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Feature Report

“Hypersonic Weapons: Background and Issues for Congress”. Published by Congressional Research Service; Updated March 17, 2020

<https://crsreports.congress.gov/product/pdf/R/R45811>

Experts disagree on the potential impact of competitor hypersonic weapons on both strategic stability and the U.S. military’s competitive advantage. Nevertheless, current Under Secretary of Defense for Research and Engineering (USD R&E) Michael Griffin has testified to Congress that the United States does not “have systems which can hold [China and Russia] at risk in a corresponding manner, and we don’t have defenses against [their] systems.” Although the John S. McCain National Defense Authorization Act for Fiscal Year 2019 (FY2019 NDAA, P.L. 115- 232) accelerated the development of hypersonic weapons, which USD R&E identifies as a priority research and development area, the United States is unlikely to field an operational system before 2023. However, the United States, in contrast to Russia and China, is not currently considering or developing hypersonic weapons for use with a nuclear warhead. As a result, U.S. hypersonic weapons will likely require greater accuracy and will be more technically challenging to develop than nuclear-armed Chinese and Russian systems.

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While Iran has the technological capacity to enrich at higher and more sensitive levels, it has not made the political decision to do so, perhaps to avoid antagonizing the remaining signatories of the nuclear deal.

- [North Korea Test Fires Two Missiles](#) (Defense News/AP)

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To satisfy the conditions of the OPCON transition in a timely manner, the ROK is committing an unprecedented level of budget to improve critical military capabilities of its Armed Forces and continue acquiring response capabilities to nuclear weapons and weapons of mass destruction.
- [Round-the-clock Surveillance of Iran's Uranium-enrichment Sites Continues, Despite Coronavirus](#) (Bulletin of the Atomic Scientists)
It is important to realize that while in-person, on-site agency inspections may suffer some possible disruption, the IAEA also relies heavily on a variety of installed on-site verification technologies that allow it to monitor nuclear activities remotely.
- [Deterrence by Detection: A New Approach to Preventing Opportunistic Aggression](#) (Real Clear Defense)
"One of the most significant challenges the United States and our allies face is the need to prevent China or Russia from launching opportunistic acts of aggression."

NUCLEAR WEAPONS

Sandia National Labs (New Mexico)

Sandia Initiatives to Protect US Energy Grid and Nuclear Weapons Systems

By Sandia Labs

March 23, 2020

ALBUQUERQUE, N.M. — To deter attempts to disable U.S. electrical utilities and to defend U.S. nuclear weapon systems from evolving technological threats, Sandia National Laboratories has begun two multiyear initiatives to strengthen U.S. responses.

One is focused on defending large U.S. electrical utility systems from potential attacks by hostile nations, as well as from damage inflicted by extreme natural disasters like hurricanes and solar flares. The Resilient Energy Systems campaign, a multi-year research portfolio with up to \$40 million in total funding, is supported by Sandia's Laboratory Directed Research and Development program, which funds exploratory work in science and technology.

"The original electric grid was not designed with security in mind against cyberhacks, or protection from electromagnetic disturbances, or natural disasters such as hurricanes or geomagnetic solar storms," portfolio manager Craig Lawton said.

"The primary objective of our mission portfolio is to mitigate vulnerabilities caused by antiquated technology in transformers and other components. Solutions require research, and we're looking for collective inputs of ideas from researchers in industry, utility companies, universities, other labs and of course Sandia," he said.

Deterring aggression by updating weapon systems

The second research campaign is developing enabling technical capabilities to help the U.S. maintain its strategic nuclear deterrent.

The Assured Survivability and Agility with Pulsed Power research campaign is a multi-year portfolio with up to \$40 million in total funding, again by Sandia's LDRD program. The mission portfolio is intended to explore technologies that use brief but powerful bursts of electrical energy to simulate nuclear explosions — without resorting to actual nuclear tests — to better understand their impact on electronics and materials.

"Our nuclear weapons systems have been relatively static, while the capabilities and technologies used by our potential adversaries are evolving at a rapid pace," said Sandia physicist Kyle Peterson, who developed and leads the mission. "We must be more agile in identifying potential threats to maintain an effective deterrent against hostile military actions.

"We're open to, and hope for, input from researchers in industry, universities and other national labs as well as Sandia to contribute ideas and work in this effort," said Peterson.

Additional benefits from both mission portfolios are expected to include more efficient electrical generation, more accurate data for astrophysicists, and a closer approach to break-even and even high-yield fusion, which can generate electrical energy by fusing atoms — a goal of a branch of physics for 70 years.

Improving resiliency of US utilities

There's room for improvement in the protection of the U.S. energy system, said Lawton.

“Our electrical generating systems may be more vulnerable than we would like,” he said.

“Many of these were built in simpler times, some around the early 20th century. Though remarkably durable, since then they have been overlaid with complex computer control systems to assist in responding to the complicated demands of today.”

These computer systems, he says, are vulnerable to cyber hacking that could alter or disable them, potentially disrupting power to large geographic areas.

“Electricity runs almost everything in modern society,” Lawton said. “Without it, food goes bad, hospitals can’t function, credit cards don’t work. Dams letting out prescribed amounts of water and gas pipelines operate autonomously through codes.”

In addition to maliciously created computer problems, “damage from naturally occurring threats, like hurricanes, can cause problems that may stretch out for long periods of time if replacement parts aren’t readily available,” he said.

While large utilities already have lightning surge arrestors to mitigate lightning strikes, and highly efficient lightning rods, “they don’t operate fast enough to catch a nanosecond electromagnetic wave from a nuclear weapon exploded high in the atmosphere.” The electromagnetic pulse could fry unprotected circuits, he said.

While utility companies are required to have contingency plans in place to provide power if one generator in a large system goes out, there’s no prepared response if they lose many generators at once, he said.

“These are some of the problems that we expect our upcoming work to mitigate,” Lawton said. “We believe that ideas proposed to increase our electrical security will come from Sandia and other national labs, universities and the utility companies themselves.”

The intense realm of ASAP

Among the military problems that an adversary might present are more capable weapon systems as well as technology intended to confuse a U.S. missile and deflect it from reaching its target. The Assured Survivability and Agility with Pulsed Power, ASAP, campaign will invest in science and technology needed to ensure that “U.S. military objectives will be met in the event that deterrence fails,” Peterson said.

Further study of brief strong pulses of electrical power are needed to help meet that goal. Pulsed-power accelerators store energy and release it in powerful bursts. Those can be converted into X-rays and neutrons to be used as a laboratory version of an actual bomb blast to assess how nuclear and conventional weapon systems would respond if subjected to those environments.

Sandia uses pulsed power technology in a number of different facilities — Saturn, Hermes and Z — and is currently developing proposals to enhance some of these capabilities.

One is directed-energy weapon systems, said Peterson. Pulses of pure energy could deter platoons of advancing soldiers by making them uncomfortably warm. Focused to a narrower beam, they could be used to shoot down incoming missiles near-instantaneously.

A dramatically improved successor to the Z facility has been proposed that would deliver 10 times the energy output of Z currently: a petawatt (quadrillion watts) electrical pulse.

Said Peterson, “This would create unprecedented levels of X-rays and neutrons, as much as tens of thousands more neutrons than currently generated by Z today.” Z is already the world’s most powerful generator of X-rays.

“We have seen petawatt lasers for many years,” he continued. “This would be the first accelerator to deliver a petawatt of electrical power and with much larger energies than lasers can generate.”

However, to realize such a facility and other advances, the ASAP research campaign is needed to develop better understanding of basic support issues like high voltages and current delivery, electrical breakdowns and how to prevent them, more efficient and reliable capacitors and switches, and new materials for delivering petawatts of electrical power.

Such basic engineering research will do a lot for science, said Peterson. “It would enable better astrophysics experiments, create higher temperatures and pressures for material science, and higher fidelity environments for radiation effects testing on electronics and materials.”

Also significant would be creating tools to manage the debris from repeated experiments from an improved Z that each would generate the energy equivalent of more than 20 sticks of dynamite exploding in nanoseconds in a tiny enclosed space.

“If a Z successor were built without improvements in its underlying support structure, its first firing would be a lot easier to achieve than its second,” said Peterson.

He’s looking for ideas from qualified researchers to help the mission succeed in its aim of improving national security.

Sandia National Laboratories is a multimission laboratory operated by National Technology and Engineering Solutions of Sandia LLC, a wholly owned subsidiary of Honeywell International Inc., for the U.S. Department of Energy’s National Nuclear Security Administration. Sandia Labs has major research and development responsibilities in nuclear deterrence, global security, defense, energy technologies and economic competitiveness, with main facilities in Albuquerque, New Mexico, and Livermore, California.

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https://share-ng.sandia.gov/news/resources/news_releases/protecting_systems/

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Arms Control Today (Washington, D.C.)

France Offers Nuclear Deterrent to All of Europe

By Shannon Bugos

March 2020

French President Emmanuel Macron offered to begin discussing with other European countries the role that France’s nuclear deterrent can play in their collective security.

France’s nuclear forces “strengthen the security of Europe through their very existence,” Macron said at the military school École de Guerre in Paris on Feb. 7. An erosion of “the comprehensive security framework” that protects Europe affects France’s defense strategy, he said, which means that “France’s vital interests now have a European dimension.” France’s nuclear deterrence “ensures our independence, our freedom to assess, make decisions, and take action. It prevents adversaries from betting on escalation, intimidation, and blackmailing to achieve their ends,” he said before extending the offer.

At the same time, Macron argued that the international community must limit the role of nuclear deterrence to “extreme circumstances of self-defense,” with the overall goal of preventing war.

“France’s nuclear doctrine strictly adheres to this framework,” he said. France currently has about 300 nuclear weapons in its arsenal.

During his address, Macron outlined three “paradigm shifts” underway in the world. The first he described as strategic, in which “a new hierarchy of powers” is emerging and bringing with it the heightened risk of conflict and military escalation due to competition.

The challenging of “a multilateral order based on law” defines the second paradigm shift, he said, illustrated by the demise of the Intermediate-Range Nuclear Forces Treaty last August. (See ACT, September 2019.) “Europeans must collectively realize today that, without a legal framework, they could quickly find themselves at risk of another conventional and even nuclear arms race on their soil,” Macron said. “They cannot stand by.”

The final shift involves the emergence of new technologies and their potential role in conflict. All of these paradigm shifts, he said, demand that the world think about what the future of war will look like. Macron suggested that the heads of state of the permanent members of the UN Security Council (China, France, Russia, the United Kingdom, and the United States) convene in order “to fully discharge [their] mandate to maintain peace and international security” in this changing landscape.

Macron presented a four-pillared strategy for confronting these paradigm shifts and achieving peace. The first pillar he called the “promotion of an efficient multilateralism,” to include an increased investment in defense by European countries and a renewed international arms control agenda.

Regarding arms control, the president urged Europe to “rethink disarmament” so that it contributes to international security and highlighted France’s “unique track record in the world,” given its irreversible dismantlement of land-based nuclear weapons, nuclear testing facilities, and fissile material.

The next two pillars Macron described were the development of strategic alliances focused on promoting peace and security and the establishment of greater European autonomy.

Macron dubbed national sovereignty as the final pillar, saying, “if France is to live up to its ambition and its history, it must remain sovereign.”

<https://www.armscontrol.org/act/2020-03/news/france-offers-nuclear-deterrent-europe>

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Defense News (Washington, D.C.)

A New Training System for the Air Force’s Airborne ICBM Launch Center Is Coming Soon

By Valerie Insinna

March 24, 2020

WASHINGTON — Next month, the Air Force is expected to get a new training system for its airborne ICBM command post after the older system was damaged in devastating floods in 2019.

Offutt Air Force Base, located near Omaha, Neb., is set to receive a shipment for a virtual Airborne Launch Control System trainer in April, said Lt. Col. Matthew Hlivko, commander of the 625th Strategic Operations Squadron.

The ALCS is an incredibly unique nuclear weapons system that provides the U.S. military a way to launch intercontinental ballistic missiles from an aircraft, giving the Pentagon another option if

launch control centers on the ground are destroyed. The ALCS is operated by Air Force personnel onboard a Navy E-6B Mercury, and only 16 of those Boeing 707-based planes are operational.

“The new virtual system will create a better training environment for students and will include improved hardware, software, 3D graphic displays and higher fidelity touch panels,” said Hlivko, whose 625th STOS is responsible for the operation of the Airborne Launch Control System.

Last March, floodwaters from the Missouri River and Papio Creek rose and spilled into Offutt, leaving much of the base underwater and damaging aircraft simulators, hangars and upwards of 50 buildings.

For the 625th STOS, “the biggest thing we lost was our simulator,” Col. Hayley James, deputy group commander for the 595th Command and Control Group, told Defense News during an October trip to Offutt. To keep up their skills over the past year, the squadron has had to fly across the country to Vandenburg AFB for contractor-provided training.

When James spoke with Defense News, the Air Force was still deciding whether it would eventually buy a full tactile trainer, which has physical buttons, switches and keys that exactly replicate those on the system, giving a more immersive experience.

“The Air Force wants to do more [with] virtual capabilities just because there is an expense piece tied to it,” she said. “I think the idea is that in the next 18 months to two years they’ll bring on the full training solution. We don’t know what that’s going to look like but my guess is it will be a combination of tactile and virtual training. It probably will not look the same as what we had before.”

The Air Force will eventually buy a full tactile ALCS trainer but remains in the early stages of the process, Eighth Air Force spokesman Justin Oakes said in a statement. There is no current estimate for when the trainer will be delivered or deployed.

Missileers who are learning to use the ALCS go through a six to eight week initial qualification training that involves both simulator training and training aboard the E-6.

The squadron has already conducted two initial qualifying classes using the new simulator at Vandenberg Air Force Base, California. The next qualifying class is scheduled to be held at Offutt AFB in early May once the new virtual trainer has been delivered and installed, Hlivko said.

But aside from simulator training, the squadron has multiple ways to keep up readiness.

Missile crews get training time during monthly E-6 training rides, which cover the full gamut of ICBM operations. Those rides are “very vocal, very loud, very fast paced,” Hlivko said. “You’re taking [the mission] with another crew member, so there’s a lot of crew coordination with one person taking action, one person vocalizing what those actions should be.”

Because the Air Force and Navy maintain an E-6 and ALCS on 24 hour alert, meaning that they are ready to take off at any moment in order to execute a mission, the missile crews also take turns standing alert for weeklong periods.

“We are the survivable portion of the ICBM of the triad. We always have an operational Airborne Launch Control System that is ready to go and execute that mission at all times,” said Capt. Blake Friend, an ALCS planner. “We’re always tethered to the plane and ready to fly away at any second.”

<https://www.defensenews.com/space/2020/03/24/a-new-training-system-for-the-air-forces-airborne-icbm-command-post-is-coming-soon/>

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DVIDS (Atlanta, Ga.)

Small Tools, Big Impact: Piecing Together a Bigger Picture

By Defense Threat Reduction Agency's Chemical and Biological Technologies Department

March 19, 2020

Warfighters will soon be able to attach a new technology to their uniforms to collect a sample of chemicals present in their operational environment. The technology is a passive, chemical sampler that complements a current technology — the handheld detector, which immediately alerts the warfighter of chemical warfare agents present at concentrations considered suspicious.

Warfighters surveying an area for unknown chemicals at varying toxic concentrations carry the handheld detector (while wearing masks and protective suits, and carrying compressed air for breathing). However, the detector could raise a false alarm that a chemical is present, may not detect a chemical if its concentration is below the minimum value programmed in the detector, or may misidentify the chemical class of a compound that is in the environment. The passive sampler is a robust complement to the handheld detector and gathers information the detector may have missed.

The new tool passively samples the chemicals in the space a warfighter is surveying. An analysis of the chemicals sampled reveals the identity and quantity of each chemical and also suggests the possible uses of the site in which the chemicals are present, e.g., to manufacture chemical warfare agents. This tool is a result of research funded by the Defense Threat Reduction Agency and carried out by scientists at the U.S. Army Combat Capabilities Development Command Chemical Biological Center (CCDC CBC).

The passive sampler is lightweight, clips on to a warfighter's uniform, and requires no power to collect a sample of chemicals that range in amounts from high parts per trillion to low parts per million. Scientists analyze these high-to-low values to understand if the chemicals collected during the survey are present at levels safe for short-term exposure or at levels immediately dangerous to life and health. A typical site survey of 30–90 minutes in duration is needed to accumulate adequate samples that characterize the site in which the agents are present. The data collection time frame matches how long a warfighter is able to wear the protective mask and breathe the supplied oxygen while conducting the survey.

Because the passive sampler picks up any chemical it encounters, the composition of the sample may contain thousands of compounds. For example, each warfighter gathers a different sample based on their activity and movements, what they carry on their person, or if they have recently fueled or operated equipment requiring gas or diesel. To identify each component in the sample, the analysis is normally performed in a laboratory setting with the use of sophisticated instruments. Chemicals identified may include those related to the manufacture of a chemical warfare agent or those associated with the breakdown of the agent.

The passive sampler collects all chemicals it encounters and, through subsequent laboratory analysis, informs warfighters on the activities that take place at the site: whether the site is a place for manufacturing or breaking down chemical warfare agents, or whether the site serves another purpose. At a minimum, this information can educate warfighters on the diverse nature of sites related to chemical warfare agents.

During a National Guard Civil Support Team exercise with the advanced chemical, biological, radiological, nuclear, and explosives training branch at CCDC CBC, analysis of data collected by the passive sampler actually distinguished between a simulated nerve-agent facility and a simulated blister-agent facility.

The clip-on, passive chemical sampler will soon become available to warfighters. Data from the sampler provide better situational awareness of the operational environment, allowing commanders to make more informed decisions.

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<https://www.dvidshub.net/news/365531/small-tools-big-impact-piecing-together-bigger-picture>

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Politico (Washington, D.C.)

'It Is Not Science Fiction Anymore': Coronavirus Exposes U.S. Vulnerability to Biowarfare

By Natasha Bertrand and Daniel Lippman

March 19, 2020

A critical lack of testing kits. A shortage of ventilators. Not enough ICU beds.

America's struggle to deal with the spread of the highly infectious new virus Covid-19 is bad enough, with the number of confirmed cases surging, hospitals begging for help and entire cities going on lockdown.

But it's also exposed just how unprepared the U.S. is for a threat many would-be Cassandras have been warning about for years: a targeted biological attack.

"When one thinks about what a bioterror attack would look like—it is crystal clear we are not even close to being ready," said former Department of Homeland Security official Daniel Gerstein, now a senior policy researcher at the Rand Corporation.

Today's mantra of "flattening the curve" — or lessening the spike in illnesses, thereby slowing the infection rate to reduce the burdens on the health care system — would not apply to a bioterror attack. "The people in that cloud would be infected all at once, so you would see a very large spike of very sick patients," Gerstein said.

As the response to the outbreak from governments at all levels has shown, the U.S. was completely unprepared for a slowly creeping pandemic — let alone a biological attack that would overwhelm it all at once.

Potential biological weapons include anthrax, which, the Centers for Disease Control and Prevention says, "makes a good weapon because it can be released quietly and without anyone knowing"; smallpox, frozen stocks of which are still maintained by the U.S. and Russia; tularemia, also known as rabbit fever, which attacks the skin, eyes, lymph nodes and lungs and was stockpiled by the U.S. military and the former Soviet Union after World War II; and botulism, which is caused by exposure to toxins made by *C. botulinum* — the most toxic substances known to humankind, which attack the body's nerves and can lead to respiratory failure.

The U.S. Postal Service could be gone by June unless Congress immediately intervenes to counteract the impact of the coronavirus crisis.

Sen. Richard Burr is being sued after stock sales he made just before the market tanked from coronavirus.

The House Rules chair is recommending against bringing lawmakers back to D.C. to vote on the coronavirus stimulus package.

Health officials warn about perils of restarting economy too soon before the coronavirus threat is adequately addressed.

Read all coronavirus coverage »

More than six weeks into the Trump administration's response effort — which began Jan. 29 with the announcement of a coronavirus task force and, two days later, the declaration of a public health emergency — ramped-up testing for the virus has only just begun, hospital systems say they don't have enough beds and medical supplies to handle the onslaught of anticipated patients, and there is a shortage of respirators, ventilators and other protective equipment for nurses and doctors on the front lines.

President Donald Trump, meanwhile, only recently shifted his tone: On Sunday, he called the virus "something we have tremendous control of." By Monday, he was urging people to stay home and beginning to hurl the full might of the federal government at what he described as "an invisible enemy." But with confirmed cases soaring past 7,000 and now reaching into 50 states, officials are warning privately that it may be as long as 18 months before the pandemic is brought to heel.

To biodefense experts, the Trump administration's sluggish response revealed a dangerous failure of imagination throughout the system, and showed how unprepared the government still is to handle a catastrophic biological event.

"The sense is that we haven't fully prepared" for that possibility, said a U.S. government official who was not authorized to speak on the record. "If we had an attack, and even if we had the treatment or the vaccine that everyone needed, we don't have the capacity to get that to 330 million Americans if we were in a lockdown situation where trucks weren't moving. So that's one thing that we've looked at."

Other basic logistical questions also have yet to be resolved, the official added. "Can we create a capacity? What does that look like? Do we set it up in gymnasiums? Who's going to do it? How are the things going to get delivered if you have sort of a general breakdown in the system?"

Covid-19 was not manufactured, and the risk of it being weaponized is extremely low given its highly infectious nature that would likely backfire on any group trying to spread it, experts said.

But an administration official cautioned that the prospect of intentional exposure targeting U.S. government employees "is a concern," and noted that the Defense Department "has imposed a lot of travel restrictions" despite a certain amount of exposure being "inevitable."

The FBI, whose field offices are known to allow "walk-in" tipsters, is also taking extra precautions. "In support of our mission, we are enacting measures to protect the FBI workforce, including heightened hygiene practices, social distancing options, like telework and flexible work schedules where appropriate, and authorizing only essential operational travel until further notice," a spokesperson said.

The scale of the outbreak is the closest thing the U.S. has seen to how a bioweapon—which may take the form of viruses, bacteria, toxins, fungi and rickettsiae—can shut down a society and severely strain resources, several sources said.

"We haven't seen anything that appears to be this pathogenic and transmissible since maybe 1918 or 1957," said the U.S. government official. And the response so far to coronavirus, the official added, "shows that we don't have the systems in place to rapidly diagnose cases, or to scale up a mass response very quickly."

“We are in the realm now where biological weapons are really becoming possible,” the official said. “People have talked about [gene editing in bioweapons] for 50 years. ... It is not science fiction anymore. Literally in the last five years we’ve crossed that threshold.”

Asha George, the executive director of the Bipartisan Commission on Biodefense, echoed those concerns. “What we’re seeing are all the places where we are vulnerable,” she said. “You can see people not really having thought about what impact a biological event would have on the nation in any number of different sectors.”

With the 2009 H1N1 pandemic, she said, a national strategy for pandemic influenza was already in place, though Dr. Deborah Birx, the White House Coronavirus Task Force response coordinator, acknowledged in a news conference on Tuesday that “now we are seeing we have to revise” the flu pandemic preparedness plan.

And because the U.S. deals with seasonal influenza every year, manufacturers already knew how to produce the necessary vaccines. The Food and Drug Administration’s emergency use authorization protocol, which clears labs to produce tests in the event of an outbreak, has also gotten more complicated—while it was streamlined for Ebola, Zika, and H1N1, the FDA was slow to trigger the workaround for coronavirus testing.

“It feels like we have regressed considerably,” said Gerstein.

The Bipartisan Commission on Biodefense, established in 2014 and co-chaired by former Sen. Joe Lieberman and former Homeland Security Secretary Tom Ridge, warned in 2018 that “the United States is underprepared for biological threats” from both terrorists and “nature itself,” via emerging and reemerging infectious diseases like Covid-19.

“Despite significant progress on several fronts, the Nation is dangerously vulnerable to a biological event,” reads the organization’s bipartisan report. “The root cause of this continuing vulnerability is the lack of strong centralized leadership at the highest level of government.”

The threat of a large-scale biological catastrophe, particularly one that hits all at once instead of over a period of weeks or months, is particularly problematic because the U.S. health care system is still “the weakest link” in the nation’s ability to respond effectively to an outbreak, said Ali S. Khan, dean of the College of Public Health at the University of Nebraska Medical Center.

“Routinely, we are not even able to surge for a bad flu season,” said Khan, who served as the CDC’s director of public health preparedness and response and helped establish the CDC’s bioterrorism program. During the 2017-18 flu season, one of the deadliest in 40 years, with more than 61,000 flu-related deaths across the country, overwhelmed hospitals in some parts of the country pitched tents outside ERs and used ambulances as stand-ins for patient rooms.

The detection capabilities are behind, too: While DHS has a BioWatch program that gathers air samples in 30 U.S. cities to monitor the threat of bioterrorism, it’s nearly two decades old and takes from 11 to 13 hours to determine whether a biological agent has been deployed.

The emergence and spread of Covid-19 should have been easier to predict and prepare for than a bioterror attack would be—but it still caught the administration by surprise.

It’s not as though the emergence of a novel disease with a significant mortality rate is “brand new,” Khan said, pointing to the SARS outbreak roughly 17 years ago. “We knew this was a possibility, so there are so no excuses. We are eight weeks behind where we should have been in terms of our planning.”

One of the biggest issues with planning effectively is that “public health is largely invisible, underappreciated, and as a result underfunded,” Umair A. Shah, a top Texas health official, told the

House Homeland Security Committee in October. “This ‘Invisibility Crisis’ problem has unfortunately led to funding cuts for public health and public health preparedness at every level of government.”

George emphasized that the issue doesn’t lie just with the executive branch — Congress, with the power of the purse, needs to be an active partner in developing an agenda, assigning responsibilities and allocating the appropriate funds, instead of just “spitting out emergency supplementals.”

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The U.S. launched a national stockpile program 20 years ago as a way to prepare for biological, chemical or nuclear attacks on the homeland. Its goal was initially to prepare for an unusual threat and was very oriented toward specific biological agents, George said. It now houses the country’s largest supply of vaccines and medical supplies for use in a public health emergency, like an outbreak of smallpox and anthrax, or widespread radiation sickness.

The stockpile is a work in progress, however. While the CDC now says there is enough smallpox vaccine in the stockpile for every American, it initially housed only 15 million doses, 90,000 of which were available for immediate use. The renowned epidemiologist D.A. Henderson, who led preparedness for the Department of Health and Human Services after 9/11, wrote in 2009 that the CDC also hadn’t checked the vaccines’ potency in nearly eight years, instead of every three as is required. (An HHS spokesperson also said in a statement that the Strategic National Stockpile participates in the FDA/DOD Shelf-life Extension Program “to extend the life of some products beyond their original use-by dates.”)

As the COVID-19 outbreak has demonstrated, the possibilities for a catastrophic biological event go beyond what was initially envisioned — so there needs to be an attendant increase in what goes into the stockpile, George said. Supplies are running low, particularly when it comes to ventilators — a growing necessity as Covid-19, a respiratory virus, spreads. In a news briefing on Monday, HHS Secretary Alex Azar declined to reveal the exact number of ventilators in the stockpile, citing “national security concerns.” (Anthony Fauci, the director of the National Institute of Allergy and Infectious Diseases, has said the number is around 12,700.)

George and Khan explained that the numbers are a matter of national security because they could reveal a vulnerability. The idea is to prevent adversaries from exploiting a shortage by launching a biological attack that would require people to use a resource, like ventilators, in numbers too large to accommodate. “We don’t want to give our adversaries a road map,” Khan said.

But it is generally well known that ventilators and essential medical supplies like needles, gauze and gloves are in short supply, George said, as are other kinds of medicines, like fever reducers, which are necessary in cases like this, where the best that can be done for now is supportive rather than preventive care. A deployable vaccine is still at least a year away, Fauci said last week.

“We are in the exponential phase right now,” said Gerstein. “It’s only going to get worse. We are nowhere near the end of our transmission.”

Jason Millman contributed to this report.

<https://www.politico.com/news/2020/03/19/coronavirus-biowarfare-terror-136194?cid=apn>

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US ARMS CONTROL

Phys.org (United Kingdom)

Researchers Detail How Antineutrino Detectors Could Aid Nuclear Nonproliferation

By Steven MacKay, Virginia Tech

March 19, 2020

Patrick Huber, a professor in the Virginia Tech Department of Physics, has co-authored an article that describes the potential uses and limitations of antineutrino detectors for nuclear security applications related to reactor, spent fuel, and explosion monitoring.

The article appears in the latest issue of *Reviews of Modern Physics*. In the paper, the scientists review current and projected readiness of various antineutrino-based monitoring technologies. Huber's co-authors include Adam Bernstein and Nathaniel Bowden, physicists at Lawrence Livermore National Laboratory (LLNL), part of the University of California, Berkeley; as well as Bethany Goldblum, also from U.C. Berkeley; Igor Jovanovic, of the University of Michigan; and John Mattingly, of North Carolina State University.

In the paper, Huber and cohorts argue that a tiny particle could offer help for a big problem—the threat of nuclear proliferation. "For more than six decades, scientists have been developing instruments for fundamental physics that can detect antineutrinos, particles that have no electric charge, almost no mass and easily pass through matter," the team said. "Antineutrinos are emitted in vast quantities by nuclear reactors, and since the 1970s, scientists have considered turning antineutrino detection into a tool for nuclear security."

With advances by scientists at LLNL and other institutions, researchers are moving closer to deploying technology to remotely monitor these subatomic particles from nuclear power plants at long distances. Such a breakthrough would allow them to warn international authorities about the illicit production of plutonium, a key material for nuclear weapons. It also could help with verification of existing and planned treaties that seek to limit nuclear weapons materials production worldwide.

Antineutrinos, the antimatter counterpart to neutrinos, are produced in nuclear power plants when the fissile materials of uranium and plutonium break apart, creating fission products that emit antineutrinos in the process.

"At close range from a reactor, antineutrinos allow the measurement of plutonium content and the production rate," said Huber, director of the Center for Neutrino Physics at Virginia Tech and a member of the Virginia Tech College of Science faculty. "This capability would provide high-level assurances of treaty compliance while being less intrusive to the facility."

The study was initiated as part of an ongoing research effort led by LLNL and supported by the National Nuclear Security Administration's Office of Defense Nuclear Nonproliferation Research and Development. Huber and team contend that advances in applied antineutrino physics have the potential to strengthen the existing Treaty on the Nonproliferation of Nuclear Weapons, which provides a framework for facilitating the peaceful use of nuclear technology while reducing nuclear weapons proliferation risks through safeguards, monitoring, and verification.

In their paper, the researchers see potential for three applications of antineutrino technology—near-field nuclear reactor monitoring, far-field monitoring, and monitoring spent nuclear fuel. They conclude that antineutrino technology stationed within about 100 meters of a nuclear reactor could

ensure that nations are not making and diverting weapons-usable material under the cover of civilian energy production. By measuring the quantity of antineutrinos produced during a set period, it is possible to approximately quantify the amount of plutonium or uranium in a reactor.

In the area of far-field monitoring, the researchers also said technology for detecting nuclear reactor activity at discovery or exclusion at ranges of 120 miles is possible. A third application for antineutrino technology to detect diversion of material could be to monitor the spent fuel that has been used to operate nuclear reactors.

Several of the article's authors are involved in efforts to advance antineutrino detection technology.

<https://phys.org/news/2020-03-antineutrino-detectors-aid-nuclear-nonproliferation.html>

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Atlantic Council (Washington, D.C.)

New Tensions between Iran and the IAEA Threaten the JCPOA

By Sina Azodi

March 26, 2020

Earlier this March, the International Atomic Energy Agency (IAEA) released two reports regarding Iran and the Joint Comprehensive Plan of Action (JCPOA), commonly known as the Iran nuclear deal.

Unlike previous reports, which detailed Iran's compliance, the new documents were reminiscent of the pre-JCPOA era and could signal an increasingly negative trend in the country's relationship with the world's nuclear watchdog. Amid the outbreak of the deadly coronavirus, concerns are also being expressed by some experts that the disease could hamper the ability of the IAEA to monitor Iran's nuclear program. Opponents of the JCPOA are trying to use these developments to destroy what remains of the landmark 2015 agreement by achieving a "snapback" of UN sanctions lifted by the deal.

According to the first report, Verification and Monitoring in the Islamic Republic of Iran, as of February, Iran's stockpile of Low Enriched Uranium (LEU) was 1020 kilograms, more than three times the amount allowed under the JCPOA. At the same time, Iran has kept its enrichment level at 4.5 percent—more than the 3.67 percent specified in the nuclear deal but well below 20 percent, which it enriched prior to the signing of the JCPOA, and from which it is relatively easy to reach the 80 percent needed to make nuclear weapons.

While Iran has the technological capacity to enrich at higher and more sensitive levels, it has not made the political decision to do so, perhaps to avoid antagonizing the remaining signatories of the nuclear deal. Iranian officials have stated that their steps are reversible and that Tehran is ready to go back to full compliance if "European signatories of the pact fulfilled their obligations." Iran wants to avoid snapping back of UN-imposed sanctions, which the remaining parties to the deal could do if Iran steps too far outside the limits of the 2015 accord.

The IAEA also issued a second negative report, NPT Safeguards Agreement With the Islamic Republic of Iran, strongly censuring Tehran for lack of cooperation with the agency. The IAEA has requested access to three undisclosed locations where Iran allegedly conducted undeclared nuclear activity. After initially ignoring three letters demanding access to these locations, Tehran responded by stating that the "Islamic Republic of Iran will not recognize any allegation on past activities and does not consider itself obliged to respond to such allegations." Iran's ambassador to the IAEA

Kazem Gharib-Abadi added, “Intelligence services’ fabricated information. . . creates no obligation for Iran to consider such request.”

He was apparently referring to the “Iran Nuclear Archive” stolen from a warehouse near Tehran by Israeli operatives in 2018. The documents provide a great deal of information about Iran’s past nuclear activities, strategic intentions and a 2003 order to halt a structured weapons program but do not elaborate on any post-2003 decision-making. The release of the Israeli archive—publicized two weeks prior to US President Donald Trump’s decision to unilaterally withdraw from the JCPOA in May 2018—seems to have influenced both the US decision to withdraw and a tougher stance toward Tehran on the part of the IAEA.

The negative reports are providing new ammunition to the Trump administration efforts to prevent the lifting of a UN-imposed arms embargo on Iran which is supposed to occur in October. In a statement to the IAEA’s Board of Governors, US ambassador to the IAEA Jackie Wolcott denounced Iran’s refusal to “address the Agency’s questions regarding possible undeclared natural uranium at a location that has been heavily sanitized.”

That the Trump administration seeks to completely kill the nuclear agreement is no secret. However, the remaining parties to the agreement—Britain, France, Germany, China, Russia and the European Union—retain a strategic interest in preserving the JCPOA. This explains why Germany, France and Britain—also known as the E3—extended the process of the dispute resolution after deciding to trigger a provision in the JCPOA, the Dispute Resolution Mechanism, in January under US pressure.

A snapback of sanctions under Chapter VII of the UN Charter would be the final blow to the agreement and would likely compel Iran to withdraw from the Nuclear non-Proliferation Treaty (NPT), which obliges members not possessing nuclear weapons not to develop them. Such a scenario would endanger the entire non-proliferation regime and clearly be detrimental to US national interests. As a Department of Energy spokesman recently noted, “It remains vital to the United States that the IAEA continue to perform its verification mission in Iran.”

It’s worth noting that new tensions with the IAEA are unfolding in the context of the coronavirus pandemic, which has killed more than 2,000 Iranians. Critics of the JCPOA, including Andrea Stricker and Jacob Nagel of the neoconservative Foundation for Defense of Democracies, have argued that Tehran appears to be “content with the pandemic’s debilitating impact” on IAEA monitoring; however, the authors fail to provide any substantial evidence to support their claim.

In the same vein, George Moore of the James Martin Center for Nonproliferation Studies (CNS) at the Middlebury Institute of International Studies has argued that suspending inspections, even temporarily, could leave a gap that Iran could exploit if it chose to develop nuclear weapons. However, a careful analysis of Iran’s behavior suggests that Tehran is interested in maintaining the JCPOA, even though it has not received the economic benefits it was promised. Meanwhile, remote monitoring equipment on site in Iran continues to record the amount and level of low-enriched uranium Iran is producing.

In analyzing Tehran’s nuclear intentions, it is important to recognize why Iran began a quest for a nuclear deterrent. After initially suspending its nuclear activities following the 1979 revolution, Iran resumed work during the Iran-Iraq War, when it was systematically subjected to the use of chemical weapons by Iraq and feared Saddam Hussein was developing nuclear arms. However, Iran’s geopolitical environment has fundamentally transformed since the US toppling of Saddam in 2003, and Tehran no longer faces an existential threat from either Iraq, or its neighbors. At a time when it is confronting a much more immediate crisis that has also taken the lives of senior officials,

it seems unlikely that Tehran would choose this moment to try to break out and “dash” for a nuclear weapon, as Moore has suggested.

Still, the recent trend in Iran’s relationship with the IAEA is concerning. To alleviate tensions, Iran should fully cooperate with the IAEA’s demands. The IAEA, in turn, should seek to satisfy its concerns without humiliating Tehran over activities that appear to have occurred long ago.

Sina Azodi is a non-resident fellow at the Atlantic Council. He is also a foreign policy advisor at Gulf State Analytics, and a PhD candidate in international relations at the University of South Florida, where he focuses on Iran’s nuclear program. Follow him on Twitter: @azodiac83.

<https://www.atlanticcouncil.org/blogs/iransource/new-tensions-between-iran-and-the-iaea-threaten-the-jcpoa/>

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Defense News (Washington, D.C.)

North Korea Test Fires Two Missiles

By Kim Tong-Hyung, The Associated Press

March 24, 2020

SEOUL, South Korea — North Korea on Saturday fired two presumed short-range ballistic missiles into the sea, South Korea’s military said, as it continues to expand military capabilities amid deadlocked nuclear negotiations with the Trump administration and a crippling global health crisis.

South Korea’s Joint Chiefs of Staff said the projectiles were fired around 6:45 and 6:50 a.m. from an area around the county of Sonchon, western North Korea. They flew 410 kilometers (255 miles) cross-country on an apogee of 50 kilometers (31 miles) before landing in waters off the eastern coast.

South Korea and the U.S. were analyzing the launches. Seoul’s military urged the North to immediately stop its “very inappropriate” military demonstrations when the world is struggling to cope with the new coronavirus pandemic.

Japan’s Defense Ministry said the projectiles didn’t reach Japanese territory or its exclusive economic zone.

The North conducted two previous rounds of similar short-range launches and other military exercises this month after leader Kim Jong Un entered the new year vowing to bolster his nuclear deterrent in face of “gangster-like” U.S. sanctions and pressure.

While the North is clearly determined to advance its missile capabilities, Japan’s Defense Minister Taro Kono said, Pyongyang’s demonstrations could also be aimed at “bracing the regime together” amid the COVID-19 crisis.

It wasn’t immediately clear what North Korea tested. Flight data released by the South Korean and Japanese militaries suggest that the North could have tested one of its new mobile, solid-fuel missile systems it first demonstrated last year.

Military analysts say such weapons, which are designed to overwhelm missile defense systems with their maneuverability and low-altitude flights, potentially strengthen the North’s ability to strike targets in South Korea and Japan, including U.S. bases there.

North Korea in recent months has also demonstrated what it described as a “super large” multiple rocket launcher, which experts say was likely tested earlier this month.

North Korea’s state media earlier reported that Kim supervised an artillery firing competition between army units in the country’s west on Friday.

The KCNA said Kim expressed satisfaction over the exercise that was aimed at evaluating combat readiness. The report didn’t mention any direct comments by Kim toward Washington or Seoul.

Pyongyang’s official Korean Central News Agency also said on Saturday that the North has decided to hold a session of its rubber-stamp parliament on April 10. It wasn’t immediately clear what would be discussed.

Nuclear talks have reached a stalemate since the collapse of the second summit between Kim and U.S. President Donald Trump in early 2019, when America negotiators rejected North Korean demands for major sanctions relief in exchange for a partial surrender of its nuclear capabilities.

Following the breakdown in talks, the North ended a 17-month pause in ballistic activity and conducted at least 13 rounds of weapons launches last year while pressuring Washington and Seoul for concessions. Those weapons also included a developmental mid-range missile that could be launched from submarines.

Some experts say the lull in North Korean launches between November and March could have been caused by the coronavirus pandemic, which started in mainland China in December.

Although Kim has vowed to build up his nuclear arsenal and achieve a “frontal breakthrough” against sanctions while urging his nation to stay resilient in a struggle for economic “self-reliance,” some experts say North Korea’s self-imposed lockdown amid the coronavirus crisis could potentially hamper his ability to mobilize people for labor.

North Korea has not publicly confirmed a single case of the COVID-19 illness, but state media have described anti-virus efforts as a matter of “national existence.” Experts say an epidemic in North Korea could have dire consequences due to the country’s poor health system and shortage of medical supplies.

The country has banned foreign tourists, shut down nearly all cross-border traffic with China, intensified screening at entry points, and mobilized health workers to monitor residents and isolate those with symptoms.

Associated Press writer Mari Yamaguchi in Tokyo contributed to this report.

<https://www.defensenews.com/global/asia-pacific/2020/03/23/north-korea-test-fires-two-missiles/>

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COMMENTARY

Defense News (Washington, D.C.)

Efforts for Peace and stability on the Korean War's 70th Anniversary

By Jeong Kyeong-doo

March 20, 2020

In today's security environment, threats including not only traditional security threats based on military power but also nontraditional threats including terrorist and cyberthreats, diseases, and natural disasters and catastrophes are diversifying and growing in their intensity. The Korean Peninsula in particular has seen the rise of nonmilitary threats due to the spread of the new coronavirus, COVID-19, while military threats have also been augmented as a result of the continued development of weapons in North Korea and increased military activities from neighboring countries.

The governments of the Republic of Korea and United States of America are working together, based on the steadfast ROK-U.S. alliance, to be ready against such a variety of security threats and to establish peace and stability on the Korean Peninsula.

Firstly, the ROK and U.S. are maintaining an ironclad combined defense posture to support with strong military might the governments' diplomatic efforts for establishing denuclearization and permanent peace on the Korean Peninsula. The Combined Command Post Training 20-1 had been postponed in consideration of stemming the spread of COVID-19 and ensuring the safety of ROK and U.S. service members.

However, other planned combined exercises and training will continue to be implemented through flexible modification of their scale and methodology. Furthermore, the ROK and U.S. are overcoming the nonmilitary threat of COVID-19 together through combined quarantine operations, sharing information and medical support.

South Korea's defense minister on a mutually reinforceable, future-oriented 'Great ROK-US Alliance'

Second, the ROK and U.S. are systematically and actively pursuing the transition of wartime operational control, or OPCON, to establish a combined defense system led by the ROK Armed Forces. The ROK and the U.S. have conducted the initial operational capability certification assessment of the future Combined Forces Command last year under the leadership of a ROK four-star general. Scheduled this year are assessments of full operational capability of the future Combined Forces Command and of the alliance's response capabilities against North Korean nuclear and missile threats.

To satisfy the conditions of the OPCON transition in a timely manner, the ROK is committing an unprecedented level of budget to improve critical military capabilities of its Armed Forces and continue acquiring response capabilities to nuclear weapons and weapons of mass destruction. Furthermore, following the OPCON transition, the ROK and the U.S. will maintain a combined defense system, and the transition itself will be pursued in the direction of further strengthening the alliance and its combined defense posture, including continued presence of U.S. Forces Korea and guarantee of the United Nations Command's role.

Third, the ROK and the U.S. have maintained a fair and mutually agreeable level of defense cost-sharing thus far, and are working together based on mutual trust and through close consultation and collaboration to create a win-win result from the cost-sharing negotiations of the 12th Special

Measures Agreement. Besides the defense cost-sharing, the ROK government continues to expend approximately \$7 billion per year for stable conditions for U.S. Forces Korea and a more powerful combined defense posture in the form of granted lands and buildings, provision of Korean Augmentation to the U.S. Army personnel, combined exercises and training, and defense-industrial cooperation.

Lastly, the ROK and the U.S. are pursuing security cooperation with neighboring countries in the context of our secure alliance. In 2019, the ROK made a strategic decision in a greater frame of understanding to temporarily suspend the effect of its decision to end the General Security of Military Information Agreement. Since then, the ROK has been consulting with Japan so that it would roll back its sanctions and recover our past relationship. As such, I also look forward to the U.S. government taking an active role toward a satisfactory conclusion to this issue for ROK-U.S.-Japan security cooperation.

In addition, China is a country that can play an important role for the denuclearization of North Korea, and it is the ROK's largest trading partner, which calls for a relationship of continued cooperation. However, issues of security will be handled on the basis of a steadfast ROK-U.S. alliance.

This year marks the 70th anniversary of the beginning of the Korean War. The ROK will engrave deeply within its heart the sacrifice and dedication of all heroes who committed themselves for the peace and stability of the Korean Peninsula, and developed the ROK-U.S. alliance into a great alliance that is both mutually complementary and future-oriented. Furthermore, it will achieve complete denuclearization of North Korea based on the strong military might borne of a secure combined defense and military readiness posture. The ROK will also continue creating a "Peaceful Peninsula" free of worries for war by establishing permanent peace.

Jeong Kyeong-doo is the defense minister of South Korea.

<https://www.defensenews.com/opinion/commentary/2020/03/20/efforts-for-peace-and-stability-on-the-korean-wars-70th-anniversary/>

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Bulletin of the Atomic Scientists (Chicago, Illinois)

Round-the-clock Surveillance of Iran's Uranium-enrichment Sites Continues, Despite Coronavirus

By Tariq Rauf

March 25, 2020

While George Moore is well-intentioned in his recent Bulletin article on the challenges of continuing on-site International Atomic Energy Agency (IAEA) safeguards in Iran at a time when the coronavirus is spreading rapidly in that country (see "One potential victim of coronavirus? Nuclear inspections in Iran"), it is important not to exaggerate the situation or raise false alarms. I base this statement upon my own experiences, as the former Head of Verification and Security Policy at the IAEA in Vienna, where I dealt with high-priority verification cases involving Iran, Iraq, Libya, North Korea, South Korea, and Syria.

This is not the first time that the IAEA's staff has faced novel, hazardous operating conditions. Agency staff continued to bravely perform their vital missions during the Chernobyl and Fukushima nuclear accidents, working in highly radioactively contaminated environments. Both before and after the invasion of Iraq in 2003, IAEA inspectors continued their vital mission of nuclear

verification there, under highly dangerous conditions. They also have conducted their safeguards missions in other conflict-ridden regions of the world without hesitation. IAEA staff has never been deterred to carry out their responsibilities for nuclear safeguards, safety, and security, even under extremely adverse conditions.

All IAEA operations are continuing during the outbreak of the coronavirus—also known as COVID-19—as the organization stated in its latest official notification. Indeed, safeguards inspections worldwide are continuing, if with some travel disruptions. And it is important to realize that while in-person, on-site agency inspections may suffer some possible disruption, the IAEA also relies heavily on a variety of installed on-site verification technologies that allow it to monitor nuclear activities remotely.

In recent years, the agency has increased its reliance on unattended containment, surveillance, and monitoring systems installed in sensitive nuclear facilities across the world—including in Iran. According to the organization’s latest “Safeguards Implementation Report,” which contains data for 2018 (the report for 2019 will be released in June this year), the agency had 1,563 cameras connected to 940 systems operating or ready to use at 277 facilities, including Iran—of which 881 were next generation surveillance systems (NGSS) installed in 29 states.

Next generation surveillance systems include specialized cameras manufactured by the IAEA that are housed in tamper-resistant containers and equipped with a long life power supply that can reliably operate for extended periods without access to external power. To ensure the authenticity and confidentiality of surveillance data acquired by the NGSS, three different layers of cryptographic data protection and multiple layers of physical, passive and active tamper-indication technology are used.

For example, a NGSS camera contains a secure surveillance core element to protect the critical electronic components and the optical sensor—as well as the cryptographic data—by an active tamper-indication mechanism. Because surveillance cameras can see movement but cannot detect radiation levels, the agency deploys unattended non-destructive assay monitoring systems that include radiation detectors to measure neutron and gamma radiation, and additional sensors to monitor temperature, flow, and other parameters. These are installed at specific locations at a nuclear facility to characterize and verify nuclear material, monitor the movement of spent fuel, and collect and transmit encrypted data around the clock

There are 171 unattended monitoring systems installed in 24 states. Remote data transmissions not only provide data directly to agency headquarters in Vienna; they enable greater efficiency by relieving inspectors from the task of data collection at facilities as well as early detection of any deterioration in system performance. The data collected from radiation monitoring systems is often analyzed in conjunction with video surveillance to track the movement of nuclear material in the facility: static photos and video streams enable remote observation and assessment by inspectors.

The agency had 1,102 of these unattended data streams transmitting information from 137 facilities in 29 states, including Iran. The costs for implementing nuclear verification or safeguards in Iran in 2018 were relatively modest, considering what is at stake: \$17,048,000.

And that’s not all. Prior to the implementation of the Iran agreement (formally known as the Joint Comprehensive Plan of Action, or JCPOA) on January 16 of 2016, the IAEA had installed what is known as an Online Enrichment Monitor or OLEM, a new high-tech device that monitors Iran’s uranium enrichment activities at the Natanz Fuel Enrichment Plant 24 hours per day, seven days a week. It measures the characteristics of gaseous uranium flowing through the processing pipes out of the cascades of centrifuges of the enrichment plant. In each unit of the equipment, the main connection node—a gamma ray detector based on a sodium iodide crystal—measures the amount

of uranium 235 in the pipe, while pressure and temperature sensors enable the machine to determine the total quantity of gaseous uranium. From the two, the device can calculate the enrichment level, which can be checked by inspectors on the site. The device can be installed in a configuration to monitor the enrichment levels of the material coming in and out of the gas enrichment centrifuges cascades. Because the device is non-intrusive and does not use a radioactive source, it is safe to maintain and can work autonomously.

The device is tamper-indicating, and connected to a computer contained in a central cabinet on-site, which is also tamper indicating and under the IAEA's seal. The computer performs calculations, stores results, and transmits encrypted data. The OLEM system includes multiple redundancy components and can operate on battery power, further ensuring its autonomy and reliability. All its components are contained in sealed boxes that are connected by special tubing and all enclosures are under IAEA seal. A special paint is used to ensure that any attempt to tamper with the system will be detected.

The use of OLEM technology at Iran's enrichment facility serves as a test bed for deployment in other enriching countries, since the technology provides continuous measurement. It has the added benefit of reducing— but not eliminating—the need for sample-taking and environmental sample-taking, resulting in gains in efficiency, and savings in cost for the IAEA.

So far, "Iran has continued to permit the Agency to use on-line enrichment monitors and electronic seals which communicate their status within nuclear sites to Agency inspectors and to facilitate the automated collection of Agency measurement recordings registered by installed measurement devices," the IAEA's latest report says. It is vital that Iran continues to facilitate the uninterrupted operation of IAEA unattended monitoring systems installed at the Natanz and Fordow enrichment plants and at other locations in the country.

But beyond these technological innovations, it is important to put the situation in Iran into perspective. As Mark Fitzpatrick noted in an insightful article for the International Institute for Strategic Studies: "Some analysts claim that Iran's current capabilities have shortened its breakout time to four months or even to three-and-a-half months. Such assessments are based on unrealistic assumptions, including that a country that has never produced weapons-grade uranium could do so without a hitch on the first attempt. And how could Iran's breakout capability today be close to what it was in 2015, when it had seven times more enriched uranium and twice as many operating centrifuges? It is more reasonable to believe the government experts from key countries who say that in a worst-case scenario, Iran may be six months away from being able to produce enough highly enriched uranium to build a nuclear weapon. These experts are from countries that have produced such weapons, so they speak from the basis of experience."

This is not to say that one should be complacent about Iran's increasing enrichment capacity. Rather, we should keep things in perspective and find ways to encourage restraint by Iran and its full cooperation with the IAEA, as well as preserving the JCPOA under which the agency continues to provide detailed information on Iran's nuclear activities.

Despite the COVID-19 outbreak in Iran, IAEA safeguards activities continue under appropriate protocols to ensure the safety and security of agency personnel, and every effort should be made by the agency and states to ensure continuing application of safeguards, in all countries, in accordance with their respective legal obligations.

One last thought: Considering the present circumstances, sanctions on Iran should be eased for humanitarian and medical reasons, so that it may better combat COVID-19 and prevent its further spread to neighboring countries in the region of the Persian Gulf. We should allow Iran to import

necessary medical equipment such as masks, gloves, goggles, ventilators, antibiotics, and other related items as reportedly proposed by both China and the United Kingdom.

And at the same time, as requested by the IAEA director general, it is incumbent upon Iran to provide prompt full access and cooperation to the agency so that it can fully implement the requirements of Iran's NPT safeguards agreement and of the JCPOA. The agency has identified a number of questions related to possible previous undeclared nuclear material and nuclear-related activities at three locations that have not been declared by Iran. In this regard, Iran should provide immediate access as soon as feasible to the three locations specified by the agency, so as to clarify and resolve outstanding questions. This would enable credible assurance by the IAEA of the absence of undeclared nuclear material and activities in Iran.

<https://thebulletin.org/2020/03/round-the-clock-surveillance-of-irans-uranium-enrichment-sites-continues-despite-coronavirus/>

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Real Clear Defense (Washington, D.C.)

Deterrence by Detection: A New Approach to Preventing Opportunistic Aggression

By Thomas G. Mahnken & Grace B. Kim

March 25, 2020

As both the 2018 National Defense Strategy and the 2019 National Defense Strategy Commission conclude, the United States urgently needs to develop new operational concepts to meet the challenges of the 21st century. In an era of constrained resources, it makes sense to identify, develop, and implement concepts that make effective use of the forces and capabilities we already have.

One of the most significant challenges the United States and our allies face is the need to prevent China or Russia from launching opportunistic acts of aggression. Beijing and Moscow have used sub-conventional gray zone aggression to erode international norms, undermine the U.S.-led rules-based order, and shift the balance of power in their favor, all without sparking open armed conflict with the United States or its allies. They are also developing the ability to launch aggression rapidly against states on their periphery under cover of increasingly capable defenses in an effort to achieve a *fait accompli*.

The U.S. armed forces are poorly configured to meet the challenge of deterring such acts, which requires long-duration monitoring rather than episodic coverage. Most information-gathering platforms, such as satellites and manned aircraft, are scarce, expensive, and can provide only periodic coverage. Moreover, their expense both reinforces a tendency to under-invest in them and breeds a reluctance to put them in harm's way.

The United States needs to rely more on capabilities that are less expensive, have greater persistence, and pose less risk if lost. Equally important, the Defense Department needs to develop new concepts of operations and organizations to employ them effectively. The solution may not involve fielding exotic new capabilities so much as employing the capabilities we already have in innovative ways. It will also benefit greatly from approaches that allow allies and partners to participate fully. If we do not adapt, we risk falling victim to potentially catastrophic surprise in a future conflict.

The concept of "deterrence by detection" represents a promising approach to meeting this challenge. The logic that underpins it, which should be familiar to policemen and parents, is that

potential transgressors are less likely to act if they know they are being watched. Specifically, the concept rests on the premise that adversaries are less likely to commit opportunistic acts of aggression if they know they are being watched constantly and that their actions can be publicized widely.

Until now, real-time situational awareness was not available due to limited surveillance assets, lack of persistence, cost, absence of communications, and limitations to data processing. Today, the means to provide round-the-clock situational awareness exist, in the form of proliferated sensors backed by communication networks and data analytics. Indeed, today the ability to generate and maintain situational awareness, and deny the same to an adversary, is at the core of strategic and operational effectiveness.

Implementing the concept of “deterrence by detection” will require an ISR network composed of systems that are cost-effective, persistent, and interoperable with a broad array of allies and partners. Any such network would include a variety of systems, including manned air, sea, and ground platforms; space assets; and cyber capabilities. Such a network would need to be supported by communications networks and feature recognition algorithms.

Force planners have overlooked the role that non-stealthy unmanned aircraft systems (UAS) such as the Reaper and RQ-4 Global Hawk can play in great-power competition because they consider them to be less survivable than other platforms in a contested or highly contested environment. Indeed, the Air Force is seeking to divest itself of many of these aircraft. Certainly, any conflict between the United States and its allies on the one hand and China or Russia, on the other, would likely result in a highly lethal and contested warfighting environment. But since the aircraft would primarily function before the outbreak of major hostilities, they can be non-stealthy and yet still be effective. In fact, as argued below, their very visibility represents a key attribute in bolstering deterrence.

In order to implement the concept of “deterrence by detection,” an ISR network should be visible, ubiquitous, affordable, and interoperable.

First, visibility is a key attribute of platforms in an ISR network designed to deter opportunistic aggression. Whereas there are many cases where it makes sense for ISR assets to operate covertly, in this case, there is value in being overt. It is important for adversaries to know that they are being observed. Moreover, “watching the watchers” would consume an adversary’s resources and could distract it from other, less visible operations.

The fact that ISR aircraft are visible means they are vulnerable, and this vulnerability is also a valuable attribute. On the one hand, it offers an adversary the opportunity to attack the nodes of the network; on the other hand, doing so would shift the onus of escalation on the adversary. Attacking the network would be a concrete sign of aggressive intent. It would also be possible to build a self-defense capability into ISR systems, whether electronic warfare capabilities or active defense.

Second, maintaining a ubiquitous presence is another key attribute of such a network. Whereas there are many cases where it makes sense for ISR assets to operate unpredictably to catch an adversary unaware, deterring through the threat of detection requires that a competitor have high confidence they are being observed. This implies that the ISR network should be composed of many rather than few ISR aircraft. Proliferating ISR assets will ensure that the loss of one or a few aircraft would not cause the network to fail. The need for ubiquitous, proliferated ISR networks make UAS particularly attractive. As the cost of space launch continues to fall, these networks could be augmented by proliferated constellations of low-earth orbit satellites.

Third, for an ISR network to provide the sort of ever-present, visible coverage needed to implement the concept of “deterrence by detection,” individual aircraft need to be affordable. This also favors UAS over manned aircraft under many circumstances.

Finally, the argument in favor of including U.S. allies and partners in such a network is strong. In light of the changing military balances in the Western Pacific and Eastern Europe, it makes sense for the United States to seek new ways of reassuring its allies and friends and generating collective responses to crisis and aggression. An ISR network represents a promising approach to do just this. Some of our allies in the Western Pacific and Europe have already begun to purchase UAS, sufficient quantities of which could augment or replace U.S. capabilities and ISR missions in those regions. Still, U.S. allies could invest further in these technologies and capabilities by increasing the number of existing long-endurance UAS in their inventory, whether they are U.S.-made or domestically produced. Other countries could also invest in them to boost their capabilities, further enhancing the global deterrence by detection strategy.

The United States and its allies face operational challenges in competing against China and Russia, including the need to deter opportunistic acts of aggression. “Deterrence by detection,” based upon the idea that our adversaries are less likely to commit opportunistic acts of aggression if they know they are being watched constantly and that their actions can be publicized widely, can contribute to solving the fait accompli challenge. Unmanned ISR aircraft capable of conducting wide-area persistent surveillance missions are best suited to implementing “deterrence by detection” by the United States, its allies, and partners. Although this concept is far from a panacea, it is a realistic, effective, and affordable step in the right direction.

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https://www.realcleardefense.com/articles/2020/03/25/deterrence_by_detection_a_new_approach_to_preventing_opportunistic_aggression_115145.html

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ABOUT THE USAF CSDS

The USAF Counterproliferation Center (CPC) was established in 1998 at the direction of the Chief of Staff of the Air Force. Located at Maxwell AFB, this Center capitalizes on the resident expertise of Air University — while extending its reach far beyond — and influences a wide audience of leaders and policy makers. A memorandum of agreement between the Air Staff's Director for Nuclear and Counterproliferation (then AF/XON) and Air War College commandant established the initial personnel and responsibilities of the Center. This included integrating counterproliferation awareness into the curriculum and ongoing research at the Air University; establishing an information repository to promote research on counterproliferation and nonproliferation issues; and directing research on the various topics associated with counterproliferation and nonproliferation.

In 2008, the Secretary of Defense's Task Force on Nuclear Weapons Management recommended "Air Force personnel connected to the nuclear mission be required to take a professional military education (PME) course on national, defense, and Air Force concepts for deterrence and defense." This led to the addition of three teaching positions to the CPC in 2011 to enhance nuclear PME efforts. At the same time, the Air Force Nuclear Weapons Center, in coordination with the AF/A10 and Air Force Global Strike Command, established a series of courses at Kirtland AFB to provide professional continuing education (PCE) through the careers of those Air Force personnel working in or supporting the nuclear enterprise. This mission was transferred to the CPC in 2012, broadening its mandate to providing education and research on not just countering WMD but also nuclear operations issues. In April 2016, the nuclear PCE courses were transferred from the Air War College to the U.S. Air Force Institute for Technology.

In February 2014, the Center's name was changed to the Center for Unconventional Weapons Studies (CUWS) to reflect its broad coverage of unconventional weapons issues, both offensive and defensive, across the six joint operating concepts (deterrence operations, cooperative security, major combat operations, irregular warfare, stability operations, and homeland security). The term "unconventional weapons," currently defined as nuclear, biological, and chemical weapons, also includes the improvised use of chemical, biological, and radiological hazards. In May 2018, the name changed again to the Center for Strategic Deterrence Studies (CSDS) in recognition of senior Air Force interest in focusing on this vital national security topic.

The Center's military insignia displays the symbols of nuclear, biological, and chemical hazards. The arrows above the hazards represent the four aspects of counterproliferation — counterforce, active defense, passive defense, and consequence management. The Latin inscription "Armis Bella Venenis Geri" stands for "weapons of war involving poisons."

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