11/why-north-korea-may-use-nuclear-weapons-first-and-why-current-us-policy-toward-pyongyang-is-unsustainable/

Nov 21 – North Korea has large incentives to use a tactical nuclear weapon—or several of them—early in another conflict on the Korean peninsula. Deciding how to respond to this is probably the most important contemporary debate inside the US-South Korea alliance.

A negotiated bargain that controls North Korean weapons of mass destruction would, of course, be the ideal way to avoid such a conflict, but any such deal seems highly unlikely. The most likely window for a breakthrough came during the overlapping "dovish" presidencies of American President Donald Trump and South Korean President Moon Jae-In. But it has closed. For a brief moment, North Korean leader Kim Jong-Un faced the most negotiation-interested leaders in the history of his country's primary geopolitical

opponents – the US and South Korea. Trump particularly was a unique American president regarding North Korea – willing to meet Kim repeatedly without preconditions.

Kim Jong Un reviews missile strike plans, March 29 2013.

Tragically, Kim missed this Trump-Moon opportunity in 2018-2020. He offered only one deal to Trump, and it was so balance-negative for the allies that Trump had to reject it. So the North Korea debate in the democratic world—particularly in South Korea, the United States, and Japan—has reverted to traditional, hawkish approaches. If North Korea will not bargain—or, more specifically, if it will only propose lopsided deals—then the allies must consider military responses to the possibility of North Korean first-use.

There are three reasons that North Korea will likely use nuclear weapons first if war erupts on the Korean peninsula: Operationally, Pyongyang will face an intense "use-it-or-lose-it" dilemma regarding its weapons of mass destruction as soon as a war starts. Strategically, its conventional military is quite inferior to the forces ranged against it. And grand strategically, any serious conflict between the two Koreas will quickly become existential for the North.

I suggest two responses to this difficult challenge for the United States and its allies: At the time of attack, the allies should respond with nonnuclear retaliation as long as politically feasible, in order to prevent further nuclear escalation. However, this will be difficult given the likely post-strike panic and hysteria. So, in preparation, the US should deconcentrate its northeast Asian conventional footprint, to reduce North Korean opportunities to engage in nuclear blackmail regarding regional American clusters of military equipment and personnel, and to reduce potential US casualties and consequent massive retaliation pressures if North Korea does launch a nuclear attack.

North Korean first-use incentives

The incentives for North Korea to use nuclear weapons first in a major conflict are powerful:

Operationally, North Korea will likely have only a very short time window to use its weapons of mass destruction. The Americans will almost certainly try to immediately suppress Northern missiles. An imminent, massive US-South Korea disarming strike creates an extreme use-it-or-lose-it dilemma for Pyongyang. If Kim Jong-Un does not use his nuclear weapons at the start of hostilities, most will be

destroyed a short time later by allied airpower, turning an inter-Korean conflict into a conventional war that the North will probably lose. Frighteningly, this may encourage Kim to also release his strategic nuclear weapons almost immediately after fighting begins. Strategically, North Korea's conventional military is almost certainly insufficient against capabilities. The (North) Korean People's Army (KPA) is large but its equipment is technologically outdated. Sanctions limit the North's production and fuel reserves. The country's chronic malnutrition likely affects its soldiers' health and fitness. Allied air supremacy would expose North Korean military assets to intense, immediate bombardment. Allied superiority in almost every area—logistics, communications, intelligence, surveillance, and weaponry—would be tremendous.

The North can leverage its proximity to South Korea's center of gravity, the massive Seoul-Kyeonggi-Incheon corridor of northwestern South Korea. This area is uncomfortably close to the demilitarized zone, and North Korean forces are flush against the border to threaten it with massive missile and artillery bombardments. But this conventional countervalue threat—particularly the well-publicized artillery threat to Seoul—does not undermine South Korea's military capabilities. The South Korean military would likely win a Korean-only conflict, and with American assistance, the North's defeat would be crushing.

North Korea's dysfunctional economic model, compounded by sanctions, make catch-up impossible. Its inability to close the conventional military gap is an obvious reason for the North's construction of nuclear weapons, and Pyongyang has unsurprisingly talked up tactical nuclear weapons and their use. Without them, the North would lose the war, and strategically, using them sooner rather than later—before the KPA starts to lose on the battlefield—would be its best move.

On the grand strategy level, nuclear first-use is the Kim regime's best chance at survival in a war. Defeat would bring regime change, and probably annihilation for the Kims. This is a critical difference between North Korea, on the one hand, and China and Russia. Russia has probably not used nuclear weapons in Ukraine because the war is not existential. A defeat there is not an offensive threat to the Russian state or territory, or to the regime of President Vladimir Putin. Similarly, if China were to be defeated around Taiwan, that would not lead to an invasion of the mainland or national collapse. Neither Ukraine nor Taiwan has revisionist intentions against their opponents. South Korea and its American ally do, so the consequences of defeat for North Korea are far worse than for Russia or China.

The South Korean constitution claims sovereignty over the entire Korean peninsula. A conventional second Korean War would open the possibility of national unity as the KPA was defeated on the battlefield and the South Korean army moved north. Nationalist hopes throughout the peninsula would soar. And for America, the opportunity to finally rid itself of one of its worst adversaries—to push for final victory on Southern terms— would be very tempting.

Because any serious Korean conflict would quickly become existential for the Kim regime, the incentive to launch nuclear weapons first—to deter or slow a march northward by the victorious allies—would be tremendous. China might militarily assist the North, per their alliance requirements, but that commitment is not very credible now. The Sino-North Korean relationship is transactional not affective. Instead, escalating to deescalate—using tactical nuclear weapons, with threats of further strikes unless the allies stop— would likely be the Kims' best chance to prevent a catastrophic defeat.

In short, North Korea has massive first-use incentives. If it will not bargain to reduce its stockpile, then fashioning an agreed alliance response is critical. And the alliance should do it now. The first wartime use of a nuclear weapon since World War II will likely ignite global panic and terror. That would be a terrible, heated time to think through the allied response. There will be immediate calls for revenge in kind, if not massive retaliation. That would threaten a major US-North Korean nuclear exchange which could then chain-gang other regional players into the conflict too.

How should South Korea and the United States respond?

For the United States and its allies, there are two reasonable responses—preparatory and contemporaneous—to the tough dilemma posed by North Korea's nuclear weapons.

Before the North can attack, the allies should prepare by deconcentrating America's northeast Asian force structure, for two reasons: North Korean will likely make immediate nuclear missile threats against regional concentrations of Americans to constrain US options in a Korean contingency. US military bases in South Korea and Japan—especially a very large site like Camp Humphreys, located just 40 miles from Seoul—present obvious missile targets for the North. They concentrate US citizens and assets; missile defense cannot assuredly defend them; and they can be taken hostage with missile strike threats.

Russia's nuclear weapons have blocked direct NATO involvement in the Ukraine War. North Korea will likely try the same in Korea by threatening US east Asian bases. If North Korean nuclear blackmail can prevent, or at least slow, US assistance to South Korea, then Pyongyang's chances of victory—coupled with tactical nuclear weapons use against the South Korean army—rise.

Were North Korea to strike American regional sites, the resultant mass US nuclear casualties would place nearly irresistible pressure on the US president to respond with nuclear weapons. Congress and the public would be outraged and demand retribution. America's tendency to geopolitically overreact, to use extraordinary levels of force in conflicts, is well-established. The larger the US death toll, the greater would be the domestic call for massive retaliation. That could spark a regional nuclear chain-gang.

Traditionally, US soldiers in South Korea have been considered a "tripwire." Their early deaths in a war would ensure an enraged American public and Congress, and therefore a commitment to fight on South Korea's behalf. This was probably valuable alliance affirmation in the era of conventional inter-Korean competition. But in today's nuclearized and missilized peninsular environment, that tripwire constrains US options and portends a spiraling regional confrontation after a likely American overresponse. Recently, the United States has been concentrating its South Korean basing for logistical reasons. Inadvertently, in this Korean missile age, the US is also offering attractive missile targets to the North.

Next, if the North does launch a nuclear attack, the United States should respond conventionally, not with nuclear weapons, as long as politically feasible. The political pressure to retaliate in kind, or with even greater nuclear force, will of course be tremendous, particularly if there were American casualties, which is likely given South Korea's high population density. But there are many reasons why an immediate US nuclear response would be a mistake:

- The United States and South Korea would initially retain conventional superiority despite Northern tactical nuclear strikes. North Korean limited nuclear war options are not necessarily battlefield-decisive. Military necessity would probably not require nuclear retaliation, so as long as North Korean nuclear use remained limited to low-yield strikes.
- Operationally, nuclear blasts would irradiate the battlefield, making it harder for allied forces to advance northward and finish the conflict. Adding US-created blast zones to those created by the North would worsen the problem. The Korean peninsula is 70 percent mountainous and only 150-200 miles wide. So the relevant battlespace—mostly between the west coast and the peninsula's mountain spine—is already narrow; more nuclear blast zones would constrain allied maneuver even further.
- US nuclear restraint would help swing global opinion—particularly in China and Russia— behind the allies. China and Russia oppose Korean unification. They will be tempted to intervene in a conflict to save their valuable spoiler with a long record of distracting their American competitor. Northern nuclear use could dramatically alter that calculus, encouraging Beijing and Moscow to remain neutral or even assist an allied victory out of sheer fear of North Korean behavior. US nuclear retaliation would override any such re-evaluation.
- Conversely, US nuclear use in Korea might chain-gang China and Russia into the war. As the Ukraine War demonstrates, a major conventional conflict involving a nuclear power can be geographically contained. A second Korean war need not spiral out of control. But US nuclear use near China and Russia would pressure both to intervene to save the North from elimination.
- US nuclear strikes would substantially worsen the reconstruction burden on a post-unification Korea run by Seoul. Blast zones from Northern nuclear strikes would be costly to rehabilitate; US nuclear strikes would only add to the load. That South Korea has revisionist intentions on North Korea—that it wishes to absorb it— substantial alters the cost-calculus of American nuclear use. The United States and South Korea would have to pay to decontaminate and rebuild after victory, which is not an element of US nuclear thinking regarding traditional opponents like China or Russia.

Unresolved issues

I have broached only a few of the many strategic problems created by North Korea's unchecked nuclear and missile programs. The situation will worsen as North Korea builds a submarine-based deterrent, improves its targeting with satellites, develops multiple-warhead missiles, and so on. Conventional deterrence in Korea may be stable, but nuclear deterrence is probably not. A stable, enduring nuclear stalemate is unlikely in a dyad as asymmetric as North Korea and the US/South Korea.

Three policy questions flow from this analysis:

Should the allies launch a massive aerial disarming strike in a conflict? As discussed above, North Korea's fear of that strike incentivizes its nearly immediate first-use. That, in turn, incentivizes exactly that immediate and large allied disarming strike. Each action responds to the other in worsening regressive spiral. When moving first has huge strategic advantages, the result is a hair-trigger balance encouraging preemption.

Should South Korea build nuclear weapons? North Korea likely hopes that its nuclear weapons—particularly their threat to the American homeland—will blunt US assistance to South Korea in a conflict, much as oblique Russian nuclear threats have retarded NATO assistance to Ukraine. Direct local nuclear deterrence might stay North Korea's hand by reducing its nuclear weapons 'wedge' between nuclear-but-distant America and nonnuclear-but-proximate South Korea. US objections to South Korean nuclearization turn on the erosion of nonproliferation norms, but such fears are likely exaggerated.

Should the United States and South Korea give up on unification? Bolstered by massive inter-Korean economic and conventional asymmetries, Seoul's desire to unify makes any serious Korean conflict an existential one for Pyongyang. An existential threat is an obviously compelling reason to build nuclear weapons. Surrendering South Korea's pretension to unity might reduce North Korea's perception that it must have nuclear weapons. South Korean progressives such as former President Moon Jae-In seem willing to countenance such a move to escape from the pressures sketched in this essay. The downsides are costly, though: North Korea might not keep its
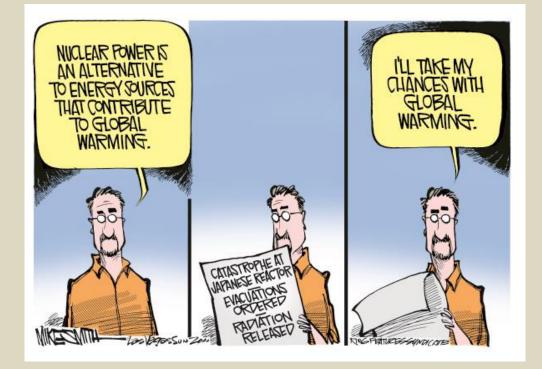
denuclearization word; North Korea's population would be lost to history's worst orwellian tyranny; and the US-South Korea alliance would likely fracture in obsolescence after an inter-Korea reconciliation.

There is no obvious policy answer to the North Korean first-use problem

All the responses suggested above have clear downsides. US regional deconcentration, for example, would be expensive and complicated, and South Korea and other US regional allies might read it as retrenchment or partial abandonment. Sanctions have blunted the North Korean problem for decades; without them, the problem would be even worse than it already is. But they are a stop-gap measure. The North Korean program marches on despite them, and China and Russia will not suddenly enforce them properly after two decades of ignoring pleas to do so.

We are approaching a critical mass of North Korean nuclear weapons and delivery systems which will demand a more radical solution—perhaps a hawkish one, such as South Korean nuclearization; perhaps a dovish one, such as South Korean recognition of North Korea. But the status quo—of allied half-measures, rickety sanctions, kicking the can down the road, hoping China will strong-arm North Korea, hoping missile defense will eventually work well enough to provide some 'roof,' and so on—is increasingly unsustainable.

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Israel may use new 'Sponge Bombs' to seal and block off Hamas tunnels

Source: https://nypost.com/2023/10/28/news/israel-may-deploy-sponge-bombs-to-seal-block-off-hamas-tunnels/

Israeli fighters may use a new weapon called a "sponge bomb" to block and seal off Hamas tunnels. AP

Oct 28 – Israel may use a new weapon called "sponge bombs" to seal and block off Hamas tunnels.

The Israel Defense Force could deploy the new handheld devices to negotiate Hamas' labyrinthine tunnel system –and trap any hidden fighters in them once they launch their long-awaited ground invasion into Gaza, according to reports.
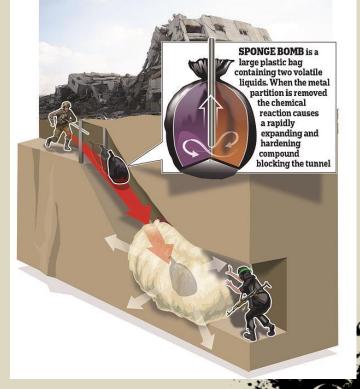
The sponge bombs consist of chemical compounds based around a liquid emulsion.

It can be thrown into a tunnel where it swiftly expands and hardens.

The device would leave Hamas fighters with no escape and allow Israeli commandos to secure safe routes to travel while searching for hostages.

The Hamas tunnels are believed to stretch for hundreds of miles underground, although the blockaded Gaza Strip itself is just 25 miles in length.

The IDF has reportedly trained soldiers to use the sponge bombs at the Israeli military's "mini Gaza," a mock-up of the underground tunnel system constructed at the Urban Warfare Training Center in the Negev desert.

SPONGE BOMB is a large plastic bag containing two volatile liquids. When the metal partition is removed the chemical reaction causes a rapidly expanding and hardening compound blocking the tunnel

The bombs feature a barrier that keeps two volatile liquids separate. When it is removed, the liquids combine and immediately react. The dangerous material left some Israeli soldiers blinded during training, according to reports. It's not the first-time foam or slime was considered for military use — American soldiers used foam as a non-lethal tactic against rioters in Somalia.

Is there a bomb worse than Tsar Bomba?

Source: https://www.energyportal.eu/news/is-there-a-bomb-worse-than-tsar-bomba/437425/

Nov 06 – In the annals of human history, few events have left as lasting an impact as the detonation of the Tsar Bomba. This Soviet hydrogen bomb, tested on October 30, 1961, remains the most powerful nuclear weapon ever detonated. With an estimated yield of 50 megatons of TNT, it unleashed a destructive force equivalent to 3,800 Hiroshima bombs. However, as technology advances and nations continue to develop their arsenals, the question arises: is there a bomb worse than Tsar Bomba?

What made Tsar Bomba so devastating?
The Tsar Bomba was an unprecedented weapon of mass destruction. Its sheer size and power were unmatched, with a mushroom cloud reaching an astonishing height of 67 kilometers (42 miles). The bomb was so colossal that the aircraft carrying it had to be modified to accommodate its weight and size. The blast generated an intense heat that could cause third-degree burns up to 100 kilometers (62 miles) away, and the shockwave shattered windows hundreds of kilometers away.

Are there bombs more powerful than Tsar Bomba?
While there are no known bombs that surpass the Tsar Bomba in terms of sheer yield, it is important to note that destructive power is not solely determined by the size of the explosion. Modern nuclear weapons have become more sophisticated, with improved accuracy, miniaturization, and multiple warheads. These advancements allow for greater precision and the ability to target multiple locations simultaneously, potentially causing more widespread devastation.

What are the risks associated with nuclear weapons?
The existence of nuclear weapons poses significant risks to humanity. Accidental detonations, miscalculations, or the intentional use of these weapons could have catastrophic consequences, leading to immense loss of life, environmental devastation, and long-lasting radiation effects. Additionally, the proliferation of nuclear weapons increases the likelihood of their acquisition by non-state actors or rogue nations, further heightening the risk of their use.

Conclusion
While the Tsar Bomba remains unparalleled in terms of raw power, the development and proliferation of nuclear weapons continue to pose a significant threat to global security. The focus should not solely be on the size of the bomb, but rather on the urgent need for disarmament, non-proliferation agreements, and diplomatic efforts to prevent the use of these devastating weapons. The international community must remain vigilant and committed to ensuring a world free from the specter of nuclear destruction.

Did you know?

Isomer bombs
For the sake of comparison, 1 gram of hafnium contains the equivalent energy of 660 pounds (299 kg) of TNT.

New Modular Portable Counter IED and Drone
Source: https://i-hls.com/archives/121606

Nov 09 – Drones used to be high-end expensive tools used very sparingly, but recent years saw the technology becoming simpler and more available, and the lowered costs of drone production meant they could be used in large numbers.
Another advanced technology is air defense systems, which have also seen major advancements to counter the rising drone threats. The issue is that they can't be deployed on all fronts. Turning these systems portable would revolutionize the industry of defense from drones and IEDs.
The C-Guard Modular ManPack is an advanced system designed to counter drones and improvised explosive devices (IEDs), a multi-purpose solution with multi-profile capabilities. It was developed by

Netline Communications Technologies- an Israeli-based manufacturer of high-end electronic warfare systems.

According to Interesting Engineering, this new technology is modular (so users can pick the features they require) and can counter drone threats. The modular ManPack contains multiple modules, each offering different jamming profiles- the user can switch between different modules with a simple switch. Since each module is a jammer in itself, the modular pack provides high flexibility without any downtime during operations. Each of the systems is built to operate in rough environmental conditions without needing periodic maintenance. Furthermore, multiple units operating in the area can work together using GPS time synchronization and use electromagnetic and radio interference capabilities to ensure communication between them.

The core of the C-Guard system is a Software Defined Radio (SDR), a real-time processing engine that can counter frequencies in the range of 20-6000MHz and scan transmissions to determine which of them pose a threat to the forces under protection.

Another huge advantage is that modules can be replaced in the field with almost no system downtime at all, while the entire system can be upgraded to support emerging threats and new frequencies that might be used.

Landmines: New Use Despite Global Ban

Source: https://www.hrw.org/news/2023/11/14/landmines-new-use-despite-global-ban
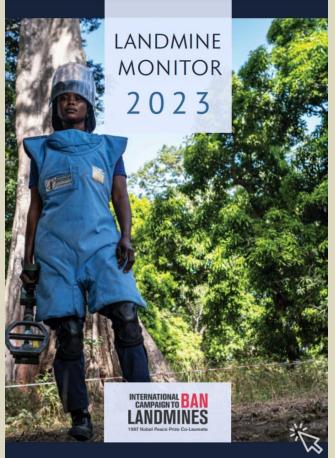

Clearance operator from DCA clearing an area suspected of being contaminated by explosive remnants of war in Pajok, South Sudan in February 2023. © 2023 Rasmus Emil Gravesen/DCA

- Russia, Myanmar, and Ukraine have used antipersonnel landmines in the past year, and armed groups used them in at least five countries, according to the annual report *Landmine Monitor 2023*.
- Antipersonnel mines are victim-activated explosive devices that kill and maim people both during and long after conflicts.
- Countries that have yet to prohibit antipersonnel landmines should reconsider their position and join the international treaty banning them.

(Geneva, November 14, 2023) – Russia, Myanmar, and Ukraine have used antipersonnel landmines in the past year, and armed groups used them in at least five countries, Human Rights Watch said today in releasing *Landmine Monitor 2023*, the annual report about the international treaty to ban landmines.

The 120-page *Landmine Monitor 2023* is the product of the International Campaign to Ban Landmines, the global coalition of nongovernmental organizations chaired by Human Rights Watch that received the 1997 Nobel Peace Prize. *Landmine Monitor 2023* will be presented at the Mine Ban Treaty's annual meeting, held at the United Nations in Geneva from November 20 to 24.

This year's Landmine Monitor 2023 cover depicting a deminer working in the Ziguinchor region in Casamance, Senegal. © 2022 M. Simoncelli/HI

"All countries that have not banned antipersonnel mines should help put an end to the casualties and suffering caused by these indiscriminate weapons," said Mark Hiznay, associate arms director at Human Rights Watch and an editor of *Landmine Monitor 2023*. "Only through universal adherence can the Mine Ban Treaty achieve its goal of a world without antipersonnel mines."

Russia has used antipersonnel landmines repeatedly in Ukraine since its full-scale invasion of the country on February 24, 2022, creating an unprecedented situation in which a country that is not party to the Mine Ban Treaty is using the weapon on the territory of a treaty party. Myanmar's armed forces have used antipersonnel landmines continuously since 1999. Ukrainian authorities said in September that they are investigating the circumstances of its forces' use of antipersonnel mines in and around the city of Izium, in Kharkiv province, in 2022, when the city was under Russian control.
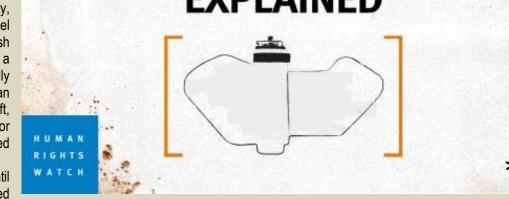
Non-state armed groups used antipersonnel mines in at least five countries—Colombia, India, Myanmar, Thailand, and Tunisia—during the reporting period in mid-2022 and the first half of 2023. This new use mostly involved victim-activated improvised explosive devices made from locally available materials. The Mine Ban Treaty prohibits all victim-activated explosive devices regardless of whether they were improvised from local materials or produced in a factory.

Antipersonnel mines are explosive devices that kill and maim people both during and long after conflicts. They are placed above, under, or on the ground and explode from a person's presence, proximity, or contact. Antipersonnel mines cannot distinguish between a soldier and a civilian. They are typically placed by hand, but they can also be scattered by aircraft, rockets, and artillery or dispersed from specialized vehicles. Uncleared landmines pose a danger until cleared and destroyed. Mined

land can drive displacement of the civilian population, hinder the delivery of humanitarian aid, and prevent agricultural activities.

The Mine Ban Treaty, adopted in September 1997, comprehensively prohibits antipersonnel mines and requires countries to destroy stockpiles, clear mine-affected areas, and assist victims. A total of 164 countries are party to the treaty including all NATO members, except the United States. No country has

joined the Mine Ban Treaty since Palestine and Sri Lanka did so in 2017. In June 2022, President Joe Biden set the US goal of ultimately joining the Mine Ban Treaty and realigned US policy with most of the treaty's core prohibitions. Countries that have yet to prohibit antipersonnel landmines should reconsider their position and join the international treaty banning them, Human Rights Watch said.

Other major findings from *Landmine Monitor 2023* include:

1. There were at least 4,710 new casualties from landmines and explosive remnants of war in 51 countries in 2022, including 1,661 deaths;
2. Syria, not a state party, recorded the highest number of annual casualties in 2022 (834) for the third consecutive year. Ukraine recorded the second highest number of casualties (608) followed by Yemen, a state party along with Ukraine, and Myanmar, not a state party, which each recorded more than 500 casualties in 2022;
3. Civilians made up 85 percent of all recorded casualties in 2022, while children accounted for half of civilian casualties where the age was recorded;
4. In 2022, global support for mine action including mine clearance and victim assistance totaled US$798.4 million, an increase on the $543.5 million provided in 2021. Ukraine headed the list of recipients in 2022, receiving $162.3 million;
5. Since the Mine Ban Treaty came into force on March 1, 1999, 33 states party have completed the clearance of all antipersonnel mines from their territory;
6. A total of 219.31 kilometers of contaminated land was cleared in 2022, resulting in the destruction of 169,276 antipersonnel mines;

Under the Mine Ban Treaty, 94 states party have collectively destroyed more than 55 million landmines from their stockpiles. Sri Lanka was the last state party to destroy its stocks in October 2021. Greece and Ukraine both possess stocks of antipersonnel mines but did not destroy any in 2022 and the first half of 2023. Greece said in June that it was transferring its remaining stocks to Croatia, where they would be destroyed over the next 18 months. Ukraine reported that storage sites where its 3.3 million PFM-series antipersonnel mines were once held had come "under air and missile attack" by Russia or were located in territories where fighting had occurred. Ukraine has requested time to conduct an audit and verification of the stocks.

"The prohibitions on antipersonnel mines that are enshrined in the Mine Ban Treaty are being put to the test, especially through the use of improvised explosive devices by non-state armed groups," Hiznay said. "Governments should ensure that adequate resources are devoted to carrying out the requirements of the Mine Ban Treaty so that the benefits of joining are clear to all."

3D Printing Rockets Could Revolutionize Industry
Source: https://i-hls.com/archives/121763

Nov 22 – Propulsion manufacturer Ursa Major announced its innovative 3D printing process for solid rocket parts, which is expected to make production cheaper and faster. The process is called "Lynx" and can be used for design and final manufacture. The company will begin by 3D printing motor cases and subcomponents for smaller systems, but believes it could be used for many other rocket parts in the future.

Founder and CEO of Ursa Major Joe Laurienti stated that the solid rocket motor production process will transform due to the increasing use of additive manufacturing, leading to an increase in the nation's ability to replenish its depleted stocks of weapons like the "Javelin" and the "Stinger."

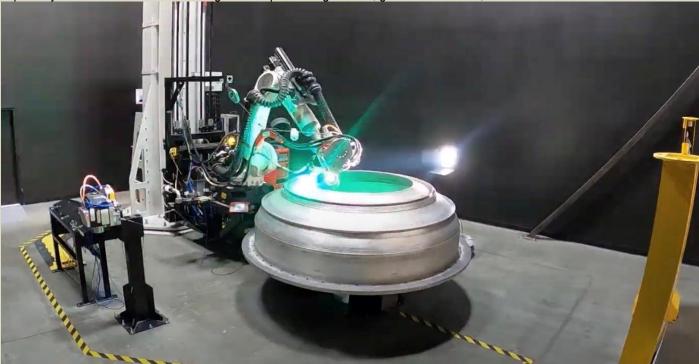According to Interesting Engineering, Ursa Major began developing the "Lynx" process by looking at the needs of the industry and seeing where there are bottlenecks that need fixing.

The Lynx process lets a company be very flexible in its production needs, switching from manufacturing parts for a certain rocket one day, and another rocket the next without hindrance or delays.

Laurienti explains that the 3D-printed design by Ursa Major will enable specific components to be fabricated together as a single piece, unlike the conventional approach, where different parts are made

separately and then assembled- resulting in fewer parts being needed, greater automation, and reduction in overall costs.

The company claims it can 3D print up to 50 small engine cases within three days, in contrast to traditional manufacturing processes that can take months. Ursa Major also developed multiple metallic alloys that are suitable for 3D printing.

The company reportedly plans on announcing the first system using "Lynx" by the end of this year, as well as another one early next year, and by the end of 2024, it will use "Lynx" to manufacture parts for up to four systems.

How Video Games Are Being Used by Foreign Actors and Extremists

Source: https://www.homelandsecuritynewswire.com/dr20231023-how-video-games-are-being-used-by-foreign-actors-and-extremists

Oct 23 – Video games are easy to exploit, and are being used by actors ranging from IS and Hizbollah for recruitment, to Russia, who use it to spread propaganda during the ongoing invasion of Ukraine. This according to a new report from Psychological Defense Research Institute at Lund University in Sweden.

Since the 2016 US Presidential election, many democratic governments have paid close attention to how foreign actors are using digital communication to further their agendas, in particular social media. Yet gaming platforms have been largely ignored, and now a new study from Lund University, funded by the Swedish Psychological Defense Agency, has identified up to 40 vulnerabilities within the gaming sphere.

"It surprised us that the gaming sector, a global industry with billions of users, has been largely overlooked by most Western nations. Currently, it offers an immersive and easily accessible arena for persuasion and

Myndigheten för psykologiskt försvar

propaganda for hostile states, organized criminals, and extremist groups", says Jesper Falkheimer, one of the co-authors and Professor of Strategic Communication at Lund University.

According to the researchers, there are several examples of video games being used as recruitment tools by terrorist groups from the beginning of the 2000s, with Hezbollah, Hamas, and Da'esh using video games for influencing different target groups. One early notable example is from 2003, when the video game *Special Force* was released by the Hezbollah Central Internet Bureau.

Video games have also been used for war propaganda, for example in the current war in Ukraine, where Russia have spread propaganda through Roblox, Minecraft and other games.

One example is the Ukrainian MiG-29 pilot known as the Ghost of Kyiv who gained significant fame on social media for taking down invading planes during the beginning of the Russian invasion of Ukraine. However, the pilot was fictional, and the footage used in some online videos was taken from the 2013 video game *Digital Combat Simulator.* Similarly, according to fact checks, a video claiming to depict the Israel-Hamas conflict was in fact footage taken from the game*ARMA 3*.

"Compared with social media, the gaming domain has insufficient policies and mechanisms to cope with information influence campaigns. Nor are there sufficient avenues for researchers, journalists, and the industry itself to better understand the degree to which gaming platforms are currently being exploited. In other words, not only do we not know how serious the situation is, we also lack the means to find out", says Jesper Falkheimer.

So what should be done to secure an industry that provides entertainment and communication for billions of users worldwide?

The researchers say that lessons can be learned from social media platforms, as they have already been under scrutiny for the same issues. For example, voluntary agreements such as the EU Code of Practice on Disinformation reveal successes and also missteps that then would not need to be repeated. Any countermeasures should be designed as partnerships between the industry, players, and governments in a spirit of dialogue aiming to avoid major threats to democratic societies, they argue.

"Freedom of speech and expression must always come first, much in the same way that the debate surrounding social media was framed primarily by this right. Raising awareness is the first step towards an open discussion on how to move forward with this pressing issue, especially given the current state of the world", concludes Jesper Falkheimer.

The Six Main Tactics Identified in the Study
1. **Reframing reality**, which includes disputing history, changing facts or disinformation about real-life situations, adopting gaming tropes in real-life situations, dehumanizing through gamification of real-life situations
2. **Projecting authority**, which includes techniques such as censoring and encouraging self-censorship in line with authoritarian norms and values, harvesting data and conducting espionage
3. **Hacking systems and phishing**, which refers to when threat actors use cyber capabilities to gain access to systems belonging to gamers, organizations, as well as the gaming industry.
4. **Interactive propaganda**, which means spreading both traditional and interactive propaganda through games, establishing relationships with players by forming in-game communities and radicalizing & mobilizing players
5. **Social propaganda**, including shaping shared cultures with gaming as a common thread, and the use of social functions to introduce propaganda and increase polarization & intolerance
6. **Psychographic targeting**, used by threat actors who use harvested data to better know, audit and understand individuals, groups, opinions and market segments. Harvested data can be used to many ends.

This New AI Tool Can Track Virus Variants
Source: https://i-hls.com/archives/121417

Oct 25 – Researchers at the University of Oxford and Harvard Medical School developed an artificial intelligence model that can predict new variants of viruses before they emerge, claiming it could have predicted mutations of the COVID-19 virus during the pandemic.

The model is named **EVEscape**- short for Evolutionary Model of Variant Effect. It combines a deep-learning model of how a virus evolves along with detailed biological and structural information about it. It is meant to help in the design of vaccines by studying how viruses mutate in response to the human immune system, with the University of Oxford saying this technology was "predicting the future".

According to BBC News, during the COVID-19 pandemic, the waves were driven by different variants of the virus that had undergone multiple genetic changes, mutations that can alter the virus's behavior and potentially make it spread faster or make it harder for our immune systems to recognize and fight off.

The research team described in an interview with the journal 'Nature' how the model works by predicting the likelihood that a viral mutation will enable it to escape immune responses, for example, by preventing antibodies from binding.

The model was reportedly tested with information that was available at the beginning of the COVID-19 pandemic in February 2020 and managed to successfully predict which SARS-CoV-2 mutations would occur and which would become most prevalent. The team reported that it also predicted which antibody-based therapies would lose their efficacy as the pandemic progressed and the virus developed mutations to escape these treatments.

Experts now hope the technology will help in prevention measures and the design of vaccines that target variants of concern before they become rampant.

Co-lead author for the study Pascal Notin said: "This work is of tremendous value, both for pandemic surveillance efforts, but also to inform vaccine design in a way that is robust to the emergence of certain at-risk mutations."

Is the Fear of Cyberwar Worse Than Cyberwar Itself?
Source: https://www.homelandsecuritynewswire.com/dr20231115-is-the-fear-of-cyberwar-worse-than-cyberwar-itself

Nov 15 – Cyberwar is a scary concept. The thought of the grid going down, markets tanking, and mass riots is chilling. Tom Johansmeyer writes in *Lawfare* that popular media and entertainment accounts of cyberwar would have us believing we're living right on the edge, with a few keystrokes enough to take the world to a dark place. "This alarmism has found some purchase in more sophisticated circles, which seems to lend credence to the belief that cyberwar is right around the corner, if not upon u," he writes, adding:

> But this hyperbolic characterization of cyberwar is likely a bigger problem than the threat of cyberwar itself. The problem is one of economic security.
>
> The global insurance market has a cyberwar problem. The industry doesn't understand the associated risks well, which has caused it to seek to avoid involvement with cyberwar altogether. By excluding cyber risks, the insurance industry buys into the culture of fear that has formed around cyberwar. This culture of fear has led insurers to require that their cyber teams hold extra capital out of concern that a major cyber conflict could devastate their balance sheets. This has to change. By refining its understanding of cyber-war risk, the insurance industry will be able to provide more insurance protection and make it more cost-effective. In the end, that would mean more insurance being provided and, as a result, greater economic security for businesses and society as a whole.

Johansmeyernotes that the global insurance market seeks to play a significant role in addressing cyber risk, although the industry's engagement with cyber risk is still in its early stages. The cyber insurance sector is still small by broader insurance industry standards, with only about $13 billion in worldwide premium and roughly $400 billion in notional protection outstanding (the amount of insurance protection companies have purchased).

Insurers have become quite adept at handling day-to-day cyber losses, such as isolated ransomware attacks and breaches: "Known as attritional losses, these are the sorts of claims insurers encounter and handle routinely, similar to slip-and-fall claims in liability classes of business and fender benders in auto."

> Systemic risk, by contrast, is more concerning. Also known as "cyber catastrophe" risk, it involves cyberattacks affecting a large number of companies at the same time, resulting in a significant and reasonably simultaneous aggregation of losses.
>
> Cyber catastrophe is analogous to hurricanes, earthquakes, and other natural disasters—in which many insureds (and insurers) are hit at the same time.

The reinsurance industry helps insurers address systemic risks outside of cyber, with more than $600 billion in capital allocated for reinsurance globally. This support has been slow to gain ground in the cyber insurance sector, though. Rather than purchase cyber reinsurance designed to hedge against the risk of systemic events, as insurance companies do for property catastrophes, insurers have been more inclined to use proportional structures, through which they effectively give a share of their portfolios to reinsurers. This means that they cede both attritional and systemic risk to reinsurers.

Among the largest and most concerning systemic scenarios for both insurers and reinsurers is cyberwar. There is a persistent fear that cyberwar is virtually uninsurable and needs to be excluded. Leading reinsurer Munich Re, which is also a leader in the cyber reinsurance market, says that cyberwar "risk transfer is not possible" because "its consequences are so large and wide-reaching that private industry simply is not able to bear such a ruinous risk."

"Cyberwar is a subset of systemic cyber risk, within the broader category of cyber risk," he adds. "Aside from war, systemic scenarios include, among others, cloud outages and attacks on centralized software vendors (Kaseya is an example)."

Johansmeyer concludes:

A healthy appreciation for the likelihood and potential impact of cyberwar could help improve how insurers and reinsurers model and price this risk, particularly as part of an effort to include coverage for cyberwar rather than exclude it. The industry's actuarial capabilities are robust; they just need to be deployed to better effect with regard to cyberwar risk. Using refined assumptions with lessons from the conflict in Ukraine could help insurers and reinsurers pair their actuarial models with a narrative of the events being analyzed. If they want to hedge against a $20 billion industry-wide insured loss from cyberwar, they should be able to explain the nature of the risk and how such a loss could arise. Essentially, actuaries should be given the chance to be actuaries, rather than see the risk dismissed by timid executives long before the models are built. Finally, reinsurers need to translate that accumulated knowledge and understanding into underwriting, pricing, and reserving (determining how much capital to hold for future losses) practices. Rather than succumb to fear, reinsurers should equip their professionals with the historical thinking, context, and data available—all of which exists, sometimes to the point of abundance. Done properly, irrational impediments to the flow of capital will fall aside, and the reinsurance market will be able to respond to the nature of the risk rather than to the popular portrayal of it. The natural consequence of this improvement in the treatment of cyberwar should meaningfully fortify global economic security. The United States has made an important bet on cyber insurance by making it a material economic component of the nation's cyber security strategy. If that bet is any guide, then it's clear that an improved flow of capital could be a powerful force in global cyber security.

Pro-Hamas Cybergang Develops New and Complex Infection Tactic

Source: https://i-hls.com/archives/121681

Nov 16 – This threat actor is now using an infection chain based on delivering a new initial access downloader dubbed IronWind, as was observed by cybersecurity company Proofpoint. The Gaza Cybergang, also known as TA402, Molerats, Frankenstein, and Write, has reportedly evolved in its tactics targeting Israel and other West Asian and North African government entities and is currently operating in the interest of the Palestinian Territories. The gang has recently acquired the "IronWind" initial access downloader, which is used to download shellcodes to infected systems. They have also adjusted their delivery methods to using XLL and RAR file attachments in their phishing campaigns, instead of the previously used Dropbox links.

Proofpoint researchers have been tracking the group since 2020, and report that the infection chain is very complex. Ever since July 2023, the gang used variations of Dropbox links, XLL file attachments, and RAR file attachments to make users download multifunctional malware.

Nevertheless, despite the current conflict in the region, Proofpoint hasn't observed any changes in TA402 targeting or seen any indications that their goals are changing.

According to Cybernews, TA402 has recently engaged in a phishing campaign using a compromised Ministry of Foreign Affairs email account to target West Asian government entities. The emails reportedly used economic-themed social engineering lures and delivered malicious links or files containing macros that installed three files, including the IronWind.

The IronWind files then start communicating with the control and command server that provides shellcode for the third stage of infection, which Proofpoint's analysis showed served as a multipurpose loader.

The researchers explained that TA402 makes its detection more difficult by using geofencing techniques. Even with the more elaborate infection chains, the group includes URLs that redirect to decoy documents hosted on legitimate document hosting platforms, if the geofencing is not bypassed.

Proofpoint researchers assess that TA402 operates in support of Palestinian espionage objectives with a focus on intelligence collection, and warn that the cybergang remains persistent and innovative, routinely retooling its attack methods and malware.

Russian Military Mulls Creating Special Units Armed With Mini-Attack Drones - Report

Source: https://sputnikglobe.com/20231021/russian-military-mulls-creating-special-units-armed-with-mini-attack-drones---report-1114378265.html

Oct 21 – Russia's cutting-edge unmanned aerial vehicles (UAVs), such as the Lancet kamikaze attack drone, have been wreaking havoc on Ukrainian forces in the special military op zone. Amid Kiev's botched counteroffensive, Russia's military has been inflicting manpower losses and obliterating NATO weaponry in enemy hands with surgical drone strikes.

The Russian Armed Forces are reportedly discussing the possibility of creating separate units armed with mini-attack unmanned aerial vehicles (UAVs).

"*There is an ongoing active discussion about creating separate units or attached units armed with mini-attack drones, which will allow to standardize the use of this type of weapon, increase its distribution in the troops and enhance combat effectiveness,*" an informed source told *Sputnik*.

It was added that in particular, there are plans to unify the tactics of using such mini-drones, as well as standardize the training of drone operators.

Drone warfare has been taken to an unprecedented scale amid the Ukraine conflagration. Mini-attack UAVs - mostly civilian quadcopters adapted for dropping grenades on the enemy or delivering hollow-charge shells to target armored vehicles - have become one of the newest areas of combat operations of Russia's forces in the special military operation zone. Such drones are utilized successfully by the hundreds, the source said, adding: "Today, such drones are an effective and very flexible means of destroying enemy personnel, their strongholds and armored vehicles on the combat front line. At the same time, the process of putting such quadcopters to use is usually spontaneous, based on the initiative of individual military personnel and their commanders. Accordingly, the tactics and usage density of such drones can vary greatly from unit to unit."

Russia's Ministry of Defense, military correspondents, and individual units have been actively publishing video footage showing the use of mini-quadcopters modified for combat purposes targeting the Ukrainian Armed Forces in the special op zone. The classic version of this type of weapon involves dropping grenades for an automatic grenade launcher or ordinary hand grenades from a *Mavic*-type quadcopter.

Another common option is an FPV (First Person View) drone with a cumulative warhead from a rocket-propelled grenade of an RPG-7 portable, shoulder-launched, anti-tank, rocket-propelled grenade launcher. In this case, the drone, together with the grenade, hits the enemy's armored vehicles with cumulative ammunition. Such weapons, while inexpensive, are nevertheless capable of successfully obliterating the most protected and durable of enemy combat vehicles on the battlefield, such as tanks.

Russia's Lancet kamikaze drone

The special operation in Ukraine has significantly transformed the vision of the place and role of certain weapons systems and military equipment in the Russian military, according to Denis Fedutinov, a leading Russian expert on unmanned aircraft. He noted that, to a large extent, this applies to small-sized multi-rotor systems, both reconnaissance and reconnaissance-strike, which had previously been underestimated. He added that feedback from the battlefield has been reaching the military leadership, prompting adjustments to the use of systems that have shown their effectiveness in practice.

"If these usage methods are generalized, supplemented, and eventually some kind of unified program for training operators is proposed, this will be the right step towards increasing the efficiency of the use of mini-drones in the military," Denis Fedutinov said. The expert also pointed out the need to adjust the procurement system for such UAVs, taking into account the experience accrued amid the ongoing special operation.

"It is clear that initially foreign-made civilian UAV systems will fail to meet certain canonical requirements. However, the choice between the presence of equipment, even if it falls short of some requirements, and its absence as such, I think, is obvious," the expert said.

As the Ukrainian Army drags on its futile attempts to reinvigorate a counteroffensive that has wrought huge losses in manpower and equipment for the Zelenksy regime, Kiev's military has been facing a formidable opponent in Russia's state-of-the-art Lancet loitering munition/kamikaze attack drone, capable of performing surgical strikes on the enemy.

Kamikaze drones are intelligent projectiles that can passively wait for hours looking for prey. After locating its target, the drone rushes towards it and the built-in warhead detonates, destroying the enemy. Kamikaze drones are cheaper than regular UAVs and smarter than cruise missiles.

The Russian Army uses Lancet drones in the special operation zone to target various Ukrainian military assets such as howitzers, air defenses, multiple launch rocket systems, as well as command and observation posts, and congregations of troops. Furthermore, a new modification of Russia's Lancet kamikaze drone is capable of hitting targets at a considerable distance, posing a threat to air bases of the Ukrainian Armed Forces (UAF), as US military news outlets have recently reported.

The Dangerous Mystery of Hamas' Missing 'Suicide Drones'

By Justin Ling
Source: https://www.wired.com/story/hamas-drones-israel-war/

Oct 21 – When Hamas launched its attacks against Israel on October 7, it unleashed a flood of rockets as cover, while militants streamed through holes in the fence surrounding the Gaza strip. One particular clip released by Hamas, played on news stations the world over, provoked a particular bit of paranoia: video of balaclava-clad Hamas fighters standing in a desert landscape, launching a line of suicide drones.

Amid the terror and chaos, the video seems to underscore a long-held fear that Hamas—with the help of Iranian technology—had developed the ability to conduct air strikes on Israel. What's more, these drones may prove more adept than Hamas' supply of rockets at thwarting Israel's sophisticated Iron Dome air defense system.

Hamas had been building this capacity for some time. In 2022, it touted its drone program with an ominous warning: Israel no longer had a monopoly on its skies. According to Hamas Telegram channels, roughly 40 suicide drones have been fired toward Israel since the war began earlier this month. Yet, besides some undated propaganda videos, there is scant evidence that these drones have actually been deployed against Israel—and, if they have, they don't appear to have done much damage.

Drone warfare has dramatically altered the dynamics in a number of recent conflicts—from Ukraine to Nagorno-Karabakh to Yemen—but not in the war between Hamas and Israel.

Why? The answer could have significant implications for people on both sides of the Israel-Gaza border.

Since the early 2000s, Hamas, which was elected to lead Gaza's government in 2006 and has held power ever since, has drastically scaled up its ability to hit targets inside Israel.

The earliest versions of its Qassam rocket were rudimentary: lightweight and capable of traveling just a few miles. In each successive generation of the missile, however, they became bigger, capable of flying farther, and equipped with larger warheads.

Over the past two decades, Hamas and Israel have engaged in a race—Hamas, to develop its offensive capabilities and extend its reach; and Israel, to frustrate those efforts as much as possible.

Like more than 20 non-state actors in conflict zones around the world, Hamas recognized that the drones could substantially upgrade its ability to wage war. Unlike its unguided missiles, which are designed to beat Israel's air defenses simply by overwhelming them, drones are considerably harder to intercept. They fly low and don't travel in a predictable, parabolic arch. As a number of countries have recently learned, thwarting an advancing drone—much less a number of them—is a tricky problem to solve.

Unlike Russia or Ukraine, Hamas couldn't source military drones through an open tender. So it tapped Tunisian-born aerospace engineer Mohamed Zouari to, in the early 2010s, design Hamas' first fleet of operational drones and stand up an industry to produce them. They called the first model Ababeel1, which was very similar to an Iranian drone and had three different models. One version was designed to conduct surveillance, one to deliver small munitions, and the third was a suicide drone.

Israel began targeting Hamas' drone program before it even produced results, striking a production facility in 2012. But the program continued.

Around that time, there were ample signs that Hamas' domestic production capacity had not grown as it had hoped. Small—probably commercial—drones were dispatched into Israel from Gaza in 2012 and 2013, according to reports of a talk by an Israeli air defense official. Israeli jets and anti-air systems soon began to intercept the drones over Israeli airspace. Around 2014, Hamas made headlines after claiming it had penetrated deep into Israeli airspace, flying over Tel Aviv. But analysts say, despite Hamas' insistence, the drones were not locally made in the Gaza strip: They were likely the Ababil-1, a product of the Iranian drone program.

This picture taken on December 14, 2022, shows a view of an unmanned aerial vehicle (UAV or drone) of Hamas flying above Gaza City during a rally marking the 35th anniversary of the group's foundation, in Gaza City.Photograph: Majdi Fathi/Getty Images

In 2016, Zouari was assassinated in his hometown of Sfax, Tunisia, in what has been described by Tunisian investigators as a multiyear operation. While Israel did not admit responsibility for the killing, then-defense minister Avigdor Lieberman said only that Israel "will continue to do in the best possible way what we know how to do—that is to protect our interests." Fadi al-Batsh, who had written papers on drone technology and who Israeli media alleged was part of Hamas' drone program, was assassinated in 2018. Lieberman suggested that al-Batsh was killed as part of a "settling of scores among terrorist organizations." In January 2022, the Hamas-led Gaza Interior Ministry arrested a Gaza resident for al-Batsh's death and alleged the man worked for Mossad, Israel's intelligence agency.

As Hamas seemed to struggle to establish its own domestic drone industry, other non-state actors began showing just how devastating these unmanned aerial vehicles (UAVs) could be. The Islamic State leveraged a huge number of commercial and hobbyist drones to conduct reconnaissance and drop grenades on advancing forces. Houthi rebels in Yemen began deploying sophisticated attack drones in its fight against the state military—analysts noted that, despite claims that these drones were locally made, they bore striking similarities to Iranian attack drones.

Faced with the looming possibility that Hamas could leverage some of the same techniques, Israel began running drills, practicing with fighter jets to intercept UAVs. In February 2014, it announced a prototype of a new air defense system:

The "Iron Beam"—a directed energy weapon which, it hoped, will be able to track and destroy incoming drones.

In 2021, Hamas again sounded the trumpets over its supposedly game-changing drone program. This time it unveiled a whole new model: the Shehab. The suicide drones starred in slickly made propaganda

videos and have been lionized for years in Hamas communiques. Yet they proved woefully ineffective in the field. Some were intercepted by the Iron Dome (as was one Israeli reconnaissance UAV) while others were shot down by F-16 jets. Video footage and unverified claims from Hamas suggest that one drone may have exploded near an Israeli chemical plant in May 2014—but appeared to do little to no damage.

Despite the program's Iranian influence, Hamas claimed some of its drones were "locally made." It said in a May 2022 press release that its drone program had made major progress, and it touted these new drones as a "turning point" for its fight against Israel. In September 2022, Hamas inaugurated "Shehab Square," a public square featuring a model of the suicide drone on a pillar.

Despite all this fanfare, a December 2022 report from the International Center for Counter-Terrorism (ICCT) took a dim view of Hamas' drone program. "Hamas has not demonstrated any ability to regularly use drones successfully," the researchers wrote. As to why Hamas would continue investing in a capability that has such a poor record, the ICCT surmised that "the association of drone technology with military status may explain the group's continued employment of drones."

What's more, the ICCT noted that Hamas' technical failures seemed to be compounded by a lack of strategy or plan for what to do with these drones. The paper suggested that Hamas may lack the technical know-how to use these drones effectively, that it may be ineffective against Israel's defenses, or possibly that "the group is more concerned about being seen using drones than using them effectively."

"I think it's surprising that Hamas didn't use more commercial and tactical drones in its invasion," Paul Lushenko wrote on Twitter in the hours after Hamas' October 7 assault on Israel. "For all the concern of an Israeli intelligence failure, I think the lack of Hamas' use of drones suggests poor organizational learning."

Lushenko is a faculty professor at the United States Army War College and an expert in the emerging field of drone warfare. Speaking with WIRED, Lushenko says there's little sign that Hamas, despite their usual bragging, actually managed to put its drone program into action. "We haven't seen the evidence."

Certainly, Hamas made some targeted use of several over-the-counter drones and quadcopters—similar to how the Islamic State deployed the UAVs during its brief control of a proclaimed caliphate. Videos reportedly released by Hamas purportedly showed drones dropping explosive devices on Israeli communications towers and machine gun positions near the Gaza border. These UAVs pose a particular challenge because they are often too small and too nimble to be successfully intercepted. Instead, Israel says it is stepping up jamming efforts to break the link between those drones and their controllers within Gaza.

Beyond those short-range and lightweight UAVs, however, Hamas' use of its homemade, Iranian-inspired suicide drones seems to be not much more than bluster.

The much-broadcast Hamas propaganda video of its fixed-wing UAVs being fired does not, in fact, show part of the assault on Israel. It was filmed before the attack—the full video shows the suicide drones crashing into a fake Israeli outpost—the explosion knocking over cardboard cutouts, as a blue-and-white Israeli flag flaps nearby.

Hamas Telegram channels have claimed repeatedly in recent weeks that their drones struck positions in Israel but offered little in the way of visual evidence or specifics. One supposed strike was conducted on "a parking lot for vehicles and personnel east of Gaza." There has been no confirmation of any of these strikes or claims of any damage inflicted.

The Israel Defense Forces declined WIRED's request to comment on whether it had intercepted any of these drones, writing that "the IDF is currently focused on eliminating the threat from the terrorist organization Hamas."

There may be two possible explanations for this apparent lack of impact. One is that Hamas has opted to stockpile these drones, saving them for an anticipated Israeli ground operation. The other is that, like past attempts, Hamas' drone program has simply failed to launch.

The first possibility could pose an enormous challenge for Israel. As we've seen on both sides of the Ukraine-Russia war, drones have substantially changed the reality on the ground. While analysts say Russia has used Iranian-made kamikaze drones to attack Ukrainian critical infrastructure, Ukraine has responded with Turkish-made Bayraktar TB2 drones to hammer Russian convoys and defensive positions. Smaller quadcopters have given both sides unparalleled visibility behind enemy lines and have proved remarkably deadly in urban warfare. If Hamas is sitting on a reserve of these drones, to be used if Israeli forces cross into Gaza—where they will not have the protection of the Iron Dome—it could be highly effective at frustrating a possible ground assault.

"It's not uncommon for non-states [actors] and states to not use all of their decisive weapons all at once," James Patton Rogers, executive director of the Cornell Brooks Tech Policy Institute, tells WIRED. "Will this be something that happens in the coming days and weeks? Is this something that was deliberately held back en masse from being launched against Israel?"

The fact that Hamas has, on dozens of occasions over the past two years, fired these drones toward Israel with little to no effect suggests that its reach may have extended its grasp. "We don't know the full impact of those yet, if there wasn't much impact," Rogers says. "Did they do anything more than the rockets or the mortars would do? Were they able to penetrate the Iron Dome more than a mortar or a rocket?"

Normally, these loitering munitions are more effective at beating missile defense systems, as they tend to fly low and slow, hugging the ground. But given that Israel has one of the most advanced air-defense

systems in the world, Hamas may simply not have had the time, capacity, or skill to adequately learn how to overcome the Iron Dome. "I do think it's a bit too early to tell in this one," Rogers says.

Lushenko adds that, even if these drones do very little physical damage, the threat they pose will still loom large. "They really have a psychological effect."

This is the World's Largest Quadcopter Drone, and it's Made of Foamboard

Source: https://i-hls.com/archives/121465

Oct 29 – A team of engineers from The University of Manchester created and flown the world's largest drone- the Giant Foamboard Quadcopter (GFQ), which is unlike any other drone worldwide thanks to its innovative design, and the fact it is made from foamboard. The drone has a wingspan of 6.4m and weighs 24.5kg, which is just under the legal limit for drones. It has four rotors, each powered by an electric motor, and can fly by itself using an on-board computer.

The drone's innovative design makes it stand out- It is made from foamboard (a cardboard type with a foam core and a paper skin) that is cut into pieces using a laser and glued together by hand to form the 3D structure of the drone. Its four arms are hollow boxes that can be detached for easy transport.

According to Interesting Engineering, the engineers behind the GFQ wanted to show that foamboard can be used to make complex and large aerospace structures that are cheaper and greener than the carbon fiber commonly used for drones, and expressed their hope that the project will inspire future designers to think about sustainability in a new way.

Despite the GFQ not being built for any specific purpose but to demonstrate the potential of foamboard, the engineers suggest that similar drones could be used for carrying heavy loads over short distances or for docking with other drones in mid-air.

Lecturer of Aerospace Systems at The University of Manchester Kieran Wood, who is the one to fly the GFQ, explains that the first moments of flight are crucial for these types of multi-copter drones, and that many hundreds of things must be taken into account. Nevertheless, if everything is designed and built well, success is expected.

The engineers are reportedly now working on improving the design and making it more efficient and stable, and also plan to test it outdoors to see how it performs in different weather conditions.

How Hamas innovated with drones to operate like an army

By Kerry Chávez, and Ori Swed

Source: https://thebulletin.org/2023/11/how-hamas-innovated-with-drones-to-operate-like-an-army/

Nov 01 – Hamas' recent attacks on Israel have shocked many with their brutality and disregard for the norms and laws of armed conflict. They have also surprised experts with their complexity and coordination, involving simultaneous linked and layered operations on land, air, and sea. While Hamas is a terrorist organization—and behaving like one—it is fighting more like a state military force.

Small, tactical drones are a central factor in its proficiency, which the group deployed in sophisticated and multifaceted ways during the invasion. Unmanned aerial systems (UAS) constituted the first wave of attacks to eliminate Israeli observation towers, cameras, and communications. This initial challenge was meant to blind, deafen, and confuse the Israeli defense.

The group also dropped munitions from UAS on tanks, apparently well aware of how to target them for disabling, as well as soldiers and emergency responders. Swarms of drones were also deployed to attack naval vessels and energy infrastructure.

Alongside thousands of rockets, the group launched volleys of a new loitering munition—also known as a suicide drone—called the Zouari, named after the late Hamas engineer and drone pilot, Mohammed Zouari. Tactical armed drones were captured from felled raiding units that stormed across the border. Palestinian Islamic Jihad, one of Hamas' key partners in the region, even seems to be running a devoted drone operations room. Since the attacks began, from near and far, drones have been crucial for achieving strategic and tactical objectives.

None of these individual tactics with small drones are new. While many are citing lessons learned from combat in the Russia-Ukraine War—and they should—there are ample, earlier precedents from violent non-state actors. The list includes the Islamic State, Hezbollah, Palestinian Islamic Jihad, Ansar Allah (the official name for the Houthi movement in Yemen), al-Qaeda, the Taliban, the Haqqani network, many Syrian rebel factions, several Iran-sponsored terrorist organizations in Iraq, and more. In other words, Hamas didn't learn how to use drones from the Russians and Ukrainians; the Russians and Ukrainians learned how to use small drones from violent non-state actors.

Imitators and innovators

Terrorists imitate—they watch what works, study demonstration points in other conflicts, and diffuse knowledge through their dark networks. For those who study terrorists, none of the tactics in this fresh war are surprising.

But terrorists also innovate. Hamas has done just that with drones in two ways: with quantity and with quality. First, the group is simulating mass with small, off-the-shelf drones that can be deployed in multiple ways, including being equipped with bombs and repurposed into weapons of war. Like the thousands of rockets that were able to overcome Iron Dome by their sheer quantity, commercial UAS provide a cheap, crude air force at scale to monitor, harass, and attack enemies.

Second and more substantively, Hamas is pioneering a new combined arms model with commercial drones that is unusual for terrorist organizations. In combined arms approaches, multiple units with different capabilities work in concert, amplifying the impact of their attack. Drones are a key component of this approach and are, thus, a force multiplier. By using UAS in tandem with, and in support of, conventional forces and platforms, Hamas is demonstrating a capacity to field a multidomain force against a stronger adversary.

Some of this capacity stems from Iran's sponsorship, which provides resources, doctrine, and training.

This support is further bolstered by lateral ties with Palestinian Islamic Jihad in Gaza, Hezbollah in neighboring Lebanon, and other Iranian-affiliated or anti-Israeli groups. Nonetheless, drones are a critical part of the picture of how Hamas has leveled up in capacity—and it will not go unnoticed.

A thousand knives

Many are speculating on the global implications of the war, including the possibility of additional battlefronts, an influx of foreign fighters, backlash against Western support, and even a more widespread war in the Middle East if Israel and Iran face off directly. One immediate implication, however, is the powerful demonstration of the prowess terrorists can attain with simple drones.

The last time a terrorist organization pioneered a new model of warfare with commercial drones, it was the Islamic State. Its notoriety and brutality attracted massive media coverage, which also made it a role model in terrorist circles. The group attained prominence for its ability to leverage cheap, effective solutions, culminating in pseudo-state power. Commercial drones were a key component of this savvy strategy. The Islamic State used them for propaganda to assert sovereignty, intimidate, and recruit; for intelligence, surveillance, and reconnaissance; during real-time battles to coordinate combat; to improve targeting with other platforms; and for weaponized attacks, including flying in large clusters that can overwhelm adversaries. It took an international coalition to degrade the organization, but its legacy as a drone innovator lives on.

Now, in a highly publicized moment, Hamas is exhibiting another innovative iteration that will likely proliferate across the terrorist underworld. Hamas enjoys legitimacy among some state and non-state actors. Consequently, it will be more difficult to disrupt signals to other violent non-state actors conveying the effectiveness of its approach. Rather, its massed and combined arms approach with small UAS will be seen as a winning one that many terrorists will aim to imitate. Contending against avid violent non-state actors in irregular warfare is already a challenge and will be all the more so as terrorist groups innovate affordable ways to fight like states.

Kerry Chávez is an instructor in the Political Science Department and project administrator at the Peace, War, and Social Conflict Laboratory at Texas Tech University. She is also a nonresident research fellow with the Modern War Institute at West Point. Her research focuses on the politics, strategies, and technologies of modern conflict and security. She partners with several policy-making and private industry groups in efforts to stay on the leading edge of UAS threats.

Ori Swed is an assistant professor in the Sociology, Anthropology, and Social Work Department and director of the Peace, War, & Social Conflict Laboratory at Texas Tech University. His scholarship on nonstate actors in conflict settings and technology and society has been featured in multiple peer-reviewed journals and his own edited volume. He also gained 12 years of field experience with the Israel Defense Force as a special forces operative and reserve captain, and as a private security contractor.

Threat in the sky: How cheap drones are changing warfare

By Sara Goudarzi

Source: https://thebulletin.org/2023/11/threat-in-the-sky-how-cheap-drones-are-changing-warfare/

Nov 06 – On October 7, in a surprise attack, Hamas penetrated Israel's famous air defense system, the Iron Dome, using small, relatively inexpensive commercial drones as part of a larger assault that killed more than 1,400 people and sparked an ongoing conflict that has left thousands dead and injured. Among other actions, the drones disabled the surveillance and observation capabilities of Israel's watchtowers along the Gaza border.

Although drones have been around for more than a century and featured prominently in combat for several years, until recently their high price tag meant only countries with hefty defense budgets like the United States and Israel could afford them. Large-scale repurposing of commercial drones was first used in the conflict that began after Russia's invasion of Ukraine in 2022. This, experts believe, became a blueprint for Hamas militants in their attack on Israeli military infrastructure early last month.

To better understand the history and evolution of drones and their use in modern warfare, I spoke to Arthur Erickson, the CEO of Hylio, a commercial drone company, and Dominika Kunertova, a senior researcher at the Center for Security Studies of ETH Zurich, the Swiss Federal Institute of Technology. They explained how the proliferation of cheap consumer-grade drones are altering the abilities of entities with smaller military budgets and changing the nature of conflict, as we know it.

Sara Goudarzi: President Obama's use of drones in the late 2000s was controversial and sparked debates. But pilotless aircraft were nothing new. How have drones factored in wars over time?

Arthur Erickson: Drones were first created as early as the early 1900s when they would put basic radio transmitters on top of balloons. The first use of drones in warfare—in the '30s or '40s—was mostly

intelligence gathering, such as flying over the enemy's trenches using rudimentary camera and radio systems. For the past say 30 years, "modern" drones have been mostly the exclusive tools of very powerful advanced militaries. Like you mentioned, Obama conducted several drone strikes and killed a lot of people. But what's different in the past five years is the explosion of consumer-grade, little multi rotor, drones that are only 10, 20, or 30 pounds and can be operated via cell phones. They're easy and cheap to build. And it's been a great leveler for the battlefields because now small insurgent groups that aren't multitrillion dollar states have access to these drones, which they can use as makeshift guided missiles. They can launch attacks that are actually very difficult for even advanced missile targeting systems to counter because the Iron Dome, for example, is built to counter traditional missiles that go from point A to point B in an arc. These little multi rotors drones can travel in different directions. So, they're really hard to intercept and predict. It's given these small military groups an outsized ability to punch up above their weight class.

Dominika Kunertova: Drones are as old as the Air Force. If we take the clinical definition of some flying aerial craft without humans on board, we can talk about the incendiary balloons Austria flew over Venice in the 19th century. The true pilotless drones were first developed in the First World War, but never directly used in the battlefield until Israel's 1980s war against Syria.

As Arthur mentioned drones were an important addition to armed forces in terms of intelligence gathering. There were remote radio-controlled drones containing primitive cameras in the 1950s, which were then turbocharged during the Vietnam, and then the Iran-Iraq, wars. So aerial photography was the drone's job. What's changed with this modern era is not just the drone technology that's matured and become more reliable, but also the payload (or what it can carry in terms of sensors) has matured. The first real-time transmission of video arrived in the early 1990s with the Predator that was deployed in Bosnia, and the first drone strike in our modern understanding was during Operation Enduring Freedom in Afghanistan in 2001. I concur with Arthur that the drone market was dominated by Israel and the United States—big, capable states with a large industrial technological base. Now, the development, and introduction of, smartphones has also reduced the cost of the control devices and sensors. So, since the mid 2000s, hobbyist drones have changed how accessible the drone technology is, and the versatility of the platform itself.

Goudarzi: How are drones being used in the conflict between Russia and Ukraine?

Erickson: Again, you have the division: You have Russia and Ukraine at the highest level using sophisticated drones, which are more airplane style—larger aircraft that can fly for sometimes more than 10 to 20 hours conducting mostly surveillance gathering via high-resolution cameras with the ability to read a license plate from 30,000 feet up. They're using that for high-level strategic planning. But on the ground, you've got guerilla style warfare with these little squads, or small groups, left to their own devices. That's how this war is very bottom up and chaotic. So, a lot it is left to improvisation, especially on the Ukrainian side where they're fighting a resistance battle. These squads on the ground are using consumer $1,000 drones and sticking rudimentary fixtures onto them to drop grenades and such and doing a fair amount of scouting as well. I would argue that the small consumer drones are more impactful right now. Because information is information. The differential between a satellite image for high-level strategic decisions and high-res drone footage isn't so different anymore.

Kunertova: From my perspective, what makes the war in Ukraine different is when we contrast it with the image of a military drone that we had from the previous era. What's different is how the technology evolved and is applied, and the type of the war. Those large drones were deployed in areas where the coalition forces basically had control of the airspace and could fly large aircraft for hours for reconnaissance missions and then shoot missiles directly from the drones. But the logic behind deploying them was to avoid deploying troops. So, the drones were the face of remote warfare, to protect the lives of soldiers.

But in the war in Ukraine, no one is controlling the airspace, and you have this influx of very cheap commercial drones that can basically do the job of delivering ammunition without depleting the axillary shells for instance. So, the driving logic is not to save lives but to reduce cost. The drone enables a cheaper delivery of explosives and of surveilling the battlespace. What is important is that those large drone platforms are operated from control stations sometimes thousands of kilometers from the actual war zone. But in case of Ukraine, the individual foot soldiers who have a better understanding what's going on the ground can directly operate that small platform from a radius of two to 10 kilometers. So really drones are live streams of the battlefield. That's how the use of drones in war zones changed since 2022.

Goudarzi: Dominika, I remember from your previous article in the *Bulletin*, you had mentioned that drones are also used for social media campaigns in Ukraine.

Kunertova: Yes, for psychological purposes, on the one hand for intimidation of the enemy. On the other hand, because you can have quick access to livestream or early photographic video documentation of the battlefield you could just upload it on the internet or social media. So, they're the connectors in communication systems; that's an important part of drone use right now. What really changed is that before when drones were used for reconnaissance missions, they collected the information, had to come back, and then the information was analyzed and turned into intel. Then the operation could continue but now everything is happening almost at the same time. There is no delay.

Goudarzi: How are drones being used in the current Israel-Hamas conflict?

Kunertova: From what we know about the initial assault is that Hamas used drones to go across the Israeli controlled borders. What is important to me is that they were part of a larger combined assault that included

ground forces and rockets. But these drones were specifically used to attack the communication infrastructure on watchtowers, the gun turrets, and to disable the surveillance and observation part of the of the borders. The second aspect that is very important is that even though Hamas has been using drones for almost 10 years, it was the first time that they demonstrated the skill of navigating drones to drop grenades on attack. This is something that they must have seen in Ukraine. So, the two things that stood out to me were that drones were deployed as part of a larger assault to overpower Israeli defenses and drones were navigated to drop explosives on armored vehicles.

Erickson: I'll just add that Israel is playing by different rules. They have their hands tied in the sense that they can't just go in and start dropping predatory strike missiles on every building, because there would be too many casualties and that's not what they're trying to do. For Hamas, these small grenade drones are not even necessarily inflicting casualties but keeping the Israelis on their toes because it's like a jab in a boxing match. A jab isn't going to knock the opponent out, but it's always there to knock them off balance. So, the IDF [Israel Defense Forces] doesn't know from where and when these small attacks come. Even if it's just minor damage, or a handful of people get hurt, it's still enough to just throw everything into chaos in terms of planning and trying to catch their breath. So, it's being used as a constant bombardment and stimulation overload against the IDF.

Goudarzi: When was the first time Hamas used drones and how were they using them?

Kunertova: From what I know from the NGOs and watchdogs who have been monitoring this, the first time Hamas sent a drone to Israel was around 2014, and the first drone that carried explosives for them was in 2016. They were basically using them in the same in the same way as rockets.

Goudarzi: Which side has more of what kind of drone?

Kunertova: The fact that Hamas hasn't used that many drones so far to me would indicate that they don't have that much to spare. Hezbollah has more drones—the US intelligence agencies estimate around 2,000. So, Hamas by logic has less than that.

Erickson: Logically, based on funding, Israel is going to have the big expensive drones. Hamas is going to use the small ones in Israel based on just the different tactics and goals that they have. Israel probably isn't relying on the small consumer-grade drones that much because that's not what they're doing. They're not trying to sow confusion and discord against an organized opponent. They're probably using the smaller drones for scouting to clear a building or see around the corner, but that's probably pretty much it from the Israeli side. What do you think Dominika, is there a worry on Hamas's part about their drones being trackable? Because Hamas right now is fighting a guerrilla war where they've got these tunnel systems underneath the city. So maybe they're worried that if they're using these consumer DJI drones that China might be relaying to Israel information, such as their positions, or that Mossad or intelligence agencies are hacking them.

Kunertova: That's interesting because I was thinking these small drones used by Hamas is a real challenge for Israel, especially in urban warfare where they can be hiding in buildings and suddenly attack from through windows or doors. But that's a good point because all of them are emitting certain signals. So, then the issue becomes who is quicker.

Erickson: You can just launch it from a building and then quickly run and it doesn't really matter if your position's exposed. But they, I would guess, have some sort of protocol to not use them at home base or sensitive areas.

Kunertova: Or however, Iran will configure them.

Goudarzi: How is each side obtaining their drones?

Kunertova: Israel is one of the first movers as we call them in the drone industry. They've been developing drones themselves since the 1980s, even earlier, and so I don't think they will have any problems getting drones. What's more important for them is to keep the Iron Dome functional by having enough projectiles to protect the territory and shoot down hostile drones. There are loitering munitions that Hamas is using with Iranian technology traces. But as I mentioned earlier, Hezbollah is the one that is more important in terms of drone technology. So, if Hezbollah is opening another front in the north, they will be the ones challenging Israeli control of the airspace there.

Erickson: Iran is allegedly providing Hamas with some of the higher tech drone technology, as well as missiles. But there are hundreds of thousands, if not millions, of consumer-grade DJI drones just floating around the world. The used market is huge. So, Hamas militants could very easily just have a front and go buy them in Egypt or elsewhere and sneak them over. There's a lot of those coming in from various black markets, or just normal channels, into Israel and Gaza.

Goudarzi: How has the evolution of drones altered the conflict between these two groups over the years, if at all?

Erickson: Dominika brought up a good point that I hadn't really thought of, but the social media element or the information war element to this is really important. What you see Hamas trying to do all over the news is muddy the water. Both sides are trying to engage in PR campaigns that make their side look better. But you have Hamas using camera drones to livestream footage and basically say, "look at this missile attack by Israel." But even if it might not necessarily be true, you have these visceral images of flying over that famous hospital attack site, showing the carnage on TikTok or other platforms, which is creating this whole stir. That's altering the dynamics besides just the conventional warfare aspect of the drones. The ability to transmit information is changing the important undercurrents

of who's backing who. Meaning, which third party countries are going to have to publicly support which side. That might be more influential overall than the actual ballistic element.

Kunertova: Exactly. Now, it's easy to access information. So, who is controlling the strategic narrative, or the message of the whole war, is really important. Drones are a very easy way to be the first to spread information. Then it becomes very difficult to counter or explain.

Goudarzi: Are there specific examples of that throughout this conflict?

Erickson: The hospital: I saw a lot of drone footage of flying over the parking lot over the past few days on X (formerly Twitter). And it's difficult for a normal person to know if what you're seeing is from this conflict or not. It's clearly some battlefield as being videoed by a drone, but it could be Ukraine for all I know. It's a bombardment of this visceral footage that's supposed to just get you not thinking about the logic of the imagery but provoke raw emotion.

Kunertova Also I saw videos of the Hamas drone with a camera filming its own attack on the watchtower. So, it's also used for intimidation effect, as in "look what we are capable of doing with such low-tech platforms."

Goudarzi: You both touched on this a bit—such as how drones are leveling the playing field in some ways between the large military complexes and smaller groups—but how are drones changing the economics of war? How will they change the economics of conflicts as we move forward?

Erickson: The playing field has been thoroughly leveled. The Iron Dome was amazing and basically indestructible up until say, eight or 10 years ago. Now drones pose a real threat of penetrating the Iron Dome very regularly. There's an outsized ability for the small groups to attack bigger foes and I think it's going to come to a head. It's untenable.

These drones are dangerous, cheap, and easy to deploy. So, there might be more and more controls over drones in the years to come following conflicts like this, where it's going to be a lot harder for a normal person to just buy a camera drone. That's because there's just no good technological, or economic way to counter this thing. You've got these anti-drone systems, which can spoof GPS and land the drone, you've got microwaves that can fry the electronics. But even with those systems, if you send say 50 drones, it's really hard to take them all down. So, I think we're going to start to see an overall worldwide banning or a lot of regulating of these drones. It's like the Wild West right now.

Kunertova: I don't see the development in the same way as Arthur because there's just too much interest in the drone market involving private actors that have commercial interest. So, from this perspective, I don't think there will be a viable way to ban drones. Also, the militaries themselves are interested in using small drones. The war in Ukraine caused a surge in procurement of loitering munitions, small reconnaissance drones, for regular armed forces. And while in the past decades, there were many ethical and legal issues surrounding drones, now the public is engaging in dronations, where they are supporting, and contributing to, the Ukrainian forces to acquire them. So, I believe the image of these drones have changed. Also, regarding the economics of war: Not only is the drone itself getting cheaper and more accessible, but also training is almost nonexistent. Drones are easily replaceable, and they can be used to increase precision, which means there's less waste of artillery shells that don't strike target.

Erickson: I agree. I don't think they can ban them, but you might see movements to try to do that. I don't personally support that either. As a drone entrepreneur, I think the good outweighs the bad. But I wouldn't be surprised if people try to impose controls. It's like the classic gun control argument. There's a lot of them out there and it's going to be hard to put the genie back in the bottle.

Kunertova: But they can control the functions. Maybe that's the way to go.

Goudarzi: Which brings me to my next question: With the proliferation of consumer-grade drones and compartments that are off the shelf, what would prevent manufacturers from altering the hardware or software that would compromise how a drone is used?

Erickson: You're touching on a good point. You can make it a lot harder, which is going to have a macroscopic effect to reduce overall bad actors from using drones because you can stick things like geofencing into your programming. So, you could for example say, this DJI drone can't be used anywhere within 500 miles of Gaza. There are ways around that. But it does require more knowledge and the ability to mess with the electronics and software on the drone itself. There's a point where most of the drones on the market are going to have SIM card connectivity. So, a lot of the ones that just hit the market are going to be talking back to home base, like DJI or Hylio headquarters. And you could in real time monitor and see what a drone is being used for and turn it off. But of course, there's ways around that.

Kunertova: Exactly. There are always some smarter actors who find a way around. This was the case of using DJI drones in Ukraine, that China would track the use of these devices and then sell the information to Russians. Then there were manuals on the internet showing how to overcome it, which was basically to not connect to the Chinese cloud, but instead use local data so there wouldn't be any server communication.

Goudarzi: As you both mentioned, some of the earliest drones were surveillance drones. Now we have surveillance drones as well as killer drones. Which, in your opinion, is more dangerous or useful in battle?

Erickson: I think you need both. Going back to the boxing analogy, you can't win a boxing match with just your left hand. You need your left and right hands. So, I think they're inextricable from one another personally.

Kunertova: I agree. An unarmed drone doesn't mean it's not dangerous. Because if they're collecting data, they're constructing the targets that the missiles are going to hit.

Erickson: If I could lean one way, I'd say the information gathering drones are probably more important because they work in conjunction with traditional artillery and can right now do more damage. That might change in the future. If drones get to a point where they can carry significant payloads or we micronized a nuclear bomb, for example, that could be carried by a cheap drone to the middle of a city center. Then that would be more impactful, of course.

Goudarzi: Can you further discuss how that might change in the future?

Erickson: I think smaller, but more deadly, payload packages are going to change the game. If you could just fly up a 30-pound drone with a little nuclear bomb on it into a subway station, it would be untold, unparalleled devastation. That would completely change the dynamics of everything. I hope we don't get to that point because micronized nukes, which don't really exist yet are hard to come by. But maybe in 100 years they're not and maybe that's a possibility.

Kunertova: How about chemical weapons? That's a bit more accessible.

Erickson: Or taking out a power grid, right? You don't even need necessarily a big bomb for that, but just one well-placed drone with a little explosive or just creating a short circuit in some transmission lines and knocking a country's power off, or at least some regions, in combination with other attacks.

Kunertova: But you know, I always think that when people are musing about these super sophisticated swarms of drones that are communicating with each other to attack, the most efficient way doesn't even have to be that sophisticated. If you have a large quantity of drones, you can overpower the defenses even if they're based on jammers. If each attacking drones is operating on a different frequency, then you need more jammers to take those drones down. There are many possibilities if the actor knows what the weaknesses of its opponents are.

Goudarzi: What are some ethical issues surrounding drones in warfare that we're seeing now and what are the some of the ones that we should be concerned about in the future?

Erickson: Bad actors. If someone hits up my company's website, for example, and gives a fake name, but their location is in the Middle East, in Israel or Gaza, then we know that drone is probably not going to be used for what we advertise our drones for, which is agriculture. It is probably going to be used in the conflict somehow, intentionally, or unintentionally. Let's assume a farmer buys a drone for farming but it gets co-opted by Hamas or some other militant group. There can't be moral absolutism. If you accidentally sold a drone one time that got used for bad things that doesn't make your whole company evil. But I think systems in place matter and there's a responsibility for us to try to vet the customer base. Commercial drone companies should stay in the commercial sector, and should really try to avoid their drones being used for unintended military applications. It's a different story if you're a company that makes military drones. That's your market. But I think the onus is on us, commercial operators, to try to limit the bad uses of drones for either side, and for violence in general. That's not the mission of my company. So, I try to make sure that doesn't happen with our products.

Kunertova: Do you have any end user guidelines for instance when you're selling drones? Because it's really difficult to control what the individual is going to do with the drone. It's not like in the traditional defense markets when arms export is state controlled and there are clauses that you can use it in only for that purpose, and you need permission if you want to resell it and such things. So, it gets tricky, right?

Erickson: Super tricky. We have end user license agreements but of course, that doesn't matter to Hamas. So, there's only so much you can do. That's why it is important that there is some level of vetting and that becomes an ethical issue because who are we to decide who can and can't use our products. But you must try to use your best judgment. Obviously, we're not going to be perfect, but you just try to keep them out of active conflict zones, to reduce the overall harm.

Kunertova: if I may add to this aspect of drone warfare: In the past with the counterterrorism operations, the use of drones was challenged on ethical and legal grounds because of the dubious use of force outside official war zones. Some critical voices were saying that they're not drone strikes, but assassinations and the targets themselves under the so-called signature strikes. Basically, the individual's identity was not known but was a target based on their behavioral patterns. So that was very controversial. I find that these days, it's really about the technology itself and the increasing level of autonomy. It's about how the human operator can make sure that the autonomous drone does what it's intended to do, and that the human command doesn't leave the crucial decision making unchecked with the machine. So, this is the main ethical debate in that respect.

Goudarzi: Which brings me to my next question, which is about drone operators, who studies show can suffer from PTSD. Can you touch on some of the trauma that's experienced by people operating drones, those on the ground, and to add to that, people watching drone footage that is currently so readily available on social media platforms?

Erickson: Studies show that PTSD is based on one's proximity to actual combat. If you stab someone, you're going to have a huge dose of PTSD to put it in simple terms. If you're one hundred yards back, the trauma is less; two hundred yads back it's even less. So, in one regard, the drone operators are able to

go in every day, clock in nine to five, and take out targets. They can get lulled into this sense of detachment where to them it feels like a video game essentially. And it's set up intentionally; there's that distance on purpose.

I'm sure the military psychologist had all that in mind. They probably did the studies and realized, if you gamified it, it's going to have less of a mental effect. But there are studies that show when you accumulate all that experience and you go home and think about it, it almost makes it even worse in a sense because you feel you just played a video game, which dehumanized people and you killed them. So, it's got a long tail to it. It's designed in a way to minimize PTSD upfront, just so they keep the turnover relatively low for these positions, but it still hits.

And from personal experience: Just looking on X or Twitter I've gotten to a level of desensitization on seeing gruesome violence. It's not that I seek it out, but I'm interested in geopolitical conflicts. So, my feed shows me that stuff and there's a level of constant dread or anxiety that I have because every morning I could see someone basically being beheaded or something. I think that has an overall bad effect on society. There's some level of anxiety and proximity to mortality that we didn't have before this access to information that's just elevating everyone's cortisol. It's having people make more fight or flight decisions in their everyday life, which is going to cascade to an overall more aggressive and paranoid society.

Kunertova: I agree I don't like finding war in my Twitter/X feed with very visual images. I don't think that's the fault of the drone, but those who are constructing war propaganda, trying to get the audiences on their side. Unfortunately. I believe it's part of the discussion of who is moderating the social media platforms. But as a user, it's disturbing.

Just to add on the trauma caused by drones, for those who are on the ground, like civilians, and that goes across the different types of conflict—so Pakistan, Afghanistan, Ukraine, or Gaza now—the mere sound of the threat in the sky, makes people really anxious and scared. They can't see it, but they know that it's close and seek shelter. So, that's something that I believe is featured prominently in the constant threat from the sky.

Goudarzi: What do you think we're looking at in the future with regards to drone usage and warfare?

Erickson: Dominika brought up a good point: autonomy. You've got ChatGPT and the likes. So, you're going to have drones making their own decisions and that's already possible from what I've seen. It's a great opportunity for someone from a military group to put a drone out there and let it go. It flies off, picks the closest building or structure, and explodes. It's amplifying what we're already seeing, which is the inability to deal with these guerrilla attacks. AI is a huge catalyst thrown into that, So, autonomy is going to be the next big conversation here.

Kunertova: I don't like looking that far into the future, and because Ukraine told us that some very short-term developments on the lower end of innovation are changing the dynamics on the battlefield. So, I would expect to see more small aerial drones on the battlefield, but also more drone use in the combined operations requiring synchronization with other units and more proliferation of drones into other operational domains, especially naval warfare. So that to me, that's going to be the new drone practice.

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Perspective – Send in the Robots: Counter-Terrorism Response and Emerging Drone Technology

By Zachary Kallenborn, Derrick Tin, and Gregory Ciottone

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Terrorists, suicide bombers in particular, create chaos and bring death and destruction to the masses. Not only are innocent people hurt or killed, buildings and critical infrastructure will likely be damaged or destroyed. Police, firefighters, medics, and other first responders may struggle to respond when bridges and roads are compromised and saving lives means entering collapsing, contaminated buildings and potentially placing their own lives at risk. Drones are increasingly being used to help.[1] Drones are already helping map, photograph, and assess damaged infrastructure after terror attacks and other disasters.[2] If a building collapses and a first responder dies, that might be someone's son, daughter, mom, dad, sister, brother, or just friend. But if a drone is destroyed, only the accountants cry.

The opportunities to use drones for terrorism preparedness and response are growing. Researchers are excitedly improving sensor processing, expanding use to new domains, enhancing autonomy, and connecting numerous drones into collaborative drone swarms. Counter-terrorism, emergency response, and homeland defense organizations writ large need to monitor these trends, identify opportunities,

provide appropriate investments in technologies, and integrate great ideas into technical capabilities, training, doctrine, and response planning.

1. Sensor processing
Drones are increasingly equipped with multiple types of sensors to include electro-optical, infrared, and light detection and ranging (Lidar). Multispectral imaging provides disaster responders with greater situational awareness to characterize a disaster area, identify survivors after a terrorist attack, and conduct triage to better meet the needs of those survivors. Multispectral imaging could also help collect additional data about an incoming natural hazard and conduct safety inspections to support preparedness efforts, while advances in artificial intelligence can assist in processing and analyzing sensor data for improved prediction of national disaster occurrence, more precise damage assessment, or more effective searches for survivors.[3][4][5][6]

2. Multi-Domain Drones
Although the role of the MQ-9 Predator in the American prosecution of the War on Terror has drawn attention to aerial drones, they also have applications across multiple domains with relevance for disaster medicine. Global militaries have been developing unarmed ground drones for logistics and medical evacuation. Some small multi-purpose equipment transport can carry over 1,000 kg of supplies, which could be useful for carrying equipment, medical supplies, or basic food and water into disaster areas or carrying victims out, with limited risk to human operations. Likewise, bipedal robots like can maneuver across rubble, remove debris, use tools to break through panels and connect fire hoses to standpipes, all of which could be useful after a disaster. Drones even may support disaster response from space: tiny satellites like 'SpaceBees' (effectively small drones) can provide backup imaging, connectivity, and communication services when alternatives are damaged or destroyed.[7] These all provide new, versatile solutions for delivering medical resources, evacuating casualties, and rescuing victims without risk to human responders.

3. Greater autonomy
Drones are becoming increasingly autonomous. Some commercial off-the-shelf drones can autonomously navigate GPS waypoints and follow designated objects. Autonomy reduces the burden on human operators because the drone can be tasked to do something without requiring the manipulation of any controls.[8] After a disaster, drones could be tasked to fly fixed routes around an area with humans monitoring sensor feeds to look for survivors and monitor damage to the local infrastructure.[9] Other applications of autonomous drones for disaster response and recovery include unmanned ground vehicles used to decontaminate after the use of chemical, biological, or radiological weapons use and autonomous unmanned aerial vehicles to sample identified potentially toxic plumes for the presence of chemical, biological, or radiological weapons agents.[10][11] Drones in multi-domains may also have better access to destroyed areas: a small unmanned ground vehicle might slip underneath the rubble to check a collapsed building for survivors.[12]

4. Drone cooperation
Drones are increasingly being formed into drone swarms in which they communicate to accomplish shared objectives.[13] In disaster response and recovery, drone cooperation enables coordinated broad-area searches. For example, drone swarms could spread out over a large disaster area to search for signs of survivors. Cooperating drones could be especially useful for searching areas that would put human responders at risk, such as a collapsing building.[14] Drones could be equipped with different sensor types to reduce false positive rates. Theoretically, cooperating drones could help provide aid: a survivor in need of medical attention is identified, and the drone calls back to another with a payload of basic medical supplies. Cooperating drones could also be useful for disaster recovery, such as coordinating clean-up and disinfection of an area contaminated by a chemical, biological, or radiological weapons agent.[15]

Conclusion
The rapid advances in drone technology have opened a world of possibilities for counter-terrorism medicine, disaster response, healthcare delivery, and disaster recovery. By leveraging the power of sensor processing, multi-domain capabilities, greater autonomy, and drone cooperation, these unmanned systems have proven to be invaluable assets in safeguarding lives and enhancing the efficiency of health systems.
Policy makers and organizations will need to take a critical look at these opportunities. First, funding organizations should finance comprehensive, critical looks at emerging drone technologies to separate hype from reality. Sponsored research should identify and separate near-term opportunities to improve counter-terrorism and emergency response from long-term and more fantastic opportunities. Second, response organizations from FEMA and county emergency response organizations to insurance companies and local hospitals should adopt pilot programs incorporating new drone technologies. Experiences and lessons learned

should be shared with others through publications, workshops, conferences, or informal knowledge transfers. Third, the most promising ideas need to be integrated fully in counter-terrorism and disaster response. That means long-term research and development relationships, dedicated drone response offices, dedicated training programs, modified response plans, and, hopefully, reduced harm from the worst attacks.

Drones have a clear role to play in counter-terrorism and emergency response. Disaster response organizations need to look ahead to not just where the technology is, but where it is going. Evolving drone technology creates real opportunity to save lives and reduce harms from terrorist attacks, tornados, hurricanes, and all manner of disasters. Let's get to work.

Endnotes
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Why cheap drones pose a significant chemical terrorism threat

By Zachary Kallenborn

Source: https://thebulletin.org/2023/11/why-cheap-drones-pose-a-significant-chemical-terrorism-threat/#post-heading

An agricultural drone. Credit: DJI-Agras via Pixabay.

Nov 21 – Earlier this year, police in the United Kingdom arrested Mohammad Al-Bared for building a drone designed for the Islamic State, the terrorist group that once held vast territory in Iraq and Syria. The 3D-printed drone was designed to deliver chemical weapons or explosives, and a search of Al-Bared's home turned up notebooks with chemical equations and "recipes for chemical weapons," unrelated, according to authorities, to his studies as a doctoral student in mechanical engineering. Al-Bared had developed a plan involving a "spoof company" to ferry his weapon, undetected, into a war zone.

Al-Bared, found guilty in September of preparing acts of terrorism, was certainly not the first would-be terrorist to explore using drones. The history of such planning dates back at least to the Japanese doomsday cult Aum Shinrikyo's experimentation with uncrewed vehicles in 1993 or 1994 for a use in a possible chemical or biological weapons attack. The group ended up attacking the Tokyo subway system without drones. Since then, drone technology has significantly improved.

Relatively cheap drones are becoming a mainstay of conflicts, from the war in Ukraine to the Israel-Hamas conflict in Gaza. Though drones were once the purview of rich and powerful militaries, it's now possible to use cheap consumer drones in battle. With a few tweaks, they can whistle past even sophisticated air defenses. As Al-Bared's case highlights, they may also present a significant chemical terrorism threat. Drones can be equipped with sprayers to deliver chemical weapons, or they could be used in an attack on

a chemical plant. They could also provide critical attack support, helping with reconnaissance to plan out and conduct an attack, monitor law enforcement response, and create propaganda to highlight terrorist activities.

Chemical attacks, on the cheap

Drones are great delivery vehicles for chemical weapons. They could fly above crowded areas, say an outdoor concert or a stadium, and spray the agent over the gathered people. Although commercial drones have small payloads that could limit the harm they inflict, low-altitude flights that target dense populations still pose a significant threat.

Commercial agricultural drones are particularly well-designed for chemical weapons delivery. **Drones for spraying pesticides come equipped with chemical tanks, pumps, hoses, nozzles, and other equipment capable of handling toxic chemicals.** A wannabe terrorist could get the complete package right off the shelf without worry. The drones can run **as low as $1,500** and **do not require any special license to purchase.**

Improvements to drone technology have also increased their effectiveness as chemical weapons delivery systems. Simple hobbyist drones available on **Amazon for a few thousand dollars are capable of basic waypoint navigation, autonomously flying a pre-determined route guided by GPS.** A terrorist organization could pre-plan spray routes over a gathered crowd, using multiple chemical-spraying drones. In addition, terrorists might **incorporate decoy drones**—simple, unarmed drones meant to distract law enforcement from the main chemical attack. Also, even commercial drones now can operate in autonomous modes, flying to a target without need of direct connection to the user, rendering defenses meant to jam the connection between drone and operator useless. Of course, there's an important challenge any terrorist would face before delivering a chemical weapon via drone: acquisition of a chemical weapon. It would not be a trivial process for a terrorist group to acquire a weapons agent like sarin, VX, or mustard gas. The terrorists would require specialized equipment, chemicals, and facilities, not to mention the know-how to use them. However, as researchers at Harvard Medical School and I have highlighted, **fentanyl derivatives could provide a deadly, affordable alternative** to traditional weapons agents. In the 1990s, the Department of Defense and Justice studied fentanyl as an incapacitating agent, but concluded it was unsafe because the margins between incapacitating and killing targets were quite small. Now, fentanyl is available easily and broadly on the black market.

A gaping vulnerability

Beyond using drones to directly deliver chemical weapons is another deadly possibility: The **use of drones to attack on chemical facilities.**

On December 3, 1984, safety failures at the Union Carbide India Limited pesticide facility in Bhopal, India lead to an accidental release of 40 tons of highly toxic methyl isocyanate. The government of Madhya Pradesh, an Indian state, reported that 3,787 people were killed and 574,366 were injured by the accident. Other estimates put the death toll as high as 16,000. Triggering a similar release would be perhaps the easiest way for a terrorist to carry out a mass-casualty chemical attack. Terrorists would not need to acquire any exotic chemical agent; they would need only to detonate enough explosives in the chemical facility to cause a disaster. The Cybersecurity and Infrastructure Security Agency has identified 3,200 "high-risk" chemical facilities in the United States.

Although Congress passed the Chemical Facility Anti-Terrorism Standards in 2006 to require and enforce a variety of security measures at chemical facilities nationally, including mandatory cyber and physical security measures, personnel vetting, and compliance inspections, the law has minimal requirements for protecting against potential aerial attacks. But on July 28, 2023, Congress allowed the one law protecting chemical plants from terrorism to expire. The Cybersecurity and Infrastructure Security Agency can no longer monitor compliance and enforce even the minimum requirements of the now-expired law.

Here's how drones could make attacks on facilities easier: **They can fly over physical barriers at the facility, such as fences, bollards, and gates and drop a bomb on a chemical storage tank, leading to a release.** Current federal law does not authorize the private sector to operate drone defeat systems, so the facility would have to identify the threat, contact federal law enforcement, and wait on officer arrival **before the threat could be neutralized with a handheld jammer or other device**. As even hobbyist drones can fly over a 100 miles per hour, an aggressive attacker would likely be able to succeed.

A terrorist could also use drones to prepare for attacks on chemical facilities. For example, Brenton Tarrant used a drone to conduct reconnaissance on the the Masjid an-Nur mosque in a 2019 attack in Christchurch, New Zealand that killed 51 people. Similarly, a would-be chemical plant attacker could fly the drone around the facility to monitor security officer movements, map the perimeter, look for security cameras, and identify potential avenues of attack either by drone or other forces. Even if facility managers spot the drone and are concerned, they may write it off as a careless hobbyist or perhaps a lawless rival.

What should be done

To mitigate the threat, Congress needs to reauthorize the Chemical Facility Anti-Terrorism Standards program. Chemical plants need to have robust security standards, enforced by federal agencies. Congress

should also update the standards with new requirements for aerial situational awareness, such as establishing sensor networks and participating in information sharing systems like the Federal Aviation Administration's plan for an unmanned traffic management system. As commercial drones become more ubiquitous, providing chemical facility owners and operators with information about friendly drone behavior will be helpful in knowing which drones they do not need to worry about.

Congress should also require purchasers of agricultural drones over 55 pounds to receive a Federal Aviation Administration certification prior to purchase. Part 137 UAS certification is already required for operating agricultural drones, so the impact on legitimate purchasers should be minimal. In addition, state, local, and federal law enforcement agencies should monitor for extremist interest in agricultural drones. A known terrorist group attempting to acquire such a drone or multiple conventional drones should set off red flags and warrant further investigation. That could include partnering with drone manufacturers like PrecisionHawk or Hylio to identify and share information about suspicious transactions. The global community should also consider export controls and relevant monitoring of agricultural drones with particularly high-capacity storage tanks. These might be brought into international agreements like the Australia Group, an arrangement among countries, including the United States, that seeks to coordinate export rules to prevent the proliferation of chemical or biological weapons.

For potential chemical terrorists, drones are quite the boon. They could serve as cheap, novel, and effective delivery systems. Or they could carry out attacks on chemical facilities, jumping over ground-based defenses. Or they might support reconnaissance before an attack or film the results. Thwarting chemical terrorism will require new initiatives that consider the growing popular uses for drones. Like the regulatory and technical advances that will allow for safe large-scale drone delivery and other operations, these could take a while to implement. At the very least, policymakers should avoid increasing the risks of chemical terrorism, for example, by letting the only US program meant to secure chemical facilities from attacks lapse. Though in Congress these days, that could be a tall order.

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Regional Security Analysts Say Africa at Risk of Drone Terrorism

By Timothy Obiezu (VOA Nogeria)
Source: https://www.homelandsecuritynewswire.com/dr20231123-regional-security-analysts-say-africa-at-risk-of-drone-terrorism

Nov 23 – Security experts in Africa are raising concerns about the growing use of drones by terrorist groups and the readiness of government forces to match their sophistication.

A report last week showed African terrorist groups are using global affiliations to acquire and modify drones for their own needs. Though the drones are not yet being used to launch attacks, analysts worry that in the long run, they could change the balance of power with governments.

The Institute for Security Studies report says that while the global focus has been on the adaptation of unmanned aerial systems in Iraq, Syria and other spots in the Middle East, drones are becoming part of the tool kit for violent actors across Africa.

The report said African militant groups like Boko Haram, Islamic State West Africa Province and al-Shabab are acquiring and modifying drones for their own purposes.

It said terror groups use social media and messaging platforms to get the knowledge they need from groups like al-Qaida and Islamic State.

The report also suggested that the increasing affordability of the technology may be contributing to the growing trend.

An analyst for Beacon Security in Nigeria, Kabiru Adamu, worries the drones will make terror groups more powerful.

"It creates another layer of challenge for the already challenged security operations that are in that region. Even though that has more or less been restricted to locations around the Middle East and some parts of Asia, but we've also seen indications of that happening in the Lake Chad basin," Adamu said. "On several instances we've had reports of military field operations encountering unmanned aerial vehicles that are mainly for surveillance purposes. We're yet to pick up any reports that indicate the arming of such unmanned aerial vehicles."

Terror groups often use drones for propaganda, intelligence gathering or reconnaissance purposes.

Last month, African air force chiefs met in Senegal and said the continent urgently needed to develop sophisticated defenses in response to the growing threat.

But the report said African countries lack the capacity to address the problem. Adamu agrees.

"It will shock you that we do not have any sanctioned or certified methods for mitigating aerial attacks in the country using unmanned aerial vehicles at the moment," Adamu said. "I think we're currently trying to develop our capacity for that. It appears to me that the Nigerian military in particular is playing catch-up in this area. The armed groups are ahead."
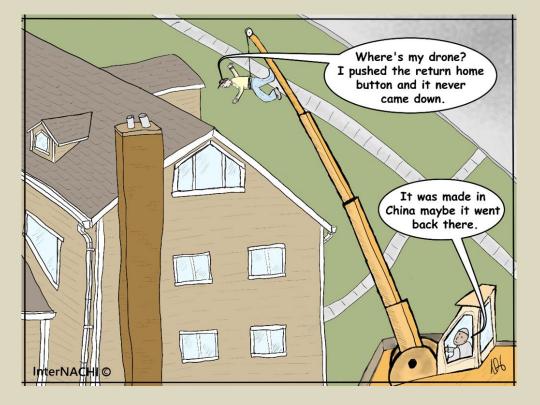
Last year, Islamic State West Africa Province used drones to shoot propaganda videos showcasing its training camp.

Also last year, the group's surveillance drones were spotted over the position of government forces shortly before fighters launched an attack.

Experts say African nations need to develop domestic approaches before they start thinking about regional and continental response. Chidi Omeje, a security analyst, says there's no time to waste.

"Just like the report said, they're watching and learning. So there's it's a very serious development, it's something that the subregion military groups should take particular interest on to see how they can be on top of the situation," Omeje said. "You know how callous those guys are, and the moment they have such window of opportunity to do more harm, they'll definitely employ that tactic. It's quite concerning."

Experts say Nigeria needs to lead the regional effort but that the country itself lacks a coherent policy to combat armed groups' use of the drones.

GPT-4 gave advice on planning terrorist attacks when asked in Zulu

OpenAI's GPT-4 advised on committing terrorism and financial fraud when requests were translated into languages it was less familiar with, like Zulu and Scots Gaelic

By Jeremy Hsu

📅 23 October 2023

Navigating the Risks and Benefits of AI: Lessons from Nanotechnology on Ensuring Emerging Technologies Are Safe as Well as Successful

By Andrew Maynard and Sean Dudley

Source: https://www.homelandsecuritynewswire.com/dr20231025-navigating-the-risks-and-benefits-of-ai-lessons-from-nanotechnology-on-ensuring-emerging-technologies-are-safe-as-wel

Oct 25 – Twenty years ago, nanotechnology was the artificial intelligence of its time. The specific details of these technologies are, of course, a world apart. But the challenges of ensuring each technology's responsible and beneficial development are surprisingly alike. Nanotechnology, which is technologies at the scale of individual atoms and molecules, even carried its own existential risk in the form of "gray goo."

As potentially transformative AI-based technologies continue to emerge and gain traction, though, it is not clear that people in the artificial intelligence field are applying the lessons learned from nanotechnology.

As scholars of the future of innovation, we explore these parallels in a new commentary in the journal Nature Nanotechnology. The commentary also looks at how a lack of engagement with a diverse community of experts and stakeholders threatens AI's long-term success.

Nanotech Excitement and Fear

In the late 1990s and early 2000s, nanotechnology transitioned from a radical and somewhat fringe idea to mainstream acceptance. The U.S. government and other administrations around the world ramped up investment in what was claimed to be "the next industrial revolution." Government experts made compelling arguments for how, in the words of a foundational report from the U.S. National Science and Technology Council, "shaping the world atom by atom" would positively transform economies, the environment and lives. But there was a problem. On the heels of public pushback against genetically modified crops, together with lessons learned from recombinant DNA and the Human Genome Project, people in the nanotechnology field had growing concerns that there could be a similar backlash against nanotechnology if it were handled poorly.

These concerns were well grounded. In the early days of nanotechnology, nonprofit organizations such as the ETC Group, Friends of the Earth and others strenuously objected to claims that this type of technology was safe, that there would be minimal downsides and that experts and developers knew what they were doing. The era saw public protests against nanotechnology and – disturbingly – even a bombing campaign by environmental extremists that targeted nanotechnology researchers.

Just as with AI today, there were concerns about the effect on jobs as a new wave of skills and automation swept away established career paths. Also foreshadowing current AI concerns, worries about existential risks began to emerge, notably the possibility of self-replicating "nanobots" converting all matter on Earth into copies of themselves, resulting in a planet-encompassing "gray goo." This particular scenario was even highlighted by Sun Microsystems co-founder Bill Joy in a prominent article in Wired magazine.

Many of the potential risks associated with nanotechnology, though, were less speculative. Just as there's a growing focus on more immediate risks associated with AI in the present, the early 2000s saw an emphasis on examining tangible challenges related to ensuring the safe and responsible development of nanotechnology. These included potential health and environmental impacts, social and ethical issues, regulation and governance, and a growing need for public and stakeholder collaboration.

The result was a profoundly complex landscape around nanotechnology development that promised incredible advances yet was rife with uncertainty and the risk of losing public trust if things went wrong.

How Nanotech Got It Right

One of us – Andrew Maynard – was at the forefront of addressing the potential risks of nanotechnology in the early 2000s as a researcher, co-chair of the interagency Nanotechnology Environmental and Health Implications working group and chief science adviser to the Woodrow Wilson International Center for Scholars Project on Emerging Technology.

At the time, working on responsible nanotechnology development felt like playing whack-a-mole with the health, environment, social and governance challenges presented by the technology. For every solution, there seemed to be a new problem.

Yet, through engaging with a wide array of experts and stakeholders – many of whom were not authorities on nanotechnology but who brought critical perspectives and insights to the table – the field produced initiatives that laid the foundation for nanotechnology to thrive. This included multistakeholder partnerships, consensus standards, and initiatives spearheaded by global bodies such as the Organization for Economic Cooperation and Development.

As a result, many of the technologies people rely on today are underpinned by advances in nanoscale science and engineering. Even some of the advances in AI rely on nanotechnology-based hardware.

In the U.S., much of this collaborative work was spearheaded by the cross-agency National Nanotechnology Initiative. In the early 2000s, the initiative brought together representatives from across the government to better understand the risks and benefits of nanotechnology. It helped convene a broad and diverse array of scholars, researchers, developers, practitioners, educators, activists, policymakers and other stakeholders to help map out strategies for ensuring socially and economically beneficial nanoscale technologies.

In 2003, the 21st Century Nanotechnology Research and Development Act became law and further codified this commitment to participation by a broad array of stakeholders. The coming years saw a growing number of federally funded initiatives – including the Center for Nanotechnology and Society at Arizona State University (where one of us was on the board of visitors) – that cemented the principle of broad engagement around emerging advanced technologies.

Experts Only at the Table

These and similar efforts around the world were pivotal in ensuring the emergence of beneficial and responsible nanotechnology. Yet despite similar aspirations around AI, these same levels of diversity and engagement are missing. AI development practiced today is, by comparison, much more exclusionary. The White House has prioritized consultations with AI company CEOs, and Senate hearings have drawn preferentially on technical experts.

According to lessons learned from nanotechnology, we believe this approach is a mistake. While members of the public, policymakers and experts outside the domain of AI may not fully understand the intimate details of the technology, they are often fully capable of understanding its implications. More importantly, they bring a diversity of expertise and perspectives to the table that is essential for the successful development of an advanced technology like AI.

This is why, in our Nature Nanotechnology commentary, we recommend learning from the lessons of nanotechnology, engaging early and often with experts and stakeholders who may not know the technical details and science behind AI but nevertheless bring knowledge and insights essential for ensuring the technology's appropriate success.

The Clock Is Ticking

Artificial intelligence could be the most transformative technology that's come along in living memory. Developed smartly, it could positively change the lives of billions of people. But this will happen only if society applies the lessons from past advanced technology transitions like the one driven by nanotechnology.

As with the formative years of nanotechnology, addressing the challenges of AI is urgent. The early days of an advanced technology transition set the trajectory for how it plays out over the coming decades. And with the recent pace of progress of AI, this window is closing fast.

It is not just the future of AI that's at stake. Artificial intelligence is only one of many transformative emerging technologies. Quantum technologies, advanced genetic manipulation, neurotechnologies and more are coming fast. If society doesn't learn from the past to successfully navigate these imminent transitions, it risks losing out on the promises they hold and faces the possibility of each causing more harm than good.

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How an AI company parsed misinformation early in Israel-Hamas war

By Colin Demarest

Source: https://www.defensenews.com/information-warfare/2023/11/01/how-an-ai-company-parsed-misinformation-early-in-israel-hamas-war/

Nov 01 — When Hamas militants raided Israel in early October, killing and abducting more than 1,000 people, videos, images and text flooded social media. Rumors and shoddy information proliferated, blurring the line between fact and fiction.

Artificial intelligence and data analysis firm Primer monitored the situation from afar using its Command software. It demonstrated its AI-enabled parsing capabilities at the Association of the U.S. Army's annual convention in Washington days later, promising to identify kernels of truth among the chaos in the Middle East.

"Just aggregating lots of data, particularly if it's a really noisy environment and the facts have yet to be established, can be really problematic because you're just making a big pile for the user to go through," Primer CEO Sean Moriarty told C4ISRNET on the show floor. "As you might imagine, data is all over the place. There's all sorts of open-source intelligence data. The question is: What can a professional do with it, using their knowledge and experience? And that comes down to speed, power and accuracy."

The Command software is designed with the single-pane-of-glass motif in mind. The program takes queries from users, much like a Google search; pulls vast amounts of data, namely social media feeds and news articles; and populates the results with summaries, context and name-entity recognition. It extracts people, places and things of note, handles translations, and presents sources that explain the process like math homework.

In a demo at the AUSA event, the software sorted through information related to the Israel-Hamas war and then produced a continuously refreshed timeline of events. Some of the points were geolocated, generating a heat map of posts and interactions.

"What it's actually doing is interrogating these disparate sources, identifying anomalies where information is in conflict, and scoring it," said Moriarty, who previously led Ticketmaster. "Anywhere there is a hot spot, our folks are looking to see what signal we can pull." The Command software is tailored for defense applications, according to the company, whose advisers include a former principal deputy director of national intelligence and former leaders of U.S. Special Operations Command and Africa Command.

Primer in June announced a $69 million funding round to help accelerate product delivery to government and commercial customers. Mark Brunner, the president of the company's federal team, said the goal of Command is to reduce "the latency between sensor and shooter." That language is often used to describe the Pentagon's Combined Joint All-Domain Command and Control effort, or CJADC2, which seeks to seamlessly link forces across land, air, sea, space and cyberspace.

"Sense, make sense, decide and act — we're the 'make sense' people in that loop," Brunner said. "If you're a customer and you're on the watch floor at SOCOM or the Army intel fusion center, our platform gives you the ability to ingest not only [open-source intelligence] from these various sources, but in over 100 languages."

Military analysts and others in the intelligence community must sift through sometimes overwhelming volumes of information. Some of it can be correct, some of it can be incorrect and some can be purposely deceptive. The U.S. Defense Department is spending money on AI and machine learning to augment such workloads and pick out patterns that may have been previously missed.

"What we have, though our product here, is the ability to ingest vast amounts of data, run it through our GPUs, and actually summarize and contextualize that data," said Chris Lacy, who led the Command demonstration. "The key things an analyst is immediately going to look for — it is categorizing that and showing that [in] real time to the analyst as soon as they walk in the door."

"As soon as the breaking news happened," he added, "I put in a monitor and just started tracking it."

The Defense Department sought $1.4 billion for artificial intelligence in fiscal 2024, which began Oct. 1. A continuing resolution that maintains funding rates from the prior year is in place until mid-November.

> **Colin Demarest** is a reporter at C4ISRNET, where he covers military networks, cyber and IT. Colin previously covered the Department of Energy and its National Nuclear Security Administration — namely Cold War cleanup and nuclear weapons development — for a daily newspaper in South Carolina. Colin is also an award-winning photographer.

Generative Artificial Intelligence (GAI) and the Israel-Hamas War

Source: https://www.homelandsecuritynewswire.com/dr20231111-generative-artificial-intelligence-gai-and-the-israelhamas-war

Nov 11 – Promoters of conspiracy theories and hate are using generative artificial intelligence (GAI) to create misleading content about the Israel-Hamas war. This not only amplifies confusion and hate on social media; it can also cause some to doubt the validity of actual war images, creating unnecessary

suspicion at a time of deeply polarized public opinion. ADL's previous research includes recommendations on what tech companies should do to address heinous abuses of GAI technology such as those listed below.

Misleading GAI Images

Disinformation peddlers are using GAI technology to tell a fictional story about the conflict. Many of these images have obvious, tell-tale signs of being inauthentic, but can fool the untrained eye and may be difficult to distinguish from the many photos showing actual victims.

On X (formerly Twitter), some GAI images depict what looks like injured or frightened children running from air strikes in Gaza. One post on X includes a series of them with the hashtag #StopIsraelCrimes.

Another image shows a fake AI-generated "tent city," which users claim was constructed for Israeli refugees. When it first started circulating, the image was popular on X and Instagram, where anti-Israel commenters hoped the camp would be destroyed. Strange artifacts in the image, such as an Israeli flag with two Stars of David on it, hint that the content is inauthentic.

Deepfake videos, which generally require several GAI tools to create, have also gained traction by presenting fictionalized "commentary" on the war from public figures. While these videos are often advertised as deliberately satirical, they can easily be shared without that context, creating further confusion.

For example, a deepfake video of model Bella Hadid, who is publicly critical of Israel, shows her retracting her prior comments about Palestine and expressing support for Israel. In reality, the video was likely created using synthetic speech, which uses AI to mimic real voices that have been "cloned" from audio samples of authentic speech. The synthetic speech was then mapped onto old footage of Hadid speaking at the Global Lyme Alliance in 2016.

Offensive and Violent GAI Propaganda

Racist and antisemitic Telegram and 4chan users are creating hateful and misleading propaganda about the war using GAI tools.

Some channels and message boards are dedicated solely to crowdsourcing memes, encouraging "memetic warfare" and advising users to create "propaganda for fun." Posts provide instructions on how to use GAI tools to produce radicalizing images based on text prompts. Many of these images reference the Israel-Hamas war — mostly glorifying Hamas, demonizing Israel and spreading already-debunked false narratives.

Several memes depict the moment Hamas paragliders crossed into Israel on October 7. One Telegram post includes the caption, "Getting the view before tearing up the Torah." Another GAI image on 4chan and Telegram shows paragliders over a burning building. At a distance, the meme reveals an image of Adolf Hitler.

An image shared on an X account dedicated to GAI memes shows a visibly Jewish man standing next to a cartoon bomb in a hospital. This is one of many recent GAI memes depicting the explosion at Al-Ahli hospital in Gaza on October 17, which many initially blamed on Israeli airstrikes. This claim has been widely debunked via multiple analyses from independent experts, the media, the U.S. government and others, which point to the explosion being caused by a rocket misfire from within Gaza.

A meme shared in an AI "art" Telegram channel shows an approaching military tank with a large nose, along with the caption, "BREAKING: Israeli tanks have been spotted moving to Gaza." The image is clearly drawing inspiration from a classic hateful trope about Jewish people having disproportionately large noses.

GAI Encourages Doubt of Actual Documented Violence

Perhaps the most worrying side effect of GAI is that its increasing popularity on social media has sowed doubt over real images of graphic or traumatic content. This phenomenon, often referred to as the "liar's dividend," has directly impacted the discourse surrounding the war in Israel and Palestine, bringing the authenticity of reported violence into question.

On X, 4chan and Telegram, many claimed that an image of a burnt body believed to be an Israeli victim was run through "AI-detector tools" and deemed fake. According to experts, including our own analysts, such tools are unreliable and routinely produce inconsistent results.

Trolls on 4chan promoted the theory that the original photo showed a puppy from an animal rescue wrapped in a towel, and that propagandists used AI tools to edit the puppy out and put a burnt body in its place. However, the puppy photo in question has not been traced to any legitimate source online beyond the 4chan edit. ADL analysts have independently verified images of other similarly burned victims in Israel.

Photos from Israeli homes showing the bloody aftermath of Hamas's October 7 attack have also been deemed fake by anti-Israel users online. One image on X alleges that the blood in the photo has been "staged" and that the knife looks like it was generated by AI. On X, a spokesperson for the Israeli government shared photos believed to show human remains at Kibbutz Be'eri, including teeth. Users on both X and Reddit declared without evidence that the images were "fake AI," alleging that the photos were a product of "Israeli propaganda" meant to fool the masses.

Fact Check: AI Fakes in Israel's War Against Hamas

By Ines Eisele and Uta Steinwehr
Source: https://www.homelandsecuritynewswire.com/dr20231111-fact-check-ai-fakes-in-israels-war-against-hamas

Nov 11 – How do fake stories created with artificial intelligence (AI) work? What narratives do they present? And how dangerous are they?
DW fact checkers answer the most critical questions about the role of AI in the conflict between Israel and Hamas in Gaza.

1) How do AI-generated image fakes work?

AI is everywhere these days — even in wars. Artificial intelligence applications have greatly improved this year, and almost anyone can now use standard AI generators to create images that look real, at least at first glance.

Users must "feed" tools such as Midjourney or Dall-E with prompts, including specifications and information, to do this. The tools then convert the written prompts into images.

Some create more artistic illustrations, while others create photorealistic images. The generation process is based on what is known as machine learning.

For example, if generators are asked to show a 70-year-old man riding a bicycle, they search their database to pair the terms with images.

Based on the information available, the AI generators create the image of the older cyclist. Thanks to more and more input and technical updates, the tools have improved vastly and are constantly learning.

All this applies to images related to the Middle East conflict.

Here, too, people use such tools to create more or less realistic scenes that, according to our observations, are often intended to capture emotional moments to spread certain narratives. But more on that later.

In a conflict where "emotions are very, very high," says AI expert Hany Farid, disinformation, including its spread through AI images, works exceptionally well.

Hardened fronts are the perfect breeding ground for creating and disseminating fake content and intensifying emotions, Farid, a professor of digital forensics at the University of California at Berkeley, tells DW.

2) How many AI images of the Israel-Hamas war are in circulation?

Images and videos created with the help of artificial intelligence have already added to disinformation related to the war in Ukraine — and continue to do so.

As AI tools have developed rapidly since Russia's 2022 invasion of Ukraine, many observers expected it to play an even greater role in the Israel-Hamas war. However, according to experts, the great flood of AI images has failed to materialize thus far.

"In the conflict between Israel and Hamas and related disinformation, we are not seeing a massive use of AI-generated images," says Tomasso Canetta from the European Digital Media Observatory.

"There are some examples, but it's not much if we compare it to the amount of disinformation that is actually old images and old videos that are now reshared in a misleading way," he adds.

However, this does not mean the technology isn't a factor. Farid explains that he does not consider the number of AI fakes to be the relevant factor.

"You can have two images that go super viral, and hundreds of millions of people see it. It can have a huge impact," he says.

"So it doesn't have to be a volume game, but I think the real issue we are seeing is just the pollution of the information ecosystem."

3) What narratives do the AI fakes serve in the Israel-Hamas war?

The AI images circulating on social media networks can usually trigger strong emotions.

Canetta identifies two main categories. One refers to images that focus on the suffering of the civilian population and arouse sympathy for the people shown. The other is AI fakes that exaggerate support for either Israel, Hamas or the Palestinians and appeal to patriotic feelings.

The first category includes, for example, the picture above of a father with his five children in front of a pile of rubble. It was shared many times on X (formerly Twitter) and Instagram and seen hundreds of thousands of times in connection with Israel's bombardment of the Gaza Strip.

In the meantime, the image has been marked with a community notice, at least on X, that it is fake. It can be recognized as such by various errors and inconsistencies that are typical for AI images.

The man's right shoulder, for instance, is disproportionately high. The two limbs emerging from underneath are also strange — as if they were growing from his sweater.

Also striking is how the hands of the two boys who have wrapped their arms around their father's neck merge. And there are too many or too few fingers and toes in several of the hands and feet in the picture.

Similar anomalies can also be seen in the following AI fake that went viral on X, which purportedly shows a Palestinian family eating together in the rubble, evoking sympathy for Palestinian civilians.

The picture below, which shows soldiers waving Israeli flags as they walk through a settlement full of bombed-out houses, falls into the second category, which is designed to spark feelings of patriotism.

The accounts that share the image on Instagram and X appear to be primarily pro-Israeli and welcome the events depicted. DW also found the picture as an article image in a Bulgarian online newspaper, which did not recognize or label it as AI-generated.

What looks fake here is the way the Israeli flags are waving. The street in the middle also appears too clean, while the rubble looks very uniform. The destroyed buildings also look like twins, standing at pretty regular intervals.

All in all, the visual impression is too "clean" to appear realistic. This kind of flawlessness, which makes images look like they have been painted, is also typical for AI.

4) Where do such AI images come from?

Private accounts on social media distribute most images created with the help of artificial intelligence. They are posted by both authentic and obviously fake profiles.

However, AI-generated images can also be used in journalistic products. Whether and in which cases this can be useful or sensible is currently being discussed at many media companies.

The software company Adobe caused a stir when it added AI-generated images to its range of stock photos at the end of 2022. These are labeled accordingly in the database.

Adobe now also offers AI images of the Middle East war for sale — for example of explosions, people protesting or clouds of smoke behind the Al-Aqsa Mosque.

Critics find this highly questionable, and some online sites and media have continued to use the images without labeling them as AI-generated. The image above, for example, appears on the site "Newsbreak" without any indication that it was computer-generated. DW found this out with the help of a reverse image search.

Even the European Parliamentary Research Service, the European Parliament's scientific service, illustrated an online text on the Middle East conflict with one of the fakes from the Adobe database — again without labeling it as an AI-generated image.

Canetta from the European Digital Media Observatory is appealing to journalists and media professionals to be very careful when using AI images, advising against their use, especially when it comes to real events such as the war in Gaza.

The situation is different when the goal is to illustrate abstract topics such as future technologies.

5) How much damage do AI images cause?

The knowledge that AI content is circulating makes users feel insecure about everything they encounter online.

UC Berkeley researcher Farid explains: "If we enter this world where it is possible to manipulate images, audio and video, everything is in question. So you're seeing real things being claimed as fake."

That is precisely what happened in the following case: an image allegedly showing the charred corpse of an Israeli baby was shared on X by Israel's Prime Minister Benjamin Netanyahu and the conservative US commentator Ben Shapiro, among others.

The controversial anti-Israeli influencer Jackson Hinkle then claimed that the image had been created using artificial intelligence.

As alleged proof, Hinkle attached a screenshot of the AI detector "AI or not" to his post, which classified the image as AI-generated. Hinkle's claim on X was viewed more than 20 million times and led to heated discussions on the platform.

In the end, many stated that the image was, in all likelihood, genuine and that Hinkle was, therefore, wrong. Farid also told DW that he could not find any discrepancies in the picture that would indicate an AI fake.

How can that be, you might ask? AI detectors, which can be used to check whether an image or text is possibly AI-generated, are still very error-prone. Depending on the image checked, they get it right or wrong and often only make decisions as likely probabilities — not with 100% certainty.

Therefore, they are at the most suitable as an additional tool for checking AI fakes, but definitely not as the only tool.

DW's fact-checking team could also not detect any clear signs of AI-based manipulation in the image, presumably showing a baby's corpse. Curiously, "AI or not" did not classify the image as AI-generated when we tried it out ourselves — and pointed out that the image quality was poor. Another AI detector (Hive moderation) also concluded that the image was genuine.

Ines Eisele is a member of *DW*'s fact-checking team, author for text and video, and Channel Manager for *DW*'s German website.
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The World Is Running Out of Data to Feed AI, Experts Warn

By Rita Matulionyte
Source: https://www.sciencealert.com/the-world-is-running-out-of-data-to-feed-ai-experts-warn

Nov 11 – As artificial intelligence (AI) reaches the peak of its popularity, researchers have warned the industry might be running out of training data – the fuel that runs powerful AI systems.
This could slow down the growth of AI models, especially large language models, and may even alter the trajectory of the AI revolution.
But why is a potential lack of data an issue, considering how much there are on the web? And is there a way to address the risk?

Why high-quality data are important for AI
We need a *lot* of data to train powerful, accurate and high-quality AI algorithms. For instance, ChatGPT was trained on 570 gigabytes of text data, or about 300 billion words.
Similarly, the stable diffusion algorithm (which is behind many AI image-generating apps such as DALL-E, Lensa and Midjourney) was trained on the LIAON-5B dataset comprising of 5.8 billion image-text pairs. If an algorithm is trained on an insufficient amount of data, it will produce inaccurate or low-quality outputs.
The quality of the training data is also important. Low-quality data such as social media posts or blurry photographs are easy to source, but aren't sufficient to train high-performing AI models.
Text taken from social media platforms might be biased or prejudiced, or may include disinformation or illegal content which could be replicated by the model. For example, when Microsoft tried to train its AI bot using Twitter content, it learned to produce racist and misogynistic outputs.
This is why AI developers seek out high-quality content such as text from books, online articles, scientific papers, Wikipedia, and certain filtered web content. The Google Assistant was trained on 11,000 romance novels taken from self-publishing site Smashwords to make it more conversational.

Do we have enough data?
The AI industry has been training AI systems on ever-larger datasets, which is why we now have high-performing models such as ChatGPT or DALL-E 3. At the same time, research shows online data stocks are growing much slower than datasets used to train AI.
In a paper published last year, a group of researchers predicted we will run out of high-quality text data before 2026 if the current AI training trends continue. They also estimated low-quality language data will be exhausted sometime between 2030 and 2050, and low-quality image data between 2030 and 2060.
AI could contribute up to US$15.7 trillion (A$24.1 trillion) to the world economy by 2030, according to accounting and consulting group PwC. But running out of usable data could slow down its development.

Should we be worried?
While the above points might alarm some AI fans, the situation may not be as bad as it seems. There are many unknowns about how AI models will develop in the future, as well as a few ways to address the risk of data shortages.
One opportunity is for AI developers to improve algorithms so they use the data they already have more efficiently.
It's likely in the coming years they will be able to train high-performing AI systems using less data, and possibly less computational power. This would also help reduce AI's carbon footprint.
Another option is to use AI to create synthetic data to train systems. In other words, developers can simply generate the data they need, curated to suit their particular AI model.
Several projects are already using synthetic content, often sourced from data-generating services such as Mostly AI. This will become more common in the future.
Developers are also searching for content outside the free online space, such as that held by large publishers and offline repositories. Think about the millions of texts published before the internet. Made available digitally, they could provide a new source of data for AI projects.
News Corp, one of the world's largest news content owners (which has much of its content behind a paywall) recently said it was negotiating content deals with AI developers. Such deals would force AI companies to pay for training data – whereas they have mostly scraped it off the internet for free so far.

Content creators have protested against the unauthorised use of their content to train AI models, with some suing companies such as Microsoft, OpenAI and Stability AI. Being remunerated for their work may help restore some of the power imbalance that exists between creatives and AI companies.

Rita Matulionyte, is a Senior Lecturer in Law, Macquarie University.

This Tool Can Detect AI-Generated Text in Science Journals
Source: https://i-hls.com/archives/121648

Nov 13 – In the age of AI and the growing concern in academia regarding AI-generated essays, a team of researchers from the University of Kansas has reassuring news- an AI text detector for scientific essays that can distinguish between human-written and computer-generated content almost 100% of the time.

In their study, they noted that while there are currently several AI detectors available, none of them can be applied to scientific papers. Professor Heather Desaire said that "most of the field of text analysis wants a really general detector that will work on anything," so her team focused on reports written specifically for chemistry scientific journals.

According to Techxplore, the team's detector was trained on journals published by the American Chemical Society. They collected 100 introductory passages written by professionals, then programmed ChatGPT to write its own introductions based either on journal abstracts or simply on the titles of reports. When the detector scanned the three categories of reports, it correctly identified the human-authored passages 100% of the time, as well as reports generated from prompts only including report titles. The results were also very good with reports relying on introductory passages, with correct identification 98% of the time.

The competition currently does not compare, with competitor ZeroGPT doing poorly when it comes to science-related reports, and OpenAI failing to correctly identify authorship of essays an average of 80% of the time.

"This new detector will allow the scientific community to assess the infiltration of ChatGPT into chemistry journals, identify the consequences of its use, and rapidly introduce mitigation strategies when problems arise," claims Desaire.

In response to the flood of AI-generated content, scientific journals are rewriting their rules regarding article submissions, with most banning AI-generated reports and requiring disclosure of any other AI processes used in composing a report.

To explain the possible risks of AI use in scientific journals, Desaire explains that their overuse may result in a flood of marginally valuable manuscripts. "They could cause highly cited papers to be over-represented and emerging works, which are not yet well known, to be ignored." She added that most concerning to her are the tool's tendency to "hallucinate" and make up facts that are not true. Nevertheless, she remains optimistic and declares that editors must now take the lead in detecting AI contamination. "Journals should take reasonable steps to ensure that their policies about AI writing are followed, and we think it is fully feasible to stay ahead of the problem of detecting AI."

AI and Nonproliferation: CNS Experts Lead the Way
Source: https://nonproliferation.org/ai-and-nonproliferation-cns-experts-lead-the-way/

Nov 21 – Over the course of 2023, the peril and promise of artificial intelligence (AI) came to the forefront of public discourse across many policy sectors, including international security and nonproliferation. The release of Chat GPT vividly and publicly demonstrated the potential of AI as a tool. The UK government's AI summit, a White House Executive Order, and dire warnings issued by industry leaders highlight potential perils. Many experts have compared the promise and perils of AI to that of the atom, with Microsoft's Open AI even suggesting that an International Atomic Energy Agency (IAEA) is needed to organize global governance of AI.

As AI becomes integrated into domains related to WMD, AI-enabled tools will likely impact on the acquisition and employment of WMD. They will also expand the toolbox for nonproliferation. Despite the serious implications of AI, hype has yet to yield significant empirical research designed to answer fundamental questions about the positive and negative applications of these tools.

CNS is examining the nexus of AI and WMD nonproliferation from several perspectives informed by a core group of staff with deep expertise on a variety of relevant issues. While the scope of CNS efforts will depend on the availability of external research funding, this article provides a snapshot of current CNS activities and identifies some issues for future research.

AI Safety, Alignment, and Global Governance
Over the past several years, experts have expressed concerns about the negative implications of AI for humanity, raising issues of safety, alignment, and the need for global regulation. Touching upon critical

issues of quality assurance, disinformation, human supervision, and privacy, many of the near-term worst-case scenarios for AI are more mundane than the hypothesized emergence of superintelligence, but no less important.

- Ian Stewart, Executive Director of the DC Office, examines the international regulatory debate concerning AI through the lens of the history and evolution of nonproliferation regimes and has recently concluded that the IAEA does not offer the best model for mitigating risks. He has also examined the implications of AI and other emerging technologies for strategic trade controls.
- Ferenc Dalnoki-Veress, Robert Shaw, and Miles Pomper authored a comprehensive report on using additive manufacturing of weapons of mass destruction (WMD) components. The report highlighted the potential risk posed by generative artificial intelligence in simplifying the construction of WMD components.
- Nomsa Ndongwe, Research Fellow, has spent several years working in Geneva at the Convention of Certain Conventional Weapons (CCW) to address the risks posed by lethal autonomous weapons and shaping guiding principles. She continues to explore the role of global governance in constraining the risks posed by AI.
- CNS Research Assistant Yanliang Pan has conducted research on China's approach to AI governance.
- CNS experts are also in discussion with leading tech firms and regulators about what alignment in the nonproliferation context might look like. Specifically, this includes engaging in red-teaming and evaluating the potential of models for enhancing CBRN capabilities.

AI, Strategic Competition, and Nuclear Deterrence

AI has major implications for strategic competition among the United States, China, and Russia and continues to shape the security environment underlying nuclear deterrence.

- Ian Stewart has led several projects that examine Chinese and Russian use of machine learning in strategic and military programs including examining this from an export control perspective.
- Natasha Bajema, Senior Research Associate, has conducted extensive research on the impact of emerging technologies on nuclear decision-making and the mindset of nuclear decision-makers and examined the transparency implications of AI for nuclear deterrence. She is exploring ways to raise awareness among NATO nuclear decision-makers about these new risks and strengthen the resilience of deterrence.
- Jeffrey Lewis, Director of the East Asia Nonproliferation Program, and Natasha Bajema are also exploring the impact of AI on command and control and deterrence issues.
- CNS Research Assistant Yanliang Pan has conducted research comparing and contrasting Chinese, Russian, and US approaches to the development and use of generative AI.

AI and Biosecurity

In recent years, advanced biotechnologies such as gene sequencing, gene synthesis and bioinformatics have transformed the life sciences into a branch of information technology through the generation and application of genomic data. This trend suggests powerful interactions between biotechnology and AI with implications for both biosecurity and nonproliferation.

- Allison Berke, Director of the Chemical and Biological Non-proliferation Program, is conducting research assessing the risks of AI-enabled biodesign tools and their capacity to be used to design new toxins and pathogens.
- Together, Allison Berke and Natasha Bajema are also examining the question of whether LLMs could assist proliferating states or nonstate actors in manufacturing bioweapons, leading to a decline in the requirement for tacit knowledge. Separately, they are exploring the question of whether specialist tools such as Alpha Fold have the potential to assist in toxin and pathogen design and under what circumstances.

AI as a Nonproliferation Tool

AI has the potential to become a powerful nonproliferation tool, enabling open-source intelligence capabilities across a broad range of state and non-state actors. It allows analysts to identify subtle changes in state behavior, detect shifts in nuclear postures, and contribute to treaty verification. CNS is working to examine AI's potential contribution in several different ways.

- Ian Stewart focuses on the question of how AI might contribute to various nonproliferation workflows. This work involves experimentation with the use of LLMs alongside other forms of machine learning for textual and open-source analysis.
- Jeffrey Lewis leads a team of nonproliferation analysts in monitoring and tracking the latest nuclear developments using innovative open-source intelligence approaches and leveraging access to commercial satellite imagery.
- CNS scientist in residence, Ferenc Dalnoki-Veress, examines the potential of agent-based models for nonproliferation. This work includes exploring whether agent-based models can contribute to arms control negotiations and arms control verification activities.

- [William Potter](#), CNS Founder and Director, is examining the potential applications of AI for pedagogical purposes in the realm of nuclear nonproliferation.

To support these efforts, CNS is undertaking a number of specific activities. CNS will create a dedicated working group and section on its website to feature research and commentary on the nexus between nonproliferation and export controls.

California publishes first report on generative AI risks, potential use cases
Source: https://statescoop.com/california-generative-ai-use-cases/

Nov 21 – California Gov. Gavin Newsom's office on Tuesday announced a new report outlining the potential benefits that generative AI could bring to state government — from improving accessibility of the state's services to bolstering cybersecurity — along with an extensive description of the risks the technology could bring along for the ride.

[The report](#) is the first major product of an executive order Newsom [issued in September](#) that directed an expansive effort to explore how the emerging technology could be used inside the state government and to capture the economic benefit of a new technology that's largely developed by California software companies. The 34-page document includes descriptions and examples of six potential ways California could use generative AI, but the bulk of the report is dedicated to exploring the many risks the technology presents — to privacy, security, the state's workforce, operations, transparency, safety and government accountability.

The report cites ways that generative AI could amplify existing threats and create new ones. Among the manifold new risks outlined in the report are threats as alarming as generative AI's potential ability to enable "bad actors to design, synthesize, or acquire dangerous chemical, biological, radiological, or nuclear (CBRN) weapons."

Other threats listed include generative AI's capacity to support mis- and disinformation campaigns, generate offensive material and to create "deepfakes," materials that synthesize the likeness, speech or writing of individuals. Authors also pointed out that generative AI can "lower technical barriers" that once kept bad actors from effectively launching campaigns on social media to harm the public's mental health or polarize politically.

Officials also cited concern with the intractable challenge of identifying how generative AI models reach their conclusions. Sourcing information, the report says, is expected to be a perennial challenge.

Generative AI could also create new risks for California's cybersecurity efforts, authors wrote. The report notes a handful of examples, including the potential for generative AI to be used to remotely execute harmful code, to modify access permissions, steal or delete data or to create content that emulates officials to aid in cyberattacks.

Generative AI 'pioneers'

Risks notwithstanding, the report's authors, a task force created by Newsom's order that includes statewide Chief Information Officer Liana Bailey-Crimmins, strike a sanguine tone in the state's press materials.

Bailey-Crimmins, who [told StateScoop in an interview](#) last month that the ultimate timeline for this work is on the order of years, not months, said in a press release accompanying the announcement that the state is excited to be "at the forefront" of government's work in generative AI.

"With streamlined services and the ability to predict needs, the deployment of GenAI can make it easier for people to access government services they rely on, saving them time and money," she said.

And Amy Tong, California's government operations secretary, is quoted in the materials as saying that the state has an opportunity to "pioneer" new use cases.

"Through careful use and well-designed trials, we will learn how to deploy this technology effectively to make the work of government employees easier and improve services we provide to the people of California," Tong said.

The report describes six major use cases that California state agencies stand to benefit from generative AI, including summarizing and classifying unwieldy collections of data, such as meeting notes and public outreach documentation; catering materials to the needs of California's diverse population, such as by identifying demographic groups who currently struggle to access state services; and expanding the state's use of foreign languages, such as by converting English educational materials into additional languages and formats, such as audiobooks, large print text and Braille documents.

The report names optimizing and converting old computer code into modern languages, or otherwise using it to streamline and "democratize" software development; finding insights that "empower and support" decision-makers, such as by spotting cybersecurity threats earlier; and optimizing the state's operations in support of environmental considerations, such as by analyzing "traffic patterns, ride requests, and vehicle telemetry data to optimize routing and scheduling for state-managed transportation fleets like buses, waste collection trucks."

Next steps

With the first step of Newsom's generative AI order complete, officials are now tasked with developing new training materials for state employees, establishing new partnerships with regional institutions and designing new tools for testing generative AI products before they can be widely deployed. The order also requires an ongoing analysis of how AI is affecting the state.

The order requires the AI task force to develop a "procurement blueprint" that explicates how California can purchase such new software from private companies, while ensuring support of a "safe, ethical, and responsible innovation ecosystem inside state government." This document is to be created with consideration of the federal government's AI Bill of Rights and the National Institute for Science and Technology's AI Risk Management Framework.

The state also plans to create formal partnerships with the University of California, Berkeley and Stanford University to better understand generative AI's effects. The state plans next year to host a summit to discuss how generative AI is affecting the state and its workforce.

OpenAI researchers warned board of AI breakthrough ahead of CEO ouster, sources say

By Anna Tong, Jeffrey Dastin and Krystal Hu

Source: https://www.reuters.com/technology/sam-altmans-ouster-openai-was-precipitated-by-letter-board-about-ai-breakthrough-2023-11-22/

Nov 23 – Ahead of OpenAI CEO Sam Altman's four days in exile, several staff researchers wrote a letter to the board of directors warning of a powerful artificial intelligence discovery that they said could threaten humanity, two people familiar with the matter told Reuters.

The previously unreported letter and AI algorithm were key developments before the board's ouster of Altman, the poster child of generative AI, the two sources said. Prior to his triumphant return late Tuesday, more than 700 employees had threatened to quit and join backer Microsoft (MSFT.O) in solidarity with their fired leader.

The sources cited the letter as one factor among a longer list of grievances by the board leading to Altman's firing, among which were concerns over commercializing advances before understanding the consequences. Reuters was unable to review a copy of the letter. The staff who wrote the letter did not respond to requests for comment.

After being contacted by Reuters, OpenAI, which declined to comment, acknowledged in an internal message to staffers a project called Q* and a letter to the board before the weekend's events, one of the people said. An OpenAI spokesperson said that the message, sent by long-time executive Mira Murati, alerted staff to certain media stories without commenting on their accuracy.

Some at OpenAI believe Q* (pronounced Q-Star) could be a breakthrough in the startup's search for what's known as artificial general intelligence (AGI), one of the people told Reuters. OpenAI defines AGI as autonomous systems that surpass humans in most economically valuable tasks.

Given vast computing resources, the new model was able to solve certain mathematical problems, the person said on condition of anonymity because the individual was not authorized to speak on behalf of the

company. Though only performing math on the level of grade-school students, acing such tests made researchers very optimistic about Q*'s future success, the source said.

Reuters could not independently verify the capabilities of Q* claimed by the researchers.

'VEIL OF IGNORANCE'

[1/2]Sam Altman, CEO of ChatGPT maker OpenAI, arrives for a bipartisan Artificial Intelligence (AI) Insight Forum for all U.S. senators hosted by Senate Majority Leader Chuck Schumer (D-NY) at the U.S. Capitol in Washington, U.S., September 13, 2023. REUTERS/Julia Nikhinson/File Photo Acquire Licensing Rights

Researchers consider math to be a frontier of generative AI development. Currently, generative AI is good at writing and language translation by statistically predicting the next word, and answers to the same question can vary widely. But conquering the ability to do math — where there is only one right answer — implies AI would have greater reasoning capabilities resembling human intelligence. This could be applied to novel scientific research, for instance, AI researchers believe.

Unlike a calculator that can solve a limited number of operations, AGI can generalize, learn and comprehend.

In their letter to the board, researchers flagged AI's prowess and potential danger, the sources said without specifying the exact safety concerns noted in the letter. There has long been discussion among computer scientists about the danger posed by highly intelligent machines, for instance if they might decide that the destruction of humanity was in their interest.
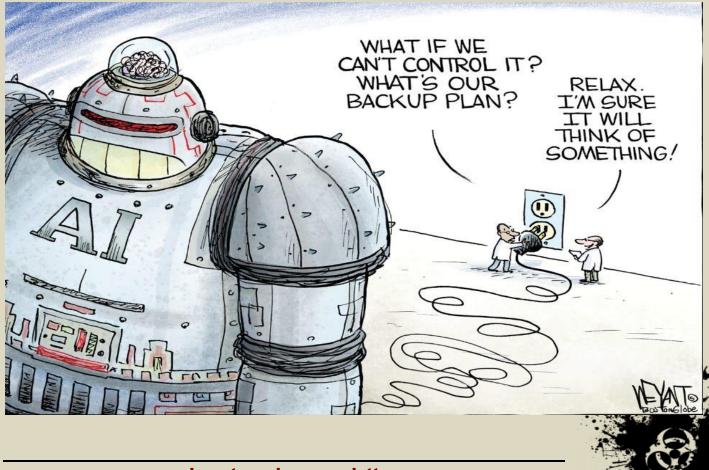
Researchers have also flagged work by an "AI scientist" team, the existence of which multiple sources confirmed. The group, formed by combining earlier "Code Gen" and "Math Gen" teams, was exploring how to optimize existing AI models to improve their reasoning and eventually perform scientific work, one of the people said.

Altman led efforts to make ChatGPT one of the fastest growing software applications in history and drew investment - and computing resources - necessary from Microsoft to get closer to AGI.

In addition to announcing a slew of new tools in a demonstration this month, Altman last week teased at a summit of world leaders in San Francisco that he believed major advances were in sight.

"Four times now in the history of OpenAI, the most recent time was just in the last couple weeks, I've gotten to be in the room, when we sort of push the veil of ignorance back and the frontier of discovery forward, and getting to do that is the professional honor of a lifetime," he said at the Asia-Pacific Economic Cooperation summit.

A day later, the board fired Altman.

The Race to Interoperability

By Charles J. Guddemi and Catherine L. Feinman
Source: https://domesticpreparedness.com/articles/the-race-to-interoperability

Nov 01 – In April 2013, more than 26,000 runners entered the Boston Marathon, but only 17,600 finished the race before two improvised explosive devices (IEDs) detonated near the finish line. That attack on citizens at a planned event changed how communities across the nation prepare for incidents at special events. As bystanders rushed to help survivors, communication had life-and-death consequences.

Collective Analysis
In September 2023, more than 600 federal, state, local, territorial, and private sector officials from 33 states and territories attended (in-person or virtually) the fifth annual D.C. Interoperability Summit, which was hosted by the D.C. Homeland Security and Emergency Management Agency, to discuss best practices and lessons learned in honor of the 10th anniversary of that event. Subject matter experts shared firsthand accounts and presented additional information to highlight opportunities for improving interoperable communications policy, products, and processes. Across the presentations and panel discussions, participants emphasized the importance of:
- Relationship building;
- Training and exercises for planned and unplanned events;
- Public-to-government, government-to-government, government-to-public, and public-to-public communications; and
- Resilient communications.

Although large-scale bombings like the one in Boston are not common occurrences in the United States, the threat of such attacks is significant with the online availability of bomb-making materials and instructions. Associate Director Sean Haglund at the U.S. Department of Homeland Security's Office for Bombing Prevention noted in his presentation that the terrorist attack cycle typically takes 12-18 months from ideation to attack. That means there is time to potentially disrupt the plans and thwart the attack. Protection measures based on the 5 Ds of Security – deter, detect, delay, deny, and defend – provide added protection as attackers begin to implement their plans.

Retired Boston Police Commissioner Edward Davis presented the keynote on September 6, 2023, at the D.C. Interoperability Summit in Washington, D.C. (Source: Charles Guddemi).

In the immediate aftermath of an incident, many uncertainties exist (i.e., "the fog of war"), so interoperable communications must be in place before the incident occurs. Breaks in the interoperability chain can lead to issues such as increased self-deployment, lack of weapons discipline, and additional casualties. Some common interoperability concerns include lack of radio communications, degradation of services (often due to high-volume use), strain on systems and equipment, not having the proper equipment, unclear alert and notification plans, and lack of clarity on roles and responsibilities.

Ensuring reliable information exchange with the public can help authorities gather pertinent information about the event, send resources where most needed, provide victim support, calm fears, and reunite loved ones. Mobile applications, 911 centers, public service announcements, and reverse 911 are some of the ways to share information between the government and the public. However, critical information gathered needs to be shared with all the resources involved in the response. Delaying communications with hospitals and the boots on the ground would have dire consequences when seconds matter.

Key Interoperability Action Items
The summit provided many action items for participants to implement in their planning processes. Some of these recommendations include:
- Having an integrated communications plan to support multiagency, multijurisdictional interoperability;
- Ensuring that third-party and private services such as emergency medical services and security have direct interoperability capabilities with local first responders;
- Including often overlooked "responders" in the planning process (e.g., 911 call centers, hospitals);
- Incorporating ICS 205, ICS 205A, and ICS 217a forms into communications plans;
- Developing a PACE plan that includes primary, alternate, contingency, and emergency means of communication;
- Staying alert for surveillance indicators, unusual material purchases, bomb-making activity, discreet information gathering, and other suspicious activities;
- Planning for the unique issues regarding patient data and transfer of care;
- Ensuring alerts and warnings capabilities are detailed in advance and integrated with event operations;

- Planning and training for common human reactions after an event: evacuating, fleeing, freezing, gawking, and helping; and
- Remembering the human factor and the need for compassion for the public and the responders.

In recognition of the 10-year anniversary of the Boston Marathon Bombing, the D.C. Interoperability Summit examined how the emergency communications ecosystem shaped a successful response and described the investigation of that major terrorist attack. Collaboration strengthens community resilience by helping emergency preparedness and response professionals across the United States work together to secure the nation.

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Emerging Technologies, Part 4 – Robotics and Automation

By Ian Pleet

Source: https://domesticpreparedness.com/articles/emerging-technologies-part-4-robotics-and-automation

Nov 01 – Robotics and automation have emerged as transformative technologies crucial in emergency management, humanitarian relief, and disaster response fields. These advanced technologies can enhance efficiency, safety, and effectiveness in responding to crises and mitigating hazards. Robotics "refers to the design, construction, and operation of robots," while automation involves using technology to perform tasks with minimal human intervention. Part 4 of this five-part series explores the concepts of robotics and automation, their applications in all-hazards emergency management, humanitarian relief, and disaster response through worldwide examples, and their significant contributions to these critical fields.

Understanding the Basics

It is critical to begin with a general understanding of robotics and automation. *Robotics* is a multidisciplinary field that combines elements of mechanical engineering, electronics, computer science, and artificial intelligence to create machines called robots. These robots can interact with the physical world and perform tasks autonomously or under human control. Robotics development has led to a diverse range of robotic systems, such as industrial robots used in manufacturing, medical robots for surgery, and uncrewed aerial vehicles (UAVs) for surveillance and reconnaissance.

Automation uses technology to perform tasks with minimal human involvement. It aims to improve productivity, reduce human errors, and enhance efficiency. Emergency management and other processes can apply automation to manufacturing, transportation, and data analysis. It relies on sensors, actuators, and algorithms to automate tasks that otherwise would require human labor.

Examples of Robotics and Automation Applications

Robotics and automation have many applications in all-hazards emergency management, humanitarian relief, and disaster response. The following are five such applications. Robots with advanced sensors, cameras, and mobility capabilities can perform *search-and-rescue* operations in dangerous or inaccessible

areas for human responders. For instance, after Japan's 2011 earthquake and tsunami, robots were deployed to search for survivors in collapsed buildings, saving valuable time and reducing the risk of exposure to radiation for human responders.

Robotics can provide essential *medical support* in disaster zones. Robotic surgical systems enable remote surgery performed by expert surgeons, allowing them to operate on patients even if they are geographically distant. This technology can be invaluable when local medical facilities are overwhelmed or destroyed.

Drones and UAVs with high-resolution cameras can rapidly *assess and map* disaster-affected areas. This real-time data helps emergency responders identify the most impacted areas and plan their response and recovery operations accordingly. For example, in the aftermath of Hurricane Maria in Puerto Rico, drones helped to survey the damage and assist in relief efforts.

Automation technologies, such as autonomous vehicles, can aid *humanitarian logistics* by transporting essential supplies and resources to affected regions. Self-driving trucks and delivery drones can reach remote or dangerous areas without risking human lives. During the COVID-19 pandemic, drones demonstrated this capability to deliver medical supplies in various countries.

Environmental monitoring and managing natural disasters like wildfires and floods employ robotics and automation. Robots can navigate hazardous terrain to gather data on environmental conditions, track the spread of fires, or assess flood levels. This information aids in making informed decisions and coordinating emergency responses effectively.

Improving Emergency Interventions

In conclusion, robotics and automation have revolutionized all-hazards emergency management, humanitarian relief, and disaster response. These technologies offer innovative solutions to complex challenges, improving emergency interventions' efficiency, safety, and effectiveness worldwide. From search-and-rescue operations to medical assistance and disaster mapping, robotics and automation applications continue to expand, saving lives and alleviating suffering during crises. As technology evolves, integrating robotics and automation in emergency response will become more vital in safeguarding human lives and minimizing the impact of disasters.

Links to other articles in this series:
Part 1 – Information and Communication
Part 2 – Uncrewed Vehicles
Part 3 – Artificial Intelligence and Machine Learning
Part 4 – Robotics and Automation
Part 5 – Legal and Privacy Concerns

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