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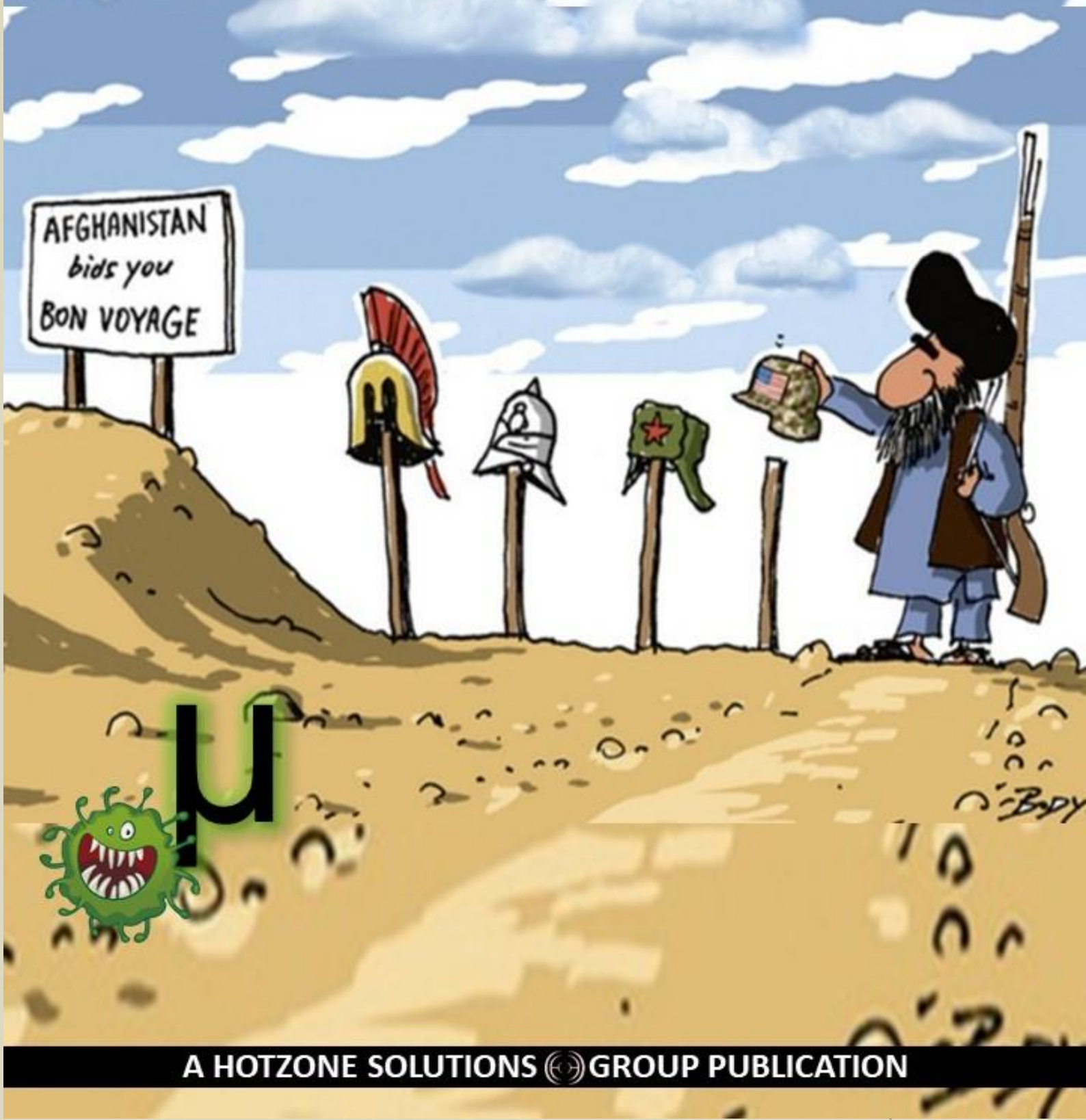

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Is Turkey Secretly Working on Nuclear Weapons?

By Hans Rühle

Source: https://nationalinterest.org/feature/turkey-secretly-working-nuclear-weapons-13898

Sept 2015 – Some months ago it became known that the German Intelligence Service (Bundesnachrichtendienst - BND) was spying on Turkey. Turkey's political leadership was none too happy. Yet the BND has good reasons to keep a watchful eye on Ankara. It is not only the crises in Iraq and Syria, drug-smuggling, people-trafficking and the activities of the PKK that make Turkey a legitimate target for German intelligence. For quite some time, evidence is mounting that Ankara is trying to acquire nuclear weapons.

Over the past two decades, discussions within the nuclear community about emerging nuclear powers always centred on the "usual suspects": Iran, Saudi Arabia, Brazil, Egypt, Japan, South Korea and Turkey. Not surprisingly, opinions as to the likelihood of a military nuclear program differed. In the case of Iran, for example, the evidence appeared solid. By contrast, the case of Turkey was built on vague indications.

This list of likely nuclear aspirants has not changed since, yet the likelihood of a Turkish nuclear weapons program has increased dramatically. Simply put: the Western intelligence community now largely agrees that Turkey is working both on nuclear weapon systems and on their means of delivery. Iran is the model to emulate. Consequently, Turkey has started a large-scale civilian nuclear program, justified by the country's urgent energy needs. In 2011, Turkey concluded a $20bn contract with the Russian company ROSATOM on a large reactor complex. Two years later, a similar agreement was concluded with a Japanese-French consortium, this time over $22bn. President Erdogan also announced yet another power plant, to be built entirely by indigenous personnel.

So far, so good, one might say. After all, nuclear energy seems like a sensible option to at least partially meet Turkey's demand for affordable energy. However, a thorough analysis of the contracts reveals that these projects are not just about improving Turkey's energy supply. Turkey has also consciously opened the door to a military nuclear option.

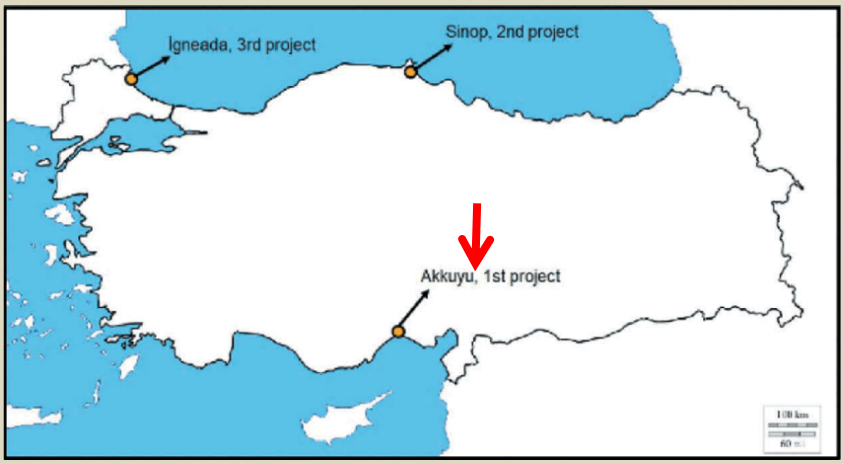
Proposals for constructing a light-water reactor usually consist not just of a commitment to build the plant according to agreed specifications and timelines, but also commitments to run the project for sixty years, to provide the required low enriched uranium and to take back the spent fuel rods. Such offers were put forward by both Rosatom and the Japanese-French consortium. However, in both cases, Turkey insisted that the deal would neither include the provision of uranium nor the return of the spent fuel rods. Ankara wanted to deal with this matter separately at a later stage. Turkey never provided an explanation for this decision. However, the intention behind this unusual maneuvering is not difficult to fathom. Turkey wants to maintain the option to run the reactors with its own low enriched uranium and to reprocess the spent fuel rods itself. This, in turn, means that Turkey intends to enrich uranium, at least to a low level.

And there is more. The option to provide low enriched uranium to currently eight agreed reactors—Turkey is planning twenty-three projects in total—indicates the scope of Turkey's envisioned enrichment effort. The path that Turkey wants to take is clear: to follow in Iran's footsteps. According to President Rouhani, Iran wants to build sixteen reactors by 2030, which are supposed to be powered by indigenously enriched uranium, although much of this low enriched uranium is earmarked for high enrichment and thus for the production of weapons-grade fuel. Of course, Turkey vehemently denies any intention to enrich uranium. However, Turkey has declared on many occasions that it will always insist on its "rights" deriving from the Nuclear Non-Proliferation Treaty (NPT), and that it regards enrichment for peaceful use as perfectly legal. That the Turkish government is at pains to justify its rejection of an external supply of low enriched uranium while not admitting a national interest in enrichment was illustrated by a statement made by the Turkish Minister for Energy, Taner Yildiz, in January 2014. Yildiz argued that the refusal to contractually settle the uranium supply with the aforementioned companies was due to Turkey's desire to understand the full nuclear fuel cycle. Not only does Yildiz' explanation appear weak; Turkey's declaratory nuclear policy also seems to follow the path taken by Iran: one only admits what in light of the facts can no longer be denied.

Turkey's motives for rejecting the continuous uranium supply by its Russian and Japanese-French business partners may appear dubious; its rejection to return the spent fuel rods to the supplying countries is outright disastrous, as it allows for only one conclusion: Turkey is bent on producing plutonium for making weapons. While reprocessing would indeed allow the reuse of the spent uranium, such an option is merely theoretical, since fuel rods made from reprocessed material are far

more expensive than those made from "new" uranium. It is for this reason that reprocessing of spent uranium is hardly being conducted anymore.

With its rejection to return the spent fuel rods, Turkey is embarking on the pathway to the bomb. The common counterargument, according to which the separation of the "dirty" plutonium would require a sophisticated reprocessing plant that currently does not exist in Turkey, remains unconvincing. Studies have shown that such a plant can be built within half a year and would be the size of a regular office building. Moreover, the widespread belief that in order to build a nuclear weapon, one requires weapons-grade plutonium with an impurity level of at most 7 percent, is long obsolete. Already in 1945, General Groves, the leader of the "Manhattan Project," noted that due to the shortage of pure plutonium, the United States would soon be forced to use material with an impurity level of up to 20 percent. In 1962, the United States detonated a plutonium bomb in Nevada that had an impurity level of 23 percent. Finally, if the fuel rods of a light water reactor do not remain inside the reactor for several years, which is the economically viable option, but are removed after only six to twelve months, one ends up with weapons-grade plutonium. The Iranian reactor Bushehr offers a telling example. If the reactor were powered down after eight months and the fuel rods removed, Iran would own 150 kilogrammes of plutonium with an impurity level of only 10 percent—the equivalent of twenty-five Nagasaki-category bombs. In short, the weaponization of plutonium has many facets.



The assumption that Turkey is aiming for nuclear weapons is also supported by the country's activities towards creating the entire nuclear fuel cycle. As has been revealed by a well-connected information service, German intelligence reported that as far back as May 2010, Prime Minister Erdogan had demanded to secretly start preparing for the construction of sites to enrich uranium. Accordingly, Turkey has started to produce Yellowcake, a chemically compressed uranium ore. Yellowcake is converted to gas, which is then enriched in centrifuges. To date, nothing is publicly known about a conversion plant in Turkey, yet according to the BND, Turkey is already in possession of enriched uranium originating from a former Soviet republic and smuggled via Kosovo and Bosnia and Herzegovina with the help of the Mafia. It would not come as a surprise if Turkey already had centrifuges to enrich uranium. After all, Turkey was involved in the activities of Pakistani nuclear smuggler Abdul Qadeer Khan, who between 1987 and 2002 sold thousands of centrifuges to Iran, North Korea and Libya. The electronics of these centrifuges came from Turkey. Khan had even contemplated moving his entire illegal production capacity of centrifuges to Turkey. In 1998, then Pakistani prime minister Nawaz Sharif offered Turkey a "nuclear partnership" on nuclear research. Moreover, there is still an organic partnership between both countries dating back to Turkey's support for Pakistan's nuclear program. Back then, many of the components that Pakistan could not acquire openly were shipped via Turkey to Pakistan. With this backdrop, it does not come as a surprise when intelligence services report that to this day there is a dynamic scientific exchange between both countries.

The question of whether Turkey already has centrifuges and where they may have come from can probably be answered without the recourse to any revelations by intelligence services. At the same time, this might help solve one of the last enigmas of the history of nuclear proliferation: the search for the "fourth customer" of A.Q. Khan. In mid-2003, a shipment of centrifuge parts and tools intended for Libya "disappeared" during a journey from Malaysia via Dubai to Tripoli. It had been ordered—and probably already paid for—by President Gaddafi as part of a major deal on 10,000 centrifuges intended to turn Libya into a nuclear power. The sender of the shipment was A.Q. Khan, who had ordered a company in Malaysia to buy the components from all over the world and ship them to Libya.

Although the International Atomic Energy Agency (IAEA) tried for years to solve that case, what happened to this shipment could never be determined. Still, the IAEA could not simply drop that case, since the disappearance of this shipment could only mean one thing: in addition to the well-known three customers of A.Q. Khan, there must have been yet another. Accordingly, many experts refer to a mysterious "fourth customer."

The enigma about the "fourth customer," who appears to work on a nuclear option with utmost secrecy, has never been solved, even though a resolution appears to become ever more urgent. If one compares Pakistan's production volumes with the production that Khan sold to his three customers beyond Pakistan's own national needs, one finds considerable discrepancies. In other words, the "fourth customer" has received much more from Khan than just the one shipment originally intended for Libya. Khan, however, remains silent. Considering that, according to intelligence

sources, Turkey is in possession of a considerable number of centrifuges of unknown origin, and considering that Khan, shortly before he was put under house arrest, had travelled to Turkey, the conclusion that Turkey is the fourth customer does not appear far-fetched.

Yet this may only be one part of the story. Khan not only delivered centrifuges to his customers, he also supplied them with blueprints for the design of nuclear weapons. The CIA uncovered such plans in Libya in 2003, which had been kept in a department store plastic bag. And in the course of investigating Saddam Hussein's nuclear activities, the IAEA found a one-page document in 1998 that turned out to be a comprehensive offer by Khan to turn Iraq into a nuclear-armed power within three years, for the price of 150 million dollars. This offer explicitly referred to providing Iraq with all necessary components and blueprints for making nuclear weapons.

If Turkey had indeed been the "fourth customer" of the Pakistani nuclear smuggler, one must assume that the country is now in possession of all documentation necessary to build a bomb. And even if Turkey had not been the fourth customer, one must assume that, given the long cooperation on the production of centrifuges, Khan did instruct his preferred partner not just in how to use centrifuges, but also in weaponization.

Given the ambiguities surrounding the level of nuclear expertise of Turkish scientists, it remains difficult to offer clear-cut facts about the current state of Turkey's nuclear activities. What appears worrying, however, are statements from intelligence circles about an advanced nuclear program. According to some sources, Israeli prime minister Netanyahu informed then Greek prime minister Papandreou on March 15, 2010 that Turkey could become a nuclear power any time it wanted to.

Another indirect piece of evidence for the existence of a Turkish nuclear-weapons program is Ankara's missile program. For a long time, Turkey appeared content with developing short-range missiles with a range of up to 150 km. However, over the past years, various public statements indicate a change of course. Much publicity was given to a December 2011 statement by President Erdogan, in particular his demand to the Turkish defence industry to develop long-range missiles. While Turkish media interpreted Erdogan's statement as a plea for intercontinental ballistic missiles, it remained unclear whether the president was really thinking in these terms. However, two months later, Turkey appears to have started developing a medium-range missile with a range of 2500 km. In 2012, Turkey tested a missile with a range of 1500 km, and it also became known that the missile with a range of 2500 km would be operational by 2015.

Even if Turkey will not be able to keep these deadlines, its intention to develop medium-range missiles is clear. This raises the question as to the strategic rationale of such weapons. The answer is fairly simple: Medium-range missiles only make sense with a nuclear payload. Thus, Turkey's development of medium- or long-range missiles can only be explained in the context of a nuclear-weapons program. In a nutshell, Turkey's desire to build missiles with longer ranges is a strong piece of evidence for the existence of a nuclear program.

But what are the views of Turkey's political leadership on this issue? There are, of course, no public statements arguing the case for a national nuclear option. However, some statements can be interpreted as conditioned statements of intent. In August 2011, Turkey's ambassador to the United States, Namik Tan, said: "We cannot tolerate that Iran obtains nuclear weapons." This position was made more concrete two years later by President Abdullah Gül. In an interview with the journal *Foreign Affairs*, Gül said that "Turkey will not allow that a neighbouring country has weapons that Turkey itself does not have." Since it should be clear by now to Turkish politicians that Iran, irrespective of the deal with the P5+1, will continue to pursue a nuclear program, there is no point anymore in conditioning one's own nuclear work. Domestic hurdles appear low: In a 2012 poll, 54 percent of the 1500 people interviewed were in favor or Turkish nuclear weapons if Iran went nuclear.

Given these developments, it becomes clear why Turkey is a legitimate target for German intelligence. A NATO ally who appears to increasingly envision its own role as that of a nuclear-armed regional heavyweight is a development of tremendous importance that Germany cannot afford to ignore. Given Erdogan's vision of Turkey as a self-confident, assertive and potentially independent regional leader in the Middle East, and given the existence of an established (Israel) and an emerging nuclear power (Iran), Turkey has no real alternative but to acquire nuclear arms as well. If Turkey does not opt for nuclear weapons, it will remain second class—a position that Erdogan cannot and will not accept.

***Hans Rühle** is a former Head of the Planning Staff in the German Ministry of Defense. He publishes frequently on security and defense matters.*

EDITOR'S COMMENT: Six years after this article, Turkey is proceeding according to plan with the Akkuyu nuclear power plant and its collaboration with Pakistan. Because the international community is busy with more important issues like the climate change or the future of the Islamic Emirate of Afghanistan…

Gantz says world needs a 'Plan B' to the faltering Iran nuclear deal

Source: https://www.timesofisrael.com/gantz-says-world-needs-a-plan-b-to-the-faltering-iran-nuclear-deal/

Aug 25 – Defense Minister Benny Gantz on Wednesday said the international community must find a "Plan B" to stop Iran from advancing toward a nuclear weapon, as the prospects of a return to a 2015 deal fade.

"Iran is only two months away from acquiring the materials necessary for a nuclear weapon," Gantz warned some 60 foreign ambassadors and envoys at a briefing.

According to Israeli assessments, it would take at least several more months after that for Iran to perform the additional steps necessary to produce a deliverable nuclear bomb, namely constructing an atomic core, installing the device in a ballistic missile and performing tests.

"We do not know if the Iranian regime will be willing to sign an agreement and come back to the negotiation table, and the international community must build a viable 'Plan B' in order to stop Iran on its way toward a nuclear weapon," he said.

The defense minister continued: "All of Iran's acts of aggression thus far have been conducted without nuclear capabilities. Imagine what will happen if Iran achieves nuclear capabilities?

"Iran has the intention to destroy Israel and is working on developing the means to do so," he said. "Israel has the means to act and will not hesitate to do so. I do not rule out the possibility that Israel will have to take action in the future in order to prevent a nuclear Iran."

Former United States president Donald Trump pulled out of the nuclear deal in 2018 and reimposed sanctions that have choked Iran's oil-dependent economy. Iran has responded by walking back measures it had agreed to abide by, including enriching uranium to unprecedented, near weapons-grade, levels.

Talks kicked off in April in Vienna to find a way to bring the US and Iran back to the deal. But the last round took place on June 20, with no date set for when they would resume. The EU chairs the meetings.

US President Joe Biden, Trump's successor, has signaled his readiness to return to the nuclear deal and has engaged in indirect negotiations with Iran alongside formal talks with the agreement's remaining parties, Britain, China, France, Germany, and Russia.

However, the ascendance of new Iranian president Ebrahim Raisi, as well as Iran's increasing moves away from the deal, have led to pessimism in the West that a return to the accord is possible.

Israel has long opposed the nuclear deal and Biden's stated intentions to reenter the treaty. On Wednesday, Prime Minister Naftali Bennett landed in the US, in his first state visit overseas since taking office, with the subject of Iran set to top the agenda for his meeting with Biden on Thursday.

Bennett has spoken out against the possibility of a new nuclear accord between Iran and world powers, and says that any agreement must also put the brakes on Iran's regional aggression.

In a statement released by the Prime Minister's Office before his departure, Bennett said the top priority in his conversation with Biden would be Iran, "especially the leapfrogging in the past two to three years in the Iranian nuclear program."

Gantz at the briefing also told the diplomats that the deadly drone attack on the Mercer Street oil tanker last month was launched from Iranian territory.

Suicide drones that hit the Israeli-linked tanker off the coast of Oman killed a Briton and a Romanian national on board.

The G7 — the US, Britain, Canada, France, Germany, Italy and Japan — blamed the attack on Iran, which denies the accusation.

"Our assessment is that the UAV employed in the Mercer Street attack was launched from Iranian territory and approved by Iranian leadership," Gantz said. "This demonstrates that Iran is a global challenge," he said, adding that Tehran disrupts international trade with its maritime attacks.

UAE starts up second reactor at Barakah nuclear plant

Source: https://www.thenationalnews.com/uae/environment/2021/08/27/uae-starts-up-second-reactor-at-barakah-nuclear-plant/

Aug 27 – The UAE's nuclear power plant has started up its second unit, just four months after commercial operations began using the first reactor.

Emirates Nuclear Energy Corporation and its operating subsidiary, Nawah Energy Company, said on Friday the second unit at Barakah had been switched on successfully.

"This highlights the significant progress being made in bringing the four units of the Barakah Plant online, in a safe and timely manner, to quickly decarbonise the UAE's energy sector," a news release read.

Start-up is the first time the unit produces heat through nuclear fission. The heat is used to create steam, turning a turbine to generate electricity.
Barakah is the region's first operational multi-unit nuclear plant.
Its power generation will significantly reduce the country's use of gas-fired power stations to generate electricity.
Once fully up and running, the four reactors will meet about 25 per cent of the country's energy needs.
"We have reached another major milestone in the delivery of the UAE's peaceful nuclear energy programme today, as part of our journey to power the UAE with clean, abundant 24/7 electricity," said Mohamed Al Hammadi, chief executive of Enec.
"The Barakah plant supports the sustainable growth and prosperity of the nation.
"With the start-up of Unit 2, we are now almost halfway to achieving our goal of supplying up to a quarter of our nation's electricity needs and enabling sustainable growth and, in parallel, achieving UAE climate change targets."

North Korea Appears to Have Restarted Yongbyon Nuclear Reactor

Source: https://www.theguardian.com/world/2021/aug/30/un-atomic-watchdog-says-north-korea-appears-to-have-restarted-nuclear-reactor

A March satellite image provided by Maxar Technologies shows a steam plant, left, and North Korea's main atomic complex, right, in Yongbyon. Photo: Maxar/Associated Press

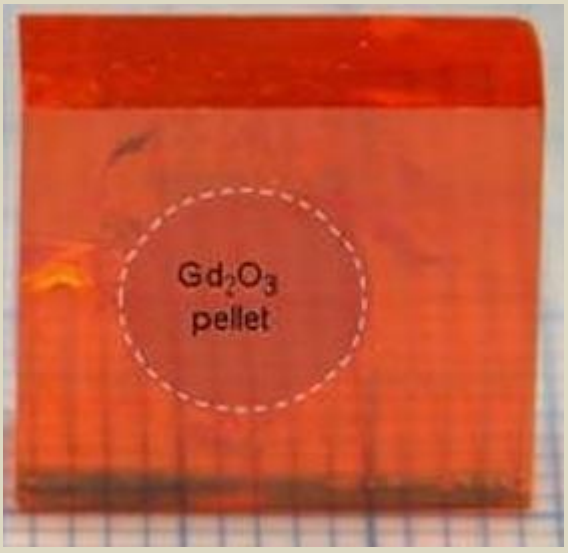
Aug 29 – North Korea appears to have restarted its Yongbyon nuclear reactor, the UN atomic agency has said in a report.

Plutonium, which is used for nuclear weapons, is believed to be produced at the reactor's complex.
The International Atomic Energy Agency (IAEA) was expelled by Pyongyang in 2009 but relies on satellite imagery to carry out assessments.
The watchdog said the reactor has been discharging cooling water since July, suggesting it is operational.
Yongbyon, a nuclear complex with a 5-megawatt reactor, is at the heart of North Korea's nuclear programme.
This was the first sign of operational activity at the reactor since December 2018, months after US President Donald Trump met Kim Jong-un in Singapore, according to the IAEA.
Yongbyon has long been monitored from afar by experts trying to get an idea of how many weapons the regime is capable of producing.
The IAEA also gave more details about a radiochemical laboratory at the same complex, which re-processes spent nuclear fuel. The agency had earlier flagged up the lab's operations in June.
The latest report said that the laboratory had been operating for five months leading up to July 2021, suggesting that it handled a full batch of spent fuel.
The IAEA said the developments at the reactor and laboratory was "deeply troubling" and a clear violation of UN Security Council resolutions.
South Korea's foreign ministry told Yonhap news agency that the government is "continuously monitoring the North's nuclear and missile activities in close cooperation with the United States".
North Korea has continued to develop nuclear weapons since IAEA inspectors were expelled, holding its last test in 2017.

Perovskite crystals given new job as nuclear radiation detectors

Source: https://newatlas.com/materials/perovskite-neutron-nuclear-detectors/

Sept 02 – Perovskite crystals are quickly gaining a name for themselves in the solar energy field, thanks to their impressive ability to convert photons into electricity. But scientists have now tweaked this process to pick up neutrons instead, making an effective detector for leaks from radioactive materials.
Perovskites are a class of minerals with a crystalline structure that makes them very effective at interacting with photons. The most notable application is in perovskite solar cells, which have exploded in efficiency in a little over a decade, reaching up to 25.5 percent alone or 29.15 percent when paired with silicon.
But their uses could extend beyond generating electricity from light. This same mechanism could be used as a light sensor – if the device gives off a jolt of electricity, then light is coming in from somewhere. And now, a team of researchers has adapted this process beyond photons to a new type of subatomic particle, the neutron. Free neutrons are emitted through nuclear reactions, so a perovskite-based device could be used to detect leaks in nuclear power plants, or radioactive materials that are being improperly stored or transported.



The particular perovskite used in this study was a compound called methylammonium lead tri-bromide. Crystals of this material were exposed to a neutron source, and sure enough tiny electric currents were produced. The neutrons penetrate into the nucleus of the crystal atoms, exciting them into a higher energy state. This quickly decays into gamma rays, which charge the perovskite and create the measurable current.

A block of perovskite containing gadolinium (highlighted), which acts like a detector for neutrons, which can indicate radioactivity
2021 M. Kollár

The problem was, this current was too small to be of much practical use. So the team boosted it by adding a thin layer of gadolinium metal, which reaches a higher state of energy than perovskite alone, thus producing more gamma photons and creating a more powerful electric current. This can then be transported through a carbon electrode into a voltmeter or current meter.
In the final version of the detector, the researchers grew the perovskite crystal around the gadolinium foil, so that the latter was completely engulfed by the former. This boosted the

signal even more, and even allowed the direction and size of the neutron flow to be measured. The materials used offer other advantages too.
"It's simple, it's cheap, and it's cost-effective," says László Forró, an author of the study. "This is a proof of principle, that it works. And now we can think about configuration for a very efficient detector."

▶▶ **The research was published in the journal** *Scientific Reports*.

As North Korea Stirs Nuclear Pot Again, Here's What We Know About Its Weapons Programme

Source: https://www.news18.com/news/explainers/explained-as-north-korea-stirs-nuclear-pot-again-heres-what-we-know-about-its-weapons-programme-4162160.html

Sept 03 – It is normally one of the world's most isolated nations, but all it needs for North Korea to become a global talking point is news of the country working on its nuclear weapons programme. It has been slapped with sanctions for pursuing the production of weapons of mass destruction, but continues seemingly undeterred by such actions. Now, the international nuclear weapons watchdog has said that the country has resumed activity at its main nuclear complex. The development comes after a recent thaw that had seen escalated engagement with South Korea and the US. But experts say that it may be more as a leverage for concessions and removal of sanctions that Pyongyang has made its latest nuclear moves.

What Has North Korea Done?
The International Atomic Energy Agency (IAEA) said in a report published in August that it had observed activity after years at the key site of North Korea's nuclear programme, the Yongbyon Experimental Nuclear Power Plant, located about 100km north of capital Pyongyang.
The IAEA said that while there were "no indications of reactor operation from early December 2018 to the beginning of July 2021" at the 5MW reactor, "since early July 2021, there have been indications, including the discharge of cooling water, consistent with the operation of the reactor".
More worryingly, it noted that the radiochemical laboratory at the reactor was in operation for about five months between mid-February 2021 until early July 2021 and that "the five-month timeframe is consistent with the time required to reprocess a complete core of irradiated fuel" from the reactor. Reports said that the Yongbyon reactor produces plutonium, "one of the two key ingredients used to build nuclear weapons along with highly enriched uranium".
IAEA added that Pyongyangs's "nuclear activities continue to be a cause for serious concern".
"Furthermore, the new indications of the operation of the 5MW(e) reactor and the radiochemical laboratory are deeply troubling," it added. Reports said that the laboratory is where plutonium is extracted by reprocessing spent fuel rods removed from reactors.

Why Is North Korea Working On Nukes In The Middle Of The Pandemic?
The pandemic and the impact it has had on North Korea, in fact, may be the reason why Pyongyang has resumed enrichment work at the Yongbyon reactor, experts say. The country claims it hasn't had a single case of Covid-19 within its borders, since the pandemic broke early last year. The highly reclusive country sealed its borders and cut down on any interactions with it even its closest neighbours, like China.
As trade dropped, economic deprivation worsened in the a;ready impoverished country. The situation was worsened by floods and there were reports earlier this year of a famine in North Korea. Experts say that while the strict lockdown was brought in because North Korea lacks even the basic health infrastructure to deal with a serious health crisis, the curbs have extracted a massive economic toll.
"According to some local embassies, buying such basic goods as pasta, flour, vegetable oil, or sugar has become challenging even for them," The Diplomat reported, noting that trade with China, the mainstay of North Korea's economy had "plummeted by 80-90 per cent throughout 2020".
An economic crisis is not something North Korean leaders can brush off so easily and experts say that reviving the nuclear programme is Kim Jong-un's way of drawing the world to the bargaining table, where he can commit to scaling back on capabilities in exchange for concessions that can keep his country afloat.
It has also been pointed out that the nuclear moves could be in response to joint South Korea and US military drills that Pyongyang has frowned upon in the past.

What Is The Size Of North Korea's Nuclear Arsenal?

From intercontinental missiles to thermonuclear devices, Pyognyang claims to have it all. But there is no confirmation of its claims because the country has shielded its nuclear programme from the outside world. As the Nuclear Threat Initiative (NTI) points out, "North Korea is the only country to have withdrawn from the Treaty on the Nonproliferation of Nuclear Weapons (NPT) to pursue a nuclear weapons program, and possesses an increasingly sophisticated nuclear arsenal".

The country has conducted tests in 2006, 2009, 2013, 2016, and 2017, the last of which it claimed was of a thermonuclear device, or Hydrogen bomb.

While the exact size of its nuclear arsenal can only be guessed at, the Council on Foreign Relations (CRF) says that "Pyongyang **could have between 20 and 60 assembled nuclear weapons**". It also cites US intelligence officials as saying in 2018 that North Korea has "**enough fissile material… for 65 weapons, and that every year it produces enough fissile material for 12 additional weapons**".

Further, the country is seen as having developed capabilities to put nuclear warheads on the tips of missiles. "A confidential US intelligence assessment from July 2017 reportedly concluded that North Korea has developed the technology to miniaturise a nuclear warhead to fit its ballistic missiles," CFR said.

In recent years, after Kim Jong-un assumed the mantle of North Korea's supreme leader in 2011, the country has aggressively pursued the development of missile technology and is now considered to have everything from "short-, medium-, intermediate-, and intercontinental- range, and submarine-launched ballistic missiles", including ones that are assumed would be able to hit the US.

What Is The Status Of Nuclear Negotiations And Peace Talks?

North Korea has been down the years slapped with a slew of sanctions by the US, UN and other countries in response to its nuclear weapons programme and IAEA's latest report noted that "the continuation of the… nuclear programme is a clear violation of relevant UN Security Council resolutions and is deeply regrettable".

However, the Kim Jong-un years have also seen wider engagement with South Korea and the US, including a meeting between the North Korean leader and former US president Donald Trump. In 2018, extensive engagement with South Korea led to a meeting between Kim Jong-un and the South Korean President Moon Jae-in, which was followed by the summit with Trump in Singapore. But as NTI notes, while "North Korea affirmed its commitment to the denuclearization of the Korean Peninsula at both summits, there has been little tangible progress" towards that.

Taking over from Trump, Joe Biden is reported to have said that he did not agree with his predecessor's approach to North Korea and would not give Kim Jong-un any "international recognition". That was met with news from North Korea that Kim Jong-un had asked his officers to prepare for both "dialogue and confrontation" with Washington. As Washington wraps up its engagement in Afghanistan and pivots to the Asia-Pacific, North Korea may have made the first move by slightly flexing its nuclear muscle, if only to bring Washington back to the talks table.

Radiation could restrict crewed Mars missions to less than four years

Source: https://newatlas.com/space/radiation-could-limit-crewed-mars-missions-four-years/

Sept 04 – An international team of scientists has calculated that a crewed mission to Mars should only last a maximum of four years if the astronauts' health isn't to be endangered by prolonged exposure to cosmic radiation.

Planning a crewed mission to Mars would be one of the most daunting challenges of any exploration attempt ever made by humanity. Every aspect of such a multi-year adventure would have complex impacts on every other factor, producing a constant tug of war as scientists and engineers seek compromises to fulfill mission requirements.

As well as things like engine type, crew numbers, diet, and a thousand other things, planning also needs to take into account the ever-present hazard of radiation. Once outside of the protective envelope of the Earth's atmosphere and its magnetic field, the astronauts would be at the mercy of cosmic rays from the Sun and the larger galaxy, so the question is, how to minimize such a threat?

According to the recent study that includes researchers from UCLA, MIT, the Skolkovo Institute of Science and Technology, and GFZ Potsdam, the key to protecting Red-Planet-bound astronauts is a matter of timing and shielding material.

The important point is that cosmic radiation isn't constant. It varies according to the activity of the Sun, which may seem changeless, but is, in fact, a variable star with a major period of 11 years during which it waxes and wanes in activity.

There are two sources of cosmic rays. One is the Sun, which blasts out Solar Energetic Particles (SEP). These tend to be lighter and of lower energy than Galactic Cosmic Rays (GCR), which are generated by supernovae, black holes, quasars, and similar high-energy

events. These GCR rays are often made up of very heavy particles flying at speeds and energies that can only be barely approached

in the most powerful of particle accelerators on Earth and can cause considerable damage to living tissue over time.
The good news is that the Sun can act as a temporary shield against GCRs. When the Sun is most active, the solar winds become very strong and can ward off GCRs, which means that astronauts would be mostly exposed to less energetic SEPs, with GCRs being more of a reduced background radiation. According to the study's calculations, since GCR activity is at it lowest in the six to 12 months after maximum solar activity, a Mars mission of less than two years duration would be practical. However, a mission that lasted longer than four years would expose the crew to dangerous levels of radiation before returning to Earth, which puts an upper limit on mission time. One reason for this limit is the nature of the radiation hazard. The worst danger would be from GCRs because they are so energetic that when the researchers used models of human organs and set them behind different shields, the shielding material itself becomes a problem. There are many different ways to shield an astronaut, including heavy metal plates, tanks of water, or slabs of low-density polymers. The problem is that a shield heavy enough to provide direct protection not only causes weight issues for the spacecraft, the shield can also give off secondary radiation as the cosmic rays split the atoms in the shield. "This study shows that while space radiation imposes strict limitations on how heavy the spacecraft can be and the time of launch, and it presents technological difficulties for human missions to Mars, such a mission is viable," says Yuri Shprits, a UCLA research geophysicist.

▶▶ **The research was published in** *Space Weather*.

Nuclear Notebook: How many nuclear weapons does North Korea have in 2021?

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July 2021 – North Korea has made significant advances over the past two decades in developing a nuclear weapons arsenal. It has detonated six nuclear devices—one with a

yield of well over 100 kilotons—and test-flown a variety of new ballistic missiles, several of which may be capable of delivering a nuclear warhead to targets in Northeast Asia and potentially in the United States and Europe. However, there is considerable uncertainty about which of North Korea's missiles have been fielded with an active operational nuclear capability.
It is widely assumed that North Korea has operational nuclear warheads for medium-range missiles. However, it is unclear whether it has managed to develop fully functioning nuclear warheads that can be delivered by long-range ballistic missiles and, following violent atmospheric reentry, detonate as planned. That said, just because North Korea has not yet publicly demonstrated a capability to deliver a functioning nuclear reentry vehicle on a long-range ballistic missile does not necessarily indicate that it is not working on developing one or could not field one in the future. It is clear from its development efforts and public statements that North Korea ultimately intends to field an operational nuclear arsenal capable of holding regional and US targets at risk.
Due to the lack of clarity surrounding North Korea's nuclear program, agencies and officials of the US intelligence community, as well as military commanders and nongovernmental experts, struggle to assess the program's characteristics and capabilities. Based on publicly available information about North Korea's fissile material production and missile posture, we cautiously estimate that North Korea might have produced sufficient fissile material to build 40 to 50 nuclear weapons and that it might possibly have assembled 10 to 20 warheads for delivery by medium-range ballistic missiles.

North Korea's nuclear policy

North Korea declared a no-first-use policy following its fourth nuclear test in 2016; however, it diluted its statement with the caveat that it would not "be the first to use nuclear weapons […] as long as the hostile forces for aggression do not encroach upon its sovereignty" (Korean Central News Agency 2016). Subsequent statements have also included such caveats; during the 75th anniversary of the ruling Korean Workers' Party in October 2020, Kim Jong Un stated that North Korea's nuclear deterrent "will never be used preemptively. But if, and if [sic], any forces infringe upon the security of our state and attempt to have recourse to military force against us, I will enlist all our most powerful offensive strength in advance to punish them" (38 North 2020).
At various times, North Korean media has also threatened to launch nuclear weapons in response to more minor provocations, such as joint US-South Korean military exercises (Ellyatt 2016). However, despite these occasional inflammatory statements, it is highly likely that North Korea—as with other nuclear-armed states—would only use its nuclear weapons in extreme circumstances, particularly if the continued existence of the North Korean state and its political leadership were in jeopardy.

Fissile material and warhead numbers

North Korea produces plutonium at its five megawatt-electric (MWe) nuclear reactor, located at the Yongbyon Nuclear Scientific Research Center in North Pyongan province. In September 2020, the International Atomic Energy Agency (IAEA) reported that despite ongoing maintenance and sustainment activities, "it is almost certain that the reactor has remained shut down since early December 2018" (International Atomic Energy Agency 2020, 4). Despite the reactor's dormancy, satellite imagery suggests that the complex's Thermal Plant—which supplies steam to the Radiochemical Laboratory used for plutonium reprocessing—has been operating since February 2021 after a multi-year hiatus (Makowsky, Pabian, and Liu 2021). However, this does not necessarily imply that North Korea is now using the complex for plutonium reprocessing; independent analysts suggest that North Korea could plausibly be using the complex to process radioactive waste or conduct operational maintenance (Pabian, Heinonen, Liu, and Makowsky 2021).
Since 2010, North Korea has also been in the process of constructing an experimental light water reactor and in recent years has begun transferring major reactor components into the facility at Yongbyon. In 2019 and 2020, the IAEA reported that North Korea may have conducted infrastructure tests of the experimental light water reactor's cooling system. Although this reactor appears to be designed for civilian electricity production, it would also have a latent capacity to produce weapons-grade plutonium or tritium that could be used for North Korea's nuclear weapons program.
In April 2021, Siegfried Hecker—the former Los Alamos National Laboratory director who was given unprecedented access to North Korean nuclear facilities over several years—estimated that North Korea had a plutonium inventory in the range of 25 to 48 kilograms and was capable of producing up to six kilograms per year at full operation (38 North 2021).
It is much more difficult to assess the state of North Korea's uranium enrichment operations because the footprint for these facilities is significantly smaller and harder to detect. North Korea has only declared a single uranium enrichment facility—the Yongbyon Nuclear Fuel Rod Fabrication Plant, which is estimated to have approximately 4,000 centrifuges—and this facility was in regular operation throughout 2020 (38 North 2021; International Atomic Energy Agency 2020, 4). However, it is widely believed that North Korea has at least one additional centrifuge facility outside of the known Yongbyon complex.
In May 2018, for example, a *Washington Post* article first reported the existence of a potential covert uranium enrichment site at Kangson—just outside of Pyongyang—citing work by the Institute for Science and International Security (Warrick and Mekhennet 2018). In July 2018, a team of researchers from *The Diplomat* and the James Martin Center for Nonproliferation

Studies identified a complex at Kangson as the centrifuge facility's suspected location (Panda 2018). A subsequent *Washington Post* article indicated that "there is a broad consensus among US intelligence agencies that Kangson is one of at least two secret enrichment plants" (Nakashima and Warrick 2018). In September 2020, the IAEA suggested that "If the Kangson complex is a centrifuge enrichment facility this would be consistent with the agency's assessed chronology of the development of [North Korea's] reported uranium enrichment programme" (International Atomic Energy Agency 2020, 5). However, recent independent analysis has raised doubts about the nature of the Kangson complex, suggesting that the site might instead be used to manufacture components for centrifuges (38 North 2021; Heinonen 2020). Without better public information or access to the site itself, it is not possible to confirm the nature of the Kangson site, or its potential role in North Korea's nuclear weapons program. Given these uncertainties, it is unclear how much fissile material North Korea has produced and how many weapons it could potentially build.

The number of weapons depends not only on the amount of fissile material produced but also on the weapon design. It is unclear whether North Korea is prioritizing development and production of higher-yield thermonuclear weapons or lower-yield fission-only or boosted single-stage weapons. More powerful warheads with the high yield demonstrated in the single 2017 advanced design test would consume more fissile material if based on a composite warhead design or require special hydrogen fuel if based on a two-stage thermonuclear warhead design. Lower-yield single-stage fission weapon designs would require less fissile material. Such assumptions can result in very different estimates for the number of nuclear weapons. One assessment in 2020 concluded North Korea only had 10-20 nuclear weapons if it committed its fissile material to thermonuclear weapons production (Fedchenko and Kelley 2020). Another assessment concluded North Korea had around 40 weapons and only "very few thermonuclear bombs" (Hecker 2020; 38 North 2021).

Based on publicly available information, we assess that North Korea has produced sufficient fissile material to build 40 to 50 nuclear weapons (if all material is used) but has possibly assembled fewer than that. If so, most of those warheads would likely be single-stage fission weapons with possible yields of 10 to 20 kilotons demonstrated in the 2013 and 2016 tests and with at the most only a few thermonuclear warheads.

Assumptions about fissile material production and warhead designs also affect projections for how many nuclear weapons North Korea might have in the future and tend to result in inflated numbers. One study in 2021, for example, assumed North Korea might already have 67-116 nuclear weapons and projected the inventory might reach 151-242 nuclear weapons by 2027 (Bennett 2021). Others found the projection to be "much too high" (38 North 2021). It seems more plausible that North Korea might be capable of adding sufficient fissile material for a few to half a dozen nuclear warheads per year, which would potentially be sufficient to produce a total of approximately 80-90 weapons by the end of the decade.

Nuclear testing and warhead capabilities

After six nuclear tests—including two with moderate yields and one with a high yield—there is no longer any doubt that North Korea can build powerful nuclear explosive devices designed for different yields. North Korea has even published pictures of what it claims to be different warhead designs (including a "thermonuclear" design) that appear small and light enough to potentially be delivered by ballistic missiles. The published designs might be real warheads, prototypes, or models. There is no way to know for sure. Nor is it known if the published designs match the devices detonated in the nuclear explosive tests.

Although North Korea is widely assumed to have developed warheads for its short-range ballistic missiles, there is less agreement about its ability to deliver functioning nuclear warheads with long-range missiles. These uncertainties are often overlooked in the public debate about North Korea's nuclear capabilities. To better understand the status of North Korea's nuclear weapons program and assessments about its warheads, it is useful to review major milestones and assessments from the last two decades or so.

North Korea apparently began to develop nuclear weapons even before the formal collapse of the Agreed Framework—a 1994 arrangement whereby the United States would provide Pyongyang two proliferation-resistant nuclear power reactors, and North Korea would freeze operations at reactors thought to be part of a nuclear weapons program. As publicly reported in 2004, Pakistan's Abdul Qadeer Khan said that, some time around 1999, he was shown "three plutonium devices" during a visit to an underground facility about one hour outside Pyongyang (Sanger 2004). Three years later, then-US Secretary of State Colin Powell publicly stated: "We now believe they have a couple of nuclear weapons and have had them for years" (State Department 2002).

The "weapons" Powell referred to might have been the "devices" Khan saw or early prototype designs intended to be used in nuclear tests if necessary. But only three years after Powell's statement, in December 2005, North Korea itself for the first time declared that it had "manufactured nukes for self-defense" and that the weapons "will remain [a] nuclear deterrent for self-defense under any circumstances" (*Washington Post* 2005).

Less than a year later, on October 9, 2006, North Korea conducted its first nuclear test. The explosive yield was limited, less than one kiloton—not an impressive demonstration of a nuclear weapons capability and widely seen as a fizzle. The US intelligence community stated that the test produced a yield of "less than one kiloton—well below the yield of other states' first nuclear test" (Office of the Director of National Intelligence 2007).

The second test—two and a half years later, on May 25, 2009—was a little more powerful and "suggests the North has the capability to produce nuclear weapons with a yield of roughly a couple kilotons TNT equivalent," according to the US intelligence community.
These tests did not demonstrate the yield needed for operational nuclear weapons. A Rand Corporation report in 2012 cautioned: "It should also be considered that even speculative sources estimate that North Korea cannot have more than a few nuclear weapons available. If they exist, these devices are very precious to the regime, and it seems unlikely that they would be mounted on inaccurate and unreliable missile systems—the risk of 'loosing' a weapon is simply too high" (Schiller 2012).
The third test, conducted on February 12, 2013, was more convincing. The intelligence community initially said that its yield was "several kilotons"—but international analysis subsequently estimated the yield to have been around 10 kilotons (Office of the Director of National Intelligence 2013; NORSAR 2017). This prompted some experts to suggest that North Korea might have developed a miniaturized warhead for the Nodong, though others thought it was too soon for North Korea to have accomplished that feat (Albright 2013; Kim J., 2014; McGrath and Wertz 2015).
Around the same time, the Defense Intelligence Agency—in an assessment distributed to members of Congress—for the first time concluded: "[The Defense Intelligence Agency] assesses with moderate confidence the North currently has nuclear weapons capable of delivery by ballistic missiles; however the reliability will be low" (Shanker, Sanger, and Schmitt 2013). The assessment did not reflect the conclusion of the US intelligence community as a whole and triggered an immediate rebuttal by the Defense Department: "It would be inaccurate to suggest that the North Korean regime has fully developed and tested the kinds of nuclear weapons referenced in the passage." The Director of National Intelligence added that "the statement read by the member is not an intelligence community assessment" and that "North Korea has not yet demonstrated the full range of capabilities necessary for a nuclear-armed missile" (Clapper 2013).
Similarly, Air Force Global Strike Command stated in a briefing in September 2013 that North Korea "currently does not have an operational warhead; if developed, it could be deployed on" the Musudan (Hwasong-10), Taepo Dong-2, or Hwasong-13 (Air Force Global Strike Command 2013).3 Global Strike Command did not list any medium- or short-range missile with nuclear capability.
Even so, the assessment among private analysts at the time was that medium- and possibly short-range ballistic missiles were the first platforms for North Korean nuclear weapons. An April 2015 report from the US-Korea Institute at the Johns Hopkins School of Advanced International Studies, for example, claimed that the Nodong missile formed "the backbone of its current deterrent… " (Schilling and Kan 2015). Similarly, after North Korea's fifth nuclear test, in September 2016, demonstrated a yield of 10 to 15 kilotons, the Institute for Science and International Security estimated that "North Korea may have a handful of plutonium-based warheads for its Nodong ballistic missile" (Albright 2017).
But military commanders also appeared to go further than the intelligence community at the time. The commander of US Forces Korea, General Curtis Scaparrotti, stated in October 2014: "I believe they have the capability to miniaturize a device at this point and they have the technology to potentially deliver what they say they have." Scaparrotti cautioned that "We've not seen it tested," but nonetheless added, "I don't think as a commander we can afford the luxury of believing perhaps they haven't gotten there." The Pentagon press secretary clarified: "General Scaparrotti said he believes they have the capability to miniaturize. That's not the same thing as saying that they have the capability to mount, test, and deliver a nuclear weapon in an [intercontinental ballistic missile] (ICBM)" (Alexander and Stewart 2014).
The South Korean Ministry of Defense did not agree with Scaparrotti's assessment. "Despite its significant technology level, we don't think the North is capable of making such nuclear weapons," a spokesperson said in February 2015 (Korea Herald 2015a).
Clearly, there was confusion about how to describe the capability. On March 20, 2015, *The Korea Herald* quoted Admiral Cecil Haney, then the commander of US Strategic Command, about North Korea's nuclear capability: "We think they already miniaturized some of this capability" (Korea Herald 2015b). But when asked at a press conference only four days later if North Korea had a miniaturized warhead that it could put on a missile, Haney said: "As of yet, I don't see any tests yet that [were] associated with this miniaturized claim" (Defense Department 2015a).
And when Admiral Bill Gortney—commander of North American Aerospace Defense Command and US Northern Command—was asked in April 2015 if he thought North Korea had "developed the capability to miniaturize a nuclear warhead and put it on a ballistic missile like the KN-08," he responded that "we assess that they have the ability to do that" (Defense Department 2015b).
At the time, however, North Korea had not even test-launched the KN08, so Gortney cautioned: "Now, we have not seen them do that. We haven't seen them test that." Yet he added that "I don't think the American people want us to—you know, there are some things that they want us to make sure we edge on the side of conservatism to make sure we get right" (Defense Department 2015b).
The explanation was an important reminder to be cautious when interpreting official statements about North Korean nuclear capabilities. "Our assessment," Gortney said, "is that they have the ability to put it on—a nuclear weapon on a KN-08 and shoot it at the homeland. And that—*that's the way we—that's the way we think. That's our assessment of the process* (emphasis added). We haven't seen them test the KN-08 yet and we're waiting to do that. But it doesn't necessarily mean that they will fly before they test it" (Defense Department 2015b).

After its fourth nuclear test, on January 6, 2016, North Korea claimed it had successfully detonated a "hydrogen" bomb. The yield of the explosion was relatively modest (around five kilotons), and the US intelligence community assessed the following month that "the low yield of the test is not consistent with a successful test of a thermonuclear device" (Clapper 2016). A second test that year, on September 9, was more powerful (10 to 15 kilotons) but still far from what one would expect from a successful thermonuclear test.4 It is possible, but unknown, that the North Korean reference to "hydrogen" implied use of tritium to boost the efficiency of a single-stage fission device. Such a technology would enable North Korea to use less fissile material in each bomb and further expand its production capacity (Jones 2016).

And it is unclear if the tests involved actual nuclear warhead designs or test devices that would require further modification to be fitted on a missile. Dennis Blair, who was director of national intelligence in 2009–2010 and is a former commander of US Pacific Command, as late as April 2017 seemed to think that the explosions involved test devices. During a talk, Blair characterized North Korea's nuclear warheads as "these crude weapons that they developed maybe seven or eight years ago," each of which "is about the size of half of this stage… ." Pyongyang's program, Blair asserted, "may be developing 10 to 15 nukes" (Blair 2017). Whether Blair was aware of later designs is not clear, but his description is a far cry from the pictures released by North Korea, whether legitimate or not, that showed the so-called "disco ball" and "peanut" warhead designs.

In early August 2017, General Paul Selva—vice chairman of the Joint Chiefs of Staff—gave a detailed account of the uncertainties that remain about North Korea's nuclear capabilities (Garamone 2017). "Before we can assert Kim Jong-un has a nuclear missile capable of targeting the United States," Selva said, "there are a couple of aspects we must know." He listed several criteria that must be met (Selva 2017):

- "One, [Kim] has to have the missile that will actually range that distance. We believe he has that capability right now. It's clear that he can build a rocket that can fly that far.
- [Two,] [h]e'll have to have the guidance and control system, the guidance and stability control, to move a rocket across that distance without it breaking up. We don't know if he has that. We don't know that he doesn't. He's been pretty successful at short- and medium-range ballistic missiles. But the physics of a long-range missile are substantially different. So stability control matters. And that's a gap we need to fill in our understanding of whether or not he can do this.
- The third piece is a reentry vehicle that can survive the stresses of an intercontinental ballistic missile shot. Once again, much easier to go straight up and down than it is to endure the reentry stresses and the actual heat of an intercontinental missile shot. We don't know if he's got that technology. We don't know that he doesn't, but we don't know that he does. He hasn't demonstrated it. We have to see.
- And the last is a nuclear weapon that can survive that trip. Again, that's what we don't know. We don't know the design specifics of his nuclear weapons—purported nuclear weapons. We don't know if he's been able to miniaturize it and make it stable enough."

One month later, on September 3¸ 2017, North Korea demonstrated clearly that it could potentially produce nuclear devices with yields in the range of thermonuclear warheads. A nuclear explosion with a yield of well over one hundred kiloton showed that North Korea had managed to design a thermonuclear device or one that used a mixed-fuel (composite) design. The US intelligence community reportedly called it an "advanced nuclear device" (Panda 2017b). Yield estimates range from 140 to 250 kilotons (Asia Review 2017; NORSAR 2017).

Despite the uncertainty about the number and ability to deliver a functioning nuclear warhead to the United States, some experts asserted that North Korea could do just that. Yet even after several ICBM flight tests conducted by North Korea in 2017, US Chairman of the Joint Chiefs of Staff Gen. Joseph Dunford in 2019 indicated North Korea had not yet demonstrated a capability to deliver a functioning nuclear warhead on a long-range missile. "I still see a potential although as-yet-undemonstrated capability to match a nuclear weapon with an intercontinental ballistic missile…" (Dunford 2019). A UN panel of experts reported in 2021 that an anonymous member state had assessed, "judging by the size of the missiles of the Democratic People's Republic of Korea, that it is highly likely that a nuclear device can be mounted on the intercontinental ballistic missiles, and it is also likely that a nuclear device can be mounted on the medium-range ballistic missiles and short-range ballistic missiles." But the size of a missile does not in and of itself show anything about the capability of the nuclear device it may be capable of carrying, so the member state cautioned that "it was uncertain whether the Democratic People's Republic of Korea had developed ballistic missiles resistant to the heat generated during reentry" (United Nations 2021).

In sum, these assessments indicate that although North Korea has developed nuclear devices small enough to be mounted on its medium- and long-range ballistic missiles, it is unclear if it has developed a reentry vehicle capable of protecting a device during reentry through the Earth's atmosphere.

Land-based ballistic missiles

Over the past decade, North Korea has developed a highly diverse ballistic missile force, including missiles in all major range categories. In addition to the aforementioned

uncertainties surrounding North Korea's nuclear warheads, it is unclear how many operational delivery vehicles North Korea possesses and which of those would be assigned a nuclear mission. It is also important to note that some of the ballistic missile types North Korea has flight-tested or displayed might be research projects intended to develop future ballistic missile technology, rather than demonstrations of operational missiles.

In recent years, a wealth of new information about North Korean missile bases has become publicly available, most prominently thanks to the recent work of Joseph Bermudez and Victor Cha on the Beyond Parallel web site (Beyond Parallel). Despite North Korea's missile development and extensive construction at suspected missile bases, however, the operational status of many of these missiles remains uncertain. The Missile Defense Review report published by the Pentagon in 2018, for example, stated that none of North Korea's modern longer-range missiles had been fielded (Defense Department 2019).

In order to ensure completeness, this section analyzes all of North Korea's known land-based ballistic missiles (see Table 1) and offers some hypotheses about which missiles are most likely to have a nuclear role.

Table 1
North Korean Ballistic Missiles With Potential Nuclear Capability, 2021*

Type/Name[1]	US/Other Designations	Year Displayed	Range (km)[2]	Stages (Fuel)	Payload x Capacity (kg)	Launchers[3]
Land-based ballistic missiles						
ICBMs (5,500+ km range)						
Hwasong-16	KN27	2020	12,000+	2 (liquid)	1 x 1,700[4]	TEL
Hwasong-15	KN22	2017	12,000+	2 (liquid)	1 x ?	TEL
Hwasong-14	KN20	2017	10,000+[5]	2 (liquid)	1 x ?	TEL
Hwasong-?	KN14	2017	? (9,000)	3 (liquid)	1 x ?	TEL
Hwasong-13	KN08[6]	Dev.	13,000+	3 (liquid)	1 x ?	TEL
(Taepo Dong-2)	Taepo Dong-2[7]	(2012)	12,000+	3 (liquid)	1 x 800+	Fixed
IRBMs (3,000-5,500 km range)						
Hwasong-12	KN17	(2017)	4,500+	1 (liquid)	1 x 1,000	TEL
Hwasong-10	Musudan[8]	(2016)	3,000+	1 (liquid)	1 x 1,000	<50 TEL
MRBMs (1,000-3,000 km range)						
Pukguksong-2	KN15	(2016)	1,000+	2 (solid)	1 x ?	TEL (C)
Hwasong-9	Scud ER, KN4	(2016)	1,000[9]	1 (liquid)	1 x 500	TEL
Hwasong-7	Nodong Mod 1/2[10]	(1993)	1,200+	1 (liquid)	1 x 1,000	<100 TEL
Submarine-launched ballistic missiles (SLBMs)						
Pukguksong-5	KN?	2021	?	2 (solid)?	1 x ?	SSB
Pukguksong-4	KN?	2020	3,500+	2 (solid)?	1 x ?[11]	SSB
Pukguksong-3	KN26	(2019)	1,000+[12]	2 (solid)	1 x ?	SSB
Pukguksong-1	KN11	Dev.	1,000+	2 (solid)	1 x ?	SSB

Table 1 [PDF]

Short-range ballistic missiles

North Korea possesses several distinct types of short-range ballistic missiles (SRBMs), although many are part of the same missile "family" and therefore share common designs and characteristics. We have not yet seen authoritative information that North Korean SRBMs are nuclear capable, but this is a category of the missile force that is undergoing significant development, so they are included here for background. Moreover, in a speech in May 2021, Kim Jong Un stated that North Korea had developed what he described as "tactical nuclear weapons including new-type tactical rockets…" For the future, he stated it was necessary to improve the technology "and make nuclear weapons smaller and lighter for more tactical uses. This will make it possible to develop tactical nuclear weapons to be used as various means according to the purposes of operational duty and targets of strike in modern warfare…" (North Korean Ministry of Foreign Affairs 2021). The meaning of "tactical" is not clear. It could mean actual short-range tactical nuclear weapons or simply weapons that have shorter range than intercontinental weapons.

North Korea operates a number of Toksa (KN02) solid-fueled ballistic missiles with a maximum range of 120 kilometers, and potentially an extended-range version with a maximum range of 170 km (Kim E., 2014). This missile is based on the Russian Tochka (SS-21 Scarab), which was developed as a dual-capable missile. However, there is no credible public evidence suggesting that North Korea has developed a nuclear capability for the Toksa.

North Korea operates several distinct types of liquid-fueled missiles belonging to the Scud missile family. The Hwasong-5 and Hwasong-6 SRBMs are the North Korean versions of Russian-built Scud B and Scud C missiles. The US Air Force's National Air and Space Intelligence Center lists the missiles' ranges at 300 and 500 kilometers, respectively, and

estimates that North Korea has fewer than 100 launchers for the combined Hwasong-5 and -6 arsenal (National Air and Space Intelligence Center 2020, 21).
North Korea is modernizing both types of missiles by equipping them with maneuverable reentry vehicles designed to evade regional missile defense systems like the Terminal High Altitude Area Defense (THAAD) system, which the United States deploys in South Korea (Panda 2017e). The modernized Hwasong-5, which has been designated KN21 by the US government, was flight-tested three times in August 2017, with one failure (James Martin Center for Nonproliferation Studies 2021). The modernized Hwasong-6, which has been designated KN18, was successfully flight-tested in November 2017 (James Martin Center for Nonproliferation Studies 2021). Given their shorter ranges, it is unlikely that any of North Korea's Scud derivatives have a nuclear role.
In recent years, North Korea has been developing a new series of more accurate, solid-fueled SRBMs with indigenous designs. These missiles, which are known as the KN23, KN24, and KN25, have collectively been tested 32 times since the beginning of 2019 (James Martin Center for Nonproliferation Studies 2021). We have not yet seen authoritative information that these systems have a nuclear role; however, the sophisticated testing program for these newer systems indicates that North Korean missile troops are becoming significantly more practiced at conducting salvo launches and lowering the time intervals between missile launches—which could also have implications for North Korea's nuclear systems (Dempsey 2020).

Medium-range ballistic missiles

North Korea has developed three medium-range ballistic missiles (MRBMs), all three of which are likely to be operational. This is the category of missile that is most likely to have an operational nuclear capability.
The Hwasong-9 (Scud ER) is a single-stage, liquid-fuel, road-mobile, medium-range ballistic missile launched from a four-axle transporter erector launcher. This launcher is very similar to the one used with Scud B and Scud C short-range ballistic missiles. Many sources designate the Scud-ER a short-range ballistic missile, but in a triple test launch on September 5, 2016, the missiles apparently flew to a range of 1,000 kilometers, the lower end of the range that the National Air and Space Intelligence Center uses for medium-range ballistic missiles (National Air and Space Intelligence Center 2020, 25).
The Hwasong-7 (Nodong) is a single-stage, liquid-fuel, medium-range ballistic missile carried on a five-axle road-mobile transporter erector launcher. The missile, which was first test-flown in 1993, exists in two versions (Mod 1 and Mod 2) and has an estimated range of 1,200 kilometers or more. The National Air and Space Intelligence Center estimates that North Korea deploys fewer than 100 Hwasong-7 launchers (National Air and Space Intelligence Center 2020, 25). Apparently, the Nodong was originally intended to carry a first-generation nuclear warhead, and US naval intelligence reportedly warned in 1994 that North Korea would probably be able to equip the missile with a nuclear warhead by 2000, and possibly earlier (Bermudez 1999; Pinkston 2008). The Nodong's accuracy is poor relative to North Korea's more modern missiles, and its conventional utility is therefore quite limited. Partially for this reason, some analysts have suggested that the Hwasong-7 is one of the most likely missiles to have an operational nuclear capability (Albright 2013; James Martin Center for Nonproliferation Studies 2006; Center for Strategic and International Studies 2018).
The Pukguksong-2 (KN15)—sometimes spelled "Pukkuksong-2" or "Bukkeukseong-2" ("Polaris-2")—is a two-stage, solid-fuel, medium-range ballistic missile carried in a canister on a road-mobile caterpillar-type transporter erector launcher. The missile was first test-launched in 2017 and appears to be a modification of the submarine-launched Pukguksong-1 (Polaris-1). It is North Korea's first attempt to field a solid-fuel, land-based ballistic missile. The first two flight tests in 2017 demonstrated a range of up to 1,200 kilometers, which fits the National Air and Space Intelligence Center's range estimate of 1,000 kilometers or more (Wright 2017a; Wright 2017c). Compared to liquid-fuel missiles, solid-fuel missiles require less logistical support and require much less preparation time before launch.

Intermediate-range ballistic missiles

The Hwasong-10 (Musudan) is a single-stage, liquid-fuel, intermediate-range ballistic missile launched from a six-axle transporter erector launcher. The missile, which is also sometimes designated BM-25, has an estimated range of more than 3,000 kilometers, but it suffered several test failures in 2016 (James Martin Center for Nonproliferation Studies 2021). The National Air and Space Intelligence Center estimates that North Korea has fewer than 50 Hwasong-10 launchers (National Air and Space Intelligence Center 2020, 25). However, given the system's unreliability, the overall status of the Hwasong-10 program remains unclear; it may have been replaced by the newer Hwasong-12 as North Korea's primary intermediate-range ballistic missile.
The Hwasong-12 (KN17) is a single-stage, liquid-fuel, intermediate-range ballistic missile carried on an eight-axle road-mobile transporter erector with a detachable firing table. After several failures, the missile was test-launched on a highly lofted trajectory on May 14, 2017, reportedly demonstrating that it could travel approximately 4,500 kilometers if flown on a normal trajectory (Wright 2017b). The National Air and Space Intelligence Center estimates the range as 3,000 kilometers or more. A subsequent test, on August 28, overflew Japan before it crashed in the western Pacific, some 2,700 kilometers from the

launch site. A third successful launch on September 14 demonstrated a longer range—approximately 3,700 kilometers (Panda 2017c; Wright 2017f). At this stage, it is unknown if the Hwasong-12 has been deployed.

Intercontinental ballistic missiles

The most dramatic development has been North Korea's display and test-launching of large ballistic missiles that appear to have intercontinental range. North Korea has publicly shown five types of missiles in this category: the Taepo Dong-2, the Hwasong-13, the Hwasong-14, the Hwasong-15, and the Hwasong-16. These systems are in various stages of development, and some may simply be mockups or technology demonstrators.

The Taepo Dong-2 is a three-stage, liquid-fuel, long-range missile that is thought to be a derivative of the Unha-3 space-launch vehicle. The Unha-3 placed a satellite in an unstable orbit in 2016. North Korea has not yet demonstrated a functioning reentry vehicle for the Taepo Dong-2, and the National Air and Space Intelligence Center's 2020 annual report lists the system as a "space launch vehicle" (National Air and Space Intelligence Center 2020, 29). Given North Korea's recent development of newer, more sophisticated long-range systems, we assess that the Taepo Dong-2 is not currently an operational military system and will not be a focus for North Korea's ICBM program moving forward.

The Hwasong-13 (KN08) is a three-stage, liquid-fuel ICBM carried on an eight-axle transporter erector launcher that uses a truck similar to the one used for the Hwasong-14 ICBM. The Hwasong-13 was first displayed during a parade in 2012. In 2013, an Air Force Global Strike Command briefing listed the KN08 as an ICBM that "could field in [the] next [five] years" (Air Force Global Strike Command 2013). However, the Hwasong-13 has not been flight tested, and given North Korea's recent development of newer, more sophisticated long-range systems, we assess that the Hwasong-13 is not currently an operational system and will not be a focus for North Korea's ICBM program moving forward.

In July 2017, North Korea conducted its first and second ever test-launches of an ICBM using Hwasong-14 (KN20) ICBMs. The two-stage, liquid-fueled Hwasong-14 appears to share its first stage with the Hwasong-12 intermediate-range ballistic missile and is launched from an eight-axle road-mobile transporter erector with a detachable firing table.

The first test launch took place on July 4th. It flew on a highly lofted trajectory to 950 kilometers, and an unnamed US government source later told *The Diplomat* that the United States assessed the range to be 7,500 to 9,500 kilometers (Panda 2017a). North Korea released a video of the launch that showed the missile had a modified payload shroud, which looked similar to a shroud that appeared in photos of Kim Jong Un, engineers, and a peanut-shaped device said to be a thermonuclear warhead. North Korea claimed that the test demonstrated that it could use a reentry vehicle to protect the missile's warhead, but that was later shown to be inaccurate (Wright 2017d).

The second Hwasong-14 test launch, conducted on July 28th, also used a lofted trajectory and reached an apogee of roughly 3,700 kilometers. According to the National Air and Space Intelligence Center and some independent analysts, the test demonstrated that the missile could, if flown on a normal trajectory, have a range of over 10,000 kilometers (Wright 2017e; National Air and Space Intelligence Center 2020, 27). This would potentially bring US cities on the west coast, including Los Angeles and Seattle, within striking range (Elleman 2018). The weight of the payload used in the test, which could significantly affect the range, is not known; however, subsequent analysis suggests that the test was likely not conducted using a reentry vehicle with a realistically heavy mock warhead (Acton, Lewis, and Wright 2018). Therefore, the test did not demonstrate whether or not North Korea has a functioning ICBM reentry vehicle to protect a warhead. It is notable that North Korea did not display the Hwasong-14 at its most recent military parade that featured ICBMs, in October 2020; this could indicate that North Korea intends to put more emphasis on its newer, longer-range ICBMs (NK News 2020).

During a parade in October 2017, North Korea also displayed two new launchers with large canisters for transport of missiles. One launcher appeared similar to the eight-axle transporter erector used for the Hwasong-14, but modified with a large canister that resembled the missile canister used on the Russian SS-25 (Topol) transporter erector-launcher. The second new launcher equipped with a missile canister strongly resembled the transporter erector launcher used for the Chinese DF-31A. Canister launchers are normally used to transport solid-fuel missiles, so the two new launchers might indicate that North Korea is trying to develop a solid-fuel ICBM.

After a two-month pause in missile flight tests, on November 29th, 2017 North Korea launched a newer ICBM with an even longer range: the Hwasong-15 (KN22). The two-stage, liquid-fuel missile was launched from a nine-axle transporter erector on a highly lofted trajectory to nearly 4,500 kilometers, which indicates a maximum range on a normal trajectory with a light payload of approximately 13,000 kilometers, sufficient to potentially target most of the United States (Wright 2017g). The National Air and Space Intelligence Center lists the range of the Hwasong-15 to be upwards of 12,000 kilometers (National Air and Space Intelligence Center 2020, 29). However, it is important to note that heavier payloads—including nuclear warheads—would decrease the missile's range. Hwasong-15 ICBMs were displayed during North Korea's October 2020 military parade (NK News 2020).

In April 2018, Kim Jong Un announced that North Korea would observe a self-imposed moratorium on nuclear explosive tests and flight tests of long-range ballistic missiles (Korean Central News Agency 2018). North Korea has adhered to this declared moratorium; despite the January 2020 announcement by North Korean diplomats that the country would no longer observe the moratorium, North Korea has not yet broken either commitment (Nebehay 2020).
At its October 2020 military parade, North Korea unveiled a new type of liquid-fueled ICBM (Figure 2), which is likely to be designated the Hwasong-16 (KN27), per North Korean naming conventions. The Hwasong-16 is significantly larger than North Korea's other ICBMs, and independent analysts estimate that the missile's diameter could range between 2.4 and 2.5 meters, with a length of roughly 24 to 25 meters (Lewis 2020; La Boon 2020; Elleman 2020). If eventually deployed, it is estimated that the Hwasong-16 could potentially deliver a large warhead—or hypothetically a small number of multiple reentry vehicles or a single reentry vehicle with penetration aids—to the continental United States. However, these advanced capabilities would require a sophisticated testing campaign that would take several years to complete (Elleman 2020).

Figure 2: The Hwasong-16 ICBM was first displayed at the October 2020 parade in Pyongyang. The missiles, which is carried on an 11-axle transporter erector-launcher (TEL), has not been flight tested. (Image: North Korean government).

Overall, despite North Korea's considerable advancements in its ICBM program, the country has still not publicly demonstrated an operationally functioning reentry vehicle that can protect a warhead during reentry through the Earth's atmosphere, and there remains considerable uncertainty about how the combination of the missile, reentry vehicle, and warhead would function in a real attack.
After the Hwasong-14 ICBM test in July, the US Central Intelligence Agency (CIA) reportedly concluded that the reentry vehicle did not survive reentry but would nonetheless likely work in an attack on the United States (Panda 2017d). Yet after the test flight of the Hwasong-15 ICBM on November 28, a US official told CNN that "the North Koreans had problems with reentry" and that the missile likely broke up upon reentry into Earth's atmosphere (Starr and Sanchez 2017).
The South Korean deputy minister of defense policy, Yeo Suk-joo, reportedly told the South Korean parliament that North Korea still needed to prove some technologies, like reentry, terminal stage guidance, and warhead activation (Kim and Solovyov 2017). And Seoul's Foreign Minister Kang Kyung-wha added the North Koreans "haven't demonstrated their

reentry capability. They haven't demonstrated their remote targeting, or the miniaturization that is required to do this" (Krever 2017). These statements match the assessments listed above from US officials.
Union of Concerned Scientists expert David Wright agreed that "North Korea has not yet demonstrated a working reentry vehicle on a trajectory that its missiles would fly if used against the United States," but added that there did not appear to be a technical barrier to building a working reentry vehicle (Wright 2017h). In 2017, Stanford's Siegfried Hecker estimated that this might take another two years of tests (Hecker 2017).

Submarine-launched ballistic missiles

North Korea is developing several types of submarine-launched ballistic missiles (SLBMs), all of which are part of the Pukguksong family of missiles (other spellings used are Pukkuksong or Bukkeukseong), or "Polaris." The National Air and Space Intelligence Center's 2020 ballistic and cruise missile report states that none of North Korea's SLBM have been deployed (National Air and Space Intelligence Center 2020, 33). The first versions may have been technology development projects intended to develop technologies for future operational missiles.
The Pukguksong-1 (KN11) is a two-stage, solid-fuel missile designed to be carried on a single Sinpo-class submarine. The submarine only has one missile tube. The Pukguksong-1 has been test-launched six times in total in 2015 and 2016, with three successes (James Martin Center for Nonproliferation Studies 2021). The National Air and Space Intelligence Center lists the Pukguksong-1's range above 1,000 kilometers (National Air and Space Intelligence Center 2020, 33).
In October 2019, North Korea test-launched a new type of SLBM: the Pukguksong-3, which could have a maximum range of up to 1,900 kilometers (Wright 2019). The Pukguksong-3's existence had previously been revealed by Kim Jong Un's visit to a chemical materials institute in August 2017 (Panda 2017f).
During the October 2020 military parade, North Korea unveiled a newer type of solid-fuel SLBM: the Pukguksong-4, which may have a longer range than its predecessor. The two-stage missile is wider than the Pukguksong-1 and possibly a little shorter than the Pukguksong-3. Its larger diameter indicates that it could hypothetically carry multiple warheads or penetration aids to overcome ballistic missile defenses. Speculations that the Pukguksong-4 might currently be capable of carrying multiple reentry vehicles seem premature. The missile has not yet been flight tested.
At the military parade in January 2021, North Korea displayed yet another SLBM version: Pukguksong-5. The missile, which has not been flight tested, is longer than the Pukguksong-4 but about the same length as the Pukguksong-3. The Pukguksong-5's shroud, however, is less stub and more elongated than the shrouds on the two previous missiles (Sutton 2021; Elleman 2021). Pukguksong-5 might have greater range and payload capacity (United Nations 2021, 96). As with other North Korean missiles, speculations about multiple reentry vehicle capability seem premature at this time.

Other potential platforms

No credible public information demonstrates that North Korea has developed nuclear warheads for delivery systems other than ballistic missiles, even though warheads for ballistic missiles are more difficult to develop than gravity bombs because of the extreme environment of their launch and trajectory. All other nuclear-armed states first developed nuclear bombs for aircraft and then proceeded to field warheads for missiles.
If North Korea had wanted to develop a deliverable nuclear weapon quickly, it could potentially have developed a crude gravity bomb for delivery by an H-5 (Il-28) medium-range bomber. This potential option is mentioned only for background; no public evidence suggests that North Korea has pursued it. A nuclear-capable coastal defense cruise missile, designated KN09, was listed in the 2013 briefing by the Air Force Global Strike Command, but was deleted in a subsequent revision (Kristensen 2013).

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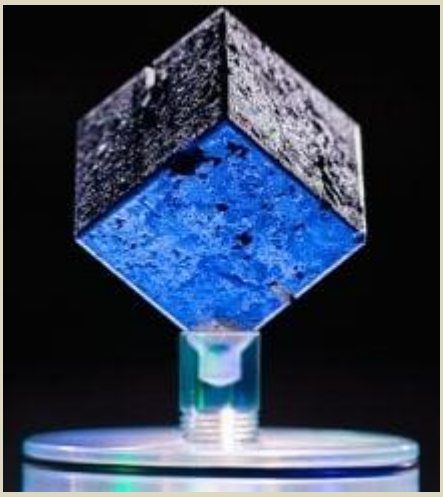
600 Cubes of Nazi Uranium Went Missing in The US. These Scientists Are on The Hunt

Source: https://www.sciencealert.com/scientists-are-searching-for-600-cubes-of-nazi-uranium-that-have-gone-missing-in-the-us

Sept 10 – On someone's desk, one of the little gray cubes wouldn't raise an eyebrow. To the untrained eye, they look like paperweights.



"Marie Curie's granddaughter has one. She uses it as a doorstop," Miriam Hiebert, a historian and materials scientist, told Insider.

The weight of the 2-inch (5 cm) objects might be surprising, though – each is about 5 pounds (2 kg). That's because they're made of the heaviest element on Earth: uranium.

The cubes were once part of experimental nuclear reactors the Nazis designed during World War II. As far as researchers know, only 14 cubes remain in the world, out of more than 1,000 used in Nazi Germany's experiments with nuclear weapons.

Over 600 were captured and brought back to the US in the 40s. But even after that, what happened to most of the cubes is still unclear.

Hiebert and Timothy Koeth, a professor of material science and engineering at the University of Maryland, are writing a book about the cubes. After years of research, they told Insider they think they know what happened.

Miriam Hiebert and Timothy Koeth. (John T. Consoli/UMD)

Small cubes with a long history

Koeth describes the cubes as "the only living relic" of Nazi Germany's nuclear effort.

"They are the motivation for the entire Manhattan project," he said.

Leading up to the war, Germany was a world leader in physics, and the science of nuclear energy was in its infancy. In 1938, German chemist Otto Hahn revealed that he'd created fission by blasting neutrons at a uranium core.

Scientists fleeing Europe, including Albert Einstein and Enrico Fermi, alerted the US that Germany could develop an atomic bomb. The arms race was on.

In its natural form, uranium is not very radioactive. So the cubes aren't very dangerous. But apply a neutron to uranium, specifically the isotope U-235, and it cracks open "like a piñata," as Koeth put it.

"You smash it open with a neutron, and new elements come out, and also more neutrons," he said.

To create an explosion, this must happen in a chain reaction: The neutron gets captured by another uranium atom, which splits open, creating more neutrons, and so on. To make that possible, the neutrons need to get slowed down by a substance called a moderator. The US used graphite for that, and it worked. Scientists with the Manhattan Project created a self-sustaining nuclear chain reaction in December 1942. But the leaders of Nazi Germany's nuclear program, Werner Heisenberg and Kurt Diebner, picked heavy water as their moderator: water in which the hydrogen atoms are replaced with deuterium. Cubes of uranium would be dipped into the water.

The Nazis developed two prototype reactors, the larger of which had 664 uranium cubes strung from a plate and suspended over a pit of heavy water. The smaller reactor used about 400 cubes.

The "Alsos" mission

The Allied forces didn't know how far along the Nazi nuclear program was. And they were nervous.

So in 1943, the Allies launched a secret mission – the codename was "Alsos" – to find out.

A team of about a dozen people, including soldiers, scientists, and interpreters, traveled through Italy, France, and Germany searching for traces of the Nazis' nuclear experiments.

Then as the war neared its end, the mission's objective shifted to making sure nuclear material (or scientists) wouldn't make it into the hands of the Soviets.

In April 1945, Allied forces found and captured about 1.6 tons of uranium cubes in southern Germany. Heisenberg, his team, and the larger of Germany's two reactors – neither of which ever worked – had previously been hiding there. Nearly all the cubes were sent back to the US. The Alsos mission never found the smaller reactor.

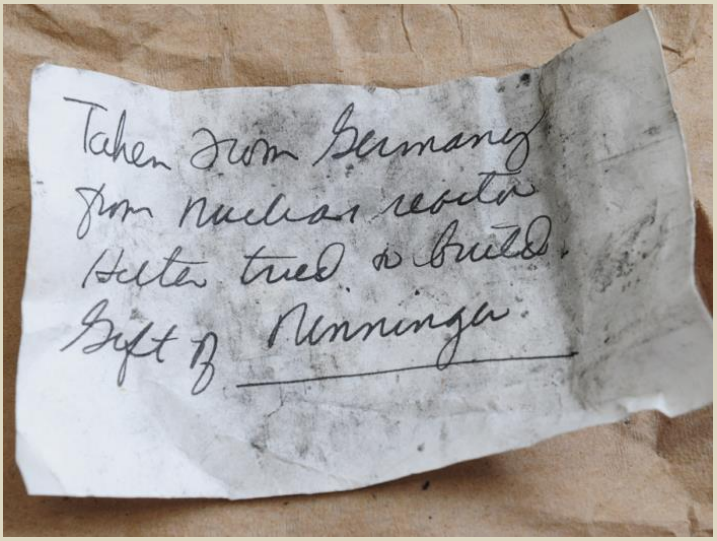
Alsos intelligence officers after locating German uranium cubes, Haigerloch, Germany. (Samuel Goudsmit/AIP Emilio Segrè Visual Archives)

Cubes were picked off the pile

After the cubes arrived in the US, Hiebert said, their trail went cold. The US was highly secretive about its own nuclear program, so there aren't many public records about the Nazi uranium.

"We currently know of 14, out of almost 1,000 that existed in total," she said, "so most of them are still unaccounted for."

But those 14 offer clues about what may have happened to the rest.



Koeth, who has been an avid collector of nuclear objects since his early teens, has two of the 14. Both were given to him by colleagues. The first was a birthday present about a decade ago, but the giver asked to remain anonymous and Koeth won't reveal how they got the cube.

It came with a handwritten note that read: "Taken from Germany from nuclear reactor Hitler tried to build. Gift of Ninninger."

The note that accompanied Koeth's cube. (Timothy Koeth)

Robert D. Nininger, it turns out (his name has just one n), was a geologist for the US Atomic Energy Commission in the 50s. Koeth and Hiebert found documents that show he worked with the Manhattan Project. Geologists with the

project had the difficult job of sourcing uranium.
"Just figuring out where to get it from was a huge task," Hiebert said.
Koeth's other cube came from a former faculty member at the University of Maryland, who in turn had gotten it from another faculty member, Dick Duffey. During the war, Duffey, a chemical engineer, had worked at a plant in Beverly, Massachusetts, that processed scrap uranium, Koeth said.
Based on these findings and others, Hiebert and Koeth think most of the Nazi cubes that made it to the US were repurposed and used in America's own nuclear program. But some, they think, got "picked off the pile" and kept as souvenirs.
As for the 400 cubes from the second reactor, Hiebert and Koeth found some documents suggesting they were sold on the black market to what became the USSR.

From a nuclear reactor to counter-proliferation efforts
The Pacific Northwest National Laboratory owns another one of the Nazi cubes but doesn't have records documenting its history.
So, two scientists there, Jon Schwantes and Brittany Robertson, recently figured out a new way to date the cube – and other uranium products – more precisely than was previously possible. To do so, they measured the levels of two atoms, protactinium and thorium, that accumulate over time as uranium decays.
In a presentation last month at the annual meeting of the American Chemical Society, Schwantes and Robertson revealed that when they applied the method to their lab's cube, the results put it squarely in the expected age range – it dates back to the years Nazi Germany was developing nuclear weapons.
Today, though, the cube has a different function: "The primary purpose it is used for is training," Schwantes told Insider.
The national laboratory teaches security personnel how to recognize nuclear and radioactive material on sight. So the cube offers a good training example.
"I find that really kind of an interesting storyline for this cube – that it was first produced for somebody's nuclear program, and now it's being used for nuclear nonproliferation," Schwantes said.

North Korea Nuclear Timeline Fast Facts

Source: https://www.wlfi.com/content/national/575295062.html?ref=062

Here is a look at North Korea's nuclear capabilities and the history of its weapons program.

1985

North Korea signs the Nuclear Non-Proliferation Treaty (NPT).

1993

The International Atomic Energy Agency (IAEA) demands that inspectors be given access to two nuclear waste storage sites. In response, North Korea threatens to quit the NPT but eventually opts to continue participating in the treaty.

1994

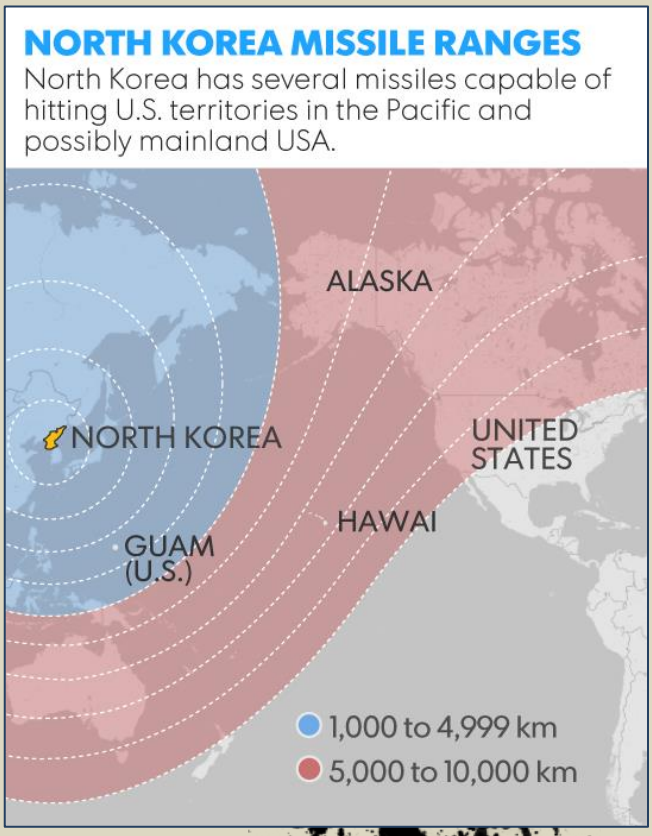
North Korea and the United States sign an agreement. North Korea pledges to freeze and eventually dismantle its old, graphite-moderated nuclear reactors in exchange for international aid to build two new light-water nuclear reactors.

2002

January 29 - US President George W. Bush labels North Korea, Iran and Iraq an "axis of evil" in his State of the Union address. "By seeking weapons of mass destruction, these regimes pose a grave and growing danger," he says.
October - The Bush Administration reveals that North Korea has admitted operating a secret nuclear weapons program in violation of the 1994 agreement.

2003

January 10 - North Korea withdraws from the NPT.



February - The United States confirms North Korea has reactivated a five-megawatt nuclear reactor at its Yongbyon facility, capable of producing plutonium for weapons.
April - Declares it has nuclear weapons.

2005

North Korea tentatively agrees to give up its entire nuclear program, including weapons. In exchange, the United States, China, Japan, Russia and South Korea say they will provide energy assistance to North Korea, as well as promote economic cooperation.

2006

July - After North Korea test fires long range missiles, the UN Security Council passes a resolution demanding that North Korea suspend the program.
October - North Korea claims to have successfully tested its first nuclear weapon. The test prompts the UN Security Council to impose a broad array of sanctions.

2007

February 13 - North Korea agrees to close its main nuclear reactor in exchange for an aid package worth $400 million.
September 30 - At six-party talks in Beijing, North Korea signs an agreement stating it will begin disabling its nuclear weapons facilities.
December 31 - North Korea misses the deadline to disable its weapons facilities.

2008

June 27 - North Korea destroys a water cooling tower at the Yongbyon nuclear facility.
December - Six-party talks are held in Beijing. The talks break down over North Korea's refusal to allow international inspectors unfettered access to suspected nuclear sites.

2009

May 25 - North Korea announces it has conducted its second nuclear test.
June 12 - The UN Security Council condemns the nuclear test and imposes new sanctions.

2010

November 20 - A Stanford University professor publishes a report that North Korea has a new nuclear enrichment facility.

2011

October 24-25 - US officials meet with a North Korean delegation in Geneva, Switzerland, in an effort to restart the six-party nuclear arms talks that broke down in 2008.

2012

February 29 - The State Department announces that North Korea has agreed to a moratorium on long-range missile launches and nuclear activity at the nation's major nuclear facility in exchange for food aid.

2013

January 24 - North Korea's National Defense Commission says it will continue nuclear testing and long-range rocket launches in defiance of the United States. The tests and launches will feed into an "upcoming all-out action" targeting the United States, "the sworn enemy of the Korean people," the commission says.
February 12 - Conducts third nuclear test. This is the first nuclear test carried out under Kim Jong Un. Three weeks later, the United Nations orders additional sanctions in protest.

2014

March 30-31 - North Korea warns that it is prepping another nuclear test. The following day, the hostility escalates when the country fires hundreds of shells across the sea border with South Korea. In response, South Korea fires about 300 shells into North Korean waters and sends fighter jets to the border.

2015

May 6 - In an exclusive interview with CNN, the deputy director of a North Korean think tank says the country has the missile capability to strike mainland United States and would do so if the United States "forced their hand."
May 20 - North Korea says that it has the ability to miniaturize nuclear weapons, a key step toward building nuclear missiles. A US National Security Council spokesman responds that the United States does not think the North Koreans have that capability.
December 12 - North Korea state media says the country has added the hydrogen bomb to its arsenal.

2016

January 6-7 - North Korea says it has successfully conducted a hydrogen bomb test. A day after the alleged test, White House spokesman Josh Earnest says that the United States has not verified that the test was successful.
March 9 - North Korea announces that it has miniature nuclear warheads that can fit on ballistic missiles.

September 9 - North Korea claims to have detonated a nuclear warhead. According to South Korea's Meteorological Administration, the blast is estimated to have the explosive power of 10 kilotons.

2017

January 1 - In a televised address, Kim claims that North Korea could soon test an intercontinental ballistic missile.
January 8 - During an interview on "Meet the Press," Defense Secretary Ash Carter says that the military will shoot down any North Korean missile fired at the United States or any of its allies.
January 12 - A US defense official tells CNN that the military has deployed sea-based radar equipment to track long-range missile launches by North Korea.
July 4 - North Korea claims it has conducted its first successful test of an intercontinental ballistic missile, or ICBM, that can "reach anywhere in the world."
July 25 - North Korea threatens a nuclear strike on "the heart of the US" if it attempts to remove Kim as Supreme Leader, according to Pyongyang's state-run Korean Central News Agency (KCNA).
August 7 - North Korea accuses the United States of "trying to drive the situation of the Korean peninsula to the brink of nuclear war" after the UN Security Council unanimously adopts new sanctions in response to Pyongyang's long-range ballistic missile tests last month.
August 9 - North Korea's military is "examining the operational plan" to strike areas around the US territory of Guam with medium-to-long-range strategic ballistic missiles, state-run news agency KCNA says. The North Korea comments are published one day after President Donald Trump warns Pyongyang that if it continues to threaten the United States, it would face "fire and fury like the world has never seen."
September 3 - North Korea carries out its sixth test of a nuclear weapon, causing a 6.3 magnitude seismic event, as measured by the United States Geological Survey. Pyongyang claims the device is a hydrogen bomb that could be mounted on an intercontinental missile. A nuclear weapon monitoring group describes the weapon as up to eight times stronger than the bomb dropped in Hiroshima in 1945. In response to the test, Trump tweets that North Korea continues to be "very hostile and dangerous to the United States." He goes on the criticize South Korea, claiming that the country is engaging in "talk of appeasement" with its neighbor to the north. He also says that North Korea is "an embarrassment to China," claiming Beijing is having little success reining in the Kim regime.
November 1 - A US official tells CNN that North Korea is working on an advanced version of its intercontinental ballistic missile that could potentially reach the United States.
November 28 - A South Korean minister says that North Korea may develop the capability to launch a nuclear weapon on a long-range ballistic missile at some point in 2018.

2018

January 2 - Trump ridicules Kim in a tweet. The president says that he has a larger and more functional nuclear button than the North Korean leader in a post on Twitter, responding to Kim's claim that he has a nuclear button on his desk.
January 10 - The White House releases a statement indicating that the Trump administration may be willing to hold talks with North Korea.
March 6 - South Korea's national security chief Chung Eui-yong says that North Korea has agreed to refrain from nuclear and missile testing while engaging in peace talks. North Korea has also expressed an openness to talk to the United States about abandoning its nuclear program, according to Chung.
March 8 - Chung, standing outside the White House, announces that Trump has accepted an invitation to meet Kim.
June 12 - The final outcome of a landmark summit, and nearly five hours of talks between Trump and Kim in Singapore, culminates with declarations of a new friendship but only vague pledges of nuclear disarmament.
December 5 - New satellite images obtained exclusively by CNN reveal North Korea has significantly expanded a key long-range missile base, offering a reminder that Kim is still pursuing his promise to mass produce and deploy the existing types of nuclear warheads in his arsenal.

2019

January 18 - Trump meets with Kim Yong Chol, North Korea's lead negotiator on nuclear talks, and they discuss denuclearization and the second summit scheduled for February.
February 27-28 - A second round of US-North Korean nuclear diplomacy talks ends abruptly with no joint agreement after Kim insists all US sanctions be lifted on his country. Trump states that Kim offered to take some steps toward dismantling his nuclear arsenal, but not enough to warrant ending sanctions imposed on the country.
March 8 - Analysts say that satellite images indicate possible activity at a launch facility, suggesting that the country may be preparing to shoot a missile or a rocket.
March 15 - North Korea's foreign minister tells reporters that the country has no intention to "yield to the US demands." In the wake of the comment, US Secretary of State Mike Pompeo insists that negotiations will continue.

May 4 - South Korea's Defense Ministry states that North Korea test-fired 240 mm and 300 mm multiple rocket launchers, including a new model of a tactical guide weapon on May 3. According to the defense ministry's assessment, the launchers' range is about 70 to 240 kilometers (43 to 149 miles). The test is understood to be the first missile launch from North Korea since late 2017 -- and the first since Trump began meeting with Kim.

October 2 - North Korea says it test fired a new type of a submarine-launched ballistic missile (SLBM), a day after Pyongyang and Washington agreed to resume nuclear talks. The launch marks a departure from the tests of shorter range missiles North Korea has carried out in recent months.

December 3 - In a statement, Ri Thae Song, a first vice minister at the North Korean Foreign Ministry working on US affairs, warns the United States to prepare for a "Christmas gift," which some interpret as the resumption of long-distance missile testing. December 25 passes without a "gift" from the North Korean regime, but US officials remain watchful.

2020

March 9 - According to US and South Korean officials, North Korea fires at least three unidentified projectiles, the second such move by the regime in two weeks. North Korean state media says military exercises began on February 28, the one-year anniversary of Kim's summit in Hanoi, Vietnam, with Trump which ended without a deal. The military drills continued March 2, when Pyongyang fired two unidentified short-range projectiles from an area near the coastal city of Wonsan, about 65 kilometers (40 miles) south of Sondok.

2021

March 24 - North Korea launches two ballistic missiles -- the second such launch in less than a week. According to a statement from South Korea's joint chiefs of staff, two short-range missiles were fired from the Hamju area of South Hamgyong province toward the sea, off North Korea's east coast, at 7:06 a.m. and 7:25 a.m. local time. The projectiles flew about 450 kilometers (280 miles), reaching an altitude of 60 kilometers (37 miles), and are believed to have been ballistic missiles launched from the ground, the statement said. The exact type of the missiles are still unclear, a senior US official told CNN, citing an intelligence briefing.

State of Nuclear Security: Trends Threaten Progress Against Nuclear Terrorism

By Jay A. Tilden and Dallas Boyd

Source: https://www.hstoday.us/911/state-of-nuclear-security-trends-threaten-progress-against-nuclear-terrorism/

Tech. Sgt. Glynn Drummonds, 628th Medical Group bioenvironmental engineer journeyman, Michelle Bates, 628th Civil Engineer Squadron Emergency Management manager and Senior Airman Ross Kreikemeier, 628th Civil Engineer Squadron Emergency Management Flight, simulate scanning for hazardous substances during an exercise March 28, 2013, at Joint Base Charleston-Air Base, S.C. (U.S. Air Force photo by Staff Sgt. Rasheen Douglas)

Sept 14 – In the weeks after September 11, while the nation was still grappling with the trauma of the attacks, U.S. leaders confronted the possibility that an even more unimaginable horror was unfolding before them. In October 2001, the CIA director informed the president and other senior officials that a source, code-named “Dragonfire,” had confided that al-Qaeda, which had been entertaining thoughts of nuclear terrorism since the mid-1990s, had smuggled a 10-kiloton nuclear device into the United States and planned to detonate it New York City. At the president’s direction, scientists from the Department of Energy’s Nuclear Emergency Support Team (NEST) quietly scoured the city for the device as part of operation “Radiant Angel” until the CIA learned its initial report was erroneous. Yet in the years that followed, the fear that the world’s most potent weapons would fall into the hands of fanatics would remain a central preoccupation at the highest levels of the U.S. government.

In the first presidential campaign after 9/11, both major party candidates agreed during a debate that nuclear terrorism was “the single most serious threat to the national security of the United States.” Moreover, the prevailing wisdom in the national security community was

that the likelihood of such an attack was high. In 2005, Sen. Richard Lugar (R-Ind.) conducted a survey of experts to elicit their best estimate of the probability of a nuclear attack in the next 10 years, and the average response was 29.2 percent. Almost 80 percent indicated that the attack was more likely to be carried out by terrorists than a nation-state. The following year, scholar Matthew Bunn devised a mathematical model to quantify the probability of an act of nuclear terrorism, which coincidentally suggested a 29 percent likelihood of attack within the next decade.

Mercifully, no such tragedy has occurred, and the haunting question we must ask ourselves is, Why not? Although there may be a temptation to chalk up earlier dire predictions to alarmism, a more compelling explanation is that the U.S. government simply took to heart its vulnerability to nuclear terrorism and responded accordingly. Even prior to 9/11, the United States and many of its international partners had begun enacting an extraordinary range of policies that dramatically reduced the threat of nuclear terrorism. These efforts have addressed both sides of the supply and demand equation, reducing access to the materials and technology needed to build a nuclear device and methodically targeting the terrorists who covet them.

Simply put, the United States has been systematic in disrupting or neutralizing al-Qaeda's and ISIS' leadership, as well as specialists in logistics, bombmaking, and other technical disciplines with relevance to weapons of mass destruction (WMD). A sophisticated global intelligence apparatus was erected to monitor terrorists' communications and activities and disrupt their financing, training, and operational plots. The United States placed particular emphasis on preventing terrorists from acquiring the knowledge and infrastructure needed to produce WMD. That terrorist attacks have been limited in recent years to car bombs, small arms, and even running people over with trucks can be explained in part by the fact that we have so thoroughly decimated their capacity to conduct more sophisticated operations.

On the supply side, U.S. initiatives to secure vulnerable nuclear weapons and materials date back more than 40 years. First begun in earnest with the Cooperative Threat Reduction program in the states of the former Soviet Union, one such operation was Project Sapphire, in which the United States and Kazakhstan cooperated in 1994 to remove more than a half-ton of highly enriched uranium (HEU) from a poorly guarded warehouse. These efforts expanded to a much larger number of countries under former President Obama's Nuclear Security Summit process. To date the United States and its foreign partners have removed, eliminated, downblended, or confirmed the disposition of over 500,000 kilograms of plutonium and HEU – the indispensable ingredients of a nuclear weapon – from 48 countries and Taiwan. We have also converted over 100 research reactors and isotope production facilities from the use of HEU to low enriched uranium or verified their shutdown altogether. The United States has also made major investments to upgrade the security of foreign nuclear facilities, furnishing security system upgrades, underwriting insider threat mitigation programs, enhancing transportation security, and offering training to strengthen regulatory regimes, cybersecurity, and overall security culture.

Notwithstanding these efforts, however, it cannot be excluded that the building blocks of a nuclear device will somehow fall into the hands of terrorists. Weapons-usable nuclear material has been interdicted on roughly two dozen occasions since the 1990s, and we must assume some quantity of this material exists outside of regulatory control. Consequently, the United States has deployed an array of radiation detectors worldwide to identify and interdict smuggled nuclear weapons and materials. More than 60 countries have received such equipment, as well as training and technical assistance to counter nuclear smuggling. Some 57,000 radiation detectors have also been distributed domestically, ranging from static portal monitors that scan cargo at ports-of-entry to mobile and handheld devices operating at border crossings and within the United States.

"Weapons-usable nuclear material has been interdicted on roughly two dozen occasions since the 1990s, and we must assume some quantity of this material exists outside of regulatory control"

As a last line of defense against nuclear terrorism, the United States maintains a suite of counter-WMD capabilities to search for, diagnose, and defeat nuclear devices on its own soil. In particular, highly trained teams in more than a dozen major cities are equipped to respond rapidly to nuclear threats, using advanced tools to image a threat device and take decisive action to protect public safety. Additionally, aerial and ground-based NEST assets are used to protect major public events such as the presidential inauguration and Super Bowl by detecting radiation anomalies. Expanded employment of these capabilities represents a dramatic improvement over the U.S. posture at the time of the 9/11 attacks.

In short, the nuclear terrorism threat appears far less menacing today than it did in the fall of 2001. Various attempts by al-Qaeda and other terrorist groups to achieve a nuclear capability, we now know, made little progress. In all likelihood, terrorists have concluded that the considerable resources and technical skill needed to construct a nuclear device are simply beyond their capabilities, and nuclear security enhancements have deterred them from attempting to acquire nuclear material in the first place. Yet, as it is exceptionally difficult to prove a negative, the United States cannot rest on its laurels and assume these conditions will hold. Rather, we must maintain the intelligence community's focus on WMD terrorism and sustain a robust nuclear counterterrorism and incident response posture in perpetuity.

Although the United States has made tremendous progress to protect weapons-usable nuclear material from outright theft, we cannot discount the possibility that a hostile government or corrupt insiders might provide such material to terrorists. To deter states from

facilitating nuclear terrorism, the United States has invested in nuclear forensic capabilities to attribute the source of any material found outside of regulatory control or used in a terrorist attack. These scientific tools underpin the credibility of U.S. threats to retaliate against any state sponsors of nuclear terrorism.

Here there is much work to be done. Beyond improving the speed of forensics analysis, additional investments are required in scientific disciplines that would allow the United States to better determine the enrichment processes used to produce the nuclear material used in a terrorist device, which can aid in attribution. The U.S government must also foster global confidence in its forensic capabilities, in part by pursuing the establishment of scientific data collection methodologies that are internationally agreed upon *before* a nuclear incident occurs.

Members of the New York National Guard CERFP prepare to decontaminate "victims" of a simulated dirty bomb incident during training June 6, 2009, at the New York State Office of Fire Prevention and Control Training Site in Colonie, N.Y. (Photo by Staff Sgt. Kevin Abbott/New York National Guard)

Additionally, efforts to secure nuclear material around the world have succeeded only where the political will exists to do so, and modest vulnerabilities persist. As of 2021, there are still nearly 40 states party to the amended Convention on the Physical Protection of Nuclear Material – the bedrock of the international nuclear security regime – that have not yet ratified the Amendment. Adopted in 2005 to expand the original requirements for protecting nuclear material during international transport, the Amendment adds protections for this material in domestic use, storage, and transport. Achieving universal ratification of the Amendment, as well as ensuring consistent implementation of its provisions, is crucial to reducing any remaining vulnerability of nuclear materials worldwide. Finally, several countries that possess large stocks of weapons-usable nuclear material have rebuffed international entreaties to eliminate excess material or make security improvements for materials that remain, and such material continues to accumulate for both military and civil purposes around the world. Several states have evinced interest in enrichment and reprocessing technologies, and global competition in the commercial nuclear sector may incentivize suppliers with more elastic nonproliferation standards to service this demand. Absent ironclad nonproliferation safeguards, these trends threaten to reverse hard-won progress on nuclear security and nonproliferation since the end of the Cold War.

Although the national security commentariat has correctly shifted its attention to the resumption of great power competition, attentiveness to the threat of nuclear terrorism must not be the casualty of a zero-sum allocation of national security bandwidth. The mere knowledge that nuclear weapons can be built ensures that active measures to prevent terrorists from obtaining them will always be necessary, and protecting fissile material from malicious use is an imperative that will simply never go away. In all likelihood the worst nuclear fears of the post-9/11 era have not come to pass because of the nuclear security and counterterrorism initiatives launched in the mid-1990s, many of which continue to this day. If our success in preventing nuclear terrorism is to continue, the United States and its international partners must remain committed to keeping nuclear material beyond the reach of terrorists and detecting, disrupting, and responding to nuclear threats as they emerge.

*Since 2016, **Jay Tilden** has served as NNSA's Associate Administrator for Counterterrorism and Counterproliferation with responsibility in preparing for, responding to, and successfully resolving nuclear and radiological accidents and incidents worldwide. Previously, Mr. Tilden served as the Deputy Associate Administrator of the same office. From 2009 to 2012, Mr. Tilden served as the Director of the Office of Nuclear Threat Science (formerly the Office of Nuclear Counterterrorism), leading an integrated technical staff of Federal, contractor, and National Laboratory personnel that executed the multi-laboratory Nuclear Counterterrorism Program, charged with the evaluation of a wide range of nuclear threat devices, including improvised nuclear device concepts and designs. Before that, Mr. Tilden served as the Intelligence and Security Advisor to the Deputy Under Secretary for Counterterrorism and NNSA's Office of Nuclear Counterterrorism. From 2004 to 2008, he was Director of the Counterterrorism Division of DOE's Office of Intelligence and Counterintelligence, which was responsible for providing technical intelligence analysis on: terrorist radiological and nuclear capabilities; potential terrorist threats to nuclear facilities, materials, and activities; and worldwide nuclear materials holdings and their security. He also served as an Intelligence and Program Analyst for the Office of Security Policy advising on Design Basis Threat policies for DOE.*
***Dallas Boyd** is the Chief of Staff of the NNSA Office of Counterterrorism and Counterproliferation. From 2017-2018, he served on the National Security Council staff as Director for Countering Nuclear Terrorism.*

Second Barakah unit connected to the grid

Source: https://www.world-nuclear-news.org/Articles/Second-Barakah-unit-connected-to-the-grid

Sept 14 – **Unit 2 at the Barakah nuclear power plant in the UAE has today begun supplying electricity to the country's power grid,** the Emirates Nuclear Energy Corporation (ENEC) announced. The milestone was reached five months after unit 1 of the plant, in the Al Dhafra region of Abu Dhabi, entered commercial operation.

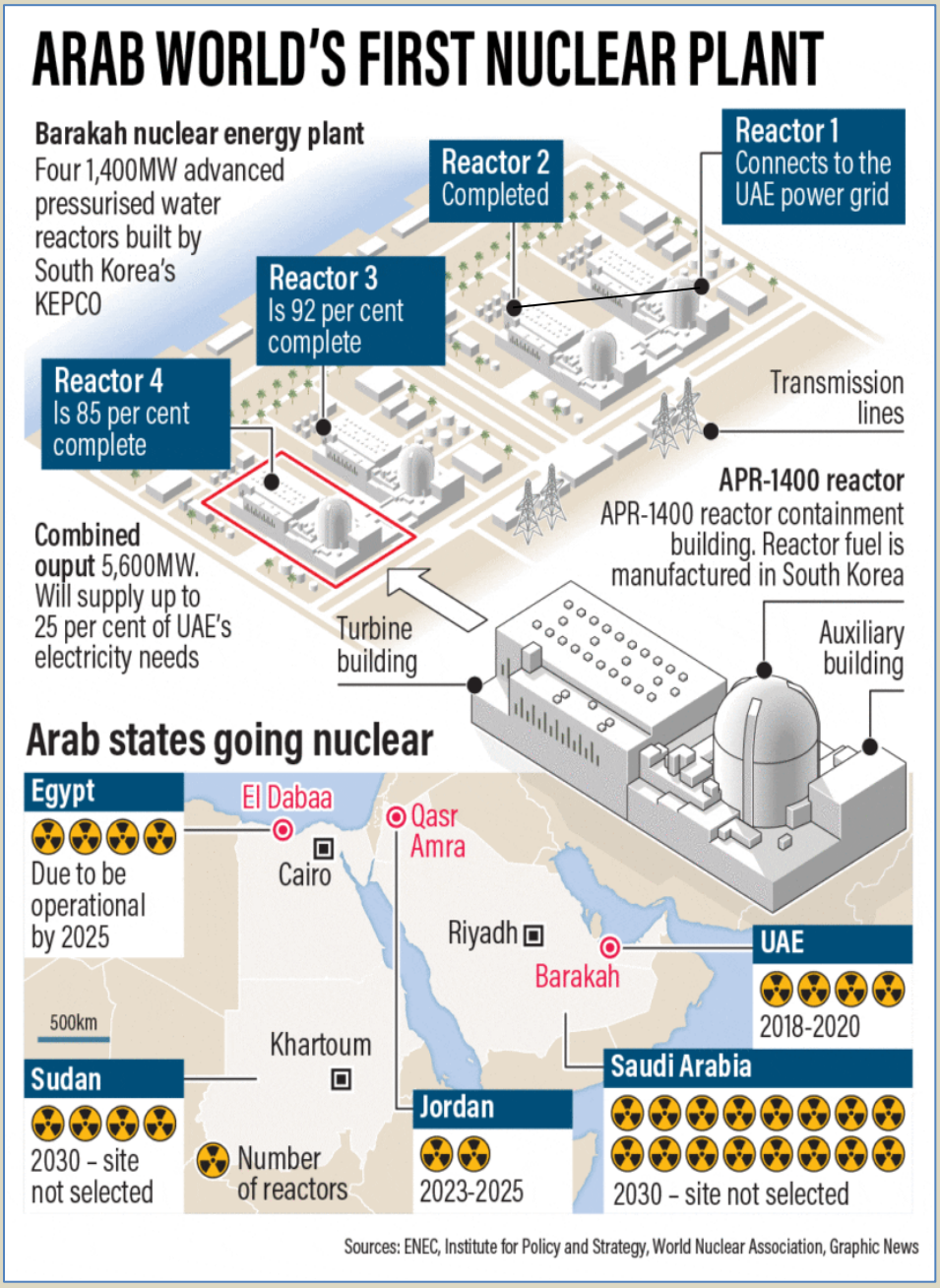
ENEC said its operations and maintenance subsidiary, Nawah Energy Company, had safely and successfully connected the unit to the UAE grid, delivering the first megawatts of carbon-free electricity from the second of four units at the Barakah plant. It said during the grid connection process, the unit 2 generator was integrated and synchronised with the requirements of the UAE's national electricity transmission grid.

The UAE's Federal Authority for Nuclear Regulation (FANR) issued an operating licence for Barakah 2 to Nawah in March, with fuel loading beginning soon after. The unit achieved first criticality - an initial sustained chain reaction - on 27 August.

ENEC said the cumulative knowledge and expertise developed by the operations teams on unit 1 has been used to connect unit 2 to the grid more efficiently, with a 10% reduction in the time between start-up and connection.

The connection of unit 2 to the grid follows the successful completion of numerous safety tests conducted after the start-up of the plant, and with the continued oversight of FANR, ENEC said. Nuclear operators will now begin the process of gradually raising the power levels of Barakah 2's reactor, known as power ascension testing. ENEC said that throughout

this process, the unit 2 systems follow international best practice to safely progress and test the unit as it proceeds towards full electricity production. This testing will be conducted under the continued oversight of FANR.



Under a USD20 billion deal announced in December 2009, four Korean-designed APR1400 reactors are being built at Barakah by a consortium led by the Korea Electric Power Corporation. **First concrete for Barakah 1 was poured in July 2012, while that for units 2-4 was poured in April 2013, September 2014 and July 2015, respectively.**

Units 3 and 4 are in the final stages of commissioning at 95% and 91% completion, respectively. The construction of the plant as a whole is now more than 96% complete. When fully operational, the plant will produce 5.6 gigawatts of carbon-free electricity for more than 60 years to come.

Clean energy ambitions

ENEC said the grid connection of unit 2 brings it "another step closer to the half-way mark of its goal to supply up to a quarter of the country's electricity needs 24/7, while driving reductions in carbon emissions - the leading cause of climate change."

UAE Minister of Energy and Infrastructure Suhail bin Mohammed Faraj Faris Al Mazrouei welcomed the start of electricity supply by Barakah 2, saying it contributes to achieving the goals of the UAE's *Energy Strategy 2050*, which aims to increase the share of clean energy in the total energy mix to 50%.

"We are proud of this new milestone accomplished within the UAE Peaceful Nuclear Energy Programme," Al Mazrouei said. "The Barakah nuclear energy plant plays a pivotal role in achieving the UAE's goals of diversifying energy sources, increasing the share of clean energy resources and supporting economic and social development, as well as meeting the UAE's objectives and international commitments to address the challenges of climate change.

"The Barakah plant contributes to consolidating the UAE's leading role in the regional and global energy sectors, as the plant is now the largest single generator of electricity in the Arab world. It is also the largest contributor to reducing carbon emissions in the region; positioning the UAE as the first Arab country to have a multi-unit nuclear energy plant in operation."

What Is the Sole Purpose of U.S. Nuclear Weapons?

By Adam Mount

September 16, 2021

Source: https://s3.amazonaws.com/uploads.fas.org/2021/08/25092950/FAS-SPNW.pdf

Summary

- Prior to assuming office, President Biden indicated that he would establish that "the sole purpose of our nuclear arsenal is to deter—and, if necessary, retaliate for—a nuclear attack against the United States and its allies."
- Sole purpose should be understood as a central component of an integrated deterrence strategy that can effectively manage the risk of nuclear escalation in a limited conflict as well as the rising stability risks from nonnuclear weapons.
- Sole purpose could significantly reduce the risk of unintended escalation and increase the credibility of more flexible and realistic nonnuclear response options in a range of importance contingencies.
- In order to attain its intended benefits, declaratory policy must be reflected in force structure and planning.
- The president's existing language on sole purpose provides considerable flexibility for the administration to define the doctrine, but does not itself provide clear guidance for strategy, force structure, or for related declaratory policies like "no first use."
- Defining sole purpose is a critical task for the administration's defense policy review.
    - As a central component of an integrated defense policy that will strengthen US deterrence and assurance credibility, sole purpose should be defined at the level of the NDS.
    - A sole type definition would state that the United States would consider nuclear use in response to a certain type of attack, having modest effects on a narrow set of plans but few effects on force structure.
    - A sole function definition would define what is and what is not a requirement of deterrence, potentially removing certain strategic or nonstrategic roles of nuclear weapons.

Depending on how it is defined, sole purpose could have transformational effects on nearly every aspect of nuclear weapons policy or relatively modest effects. It could accommodate or incorporate a range of related policy options, like a deterrence-only posture or no first use.

- Fully implementing a sole purpose policy is critical to attaining its benefits.
    - A simple declaratory statement is not a complete sole purpose policy. Because any statement is likely to be ambiguous, sole purpose should also consist of a set of presidential directives that determine how the policy will be affect force structure and planning.
    - By eliminating one or more of the requirements that structure US nuclear forces, a sole function definition could potentially have significant effects on a range acquisition decisions and plans.
    - If the president concludes that sole purpose has implications for force structure or force posture, the administration should ensure that these changes are made before the presidential term is concluded.
    - Following a decision to adopt sole purpose, civilian officials should review existing operational plans and concepts to ensure that they comport with the president's guidance for escalation management of a conflict with a nuclear-armed adversary.
    - Embedding the policy in plans, force structure, and allied consultations is critical to achieving its benefits and reducing the risk that it is reversed by a future president, which would be highly risky.
- If defined, implemented, and communicated as a part of an effective integrated deterrence posture, sole purpose could strengthen assurance of allies.
    - Some allies will be understandably apprehensive about any shift in US nuclear weapons policy in the current environment.

- Allies should be consulted closely as sole purpose is being defined, as it is released, and as it is being implemented.

In January 2021, President Biden assumed office after having made unusually explicit commitments to reduce the role of nuclear weapons in US national security strategy. In his primary articulation of his campaign's foreign policy, Biden declared that "the sole purpose of the US nuclear arsenal should be deterring—and if necessary, retaliating against—a nuclear attack."[1] Since assuming office, Biden has not repeated the pledge, though his initial national security guidance and his Secretary of State have reiterated the goal of reducing reliance on nuclear weapons.[2] As the Pentagon begins its review of nuclear weapons policy, Biden and his national security officials will have to determine whether to adopt sole purpose and, if so, what it means. The established language on sole purpose offers the administration considerable latitude in how it chooses to reduce reliance on nuclear weapons. Depending on how sole purpose is defined and implemented, it could have transformative consequences for nuclear force structure and strategy, or it could end up as a rhetorical commitment that has few practical effects at all.

Though the language dates back decades, there has never been a precise or agreed definition of sole purpose. The first published use of the phrase is in a piece Albert Einstein related to the eminent journalist Raymond Swing that was published in the *Atlantic* in 1947. Einstein argued while the United States must stockpile the bomb, it should forswear its use. "Deterrence should be the only purpose of the stockpile of bombs." If the United Nations were granted international control over atomic energy, as President Truman had proposed, it should be "for the sole purpose of deterring an aggressor or rebellious nations from making an atomic attack."[3] Since the idea was popularized in the 1960s, sole purpose has become a persistent staple in ongoing debates about the role of nuclear weapons, but it has rarely been attached to a precise definition or a plan to implement it.

Sole purpose is more ambiguous than other declaratory policy proposals (such as no first use) because it purports to define, or constrain, the purpose of nuclear weapons. Depending on how the terms of the statement are defined and how the statement is implemented in practice, its effects could be broad, narrow, restrictive, permissive, or ambiguous. For example, President Biden's sole purpose language could be construed to proscribe nuclear weapons from performing a wide range of functions or from being used in wide ranges of contingencies. Slight variations in the wording of a sole purpose declaration can produce dramatically different policies and be perceived differently by allies and adversaries, who will examine the policy closely. Depending on how sole purpose is defined and implemented, sole could reduce or eliminate requirements for each piece of the triad or for nuclear use in a variety of different contingency plans.

Sole purpose is one potential option in declaratory policy, that aspect of nuclear weapons policy that publicly communicates when and why the United States would consider the use of nuclear weapons. It can be combined with or can subsume a range of other potential declaratory policy options. Because the president has sole authority to order the use of a nuclear weapon, only the president can set limits on that power. Though changes in declaratory policy should consider the views of civilian national security officials, uniformed military officials, members of Congress, US allies, and the American public, the president should provide clear guidance on how to modify US declaratory policy. Like all presidents, President Biden should provide clear guidance to the officials conducting the national defense strategy about nuclear declaratory policy.

Because sole purpose could potentially be defined in many different ways, some definitions will be better or worse. Advocates or opponents should be clear about what constitutes a better or worse definition. The administration should not accept the argument that a good definition is one that preserves existing force structure or plans, maintains ambiguity for its own sake, or comports with the preferences of certain allies or services. This piece argues that a good definition of sole purpose is one that assists with the development and implementation of a credible, integrated posture by which the United States and its allies deter aggression and nuclear use; reflects the president's preferences about how to manage escalation in limited conflicts with nuclear-armed adversaries as well as his assessment of the requirements of deterring a major strategic attack; reduces the risk of misperception and adversary nuclear first use incentives; and can be implemented in force structure and plans so that it is resilient to leadership changes in the United States. Because the president has expressed a preference to reduce the nation's reliance on nuclear weapons, a good definition of sole purpose should help to do so in ways consistent with his preferences.

This piece examines the range of options available to officials working to define sole purpose and reduce reliance on nuclear weapons. It explores the practical implications of different definitions of sole purpose and the steps necessary to ensure that they are implemented in a way that is responsible, effective, and most likely to endure over time. There are two central arguments. First, sole purpose should not be understood as a nuclear declaratory policy but as critical component in an integrated deterrence strategy. Understood in this way, sole purpose is not only a valuable means of reducing the risk of nuclear escalation and of meeting US commitments to reduce reliance on nuclear weapons but because it is a substantive judgment about how US nuclear and nonnuclear forces can best manage escalation in a limited conflict with a nuclear-armed adversary. Second, an effective sole purpose policy cannot simply be a sentence in a paragraph on nuclear declaratory policy. If the administration is serious about attaining the benefits of sole purpose, the policy should be comprised of the declaratory statement, additional language to clarify and contextualize the policy, and a set of directives that communicate the president's guidance for how the policy should affect force structure and plans.

Each of these arguments is critical for attaining the benefits of sole purpose and for maintaining an effective deterrence posture. Sole purpose will be a contentious idea under any circumstances. Allied governments, advocates of various aspects of the current nuclear weapons policies, and political opponents are understandably concerned about the president's statements. Clearly defining the policy, articulating how it will strengthen an integrated deterrence policy, and moving forward with implementation will help to convince allies and many deterrence experts that sole purpose will increase rather than decrease deterrence credibility.

[1] Joseph R. Biden, "Why American Must Lead Again: Rescuing US Foreign Policy after Trump," *Foreign Affairs* 99 (2020): 64.
[2] U.S. National Security Council, "Interim National Security Strategic Guidance," March 2021, https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf; Eri Sugiura, "Transcript of Interview with US Secretary of State Antony Blinken," *Nikkei Asia*, March 17, 2021, https://asia.nikkei.com/Editor-s-Picks/Interview/Transcript-of-interview-with-US-Secretary-of-State-Antony-Blinken.
[3] Albert Einstein, "Atomic War or Peace," *The Atlantic*, November 1, 1947, https://www.theatlantic.com/magazine/archive/1947/11/atomic-war-or-peace/305443/.

***Adam Mount**, Ph.D. is a Senior Fellow and Director of the Defense Posture Project at the Federation of American Scientists, where his work covers U.S. nuclear strategy and force structure, conventional deterrence, and progressive foreign policy. Previously, he was a Senior Fellow at the Center for American Progress and a Stanton Nuclear Security Fellow at the Council on Foreign Relations. Dr. Mount teaches an annual graduate seminar in nuclear strategy at the George Washington University and previously taught international ethics at Georgetown University. He holds a Ph.D. and M.A. from the Department of Government at Georgetown and a B.A. from Reed College.*

The Evolving Global Threat to Nuclear and Radiological Transports

On Sept. 13, 2021, Prof. Matthew Bunn presented his work on the evolving global threat to nuclear and radiological transports to the Transport Security Unified Stakeholders Group.

►► Click here to download the presentation slides.

***Matthew Bunn** is a James R. Schlesinger Professor of the Practice of Energy, National Security, and Foreign Policy; a Co-Principal Investigator, Project on Managing the Atom and a Member of the Board, Belfer Center*

AUKUS plans to provide nuclear submarines to Australia seriously endangers nuclear non-proliferation

By Guo Xiaobing
Source: https://www.globaltimes.cn/page/202109/1234647.shtml

Sept 19 – The US, UK, and Australia have announced the establishment of a security alliance known as AUKUS. One of the key elements of this military alliance is that Washington and London will help Canberra develop nuclear-powered submarines.

It is an act by the US and UK, two nuclear-weapon states, to secretly support and provide carriers of weapons of mass destruction, nuclear technology, and nuclear materials to Australia, a non-nuclear-weapon state, within the Anglosphere. But the move apparently runs counter to the objectives and core obligations set by the Treaty on the Non-Proliferation of Nuclear Weapons (NPT).

First, the AUKUS move will lead to the proliferation of carriers of weapons of mass destruction (WMD) in the world. Although the nuclear-powered submarine is not a type of nuclear weapon itself, it still has the potential to carry nuclear weapons. It also belongs to an important platform for carrying WMD.

There are only six countries in the world that have nuclear submarines, including China, the US, Russia, the UK, France, and India, all of which possess nuclear weapons as well. It is clear that nuclear-powered submarines and nuclear weapons are inextricably linked with each other.

Second, AUKUS will spread fissionable material that could be used to make nuclear weapons. The second paragraph of Article III of the NPT states that each member party to the Treaty undertakes not to provide special fissionable material to any non-nuclear-weapon State unless subject to various safeguards.

The International Atomic Energy Agency has no authority to supervise nuclear materials for submarines because of their military implications, which has objectively created conditions for Australia to make nuclear weapons. In history, Australia once planned to build up its own nuclear arsenal, while the UK conducted its first nuclear test in Australia in 1952.

Third, the partnership between the UK, the US and Australia may lead to the proliferation of uranium enrichment technology. Washington and London's nuclear-powered submarines run on highly enriched uranium, while Canberra is rich in uranium deposits. If the US and the UK transfer the uranium-enriching technology to Australia to help it become self-sufficient in nuclear fuel, it would be no better than the international nuclear black market reported by the media in the early 2000s.

Fourth, the AUKUS move will negatively impact the international nuclear non-proliferation regime. Since Australia can openly acquire nuclear materials by developing nuclear-powered submarines, other non-nuclear-weapon states may follow suit, resulting in the endless risks of nuclear proliferation on our living planet. Therefore, James Acton, co-director of the nuclear policy program at the Carnegie Endowment for International Peace, called the recent action of the three countries "a terrible precedent."

And, finally, the trilateral security partnership is almost certain to trigger a regional arms race.

Canberra's peace record in the Indo-Pacific region is not unblemished. There were Australian troops participating in unjust wars in countries such as Korea, Vietnam, and Afghanistan. Thus, Australia's enhanced underwater attack capability is no good news for its neighbors that may be forced into a vicious circle of the arms race to protect their national security.

Looking at the latest changes in nuclear policies of the US and the UK, it is needless to say that what these countries have done has disappointed the world. US President Joe Biden once campaigned in his election campaign to reduce the role of nuclear weapons in the US security policy. However, less than eight months after entering the White House, he is eating his campaign pledge.

The same is also true with the UK. In March this year, the country adjusted its nuclear strategy drastically and took a significant step backward in its nuclear arms control. It not only increased its nuclear weapon stockpile cap from 180 to 260 warheads but moved to lower the threshold for the use of nuclear weapons.

Peace, development, and nuclear non-proliferation are what most countries in the world yearn for. The actions of the US, the UK, and Australia to challenge the bottom line of nuclear non-proliferation, won't bode well for our living world.

***Guo Xiaobing** is director of Arms Control Studies Center, China Institutes of Contemporary International Relations.*

EDITOR'S COMMENT: A naïve question to start with: Is China's intention to conquer SE Asia (India included) and Australia? Does SE Asia belong to the USA, UK, and Australia? Is this why AUKUS was formed? The only good thing is that France learns a common lesson very well known by other smaller countries: There are no friends and allies; only strategies and profits! Perhaps now the French will be more sympathetic to Afghanis since they share common betrayal! Besides, the letter "F" (France) was not suitable as the first letter of the new acronym!

As the West Watches, Iran Enriches Uranium

By Kersten Knipp

Source: https://www.homelandsecuritynewswire.com/dr20210921-as-the-west-watches-iran-enriches-uranium

Sept 21 – Iran may now be capable of producing enough weapons-grade uranium for a single nuclear warhead within just a month. That's according to US experts who were quoted in *The New York Times* last Wednesday after reviewing classified new data from the International Atomic Energy Agency (IAEA).

The experts weren't permitted to speak in an official capacity, but told the newspaper off the record they think Iran could have the necessary materials to arm a warhead in the foreseeable future. But they think it will be some time before Tehran will have a deployable nuclear device.

No Concrete Military Plan

The NYT also cited a study that was published a few days earlier by the Institute for Science and International Security (ISIS) in Washington. It contends that because of Iran's "race to 60% uranium enrichment over the summer" it may now be able to produce a second batch of weapons-grade uranium in less than three months, and a third batch in less than five months.

Weapons-grade uranium is defined as having an enrichment level of 90%, meaning that it consists of 90% of the fissile isotope uranium-235. According to the latest IAEA report, Iran now has about 10 kilograms (22 pounds) of uranium at 60% enrichment and about 84 kilograms at 20%. Under the 2015 nuclear agreement, it is allowed to enrich uranium only to a maximum level of 3.67%.

ISIS's calculations have proven to be for the most part accurate, says political scientist Oliver Meier from the Institute for Peace Research and Security Policy at Hamburg University. "In

this respect, it is quite possible that Iran now has enough fissile material and centrifuges to fuel a nuclear warhead within one to two months. But that does not mean it is already nuclear weapons capable. It takes much more than that."
"There are no indications so far that Iran has resumed its military nuclear program, which it stopped about 15 years ago," he told DW. "Presumably, Iran currently wants above all to increase its negotiating leverage and put more pressure on the Europeans and Americans."

Iranian Chief Negotiator Replaced
Meanwhile, Iran has announced that Abbas Araghchi will no longer be its chief negotiator at the IAEA talks in Vienna on reviving the nuclear deal. He will remain as part of the negotiating delegation, but only in an advisory capacity. Replacing him is Ali Bagheri, a hard-liner and a close confidant of Iran's new president, Ebrahim Raisi. Bagheri, who is known in the West for his intransigent positions, will also replace Araghchi as deputy foreign minister.
The personnel change is part of a general reshuffling at the Iranian Foreign Ministry, according to political scientist Hamidreza Azizi from the Berlin-based German Institute for International and Security Affairs. He says that although swapping out a deputy minister is quite normal when there are changes at the top, the choice of the hard-liner Bagheri could indicate a new confrontational course. "Overall, however, the switch is a bureaucratic matter and should not necessarily be seen as a change in Iran's nuclear policy," Azizi told DW.

Bumpy Road Ahead
Last weekend, during a visit to Tehran by IAEA director general Rafael Grossi, Iran's leaders said they would permit international inspectors to install new memory cards in surveillance cameras at relevant nuclear sites. This marked at least a partial end to a months-long blockade of IAEA monitoring activities and indicates that Iran still wants to pursue diplomacy, Azizi said.
But he thinks the country's leaders have hardened their stance on a number of critical issues, including Tehran's demand for guarantees that the United States not withdraw once again from the agreement.
So what will be the next chapter look like? It is important that the talks be resumed as quickly as possible, says Oliver Meier. The West needs to push for this, he thinks. "But it is also clear that it was the US that first violated the agreement and Iran responded to it. For this reason, it would be appropriate to send a clear signal that there is a readiness to lift all of the sanctions that were imposed under Trump." Generally speaking, he says, concrete commitments should be made toward Iran to make it clear that the benefits of returning to the deal outweigh those of any further violation on its part.
According to Hamidreza Azizi, Iran still seems interested in an agreement. But the experience of the last three years seems to have taught Tehran to be more assertive and less flexible. "I think an agreement is still possible", he said. "But the road in that direction is quite bumpy."

***Kersten Knipp** is a journalist and author.*

Evaluating Nuclear Trafficking Threat In India

By Umer Jamshaid
Source: https://www.urdupoint.com/en/blog/evaluating-nuclear-trafficking-threat-in-indi-1355720.html

Sept 21 - Since 2001, one of the most pressing issues surrounding nuclear security is the threat of nuclear terrorism. In order to prevent any such incident, various measures have been taken since the 2002 General Conference of the International Atomic Energy Agency (IAEA) and its subsequent Nuclear Security Plans.
However recent events of nuclear theft and trafficking in India have raised renewed concerns. **The latest incident occurred on August 26, when the Indian Crime Investigation Department (CID) arrested two persons with 250 g of radioactive substances as they attempted to sell the material in the Indian city of Kolkata.**
The CID India reported that the estimated worth of illegally possessed radioactive substances is $537 million USD.
However this has not been the first precedent of illicit nuclear trafficking in India in recent years. In June 2021, Indian police captured 6.4 Kg of Uranium and arrested 7 suspects. In May 2021, the Anti-Terrorism Squad of Indian police seized 7 Kg of Uranium from 2 residents in Maharashtra.
While earlier in December 2016, around 9 Kg of depleted uranium was also seized by Indian police in the same province of Maharashtra.

The repeated incidents come under the purview of the Convention on the Physical Protection of Nuclear Materials (1980) and the IAEA Code of Conduct (2004).
They are also in violation of United Nations Security Council Resolution 1540, which obliges all states to take measures to prohibit non-state actors from acquiring – among others – nuclear weapons, and any activities that facilitate such acts.
The IAEA reference manual for "Combatting Illicit Trafficking in Nuclear and Other Radioactive Material" also states that detection of criminal acts involving small quantities of nuclear and radioactive material could be indicative of security issues, and that larger quantities of nuclear material could be accumulated from smaller consignments for illicit purposes including nuclear terrorism.
The US National Research Council also noted in 2002 that "the primary impediment that prevents countries or technically competent terrorist groups from developing nuclear weapons is the availability of [nuclear material], especially HEU (Highly Enriched Uranium)."
However the frequency of above mentioned incidents suggest that India is not performing its obligations for nuclear security effectively.
The media and police reports of December 2016 and June 2021 incidents indicated the intent of selling the radioactive material in black market. According to the latest factsheet of IAEA Incident and Trafficking Database (ITDB), only 6 incidents related to trafficking or malicious use of nuclear and radioactive materials were reported around the globe in 2019.
Whereas three incidents in India have been reported in 2021 between May and August alone. This roughly makes up half the incidents of trafficking or malicious use across the globe.
Prosecution and lack of any meaningful conclusion of such sensitive cases in India is another issue that remains unresolved.
Apart from initial media reports of registering FIRs, there is usually little to no clue about how these cases conclude. According to a 2003 report on various cases of uranium thefts in India, no charges were put against the miscreants who stole nuclear material.
Neither was the root of these thefts ever investigated. The lack of investigation and law enforcement may also point towards the possibility of undetected smuggling that may never even have come on record.
This issue aggravates further as **several Indian nuclear facilities are immune from international safeguards and inspections.**
India became the only country in 2008 to obtain an exception waiver from the Nuclear Suppliers Group (NSG) with US support.
This allows Indian export of civilian nuclear supplies without signing a comprehensive safeguards agreement with IAEA, which is otherwise a requirement.
In conclusion, the incidents of illicit trafficking and theft of nuclear and radioactive materials in India raise alarms for many reasons.
First, it renews apprehensions regarding nuclear and radioactive materials proliferation through organized black market in facilitating terrorists, criminals, and other illicit actors. Second, it reveals loopholes in detection, prosecution and law enforcement by India regarding incidents of nuclear theft.
Third, it reflects how evading international safeguards and overlooking norms may exacerbate international peace and security, as it happened when India was given a waiver to NSG. Whether these incidents are isolated accidents, or a greater global nuclear security threat with far-reaching effects, will only be determined if independent enquiries by responsible international organizations are carried out.
To that end, the international community must demand such enquiries and safeguards to be implemented on India's nuclear program.
Perhaps it is also the time for the international community to demand revocation of India's NSG waiver and comprehensive IAEA safeguards to be implemented to ensure nuclear security globally.

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Irreversible: Iran's Nukes

Source: https://www.homelandsecuritynewswire.com/dr20210922-irreversible-iran-s-nukes

Sept 22 – Over the last several months, Iran has continued to advance its sensitive nuclear programs, largely unhindered by weeks of Joint Comprehensive Plan of Action (JCPOA) negotiations, Iranian presidential elections, criticism from the G7, Britain, France, the United States, and the European Union (EU), and unresolved International Atomic Energy Agency (IAEA) safeguards probes.
David Albright and Sarah Burkhard of Institute for Science and International Security write in a new report that

> In many ways, Iran's nuclear capabilities now greatly exceed their status in early 2016, when the JCPOA was implemented. Its breakout time, namely the time needed to produce enough weapon-grade uranium for a single nuclear weapon or explosive device, is on order of one month, rivaling breakout timelines prior to the Joint Plan of Action (JPA) in late 2014. Although Iran would need more time to build a nuclear explosive devise or even longer to build a deliverable nuclear weapon, it has extensive experience in developing and manufacturing nuclear weapons and is ready to build its first one on short order

With its multiple violations of the JCPOA, Iran has reached previously uncharted territory, accumulating important new knowledge, experience, and practice, representing a significant block of nuclear capability banned to Iran by this point in time under the JCPOA. These advances not only violate the JCPOA limits, but many are irreversible, threatening to collapse the JCPOA's overall purpose of keeping Iran a certain timeframe away from being able to produce enough weapon grade uranium (WGU) for a nuclear weapon and assemble a nuclear weapon. **The irreversible advances, which accelerate both Iran's WGU production and weaponization capability, have occurred mainly in three areas: (1) advanced gas centrifuge production and operation, (2) highly enriched uranium (HEU) production, and (3) uranium metal production.**

Kromek to supply 'dirty bomb' detectors to United States

Source: https://www.kromek.com/product/d3s_riid/

Sedgefield-based Kromek Group plc has announced a contract worth up to $1.6m to provide its world-leading radiation detection equipment to a US federal entity.

Kromek's D3S-ID wearable nuclear radiation detector is designed to enable first responders, armed forces, border security and other chemical, biological, radiological and nuclear (CBRN) experts to detect threats.

The order will be delivered over two years commencing immediately.

The D3S-ID is a wearable gamma neutron RIID (radioisotope identification device) that scans continuously to identify radioisotopes and detect neutrons in real time. It is one of the fastest and most accurate isotope identification devices on the market and is also a fraction of the size and cost of similar products. It is designed to detect radiological threats like dirty bombs, radioactive contamination, smuggling of radioactive substances and radiation at the scene of an accident or terrorist attack. Kromek's D3S platform – comprising the Group's range of D3S products – is widely deployed as a networked solution to protect cities, buildings or critical infrastructure.

Dr Arnab Basu, CEO of Kromek, said: "We're pleased to have received this order from the United States. It is testament to the ingenuity and innovation of our company in delivering world-leading capabilities.

"The D3S-ID nuclear radiation detector provides a comprehensive and cost-effective solution for the detection of nuclear threats.

"With global defence and security spend on the rise around the world in response to volatile international relations, we expect to receive further orders for our nuclear security products, contributing to our significant anticipated revenue growth for this year and our pipeline for the years ahead.

"Only last month there was an incident in France of a student building a dirty bomb with uranium oxide bought online. This case highlights both the pervasiveness and accessibility of such dangers and the need for constant monitoring. Networked solutions such as our D3S

platform, which is continuously scanning in real time, provides security authorities with an early warning system for potential threats, enabling a more effective response."

D3S ID Features

- One of the fastest and most accurate isotope ID devices on the market.
- Discreet, wearable, lightweight.
- Rapid, visible, audible and tactile alarm settings
- Extensively tested and characterised in multiple DNDO and DARPA programs
- Quick, simple and intuitive to use, no need for specialist training or knowledge
- Works in high dose environments.
- English and Japanese versions available.

Far exceeds RIID standards

- Identifies 22 more isotopes than RIID standard: ANSI N42.34.
- Four times faster than RIID standard.
- A fraction of the size and a fraction of the cost of other RIIDs.
- Small and concealable to allow for covert monitoring of suspects or locations.

Kromek is a worldwide supplier of detection technology focusing on the medical, security screening and nuclear markets, it currently exports to around 55 countries.

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EXPLOSIVE NEWS

She Survived Suicide Bombing in Vietnam as a Baby — Now Paralympian Haven Shepherd Is Competing for Team USA

Source: https://people.com/sports/tokyo-paralympics-haven-shepherd-swimming-for-team-usa-survived-bombing/

Aug 19 – For Haven Shepherd, faith is more than just her middle name. It's a word she wants people, especially young girls, to think about when they hear her story.

"If you have faith in yourself, you can push through," Shepherd tells PEOPLE.

At 13 years old, Shepherd told herself that she would be a Paralympic athlete, and today she's part of Team USA.

That faith has pushed her through a life with challenges that began as a baby in Vietnam. At 14 months old, her birth parents held their healthy baby girl between them and detonated a suicide bomb. The force, she's been told, propelled her into the air.

Her parents died, and she lost both of her legs. Yet she says that she doesn't carry resentment for what happened. "That's a life I never lived; I don't remember it," she says.

Her birth parents had an affair and believed that if they couldn't be together, they all had to die. Six months later, her adopted parents Rob and Shelly Shepherd, gave her every reason to live.

After five years of training, often twice a day, Shepherd will be representing Team USA for the first time in Tokyo, swimming the 100m breaststroke and 200m individual medley races.

"My parents gave me the world," Shepherd says, "and they put me in every single sport."

Growing up with six older and very sporty brothers and sisters, Shepherd was given prosthetic legs by a nonprofit at a young age and took off running. Between all the sweat and her sore legs, Shepherd realized at age 9 that she hated to run. She quit, but her parents insisted on another sport.

With a big pool in the backyard of her family's Carthage, Missouri, home, Shepherd started swimming. Swim lessons turned into a club team, and her journey to become an elite swimmer began.

Like most teenagers, Shepherd's social life is her friends, her phone and the constant buzzing of texts and emails. At swim practice, all of that noise goes away. The pool is where Shepherd feels free in the "nothingness" of the water, she says, where there's no sound and no need for her prosthetic legs. "I get my Zen back," she shares.

Looking ahead to Tokyo, Shepherd is proud of her dedication to training over the years, and her optimism is contagious. Shepherd's family will stay in Missouri together to watch her Paralympic debut.

"If I leave Tokyo with my head held high, that's worth more to me than a gold medal," she says.

She's done the work and feels confident. "Faith is believing without seeing, and I've had this belief that I'm going to do well," she says.

Women who did dangerous work for New Zealand in Afghanistan are now threatened by the Taliban

Source: https://www.stuff.co.nz/national/126367834/women-who-did-dangerous-work-for-new-zealand-in-afghanistan-are-now-threatened-by-the-taliban

Sept 15 – Back in 2018, when the world was a different place, “A” made what would become a life-defining decision.

From her home in Bamiyan, central Afghanistan, soon after graduating from university, she signed up for a team which was breaking gender stereotypes in a country trying to get to its feet.

“I could not only help myself and my family financially, but my work allowed me to serve my people and save lives.”

“A”, whose name, and those of her colleagues, *Stuff* is withholding for safety reasons, had joined the first all-female demining team. It was their job to clear this war-ravaged land of dangerous explosives left behind by enemies and allies alike, including New Zealand.

Members of Afghanistan's all-female demining team working in the Bamiyan province in 2019. (Phil Johnson/Stuff)

In fact, the biggest threat to "A" and her colleagues would come from somewhere beyond the minefields, battlegrounds and firing ranges where she worked.

"Now our country is in a critical political insecure [situation], and we have the memories of the Taliban in the 1990s," she says. "I consider this situation more dangerous than demining."

The situation she refers to, of course, is the collapse last month of Afghanistan's government, replaced by the Taliban.

The women who worked for the ground-breaking demining team say they now fear for their lives. (*Phil Johnson/Stuff)*

"I have received several threats from the Taliban, calling my [phone] from various numbers threatening me to stop working for the demining NGOs [non-government organisations]," says "A".

"I reasoned with them but they believed that the demining work for women is against Islamic Sharia commands and we should be punished if found." She was also accused of being a slave to foreigners or even a spy.

Other women in the team also fear what is coming. "If they [the Taliban] find out about our demining work and the way we used to dress – demining uniform – we will definitely be abused and killed," says one.

"A", like many others, has fled her home to a remote district, hiding and hoping.

"We hope that New Zealand and its people do not withhold any kind of humanitarian co-operation and assistance they are capable of."

Pleas for help rejected

So far, their cries for help from New Zealand have gone unanswered.

Last month, amid the panicked withdrawal of foreign troops from Afghanistan and an emergency evacuation mission by New Zealand, United Nations officials who have previously worked with the women appealed to Wellington.

Caitlin Longden, a former deputy programme manager of the United Nations Mine Action Service (UNMAS) in Afghanistan, says they were told the team's request for assistance had been rejected because the Government was "unable to verify [they] meet the criteria at this time".

But Longden has not given up hope. "We stand ready to help with any further verification that might be needed."

The plight of the demining team, once lauded around the world as a bastion of hope in Afghanistan, is no doubt heart-breaking and terrifying.

But what has New Zealand got to do with it?

In 2003, as part of a contribution to bring stability to Afghanistan after the fall of the Taliban in a post-September 11 United States invasion, New Zealand agreed to send what was called a Provincial Reconstruction Team (PRT) to Bamiyan.

The Defence Force-led mission stayed in Afghanistan for 10 years and the Government is proud of what was achieved, often saying its contribution helped bring about stability and safety and helped lift up women through education and employment.

During its time in Bamiyan, the PRT used a series of firing ranges for practice and to keep soldiers prepared for the security work. The ranges were cleaned up to internationally agreed standards in place at the time but not long after those standards were changed. UNMAS considered the ranges to be dangerous. A 2019 *Stuff Circuit* documentary, *Life + Limb*, revealed allegations the firing ranges were associated with deaths and injuries of civilians.

Although the Defence Force argued it could not be proved that ordnance left behind by New Zealand was responsible for the incidents, instead suggesting other forces could be to blame, Prime Minister Jacinda Ardern immediately demanded action.

Soon after, the Defence Force signed a contract with an NGO to clean up the ranges. The female demining team has been involved in that work.

"We had to stop our work because of the Taliban," says one of the women – "B". "We were about to clear Bamiyan entirely from all the unexploded ordnance but that is no longer possible."

The 'city of the dead'

Bamiyan was considered one of Afghanistan's most peaceful provinces and it had hopes of growing its once-famous tourism industry. When *Stuff* visited in 2019, about a dozen foreign tourists were in town for a marathon around the majestic Band-e Amir lakes, and Bamiyan's central marketplace was bustling and friendly.

It felt like the 1990s – when Bamiyan's people were persecuted during the Taliban's previous rule – were a long way behind it.

One of Afghanistan's famed lakes in the Band-e Amir area of the Bamiyan province. (*Phil Johnson/Stuff)*

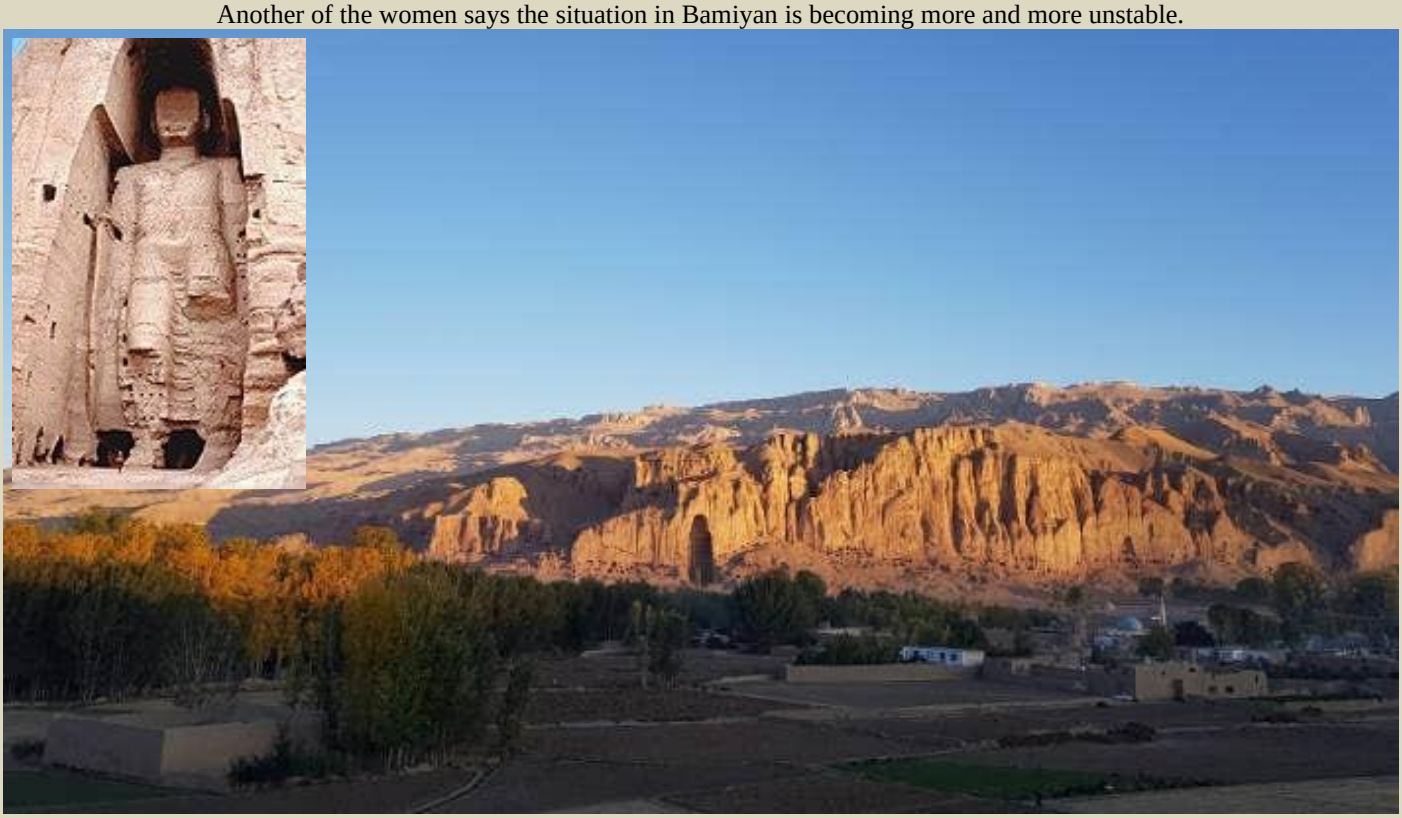
Bamiyan's population is mostly ethnically Hazara and are part of the minority Shia sect of Islam. The Taliban is a predominantly Pashtun movement and adheres to a hardline form of Sunni Islam.

According to the demining team, Taliban enforcers are already flexing their muscles against the people of Bamiyan since recently taking back control.

"An aged woman who had proper dressing was stopped and questioned on why she was outside her home without a male escort," says "B". "She told them that her male family members were busy working on their potato land and she had no choice. They took her and no-one knows what happened to her."

In neighbouring Ghor province, a pregnant female police officer was murdered, an incident which "B" says demonstrates the true face of the Taliban, not the one they are trying to portray. "Taliban exhibit themselves as good people in front of the media to be accepted by the international community."

Another of the women says the situation in Bamiyan is becoming more and more unstable.



The famous Buddha statues of Bamiyan which were destroyed by the Taliban in the 1990s. (Phil Johnson/Stuff)

"For instance, [the Taliban] shot two people in the market for robbery – not even investigating if they were really thieves," says "C". "There are rumours that they will make a list of people who used to work for the government and NGOs and do a night hunt. In Bamiyan, we female deminers will definitely be part of that list."

Markers setting out a former New Zealand firing range in Bamiyan's Dragon Valley stretch into the hillside. (Phil Johnson/Stuff)

Others described the fear, as well as the economic pressure. Women, many of whom were breadwinners, are now forced to stay home, depriving their families of income. Many families have fled the provincial centre for the mountains or outlying districts.

A stone statue of a legendary Hazara leader, Abdul Ali Mazari, which stood at a roundabout near the Kiwi PRT's base, was recently destroyed, an echo of the destruction of Bamiyan's famous Buddhas, which the Taliban blew up in the 1990s.

"Bamiyan used to be the best place for tourists in Afghanistan, it was a safe province," says "D". "Now it feels like it is a city of the dead."
A UN official who initiated the female demining team says he is devastated it has come to this.
The establishment of the team had been a "great moment", pushing back against years of resistance that women could not possibly be involved in such work. Now they are living in fear.
He worries for them and also himself. "I have taken a great risk with the establishment of the first-ever female demining team in spite of lots of resistance, even from the demining sector, and then supported them to [try to] get out of Afghanistan.
"I have a great fear for the safety of myself and my family if the Taliban find out about my support to women, particularly Shia."
He was directly involved in advocating for New Zealand to take responsibility for clearing the firing ranges and even pushed for a survey which drastically reduced the scale of the job required, essentially saving the Government tens of millions of dollars.
New Zealand should be proud that it went ahead with the clearance of the ranges and the work that has been done, he says.

Members of Afghanistan's all-female demining team were involved in clearing firing ranges previously used by New Zealand's Provincial Reconstruction Team. (Phil Johnson/Stuff)

The women are certainly proud of the work they have done on behalf of New Zealand.
"Yes, we were working with lots of passion and were proud of our work," says "E". "We knew it was dangerous and deadly but we had faith that Allah would take care of us, and even if any accidents were to happen, we would have died proudly for our country.
"Mines would have taken our lives but this situation has killed us alive; our dreams and hopes are dead, we do not have any goal for our lives anymore."

Harnessing Drones, Geophysics and Artificial Intelligence to Remove Land Mines

By Kevin Krajick
Source: https://www.homelandsecuritynewswire.com/dr20210922-harnessing-drones-geophysics-and-artificial-intelligence-to-remove-land-mines

Sept 22 – Armed with a newly minted undergraduate degree in geology, Jasper Baur is in the mining business. Not those mines where we extract metals or minerals; the kind that kill and maim thousands of people every year. Baur and colleagues are trying to show that

drone-borne geophysical sensors already used in fields such as exploration geology, volcanology and archaeology may be applied to more efficiently spot and eliminate these deadly hazards

As a freshman at upstate New York's Binghamton University in 2016, Baur started working with two geophysics professors, Alex Nikulin and Timothy de Smet, to look into employing instrument-equipped drones to speed the slow, hazardous task of finding land mines. Baur stuck with the research all the way through college; now a grad student in volcanology at Columbia University's Lamont-Doherty Earth Observatory, he is still pursuing it.

"It seemed like a really relevant and impactful use of science," he said. "It has a humanitarian aspect, and that's definitely what motivates me in my research."

Mines and other unexploded ordinance are a worldwide menace; about 100 million devices are thought to be currently scattered across dozens of countries. Aside from putting both wartime and postwar areas off limits to travel, agriculture or anything else, they caused at least 5,500 recorded casualties in 2019; totals in many previous years have been much higher. Some 80 percent of the victims are civilians, and of those, nearly half are children. Over the last decade, mines have been deployed in at least 15 countries: Afghanistan, Colombia, India, Iran, Israel, Libya, Myanmar, Nigeria, North Korea, Pakistan, Syria, Thailand, Tunisia, Ukraine and Yemen. This, despite the fact that more than 160 nations have signed a 1997 convention to bar their stockpiling or use (major exceptions: the United States, Russia and China).

Those who lay mines rarely come back to clear them. That generally falls to nonprofit humanitarian organizations, who mostly find them the old-fashioned way: on foot, slowly sweeping suspect sites with magnetometers or other handheld instruments. Finding and disarming a single mine takes plenty of time, and costs an estimated $300 to $1,000. "And, of course, it's dangerous," notes Baur.

Enter increasingly affordable and sophisticated drones and miniaturized geophysical sensors. The Binghamton team's first focus: the Russian-made PFM-1 mine, a device just five inches across, made largely of plastic, and shaped like a butterfly. Designed to be dropped from the air in large numbers, they flutter gently to the ground like flocks of birds, and await the unwary. Designed mainly to maim, not kill, they are difficult to spot with a magnetometer, because they contain little metal. And because they resemble plastic toys, many children handle them, and get blown up. They remain in the arsenals of various countries, but Afghanistan is ground zero for them. An estimated 10 million may still litter the country—many not even from recent fighting, but from the Russian occupation of 1979-1989. They have killed or injured more than 30,000 Afghans. More recently, they have shown up along Ukraine's violently contested border with Russia.

To carry out experiments, the team bought a few dozen PFM-1s off a military collectibles site—disarmed of course, their explosive liquid interiors drained and refilled with an inert oil. They scattered the mines in a variety of landscapes on campus and at nearby Chenango Valley State Park, including grass, sand and snowy ground. Then they sent drones up to explore various ways of spotting them, visually or otherwise. To simulate the rubbly high-

mountain Afghan terrain where the mines are most often found, they got permission from the state park to mine an abandoned, partly broken-up old asphalt parking lot.

One fruitful avenue, they found, was thermal imaging; in early morning and at the end of the day, the mines heat up or cool off at different rates than surrounding material. In early trials, they demonstrated that they could find about three-quarters of PFM-1s by manually observing temperature differences on a computer. They also tried out visible and infrared light spectra to spot the mines visually, with similar success. The team admits this is not good enough for drones to replace ground teams, but it could quickly narrow down locations and layouts of mine fields. (Flying at 10 meters above the surface, a drone can survey a 10-by-20-meter plot, the typical size of a single ellipsoidal PFM-1 mine field, in three and half minutes.)

More recently, in order to improve the detection rate, the team has started employing machine learning, training their computers to recognize various mine characteristics and quickly display them. In a paper just published in the *Journal of Conventional Weapons Destruction* led by Baur and former fellow student Gabriel Steinberg, they show how artificial intelligence has allowed them to increase the visual detection rate to more than 90 percent.

The group has also looked into spotting traditional buried metal mines, showing that drones bearing aeromagnetic instruments can see some of these too, including big antitank mines. (Like many other munitions, these also are available on military surplus sites, disarmed.) They are also investigating how to find unexploded ordinance fired from multi-barrel rocket launchers.

Now that he is pursuing volcanology, Baur may not have as much time for demining. Working under Lamont-Doherty volcanologist Einat Lev, this summer he traveled to Okmok Volcano, in Alaska's remote Aleutian Islands. There, he worked on a project to install geophysical instruments on the highly active peak to measure changes in ground level, seismic waves and other properties, part of a broad, long-term effort at Lamont to refine the still crude science of predicting dangerous eruptions.

What does volcanology have to do with land mines? Nothing, he says—and everything. Some instruments and data analysis techniques useful in studying volcanoes are similar to those useful for detecting mines. And, increasingly, volcanologists are deploying drones to survey places too hazardous to go on foot. Applied volcanology, too, is like demining in that it is ultimately aimed at helping people avoid injury or death.

In the meantime, Baur has formed an organization, the Demining Research Community, with his old professors and Steinberg. They have been in contact with, among others, demining professionals at the Red Cross and the United Nations. Various organizations have already considered using drones to speed their work, but so far there has been little other published research, and no uptake. "For very good reasons, the demining community is very cautious. They're reluctant to accept new methods," said Baur. "So you really have to establish that this works, and that is going to take time."

So far, Baur has glimpsed only one actual mine field, a marked one, during a visit to Israel. Eventually, he says, "we want to test our methods on a real mine field. You can't account for everything you might run across in an artificial environment. There's a lot more chaos in the real world."

Now that the Taliban has taken over Afghanistan, would he consider going there to do his real-world research? "Uh, no." But there is always Ukraine. "We have some contacts there," he said.

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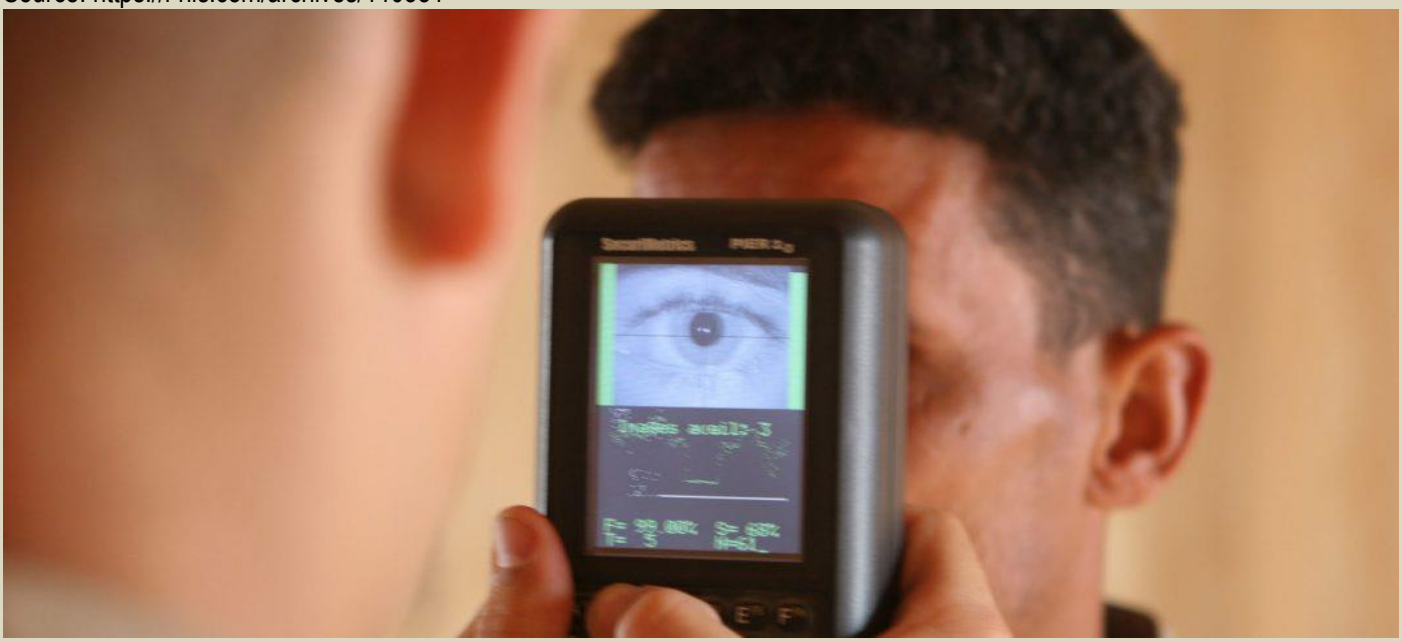
Biometric Technology Helping Taliban Forces?

Source: https://i-hls.com/archives/110351



Aug 24 – The US military has long used biometric devices in the global war on terror. But following the US withdrawal from Afghanistan, there are concerns that sensitive biometric data might be used by the Taliban.

The Taliban have seized US military biometrics devices that could aid in the identification of Afghans who assisted coalition forces. The devices, known as HIIDE, for Handheld Interagency Identity Detection Equipment, were seized during the Taliban's offensive, theintercept.com learned from a Joint Special Operations Command official and three former U.S. military personnel.

HIIDE devices contain identifying biometric data such as iris scans and fingerprints, as well as biographical information, and are used to access large centralized databases. It's unclear how much of the U.S. military's biometric database on the Afghan population has been compromised.

While billed by the U.S. military as a means of tracking terrorists and other insurgents, biometric data on Afghans who assisted the U.S. was also widely collected and used in identification cards, sources said.

An Army Special Operations veteran said it's possible that the Taliban may need additional tools to process the HIIDE data but expressed concerns that Pakistan would assist with this. "The Taliban doesn't have the gear to use the data but the ISI do," the former Special Operations official said, referring to Pakistan's spy agency, Inter-Services Intelligence. The ISI has been known to work closely with the Taliban.

The U.S. government appears to also have been collecting biometrics from Afghans assisting diplomatic efforts.

The federal government has collected biometric data from Afghans despite knowing the risks entailed by maintaining large databases of personal information, especially given recent cyberattacks on government agencies and private companies. These efforts are continuing to expand, theintercept.com remarks.

Largest-Ever DDoS Attack Foiled

Source: https://i-hls.com/archives/110406

Aug 26 – The largest-ever distributed denial of service (DDoS) attack was foiled by the internet infrastructure giant Cloudflare. The attack occurred earlier this summer.

According to Cloudflare, its protections mitigated a DDoS attack that pinged 17.2 million requests per second. The attack was committed by a botnet at one of the company's customers in the financial services space.

The attack was automatically detected and mitigated by Cloudflare's autonomous edge DDoS protection systems.

A DDoS attack is a malicious attempt to disrupt the normal traffic of a targeted server, service or network by overwhelming the target or its surrounding infrastructure with a flood of Internet traffic.

DDoS attacks achieve effectiveness by utilizing multiple compromised computer systems as sources of attack traffic. Exploited machines can include computers and other networked resources such as IoT devices.
Cloudflare manages an average of more than 25 million HTTP rps, so at its peak, this botnet-driven DDoS attack was sending the equivalent of 68% of Cloudflare's daily average RPS rate of legitimate traffic.
According to a company blog post, **the botnet comprised more than 20,000 bots in 125 countries, with almost 15 percent of the attacks coming from Indonesia and another 17 percent from India and Brazil combined,** an indication that there could be many malware-infected devices in those countries.
The company notes that the attack and others like it have been observed in increasing frequency on its network over the past few weeks.

The battle for control of Afghanistan's internet

Source: https://www.wired.co.uk/article/afghanistan-taliban-internet

Sept 07 – When the Taliban last ruled Afghanistan, between 1996 and 2001, the nation remained resolutely analogue. The internet was effectively banned alongside music and other 'modern concepts' such as women having a role in society. The result was that most Afghans were cut off from the emerging online world.
Yet despite its hostile approach to digital life within its borders, the Taliban held a more nuanced view when it came to spreading the word outside Afghanistan. The terror group has been on Twitter for a decade, and has maintained an official website since 1998, even while Afghan civilians were barred from going online.
Twenty years on, the situation is even more complicated. Our reliance on digital connections has grown exponentially since the Taliban were last in power, and even the militia themselves use social media as part of a vast propaganda machine. Afghanistan's new leader – expected to be Mullah Baradar, head of the Taliban's political arm – has a full in-tray of issues. Policing, the economy and Afghanistan's place in the international community are all priorities. But equally challenging is what the Taliban does with the internet.
"The internet is a microcosm of all these questions about what is the future of Afghanistan," says Doug Madory, director of internet analysis at Kentik, a network observability company. Even in a country with low internet penetration, around 11.5 per cent, Afghanistan's online presence and infrastructure is key to its future. It's also vital for its people as they try to stay connected to the outside world. And while the Taliban has to decide what to do with the internet in Afghanistan, the global companies that underpin its infrastructure have to decide what to do with the Taliban.
Currently, five telecoms companies operate in Afghanistan, according to Raman Jit Singh Chima, Asia policy director at Access Now, a non-profit defending and extending digital civil rights worldwide. Three of them are primarily owned or invested in by foreign countries. One of them, South African company MTN, announced last year it was leaving the country but has yet to do so. "I wouldn't be surprised if they decide: 'We already said we're leaving, and this is getting too crazy' and expedite the process," Madory says.
Key services could also disappear from Afghanistan because of international sanctions, Madory warns. The centralisation of the internet into the hands of a small number of service providers – most of whom are based in the United States – means that everything from cloud servers to social media could go silent if America decided to act on the threat of sanctions to Afghanistan. (It already has frozen $9.5 billion (£6.4bn) of assets held by the Afghanistan Central Bank.)
Madory was involved in developing a list of IP addresses from Syria, North Korea and Sudan, from which incoming traffic to Oracle's cloud services was blocked when he worked at the company. But whether that would happen to Afghanistan's 327,000 IP addresses is up for debate. "In this whole area of sanctions there has been a movement to exclude telecommunications because it doesn't really affect the right people," he says. It punishes the everyday users while hardly affecting those in charge.
Not that it may take international action to severely limit internet access to Afghans. "Poor connectivity may be further attacked in case of an emergency situation, [such as] unrests, protests and any future elections," says Pavlina Pavlova, consultant to the Organisation for Security and Co-operation in Europe (OSCE), which monitors human rights and cybersecurity.
"The Taliban has a history of targeting telecommunications infrastructure and later mobile-phone towers which forced mobile companies to shut or limit their coverage," Pavlova adds. "Now when in power, it can control internet providers and force them to shut down the

connection." The Taliban has already reportedly shut down internet and phone services in the Panjshir Valley north of Kabul, the last place in the country it has not taken over. (The Taliban claims to have gained control of the area as of September 6, though the rebel leader with oversight of the area disagrees.) Such internet shutdowns would be deleterious to Afghans, limiting their ability to access and share reliable information, and putting them at higher risk of misinformation – which could lead to them taking what Pavlova calls "badly-informed actions". That has been seen in reporting of the Afghanistan evacuation, where reporters encountered Afghans congregating around the airport after hearing rumours circulating online that they would be allowed out of the country. "There are a whole bunch of different issues here," says Andrew Sullivan of the Internet Society, an advocacy group promoting good maintenance of internet infrastructure. The first issue is that Afghanistan's internet isn't up to scratch in comparison to most other countries worldwide. "Although it's not terrible, it's not highly interconnected and doesn't have the different constituent networks that make the internet robust in the face of failures," he says. With highly-skilled workers who would be able to maintain the internet infrastructure in Afghanistan among those most likely to be fleeing the country under Taliban rule, there's a risk that brain drain could put paid to the internet. "Not all 39 million people can get on a C-17 and leave Afghanistan," says Madory. "But it does seem like it's hard to get highly-skilled technical talent." Madory has seen similar issues in Syria, where those who are talented enough to maintain such a network try to get out of the country. The result is that while the systems don't immediately go offline, they're held in a holding pattern, not improving and gradually falling behind international standards and into disrepair.

International support to keep Afghanistan online also seems unlikely. The Taliban is still a proscribed terrorist organisation among much of the world's leadership, and although some countries such as Pakistan, Qatar, China and Russia have made overtures to the Taliban government, most of the network operators and companies that deal with the technology underpinning the smooth running of Afghanistan's digital presence are based in countries that still see the group as people not to be dealt with. "If you decide nobody is allowed to have any communication with network operators because of the countries they're in, that's pretty much fatal for the internet," says Sullivan.

Currently, Afghanistan's 6,000 or so .af domains are given DNS services by US not-for-profit Packet Clearing House and Czech registrar Gransy – the latter of which also provides DNS services for South Sudan's top-level domain name. "Who is the ccTLD operator for .af is not a matter for us to interpret," Gransy has said, adding: "politics has nothing to do with our daily work, and we are a 100 per cent apolitical organisation." The company says it follows procedures laid out by ICANN, the American non-profit that helps keep the internet online. ICANN has said it "defers decision making to within the country" in question – here, Afghanistan and its Taliban rulers.

However, keeping those services online allows the Taliban to utilise the internet as a method of communication to the masses. The group has used social media and the internet to surprising ends given its highly theocratic stance on modern technology. But the Taliban has been compelled to do so because of the realities of the situation, says Emerson T Brooking, resident fellow at the Atlantic Council's Digital Forensic Research Lab. "If you're trying to survive, and even win a political contest against a much more powerful entity like the US-backed Afghan government, you have to use every tool at your disposal," he explains. "That's why the Taliban were pretty early to embrace social media communications." That Taliban spokesmen are regularly posting on Twitter is something that might have seemed implausible even a few years ago. Yet it seems likely to continue as the Taliban continue to try and shape public opinion, within and outside its own borders. Big Tech has taken a mixed approach to the Taliban's rule of Afghanistan. Brooking believes the future is a two-track system similar to Mosul under the control of the Islamic State, where internet access for Afghan civilians will be highly restricted and monitored, while at the same time the Taliban will freely use it for their propaganda purposes.

"The Taliban have every incentive to remain on these platforms to try to legitimise their own role, because their first priority right now is the fact that Afghanistan is not a self-sustaining country," Brooking says. "It's entirely reliant on international aid." All of which means that some of the trickiest, most momentous decisions that could shape the future of Afghanistan won't be made by international governments or supra-governmental organisations. They'll be made by the likes of Facebook, Google and Twitter.

"Because of the way the modern world works," says Brooking, "many extremely consequential foreign policy decisions are going to be made first by the social media platforms." Whether Facebook decides to totally deplatform the Taliban could end up affecting not just those at the head of the government, but the millions living under its iron fist, too.

Op-Ed: How the internet changed the dynamics of terrorism after 9/11

By Emerson T. Brooking

Source: https://medium.com/dfrlab/op-ed-how-the-internet-changed-the-dynamics-of-terrorism-after-9-11-f35f63c3e88b

Sep 09 – On September 11, 2001, terrorists murdered 2,997 Americans in 102 minutes. The collapse of the Twin Towers in New York City became the first media spectacle of the new

millennium, broadcast on repeat to tens of millions of American homes. The United States was plunged into a state of fearful anticipation. Experts warned of more imminent attacks; of biological or even nuclear terrorism.

Twenty years later, those catastrophic attacks have not arrived. Militant jihadists have murdered a total of 107 individuals in the United States in the two decades since 9/11, an average of roughly five people per year. Far-right extremists, who now represent the principal US terror threat, have murdered slightly more over the same period. Yet no successful attack has come close to matching the terrible destruction wrought on 9/11. Indeed, few serious thwarted plots have aspired to do so.

The reason for this is only tangentially connected to the United States' inefficient and frequently counterproductive $6.4 trillion-dollar Global War on Terrorism. Instead, the reason is best explained by the rise of the modern internet. The social media revolution has altered the organization, incentives, and broader context in which terrorist groups operate. As the world in which terrorists operate has changed, the face of terrorism has changed as well.

"Terrorism is theater," as Brian M. Jenkins observed in his seminal 1974 RAND Corporation monograph. The purpose of politically motivated bombings, shootings, or assassinations is not to maximize fatalities, but to command attention. Terrorists use this attention to increase the visibility of their cause, strengthen their organizations, and compel their adversaries to action. By this measure, the 9/11 attacks were horrifically successful. Osama bin Laden and al-Qaeda became fixtures in global media, and their destruction became the singular focus of the US national security apparatus. On the day that the Twin Towers fell, Gallup found that the number of Americans who feared being the victims of an imminent terrorist attack had more than doubled to 58 percent. The mass death and terrible symbolism of 9/11 made the threat seem omnipresent and inescapable.

Yet as US-targeted terror attacks declined precipitously, American fears of terrorism did not. In September 2014, following the murder of two US hostages by ISIS militants in highly choreographed videos, fully 47 percent of Americans expressed fear of an imminent terror attack, higher than at any point since 9/11. ISIS's abrupt domination of the American political discourse showed how social media manipulation and careful editing could inflate small acts of barbarity into much larger ones. In 2001, broadcast and cable media had made the 9/11 attacks impossible to miss. Now Twitter and Facebook could be used to magnify each horror that ISIS inflicted — and at a much lower price.

This vastly different information environment has wrought changes for terrorist organization and tactics. The 9/11 attacks were the culmination of a perilously complex five-year process involving nineteen al-Qaeda operatives under deep cover and supported by an international network of sympathizers. On the other hand, most ISIS-adjacent terrorism targeting the West was remarkable for its simplicity and lack of central coordination. "Remote control" attacks saw ISIS militants essentially serve as spiritual mentors to terrorist aspirants as they planned shootings, bombings, or vehicular murders in their home countries. In "lone-wolf" attacks, ISIS rushed to attach its brand to sporadic acts of violence that had been "inspired" by the group. Only ISIS's November 2015 Paris attack, which resulted in the deaths of 130 people and required months of preparation, significantly departed from this trend.

Just as the nature of the modern internet has imparted more value to simpler terrorist attacks, it also requires that attacks come faster and with more regularity. According to diaries recovered from his Abbottabad compound in 2011, bin Laden spent the final months of his life reckoning with his own obsolescence. The leader of al-Qaeda could not understand how, less than a decade after 9/11, he was already being relegated to history and losing his place within the global jihadist movement. Essentially, bin Laden and al-Qaeda were ill-equipped to target internet-age attention spans, which reward shorter and more frequent engagement. By contrast, ISIS rose to prominence through its (sometimes tenuous)

association with dozens of mostly small attacks between 2014 and 2017. More recently, far-right extremist and white supremacist terrorism have gained prominence thanks to the steady stream of terrorist acts associated with their ideology.
Finally, social media has opened the door to new kinds of spectacular, attention-grabbing terrorism whose novelty is unrelated to raw ambition or death tolls. The 9/11 attacks were so destructive, in part, because they had to be impactful enough to inspire potential terrorist recruits for a generation. ISIS, on the other hand, was able to transform something as basic as prisoner executions into extraordinary viral spectacles by inventing increasingly bizarre methods of murder and releasing the videos in high definition, distributed via Twitter botnets. The white supremacist terrorist responsible for the 2019 Christchurch Mosque massacre went even further, building an entire internet community around his shooting by attaching a camera to his rifle and uploading a link of the first-person livestream to 8chan.
This, then, is the nature of modern terrorism: as rudimentary and repeatable as possible; laser-focused on maximizing its resonance across the global information environment. The reason that the catastrophic terrorism of 9/11 has not been repeated is because other tactics have — so far — worked better, faster, and far more cheaply.
Of course, it is possible this dynamic will shift again. The January 6 insurrection at the US Capitol building has been compared to the spectacular terrorism of 9/11 and, indeed, bears many similarities in its symbolism and the trauma it inflicted, absent the presence of mass death. It is also possible that, with the restoration of the Taliban in Afghanistan, militant jihadist terrorists may again find the space to plot catastrophic attacks abroad.
Regardless of these outcomes, one thing is almost certain. In the words of John Mueller and Mark G. Stewart, fear of terrorism has become "permanent or at least perpetual" in the years since 9/11, largely unmoored from the scale or danger of particular threats. This deep-seated fear has persisted for two decades. It will likely persist for many years more.

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Cybercriminals Use Pandemic to Attack Schools and Colleges

By Nir Kshetri
Source: https://www.homelandsecuritynewswire.com/dr20210915-cybercriminals-use-pandemic-to-attack-schools-and-colleges

Sept 15 – Cyberattacks have hit schools and colleges harder than any other industry during the pandemic. In 2020, including the costs of downtime, repairs and lost opportunities, the average ransomware attack cost educational institutions $2.73 million. That is $300,000 more than the next-highest sector – distributors and transportation companies.
From Aug. 14 to Sept. 12, 2021, educational organizations were the target of over 5.8 million malware attacks, or 63% of all such attacks.
Ransomware attacks alone impacted 1,681 U.S. schools, colleges and universities in 2020. Globally 44% of educational institutions were targeted by such attacks.
I study cybercrime and cybersecurity. In my forthcoming book – set to be published in November 2021 – I look at how the shift to remote learning during the pandemic has posed new cybersecurity challenges.
I see six important ways the pandemic has created new opportunities for cybercriminals to attack schools and colleges.

1. Unsafe Devices
Devices that were loaned to students during the pandemic often lack security updates. This is a serious issue since in 2020 alone, 1,268 vulnerabilities were discovered in Microsoft products. One such vulnerability can enable hackers to gain higher-level privileges on a system or network, which can be used to steal data and install malware.
As students, teachers and administrators return to school with devices that haven't been patched in a while, a large number of vulnerable devices are likely to be reconnected to school networks.

2. Distracted Cybersecurity Staff
The shift to remote learning has also distracted the attention of limited cybersecurity staff from important security issues. In at least one case, persons responsible for cybersecurity were assigned to investigate bad online behavior, such as name-calling, that teachers and administrators handled before.

For most schools, cybersecurity has had to compete with other urgent issues created by the pandemic, such as mental health, vaccines and mask mandates.

3. Victims More Likely to Comply

In 2020, 77 ransomware attacks on U.S. schools and colleges affected more than 1.3 million students and resulted in 531 days of downtime. This downtime was estimated to cost $6.6 billion in economic terms.

The economic impact was based on an estimated average cost of $8,662 per minute. Some cyberattacks during the pandemic completely shut down major school districts for many days.

At the same time, public schools faced political and social pressure to ensure students' access to learning opportunities during the pandemic. The pressure to quickly restore networks can make victims desperate and willing to comply with criminals' demands. For instance, the Judson Independent School District in Texas paid $547,000 to ransomware attackers in the summer of 2021 in order to regain access to its systems and stop student and staff data from being published. In 2020, the Athens Independent School District in Texas paid a $50,000 ransom.

4. Vulnerable Platforms

When the pandemic forced schools to use online platforms to conduct classes and evaluate students, it created new entry points for cybercriminals to target. These platforms include video chat programs such as Zoom and Microsoft Teams, as well as providers of curricula, technology and services, such as K12, recently renamed as Stride. They also include online proctoring services, such as ProctorU and Proctorio. Collectively, such platforms were targeted in three-quarters of the data breaches in school districts that involved personal information.

In November 2020, online education vendor K12 reported that some students' information on its system could have been stolen during a ransomware attack, even though the company paid the ransom.

Likewise, in July 2020, hackers stole sensitive personal information from 444,000 students – including their names, email addresses, home addresses, phone numbers and passwords – by hacking online proctoring service ProctorU. This data became available for sale in online hacker forums.

5. More Baiting Opportunities

Cybercriminals increasingly turned to social engineering attacks during the pandemic. These are attacks in which the cybercriminals use emotional appeals to things such as fear, pity or excitement to bait people into providing sensitive information. For example, cybercriminals have launched phishing campaigns in which they pose as human resources staff and ask recipients to submit information about their COVID-19 vaccination status.

Victims may be lured to give their credentials, click malicious links or download files containing malware. Fear and uncertainty – such as that created by the pandemic – make individuals more susceptible to social engineering attacks.

An analysis of 3.5 million social engineering attacks from June to September 2020 found that more than 1,000 schools and universities were targeted. Educational institutions were also more than twice as likely as other institutions to be victimized by such attacks. Many of the emails have COVID in the subject line. In May 2020, the Federal Trade Commission posted a message on its website with a screenshot of a social engineering attack email. The message warned college students that the emails about COVID-19 economic stimulus checks claiming to be from their universities' "Financial Department" could be from scammers.

6. COVID Resources Have Created New Targets

Colleges have been designated to distribute COVID-19 relief funds – and criminals caught on to this. In May 2021, the U.S. Department of Education made more than $36 billion in emergency grants available for students and colleges under the American Rescue Plan Act. In California, more than $1.6 billion in such grants were available to community college students alone. This explains why, not long afterward, more than 65,000 fake students applied to California community colleges for such aids and loans. Most two-year institutions don't have resources to vet applicants. The lack of a requirement for identity verification and other documentation to get COVID-19 relief grants from community colleges also attracted attention from criminals overseas. Many of the fake student applications in the California community college system were from foreign countries. Officials have been silent about whether these fake students got any money.

The bottom line for schools and colleges is that as they continue to confront the challenges of the pandemic, cybersecurity cannot be placed on the back burner. Ignoring threats to cybersecurity now can be quite costly in the future.

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DRONE NEWS

US Air Force showcases 35 high-speed VTOL aircraft concepts

Source: https://newatlas.com/aircraft/afwerx-high-speed-vtol-challenge-showcase/

Jetpack Aviation has released new renders of its Speeder flying motorcycle. Looks a tad different to the current prototype! Jetpack Aviation

Aug 24 – Forget your friendly little electric air taxis. The US Air Force wants to take things up a notch with a new generation of high-speed vertical takeoff and landing aircraft. Thirty-five designs have been selected, here's a peek at just a few to catch our eye.

AFWERX is a US Air Force program first announced in 2017, designed to encourage a culture of innovation in the service, both by promoting interesting ideas raised internally and by getting involved with the entrepreneurial tech sector to draw in and fast-track the best ideas in the civilian world as well. It's not just to get sweet new gadgets into the field; America's national security depends on a thriving commercial technology sector, and one of AFWERX's aims is to give US companies a leg-up on development where it's prudent.

AFWERX put the call out in June for companies to make submissions on a new High-Speed VTOL (HSVTOL) challenge. Its current VTOL (vertical take-off and landing) aircraft get plenty of use thanks to their runway-free convenience and operational flexibility, but its most common helicopter, the Sikorsky HH-60 Pave Hawk, is limited to a speed of 193 knots (222 mph, 357 km/h), due to retreating blade stall.

The famous tilt-rotor Bell Boeing V-22 Osprey is a bit more sprightly, topping out at 305 knots (351 mph, 565 km/h) provided you keep it over 15,000 feet, but it's even more complex than a helicopter, and costs around US$75 million apiece. Various high-speed helicopters are in development, using coaxial twin rotors on top, spinning in opposite directions to cancel out retreating blade stall, but they're going to be hideously complex as well – heck, helicopters are complex enough to start with – and they'll be lucky to keep up with an Osprey in a straight line.

Hence the HSVTOL challenge, which seeks agile designs that can get people and cargo in and out of contested territory as fast as possible. The challenge overview laid out some key wish-list items, including jet-like speed, airborne transition between hover and cruise modes, increased range and endurance, in-air refueling capability, and flexible payload capabilities.

Bonus points would be awarded if the design could fit on a standard pallet, or run its own smart collision and threat avoidance systems.
From 218 applicants, the AFWERX team has chosen 35 designs, which it has presented recently in an HSVTOL showcase. AFWERKS has not yet announced the winners, but some of the companies themselves have made their own announcements. So here are some of the finalists that have caught our eye so far.

▶▶ Read the full article at the source's URL.

EDITOR'S COMMENT: Instead of so much focus on the future it would be much better to invest in people and their properties to handle complex situations like war operations and how to conquer a country with a different mentality and status. Machines will never make a difference and history will continue to repeat itself.

Greece: Coming soon in blue skies

UAV Archytas[1]

[1] Archytas was an Ancient Greek philosopher, mathematician, astronomer, statesman, and strategist. He was a scientist of the Pythagorean school and famous for being the reputed founder of mathematical mechanics, as well as a good friend of Plato.

Red Sea Drones: How to Counter Houthi Maritime Tactics

By Håvard Haugstvedt

Source: https://warontherocks.com/2021/09/red-sea-drones-how-to-counter-houthi-maritime-tactics/

Sept 03 – Mariners in the Red Sea have long been threatened by pirates, but they now must deal with a much more modern threat as well: unmanned explosive boats. Since 2017, Houthi forces in Yemen have been perfecting their use of maritime drones — sometimes referred as unmanned surface vehicles, drone boats, or water-borne improvised explosive devices — to carry out attacks against maritime vessels and port facilities in the region. While only one of these attacks to date has led to the loss of lives, others have caused material damage to a number of ships and led to the temporary shutdown of one of Saudi Arabia's busiest ports.
Fortunately, there are a number of steps that governments and private maritime firms can take to counter the threat of maritime drones before it gets worse. Better intelligence sharing and evasive tactics coupled with proactive measures such as electronic jamming, water cannons, and boat nets can help keep commercial vessels safe as they pass by Yemen.

Tabulating the Threat

Open source research based on the same data collection methods used to study aerial drones reveals **24 successful or attempted Houthi maritime drone attacks** carried out between **January 2017 and June 2021**. Tabulating these attacks offers some preliminary generalizations about target and location, while also highlighting the difficulty of making similar generalizations about timing.
The majority of all Houthi maritime drone attacks were directed at commercial shipping vessels such as tankers or freight carriers. Four targeted civilian ports and two targeted oil production and distribution facilities. This makes the total number of attacks against civilian and oil-related targets 16, or two-thirds of the total. These include commercial shipping vessels sailing under different flags, including Yemen's and Singapore's, but a majority have been Saudi carriers. As for location, these **attacks have been clustered around Hodeidah, the Salif port, and Mocha**. The first two locations are currently under Houthi control, while the more southern city of Mocha is not. In addition to these maritime drone attacks, the Houthis have also carried out aerial drone bombings, rocket-propelled grenade strikes from fast moving boats, and indiscriminate naval mining in the strait connecting the Red Sea with the Bay of Aden. It is harder to see patterns in the timing of Houthi maritime drone attacks, however. There is an average of 70 days between each attack, but some have been separated by a mere four days and others by as many as 217.

Proactive and Evasive Tactics

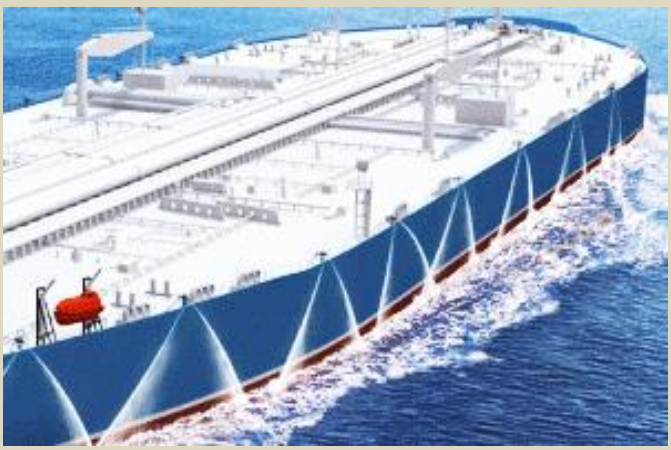
The maritime drone threat may be new, but in trying to counter it, navies and shipping companies can draw on their experience fighting piracy as well as on military efforts to counter aerial drones. The steps that have contributed to the decline in piracy off the coast of Somalia include evasive tactics as well as active countermeasures. Both are important in addressing the threat of Houthi maritime drones.

The first step is to maximize situational awareness for both military and civilian vessels. This means keeping track of recent attacks, actively seeking intelligence reports through open source services, and then sharing this information widely. Just as government agencies need to share their intelligence in the battle against terrorism, the civilian maritime community must do the same. This requires a system for sharing up-to-date situation reports with captains. These reports should contain information about attempted or successful maritime drone attacks as well as details about any other maritime threats or friendly naval forces in the area. Ideally, these reports would draw on the work of security or intelligence agencies, while being carefully vetted to avoid revealing sources and methods.

Armed with good situational awareness, military and civilian vessels in dangerous maritime environments can focus on identifying threats through visual recognition and patterns of movement. However, experimental research has revealed that the human ability to accurately detect hostile intent in surrounding vessels is limited, particularly when approaching vessels employed strategies to mask their intentions. This means that relying solely on human identification may not be sufficient. Fortunately, in contrast to many civilian and military installations on land, larger civilian and military maritime vessels are already equipped with radar technology. This makes detection, and possibly also identification, of approaching vessels possible, particularly when taking key visual and radar signatures into account. Advances in machine learning and improvements in configuring radar circuitry can help overcome ongoing challenges presented by sea clutter, rain, and fog.

Active Countermeasures

Many of the existing countermeasures used to safeguard civilian maritime vessels are directed at the personnel on board hostile ships. These include the use of **armed guards** to deter approaching vessels or engage their crews with small arms weaponry, as well as barbed wire on the sides of ships to prevent boarding and acoustic systems to inflict painful yet non-lethal harm on pirates.



The problem is that all of these countermeasures have a human attacker as the common denominator. Hence, they are useless when a hostile unmanned vessel is approaching.

Instead, for maritime drones, it is important to focus on kinetic and mechanical options. Kinetic options would include projectiles targeting a maritime drone's hull or engine that could slow it down or reduce its maneuverability. As commercial vessels are unlikely to be equipped with high-capacity Gatling gun defense systems, like the Phalanx Close-In Weapons System, **high-caliber precision rifles** are probably a more likely alternative for defensive measures.

Another option, first developed to be deployed from helicopters, is boat nets (photo left), which could render the propeller of an engine useless by restricting its movement. These could be adapted for use on ships. These **nets** must have a delivery system that enables the defending vessel to move away from the actual net after it is deployed so as to protect against any subsequent fail-safe detonations. Nets could be used as a stand-alone countermeasure or in combination with **water cannons**. Water cannons (photo left) can not only deny approaching pirates access to a ship, but also fill their boats with water. This both slows the boat down as well as reduces its maneuverability. These systems can be remotely operated from the bridge of a ship and could also serve to help suppress onboard fires if an attack succeeds.

The application of these measures could be enhanced by deployment of threat-specific security personnel. Already, there are private maritime security companies in the Red Sea and the

Bay of Aden. According to research by Katinka Svanberg, ships with private security forces on board have never been hijacked. But, of course, their success in deterring maritime drone attacks would be dependent on their having tools and techniques that interfere with the vessel itself rather than the humans on board the vessel.
Technologies used to combat aerial drones such as **jamming and spoofing** techniques, as well as high energy weapons, should also be adapted to the maritime environment. Both U.S. and British warships have already begun doing this, particularly after the latest attack on motor tanker Mercer Street off the coast of Oman. Jamming techniques may be used to bombard the receiver — in this case, the attacking drone — with noise signals, while spoofing techniques can be used to "confuse" the drone control device. **High energy weapons** such as laser systems and high-power microwave weapons can disrupt or disable internal electronics, rendering the attacking platform incapable of carrying out an attack. These techniques are currently being tested by U.S. armed forces against aerial drones and should be adapted to the maritime environment.
That said, there is only so much a commercial vessel can handle on its own. Obviously, all of the evasive and countermeasures above are unlikely to be used in a non-military context. This is especially true of the more technologically advanced measures for identification and jamming as well as high-capacity projectile weaponry. This means naval vessels that have patrolled the area since 2019 should continue their valuable work. More broadly, a generous flow of experience and knowledge between both military and commercial actors at sea can help strengthen anti-drone efforts.
Finally, **more aggressive naval action** could also play a role in countering the Houthi maritime threat. Since the Israeli attack on the Iranian ship MV Saviz on April 6, 2021, only two Houthi maritime drone attacks have been confirmed. The Saviz is a cargo vessel that was used for offshore surveillance and for supporting the Houthis' naval operations. It is worth paying careful attention to whether the attack on the Saviz, or its subsequent relocation, have an impact on Houthi naval operations.

Conclusion
The Houthi maritime threat is real and rising, as shown by the group's 24 attacks over the past four years. But commercial vessels are not defenseless. Better situational awareness, better measures to avoid approaching maritime drones, and better tools to disable them can all play a key role in keeping the Red Sea safe.
Looking forward, maritime security experts should be alert to the risk that technologies currently deployed by the Houthis will spread to other seas. Iran may be deliberately using the Red Sea as a testing area for new naval technologies, or the Houthis may be pioneering these technologies on their own. But either way, Iran will be eager to learn from the Houthis' experiences and tactics. It will be important to develop effective countermeasures before maritime drones potentially appear in the Strait of Hormuz as well.

▶▶ **Read also:** https://www.maritimemanual.com/anti-piracy-weapons/#2_Water_Cannon

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Robots Revolutionize Base Security

Source (+video): https://i-hls.com/archives/110508

Sept 02 – The capabilities of a semi-autonomous robotic dog were demonstrated to a US security unit as a potential enhancement to base security. The Quad-legged Unmanned Ground Vehicle, developed by Ghost Robotics, could add an extra level of protection to the base, according to the 75th Security Forces Squadron at Hill Air Force base.
Within the perimeters of the base there are areas where rugged terrain and harsh weather make it difficult for the airmen to patrol. The robot dogs can get through any type of terrain and get to remote areas.
The robot dogs can operate in minus 40-degree to 131-degree conditions and have 14 sensors to create 360-degree awareness. They are also integrated with command and control software, with semi-autonomous and user-operated modes. They are equipped with advanced multi-directional, thermal, and infrared video capabilities, allowing for artificial intelligence-based threat detection.

The robot dogs are capable of easy navigation on difficult terrains. They are equipped with a crouch mode that lowers their center-of-gravity and a high-step mode that alters leg mobility, among other features. Several bases throughout the Air Force are already using or testing robotic dogs, as reported by gephardtdaily.com.

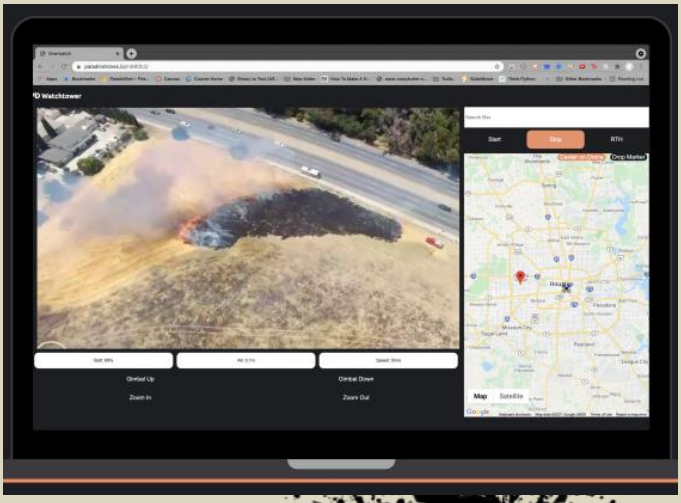
New First Response Drone Unveiled

Source (+video): https://i-hls.com/archives/110526

Sept 04 – Emergency dispatch centers and first responders seek better technology to help them gain more information from calls and to better communicate overall with residents needing assistance. A new emergency response drone recently unveiled could offer a solution for police and fire departments.

Public safety agencies in the U.S. are working to upgrade their emergency response and dispatch technology, in large part to get more information to first responders as they arrive at scenes, and to improve location data, according to govtech.com.

Launched by the startup Paladin, the Knighthawk custom-made drone along with accompanying Watchtower software is meant to enable first responders to obtain overhead video of crime and other emergency scenes, helping law enforcement, fire and medical personnel respond more efficiently.



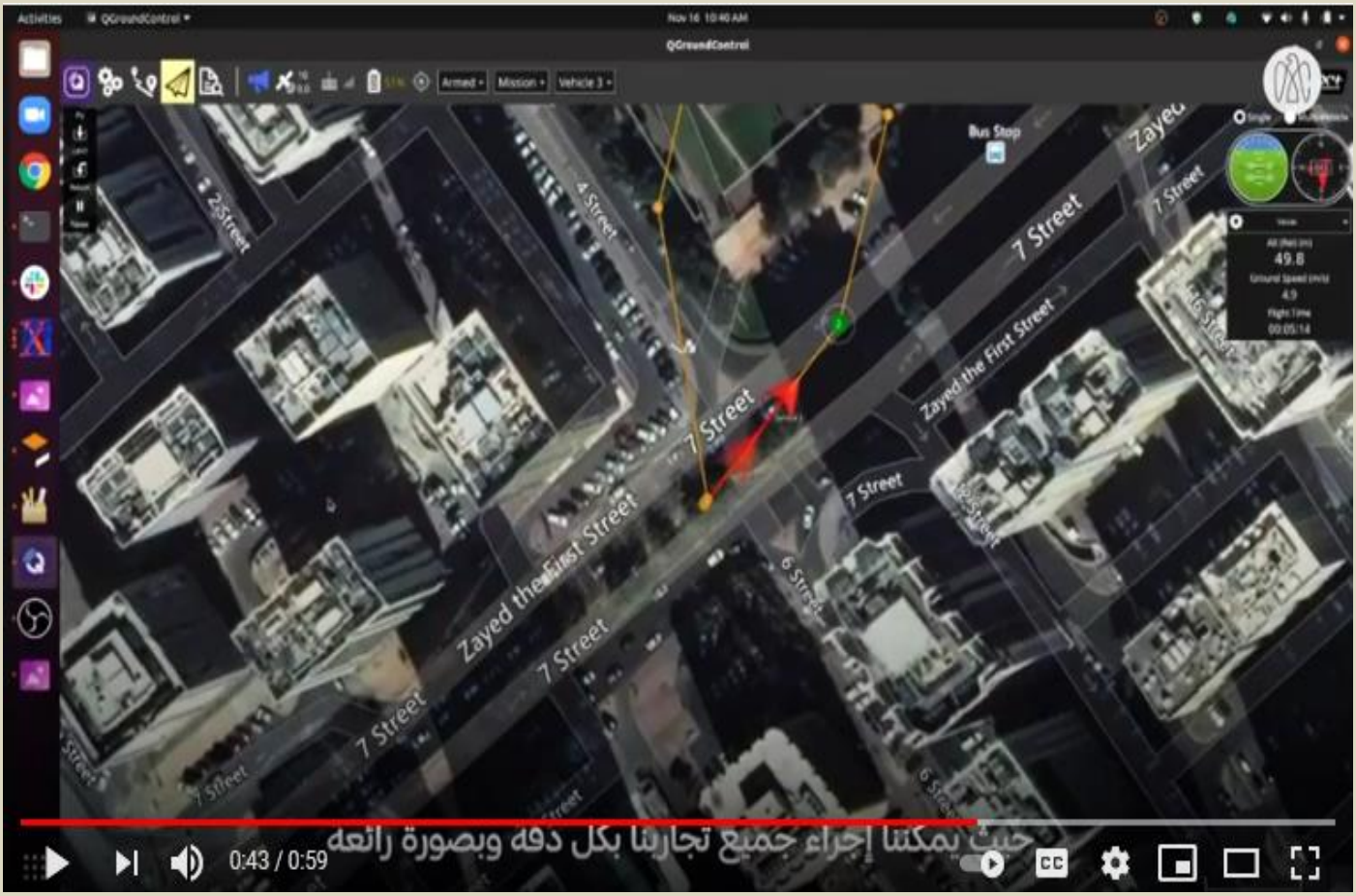
The drone carries two cameras — one optical, one thermal — and has a service radius of three-square miles. Navigation is done via trained first responder professionals working for the particular public agency, with drones being directed by digital maps and by dropping pins onto those maps.

The live feed can be sent to anyone who needs it, and the drone cameras are pointed forward during flight to an emergency response area because of privacy and safety concerns, according to the company. The drone feed goes to a dedicated screen at a dispatch center and can be shared via mobile devices used by emergency responders.

Abu Dhabi Establishing Pioneering Testing Facility

Source: https://i-hls.com/archives/110730
Video: https://www.youtube.com/watch?v=IGv256wTqsE&feature=emb_imp_woyt

Sept 18 – Autonomous drones are already playing a key part in package delivery and infrastructure inspection. As smart cities evolve, it will be critical to ensure the safe operation of drones in an urban setting.



Abu Dhabi is launching a pioneering drone testing facility. The local technology Innovation Institute (TII), which is the applied research pillar of Abu Dhabi's Advanced Technology Research Council (ATRC), is establishing a first-in-the-region Motion Capture (MOCAP) facility, outside of the United States.

The facility will enable the testing of Unmanned Aerial Systems (UAS) or drones in an augmented reality (AR) or mixed reality environment, UAE's state-run news agency Wam reported.

The new facility is particularly suited to the task of bringing algorithms for the security of drones from simulation to real-world application by allowing a gradual transition of scenario elements from pure simulation, to virtual, to real-world.

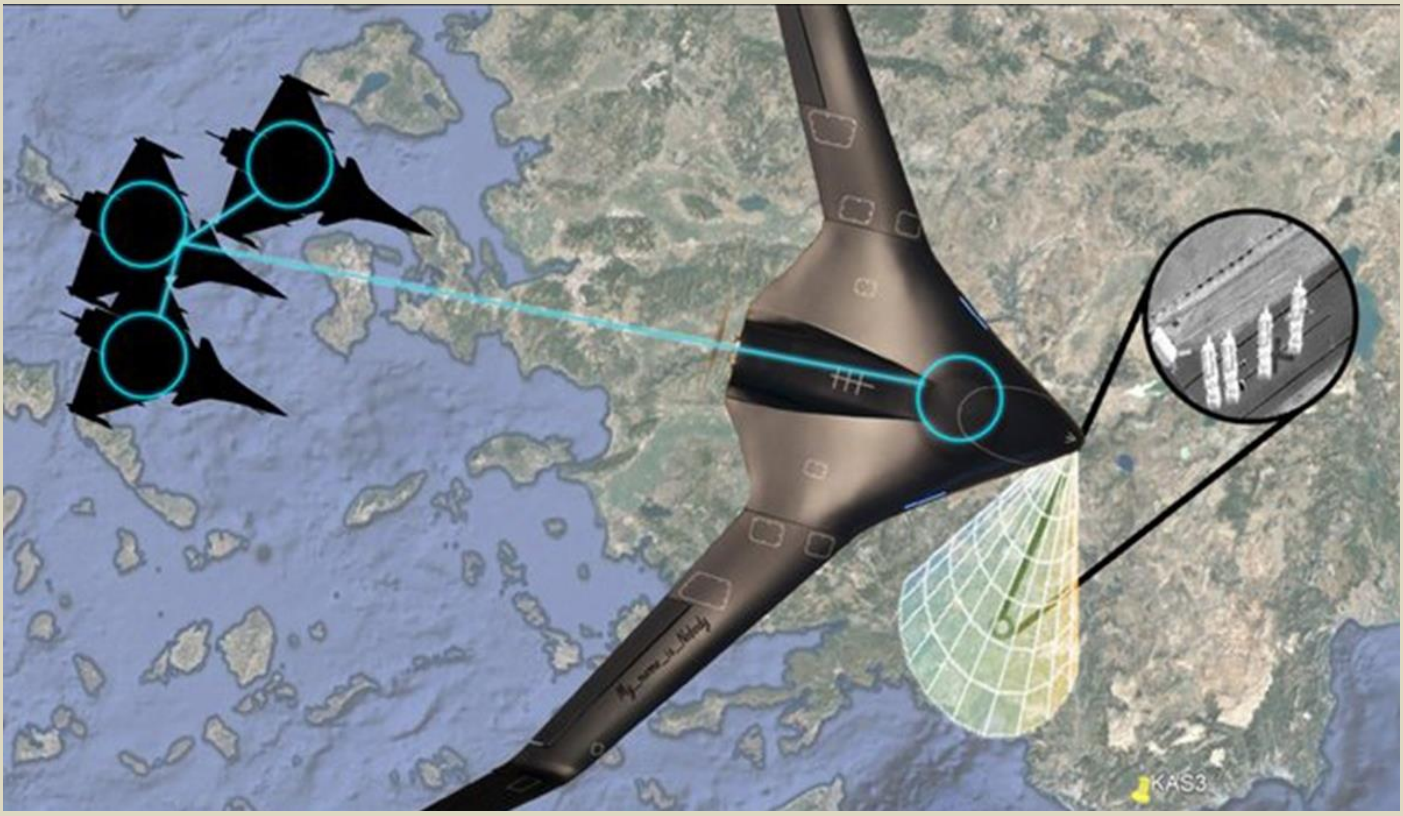
Thanks to the facility, the Secure Systems Research Center (SSRC) will be able to simulate flying through the city of Abu Dhabi, conduct sophisticated experiments and enable virtual, augmented, and mixed reality testing. The ability to simulate virtual camera images and sensors will allow testing in environments that are too large, too dangerous, or too time-consuming to construct in reality.

The facility is based on an ongoing collaboration with US-based Purdue University that holds the distinction for the largest indoor motion capture facility in the world, according to constructionweekonline.com.

The Greek Defense Industry in the 21st Century: Hope at Last?

By Dr. Spyridon Plakoudas

Source: https://besacenter.org/greece-defense-industry/



Lotus

Sept 22 – To some, the phrase "Greek defense industry" is an oxymoron. One would hardly associate Greece with high-tech weaponry that can be exported abroad, and with good reason. From 2007 to 2012, Greece was the biggest importer of armaments in the EU, according to SIPRI's online data. During the Debt Crisis (2009-18), the country's bankrupt state-owned defense industries became a source of discord between the Troika and Athens.

Yet the Greek defense industry was the star at the DEFEA defense exhibition in July 2021. Not only did Greek defense companies proudly showcase their made-in-Greece high-tech weaponry alongside other established defense exporters (e.g., Israel), but they signed contract after contract. How did the Greek defense industry accomplish this spectacular turnaround?

Ahead of the Debt Crisis, the Greek defense industry was a microcosm of the country's systemic and chronic malaise: it was riddled with corruption, cronyism, a labyrinthine bureaucracy, bankrupt state-owned companies, and overtaxed privately owned enterprises, and there was no academia-industry nexus whatsoever.

Indeed, defense and health were the most fertile grounds for corruption in Greece in the 1990s-2000s. Notably, the only politicians ever arrested and imprisoned on corruption charges during the Debt Crisis were associated with the procurement of weapons. Cronyism also afflicted the oversized state-owned defense companies, which, though bankrupt since the early 2000s, continued to employ thousands of "clients" from the ruling parties and to be administered by "friends" of these parties—all at the expense, of course, of the ailing companies and the national economy.

And while the governments supported the virtually bankrupt state-owned companies with "quick fixes" (i.e., state subsidies) every now and then, their privately owned counterparts struggled against over-taxation, indifference, and/or bureaucracy. Far worse, the governments usually inked these multi-billion armaments deals (thanks to corrupt politicians-middlemen) with only negligible industrial offsets. Unlike its neighbors, Israel and Turkey, Greece did not adopt "developmental state theory." Instead, Athens opted for "armaments diplomacy" and thus never achieved self-sufficiency in the military sector.

Years of woe (and debt)

As if all that were not enough, the EU's new legislation and the Troika's austerity during the Debt Crisis added insult to injury.

The 2007-08 crash arrived in Greece on a delay but nonetheless devastated its ailing economy for years. Under a strict austerity policy, Athens reduced its defense budget by 30% and, most notably, did not procure any new weaponry or even initiate modernization of aging weapons systems for over a decade. This austerity affected state- and privately owned defense industries, both of which depended on MoD contracts for their development. For several years, less than 10% of the MoD's budget was allocated to the maintenance of critical weapons systems—for example, the Hellenic Air Force.
Even after the end of the Debt Crisis, Greece would not reverse the defense cuts until 2020, after two crises with Turkey (the Evros Crisis in March 2020 and the Cesme Crisis in July 2020). Three years into the Debt Crisis, Greece adopted the European Directive 2009/81/EC, which stipulated the establishment of a joint defense market within the EU and thus the abolishment of the "protection" the defense industry of every EU member state enjoyed. Owing to its problematic situation (due to its small size, numerous debts, and negligible exports), the Greek defense industry was disproportionately affected.
Partly because of pressure from the Troika and partly because of economic pragmatism, successive Greek governments assented to the privatization of bankrupt state-owned defense corporations (ΕΑΣ, EBO, ENAE, EAB) despite the expected political cost. Though it had been attempted several times, none of these companies had been successfully privatized before the end of the Debt Crisis in 2018, so the difficult situation persisted.

The surprising turnround

And yet, the Greek defense industry executed a *tour de force* in 2020. From a state of decay, the sector emerged into a state of stabilization.
Despite fierce (and not entirely fair) competition against the European defense giants, the Greek defense companies (the majority of whom are privately owned) secured almost a third of upcoming programs under the EU's PESCO.
They will participate in five of the 16 projects under the European Defense Industrial Development Program (EDIDP) along with over 180 participants from other EU countries. Those projects are:

- LOTUS (a low visibility drone)
- DECISMAR (an upgraded maritime surveillance system)
- ESC2 (an improved command-and-control system)
- PANDORA (improved cyber-defense)
- SMOTANET (next-generation internal communications)

They will also participate in one of eight research projects in the context of the Preparatory Action on Defense Research (PADR):

- PRIVILEGE (encryption of sensitive military data)

In other words, these Greek defense companies not only competed successfully against their far bigger counterparts but also achieved significant industrial synergies with the latter. And synergies in the defense sector can prove invaluable for the Greek defense ecosystem.
In the same year, Greek defense companies inked their biggest deals to date. In fact, four privately owned defense companies (Intracom Defense Electronics, EODH, Theon Sensors, and Skytalis) signed new deals that exceeded €255 million ($330 million). That figure pales in comparison to the export deals of Greece's neighbors, Turkey and Israel, but these Greek companies undoubtedly performed very well when one considers the odds against them. Unfortunately, data for deals of the other privately owned firms for 2020 could not obtained. According to a catalogue of the Hellenic Manufacturers of Defense Materiel Association (ΣΕΚΠΥ), however, exports of other privately owned firms totaled €54.5 million ($78.59 million) in 2019.
The situation at the state-owned companies was nowhere as dynamic, but still far better than in recent years. The ΕΛΒΟ was auctioned to an Israeli consortium after three unfruitful privatization attempts since 2015. The ΕΑΣ recorded zero losses after nearly 17 (!) years and the EAB will profit from the deepening cooperation between Abu Dhabi and Athens. The ENAE, Greece's most significant and troubled shipyard, was finally privatized in July 2021 after a years-long effort to be bailed out.
The Greek defense ecosystem currently consists of 80 companies, a 22% *increase* since last year. Most of these companies undertake military and civilian projects alike. Only half (four state-owned and 35 privately owned) execute solely defense-related contracts. These 39 companies employed 6.268 people in 2019 and their operations' cycle amounted to €318 million ($382 million). These firms can be further categorized as such: 25 small (<€2 million annual turnover), 11 small-to-medium (<€50 million), and three medium (=>€50 million). In an indication of the Greek defense ecosystem's status, not one of these 26 companies exceeds €100 million in annual turnover.
One critical point about the Greek defense ecosystem must be made: the vast majority of these defense industries specialize in new technologies of the Fourth Industrial Revolution (e.g., cyber-defense or drones). In an analogy to a computer, most of these firms produce the software, not the hardware, of the weapons systems. Because Greece intends to upgrade itself into a major hub for digital nomads in the Balkans and the Eastern Mediterranean, the growth of the start-up ecosystem in Greece could have a positive impact on the expansion of the defense industry as well.

The future of the Greek defense industry

The Greek defense ecosystem, after several years of decay, entered a phase of stabilization and cautious development. The Greek defense industries either supplied the Greek Armed Forces with high-tech weapons made in Greece or signed new export deals for their products in the first half of 2021.

The rearmament program of Greece in the face of increasing Turkish aggression (which may exceed €11.5 billion by 2025) will offer the Greek defense industries new MoD contracts and, most importantly, open the door for collaborations between the Greek and foreign defense industries. Such synergies with Western defense giants will only deepen thanks to the participation of the Greek defense ecosystem in a third of the EU's weapons programs.

Such synergies may remedy one of the chronic illnesses of the Greek defense ecosystem: the shortage in funds for R&D. Another problem, the absence of a nexus between the industry and universities, should gradually wane as more and more universities join hands with the industry for MoD projects—most notably, drones.

Another possible benefit could arise from the negotiation of defense agreements with allies, both old and new. For example, the UAE invested in the EAB in the context of the strategic cooperation between Athens and Abu Dhabi. In a similar way, Washington could offer Athens critical offsets for the use of Greek military bases—for example, inclusion of the Greek defense industry in the F-35 manufacturing consortium.

All the above, however, will require the Greek defense industry to construct a sound and coherent strategy. The mammoth rearmament program after the Imia Crisis of 1996, in which billions of dollars were wasted only to fatten the wallets of middlemen and politicians with negligible benefits for the Greek defense industry, stands as a stark reminder.

Dr. Spyridon Plakoudas *is Assistant Professor of Homeland Security at Rabdan Academy in the UAE*.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FEMA Launches National Risk Index Update

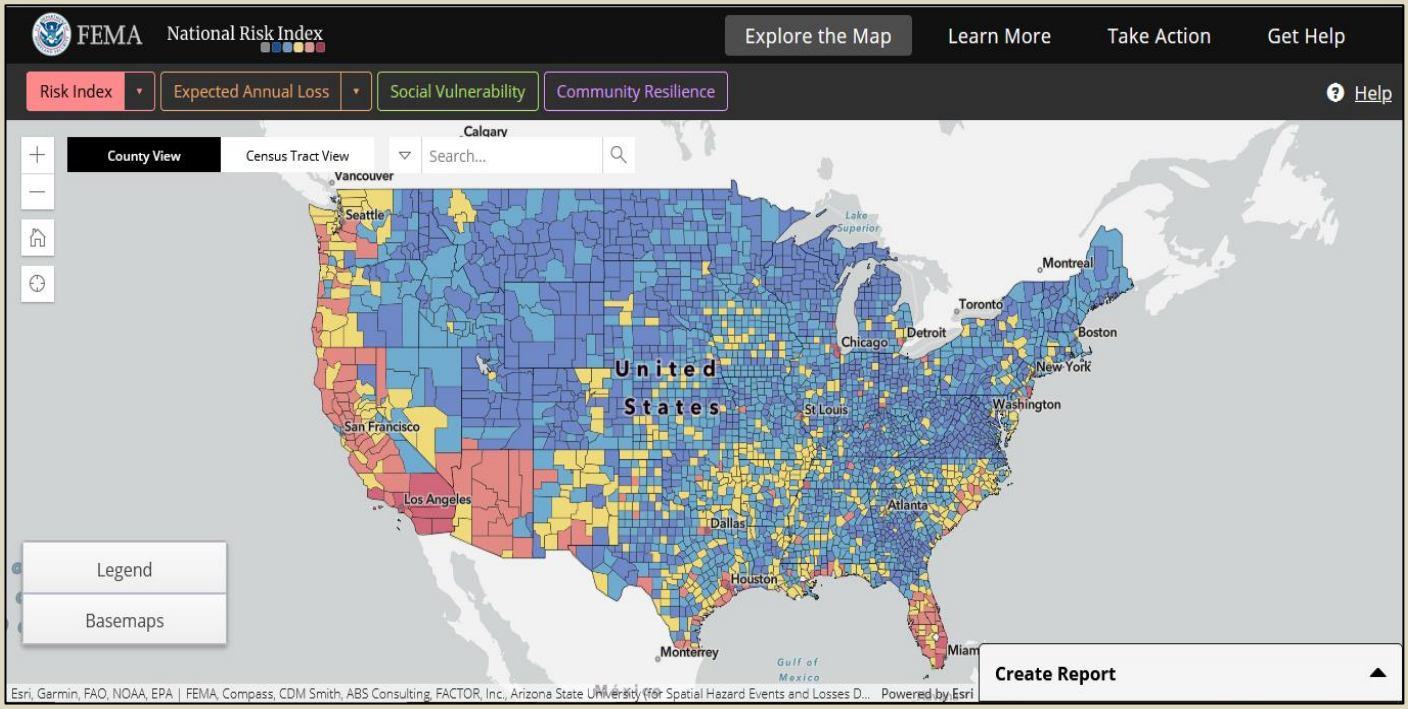
Source: https://www.hstoday.us/subject-matter-areas/emergency-preparedness/fema-launches-national-risk-index-update/

Aug 18 – FEMA announced the full application launch of the National Risk Index, a new online resource that provides a clear, visual guide to natural hazard risks throughout the United States, and information to help communities to understand and reduce those risks, whether they involve flooding, wildfire, extreme heat, or drought.

Developed with attention to the increased risks from climate change, and the need to develop new approaches to reduce those risks, this online mapping application provides simple measures of a community's risk for 18 natural hazards. The online mapping application also measures resilience, social vulnerability and expected annual loss.

"It is important for people to educate themselves about the severe weather events that can pose a serious threat to their communities," said FEMA Administrator Deanne Criswell. "The National Risk Index is a free tool that allows anyone to take a deeper look at local hazards, and can help inform risk based decision making, so that people can be as prepared as possible."

Climate change is a top priority for the Biden-Harris administration and FEMA. The Index is specifically designed to help enable communities to develop new preventive strategies, and emergency responses, by helping them to increase resilience and adaptation. By providing standardized risk data and an overview of multiple risk factors this interactive mapping and analysis tool can enable communities, especially those with limited flood mapping and risk assessment capabilities, to prepare for natural hazards.



FEMA released this application a week after nearly $5 billion in new funding opportunities was made available to help communities prepare for extreme weather and climate-related disasters. The Index provides efficient, standardized risk assessment methodology, free interactive web maps and geographic information system services. States, tribes, territories and local communities can also use the Index to meet certain grant application requirements.

The Index was originally released in November 2020 in a limited capacity. Now made fully available for state, local, tribal and territorial governments, the Index can generate more customized analyses and reports, including community risk profiles and risk comparison reports for any county or census tract.

The data and reporting tools in the Index were custom designed and developed to help any community discover its risk to natural hazards. Users can share reports through unique links, save them as printable PDFs or extract the underlying data in spatial or tabular formats. The Index based ratings on data from the best available resources from 2014 through 2019 and frequent updates, including responses to new information as it becomes available, are expected to keep ratings current.

The Index is free and easy to use, and data from the site can be downloaded. Visit FEMA's National Risk Index webpage to learn more about the data and the natural hazards that may affect your community.

Fire safety and evacuation requirements for hospital buildings

By Kimon Pantelides, MSc, GIFireE, MIAAI; Fire Safty Officer @ University of London
Source: https://www.fire.gr/?p=45906

The **evacuation of a hospital requires special consideration** based on the premise that persons residing or visiting hospitals (other than abled bodied staff and visitors) might not be readily mobile and are likely to have some sort of ailment that requires hospital care and/or attention. Furthermore, patients in hospitals might be bed-ridden, or undergoing a surgical procedure (under local or general anaesthetic), or an examination (MRI scan), they might have temporary or permanent mobility, visual or other impairment that requires assistance in the event of an evacuation, or they might be kept on life support and/or other complex machinery that is vital to their health.

In any case, the complexities faced in hospitals due to the variety in the characteristics of occupants, as well as the work taking place[1] in these buildings, **gives them a higher risk profile when considering the requirements of emergency procedures.** As such, conventional methods for the evacuation of occupants in the event of a fire or fire alarm activation would not be appropriate for hospital buildings. The above measures could equally apply to residential care homes, where characteristics of occupants would necessitate assisted evacuation.

How the Terrifying Evacuations from the Twin Towers on 9/11 Helped Make Today's Skyscrapers Safer

By Erica Kuligowski
Source: https://www.homelandsecuritynewswire.com/dr20210912-how-the-terrifying-evacuations-from-the-twin-towers-on-9-11-helped-make-todays-skyscrapers-safer

Sept 12 – The 2001 World Trade Center disaster was the most significant high-rise evacuation in modern times, and the harrowing experiences of the thousands of survivors who successfully escaped the Twin Towers have had a significant influence on building codes and standards. One legacy of the 9/11 tragedy is that today's skyscrapers can be emptied much more safely and easily in an emergency.

The 110-storey Twin Towers, constructed from 1966 to 1973, both had open-plan floor designs, with stairs and elevators located in the buildings' core. Each tower had three staircases which, barring a few twists and turns, ran all the way from the top of the building down to the mezzanine level just above the ground floor. One of the stairways had steps 142 centimeters wide, but the other two measured just 112cm, which would not be permitted by today's skyscraper building codes.

As a result of the Twin Towers' system of "sky lobbies", which was innovative for its time, the number of available elevators varied depending on the floor. The system was not designed to be used in an emergency, and today, many towers above a certain height are required to be fitted with dedicated emergency elevators or an additional staircase.

When the planes hit on the morning of September 11 2001, the Twin Towers were at less than half their full occupancy, with about 9,000 people in each tower. Many people who worked there had not yet arrived, partly because of a New York mayoral election scheduled for that day.

At 8:46am, American Airlines flight 11 slammed into the north face of the North Tower, rendering all three staircases impassable for anyone above the 91st floor. Sixteen minutes later, and after one-third of its occupants had already evacuated, the South Tower was hit by United Airlines flight 175, leaving only one staircase available for evacuees above the 78th floor.

Besides the problems posed by fires and damage on floors, and debris inside the stairways, people in both towers also faced issues with communication. The North Tower's public address system, which would have been used to make emergency announcements to the building's occupants, was disabled by the crash.

In the South Tower, three minutes before the impact, occupants were told via the public address system to stay in place and wait for further information. Two minutes later they were told they could evacuate if they wanted. This may have meant more people from higher floors were waiting at the sky lobby on floor 78 when the plane crashed into that floor.

In both towers, people had only limited information on which to base their decisions. For those closest to the impacts, the seriousness of the situation and the need to evacuate was clear. But for those further away, who may have witnessed only the lights flicker, the uncertainty was palpable. Many people delayed their evacuation to seek out extra

information, whether by speaking with colleagues, making phone calls, sending emails or searching online for news updates.
Many lives were saved by the brave leadership of people who took control of the situation, urging others to evacuate and helping those who needed assistance. My PhD research revealed these were typically people who were used to taking charge: high-level managers, fire wardens and people with military experience.

Hazardous Exit

Evacuees faced a dangerous and claustrophobic journey down to ground level. A subsequent US government investigation found 70% of evacuees encountered crowding on the stairs. Some people recalled having to leave the stairwell either because of overcrowding, being told to do so by fire or building officials, or because they needed a rest. Other problems included poor lighting, not knowing which direction to go, and finding the route unavoidably blocked by people with permanent or temporary disabilities.
While people are typically told not to use elevators in an emergency, 16% of those who escaped the South Tower used the elevators to evacuate during the 16 minutes between the two impacts. Simulations of a hypothetical 9/11 in which elevators were unavailable showed that occupants' use of elevators saved 3,000 lives in the South Tower.
Not everyone was so lucky. The US National Institute of Standards and Technology (NIST) investigation (on which I was an author) estimated that between 2,146 and 2,163 people were killed in the towers, and that more people died in the North Tower, which was struck first. Most of those who died on 9/11 were on or above the floors hit by the planes.
Roughly 99% of people on floors below the impacts managed to evacuate successfully. For those who didn't, the factors linked to their deaths included delaying their evacuation, performing emergency response duties, or being unable to leave their particular floor because of damage or debris. Had the buildings been fully occupied, the consequences would undoubtedly have been even worse.

Building Better

The stories of those who experienced the terrifying evacuations have helped to shape important and life-saving changes in high-rise buildings. The NIST report made several recommendations that were eventually implemented in a range of building codes and standards around the world, notably the International Building Code.
Emergency stairs in skyscrapers must now be at least 137cm wide, and feature glow-in-the-dark markings on the stair treads that are visible even if the power fails.
What's more, while elevator use is not typically encouraged during building fires, the International Building Code now requires a new "occupant-safe" elevator system or an additional staircase in buildings over 128 meters tall. These new elevator systems are designed to be safely used during fires, offering a vital escape route for people unable to use stairs.
The tragic events of 9/11 changed the world in all sorts of ways. But hopefully, when it comes to the design of today's skyscrapers, it has changed things for the better.

***Erica Kuligowski** is Vice-Chancellor's Senior Research Fellow, RMIT University.*

EU launches health-security agency

Source: https://euobserver.com/tickers/152953

Sept 17 – The European Commission has launched a new health agency to help prepare for future pandemics. **The 'health emergency preparedness and response authority' (HERA),** will assess threats, fund research, and build stockpiles of drugs, with a budget of €6bn in 2022 to 2027. The agency "will be our main instrument to coordinate preparedness and, if needed, response ... This is what we are missing today," EU commission vice-president Margaritis Schinas said.

Eight killed in Russian university shooting, gunman 'liquidated'

Source: https://www.reuters.com/world/europe/fatal-shooting-incident-takes-place-russian-university-ifax-2021-09-20/

EDITOR'S COMMENT: What if in each first floor (and above) class there were escape folding ladders? – instead of jumping and injure themselves?

- Detection
- Monitoring
- Sampling & Analysis
- Protection
- Decontamination
- Destruction & Waste Management
- Scene Management Training
- Instructional Equipment
- Live Agent Testing & Validation

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