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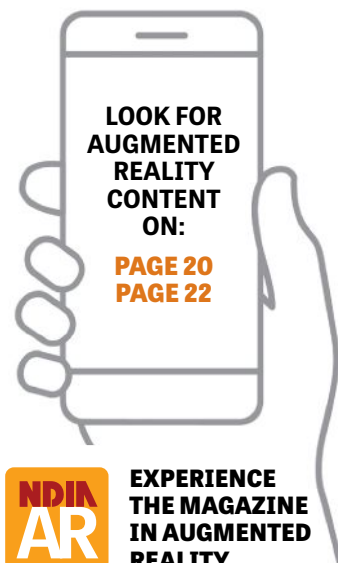
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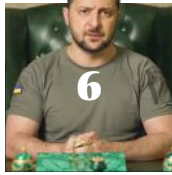
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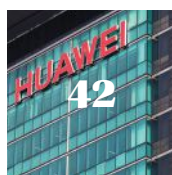
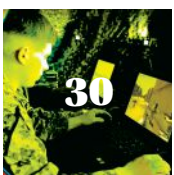
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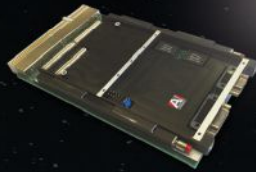
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As I begin my two-year tenure as chairman of the National Defense Industrial Association, I want to start by thanking each of you for the work you — our government and industry leaders — execute every day on behalf of the men and women defending our country. Your efforts matter, and your dedication is vital.

In its 103-year history, NDIA has been at the tip of the spear during many challenging times for our industry. This is yet another.

The president's National Security Advisor Jake Sullivan has said, "The world is at an inflection point" and we must "advance America's vital interests and position America to outpace our competitors."

Yet, we are hobbled with a politically divided government and polling showing that many Americans rank national security threats well below their economic and social concerns. Sadly, the disconnect is widening between the scale of our security challenges and the necessary focus on solutions to successfully address them.

With China seeking to revise the rules and norms of the current international order to benefit its authoritarian and expansionist vision and Russia testing the resolve of democracies with its savage invasion of Ukraine, allies and partners are looking to the United States for greater economic and security leadership. They are calling for America to restore the initiative in global technological standards setting, increase plurilateral cooperation on trade and export controls, and promote a more effective deterrence against antidemocratic governments.

Meanwhile, the U.S. national security ecosystem is relearning how to maneuver in an era of economic and technological great power competition. Leaders in the legislative branch are focusing on the resources and commitments required to sustain a resilient, strong and diverse defense industrial base. The Defense Department's leaders are re-orienting operating concepts and requirements to align with the changing character of war and to accelerate its business and military operations to the speed of the digital world.

Conversely, budget stability remains



an elusive goal. For the past 14 years, the department has 13 times operated under a continuing resolution for part of the year. This budgetary dysfunction delays new starts, increases costs, stifles innovation and negatively impacts the readiness of warfighters. Only U.S. adversaries benefit from this extravagant waste of resources and momentum.

Combined, the escalating nature of economic and technological great power competition, internal domestic discord and challenging global business conditions increases the likelihood of breakdowns in the many connections between government and what we do. The consequences of such breakdowns have never been more significant.

Therefore, the necessity for our team to move the needle has never been greater. To do so, we must leverage our greatest strength — you. We must significantly amplify your voices and priorities to key department and congressional leaders. Collectively, we will be unmatched in our credibility, competence and experience derived from the combined technical depth that each of you bring — the technical depth of NDIA's divisions, the geographic diversity of its chapters and the business acumen of the board of directors.

We have an ambitious vision on your behalf. We will focus on secure budget stability and sufficiency; advance digital modernization; facilitate foreign military sales modernization and technological integration with allies and partners; enhance industrial readiness and capacity;



and address the root causes to the instability of the supply chains.

And we will continue to represent all companies in the defense industrial base and highlight the unique challenges of its workforce disruptions.

To implement this vision, we are fortunate to have excellent partners leading the acquisition community at the Pentagon. Starting with Bill LaPlante, the undersecretary of defense for acquisition and sustainment, industry has experienced partners in the department and the military services with both significant business experience and a passion for supporting service members. They want to better understand your concerns with facts, data, experiences, and yes, the pain points in working with the department.

Therefore, we are energized to continue to connect you with government acquisition officials attending NDIA's many conferences and chapter events. We will continue to host technical forums to give you the opportunity to directly engage with government leaders. And we will continue to focus on representing your interests, challenges and concerns to successfully educate external audiences on the best solutions to remove the barriers impeding your work.

We will also continue the tradition of sustaining deep and bipartisan relationships with congressional committees as well as individual members and staff. The association is a trusted brand for providing nonpartisan, technically sound information regarding the challenges and opportunities for the defense industrial base. And Congress counts on NDIA representing all companies in the defense ecosystem.

As the 118th Congress begins, we are well-postured to work with stakeholders to help you translate your ideas and initiatives into effective policy solutions.

You are the sinews of deterrence — America's Arsenal of Peace. With your dedication, imagination, invention and production, we will move the needle for these challenging times.

Join us. **ND**

Michael Bayer is National Defense Industrial Association's board chair and the president and CEO of Dumbarton Strategies.

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Ukraine's Valiant Fight Inspires At this Year's Halifax Forum

HALIFAX, Nova Scotia — The Halifax International Security Forum — held the third weekend of November on the shores of the Atlantic in one of Canada's maritime provinces — is a conference for democracy's true believers.

The three-day forum brings together those who think free and fair elections and the governments they form — no matter how messy the process — is the only way forward for humanity. Alliances such as NATO and the less formal Quad in the Pacific — comprising the United States, Japan, Australia and India — can be forces for good.

They believe national security is a bipartisan issue. The United States sends a delegation of senators and representatives to the forum every year from both sides of the aisle.

The delegation was once led by the late Sen. John McCain, R-Ariz., and his family members still participate in

Pacific, and Iran, where street protests against the theocracy were in their fourth week. However, Ukraine dominated the agenda and conversations in the hallways — literally.

"Why won't the U.S. send Gray Eagles to Ukraine?" one participant asked me as I was walking down the hallway to my hotel room after a session. "So what if Russia captures one and sends it to Iran. It's 15-year-old technology. Who cares?"

There were some 20 participants from Ukraine at this year's forum, along with taped or video feeds of leaders still in Kyiv.

The forum's president Peter Van Praagh set the tone for the conference in his opening remarks.

"It was Ukraine's fight that gave us our unity of purpose. Had Ukraine surrendered, as some European leaders urged President Zelenskyy to do, it's not difficult to imagine where we would be now: a much-weakened Europe, a divided NATO, a humbled America — all confronting an empowered Russia backed by a smiling Xi Jinping. That is not where we are. Quite the opposite," he said.

"Because of Ukrainian sacrifice, Ukrainian courage and Ukrainian ingenuity, the era that began on Feb. 24, 2022, now has the potential to be the most positive era yet for freedom and democracy. ... If we needed reminding, Ukraine taught us all over again: our democracies are worth fighting for. Our democracies are worth saving," he said.

A year has made a major difference in the lives of Ukrainians and its leader President Volodymyr Zelenskyy.

As Russian forces gathered on the border in 2021, he was far from being a household name. Newscasters always noted that he was a former actor and comedian.

A global superpower was about to invade its smaller neighbor, and the man running the show was a former rom-com actor. How well could that go? A lot of pundits gave the country four days. Putin himself apparently believed it.

Shortly before the 2022 forum, Russian forces retreated from

Kherson, prompting some to call for compromise.

Zelenskyy — in a taped message to the conference participants — was having none of it.

"Immoral compromises will lead to new blood. A truly real, long-lasting and honest peace can only be the result of the complete demolition of Russian aggression," he said.

While Zelenskyy is an inspirational leader, it's the Ukrainian people who should be lauded the most.

Perhaps that's why the forum bestowed this year's John McCain Prize for Leadership in Public Service to the women of Ukraine. First Lady of Ukraine Olena Zelenska accepted the prize on their behalf.

"I want you to try and see, in your mind's eye, what Ukrainian women are experiencing now.

As we speak, 40,000 of them are at the battlefield serving in the armed forces of Ukraine. They are all volunteers," Zelenska said.

What a difference a year can make. And what a difference a week can make.

Only about seven days after the Halifax Security Forum ended, citizens in China rose up and took to the streets to protest the government's COVID lockdown policies. In front of cameras, they have demanded freedom of speech and freedom of the press and called for the end of Xi's rule. Many have been beaten and hauled away by the police — a fate they surely knew was in store for them prior to leaving their homes to protest.

Knowing what we know about China's government, these acts by ordinary Chinese citizens are real acts of courage.

A year ago, it looked like democracy was on its heels. But the bravery of ordinary Ukrainians, the Russians who oppose the war, Iranian protesters and now some in China have proven otherwise.

So, what will the next year bring? Making predictions is foolish, as this past year has proven. No one thought Ukraine would send Russian forces packing. No one predicted street demonstrations in Beijing.

But here is one anyway: by the 2023 Halifax International Security Forum, Russia has ended its war of aggression against Ukraine, and Vladimir Putin will be sitting in a cell in The Hague awaiting his trial for crimes against humanity. One can always hope. **ND**



the forum. This isn't a confab for the "America First" or isolationist crowd.

While there is a range of topics every year, the overwhelming theme of the 2021 forum was China and the threat it poses to the democracy loving peoples of the world.

What a difference a year can make.

At the 2021 forum, there were a few discussions on Russia and the Ukraine: "Will he, or won't he?" being the main topic. "He" being Vladimir Putin and the question: will he invade Ukraine?

A year later, China was still on the Halifax agenda, as was North Korea, which was lobbing missiles over the

Balance Needed for High Skills Immigration Reform

The U.S. defense industrial base faces a critical science, technology, engineering and math talent shortage, exacerbated by an outdated immigration system.

As has been highlighted previously in this space and reiterated by national security experts in many fora, increasing “high skills immigration” is a critical national security issue. While the government and defense contractors struggle to hire new STEM employees, caps on available visas force thousands of foreign-born graduates of U.S. universities to return home rather than remain here.

Responding to calls for reform, advocates have proposed legislation to exempt all foreign citizens who have earned an advanced STEM degree at a U.S. university from numerical visa caps. However, a similar reform effort failed last summer when a nearly identical measure was left out of the China-focused competition bill, the CHIPS and Science Act.

Advocates are right to continue pushing for high skills immigration reform — but if these efforts do not address concerns raised during previous debates on this issue, new legislative attempts will likely fail as well.

Given the complex and sensitive nature of today’s immigration debate, a broad reform design would be unlikely to succeed. A pragmatic look at immigration and the political context suggests that a more measured proposal, which navigates security and labor concerns, offers a better chance of successfully moving forward.

Some of the more sweeping reform attempts have failed to address legitimate growing apprehension about the Chinese Communist Party’s attempted influence on, and espionage in, U.S. society. In the current political climate, a significant increase in the number of visas allowed without a corresponding expansion in robust security procedures is likely to fail as it does not present the sort of balanced approach that gathers consensus.

For example, some opponents of last summer’s bill raised concerns that the Chinese government could use the additional visas to bring spies into the United States.

Some have even called for a total ban on admitting Chinese students to U.S.

universities due to perceived systemic weaknesses in the vetting system, even though most Chinese students would remain in the country after graduation and provide much-needed high caliber support to our talent-strapped defense industrial base.

There is also skepticism in some circles about the value of cooperation between U.S. and Chinese companies. For example, several prominent lawmakers sought to increase security in the Small Business Innovation Research program due to worries about the Chinese government gaining access to technology. Other lawmakers have sought to prevent potential Chinese influence on U.S. consulting companies and universities.

Security-focused decisionmakers in Congress and the Pentagon are unlikely to support any program they deem ripe for Chinese exploitation. Thus, a politically successful high skills immigration proposal must be limited in size and scope and include explicit protocols and institutional capacity for identifying and preventing potential espionage.

While limiting the size of a STEM talent program is not ideal, advocates for reform can take solace that some foreign talent is better than no foreign talent, and increased security will help prevent other nations from exploiting U.S. openness and avoid incidents that would threaten the program’s long-term political viability.

Previous reform measures have also failed because their broad scope invited criticism from an economic populist perspective. In some circles, immigration reform is attacked as an opportunity for “executives ... to easily hire grateful, lower-wage foreign graduates,” displacing U.S. workers. Similar criticisms have been made against increases in H-1B visas to fill domestic labor shortages. Regardless of the STEM talent shortage, some segments of the political spectrum will be wary of an increase in the number of visas connected to high-paying jobs that could otherwise go to domestic workers.

Reform advocates should recognize these concerns and craft

future proposals accordingly. To mitigate allegations of an overt “Big Tech” influence on the effort, advocates must clearly articulate that an increase in foreign talent will fill a gap critical to national security.

One option could be to require direct government or industry service in exchange for acceptance into the visa program. Such a system would help not only support national security but would make the program part of efforts to bolster industrial base capabilities rather than an attempt to depress domestic wages.

Similar programs, such as the Military Accessions Vital to the National Interest “service-for-citizenship” program, have been successful in the past. To that end, lawmakers recently introduced a similar program within the STEM Corps Act of 2020.

Advocates must also recognize that high-skilled immigration reform exists as part of a larger immigration debate. Some detractors argued the issue should be addressed in a broader immigration-related bill, suggesting that agreement might be crafted with some tradeoffs on other immigration policy issues. While safeguards against Chinese Communist Party exploitation and domestic wage depression are a good start, advocates may benefit from developing ideas for policy trades that are politically tenable for all concerned parties.

Despite the sensitivities that exist in today’s political environment, policymakers can create a bipartisan proposal that leverages foreign talent for U.S. national security.

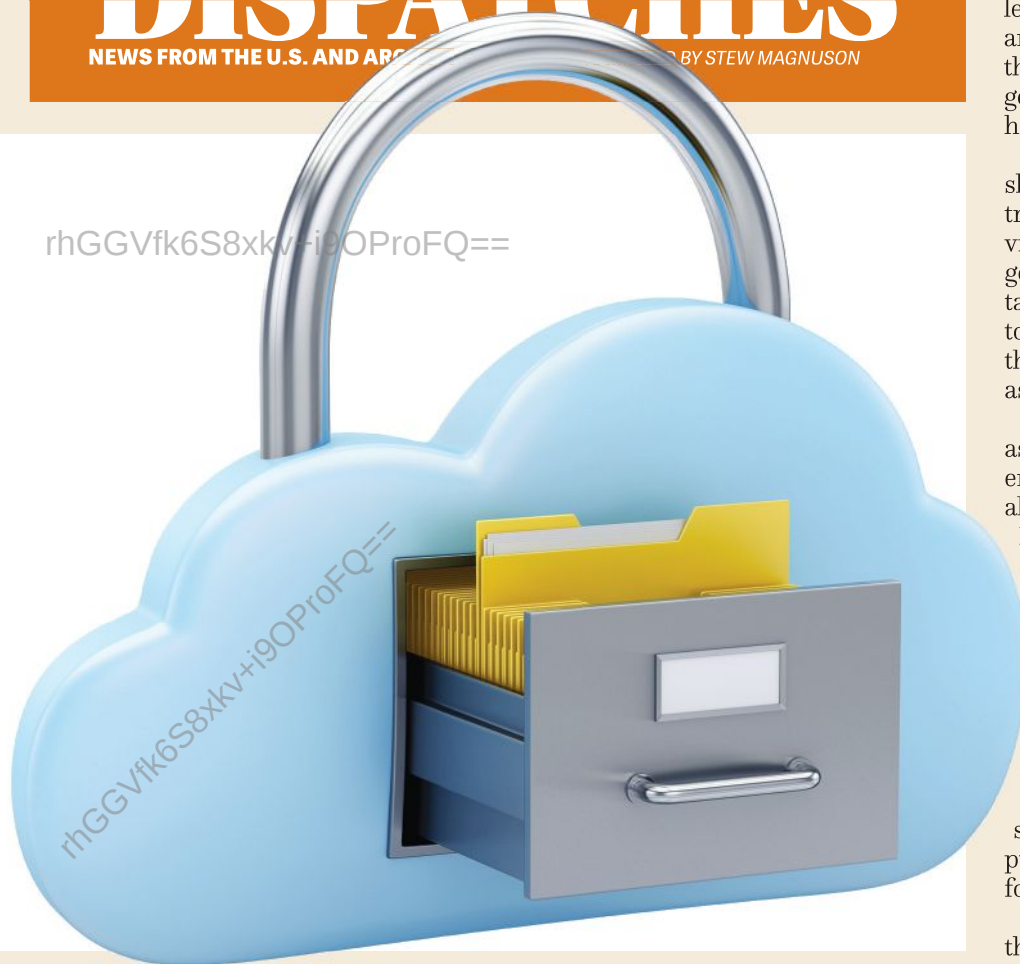
One of America’s great strengths has been that the best and the brightest from around the world want to come here to study, and ultimately join, its free society. Absent a strong STEM talent pool, the nation will have increasing difficulties in its competition with China. High-skilled immigration reform must be pragmatic and bipartisan. **ND**

Ben Ackerman is an Emerging Technologies Institute research intern and an undergraduate student at Brown University.



DISPATCHES

NEWS FROM THE U.S. AND ABROAD BY STEW MAGNUSON



Pentagon Cloud Computing Enterprise Finally Moves Forward *BY SEAN CARBERRY*

ARLINGTON, Virginia — After years of awards, protests, revisions and delays, the Defense Department issued a \$9 billion enterprise cloud contract it believes fixes flaws that led to the cancellation of its predecessor, the Joint Enterprise Defense Infrastructure, or JEDI.

Whereas the JEDI was a single-vendor award — that was protested and later scrapped — the Joint Warfighting Cloud Capability contract, or JWCC, has been awarded to Amazon Web Services, Google, Microsoft and Oracle. Each vendor is guaranteed \$100,000 and will then bid for task orders, explained Defense Department Chief Information Officer John Sherman during a press conference.

“What this brings us is direct access to these cloud service providers without going through an intermediary or reseller,” he said.

The contract — which runs for

three years with two option years — requires all four vendors to be able to provide services at the unclassified, secret and top-secret levels, he said.

“Now we’ve got other types of clouds here within the department, but none of them do this at all three security classification levels, spanning the entire enterprise from the continental United States, all the way up to what we call the tactical edge,” he added.

The tactical edge is perhaps where cloud capability is most needed, said Air Force Lt. Gen. Robert Skinner, director of the Defense Information Systems Agency.

“It’s this information, these applications that are churning out the right information at the right time at the right level, that enable us to have that decision advantage ... but also allows us to have that tactical advantage,” he said.

Sharon Woods, director of DISA’s Hosting and Compute Center, said

warfighters “need to be able to collect and process data at the point of need” rather than backhaul data to higher levels to process. JWCC “takes cloud and puts it into a smaller form factor that becomes portable, and so that can go with the warfighter as opposed to having to do the backhaul,” she said.

While the multi-vendor award should prevent a protest of the contract, competitors could protest individual task orders, Woods said. Ideally, government evaluators will complete task order awards in a matter of weeks to months, “but we need to work through the specifics, and we’ll learn as we go in the beginning,” she said.

Sherman noted that JWCC will serve as a “binding element” to realize the enterprise compute capability of joint all-domain command and control.

He said the contract is as much of a cultural shift as a technical one.

Both shifts could be difficult for a department that has long struggled with adapting to new technology, said Teri Takai, former Defense Department chief information officer, during an interview.

The department is going to have to pay more attention to data standards. “They’re going to have to put in standards and ground rules for that sharing of data,” she said.

Data has always been a struggle for the department, she said. “So, that’s going to continue to be an issue and it’s going to have the added complexity of working with the cloud providers” who have their own rules and applications for moving data.

Other challenges include the fact that some cloud applications are vendor specific, the task order process could be cumbersome and migrating from one cloud provider to another could be complicated.

“The last one is that they’re still going to have to figure out how actually to manage usage,” she said. There will need to be a mechanism to monitor cloud usage to avoid runaway costs, she added.

Furthermore, the extent to which operators at the tactical edge will see a benefit from cloud services isn’t yet clear, she said.

Still, moving to the cloud is an essential step, she said. “The DoD really does have to continue to move forward as the technology is moving forward. But it doesn’t simplify it and make it easy. It just means that there’s another added complexity that they have to work with.” **ND**

B-21 Raider: Just the Beginning?

• Undersecretary of Defense for Research and Engineering **Heidi Shyu** — like many after the Air Force and Northrop Grumman unveiled the B-21 Raider — gushed about the new aircraft but raised some eyebrows at the Reagan National Defense Forum the following day by suggesting that there was more to come.

“We all saw the B-21 rolled out, right? Well, there’s other stuff in development that is even more capable,” she said.

And some of it will come from down under. Shyu said the Defense Department has created a “classified construct to share information” with partners from Australia, which solves prior issues with exchanging ideas on top secret programs.

“We’re collaborating hand in fist,” she said. Technologies developed in such a manner are “born interoperable,” she added.

“And we can deliver some of the capabilities a lot faster than just developing them on our own,” she said.

The Defense Department is using the same construct to collaborate on classified programs with other nations, she said, without mentioning specifics.

It’s all top secret, “but there is some really cool stuff,” she promised. **ND**

For more on the B-21 Raider, see page 18.

Ignore the Yahoos

• Now retired, the former chair of the House Armed Services Committee **Rep. Mac Thornberry**, R-Texas, pulled no punches, targeting the media and extremist lawmakers when discussing the future of defense funding and support for Ukraine.

People need to step back from the bad news “buzzing in our pockets,” and see that there will be continuity, he said at an International Stability Operations Association event recently. He spoke the day after **Rep. Marjorie Taylor Greene**, R-Ga. — a vocal critic of U.S. support for Ukraine — led a press conference and called for an audit of all military support provided to Ukraine.

“You had four yahoos do a press conference yesterday, who were basically the most isolated, least influential people in in the House Republican conference, and yet the press was just all over them,” Thornberry said.

“I would say I’m reasonably optimistic that we will be stable when it comes to defense and foreign policy with [the] Biden administration and the new Congress,” he said.

“Leavening factors” would prevent the extremists in both parties from getting together to block defense priorities, he said. “I think you will have a big majority in both bodies who support continuing to fund Ukraine.”

Thornberry expressed confidence that Congress would complete the 2023 National Defense Authorization Act and pass a budget for fiscal year 2023.

“I think after that — especially with such narrow majorities in both parties — everybody’s jockeying for 2024. The best you can, I would plan for a yearlong [continuing resolution] to go for the next year through the election,” he said. **ND**

State Department Victim Of Extreme Sarcasm

• **Sen. Chris Coons**, D-Del., said the U.S. Congress is lagging behind other nations in writing legislation that could help stop foreign disinformation campaigns.

“I would argue one of our great challenges legislatively [in the] United States Congress is both understanding and coming to grips with the impact of social media on our body politic, on our sense of ourselves, on our ability to focus,” he said at the Halifax International Security Forum.

He called out China-owned TikTok as being malevolent, siphoning off huge amounts of data to be used as a tool of state power.

“Getting my kids to stop looking at TikTok every day, every minute, is enormously challenging. It’s engaging. I would even say addictive,” he said.

The State Department is the lead agency in charge of countering disinformation issued by Russia via

media platforms such as RT and Sputnik, but Coons seemed to lack faith

in the department’s capabilities.

“I don’t really ever expect the State Department — that model of crisp, concise, edgy and funny communication — to be at the cutting edge of our engagement in the world,” he said.

U.S. culture “is one of our greatest sources of soft power. And if the United States better partners between the private sector and public sector, we could be more successful,” he said.

As for his remarks about the State Department, “I suspect I’ll get a five-page memo in my inbox three weeks from now expressing calm discontent,” Coons said. **ND**

Space Force 1, Elon Musk o

• Billionaire **Elon Musk** successfully acquired Twitter in October. But there’s one thing he won’t be getting: SpaceVerse.

SpaceVerse is the Space Force’s “metaverse equivalent,” said the service’s Chief Technology and Innovation Officer **Dr. Lisa**

Costa. The goal is to develop a virtual training and collaboration environment for the service’s guardians.

The Department of the Air Force filed a trademark application for SpaceVerse in April, “because we were concerned that a company might trademark it, and then we would no longer control that messaging that was going on,” Costa said during the Interservice/Industry Training, Simulation and Education Conference in Orlando.

“So, we trademark it, and literally the next week there was an article ... about ‘Elon Musk is going to create the SpaceVerse,’ and the Air Force lawyers got to send a cease and desist to Elon,” she said, drawing laughs from the audience.

“Our four-star [general] was pleasantly surprised at how forward leaning we were,” Costa added. **ND**

For more on military space, see page 28.



SHYU



MUSK

COSTA



Innovation Nation

Tech Incubator Exploring Hypersonic Missile 3D Printing

BY MEREDITH ROATEN

ARLINGTON, Virginia — The Defense Department wants to find out how it can make hypersonic missiles more efficiently through a new additive manufacturing program, officials said.

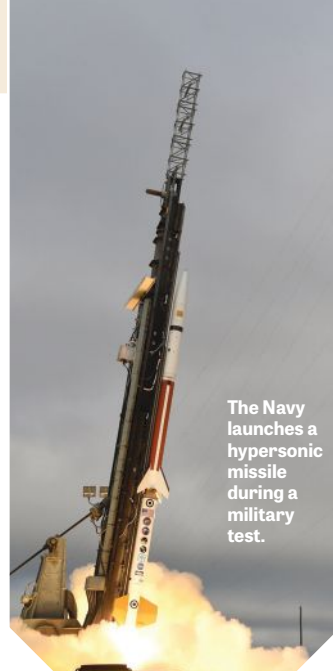
The Office of the Secretary of Defense's Manufacturing Technology Program and the Naval Surface Warfare Center recently put out a request for solutions for the Growing Additive Manufacturing Maturity for Airbreathing Hypersonics challenge, also known as GAMMA-H.

It aims to find 3D printing techniques that can meet the high temperature and propulsion standards for hypersonic airbreathing systems, the technology that powers hypersonic weapons, according to an Office

of the Under Secretary of Defense for Research and Engineering press release.

The non-profit membership National Security Technology Accelerator will manage a consortium to help select the most promising solutions for other transaction authority contracts, said Tony Kestranek, deputy director for strategic and spectrum missions advanced resilient trusted systems at the accelerator.

Hypersonic weapons — highly maneuverable missiles that can travel faster than Mach 5 — are one of the biggest technology priorities in the defense world, he said. While the Army, Air Force and Navy each have their own development programs, Russia and China have tested their own missiles in recent years.



The Navy launches a hypersonic missile during a military test.

"I think everybody is fully aware that we are not first when it comes to hypersonics in the world," Kestranek said. The Pentagon "is trying to catch up," he added.

Additive manufacturing will help decrease the number of individual parts that need inspection, shipment and construction during the manufacturing process, making the development of hypersonic

systems more efficient and cost-effective, he said.

After a contract is awarded in June, the program will begin a 36-month prototyping effort, Kestranek said.

While there is no set number of awards, the Pentagon expects several will be necessary "to cover the breadth and depth of solutions the GAMMA-H challenge represents," according to a Defense Department spokesperson.

The flexibility of the challenge can encourage non-traditional industry to get involved, Kestranek said.

"It's the speed — more like commercial contracting — that gets it moved downstream a little bit faster," he said.

The challenge has about \$106 million in funding, which is helpful for attracting the attention of the more than 800 members in the accelerator's network, Kestranek noted. The request for solutions closed in December, which will lead to a downselect in April. **ND**

New Pentagon Office Hopes to Bridge 'Valley of Death'

BY STEW MAGNUSON

SIMI VALLEY, California — Transitioning promising technology funded by the U.S. military from research projects to programs of record has been a long-time and difficult problem.

When a potentially game-changing technology doesn't get adopted by one of the services or an agency it has entered the so-called "Valley of Death."

Startups and small businesses rarely have the capital to continue the product's development and the money taxpayers invested in the projects goes to waste.

Secretary of Defense Lloyd J. Austin III in December established the Office of Strategic Capital, a Defense Department organization that will help small businesses and startups find the capital they need to make it across the valley.

Critical technologies such as advanced materials, next-generation biotechnology and quantum science often require long-term financing to bridge the gap between the laboratory and full-scale production, a Defense Department statement said.

The office will fall under the purview of Heidi Shyu, undersecretary of defense for research and engineering.

The program should not require a lot of funding from Congress, she explained at the Reagan National Defense Forum in Simi Valley, California. The idea is to become a matchmaker between the startups

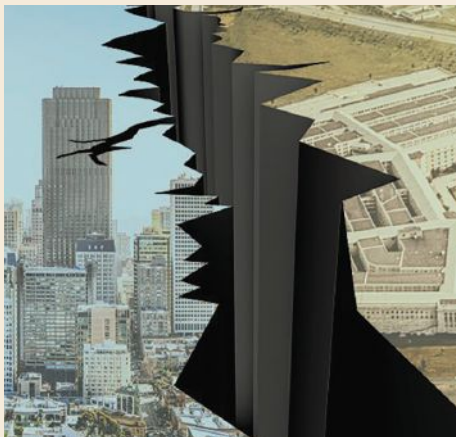
and venture capitalists, who will keep the technology in the United States.

"We're working with the venture capital folks to say, 'Hey, there [are] some critical technologies and we want to make sure that we as a nation keep and that there is no adversary capital and it's stolen,'" she said.

Chinese companies have been known to invest in U.S.-based startups, then take their intellectual property back to China. Meanwhile, the slow Defense Department acquisition system often means small businesses don't get paid for their products in a timely manner. Sometimes, they can't afford to stay in business.

Along with venture capital, the new office will serve as a liaison between the startups and the Small Business Administration, which has some 300 funds available for startups to tap into, she said.

The Pentagon is seeking funding from Congress to establish the office and start hiring staff, she said, although she couldn't say how much was being requested. **ND**



Army Experiments With Next-Gen Aerial Resupply

BY MIKAYLA EASLEY

FORT IRWIN, California — To improve the Army's ability to move supplies into future battlefields, the service is experimenting with new technologies for its contested logistics strategy.

The Army recently tested how the Joint Precision Aerial Delivery System, or JPADS, could deliver critical supplies directly to soldiers in austere environments where they may be unable to use GPS to locate supply packages. The system was one of two dozen logistics technologies tested during the service's annual Project Convergence 2022 experiment in late fall, said Col. Marchant Callis, the Army's sustainment capabilities development and integration director.

The experiment is helping bring the service's sustainment efforts into the 21st century by conducting missions "over increasingly dispersed footprints and across contested, degraded or denied environments," Callis said during a demonstration at Project Convergence.

The services already use JPADS in operations today. The system comes in two variants — one able to carry 2,000 pounds of supplies and a 10,000-pound version — that are typically launched from a C-130 aircraft from altitudes up to 24,500 feet and around 15 miles from the target destination, Callis said.

Once dropped, an onboard computer uses GPS-designated coordinates to autonomously steer a parachute that delivers the palletized load. Multiple JPADS can be launched simultaneously and sent to different waypoints on a battlefield, Callis noted.

"This is key in that it reduces the aircraft's loitering time, which by extension reduces its exposure to enemy air defense systems," he said.

At Project Convergence, the Army used JPADS to conduct an aerial resupply mission through congested airspace to a GPS-jammed battlefield. Despite friendly and enemy aircraft crowding the skies, the system deliv-



ered 4,000 pounds of supplies so accurately that soldiers didn't need GPS on the ground to locate it, Callis said.

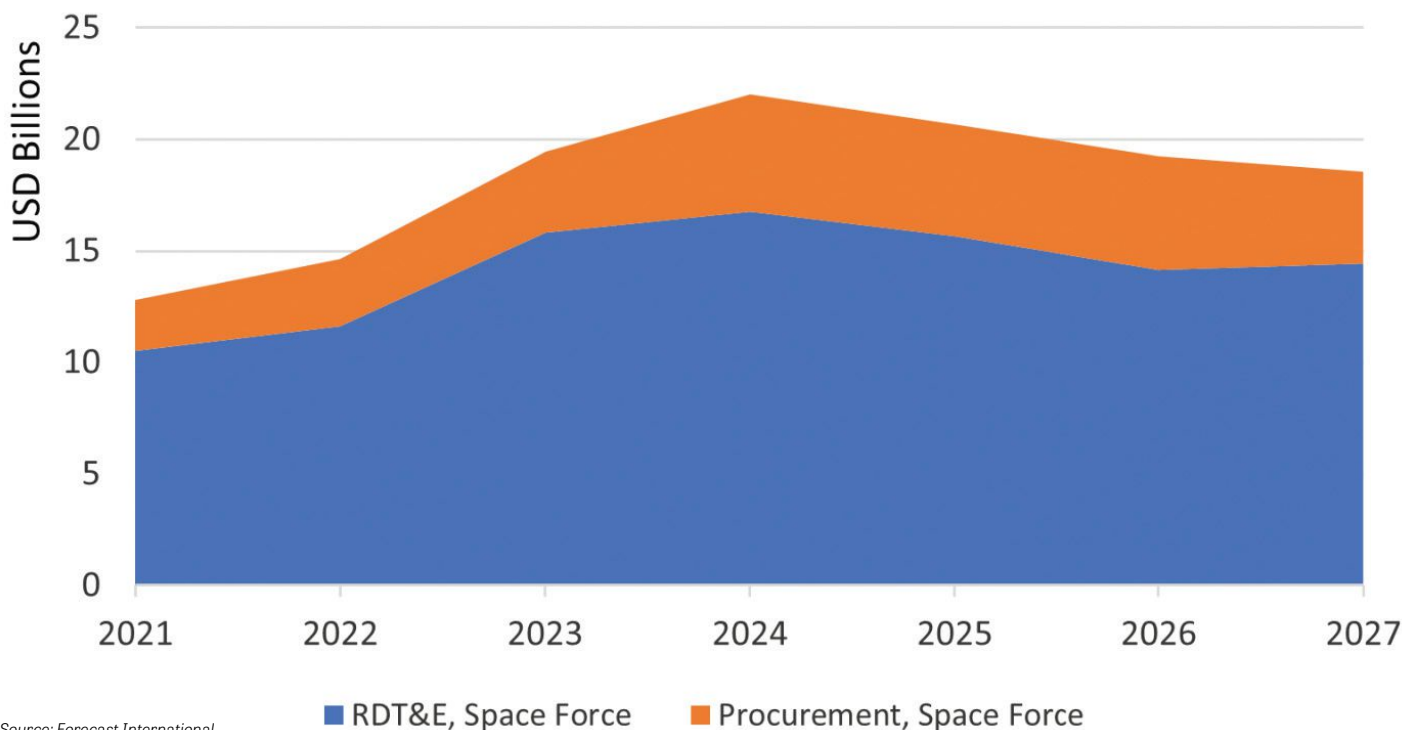
The experiment reflects an operating environment Army leaders said they believe will be common in the future: one with multiple manned and unmanned systems, as well as cyber and electronic warfare technologies.

The service is evaluating different ways an adversary can contest logistics and how autonomous capabilities could give them an advantage, Lt. Gen. Charles Hamilton, deputy chief of staff for Army logistics, told reporters.

"We've gone uncontested in the last 20-plus years now in Afghanistan and Iraq," Hamilton said. "We know that will not be the case in the next large-scale combat operation." **ND**

BY THE NUMBERS

Space Force Acquisition Budget





Czech Company Unveils Mixed Reality Apache Trainer

BY JOSH LUCKENBAUGH

ORLANDO, Florida — A new training simulator could take advantage of the niche market for the Army's legacy attack helicopters as the training industry focuses on newer platforms.

Vrgineers, a developer of virtual and mixed reality pilot training systems based in the Czech Republic, recently debuted a new advanced mixed reality trainer for Apache helicopters.

While the Apache is currently the attack helicopter of choice for the U.S. Army, many vendors are looking ahead to the rotorcraft that could come out of

the Future Vertical Lift, or FVL, program. Vrgineers saw an opportunity, the company's CEO Marek Polčák said.

With countries such as Australia and Poland deciding to acquire Apache helicopters over the last year, there is "still quite decent demand for Apaches," Polčák said during an interview at the National Training and Simulation Association's annual Interservice/Industry Training, Simulation and Education Conference in Orlando, where Vrgineers debuted the Apache trainer.

"We found out that a lot of trainers for Apaches are ... ending their lifetime, and there [is] not that much willingness of other suppliers ... of trainers to develop new ones, because everyone knows it will be succeeded by" FVL, he added.

Given how fast and affordably Vrgineers could build the Apache trainer with technology it already developed, the company decided to create the system in partnership with U.S.-based company DigiFlight, he said.

The trainer features Vrgineers' XTAL 3 mixed reality headset, which offers 4K resolution and a 180-degree field of view, according to Polčák.

"[Pilots] need to be able to use their peripheral vision during the simulation, as well as ... learn proper scanning patterns — so where they are supposed to look when and how often," he said during a talk at the conference.

Most virtual reality headsets have a narrow field of view, he added. When using those headsets, operators must rotate their heads to see what they need to see.

"But that's called negative training because you are not supposed to do that," Polčák said. "If you are a pilot, you are supposed to do the scanning patterns [with] your eyes. That's what we are trying to offer."

Additionally, the Apache system can offer training not only for the pilot, but the gunner and joint terminal attack controller, he said.

Vrgineers is negotiating with a helicopter command within the United Kingdom's military to acquire the Apache trainer, Polčák said. The United Kingdom signed an agreement to buy 50 AH-64E Apache helicopters in 2016. Fourteen have already been delivered, with the remaining 36 due to arrive by summer 2024, according to a Ministry of Defence press release. **ND**

Hello, Goodbye

• Boeing named **Dr. Brendan Nelson** president of Boeing International. The former Australian diplomat and government minister will succeed **Sir Michael Arthur** when he retires in early 2023 after spending the past four years at the helm of Boeing International.

Maria Fernandez will succeed Nelson as president of Boeing Australia, New Zealand and South Pacific.

Fernandez previously ran a consultancy that provided strategic advisory and independent assurance services to Australian government agencies.

Nick Jones, the National Defense Industrial Association's director of strategy, has moved on to a position at ST Engineering, the Singapore-based technology company.

In other ST Engineering news, the company sold a

pair of its U.S.-based maritime companies — Halter Marine and ST Engineering Halter Marine Offshore — to Louisiana-based Bollinger Shipyards. Halter Marine has the contract to build the Coast Guard's new Polar Security Cutters and a Navy Oceanographic Survey Ship. The combined shipyards will now operate under the name Bollinger Mississippi Shipbuilding.

The Air Force Research Laboratory broke ground on the Facility for Radiation Tolerance Research on Electronics for Space and Strategic Systems, or FORTRESS, a 6,200-square-foot, \$4.5 million facility, located at Kirtland Air Force Base, New Mexico.

It will enable researchers to investigate and develop components that ensure the survivabil-

ity of Space Force and Air Force systems in harsh, natural and man-made environments. It replaces a 50-year-old facility.

Two IT and cybersecurity leaders that specialize in serving defense companies — Steel Root

and C3 Integrated Solutions — announced their merger. The new company will operate under the C3 Integrated Solutions name. **Marc**

Pantoni, formerly president of Thrive, joins the new company as CEO.

Truck maker Oshkosh Corp. entered into a definitive agreement to acquire Hinowa S.p.A., a privately held company based in Nogara, Italy. Hinowa is a manufacturer of track-based aerial work platforms, mini dumpers, lift trucks and undercarriages. It is known for its advanced



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track designs, electrification expertise and as an early adopter of lithium-ion battery technology.

Arlington, Virginia-based Leonardo DRS completed the all-stock merger between it and RADA Electronic Industries Ltd., an Israeli specialist in tactical radars. They are now a combined public company.

General Dynamics Electric Boat held a keel-laying ceremony for the Virginia-class submarine Arizona, SSN 803, on Pearl Harbor Day, Dec. 7, at its Quonset Point Facility in North Kingstown, Rhode Island.

The submarine's sponsor is **Nikki Stratton**, the granddaughter of **Donald Stratton**, a survivor of the crew of the USS Arizona (BB 39) that was sunk in the attack on Pearl Harbor on Dec. 7, 1941.

The Arizona will be the 30th boat of the Navy's Virginia-class fast attack submarines. **ND**

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NATO Applicant Sweden Pledges to Reach Spending Goals by 2026

BY STEW MAGNUSON



HALIFAX, Nova Scotia — In light of its pending NATO membership, Sweden will begin spending 2 percent of its GDP on defense two years earlier than planned, the nation's minister of defense said Nov. 19.

Sweden and Finland were invited to join the alliance in the aftermath of Russia's invasion of Ukraine. All but two of the member nations have ratified their applications, with only Turkey and Hungary remaining.

"We're hoping of course to become full-fledged members of the alliance as soon as possible, pending on the ratification process in Hungary and in Turkey," Sweden's Minister of Defense Dr. Pal Jonson told *National Defense* in an exclusive interview on the sidelines of the Halifax International Security Forum.

NATO nations are required to spend 2 percent of GDP on defense funding, but many fail to do so. The issue came to public prominence after former U.S. President Donald Trump chastised some NATO members for falling short.

Sweden elected a new government in September, and Jonson was sworn in as the new defense minister about a month later. The previous government had vowed to raise its defense spending in line with the NATO threshold by 2028. Jonson said Sweden currently spends about 1.4 percent of its

GDP on defense. However, with the worsening security situation in Europe, the nation will move that goal up to 2026, he said.

"This is about solidarity with other allies. The Baltic nations are at about 2 percent. Poland is way over 2 percent, and Germany is on the track to 2 percent," he said. All eight parties in the newly formed Swedish government support meeting the threshold, although half of them want to keep the original goal of 2028, he noted. "We can find bipartisan agreement on it," he added.

Sweden will be ready to participate as a full member once approved, he said. Sweden and Finland were already two of NATO's closest non-member partners, although they were not parties to Article Five of the treaty that calls for members to come to the defense of any nation that is attacked.

"It was clear after the 24th of February when Russia made this full-scale invasion of Ukraine that there was a difference between partnership and membership. Ukraine was also partner to NATO. Yeah, it didn't help," he noted.

Sweden has participated in exercises with NATO nations for years, and has a lot to offer the alliance, Jonson said. "When we become members of NATO, then we can be part of NATO's common defense planning. We can provide our assets and capabilities to

integrate those into NATO's defense planning," he said.

Those assets include Patriot batteries, 100 jet fighters, electric submarines, naval surface combatants with low signatures and "good intelligence capabilities, particularly on Russia," he said.

In addition, Sweden punches above its weight when it comes to its defense industry. "There's no other country in the world of 10 million people who can produce submarines, fighter aircraft, advanced combat vehicles and artillery pieces," he said. "I think we can bring things to the table when it comes to innovation and technology and partner up with corporations and new starts in the United States."

The new Swedish government is supporting Ukraine's fight against Russia with its ninth military aid package, totaling some \$300 million — more than the previous eight aid packages combined, he said. The new funding will provide cold weather gear and equipment and air defense technology, he added.

"We're 100 percent committed. This is a top priority of our government to step up to support Ukraine, for it to regain its territorial integrity and its independence. That is our objective. And by supporting Ukraine, we're also investing into our own security. Putin will not be stopped unless someone stops him," he said.

Creating interoperable

command, control and communications systems among NATO allies has been a long-standing problem as members go their separate ways when acquiring systems. Sweden doesn't have far to go, Jonson said.

"We're quite interoperable with NATO. We use Link 16 and Link 22 [radios]. Since we participate in many crisis management operations, we're not so worried about the command structures as such. I think we're well on our way to integrate the internet since we've been participating in so many exercises," he said.

Some of those exercises are in an area of particular concern to Sweden: the Arctic region, where Russia has been continuing to aggressively advance its interests, he said. The war in Ukraine has not diminished Russia's activity in the region, he noted.

And China has declared itself a "near-Arctic" nation and is increasing its activity there even though no other nation recognizes it as such, Jonson added. Sweden published a new Arctic strategy two years ago, which is "more precise" about some of the threats, risks and vulnerabilities there, especially with increased Russian presence, he said.

"There's going to be more focus on the Arctic in the future," Jonson said. **ND**

— Posted on *NationalDefenseMagazine.org* on Nov. 20.

COMING SOON

• *National Defense* will be sending out dispatches from the Surface Navy Association's

annual symposium Jan. 10-12 in Arlington, Virginia; NDIA's 25th Annual Expeditionary Warfare Conference, in Arlington, Feb. 22-23; Avalon-The Aus-

tralian Air Show in Geelong, Victoria, Feb. 27 to March 1; and NDIA's Tactical Wheeled Vehicles Conference in Columbus, Ohio, Feb. 27 to March 1. **ND**



New Computer Makes Quantum Leap in Processing Power

NEW YORK, New York — As the world grapples with how to take advantage of emerging quantum computing technologies, IBM recently debuted its most advanced computer ever — and broke its own world record in the process.

Unveiled at the annual IBM Quantum Summit in New York, the Osprey computer has more than three times the computing power of the previous model. While the advancements in quantum are expected to impact all industries, the technology could have unique implications for how nations defend themselves, researchers said at the recent summit.

Quantum computers utilize basic units known as qubits as opposed to the 1s and 0s used by traditional computers. The computing power stems from the potential for each qubit to be both 1 and 0 simultaneously, rather than being restricted to one or the other.

At 433 qubits, IBM's Osprey is the world's largest quantum computer, surpassing the former largest system in the world, IBM's 127-qubit computer Eagle.

"We're living in a moment where computing with a capital C, as I like to call it, is going through one of the most exciting moments since the

to solve complex problems. But stringing together more qubits creates more "noise," a term meaning interference with the state of the bits in the computer that affects the outcome of the calculations run on it.

As the number of bits without error increases, the closer the quantum computer gets to reaching its full potential. In addition to error issues, current quantum computers are prohibitively large and researchers are continuing to work on increasing processing power while reducing size.

Some of the progress for quantum computers comes from new IBM-developed hardware, including new wiring that helps control temperature, said Jerry Chow, manager of the Experimental Quantum computing division at IBM.

This new hardware will enable the next scale-up of the computers in the next few years, he said. IBM's Condor at 1,121 qubits is expected to be unveiled next year, and its Flamingo the following year with 1,386 qubits.

Even though quantum computing has not reached its fullest potential, it still has national security implications today.

For example, Oak Ridge National Laboratory is using IBM's quantum computing software Qiskit, said Travis Campbell, director of the Quantum Computing Institute at the lab. The lab oversees national security science areas, such as nuclear nonproliferation and cyber resilience and intelligence, and runs more than 1 million executions per month on the system.

"Quantum computing is one of those emerging technologies where we see an enormous value whether it comes down to doing calculations of chemistry, material science, modeling, new types of catalyst or developing new types of superconductors," he said during the summit.

Additionally, as quantum tech-

nology progresses, new threats to national security could arise, said Ray Harishankar, fellow for QuantumSafe at IBM.

Most encryption relies on complicated algorithms. The encryption is safe because it would take hackers too long to guess the key using a traditional computer. But if a hacker leverages the processing power of quantum, it renders the key much easier to understand, bypassing the encryption and gaining access to protected communications.

Several companies, including IBM, are developing encryption that will protect sensitive information from adversaries who may have access to quantum computing in the future, Harishankar said.

While he noted that organizations like the World Economic Forum and National Security Administration foresee a "danger zone" for quantum cryptography in the early 2030s, he said it can take several years to protect critical infrastructure even with one algorithm.

"You have to figure out that you need to put them into the production line several years in advance. It cannot be thought of today and implemented tomorrow," he added.

But the technology still has a ways to go before it's broadly applicable in any field. Corporate quantum researchers crowded into the annual quantum summit were encouraged to be advocates for quantum in their workplaces.

The field is still waiting for the "quantum advantage" moment, Oak Ridge National Lab's Campbell said.

"It's coming up with that demonstration that we can use quantum computing to advance scientific discovery or innovation or whatever your personal goals are," he said. "But getting to the point of demonstrating that experimentally, that for us is a clear priority for what's next."

IBM thinks it can make that progress by collaborating with partner organizations through its quantum computing network, Gil said. The company's network has grown to more than 200 partners, including Lockheed Martin and Boeing, according to IBM.

"When you see the energy and the enthusiasm that we all get to witness in the world of quantum, how much appetite there is to learn, to contribute, to shift careers into this new area, you know that we are together on to something really big," Gil said. **ND**



advent of digital computers in the 1940s," said Dario Gil, senior vice president and director of IBM research.

"It is an undeniable amount of technical progress that is occurring, and the rate of pace is only accelerating," he said during the summit.

Creating larger quantum computers increases the ability for the computer

Congress to Pass Record Defense Bill, Late Again

With the clock ticking on the lame duck session, Congress was scurrying to complete the fiscal year 2023 National Defense Authorization Act and a federal budget. As of Dec. 15, the House had passed a compromise NDAA and another continuing resolution. The Senate was expected to pass the NDAA but was still considering amendments.

At best, the 2023 NDAA would come 76 days after the start of the fiscal year. That's worse than usual. According to a Congressional Research Service report, "FY2022 National Defense Authorization Act: Context and Selected Issues for Congress," since 1977, on average Congress completes the NDAA 42 days after the start of the fiscal year.

The 2023 act merged the House and Senate versions marked up during the summer and authorizes a record \$857 billion for national defense: \$816.7 billion for the Pentagon, \$30.3 billion for the Department of Energy, and \$10.6 billion for "activities outside NDAA jurisdiction."

The act authorizes \$45 billion more than the White House requested. Congress added \$19 billion to compensate for inflation.

For the Air Force, it authorizes five more F-35A joint strike fighters and 10 HH-60W combat rescue helicopters than the initial request and it prohibits retirement of Block 20 F-22 jet fighters, while supporting divestment in the venerable A-10 Thunderbolt II, the subsonic attack aircraft better known as the "Warthog."

Congress also plussed up funding for shipbuilding, munitions production and advanced technologies such as unmanned systems, artificial intelligence, quantum computing and electronic warfare tech, according to a Senate summary.

However, due to the delay in passing the NDAA and the continuing resolution, new starts have been on hold and the Defense Department has already lost nearly \$18 billion in purchasing power in fiscal year 2023, according to a report by the National Defense Industrial Association, "How Inflation Hurts America's National Defense and What We Can Do About it."

That number will increase until Congress passes a 2023 budget.

One person who had a front row

seat to the dysfunction is former Rep. Mac Thornberry, R-Texas, who served as chair of the House Armed Services Committee. During an interview at a recent conference in Virginia, *National Defense* asked what it will take to break the annual congressional cycle of criticizing the defense budget request for being too low, adding large sums in markup and then failing to pass a final NDAA and budget before the beginning of a fiscal year.

"There are so few legislative vehicles that go through the Congress anymore that everybody wants to put everything on the omnibus or the NDAA," he said. "And so, part of the reason it's so slow is because it's all this stuff that's not related to defense anymore. And we had that problem, and it's just gotten worse and worse."

That phenomenon was evident in the closing days of 2022 as legislators attempted to attach a host of non-defense amendments to the 2023 NDAA. Senators filed more than 900 amendments. While many were military in nature, others not so much.

Senators rejected a measure to allow banks to conduct business with legal marijuana operations. And an attempt by Sen. Joe Manchin, D-W.V., to include an infrastructure permitting reform measure dragged out the proceedings.

"House and Senate Democrats are still obstructing efforts to close out the NDAA by trying to jam in unrelated items with no relationship whatsoever to defense," said Senate Minority Leader Mitch McConnell, R-Ky., in an early December floor statement.

Which gets back to Thornberry's point — when there are few bipartisan pieces of legislation each year



that members can attach pet projects to, they pile on the must-pass items like the NDAA.

"The Senate and the House have to have floor time in May to do the bills," he said. "Then the conference can happen before the end of the fiscal year, but you've got to restrict it to defense. You can't keep allowing all these other issues to catch a ride," he continued.

That requires congressional leadership to move more legislation so "it's not just three or four bills a year that everything has to attach to," he said.

One thing that could help the process, he said, is the Commission on Planning, Programming, Budgeting and Execution, or PPBE, that Congress created in the 2022 NDAA. It is tasked with reviewing the budget process, long criticized for being outdated and overly restrictive. The commission's final report is due in fall 2023.

One concept gaining traction is multi-year portfolio funding. That would allow the department to shift gears and move away from programs that aren't panning out and shift funds to more promising technologies.

"I'm in a lot of conversations, including with some of the commissioners, about what some of the options may be," Thornberry said.

Some of the ideas are "countercultural," he said, and "are going to have to shake things up a little to get it done."

Some have cast doubt that appropriators would be willing to give up control and give the Defense Department portfolio flexibility. Thornberry disagreed.

There are appropriations committee members interested in the idea, he said. "But if you have full transparency in a timely way — so the Pentagon has to say where every dollar goes when it's spent — then I think the appropriators are much more willing to give them more leeway."

Especially when it comes to acquiring rapidly evolving technology like software, that kind of flexibility "just makes sense," he added.

If only that were the threshold for getting things done on the Hill. Passing a budget on time each year makes sense, too. **ND**



VIEWPOINT

How U.S. Can Compete With China in Latin America

BY R. EVAN ELLIS

During the Cold War, the struggle between the United States and the Soviet Union forced attention to the question of whether government, or free markets and private property, best supported achieving the broad range of human desires from prosperity to security to dignity.

That debate played out in a range of centers of thinking, political movements and insurgencies across the globe, although the core philosophical question was colored by perceptions in the developing world of the benefits that “capitalism” had brought to them, as well as the complex historical relationships with the United States and former colonial powers as its champions.

The fall of the Soviet Union seemed to settle the question in favor of capitalism, perhaps best symbolized in Francis Fukuyama’s iconic essay “The End of History?” Latin America, among other parts of the world, was temporarily infected by the idea that capitalism was the best route, with a wave of conservative and neoliberal governments elected in the 1990s such as Raul Menem in Argentina, Alberto Fujimori in Peru, Carlos Salinas de Gortari in Mexico, and Gonzalo Sánchez de Lozada in Bolivia, among others.

The diverse group of leftist governments that came to power in the early 2000s, from populist socialists such as Hugo Chavez in Venezuela, Rafael Correa in Ecuador and Evo Morales in Bolivia, to more moderate social democratic coalitions such as the Workers Party government in Brazil, the Concertación in Chile and Frente Amplio in Uruguay, reflected the inability of neoliberal policies to satisfactorily address the region’s problems.

Yet the range of political responses also reflected a diversity of thinking about why Latin America’s neoliberal moment had not satisfied elevated hopes and what was the best

path forward.

Latin America’s latest “turn to the left” is both broader than the region’s last “pink tide,” and arguably more problematic for the United States in strategic terms, with increased challenges to U.S. security, migration, and economic cooperation with the region’s partners, decreased leverage to pursue its policy objectives in bilateral and multilateral forums, and possibly greater opportunities for the People’s Republic of China to expand its presence in the region.

While Latin America’s new left is diverse, in both its ideology and commitment to democracy, the new political landscape also highlights a monumental shift across the hemisphere, including in the United States, with respect to fundamental questions about the role of government versus private enterprise and initiative, in both achieving desired economic and social objectives, and in protecting individual rights and liberties.

The remarkable commonality across Latin America’s heterogeneous left is that virtually all its regimes look to the expansion and empowerment of government to address the grave challenges of their countries.

While the particular agendas, and the likelihood of implementing them, vary greatly across countries, virtually all involve the expansion of government spending, programs and authorities, whether for poverty reduction, helping marginalized groups, infrastructure construction, public security, or providing education, healthcare and pensions.

Most, from Chile to Colombia to the United States, involve some corresponding form of tax increases to pay the bill.

While the Biden administration has important differences with and concerns about the new governments in the region, it arguably concurs on important parts of the new agenda, from attention to social justice to health care and education, to environmental protectionism and dismantling



the carbon economy for an accelerated transition toward green energy.

The Biden administration has not abandoned the private sector and continues to work through it in organizations such as the Development Finance Corporation. Yet its reflexive coincidence with Latin America in focusing on expanded government programs, spending, authorities and taxes de-emphasizes the primacy of the private sector as the primary generator of wealth, inspiration of human initiative, and source of protection for individual rights and liberties.

The eroding attention to the fundamental role of the private sector as generator of value and protector of individual rights and liberties is compounded by the growing wealth and power of the People’s Republic of China and its impact on the hemisphere through its engagement, discourse and example.

Most Latin Americans understand that the authoritarian Chinese system impinges on the free expression and other liberties of its population, as well as on others, including its imprisonment of Uyghur Muslims and its suppression of democracy in Hong Kong.

Nonetheless, the economic transformation of Communist Party-led China over the past 40 years, whatever the true causes or underlying contradictions, sends the message, in ways the failed economy of the Soviet Union never could, that state-led development can produce results.

In the same fashion, Beijing’s use of state control, empowered by emerging technologies, generates the superficial appearance of security, order, and efficiency attractive in Latin America where such conditions are often lacking. From afar, it is easy for Latin Americans to overlook the corresponding sacrifice of personal rights and privacy.

Going beyond the power of its ambiguous example, China has also become increasingly assertive in publicly challenging the West as embodying democracy and human rights versus its own authoritarianism. While few maintain that China has the same quality of democratic freedoms and the protection of individual rights as the West, its obfuscation of democracy and rights creates moral space for authoritarian governments from Russia to Venezuela.

Such moral ambiguity also facilitates expanded government pro-

grams, authority and intrusive technologies on populations who hope that accepting them will bring them the security, order and economic benefits they yearn for.

What is arguably missing as the United States responds to the challenge of China, as well as to the crises and transformation of its own region, is clarity of thought and effective communication of the value of protecting and empowering the private, vis-à-vis the government as the fundamental generator of value and guarantee of human rights and liberties.

Doing so is not an easy sell in Latin America and other parts of the developing world as educational institutions, the media and public discourse have long associated capitalism with society's ills. In the wake of COVID-19 and the inflationary effects of Russia's invasion of Ukraine, societies have become fatigued with the inability of market-based democracies to overcome endemic corruption, inequality and insecurity.

Yet time and time again, empowering the state over the individual and the will of the strongman over the rule of law has proven a recipe for disaster, whether the dystopian authoritar-

ian kleptocracy of Venezuela, or those finding themselves not aligned with the interests of Xi Jinping in Beijing, from the Uyghurs, to democrats in Hong Kong, to neighbors whose territorial waters are on the wrong side of China's "9-dash-line," to Hu Jintao at the 20th Party Congress.

The non-state basis of Western economies means the United States cannot compete with China in mobilizing resources into questionable projects to win Latin American hearts and minds. Nor can its diverse political system out-propagandize Beijing with ambiguous platitudes that protect dictators while wooing the economic interests of democrats.

In Latin America, emphasizing common ground with the economic and social agendas of Latin America's new left may permit friendly interactions in the near term, but may ultimately be self-defeating if the statist projects of those new governments unleash capital flight, economic collapse, further social conflict and Chinese dependence.

Against the siren song of Beijing's seductive statism, and Latin America's turn to unpromising government-led solutions, the Biden administration's emphasis on democracy,

VIEWPOINT

however laudable, is not enough.

U.S. intellectual leadership in Latin America, and against mounting challenges to the Western-led global order more broadly, requires a return to first principles. That includes a focus on the fundamental nature of the private sector, coupled with effective rule-of-law, to collectively enable the prosperity and protection of individual rights and freedoms that makes true democracy viable.

The key for the United States in maintaining a secure and prosperous Western Hemisphere for all, and in effectively responding to the global China threat, is not to outbid China with gifts, but to show a new generation the merit of putting private, not government, initiative at the core of its sovereign national strategies and policies, and to make those same good choices itself. **ND**

R. Evan Ellis is Latin America research professor with the U.S. Army War College Strategic Studies Institute. The views expressed here are strictly his own.

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- Strategic Bombers

February

- Vital Signs:
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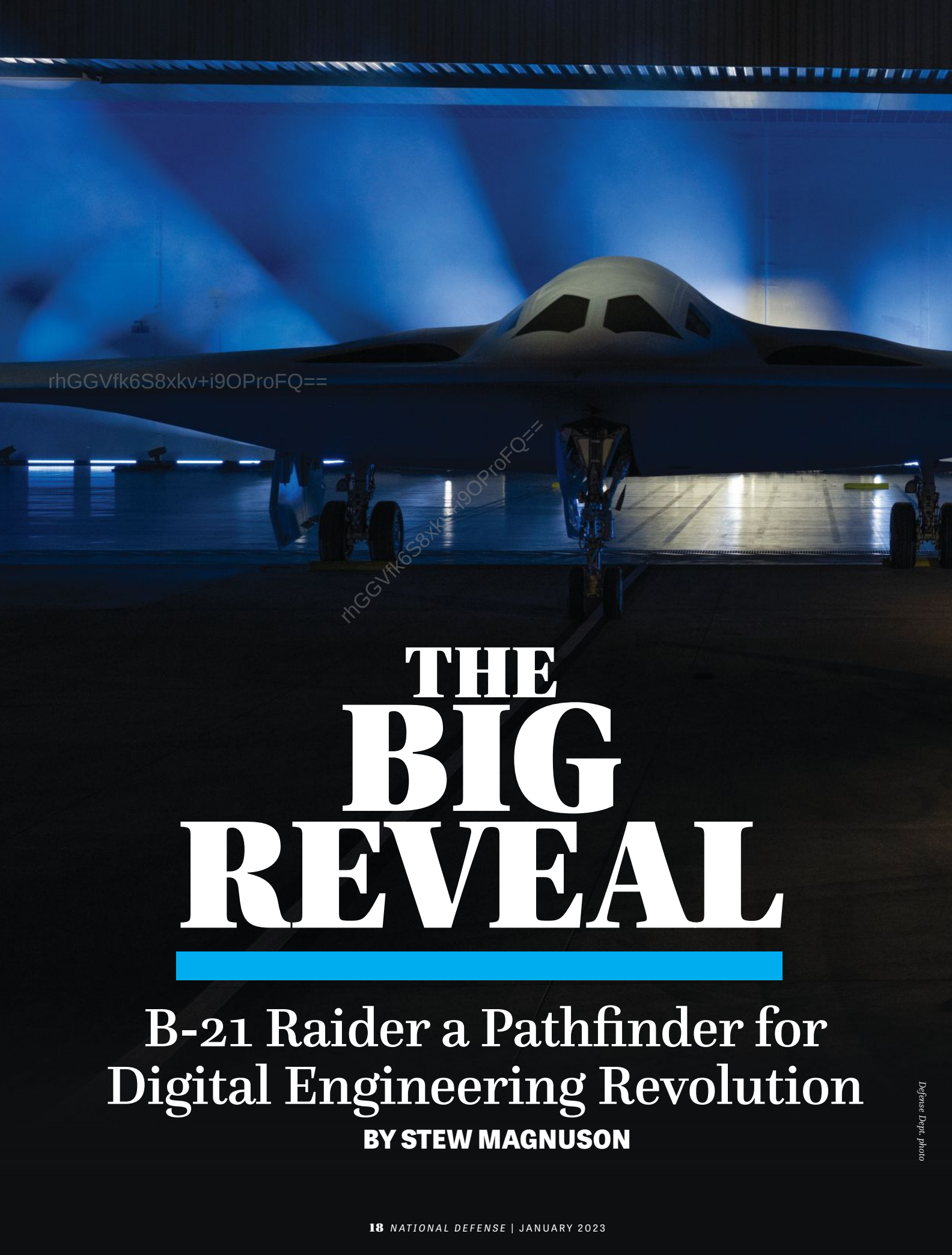
- Soldier Systems
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November

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THE BIG REVEAL

B-21 Raider a Pathfinder for
Digital Engineering Revolution

BY STEW MAGNUSON

Defense Dept. photo

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ALMDALE, California — Just after dusk on Dec. 2 — to the sound of swelling music and applause from thou-

sands of workers and dignitaries — Northrop Grumman employees removed a white shroud from the B-21 Raider and tugged it out of its hangar for the whole world to see.

Most of the aircraft anyway.

About one-fourth of the bomber — the tail-end specifically — was kept inside Air Force Hangar 42 to prevent overhead intelligence from seeing the aft section, a crucial part of the overall system that gives the aircraft its stealth capabilities. However, it was overcast, so prying spy satellites couldn't have seen much anyway.

Secretary of Defense Lloyd Austin III in a speech after the unveiling said the B-21 "is a testament to America's enduring advantages in ingenuity and innovation. And it's proof of the department's long-term commitment to building advanced capabilities that will fortify America's ability to deter

aggression today and into the future."

The B-21 Raider is being called a "sixth-generation aircraft" and is designed as a low-observable, or stealthy, strategic bomber that can penetrate air defenses and deliver nuclear or conventional weapons deep in enemy territory and return undetected to a base in the United States.

Despite revealing the nation's newest long-range strategic bomber to the public for the first time, this is still a top-secret program, as Northrop Grumman executives and Air Force personnel reminded reporters in a series of briefings throughout the day.

What is the wingspan? They couldn't say. What is the aircraft's range? Can't tell you. How much do you think each aircraft will cost taxpayers? That's classified.

Yet the company and government representatives did have a good news story to tell: namely, how industry and the Air Force went from signing a contract in 2015 to having six prototypes in various stages of production in a little more than seven years.

Test flights are expected to begin sometime in 2023 — meaning the program could go from concept to flight in eight years.

Northrop Grumman is aiming to deliver the first Raiders to the Air Force by the middle of the 2020s. The first squadron will be located at Ells-

worth Air Force Base in South Dakota.

"We are taking technology from the future and bringing it to the here and now," Kathy Warden, Northrop Grumman president and CEO, said in a press briefing prior to the aircraft's debut. "It's not just about what the technology advancement of the aircraft means, but it's also about how we went about developing this aircraft."

The B-21 was a digitally designed bomber from day one, meaning the company abandoned the traditional means of designing aircraft on paper, CAD files and clay models and embraced the new era of digital engineering.

The technique uses computer modeling and data that represent the characteristics of complex systems. Engineers can run component tests on computer simulations rather than building real-world equivalents, which takes time and money.

Developers can then create an entire computer-simulated aircraft — what's known as a "digital twin" — on which to run tests.

"We iterated on thousands of designs for this aircraft in a digital environment before selecting the design that would go forward," Warden said.

The Air Force chose a wing-shaped design, similar to the first stealth

U.S. AIR FORCE STRATEGIC BOMBERS

B-52 Stratofortress

INTRODUCED: **1955**

INVENTORY: **76**



B-1 Lancer

INTRODUCED: **1986**

INVENTORY: **45**



SEE THE
B-52, B-1 &
B-2 BOMBERS
IN ACTION

SCAN
THIS
IMAGE

NDIA
AR

bomber, the B-2 Spirit, also built by Northrop Grumman. (See story on page 23)

"It's going to change the way we do things here in the future," Air Force Chief of Staff Gen. Charles "CQ" Brown said of the digital engineering revolution.

The all-digital open architecture will also make the aircraft more adaptable, said Andrew Hunter, assistant secretary of the Air Force for acquisition, technology and logistics. The B-21 is designed to penetrate today's air defenses. But potential opponents will inevitably improve their radars and other sensors. The Air Force will be able to perform upgrades to the electronic systems to keep up with them.

"As the missions that we have to perform change, and as the threat evolves, the B-21 will continue to be able to perform that mission for the long term," Hunter said.

"Digital engineering and digital tools have enabled us to iterate the designs, get to tests faster and do more testing before we actually fly the airplane," said a source with intimate knowledge of the program who provided reporters with background information.

"It has enabled us to make the first production airplane. That reduces risk as we go into production," the source said.



Tony Nolls, B-21 build lead at Northrop Grumman, said a great deal of work went into creating the digital models.

Company employees are in two primary sites, Palmdale and Melbourne, Florida. Maintainers, pilots, manufacturing experts, engineers and Air Force personnel all worked together on the model, he said.

Everyone — no matter where they were physically located — was connected to a virtual room where work proceeded, even during the worst part of the COVID-19 pandemic.

"We didn't have to wait to share information. We shared live. All the walls were down. Everybody saw [a problem] as it happened and we dealt with it immediately," he said.

"We were solving problems that weren't even problems yet," he added.

Today, technicians are using augmented reality goggles as they put

AIR FORCE NEWS

the prototypes together. They can see things that are there and that are not there but will go in a certain spot in the future. And when doing inspections, the AR helps them understand where every component is supposed to go, Nolls said.

All these new digital engineering techniques will upend the way future programs are developed, Brown said. There just aren't as many "test points" needed, which speeds the process up, but might upset the traditionalists, particularly in the test and evaluation community.

"This is a cultural shift as well ... for our test community. They like testing," Brown said.

After the Raiders go into production and are sent to the Air Force for operations, the open architecture will keep them relevant, the source said.

"Our adversaries are always changing, always improving. We're always trying to stay one step ahead of them and that is what the B-21 allows us to do," he said.

The ability to rapidly swap out both software and hardware will make the aircraft more flexible, the source said. The aircraft will evolve.

"It will be the most advanced aircraft today, but with what we have

B-2 Spirit

INTRODUCED: **1997**

INVENTORY: **20**

B-21 Raider

EXPECTED INTRODUCTION: **MID-2020s**

EXPECTED PROCUREMENT: **100**



built in, it will continue to be for the next 30 to 50 years,” the source said.

In addition, maintainability has been a key requirement from the start, he said. The Air Force and Navy in recent years have struggled to keep their aircraft fleets operable due to parts shortages and obsolescence, lack of maintainers and other problems.

“The key here is you have to have an aircraft that is maintainable and is a daily flyer for the United States Air Force,” he added.

Next will be runway tests where the B-21 will roll down the tarmac without taking off. Two pilots will be in the cockpit for those tests, one employed by Northrop Grumman, the other an Air Force officer.

They both have been deeply involved in the development of the B-21, particularly in matters important to those who will be flying the aircraft.

“One of the key tenets of the program has been risk reduction, and really focusing on doing as much of that testing upfront to reduce the risk before we go into flight testing,” said Lt. Col. Clifton Bell, head of testing at Edwards Air Force Base in California.

Chris Moss, Northrop Grumman’s test pilot, said the pair have been working extensively on a high-fidelity simulator for the past six months that

allows them to evaluate the aircraft, get comfortable with how it handles, understand the flight control systems, and how they work on the aircraft.

Using the simulator helps them understand the difference between something going wrong, and the way the aircraft is supposed to operate.

“We spend a lot of time on simulators working on that,” Moss said.

Despite the digital engineering push, some real-world testing is being conducted aboard a flying testbed, which is a business jet that can carry components and instruments, Bell said.

“We’re flying with the systems before the B-21 has actually flown yet,” Moss said. Along with being a less expensive alternative, the testbed allows them to find and fix problems before the components are integrated on the Raider, he added.

They have also used one of the six prototypes in production to do load calibration and to test the structural strength of the airframe, he added.

Bell said during testing, “You always expect to have some sort of discovery, and it’s just that process of if you discover something, you compare it to what you’ve found in the model, and then you go update whatever you need to update and then you

keep pressing forward,” he said.

“We use lessons learned all the time from other flight test programs,” Moss said. “What did they miss? Where do we need to look? What kind of things did they not think was a problem and ended up being a big problem? Because a lot of times the things that surprised you the most are little things that you didn’t think would have any issues at all.”

Still, a high-fidelity simulator is no substitute for the real, upcoming test flights, Moss said.

“We can’t validate the model until we actually go and fly. So, all we can do is be prepared for everything that we think may be a problem, or could be a problem,” he said.

As for when the B-21 leaves Air Force Hangar 42 and takes to the sky, officials are aiming for mid-2023, but say that is not engraved in stone.

The source familiar with the program said the timing of the B-21’s first flight will be “data driven.”

Tests during the beginning of the year will be key.

First will be runway only tests, where the B-21 will taxi at high and low speeds, he said.

“We kind of have a saying that ‘the airplane is the boss,’ and the airplane will fly when it’s ready to fly,” he said. **ND**



Air Force photo





B-2 Spirit, B-21 Raider Draw Inevitable Comparisons

PALMDALE, California — Only a few minutes before the new B-21 Raider was rolled out of its hangar in Northrop Grumman's high desert facility, its predecessor the B-2 Spirit flew above the crowd as a company employee sang the National Anthem.

Comparisons between the two strategic bombers are inevitable as they are similar in shape — both so-called “flying wings.”

Northrop Grumman also built the B-2, which made its public debut in Air Force Hangar 42 at the contractor's Palmdale factory almost 34 years ago.

Prior to the roll-out ceremony for the Raider, Northrop's program manager for the B-2 Sean Reynolds stood in front of the Spirit of California, one of the 20 stealthy bombers remaining in the Air Force inventory.

“As the world's only long-range penetrating strike platform, you can tell them the flying wing is here and alive and well,” he told reporters.

It may look so, but it's not the same aircraft that the Air Force began operating at the tail end of the Cold War.

The Spirit of California was wrapping up a year-long refurbishment where it had its stealth coating stripped off and replaced with the latest top-secret radar-resistant material, Reynolds said.

“Then we go through modifications — both structurally and with the avionics components — and refurbish them, pulling it all back together within 365 days,” he said. B-2s come in for a refitting every nine years, he added.

The new tech and materials can be compared to the iPhones of a decade ago and what the public is using today. “That's the technology advancements that you're seeing here on the material side,” he said.

Although he was prevented from talking specifics, the radar cross measurement, the number the program uses to assess how “invisible” the B-2 is to enemy sensors, is

“significantly improved” over how it performed 10 years ago, he said.

After some flight checks the refurbished B-2 will be returned to the 509th Bomb Wing at Whiteman Air Force Base, Missouri, he said.

Choosing the flying wing design wasn't a given, assistant secretary of the Air Force for acquisition, technology and logistics Andrew Hunter, told reporters later. “There were thousands of designs proposed and this was the winning design,” he said.

Kathy Warden, president and CEO of Northrop Grumman, said, “We iterated ... on thousands of designs before picking the design that met the aircraft requirements, and the flying wing is the best alternative for meeting those requirements and affordability targets,” she said.

The company's experience building a stealthy flying wing has helped in the development of the B-21 Raider, Reynolds said.

“We look at the B-2

as risk reduction for the B-21,” he said. One of the major benefits of building both flying wings is in manufacturing techniques, he added.

“We still have technicians that are still with the company that did the [B-2] production line,” he said. They are experts in the manufacturing process, he added.

Meanwhile, the B-21's development has helped keep the B-2 relevant as some of the technologies in the new program have been integrated into Spirit, he said.

One similarity between the two bombers Northrop Grumman and the Air Force wouldn't want to see is the B-2's history in Congress. Originally slated for more the 70 bombers, the program costs spiraled as the end of the Cold War approached, and the program was terminated with only 21 Spirits constructed. One was later destroyed in a crash. (See story on page 24)

The Air Force is aiming for 100 B-21 Raiders at \$550 million each in 2010 dollars. Both Hunter and Warden said the program is on schedule and on budget but declined to update the current per-aircraft cost. **ND** —Stew Magnuson

ANALYSIS

The B-21 Raider's Critical Numbers Game BY STEW MAGNUSON

The Air Force's B-21 Raider is designed to prevail against robust air defenses, deliver precision weapons on targets deep in enemy territory and return its two-man crew safely home.

But a bigger challenge as the program moves forward is whether the program can prevail in the yearly Defense Department battles over funding, keep its costs down and deliver the 100 aircraft the Air Force says it needs to maintain its edge over adversaries.

Air Force and Northrop Grumman officials at the B-21 roll-out ceremony in Palmdale, California, gave an upbeat assessment of not only the program's current costs, but how much funding it will require in the future.

Andrew Hunter, Air Force undersecretary for acquisition, technology and logistics, told reporters that so far, the program is "tracking well" on cost and schedule.

"One of the key aspects of this program is that we had a very firm cost target. That is a requirement for the program. And that will support our ability to deliver the number of aircraft we need to truly perform the missions that are outlined in the National Defense Strategy," he said.

The program kicked off 12 years ago with a requirement for 100 aircraft at a cost of \$550 million each in 2010 dollars. Officials say the current per-aircraft cost is classified, but with a cumulative rate of inflation of 36.7 percent, that comes to \$751 million per aircraft in 2022 dollars.

Maintaining steady numbers is critical to the Air Force as it divvies up funding for its own needs and engages in the yearly food fight with the Navy, Army and Marine Corps for finite taxpayer dollars to fund their priorities.

And there will be many budget battles in the coming years that will put pressure on the B-21 program.

Jet fighters have their own advocates within the Air Force, which is trying to build out its F-35A Light-

ning II, field the F-15EX, maintain its legacy fleets and develop a sixth-generation Next Generation Air Dominance fighter.

Bombers are part of the nuclear triad along with submarines and intercontinental ballistic missiles.

All three are being modernized and replaced with completely new systems over the next decade, with the Air Force in charge of the Ground-Based Nuclear Deterrent ICBMs as well as upgrading the nuclear command and control infrastructure that ties the triad together. The Navy is building 12 Columbia-class ballistic missile submarines.

Meanwhile, the Navy's ultimate goal is to operate as many as 372 ships, the Army has a big modernization push and the Marines are retooling for 21st century

conflicts in the Indo-Pacific.

In short, the B-21 Raider will have a lot of competition for Defense Department dollars over the next decade.

And cutting the 100 number is no solution, as retired Air Force Col. Chris "Jekyll" Brunner, senior resident fellow for airpower studies at the Mitchell Institute for Aerospace Studies, succinctly put it in a recent podcast.

The B-2 Spirit stealth bomber, which Northrop Grumman also developed and manufactured, shows how the Air Force ended up with a \$2 billion apiece aircraft, he said.

The service was supposed to acquire 132 B-2s, but out-of-control costs and the end of the Cold War prompted Congress to cut their numbers.

That put the program in a death spiral.

Brunner said cutting aircraft numbers is counter-intuitive. "It increases the cost of the aircraft because you don't have a large enough fleet to spread costs over, so it makes it incredibly hard to modernize and sustain, driving up bills. And that's how you get a \$2 billion airplane," he said.

That's the predicament the F-35A jet fighter program finds itself in today as the Air Force wants to acquire about 72 A-models per year, but falls short, he noted.

"You're going to drive up sustainment costs over the long run because you're not buying the fleet size that you intended," he said.

"My greatest fear with the B-21 is we end up in a B-2 scenario," he said.

The Air Force had to settle for 21 B-2s — and after one of them crashed — now 20. They are being modernized, returning to the factory to be refurbished and updated every nine years.

But what of the Spirit's eventual fate? If history is any guide, the Air Force will eventually build enough B-21s to the point where it will want to retire the B-2 and probably its predecessors, the B-1 Lancer and B-52 Stratofortress.

But Congress won't allow it — finding some way to rationalize their existence — sticking the Air Force with ever-higher bills to sustain aging aircraft in the name of keeping jobs in their districts. **ND**

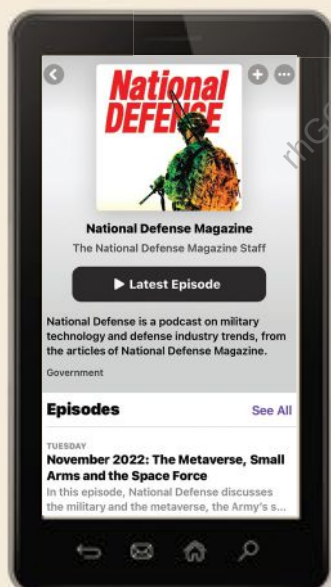
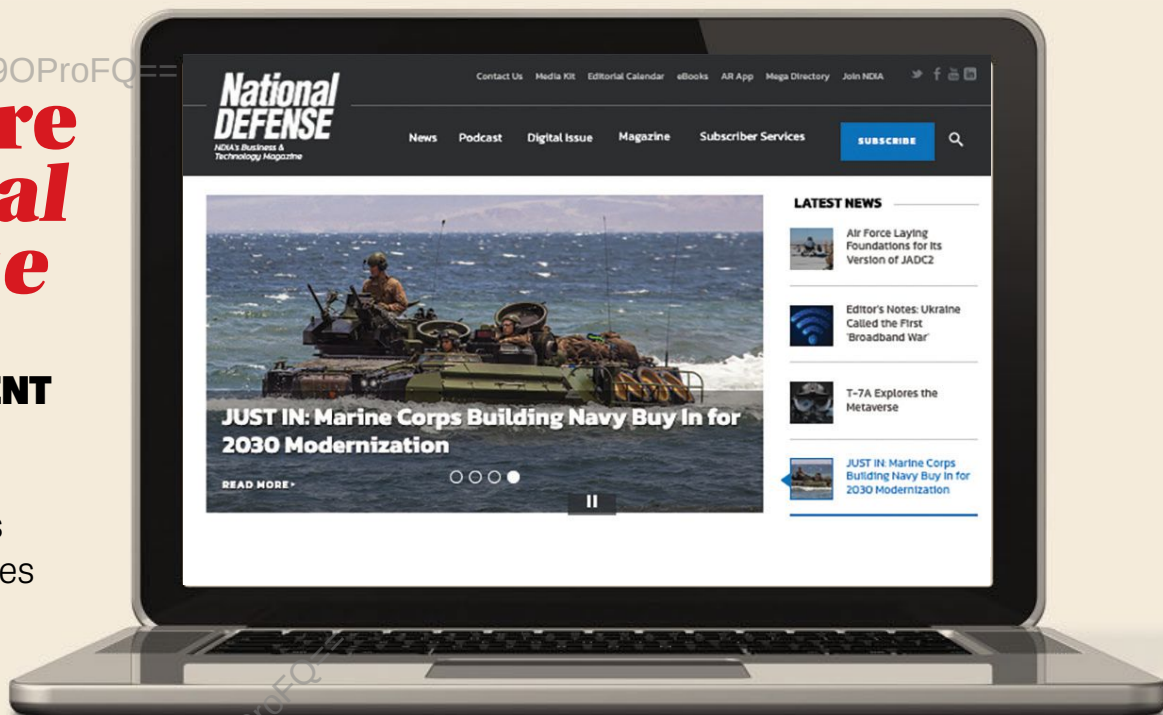


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Need for Speed

Air Force Labs Pursue More Powerful, Efficient Engines **BY STEW MAGNUSON**

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From engines cheap enough to be considered “expendable” on munitions, to rockets that can carry payloads to the Moon, the Air Force is constantly looking to improve its means of propulsion.

“Propulsion is a critical component of our quest to attain faster speeds, greater range, higher altitudes and improved power and thermal management capabilities,” Maj. Gen. Heather Pringle, commander of the Air Force Research Laboratory, said recently.

The service has several programs underway nestled under different organizations to improve the engines that power every size of aircraft from its smallest unmanned aerial vehicles to its heavy airlifters, as well as rockets and spacecraft, Pringle said at the Air and Space Force Association annual conference in National Harbor, Maryland.

“This is really a very exciting time to be in the propulsion world, and that’s no hyperbole,” said John Sneden, director of the Air Force’s propulsion directorate, which supports 10 major commands and 50 international partners.

“In order to be able to move further, we have to be able to transition our next-generation technology, we have to be able to update the performance capability of our legacy systems, and ensure that the warfighter has the readiness, has the capability to be able to go fly, fight and win,” Sneden said.

“When you hear that the lab in particular is drawing down some investments in the larger engines, that’s true, but it’s still a very exciting portfolio, and we are innovating truly at the edge,” he added.

The United States has long held the propulsion advantage over China, “and I’ll offer that our intent is to maintain that propulsion dominance,” Sneden added. Yet China is catching up, he said. If the Air Force were to do no research and development on propulsion, China would reach parity with the United States in a decade, he said.

“I will tell you that anytime you have

an advantage, it’s important to check your six. How fast is your adversary coming up behind you? What’s going on? We can’t keep living off the advantage. We have to always be innovating, always be moving forward,” he said.

“We also have to look at not only what China’s doing, but what’s happening within our own environment. What are we doing that’s contributing to the degradation of some of that lead? And I would offer to you that if you look in our labs, we don’t have any large engine [science-and-technology] efforts,” he said. The last fighter engine fielded was the F135 about 20 years ago, he said.

One line of research that the Air Force and other organizations, including the Navy and NASA, are looking into is rotating detonation engines, which create thrust by harnessing a series of explosions that are contained in a ring-shaped enclosure. The detonation waves — which are a result of the explosions — travel around in a circle within the engine rather than being expelled out of the back, as with a traditional motor.

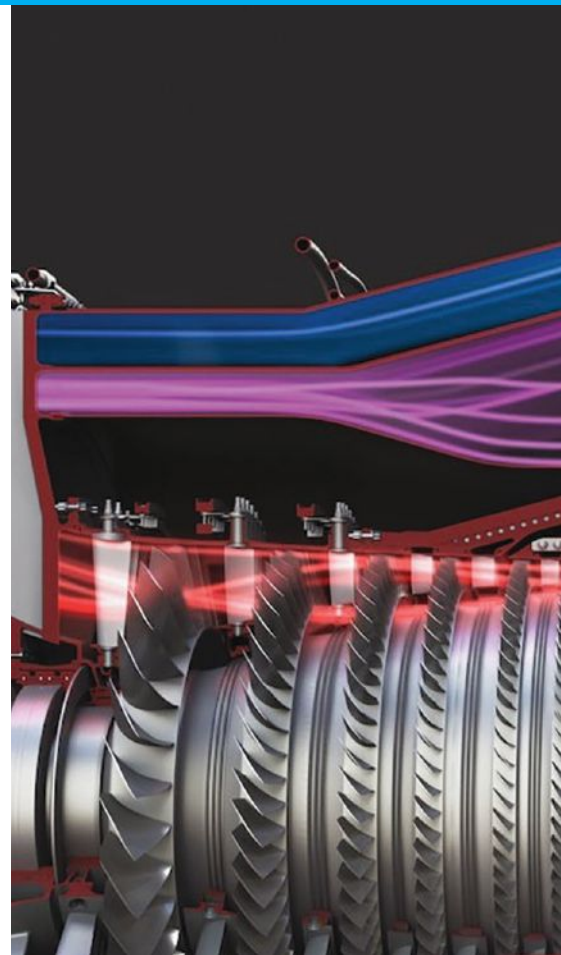
This creates efficiencies that can result in more power and longer ranges for both aircraft and rockets, said Mike Gregg, the Air Force Research Laboratory’s aerospace systems director in Dayton, Ohio.

“This is a significant leap ahead, especially where we want to go with things like long-range strike,” he said.

Rotating detonation engines could be anywhere from 5 to 25 percent more efficient, and with no moving parts in the combustion part of the engine, they could have smaller form factors, Gregg explained. “Or if you want to keep the same form factor, you can double your range,” he said.

The concept has been around since the 1950s, but digital engineering techniques are helping to quicken the technology’s development. Although, there is still a long way to go, he said.

One of the key problems is how to inject the fuel and air into the rotating cylinder. Historically, that solution may have gone through 12

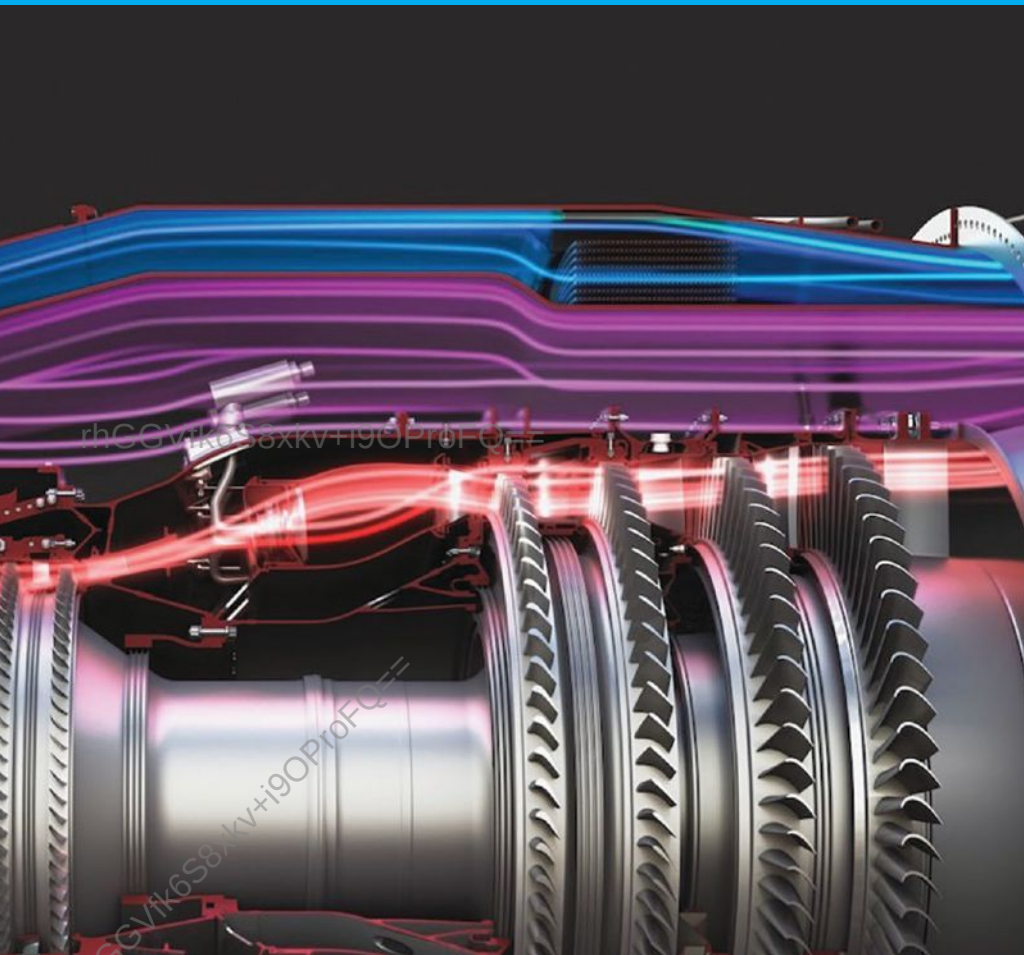


different designs, each of them taking a long time and requiring a lot of expensive material, he said.

“Now, we can use digital modeling to help us focus that cone of uncertainty. ... We can shrink the time. We can shrink the cost, and we can dive in on exactly what we need to do that much faster. This is a perfect example of how, once again, we’re using digital to really focus in on something that’s really exciting.”

A more well-known program is the adaptive engine transition program, or ATEP, which seeks to improve the performance of the F-35 joint strike fighter’s power plant. Contractor GE Aviation announced in September that it had wrapped up the ATEP’s development phase and was awaiting a decision from aircraft’s joint program office on whether it would proceed with the new engine, or go with Pratt & Whitney, which is offering upgrades to its existing engine — the F135 Enhanced Engine Package.

Meanwhile, in September the Air Force made some moves toward developing larger engines when it awarded contracts worth some \$4.9 billion to five companies to develop prototypes of an adaptive engine for its next-generation fighter jets. Gen-



eral Electric, Pratt & Whitney, Boeing, Lockheed Martin and Northrop Grumman all received an indefinite delivery, indefinite quantity contract worth up to \$975 million each to carry out the prototype phase of the Next Generation Adaptive Propulsion program.

The Air Force is keen on investing in fuel efficiency, which expands an aircraft's range, Sneden noted.

It "means that there is more time on station. It means that you can start your operations from farther out. It means that you have less tanker dependency. It means survivability, because we have better acceleration capability to get in and out of the fight, and it means that you have better power and thermal management capacity to be able to feed those advanced mission systems that all the next generation weapon systems seem to have."

Such research-and-development investment "allows us to stay ahead of China. And China has a very specific focus of catching up to the United States, getting to propulsion parity, and exceeding our capacity," Sneden added.

The problem is a typical new engine program takes 10 to 15 years to develop, and that timeline is no longer acceptable, he said.

The answer is, again, digital engi-

neering, he said.

The new adaptive engine program will fully use such methods where the ATEP program could not completely take advantage of the techniques, which were still emerging when that program began.

As far as rocket engines, the commercial sector continues to be a dominant force. However, the Air Force Research Laboratory is still deeply involved in its technology development, said Shawn Phillips, chief of the lab's rocket propulsion division.

So-called "new space" companies such as SpaceX, Blue Origins and Rocket Lab USA have been driving innovation in the field for the past 20 years.

Phillips said the challenge at first was to make these commercially oriented companies turn their attention toward the Defense Department to help it with its challenges.

It had two things to offer them: launch pad infrastructure and the Air Force labs staffed with experts who had decades of experience.

Public-private partnerships have paved the way for companies to colocate in AFRL's space labs where they work on such items as non-toxic, or "green" propellants.

The Aerospike Rocket Integration and Suborbital Experiment, under the Affordable Responsive Modular Rocket portfolio, is the lab's R&D programs that seeks greater efficiencies for space-bound rockets.

Unlike today's engine nozzles, the aerospike nozzle expands as the rocket ascends and the atmospheric pressure drops, creating more efficiencies, and therefore more thrust.

The Affordable Responsive Modular Rocket program looks to do away with the many different components that comprise liquid-engine rocket boosters and upper-stages and simplify them into one system, with the aerospike nozzle serving as a key technology.

The goal is to reduce new engine development timelines and make the rockets more efficient, Phillips said.

"Propulsion, of course, is also important to our space domain operations as it takes extreme speed to escape the Earth's gravity and to get to those far-reaching orbits ... but it also helps us efficiently manage space operations once we're on orbit," Pringle said.

Once in space, satellites use propulsion to move from one orbital plane to another. However, they can only carry so much fuel and doing such tasks in space uses up finite resources.

Tackling this problem has become known as "maneuver without regret," Sneden said.

"Maneuver without regret' gives you the tools — that propulsion capability — that allows you to go where you need to go without saying, 'I just lost three years of my satellite life,'" he added.

Sneden said it's important that the United States continues to invest in advanced propulsion programs such as these so it can maintain its industrial base.

"That investment in propulsion means that you're helping maintain a viable propulsion industrial base. ... Our engine [original equipment manufacturers] are not going anywhere. They're all well maintained by the commercial market," he said.

"But what we're keenly focused on is that advanced propulsion space and how we maintain it," Sneden said.

Meanwhile, "I'll offer to you that there are more countries that can produce a nuclear weapon than can produce an advanced propulsion system," Sneden added. **ND**



Ready for Launch

Small Agency Blazes Trail For New Space Architecture

BY JOSH LUCKENBAUGH

The Space Development Agency is trying to live up to its motto — “Semper Citius,” or always faster — as it integrates with the Space Force and ramps up acquisition for the service.

The agency officially became part of the Space Force in October 2022. Through its acquisition strategy that prioritizes delivery speed over cost and performance, the agency is looking to transform how the service procures and fields new technologies and capabilities from the inside out.

Creating change has been a focus for the Space Development Agency since its inception in March 2019, said the agency’s director Derek Tournear.

“We were established outside of what was the Air Force — there was no Space Force back then — for one reason and one reason only, and that was to come up with a completely new way to do space architecture that disrupted the status quo,” he said during a recent keynote address at the Mitchell Institute Spacepower Security Forum.

The SDA modeled itself off the book “The Innovator’s Dilemma” by Clayton Christensen, “which essentially says ... you cannot have disruption from within, it really has to happen from outside,” Tournear said.

The agency has led the Defense Department’s efforts to develop the

National Defense Space Architecture, or NDSA, a proliferated system of satellite constellations primarily in low-Earth orbit to provide warfighters beyond-line-of-sight targeting of mobile objects such as ships and advanced missiles in flight.

Demonstrating this increased capability to track and alert soldiers to vehicles and missiles will help U.S. forces deter aggression and prevent future conflict, Tournear said.

“Once you can demonstrate that we have these capabilities ... that will prevent war, because everyone will see that and see how rapidly we can employ those capabilities and know that if they choose to actually engage in the United States, then we will be able to defeat them,” he said during a panel discussion at the Air and Space Forces Association’s annual conference in National Harbor, Maryland, in September.

To put the new spacecraft in orbit as soon as possible, the SDA introduced an acquisition strategy called “spiral development,” fielding capabilities in two-year stages called tranches.

“We are not going to take 10 years to field a constellation, 10 years to field a capability,” Tournear said. “We’re going to start with a minimum viable product, and we’re going to field that and increase that capability every two years by hook or by crook, get those new capabilities up there.”

Rather than wait for the best platform possible, the agency incentivized solutions that maintain the architecture’s rapid fielding schedule over cost and performance, he said.

“The spiral development approach only works if you can keep that ... model of delivering these capabilities on time,” Tournear said. “The better product that’s sitting on the ground when you go to war is not helpful. That’s our unofficial motto ... ‘better is the enemy of good enough.’”

This rapid acquisition strategy, with competition for contracts every other year, relies heavily on industry to continue providing the necessary capabilities, he said.

“So in a sense, I am supplementing ... SDA’s budget with [industry’s] internal research and development dollars to make products that then you can sell back to the government,” Tournear said.

Spiral development was not “an easy concept for folks within the Pentagon to grasp,” he said. SDA has faced some delays, but the agency remains committed to its approach.

The initial Tranche 0 launch was originally scheduled for September 2022, but as vendors identified challenges to the “aggressive delivery schedule,” it was pushed to December 2022 and then again to March 2023 “after careful analysis and with input from our performers,” an SDA

spokesperson said in an email.

“SDA built in some launch flexibility to account for risks,” the spokesperson said. “We anticipate all Tranche 0 satellites will be flying in time to participate in critical capability demonstrations including military exercises in summer 2023 and missile targeting demonstrations in 2024.

“SDA is confident our spiral development model works, while the learning process provides SDA the opportunity to grow our relationship with industry and apply Tranche 0 lessons to future tranches,” the spokesperson added. “SDA is not backing off on speed, as we still believe schedule is king.”

The Tranche 0 satellites were less expensive than expected, Tournear said.

Tournear anticipated SDA would pay as much as \$25 million per satellite, but the average price for Tranche 0 satellites landed at about \$14 million. They “came in below what I thought, so that [gave] a lot of people confidence,” he said.

Tranche 1 satellites — which are expected to launch in 2024 and 2025 — have cost just under \$14 million per unit while increasing capability from Tranche 0, he added.

As long as the agency doesn’t try to push ahead of what industry can develop, it can receive affordable price points, Tournear said.

The Space Development Agency is now part of the Space Force, which is also trying to improve upon traditional Defense Department acquisition practices. In its April 2022 report, “Space Acquisitions: Changing Environment Presents Continuing Challenges and Opportunities for DoD,” the Government Accountability Office noted the creation of the Space Force “will consolidate leadership, planning, and management for selected DoD space programs.”

That said, “Only time will tell if Space Force ... will be able to address the long-standing concerns raised by [the Government Accountability Office] and others including historical fragmentation in space acquisition leadership,” the report added.

“There’s a track record of being late on programs. We have to turn that track record around and actually execute,” said Assistant Secretary of the Air Force for Space Acquisition and Integration Frank Calvelli, who assumed the role in May.

In a memo sent to the Space Force’s

acquisition workforce in October, Calvelli outlined nine acquisition tenets to ensure “timely delivery of space capabilities,” he wrote.

Several of the tenets directly aligned with the Space Development Agency’s spiral development strategy, such as building smaller satellites, maintaining stability in programs and executing and delivering capabilities that work, on schedule and on cost.

“The traditional ways of doing space acquisition must be reformed in order to add speed to our acquisitions to meet our priorities,” Calvelli said in the memo.

Another tenet was avoiding overclassification, which makes many programs “top secret,” a problem that has hindered the delivery of space capabilities for a long time, said Gen. David “DT” Thompson, vice chief of space operations.

“Security remains probably one of our biggest challenges, and ... while we own the ability to change it, we just have some form of bureaucratic inertia that will not let us do so,” he said during a keynote address at the Mitchell Institute Spacepower Security Forum.

Senior leadership in the Defense Department, including Deputy Secretary of Defense Kathleen Hicks, is “very focused on streamlining and hopefully ... normalizing that structure,” he added.

Thompson went on to commend the Space Development Agency for its acquisition strategy.

“They have found a way to use law and regulation to move out rapidly and field capabilities,” he said. “They have demonstrated that [Federal Acquisition Regulation] and statute are not the problem. If we will simply empower and use them the way we should, we can do what we need to do.”

Calvelli also expressed his support of the SDA’s spiral development method for acquisition.

“I am generally excited about their approach to [doing] business,” Calvelli said during the AFA conference. “They are building small, they are doing things on two-year centers, and they are delivering capabilities faster. And I actually think that’s a model that we can take advantage of and actually push across the organization, across the other PEOs, and something we can learn from.”

One of the Space Force’s other acquisition arms, Space Systems Command, has already taken a cue from SDA in its plans to acquire

missile warning and tracking satellites for a medium-Earth orbit network, Tournear said during a media roundtable at the conference.

Space Systems Command is “following the model of spiral development and this two-year timeframe to get things up and operational,” Tournear said.

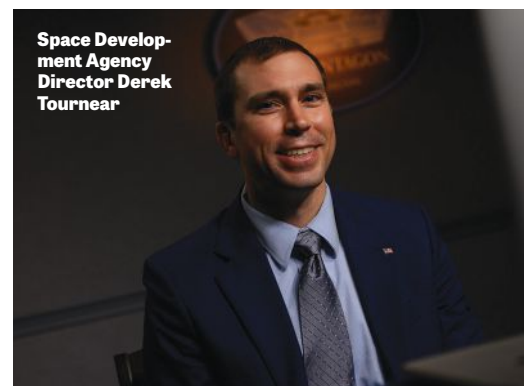
The two-year stages, called “epochs,” in Space Systems Command’s missile-warning constellation will be a year behind the NDSA satellites, he added.

“You’ve got Tranche 1, Epoch 1, Tranche 2, Epoch 2 in perpetuity until we get these constellations up there and delivering to the warfighter,” Tournear said.

Space Systems Command adopting spiral development shows that this acquisition strategy has “really taken hold” within the Space Force, he added.

Despite initially wanting the Space Development Agency to remain outside of the Space Force until 2025 when the Tranche 1 satellites would all be launched, the desired “disruption actually occurred more quickly,” thus allowing the agency to become part of the service in 2022, Tournear said.

“What we were proposing to do at SDA was clearly outside, was clearly disruptive and ... a lot of people were worried that we were basically proposing this and promising



Space Development Agency Director Derek Tournear

too much,” he said. “The prevailing thought [now] is: this is the new architecture. We have to get to this proliferated architecture, and you know what, we have to get to this faster spiral development approach.”

“The Space Force going forward is ... all in on this new model. Let’s push forward. Let’s make SDA a success because that is the success for the Space Force,” he said. **ND**

REPS AND SETS

Marines Marching Ahead On Virtual Training Program

BY SEAN CARBERRY

ORLANDO, Florida — In 1805, U.S. Marines battled Barbary pirates on the shores of Tripoli. Today, Marines are engaged in a far more ambitious Tripoli campaign — an effort to build a live, virtual and constructive training environment — that officials say will take years to complete.

After more than a decade of concept development, the Marine Corps launched Project Tripoli in April 2022. It is a live, virtual and constructive training environment, or LVC-TE, that will “provide architecture and integrate, employ and train all of our advanced concepts and capabilities across our force and the joint force,” Lt. Gen. Kevin Iiams, commander of the Marine Corps’ Training and Education Command, said at the National Training and Simulation Association’s annual Interservice/Industry Training, Simulation and Education Conference in Orlando.

“We see a synthetic capability that blends all of our force-on-force training systems, our simulation and our simulators such that ... we’re not just training our individual Marines in our units, but we’re training decision makers with AI to the high-end,” he said.

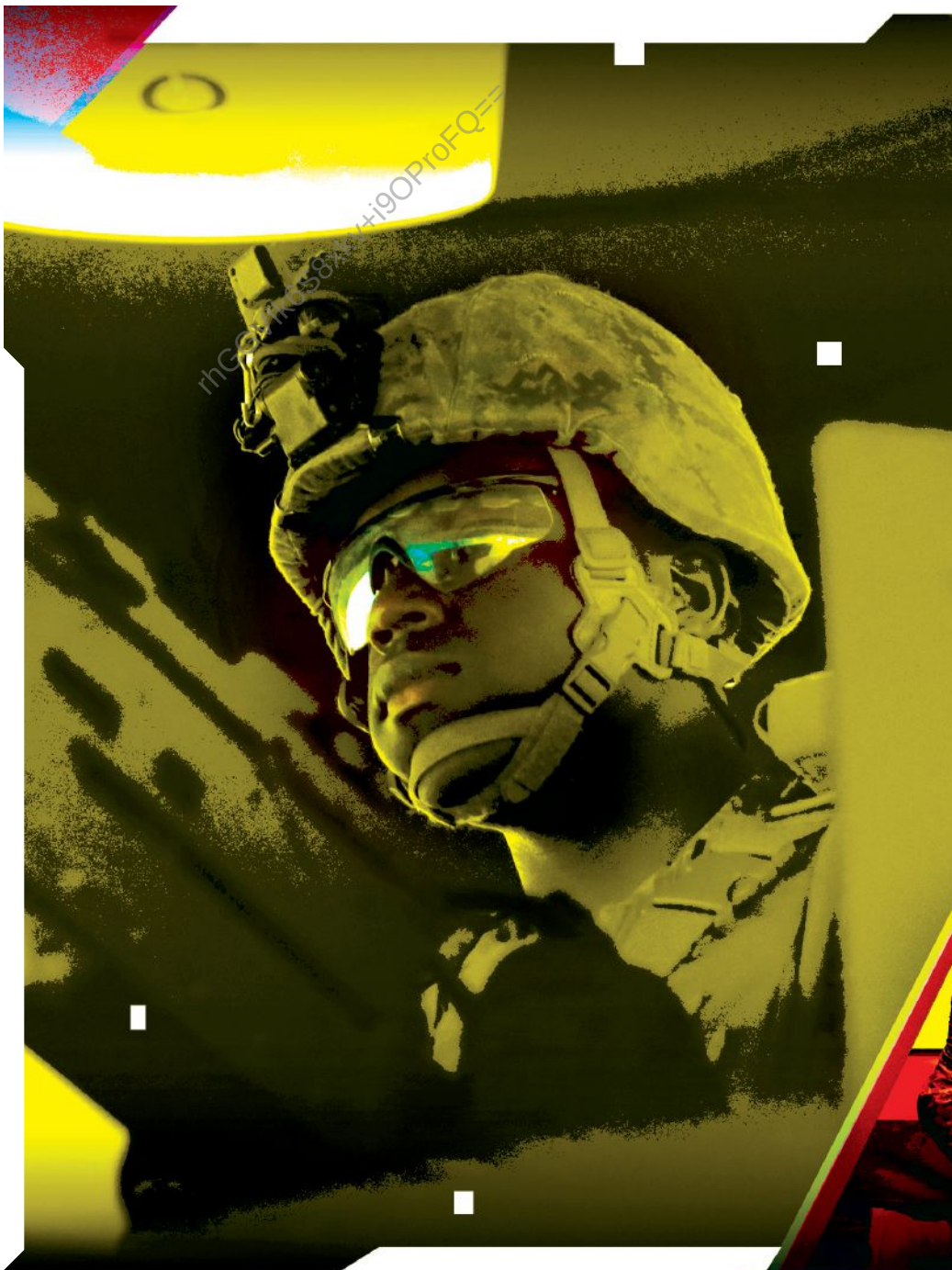
The objective is to train to the Marine Corps’ Force Design 2030 modernization plan, he continued. That plan seeks to reorganize, reequip and retrain Marines for the Indo-Pacific theater. Hence, training systems need to evolve, he said, so that “when we do have the next fight, and it is coming, that we’re actually going to be ready, relevant and capable for that fight.”

Given the present state of the Marine Corps’ virtual and simulated training systems, it will be a long march.

Currently, the service has a mix of legacy, non-networked, non-standardized training systems at facilities

around the world that allow Marines to get some “reps and sets” in mission activities like convoy driving or small arms training, Lt. Col. Marcus Reynolds, program manager training systems, said in an interview.

“With LVC-TE, we’ll have the ability to connect [Marines] into the same environment,” he said. “So, you can take the next step for training — for not just getting some reps and sets — but maybe you can start supporting an operation and connect multiple convoy trainers or driver trainers into a convoy and drive supporting a unit that’s in Twentynine Palms while they are in other parts of the nation or overseas.”



The end goal is a common operating environment and modern simulations that can link forces around the world into real-time exercises the way video games like Fortnite do, he said. Based on what his team saw at the conference, much of the technology that could support connected, multi-domain LVC training is already out there.

"There's some really good niches where they've done some really good stuff, and they've kind of incorporated everything from the individual warfighter ... even up to a platoon and company level," said John Taylor, deputy program

manager, training systems.

"But again, you get to, 'Okay, that looks really good at this level, how scalable is it? Can it be big?'" he continued. There are other challenges, he noted, such as networking aviation simulators, developing cross-domain connectivity and dealing with latency.

"I think we've done a lot of market research this year, and it's been pretty eye-opening of some of the capabilities some of these companies have got out there right now," Reynolds said. "And they're interested in partnering with the [Defense Department], which is great."

However, it's not that simple.

MARINE CORPS

"Now, to get everything that they have, that we would love, that's going to cost quite a bit of money, so we had to do it economically," he said. The budgeted approach is iterative — take incremental steps to update and connect existing technology rather than purchase a new environment and platforms.

Like something out of Star Trek, the first major step of LVC-TE is creating a universal translator that can link together legacy simulators that were built with dif-

"We see a synthetic capability that blends all of our force-on-force training systems ..."



ferent source codes, he said.

"It will translate that code and data into a common operational picture, which eventually will also add in layers of assets of our red force that's simulated, sort of bringing in the constructive part of LVC-TE," he said.

In addition to developing the translator, the Marines are working on upgrading outdated tools like the Marine Air-Ground Task Force Tactical Warfare Simulation.

"We have a program that right now that's with the Air Force office that's basically upgrading the code on that," he said. "With that, we're doing the architecture modernization, hardware reduction, database optimization, algorithm optimization and then improving the user's experience."

That will allow it to network with other simulations through the translator and facilitate more complex virtual training in the short-term, he said. Eventually though, the systems that are part of the "initial federation of legacy systems" will retire, said Taylor.

"We have a plan to transition from the legacy to the open system architecture ... so we don't get stuck where we're at now," he said.

Based on comments from Marines at the conference, the Tripoli transition can't happen nearly fast enough. Marines constrained by the limitations of existing ranges and training systems are eager for collective, virtual training.

Maj. Brent Birchum, operations officer in the 3rd Marine Raider Support Battalion, served in Iraq in 2017. He recalled a clearing operation against ISIS in Mosul with U.S. and Iraqi forces maneuvering with armed air assets.

"So, within that scenario, I thought it was probably the peak pinnacle of what a battlefield commander would have to balance out — that ability to collect, identify threats moving into the area in real time, while battle tracking and simultaneous clearing through the area," he said.

He subsequently worked with the Air Force Research Lab and Marine Corps Special Operations Command, which have simulator capabilities that can replicate much of what he experienced in Mosul.

"And where I think that there's a lot of opportunity for improvement is getting intelligence infused into that virtual environment," instead of having instructors

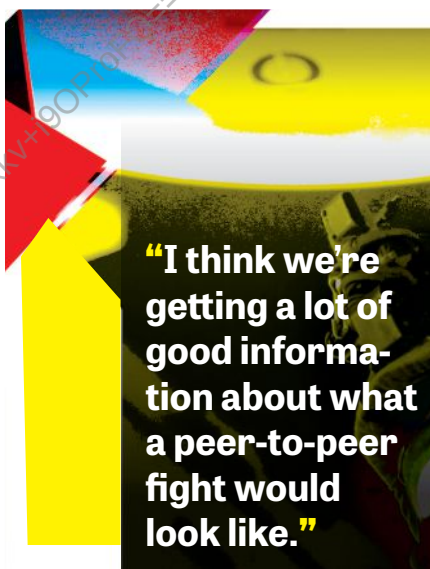
script and roleplay that, he said.

Developers need to be thinking about how to replicate intelligence reporting and concepts like target confidence into simulations, he said. "So, it's building out those layers of complexity for the training audience."

He likened current simulated training to a football team practicing drills from the 2-yard line. "You can get a lot of good reps and sets out of that," he said. But it would be better "to move the ball back to about the 50-yard line, where you're really having to develop that scenario for the commander to make those decisions," he said.

In addition to incorporating more intelligence tasks into simulations, there is a need to rapidly replicate operating environments, he said.

"I think we're getting a lot of good



information about what a peer-to-peer fight would look like. It's the ability to then replicate that in a virtual environment and then utilizing that in our wargaming efforts," he said.

Other Marines highlighted the need for networked, distributed and collaborative training since many current systems are single user.

"We know where we need to go and we know we've got a long way to go there," said Reynolds. "We're trying to get some small steps done so we can truly understand the potential and ... where the future requirement is saying that we need to be."

Project Tripoli will evolve through minimal viable capability releases under the software acquisition pathway, he said. The first was supposed to take place in fall 2022 but has been pushed back to April 2023.

"I know that our leadership wants us

to go a little bit faster," said Reynolds. "But we're probably at least a couple of those releases away from figuring out, are we on the right path?"

"And this first phase is really just the boring part," he continued. "Because you're really getting the code in there, doing the translation services, seeing the issues that you're running into."

That means the first demonstration of the capability is not going to be exciting, he said. "This would be like, 'Hey, this is where we're at, and this is all the things that we've learned, and here's the things that we think we need to bring into it to help us get to the next step.'"

The program is looking to purchase hardware in the fourth quarter of fiscal year 2023. It is currently funded under a task order within the Army Consolidated Product Line Management Plus Program. General Dynamics Missions Systems has an eight-year, \$883 million contract with the Army for that program.

In fiscal year 2023, Tripoli is set to receive \$9.4 million for research and development with another \$13.2 million set aside for procurement and investment, according to the program manager. Reynolds said that as of early December, the continuing resolution had not impacted progress on Tripoli. However, if it is extended, it could hinder future phases, he added.

Assuming the funding is stable — and the requirements remain stable, which has been a challenge so far, he said — the Marines will still have several challenges to sort through, ranging from ensuring the system meets latency targets to storing and managing the volumes of data that will be collected and generated by the training environment, he said.

The Marines must decide whether to host the system on the Navy's Continuous Training Environment, the Army's Synthetic Training Environment, or the Marine Corps' network.

The Marines are also keeping an eye on the other services as they march on Tripoli. They are regularly conducting engagements and reviews with the Army and Navy, he said.

"We're getting updates on where they're at with their programs, and they also see where we're at," he said. If one of the other services is in a better place with their live-virtual-constructive environment, "we will fully jump up and join them because we'll get there faster and maybe have a better product." **ND**

Undersea Threats



Navy Mine Warfare Teeters Between Present, Future

BY JAN TEGLER

Sea-based mine warfare is in a state of flux, suspended between decades-old, manned technologies and a long-promised future of multi-domain unmanned drones capable of finding and neutralizing enemy mines or covertly mining in deep and shallow waters.

Roughly 35 years after becoming operational, the Navy's two main legacy mine countermeasure platforms, its Avenger-class minesweeper ships and its MH-53E Sea Dragon helicopters, are in short supply.

Eight of the 14 Avenger-class ships built remain in service, forward-deployed in Japan and Bahrain. According to Naval Air Systems Command, 30 MH-53Es of the 44 delivered remain in service with two squadrons, HM-14 and HM-15. But the Navy's number fails to account for the four MH-53Es severely damaged last July when a major thunderstorm tore across NAS Norfolk, tossing at least one Sea Dragon upside down.

Retirement of the minesweepers and helicopters has been planned for more than a decade, but operational delays for their primary replacement — the littoral combat ship and its mine countermeasures package — have moved out-of-service dates back again and again.

Navy public affairs officer Lt. Meagan Morrison said, "The Navy will comply with 2021 NDAA requirements before retiring legacy MCM [mine countermeasure] platforms. Those retirements are based on fielding expeditionary modular MCM capabilities and not on a target date."

Last March, Fincantieri Marine Systems North America was awarded a maintenance contract for the Avenger-class minesweepers. The contract could be worth up to \$78 million, according to Fincantieri Marine Group

director of communications Eric Dent, if the Navy takes up its option for four years of maintenance, suggesting that the ships may serve until 2026 or 2027.

The 20-year-old saga of costly missteps in the development of the littoral combat ship, or LCS, has been mirrored in some ways by the decade-plus development of the modular MCM package, one of two mission packages the LCS is to feature.

Six systems make up the package, including three airborne detection and neutralization systems fielded by MH-60S helicopters and MQ-8B/C Fire Scout drones, and three in-water systems including a mine hunting sonar, a minesweeping system operated from a common unmanned surface vehicle and an unmanned underwater vehicle capable of finding mines buried in the sea floor.

The Navy stated that the package was supposed to be fully operational by the end of 2022. But the sonar, Raytheon's AN/AQS-20C, only completed initial operational test and evaluation at the end of 2022. Morrison said initial operational capability for the MCM mission package as well as the mine hunting sonar is expected sometime this year.

"The program remains on track to deliver four MCM mission pack-

Mike Egan, branch head for mine warfare in the Office of the Chief of Naval Operations, said last May at the 2022 International Mine Warfare Technology Symposium of the Mine Warfare Association.

Those may include the Navy's expeditionary sea base ships, flexible vessels that also deploy expeditionary mine countermeasures companies. The companies are teams of explosive ordnance disposal sailors who deploy from shore and ships to detect, classify and neutralize mines.

Anthony Freedman, senior research scientist with the Center for Naval Analyses, is a "big fan" of the expeditionary companies. The teams, which include divers, operate rigid-hull inflatable boats and deploy the "Knifefish" underwater unmanned vehicle that is part of the LCS mine countermeasure package and "are relatively low signature, particularly if they're operating from shore," he said.

"That makes them relatively more flexible for MCM as opposed to an LCS, which has to basically sit in a box or position its systems where it can operate from," he said.

Morrison said the ships and sailors "will provide our Navy's MCM capability, together as a modular



ages with trained sailors in 2024," she added. "This timeline supports the planned retirement of the Avenger-class ships and MH-53E helicopters."

The service plans to buy 24 packages to equip 15 of the Independence-class LCS. That leaves nine mine countermeasure packages for potential use on "vessels of opportunity," as Capt.

force, replacing the legacy forces without a gap in MCM capability for the fleet commanders over the next three to five years."

But Freedman is concerned that these capabilities may not be effective in a contested environment, a view he said is shared by some in the Navy. "Our current and projected systems

[for MCM] are not really suitable for that environment, even though expeditionary MCM is probably the best capability in that environment.”

A range of mainly unmanned surface and sub-surface mine countermeasures sensors and neutralizers — which could add capability to the systems the Navy will field this decade — are still in development at the Defense Advanced Research Projects Agency, the Office of Naval Research and elsewhere.

Freedman said some of these technologies have promise but added that most remain years away from operational capability, unlikely to be fielded by 2030. And they don’t yet consolidate the functions of mine hunting and neutralization into one platform, he added.

“The way we do mine hunting is with a number of different systems that have to go back to the same location,” he said. “You detect them. You go back and you classify them, you identify them and then you have to neutralize them. Often you have to use different platforms, people or systems to do this.”

That can be effective for static mines, Freedman explained, but countering newer technologies such as mobile mines may require “a single detector/engage platform which could sense then go all the way through neutralization.”

“If you look at the LCS MCM package, it still has the older paradigm, different systems doing different things,” he said.

Morale is low in the mine countermeasures community because it hasn’t been well integrated with the Navy’s major commands. There are few MCM advocates among Navy and Marine Corps leadership because relatively few senior officers have experience with it, Freedman said.

“It has been somewhat neglected for a long time, forgotten about until something happens,” he explained.

The Navy is now reorganizing its mine countermeasure squadrons into task forces with members within each of the geographic combat commands. “I think that could be a step forward for

the community,” Freedman added.

As for placing mines, the Navy declined to comment. But it’s a mission that could give the service an asymmetric advantage in a conflict with China or Russia, according to Freedman.

Freedman said he’s not able to speak publicly about the Navy’s largely classified mining capabilities in his advisory role with CNA. But the service has a renewed emphasis on mining, with the Navy transitioning the mission from the surface fleet to commander, submarine forces, known as SUBFOR, he said.

That could fuel progress in fielding new types of subsurface-deployed mines like the Clandestine Delivered Mine or the Hammerhead moored anti-submarine mine to replace the Mark 67 Submarine Launched Mobile Mine the Navy has had in service since 1983. Last March, General Dynamics Mission Systems was awarded a \$92.9 million contract to deliver Hammerhead prototypes by 2023.

Transported to an area and released by an extra-large unmanned underwater vehicle like Boeing’s Orca, Hammerhead can lie in wait until remotely activated. Then, once it detects an adversary submarine, it can release a Mark 54 lightweight hybrid homing torpedo autonomously.

But a September 2022 report from the Government Accountability Office states that the effort to rapidly deliver five of the unmanned subs “is at least \$242 million or 64 percent over its original cost estimate and at least three years late,” with delivery now expected between February and June 2024.

In April 2022, the Navy’s Program Executive Office Unmanned and Small Combatants issued a request for information on its Mining Expendable Delivery Unmanned Submarine

Asset, a tactical clandestine mining system with an expendable unmanned underwater vehicle capable of being torpedo-tube launched from Navy submarines. The system consists of a medium-class unmanned, underwater vehicle, supporting equipment and payloads. The service has specified that four prototypes are to be delivered by fiscal year 2026 and wants industry feedback on development.

A Pacific Air Forces press release detailed a Navy mine exercise on Oct. 24 during which Air Force B-1B bombers from the 37th Bomb Wing flew from Andersen Air Force Base in Guam with 21 Navy-assembled Mark-62 Quickstrike 500-pound airborne mines aboard. Similarly, a 28th Bomb Wing B-1B dropped a 2,000-pound Mark-65 Quickstrike mine off the California coast in August.

Further development of the Quickstrike family of shallow-water mines appears to be underway. Derived from the Mark 80 series general purpose bombs, they’re adapted for mining via the installation of a nose-mounted arming device and a target detection device integrated in the bomb’s tail. The target detection device can detonate when a vessel passes within range of its position on the seafloor.

The Air Force declined to comment on the airborne mining mission. Maj. Joel Banjo-Johnson, chief of public affairs at Air Force Global Strike Command, said the service could not speak about airborne mining “because the Navy owns that mission.”

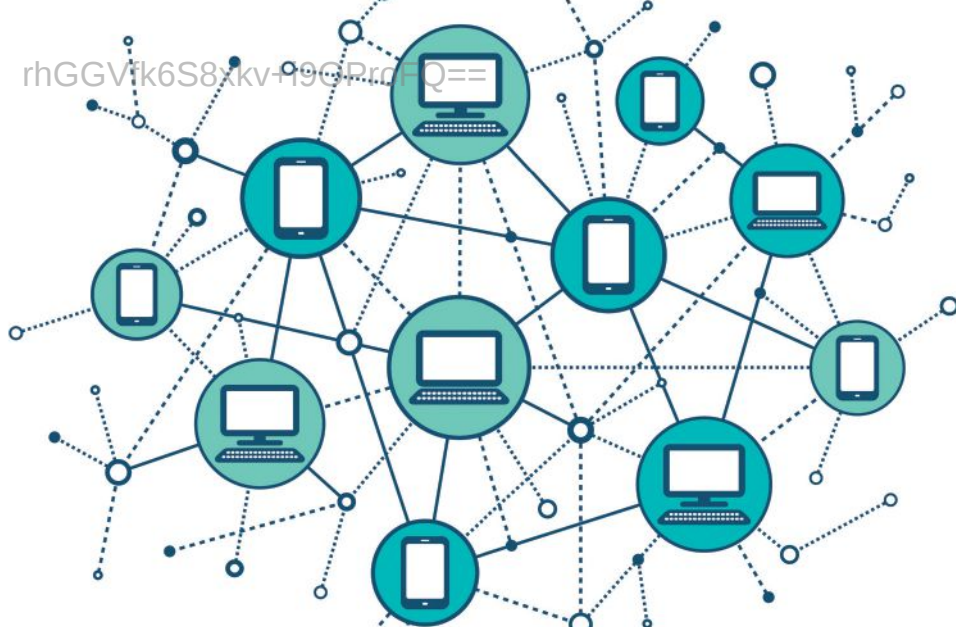
In September 2018 during exercise Valiant Shield in Guam, a B-52 tested a 2,000-pound version equipped with a joint direct attack munition-extended range kit. With the addition of GPS-guidance, the kit could allow aircraft dropping the mines to stand off as much as 50 miles. That would aid bombers or tactical jets. F/A-18s have also flown with Quickstrike mines in tests in a contested environment like the South China Sea.

But they would still be vulnerable to Chinese land and sea-based air defenses. That explains the remarks made by Capt. Chris Merwin, then head of the mine warfare division at the Naval Surface and Mine Warfighting Development Center, in a November 2019 U.S. Naval Institute News article.

“The future of mining will be [unmanned underwater vehicle] clandestinely launched mines. And that’s probably as much as I can say here,” he said. **ND**



LEFT: Avenger-class mine countermeasures ship USS Chief **BELOW: Mine countermeasure exercise**



Cyber Strategy

Pentagon Paves Road Map for Zero Trust by 2027 **BY MEREDITH ROATEN**

The Defense Department has finally laid out its plan for protecting its cyber networks after years of pledging to make it a commitment.

The Office of the Chief Information Officer released “The DoD Zero Trust Strategy” in November — which laid out metrics and deadlines for the department to achieve full zero trust adoption by 2027. Cybersecurity experts said the government and private sector should work together to leverage resources to successfully enter the new regime.

“Cyber physical threats to critical infrastructure really are one of our biggest national security challenges that we’re facing today, and that the landscape that we’re dealing with has gotten more complex,” Nitin Natarajan, deputy director at the Cybersecurity and Infrastructure Security Agency, said during a MeriTalk event in October.

Cyber attackers have more resources than they have in the past, and it’s less expensive to do a lot of damage to an unsecure system, he said. It’s not just lone wolf hackers, but nation states and cyber terrorists who can pose a threat.

For example, the 2019 SolarWinds cyber attack, which swept past the defenses of thousands of organizations, including the fed-

eral government, has been linked to Russia-backed operatives.

The new strategy’s basic tenet is that treating organizations’ security like a moat around a castle doesn’t keep out bad actors.

“Mission and system owners, as well as operators, increasingly embrace this view as fact. They also see the journey to [zero trust] as an opportunity to affect positively the mission by addressing technology modernizations, refining security processes and improving operational performance,” the document said.

Zero trust culture requires every person within a network to assume that it is already compromised and requires all users to prove their identities at all times.

The strategy lists technologies that can help cultivate a zero trust environment such as continuous multi-factor authentication, micro-segmentation, advanced encryption, endpoint security, analytics and robust auditing.

While these various technologies can be used to implement this basic premise, it essentially means that “users are granted access to only the data they need and when needed.”

The strategy revolves around four pillars: accepting the culture of zero trust, operationalizing zero trust practices, accelerating zero trust technology and department-wide integration. The strategy notes

that while IT departments across the Pentagon may need to purchase products, there is no one capability that can solve all their problems.

“While the objectives prescribe ‘what’ shall be done in furtherance of the goal, they do not prescribe ‘how,’ as DoD Components may need to undertake objectives in differing ways,” the strategy read.

For the technology pillar, the Pentagon’s zero trust strategy calls for capabilities to be pushed out faster while reducing silos. Capabilities that promote simpler architecture and efficient data management are also important, according to the document.

While many methods can be used to authenticate users, the integration pillar calls for creating an acquisition plan for technologies that can be scaled department-wide by early fiscal year 2023.

One technology development already underway is the Thunderdome, a \$6.8 million contract awarded to Booz Allen Hamilton earlier this year. The technology would protect access to the Secure Internet Protocol Router Network, the Pentagon’s classified information transmitter, according to a Defense Information Systems Agency press release.

It won’t be possible to completely retrofit every legacy platform with technology such as multi-factor authentication, the strategy points out. However, the services can implement safeguards for these less modern systems in the interim.

The securing information systems pillar will also require automating artificial intelligence operations and securing communications at all levels.

Automating systems is an important part of zero trust, said Andy Stewart, senior federal strategist at digital communications company Cisco Systems and a former director at Fleet Cyber Command/U.S. Tenth Fleet. If the processes behind zero trust don’t work well, people can struggle to use the technology and adopt the zero trust mindset.

“Zero trust is about raising the security, but it also means, ‘How do I operate more efficiently?’” he said. “The user experience should get a vote.”

While the strategy marks a turning point for the effort, the Pentagon started down the road of zero trust years ago. Its 2019 Digital Modernization Strategy mentioned that zero trust was an emerging initiative concept it was “exploring.”

Accepting more rigorous cybersecurity measures through the zero trust mindset is something the Marine Corps has been working on through education and raising awareness, said Renata Spinks, assistant director and deputy chief information officer of information, command, control, communications and computers and acting senior information security officer.

"We spend a lot of time educating, because if people know what they're doing and why they're doing it ... it has been my experience that they will get on board a whole lot sooner than resisting," she said.

The 2021 zero trust mandate from President Joe Biden's administration was "a godsend" because it gave justification for personnel inside the Marine Corps who may not have understood the necessity of some of the IT initiatives, she said.

A successful zero trust implementation will reduce threats to some of the most critical types of capabilities that warfighters will be relying on in the

a service data officer who could use input from contractors about how much access the military will need to figure out the best ways to classify and manage the service's data, she noted.

Having access to secure data anywhere will help military members and personnel in the defense industrial base who are working outside of business hours and in remote locations, according to the Pentagon's strategy.

The push for zero trust is different from some cybersecurity initiatives because it has muscle behind it, Spinks added. Leadership has provided policies and procedures and are willing to be held accountable, she said.

"Cybersecurity is not an inexpensive venture. But I think what truly drives it is the vicious adversary and all of the activity across not just the federal government, but even at the state and local levels," she said.

Better cybersecurity practices will also be needed to secure supply chains, Natarajan noted. Making them more resilient, especially in critical technologies such as semiconductors, has been a focus at the Pentagon in recent years.

"We know that this is being used by malicious cyber actors really to exploit a lot of third party risk after going after an organization's supply chain," he said.

That's another reason why the government can't work alone, he added.

"As we look at this, we're looking at this not just from a sector perspective but also looking at this from national critical functions," he said.

CISA released cybersecurity performance goals for companies

to measure themselves in October. Though the performance goals don't cite zero trust specifically, the goals are intended for companies to use regardless of their size.

"We're really looking at these to be that minimum baseline of cyber protections that will reduce the rest of critical infrastructure operators," he said. "But at the end of the day, by doing that we're also impacting national security and the health and safety of Americans throughout the nation."

The private sector in turn needs the government's invest-

ment in education and resources to build up its cyber workforce.

"Cyberspace involves not just the hardware and software, the technology, your tablets, your iPhones, your technology, but it involves people. People developed cyberspace. People use cyberspace. We are in cyberspace," Kemba Walden, principal deputy director of the National Cyber Director's Office, said during the MeriTalk event.

Not yet at full operating capacity, the National Cyber Director's Office was established in 2021 to take the lead on cyber issues at the federal level, including the first national cybersecurity strategy.

Just as important as the broad strategy will be the national workforce and education document that will be released after the cybersecurity strategy, Walden said.

"We took a look and recognized that 700,000 or so U.S. jobs with the word cyber in it are left unfilled," she said. That number comes from market research firm Lightcast's 2022 report based on 2021 data.

"As a national cyber and national security lawyer, that frightens me," she said. "That is a national security risk from my perspective."

In recent years, organizations such as Joint Cyber Defense Collaborative and the National Security Association's Cybersecurity Collaboration Center have sprung up to gauge the needs and collect feedback from large enterprises, she said.

"Those are the types of collaborative efforts that I think are necessary in order to evolve public-private collaboration and information sharing overall," she said.

Ultimately, the benefits of zero trust trickle down to the warfighter, according to the document.

For example, the Pentagon's joint all-domain command and control effort — which aims to link sensors and shooters while using artificial intelligence to make decisions — relies on that data being secure. If it falls into the wrong hands, military leaders can't achieve information dominance, the strategy notes.

"We need to make certain that when malicious actors attempt to breach our zero trust defenses; they can no longer roam freely through our networks and threaten our ability to deliver maximum support to the warfighter," Chief Information Officer John Sherman said in the strategy. **ND**



An airman makes in-person visits to configure switches that enable remote work.

future: cloud, artificial intelligence and command, control, communications, computer and intelligence.

The military needs the help of defense contractors to protect sensitive data, Spinks noted. Industry can help the military's IT personnel understand how to work with the type of data that they will be providing and to how much the military will need access.

"Zero trust will not be zero trust successfully if we don't get help in managing identities," she said.

The Marine Corps recently hired

Next-Gen Comms

Pentagon Leveraging 5G To Fight in Electromagnetic Spectrum **BY MIKAYLA EASLEY**

Whether it's to look up funny cat videos or operate a robotic system using wireless internet, 5G has become a staple in the everyday lives of many.

But for the Pentagon, the communications technology has become a key enabler for another more critical function — the ability to harness the electromagnetic spectrum for operations.

A significant amount of military weapon systems and applications depend on the electromagnetic spectrum — the range of frequencies or wavelengths of electromagnetic energy — to operate, according to a Congressional Research Service report published August 2021.

The spectrum supports military operations today by linking wireless communications, satellites, signal intelligence and radar technologies that support situational awareness and electronic warfare, said the report, titled “Overview of Department of Defense Use of the Electromagnetic Spectrum.”

To ensure the United States maintains its advantage over adversaries across an increasingly complex, congested and contested electromagnetic spectrum, or EMS, the Defense Department released its Electromagnetic Spectrum Superiority Strategy in 2020. It called on the department to develop capabilities and policies that support electromagnetic spectrum operations — coordinated actions to exploit, attack, protect and manage the electromagnetic environment.

“In modern warfare, EMS superiority is a leading indicator and fundamental component of achieving superiority in air, land, sea, space or cyberspace,” the document said.

One of the emerging technologies the Pentagon believes will give

a decisive edge on future battlefields — especially for electromagnetic spectrum operations — is the fifth-generation wireless network known as 5G, said Tom Rondeau, principal director for FutureG and 5G at the Pentagon's Office of the Undersecretary of Defense for Research and Engineering.

“It's not just about the spectrum. It's not just about the radio at the edge. It's about the network and the control of that radio surface, and that becomes a really powerful tool for us to use,” Rondeau said during a panel discussion at the Association of Old Crows annual symposium in Washington, D.C.

The power of 5G comes from its ability to leverage higher frequencies on the electromagnetic spectrum as well as the mid- and low-range frequencies accessible by its predecessor 4G. The addition of high-range frequencies allows the department to transmit vast amounts of information — such as critical communications needed for operations at the edge or sensor data — at a faster speed and lower latency, while maneuvering around the spectrum to perform actions on the best-suited frequency.

Rondeau compared 4G to a highway during rush hour — slow and congested with traffic.

“You want to differentiate your services. You want to have access roads and other highways and local roads and driveways,” he said. “And that's what 5G starts to allow us to do — differentiate those services and split off those resources in a way that allows you to customize the network to your application.”

Another benefit of 5G is the additional flexibility it provides to users through technologies like network slicing, Rondeau said. Because of 5G architecture's design, operators can “slice” parts of the 5G network and create a separate, iso-

lated and secure network that is tailored to an application's needs.

Those tailored networks can supply the Defense Department's demand for unique network requirements among its variety of platforms, he said. In the past, organizations have had to create purpose-built networks from scratch for individual platforms or adhere to requirements for shared networks like Link 16, he noted.

“5G is going to allow us to pull that together and help us craft those different resource services — the network for bandwidth, latency, quality-of-service demands — per application,” he said.

The Pentagon has recognized the importance of 5G and its potential contributions to electromagnetic spectrum operations. In December 2020, the department released a separate 5G strategy implementation plan that outlined how it would accelerate its development — both for domestic platforms and those of U.S. allies and partners.

Since the strategy's publication, the Pentagon has awarded contracts for 5G testing and experimentation at 16 locations across the country, according to a department press release.

Likewise, Congress authorized \$120 million more than the Biden administration's request for 5G technology development, experimentation and transition support in the 2023 National Defense Authorization Act.

The Defense Department will also be able to operate on the spectrum globally by utilizing the 5G infrastructure of the United States and its allies, according to the Pentagon's 5G strategy implementation plan. These could be private, hybrid or public networks, the strategy noted.

For global operations that require using non-department spectrums, the Pentagon plans to use 5G tech-

nologies “such as end-to-end network slicing and adaptive techniques such as dynamic spectrum utilization to enable DoD to achieve the capability necessary to accomplish the mission,” the strategy read.

Marine Corps Maj. Ben Pimentel, communications officer and electronics engineer, said the ability to conduct electromagnetic spectrum operations alongside a host nation’s normal network traffic gives them an upper hand during “gray zone” missions before full-scale conflict operations.

During this window, Marines are looking to “provide complication and thought for the adversary,” he said at the symposium. “Blending into normal traffic can be really useful.”

“Operating across host nation’s 5G infrastructure, that we’re allies or partners with, it’s going to put our traffic alongside there,” he added. “If an adversary wants to take actions against that, they’re also going to be taking actions against our ally’s network — and potentially harming their own communications.”

However, the United States and its allies aren’t the only nations harnessing 5G for electronic warfare. As the spectrum becomes more accessible across the world, adversaries such as China gain the capability to exploit security vulnerabilities against the United States, noted the Pentagon’s 5G strategy.

“The complexity and diversity of 5G networks offer a wide range of potentially disruptive options to an adversary,” it read. The Pentagon could be at risk of an adversary hacking the network or intentionally jamming communications, it noted.

While operating 5G for electromagnetic spectrum operations has security risks, the network itself is designed with security measures built in at every layer, said Sheryl Genco, senior advisor at global telecommunications company Ericsson. As a developer of 5G communications, the company works with the Defense Department and commercial communications regulators.

“It’s very analogous to what is done on a base,” she said during the discussion. “First, you have your perimeter defense. Then you have little rings [of] defense around buildings ... on the base. And then you have ... security officers roaming. And that’s

exactly what the network has.”

Furthermore, every layer of defense in the 5G network is reinforced by a zero trust architecture, she added. The cybersecurity framework requires all users and data to be authenticated and approved after every digital interaction.

“This authentication process ... on every step of the way across the network is going to make it more secure,” Genco said. “And then, on top of it all, there’s new concepts that can make your network or make your end-to-end security more robust — one of those things is network slicing.”

But military adversaries aren’t the only entities on the electromagnetic spectrum that the Defense Department needs to worry about.

The need for advanced communications technologies in the consumer world has caused a growing demand for multiple frequency bands previously reserved for federal agencies, the 2021 Congressional Research Service report noted. With more commercial companies crowding into 5G, there is the possibility that they could disrupt military operations, it read.

The Pentagon and commercial partners are looking into spectrum sharing policies and technologies that will allow both the defense and commercial sectors to share bands on the electromagnetic spectrum without interference.

However, policymakers and stakeholders have been talk-

ing about spectrum sharing for decades, trying to align the incentives of both the commercial and federal sectors, Rondeau noted.

“We don’t have the same incentives, and we never will have the same incentives. I don’t think that that’s the solution” he said. “I would rather go at it like, ‘How do we actually make coexistence feasible? How do we build technologies that can enable coexistence and overcome some of these issues?’”

While multiple federal and commercial agencies are still understanding what the policies and standards for spectrum sharing should be, Pimentel emphasized that “technology solutions for spectrum sharing may alleviate some of that.”

Even though 5G is still a developing technology, the Pentagon and industry are already looking forward to the future generations of communications — such as 6G or FutureG — and their use cases for electromagnetic spectrum operations.

Next-generation networks could lead to better integrated sensing and communications, Pimentel said. As the need and technology for 5G communications grows, so does the density and deployment of advanced radio access networks that can allow warfighters to sense their environment, he said.

“So, as opposed to just thinking about it as a communication platform, from an EW perspective I would encourage you to think of it as a sensing platform,” he said.

The Marine Corps is developing capabilities that use 5G radio access networks to produce radio frequency spectrum maps to give the service an idea of what’s happening on different frequencies at different locations, he said.

The capability could also help the Corps identify possible targets or even mitigate interference on the spectrum “that now forms the basis for an electronic support mission, which can inform the electronic attack,” he said.

Genco added that as innovation continues, future generations of wireless communications will build upon the technology of 5G while simultaneously opening up new markets and businesses around the capability.

Next-generation wireless is the realization of the 5G promise, she said. “It’s limitless connectivity, everything can be connected. That’s millions of sensors in a kilometer squared — it just blows my mind.” **ND**



Marine Corps photo

Q&A

Coast Guard Commandant Adm. Linda L. Fagan

HALIFAX, Nova Scotia — Adm. Linda L. Fagan, the 27th commandant of the Coast Guard, is serving the first year of a four-year term. She sat down for an interview with National Defense Editor in Chief Stew Magnuson on Nov. 19 on the sidelines of the Halifax Security Forum. The transcript has been edited for clarity and brevity.

Q. Unfortunately, every time I've done this interview with the Coast Guard commandant at the conference, the first question is always the same. How is the failure of Congress to pass a budget and the continuing resolution (CR) affecting the Coast Guard?

A. Obviously, this CR impacts all the federal agencies in the government, and a CR is not the most helpful place for us to be organizationally. A CR, as you know, limits new starts and a number of other areas. That said, the good news is that the Coast Guard enjoys wide bipartisan support [in Congress], and some of that translates into budget support. So, it's an exciting time to be in the Coast Guard.

Q. Are there any new starts that the CR affects right now?

A. Right now, I can't give you a specific example, but CRs have become almost the norm. We're still executing the largest acquisition programs that we've had since World War II. I remain committed to the path that my predecessors put the organization on with regard to those major ship investments. So that's all good news there. I'm particularly focused on our workforce — onboarding the talent that we need to operate those state-of-the-art ships and aircraft. But having a reliable budget is important to have.

Q. Another hot topic is inflation. Two



parts to that: how is that affecting the Coast Guard and its acquisitions of those new technologies? And then the people part: how do you help Coast Guard personnel deal with higher prices and cost of living?

A. Inflation is obviously real. It's here for all of us as citizens. Probably the biggest impact on the organization has been fuel costs. We are working with our [Defense Department] counterparts in regard to expenses that the workforce may be experiencing. All the services have service members that have experienced it, particularly around housing and housing expenses. There was a mid-year increase in some of the travel rates that are in the line with our DoD forces, and we're very conscious of the fact that we need to ensure our members are able to secure adequate housing and have resources to support themselves and their families.

It's obviously been a pretty dynamic situation throughout the summer and I suspect will be for some time to come, but we can continue to operate the Coast Guard. The frontline operations are not impacted by any of that, and the contracts are long-term contracts for acquisitions. They can continue without impact. There are time schedules and the supply chain where you also get a little bit of disruption there, but nothing that has been super substantial from time or a cost standpoint.

Q. Are there any vendors on these long-term contracts who have been complaining about inflation, saying, "We signed this contract back then and now our raw materials are costing so much more."

A. Not that I'm aware of at my level. I mentioned workforce, recruiting, and the shipbuilding industry and the defense base. They need access to labor as well. We're all focused on onboarding the labor needed to actually build the ships or operate the Coast Guard, in my case.

Q. With the change of administration there's a renewed focus on climate change and its impact. Is the Coast Guard doing anything differently as far as operations in the Arctic?

A. I always start with that we are an Arctic nation, right? As you know, the United States has a large Arctic coastline where we need to ensure our own national sovereignty. The Coast Guard operates both the heavy icebreaker Polar Star and the medium icebreaker Healy. We are on budget to begin building and fielding Polar Security Cutters, which will be new state-of-the-art heavy icebreakers. VT Halter Marine has the contract for those icebreakers. We're working toward a detailed design. They are going to be great, capable ships. As a nation, we've not built [an icebreaker] since the mid-70s. I would say it's going to be a complicated ship to build, but it's going to be an impressive ship. We're excited to be able to operate them on behalf of the nation.

Q. The last I heard the Polar Security Cutter will set sail spring 2025.

A. We are continuing to work with urgency to get to the detailed design level that allows us to begin cutting steel and constructing the shipyard to begin constructing the Polar Security Cutter. Until the detailed design is finalized, we will know better what the actual schedule is. Then once we begin, it will be several years to actually field the ship.

Q. Do you think as a nation, we're prepared for great power competition in the Arctic? As we stand now, we kind of have a single point of failure. There is the medium icebreaker Healy, but as far as the big one, we've got this very old ship.

A. So, with the changing environment in the Arctic — where there's more water and less ice — there are free portions of the year we are able to

operate other Coast Guard ships like National Security Cutters, and we have to do that. We've obviously got national security interests in the shared maritime boundary line between ourselves and the Russians, and then just ensuring that we're providing presence and the kind of life-saving work that we do. There's increased human activity around the more open Arctic, and so while the icebreakers are critical, this is not an ice-free region, and we need to be able to operate year-round and other parts of the year. We've got other ship types that we're able to operate up there, and we do.

Q. And moving south, what are you seeing now in the border areas as far as interdiction of drug smugglers and migrants? There's a lot of pressure on the land border, but what are you seeing in the Caribbean?

A. Obviously, we have a role in maritime migration. It's a life-saving role. It's an incredibly perilous journey for people who take to the sea and in conveyances that are not seaworthy. We have assets in the Caribbean and elsewhere to ensure that people don't lose their lives [when] those dangerous journeys are attempted, and we remain committed to that that life-saving work.

Q. Are you seeing an increase in numbers, people trying an alternative route to the sea?

A. They're sort of always there, and we continue to ensure that we don't have a tragic loss of life. In the recent months, it has primarily been folks from Cuba attempting those migra-

tion patterns. The best way to prevent those big tragic losses of lives is to not allow large numbers of folks to take to the sea. We work with our other federal agencies to help keep that stable, again so that people don't tragically lose their lives.

Q. As for the new Offshore Patrol Cutter, there are recent reports in the press about the main drive shafts not being up to standards or not working correctly, which possibly puts that schedule at risk. What's the latest update on that?

A. We're really excited about the Offshore Patrol Cutter. Eastern Shipbuilding will deliver four of them for us, and then there was a phase II re-compete. The subsequent hulls will be built elsewhere. I am aware of some of the shaft challenges that they've experienced with their subcontractor. At this point, I am not aware of any sort of delivery schedule risk. Obviously, we're not on the timeline I thought we were on six months ago, and we're still not. Again, I'm confident we're going to get that ship in the water before too much longer. ... They're going to be great, great ships.

Q And that was about June 2023?

A. One should go in the water sometime next spring, and then we'll start working all the post-delivery issues. I don't recall whether it's June or August, but it will be next year.

Q. What is next for Coast Guard acquisitions?

A. Waterway Commerce Cutters. ... Those are the inland cutters that do all the aids to navigation and maintenance on the inland river systems.

... I'm excited about those. We're talking and working with the congressional delegations around the Great Lakes about the potential for an additional Great Lakes icebreaker.

And then as I look across the fleet, there are some just broader conversations that we've not yet stepped into [like] how we maintain the marine transportation system, assurance, resiliency and security. We've got small 65-foot harbor tugs with icebreaking capacity in New England primarily, but they play a key role in that system and some of them are 50-plus years old.

Q. And aircraft. Is there anything happening in that realm from unmanned aerial vehicles all the way up to fixed wing?

A. We've got the ScanEagle [small UAV] on the National Security Cutter. We've got a team at headquarters looking at what type of unmanned capability and sensors we need to be onboarding. It is really about sensors, about creating information. And then using that information for a decision advantage. We've stood up a data office two months ago to work through our data, infrastructure and governance systems so that we can begin this foundational work that then will allow us to begin to use machine learning, AI in those types of initiatives. We've got a little bit of groundwork to do there, but I'm excited about that.

We're on record to move toward a single fleet of helicopters, to move toward a tail-fold, blade-fold H-60 fleet, and we're on a path that will take us forward. You're well aware of the age of the H-65s. I'm excited about that opportunity to [upgrade those].

Q. Are you casting an eye toward the Army's future vertical lift program?

A. We're obviously watching that closely. Right now, the H-60 is going to be our vertical lift for the foreseeable future. ... There are many ways to create information and situational awareness and using unmanned systems is a cost-effective way to do that. But at the end of the day, we are in the people business, and we will always need a human being and a piece of steel to either come out of the sky or reach over the edge and save someone's life. But there's a lot of space in the operations part before you get there. **ND**



ScanEagle UAV

Additive Manufacturing Can Revolutionize Industry

The impact of the COVID-19 pandemic continues to reverberate throughout the global economy. Supply chains and logistics — once mundane and arcane topics — have gone mainstream and are grabbing news headlines in ways previously unseen.

The status quo of most industries was overturned as businesses, governments and private citizens scrambled to purchase materials that were previously ubiquitous.

Because of microchip shortages, the production of new cars ground to a halt and prices for used cars skyrocketed. As building supplies dried up, commercial construction, residential development projects and home renovations were delayed indefinitely or switched to subpar materials to continue.

The true shortages from the pandemic were not the panic-induced toilet paper shortages in the early months of 2020, but the lingering effects caused by disruptions to global supply chains.

Imagine, however, a world where builders, vehicle manufacturers and semiconductor foundries are able to manufacture their products at their delivery points without the reliance on long, interconnected, global supply chains. That world may soon be possible due to advancements in additive manufacturing that will have significant national defense implications.

Also known as 3D printing, additive manufacturing is increasingly becoming integrated in the U.S. military and has a growing influence in the defense industrial base. In February, the Defense Department assessed critical defense supply chains. The assessment advocated for the military to continue efforts to advance its use of additive manufacturing to significantly exceed its current capabilities.

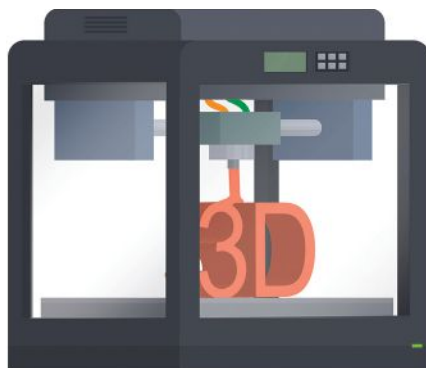
The use of 3D printing, which builds a physical, 3D object from a digital model — known as a computer-aided design, or CAD — often provides a swift and cost-effective way to obtain necessary items on-demand at the frontlines of global conflicts — whether on land or at sea.

Increasing the utilization of 3D printing is a vital way to improve force security amidst contested logistics, especially given the recent

unpredictability of supply chains. Additionally, industry is using additive manufacturing to improve production cost and efficiency.

The military is currently taking advantage of this resource, as it provides timely manufacturing that is not hindered by supply chain challenges. 3D printing can produce spare parts for ships, vehicles, aircraft and other platforms; the tools used to provide repairs; prototypes for new equipment; and essential medical instruments and supplies during combat.

Already, the services have conducted numerous projects testing additive manufacturing's capabilities. The military has already developed the world's largest metal 3D printer. By 2027, its 3D printing sector is predicted to be worth \$1.7 billion. The Army launched the Jointless Hull



Project, which aims to use 3D printing to reduce production costs and manufacturing time for Army combat vehicles while minimizing weight and maximizing durability and reliability.

The Air Force has integrated additive manufacturing into two key areas: small batch production and distributed manufacturing. 3D printing is beneficial to the Air Force due to its ability to produce lower quantities of components compared to higher batch production cycles. Further, additive manufacturing eases the reliance on single production sources due to its ability to efficiently distribute components that require replacement.

For the Navy, 3D printing enables sailors to obtain necessary components and tools while at sea. Recently, the Navy successfully tested 3D printing capabilities with sailors aboard the USS Tulsa. The service has also

created a submersible vehicle via 3D printing, reducing the production cost per vehicle by 90 percent and producing it in just four weeks instead of three to five months.

In 2019, the Marines utilized 3D printing at Camp Pendleton, creating a bunker out of quick-dry concrete that suitably concealed multiple rocket launchers in less than 36 hours. Similarly, the Army Corps of Engineers advanced 3D printing capabilities by creating a printer that could generate myriad structures resistant to shrapnel fragments. With these abilities, dispersed and potentially isolated forces could quickly produce the fortifications they need to defend their positions.

Additive manufacturing still relies on nascent technologies. Particularly, the ability to produce large, metalized segments needed by the military to fully realize these new capabilities requires additional operational and logistical development.

For the defense industry to continue integrating 3D printing into its supply chains at the required scale, it must overcome this technological immaturity while ensuring a quality of products consistent with current deliverables. Experts at Deloitte also highlight these concerns, recognizing that, “Many manufacturers and end users have difficulty stating with certainty that parts or products produced via 3D printing — whether all on the same printer or across geographies — will be of consistent quality, strength, and reliability.”

With the lives of warfighters on the line, for the defense industry to continually integrate and strengthen additive manufacturing capabilities, certified production quality is vital.

Due to its strategic and operational importance, additive manufacturing can be a revolutionary technology for the U.S. military and its industry partners, if utilized properly. If it continues to be properly integrated, the nation can reduce reliance on distant factories and potentially fragile supply chains. Developing these capabilities will likely become foundational to the continued success and dominance of America's armed forces abroad. **ND**

Kristen Falconi is an NDIA junior fellow.

FCC Expands Ban on Chinese Telecom Devices

As experienced operators in the U.S. defense industry are keenly aware, the U.S. government has taken several actions in recent years to counter the threat posed by adoption of Chinese technology and the impact on U.S. defense capability.

These actions include the prohibition on defense contractors utilizing telecommunications equipment or services produced by Huawei Technologies Co. or ZTE Corp., and the more recent requirement that defense contractors disclose certain activities in China.

The U.S. government has taken these efforts to another, broader level as the Federal Communications Commission has now effectively banned certain Chinese telecom and video surveillance devices from the U.S. market — demonstrating the power of its authority over virtually all electronics equipment, which until now had been exercised only to address technical, scientific and engineering concerns.

With congressional backing, the FCC now has established itself as a potent vehicle for excluding products from the U.S. market on national security concerns.

Specifically, the FCC released a Report and Order and a Further Notice of Proposed Rulemaking on Nov. 25 that changed the FCC's device and equipment authorization rules to broadly prohibit the importation, marketing, and sale of radio frequency devices and equipment by entities that the FCC has determined, based on input from the national security community, to pose a threat to the security of U.S. supply chains and networks.

The commission has published the list of such entities on its "Covered List," and each of the equipment manufacturers on the list has some reported affiliation with the Chinese government. Radio frequency devices and equipment are those that generate and/or emit RF energy, which effectively amounts to all electronic devices. Going forward, all applicants for FCC device and equipment authorizations will be required to attest that they are not subject to this prohibition to secure their authorizations.

Furthermore, the FCC previewed

potentially greater changes to its rules in its effort to advance national security goals. For example, the commission has asked for comment on whether and to what extent to revoke existing device and equipment authorizations held by covered entities, such that equipment already in the marketplace could be rendered unlawful. It also asked whether the new ban should extend to "components" made by covered entities but used by others in their own devices and equipment. How it decides these and other issues presented in the notice of proposed rulemaking could have profound effects on the market for RF devices and equipment in the United States.

The Communications Act requires the FCC to issue authorizations for devices and equipment that generate and/or emit RF emissions before they can be imported, marketed or sold in the United States. Such authorizations are needed to ensure that devices and equipment do not exceed certain emissions thresholds, which can cause harmful interference to other services and equipment or present health and safety risks.

For decades, the FCC generally has been expansive in issuing device and equipment authorizations, including to foreign-owned companies, provided they satisfied the RF emissions rules. But newly enacted laws, resulting in part from increased strains in U.S.-China relations, have prompted the commission to reconsider this approach.

The Report and Order amended the FCC's device and equipment authorization rules to prohibit the authorization of telecommunications and video surveillance equipment imported, marketed or sold by an entity on the Covered List.

Underscoring the impact of refusing equipment authorizations to these entities, FCC Chairwoman Jessica Rosenworcel explained in an accompanying statement:

"The action we take today covers base station equipment that goes into our networks. It covers phones, cameras, and Wi-Fi routers that go into our homes. And it covers re-branded or 'white label'

equipment that is developed for the marketplace. In other words, this approach is comprehensive."

The new rules also closed loopholes that might otherwise have enabled the continued sales of equipment on the Covered List. Moreover, although the FCC declined to decide immediately whether existing authorizations for equipment by Covered List manufacturers should be revoked, it set the stage to do so by concluding that the agency has authority to revoke authorizations of equipment on the Covered List authorized before the Report and Order's adoption on Nov. 11.

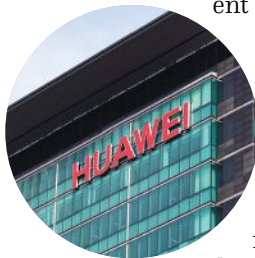
In the accompanying further notice, the FCC made clear that it may continue to use the equipment authorization rules as a lever to promote national security concerns.

The ban adopted in the Report and Order is prospective and therefore doesn't require removal of equipment manufactured by Covered List entities in the past. In the further notice, the FCC asks whether and under what circumstances it should apply the ban retroactively. Given that equipment on the list remains in the telecommunications networks of many carriers, any retroactive ban could cause a meaningful financial impact. While Congress previously has appropriated funding for carriers to "rip and replace" such equipment from their networks, demand for the available funding far exceeds the appropriated amounts.

Furthermore, the new rules do not require applicants for equipment authorizations to state whether any component part of the equipment to be authorized consists of covered equipment.

In the further notice, the FCC recognizes that this may be a gap in the rules. It accordingly has sought comment on the extent to which component equipment parts should be considered in the prohibition on covered equipment and on a range of related issues, including what should be considered a "component part." **ND**

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NTSA Bestows Annual Modeling and Simulation Awards

The National Training and Simulation Association — an affiliate of the National Defense Industrial Association — recently bestowed its highest honors in the modeling, simulation and training fields at the annual Interservice/Industry, Training, Simulation and Education Conference in Orlando, Florida.

Peter Hancock, a professor and researcher at the University of Central Florida, received the NTSA 2022 lifetime achievement in modeling and simulation in academia award for his work on modeling physiological systems.

NTSA's 2022 lifetime achievement in modeling and simulation in industry award was given to JoAnne Puglisi, director at Lockheed Martin's F-35 fighter jet program, for her work on the project.

The education and human performance individual award went to Sofia Santiago, president of Pathways Business Seminars, for her work on training for soldier readiness during the COVID-19 pandemic.

A team from the Rigil and Hampton University's StrataGem project won the education and human performance award. The team's immersive gaming platform is designed for training in the aviation field and has been used by the Federal Aviation Administration to train air traffic controllers remotely and in classroom settings.

For the training and simulation



NTSA President James Robb speaks during the I/ITSEC 2022 awards ceremony.

category, the 705th Combat Training Squadron, Distributed Mission Operations Center, Modeling and Simulation Team based at Kirtland Air Force Base, New Mexico, was selected as the

winner. The squadron has effectively modeled and replicated realistic nuclear weapons effects for several U.S. and coalition training events.

The Persistent Cyber Training Environment Acquisition team, Product Manager Cyber Resiliency and Training took home NTSA's training systems acquisitions award. The team has implemented an innovative acquisition strategy that resulted in capabilities delivered ahead of schedule to warfighters specializing in cyberspace. **ND**

INDIVIDUALS HONORED FOR SPECIAL OPS WORK

The National Defense Industrial Association's Special Operations and Low-Intensity Conflict division recognized eight individuals in November during its annual Special Operations/Low Intensity Conflict conference in Washington, D.C.

Joseph Votel was honored with the R. Lynn Rylander Award — the SO/LIC division's highest honor. Votel is a retired Army four-star officer who served as commander of Special Operations Command from 2014 to 2016 and later Central Command until his retirement in 2019. He currently serves as the president and CEO of Business Executives for National Security, a consulting agency.

The division awarded the DeProspero Lifetime Achievement Award to Ken Tovo, former commander



of Army Special Operations Command. He was responsible for manning, training, equipping and providing strategic direction to all the service's Special Ops forces, a combined organization of more than 34,000 personnel. Tovo currently serves as the president and CEO of DOL Enterprises Inc., a consulting firm.

Six individuals also received Superior Achievement Awards: Marine Staff Sgt. Robert Barela, executive communicator to the commander of Marine Forces Special Operations Command; Army Lt. Col. Amanda Hughes, former senior intelligence officer at the Joint Inter-Agency Task Force; Navy Chief Petty Officer Nicholas Korinis of Navy Special Warfare Command; Air Force Tech Sgt. Jeremy Morlock, flight chief, 1st Special Operations Squadron Intelligence Flight; Jennifer Powers, program manager for special reconnaissance at Special Operations Command; and Coast Guard Military Expert 2 Randy Robinson of the Maritime Security Response Team-East. **ND**

Alliance to Support Professional Development

The National Defense Industrial Association recently announced a strategic alliance with the Institute for Defense and Business, a nonprofit education and research institute.

Signed in November, the agreement aims to expand professional development opportunities within the defense industrial base, while also accelerating both the work of NDIA's Business Institute and the

Institute for Defense and Business, according to the association. The alliance will bring together individuals from military, government and the private sector to facilitate innovative oppor-

tunities and experiences by expanding access to subject matter experts in numerous career fields.

"I am very excited about the opportunities and outcomes that will result for both organizations from this burgeoning partnership," said Mark Faulkner, president of the Institute for Defense and Business.

"The education and professional development of key leaders from government and private industry has never been more important to help ensure our nation's security."

NDIA's newly formed Business Institute team will be the key players at NDIA coordinating these activities with Mike Bogdahn, senior client relations director at the Institute for Defense and Business. **ND**



NDIA Executive Vice President Jim Boozer (left) and IDB President Mark Faulkner (right)

NDIA CALENDAR

• The National Defense Industrial Association continues to follow all developments regarding COVID-19 and is diligently examining each event to determine the best course of action as we look forward to gathering leaders in government, industry and academia again to solve the most challenging issues in national security in person.

The health and safety of all our

registrants is our highest priority, and we will continue to follow local, state and CDC guidelines to keep everyone safe.

Visit [NDIA.org/events](https://ndia.org/events) for more information.

Christine M. Klein
Senior Vice President, Meetings,
Divisions & Partnerships

February

1-2

Winter 2023 Integrated Program Management Division Meeting

[NDIA.org](https://ndia.org)

8-9

37th Annual National Logistics Forum

Orlando, FL

[NDIA.org/Logistics37](https://ndia.org/Logistics37)

22-23

Expeditionary Warfare Conference

[NDIA.org](https://ndia.org)

27-Mar. 1

2023 Tactical Wheeled Vehicles Conference

Columbus, OH

[NDIA.org/TWV23](https://ndia.org/TWV23)

March

1-2

2023 Human Systems Conference

Arlington, VA

[NDIA.org/HumanSystems23](https://ndia.org/HumanSystems23)

6-9

2023 Pacific Operational Science & Technology (POST) Conference

Honolulu, HI

[NDIA.org/POST](https://ndia.org/POST)

May

3-4

DLA Supply Chain Alliance Conference & Exhibition

Richmond, VA

[NDIA.org](https://ndia.org)

22-23

MODSIM World 2023

Norfolk, VA

MODSIMWorld.org

June

21-22

TSIS 2023

Orlando, FL

NTSA.org

FOR THE LATEST NDIA CALENDAR: [NDIA.ORG/EVENTS](https://ndia.org/events)

EMERGING TECH HORIZONS

An ETI Podcast

Listen in as our nation's security experts share their personal takes on the latest defense technology.

Hosted by our resident expert Dr. Mark Lewis, Executive Director of NDIA's new Emerging Technologies Institute, our brand-new podcast takes a deep dive into how technology will shape the future of warfare.

EmergingTechnologiesInstitute.org/Podcast



ETI EMERGING
TECHNOLOGIES
INSTITUTE





2023 TACTICAL WHEELED VEHICLES CONFERENCE

Driving to 2030 and Beyond

How should the Department of Defense modernize and ensure the sustainment of the tactical wheeled vehicle industry?

Join us in Columbus, OH for the next Tactical Wheeled Vehicles (TWV) Conference to learn more.

Recognized as the industry's premier event, TWV is invaluable to military leaders, industry, prime and subcontractors, suppliers, and academia focused on the design, development, innovation, acquisition, production, delivery and sustainment of tactical wheeled vehicles.

With interactive panel discussions and bespoke networking events that offer direct access to OEMs and military leaders, you won't want to miss out.

Register Today.

February 27 – March 1, 2023 | Columbus, OH | [NDIA.org/TWV23](https://www.ndia.org/TWV23)



2023 PACIFIC OPERATIONAL SCIENCE & TECHNOLOGY (POST) CONFERENCE

Seizing the Initiative via Decision Superiority, Innovation and Collaborative Partnerships

Head to Hawaii for the Indo-Pacific's foremost event on regional security, hosted in-person by NDIA and the U.S. Indo-Pacific Command.

Pacing threats from near-peer competitors and belligerent actors are on the rise. Join experts in science, technology, and security who are set to meet on this year's theme: *"Seizing the Initiative via Decision Superiority, Innovation and Collaborative Partnerships"* and address the critical challenges facing the region.

Featuring DoD opportunities for joint research, development, and prototyping and experimentation in support of joint fires, information advantage, contested logistics and other joint warfighting challenges, this event is a premier networking opportunity.

Registration Now Open!

March 6 – 9, 2023 | Honolulu, HI | [NDIA.org/POST](https://ndia.org/POST)

DLA SUPPLY CHAIN ALLIANCE CONFERENCE & EXHIBITION

Building Resilient Supply Chains, Revitalizing Domestic Manufacturing & Fostering Growth

Mark your calendars for 2023's most important supply chain and logistics event hosted by the National Defense Industrial Association (NDIA) and the Defense Logistics Agency (DLA).

This year's theme "Building Resilient Supply Chains, Revitalizing Domestic Manufacturing & Fostering Growth" promises to be one of the best, with Government and Industry leaders focusing on domestic manufacturing and learning about solutions to the challenges jointly faced by global events impacting supply chains. Join us for this two-day event as we host dynamic speakers from Industry and Defense with backgrounds in Logistics and Acquisition, as well as General and Flag Officer from military services who will provide critical perspective across the DoD supply chain. New this year are Government and Industry codeveloped and led breakout sessions. These sessions will provide attendees the opportunity to share ideas, ask questions and solve problems; along with insight on doing business with DLA. This conference and exhibition, tailored for small and large businesses, will offer new concepts, insight on Government policy and processing, and will allow for networking, opportunities to share issues, and collective problem solving for a long-term, sustainable supply chain.

No matter if you are a small business looking to begin a working relationship with DLA or an established large business that wants to strengthen the relationship you have already developed, we look forward to your participation at this event.

Save the Date

May 3 – 4, 2023 | Richmond, VA | [NDIA.org](https://www.ndia.org)

Co-Hosted by DLA Aviation

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The National Defense Industrial Association (NDIA) is the premier association representing all facets of the defense and technology industrial base and serving all military services. For more information please call our membership department at 703-522-1820 or visit us on the web at NDIA.org/Membership

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