

# *National* **DEFENSE**

**SPECIAL  
REPORT**

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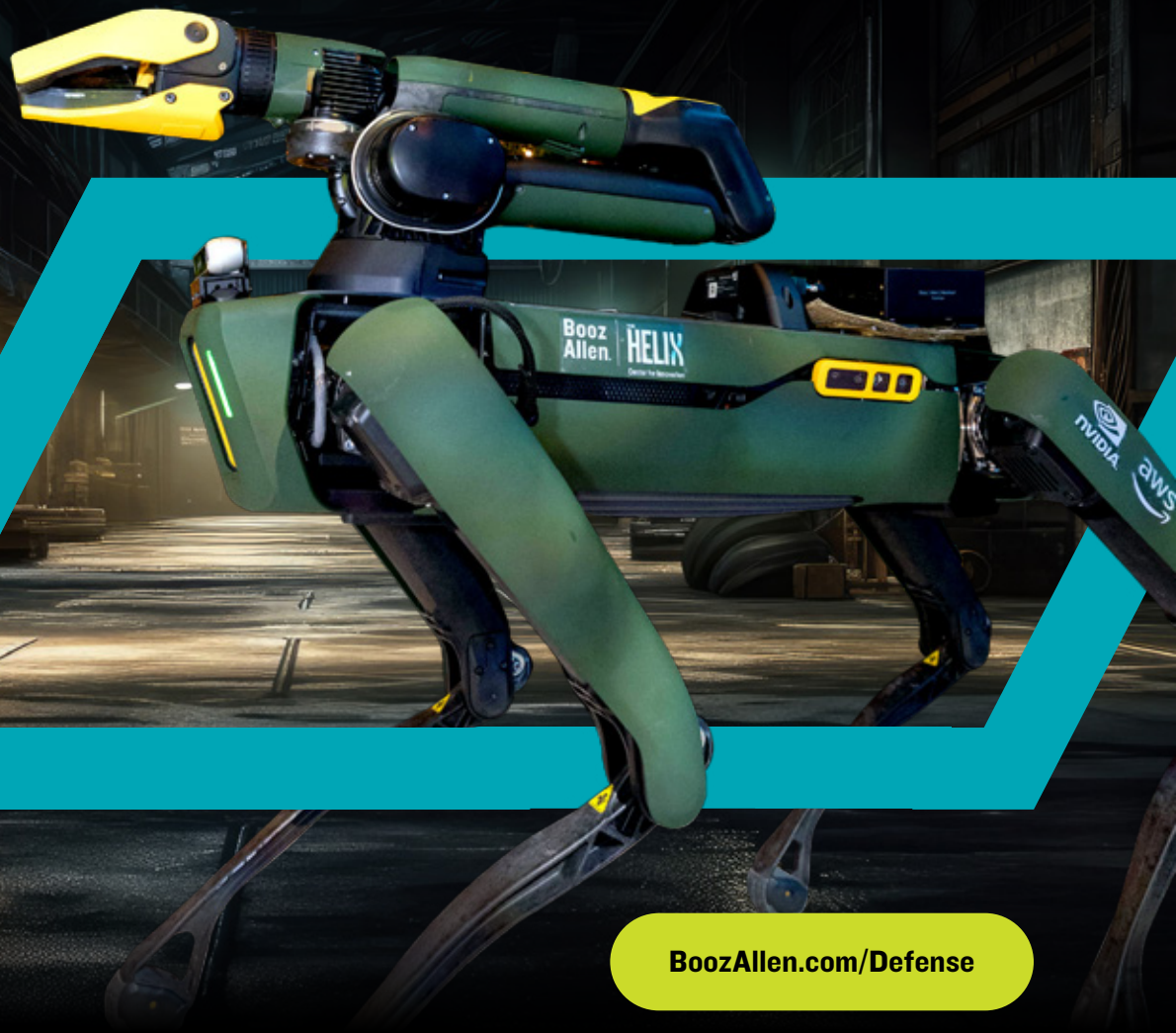
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# Introduction: Shifting Munitions Requirements For Great Power Competition *BY JENNIFER STEWART*

This fall, the congressional defense committees will be hard at work negotiating the final fiscal year 2024 funding, policies and authorities critical to support our warfighters and the defense industrial base.

One important focus area is the resolution of the president's request for multi-year procurement authorities and funding for specific munitions.

The illegal invasion of Ukraine highlighted surge production challenges with munitions, including supply chain limitations and vulnerabilities, long lead times for components and raw materials, price volatility, the availability of skilled workforce, aging industrial infrastructure and constrained production capacity. These challenges inform the difficulties in meeting immediate requirements to restock current inventories, let alone addressing emerging requirements to scale new production.

Government requirements, budgets and contracts drive both investment and production levels. Munitions requirements generated by the military services are derived from the National Defense Strategy, and these requirements have evolved over the last 30 years. In the 1990s, the munitions requirements for the military services were tied to operational plans with planning assumptions for the United States to prevail in two major theater wars.

Over time, the munitions requirements have adjusted to new national strategies. The first adjustment was to generate requirements needed to prevail in one major theater war while maintaining effective deterrence in a second theater until resources could be shifted.

The second adjustment occurred as the United States shifted from planning for major theater war operations to executing low-to-medium intensity conflicts. This second adjustment also de-prioritized certain categories of munitions such as artillery and long-range fires.

In addition, munitions have often been the bill payers for higher priorities in the Defense Department budgeting process. While the military services and combatant commands reference requirements-based processes, the munitions requirements in the annual budget process

are often softened from "what is required" to "what we can afford."

As an example, the services have resourced buying enough munitions to meet training requirements rather than major theater of war requirements. The services also tend to prioritize a wider breadth and shallower depth of munitions capabilities rather than completing the depth of any one capability.

These decisions assumed production could be accelerated in the event of conflict. The services should baseline budget conversations on the total inventory requirement for operational plans for different theaters.

Industry also needs consistent, steady and sustained funding through contract vehicles, not press releases, to ramp up production volume. The importance of the multi-year procurement authorities, and the associated advanced procurement and economic order quantity funding, help companies and investors make important decisions regarding investments in modernizing facilities, infrastructure, production lines and equipment.

For both the commercial and the organic industrial base, it is important these modernization investments include improvements to facilities and infrastructure, not just production lines and equipment. In addition to increasing production, these investments also help industry retain and recruit skilled workers. In a tight labor market, many companies are stretched managing the current production demand signal and need additional support in expanding capacity, both in terms of workforce and industrial footprint.

Ramping up production of munitions will also exacerbate the competition for component parts, such as electronics and circuit cards. The competition is both between munitions categories and with the civilian economy, including the automobile and mobile phone sectors.

This competition puts additional pressure on fluid and unpredictable supply chains. For multiple munitions, the lead time for critical components has nearly doubled, and industry forecasts supply chain challenges will not smooth out until late next calendar year in many of these areas.

Therefore, earlier this year the under-secretary of defense for acquisition and sustainment established the Joint Production

Acceleration Cell to shift the department from a crisis-management, reactive posture to a proactive posture that can identify opportunities to optimize production capacity, resiliency and surge capability. Its initial focus will be on munitions.

The Defense Department requested multi-year procurement authorities as part of this larger strategic shift. The purpose is to send a strong demand signal to both industry and to investors. For this effort to be successful, the department will have to also consider carefully providing Economic Price Adjustment clauses in contract vehicles, and Congress will have to be open to providing the associated funding.

In the past year, suppliers have emphasized inflation escalation on long-term contracts as a significant deterrent to signing multi-year contracts, and they have highlighted price volatility in raw chemicals and energy as two specific, but not exclusive, challenges in locking in cost estimates.

The current industrial posture for munitions production did not occur in a vacuum. Thirty years of bipartisan policy and funding decisions have shaped budgeting strategy for government and investment strategy for industry. Each of the powerhouses of U.S. defense industrial readiness — stable and predictable budgets; an experienced and specialized workforce; diversified and modern infrastructure; manufacturing innovation; and sufficient, including idle, capacity — required for scaling munitions production have all atrophied over the last 30 years. Approving and funding the requested multi-year authorities is an important step in reversing that trend. **ND**

*Jennifer Stewart is the National Defense Industrial Association's executive vice president for strategy and policy.*



Defense Dept. photo

# Congress Adds Energetics, Critical Chemical Provisions To Defense Bill

BY SEAN CARBERRY

**W**hile the Defense Department continues to field new missiles, rockets and other munitions loaded with precision technologies, the chemicals that provide the thrust and explosive punch have remained the same for decades.

Meanwhile, China has continued to experiment with more powerful energetic materials — chemicals used in explosives, propellants and pyrotechnics — which experts claim has led to China having munitions that can travel longer distances or destroy larger targets.

That's why the energetics community has been hammering Congress and the Defense Department for years to invest in research, development and production of advanced energetic materials.

Based on language in the House and Senate drafts of the 2024 National Defense Authorization Act, the message has finally been received.

"What you see in the legislation is also a reflection of the fact that the world marches on, and that exogenous variables weigh heavily on legislators' and staffers' minds," said a senior advisor to the Energetics Technology Center, who spoke on background due to an affiliation with another organization.

"With what was an awareness before of China as a pacing, competitive military threat, even in two years that threat is understood to be ... far more highly developed and arguably more urgent than was understood or appreciated two years ago," the advisor said.

Plus, Russia's invasion of Ukraine is putting stress on the U.S. industrial base — which relies heavily on China for energetic chemicals — as manufacturers scramble to crank out munitions, the advisor added.

"So, that's a driving consideration and what you see in the legislation, specifically the supply chain related aspects of it, which are quite explicit about the importance of isolating U.S. supply network reliance on sources

other than those which originated in China," the advisor said.

Both chambers drafted provisions that align closely with the May 2023 National Energetics Plan issued by the Defense Department's Office of the Undersecretary of Defense for Research and Engineering and start with the creation of a Joint Energetics Transition Office, the head of which would report directly to the deputy secretary of defense. The office would be responsible for evaluating the current regulatory and acquisitions environment and speeding the process of developing, prototyping, demonstrating and transitioning advanced energetic materials.

The office would be tasked with promoting the use of artificial intelligence and machine learning developing energetics strategies across the future years defense program and program objective memorandum processes.

Furthermore, Congress is looking to invest in the industrial base to make the production of current chemicals — particularly RDX and HMX, which have been mainstays since World

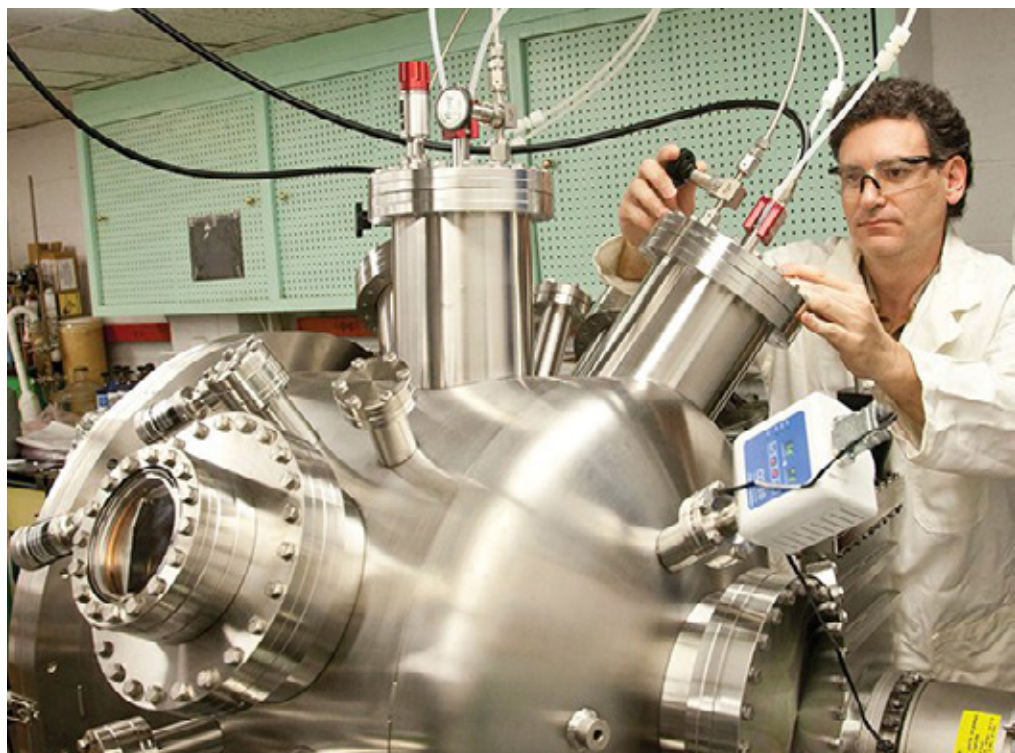
War II — more resilient and efficient while laying groundwork to produce advanced energetic materials.

Even if some energetics provisions don't survive what is expected to be a contentious conference process on the Hill, "I think it's fair to expect enough emphasis and attention on the issue that new pathways for transitioning materials from the lab downstream into weapon systems will unfold with greater haste than has been true for a long time," the advisor said.

The problem isn't that U.S. scientists haven't been able to develop new chemicals with more explosive and energetic properties than RDX and HMX, developed roughly 120 and 90 years ago respectively.

In the 1980s, the United States developed CL-20, which has far greater explosive and propellant properties than the older materials. However, it was deemed too costly and risky to continue working with the powerful chemical. Plus, there was no requirement pulling the material to transition across the valley of death.

Yet China took it on and has devel-



oped weapons using CL-20.

In addition to requiring a pilot program to incorporate CL-20 into weapons systems, the House version of the NDAA includes language that could help transition energetics across the finish line by making lethality a munitions requirement.

“The secretary of defense shall ensure that lethality is considered, as appropriate, as a key performance parameter in the analysis of alternatives conducted for purposes of procuring any new munition or modifying an existing munition,” the House draft stated.

Will Durant, president and COO of the Energetics Technology Center, said: “When you look at lethality or range, you can’t just have larger rocket motors every year, you have to really start to address what’s going to be the capabilities that we need, and how can energetics be a significant component?”

The advisor stated that for too long lethality has been an implied characteristic of weapons systems rather than a holistic concept.

“The inclusion in legislation this year of lethality ... as a key performance parameter for evaluating systems, it’s



easy for a lot of people to overlook, conceivably, how important that could turn out to be, depending on how it’s understood and played out and implemented,” the advisor said.

“Because a holistic understanding underscores a requirement — the need to look at weapon systems effects, both narrowly against targets ... but more broadly as consistent with a tactical or operational concept,” the advisor continued.

Experts have long argued that advanced energetic materials could provide a host of tactical advantages: missiles that can travel longer distances, which would allow launchers to stay out of enemy range, or more powerful bombs, which would require fewer air assets and sorties to deliver the same

effect as current munitions.

More powerful energetic materials would change the equations behind strike planning in a contested environment, the advisor said, and planners need to understand the consequences of improved lethality. “That can have really extensive implications and ripple implications throughout the way defense acquisition understands how it develops technologies.”

In addition to making lethality a requirement that will drive development of new energetic chemicals, the proposed legislation should spark improvements in the production process, Durant said.

“The community seems to be in alignment for the need to do this, the need to look for new processing — looking at continuous flow like they do in pharmaceuticals,” he said. New processes would improve safety, agility and resiliency, he said.

“There are technologies and performers that are working toward doing things like this,” he continued. “There’s a lot of great ideas, a lot of great projects.”

That includes bringing modeling and simulation into the energetics domain, he said.

“There’s a general consensus on what that modeling and simulation can be — how do you better model the overall weapon effects? Or how do you model a warhead or how do you model solid rocket motors?” he said.

“It’s not an unknown on the path forward. Right now, it’s just what’s the investment priority to push any of those further along?” he added.

Investments in modeling and simulation would reduce costs for qualification testing of energetic materials, he said.

“You have to do less shots, do less explosions,” he continued. “So, understanding that is a reduction of cost in the future, what’s our upfront tolerance for the investment to establish those capabilities that support across all the services or support a particular weapons system?”

The advisor described test and evaluation as “the Mount Everest of the problem,” adding that there are many inside the Defense Department and industrial base who understand the importance of improving the evaluation and qualification process.

“I think the problem is well appreciated and understood and the barriers are well understood,” the advisor continued. “It’s a question of empowering

these people to do what they know needs to be done.”

Durant said the energetics community considers the needed advances “to be a billion-dollar problem, not a million-dollar problem.” And there are differences of opinion on the sequence and focus of investments, he added.

“That’s why we do need this coordinating body that can really help take all that information in and recommend the strategic path forward as a sort of governing authority on energetics,” he said.

John Fischer, principal scientist at ETC, said at a May 2022 energetics conference he left the energetics field in 1990, and when he returned a few years ago, the community hadn’t advanced from RDX and HMX.

A year after that conference, he expressed optimism about the path forward for energetic materials.

“I can say, without fear of exaggeration, that the progress that’s been made in the past two years has been nothing short of phenomenal,” he said. “The fact that we’re actually having this conversation is proof that for the first time in my career that energetics and energetics technology is now front and center.”

“We’re talking about it, we’re talking about how much money is going into it,” he continued. “The fact that it’s showing up in authorization language, that is just huge.”

That said, it will take perseverance and patience to move the “herd of elephants” that is the Pentagon in the right direction on energetics, he said.

However, there are many things that can be done now, he said.

“For example, investing in ammunition plants, investing in labs, across academia, government, industry, etc.,” he said. “Because one of the things we want to do is attract workforce. So, having a state-of-the-art laboratory facility ... is going to make a very positive impression on people coming out of school who are looking for a job if they see a well-kept, new facility.”

Failing to make those investments could drive away talent and undermine the entire energetics endeavor, he said.

In the long run, success will be measured by looking at the out years of the future years defense program, or FYDP, he said, noting his experience as a former acquisition professional.

“When new lines appear in a program manager’s FYDP that are related to energetics, that’s the win,” he added. “That’s the big win.” **ND**

# New 'Scalable' Hand Grenades on Way to Army

BY SCOTT GOURLEY

**G**JØVIK, Norway — The U.S. Army recently completed first article testing and conducted lot acceptance testing in preparation for fielding a new Scalable Offensive Hand Grenade produced in Norway.

Olli Harju, product director for hand grenades in Nammo Defense Systems' large caliber systems business unit, said a tactical dilemma confronting troops is whether their heavy personal loads should include fragmentation or different sized overpressure grenades.

With the Scalable Offensive Hand Grenade, "you need only one product basically for the offensive environment," he said in an interview at a test

range near the company's headquarters.

The design features standard threaded modules that can be used in "base," "base plus 1," or "base plus 2 configurations," he said. The warfighter can connect up to three of the bases depending on how big of a charge they think is needed. Each base contains 115 grams of explosives. They measure 85 millimeters tall with a 53-millimeter diameter.

"The same hand grenade with identical modules can be used in different situations, and the user can scale the effect during the mission," he said.

In addition to scaling the amount of explosives, the design features a "fragmentation sleeve" that slides on the

modules "to add some steel in the air," he noted.

Following completion of field acceptance testing in March and lot acceptance testing in June 2023, the program is on track to meet the first two deliveries in October and February 2024, the company said. Under an August 28, 2022 contract award, the Army will receive 76,935 of the scalable grenades.

The scalable design reflects lessons and experiences from the company's manufacture of one million grenades over the past 50 years, Harju said.

The company's "modern era" of offensive hand grenades started with the Fragmentation Hand Grenade 165, a "black ball" design featuring 165 grams of Comp B or PBXN110 explosive in a pre-fragmented steel body that provides nearly 360-degree distribution of 2,500 to 3,000 equal sized lethal fragments.

For other scenarios such as door breaching and clearing improvised explosive devices that call for overpressure effects, the company's more powerful HGO225 explodes with a limited number of fragments. **ND**



Scott Gourley photo



# Army Awards First Multiyear Munitions Deal, Reveals New Loitering Bomb

BY JOSH LUCKENBAUGH

**A**RLINGTON, Virginia — The Army has awarded its first multiyear contract to procure a munition, the service's acquisition chief announced Aug. 7.

The service has begun ramping up artillery production to actively supply munitions to Ukraine while also working to maintain its own stockpiles, Assistant Secretary of the Army for Acquisition, Logistics and Technology Doug Bush said during a media roundtable.

The Army is currently producing 24,000 155mm rounds per month, with the goal to manufacture 80,000 to 85,000 per month by fiscal year 2025, Bush said. "So, that ramp-up is really about to kick in, and we look forward to working with industry as we make that happen. And we made multiple investments there, in multiple facilities. So, we're working with a variety of industry partners on that."

One of those investments was the multiyear contract award to IMT Defense, which spans from fiscal years 2023 to 2027, Bush said. The contract is specifically for M1128 rounds — which Bush described as the Army's "new generation of shell" — and is currently valued at \$162.7 million, but

there are "hooks in the contract to go higher," he said.

"It's a multiyear contract, so it will allow for additional delivery orders," he said. "We did it that way because we're getting replenishment dollars to replace what we sent to Ukraine, and we want to be able to use this multiyear contract for a good portion of that."

It is the first of four planned multiyear contracts "that will specifically support artillery production," he added.

Industry has long advocated for multiyear contracts as it gives contractors the ability to plan ahead, and procure raw materials at larger quantities, which they say brings prices down. It also saves them from the vagaries of yearly funding from Congress, which rarely passes budgets on time.

"That's something we have had the authority to do for a while," he said. "I think the conflict [in Ukraine] raised the importance of doing it to strengthen the industrial base. And of course, the other multiyears under discussion still require Congressional approval. These four we're doing are under the threshold, and we're able to execute them this year, based on language we

received for fiscal year [2023]. So, very excited about that, and more to follow."

Along with producing more artillery rounds, Bush said the Army is also looking to develop one-way attack drones — also known as loitering munitions, which have proven effective in Ukraine.

The service's Program Executive Office Soldier announced on July 7 it had initiated the Low Altitude Stalking and Strike Ordnance, or LASSO, program. The system is "a man-portable, tube-launched, lethal payload munition, unmanned aerial system" that includes an electrical optical/infrared sensor, precision flight control and "the ability to fly, track and engage non-line-of-sight targets and armored vehicles with precision lethal fires," the office's release said.

LASSO will "provide infantry units primarily with a loitering attack munition," Bush said. "We are, though, going to take a competitive approach. So, I think early increments of that might be some of the things that have been sent to Ukraine, but there [are] a lot of companies in that space. So, we're going to leverage competition, as well as maybe have more than one version so we can have more production capacity." **ND**



# GD, Rheinmetall Win Optionally Manned Fighting Vehicle Contract

BY STEW MAGNUSON AND ALLYSON PARK

**T**he Army awarded contracts June 26 to General Dynamics Land Systems and American Rheinmetall Vehicles for the next two phases of the service's Optionally Manned Fighting Vehicle program and also gave the vehicle a new name.

With the initial digital design phase of the program now complete, the Army is redesignating the OMFV program as the XM30 Mechanized Infantry Combat Vehicle, a statement said.

The XM30 is the Army's latest attempt to replace the Bradley Fighting Vehicle, an effort that dates back to 2009 after the cancellation of the Future Combat Systems. That program begat the Ground Combat Vehicle, which was canceled in 2014. That was followed briefly by the Future

Fighting Vehicle Program that became the Next Generation Combat Vehicle Program, which includes the OMFV — now the XM30.

The contracts are for Phase III and IV Detailed Design and Prototype Build and Testing phases. The total award value for both contracts is approximately \$1.6 billion, the statement said.

Developed with a modular open system architecture, the XM30 will allow new, developing technology to be added to the vehicle as that technology matures, ensuring overmatch against any future adversary, the statement said.

The XM30 will be a tracked combat vehicle with the capacity for two crew members and six passengers and will employ a 50mm cannon with a remote

turret, guided missiles and machine guns, "all of which are employed through advanced third-generation software and intelligent control," Brig. Gen. Geoff Norman, leader of the next generation combat vehicle cross functional team, told reporters earlier in the day.

"Our requirements for the XM30 outline the capabilities which will provide our formations leap-ahead advantages," he added.

During the next two phases of the program, the Army will conduct activities to mature XM30 designs and will verify prototype performance during test activities, including a limited user test. The awardees will be required to deliver up to 11 prototype vehicles, as well as two ballistic hulls and turrets, armor coupons and digital engineering data.

Following the detailed design and prototype build and testing phases, the Army intends to have a limited competition to downselect to one vendor at Milestone C near the end of fiscal year 2027, with first unit equipped anticipated in fiscal year 2029.

"These same vendors will then compete, based on demonstrated platform performance, in a limited competition for XM30 low-rate initial production," said Maj. Gen. Glenn Dean program executive officer for ground combat systems. **ND**



American Rheinmetall concept

# DSEI Roundup: Future Force Tech Makes Waves at Defense Trade Show

BY JOSH LUCKENBAUGH AND STEW MAGNUSON

**F**ront and center at the Spets Techno Export booth at the DSEI defense industry trade show was a family of small kamikaze drones, each with an accompanying video showing a nonstop loop of the loitering munitions destroying Russian artillery and fighting vehicles.

Spets was the Ukrainian government's representative at this year's DSEI, one of the world's biggest exhibitions of military hardware. It attracted a steady stream of visitors and well-wishers throughout the four-day show, although the technology on display wasn't necessarily for sale — not yet anyway.

In June 2022, when *National Defense* visited Ukraine's booth at the Eurosatory trade show in Paris, the country was there to look for weapon systems and new sources of ammunition for its fight against Russian invaders.

But not this year, Antone Voronin, the government-owned company's deputy director, said in an exclusive interview. "We're looking for investors," he said.

"If we can get new investors, they can give us the possibility of building factories outside the country and inside the country, he said. Then our facilities grow, our manufacturing grows and that helps supply the Ministry of Defense."

The war has forced Ukraine's defense industry to mature quickly, he said. The loitering munitions are one example. When it first started resisting the Russians, it had commercial-off-the-shelf, DJI drones made in China. Today, the country is manufacturing its own flying munitions from scratch, he said.

On display were the company's family of vertical take-off and landing surveillance drones: the Jet 8, Saber, Night Saber and Boxer.

The rail-launched Punisher unmanned aircraft system is capable of carrying three varieties of warheads up to 45 kilometers at speeds of 180 kilometers per hour. The larger FP-1 can fly as far as 700 kilometers to deliver up to 50 kilograms of explosives.

And then, because the Russians

are using the same loitering munitions tactics, the company makes a handheld SkyWiper EDM4S electronic drone mitigation system and Sky-Wiper Omni, designed to be mounted on vehicles.

The videos accompanying the static display were not from a test and evaluation event, but actual battlefield footage of the drones slamming into their targets, rendering the platforms useless, and presumably causing Russian casualties.

"For something like a \$2,000 drone, you can destroy a battle tank," he noted.

To call the technology "battle tested" would be an understatement.

For now, the drones are not for sale. Ukraine needs what it can produce for its fight, Voronin said. Factories are going 24 hours a day, seven days a week. But one day that fight will be over, and the company will return to the export business, he noted.

"We're looking to the future, not just now," he said. "In the long term, Ukraine will be open and there will be a big market for these supplies," he said.

As far as where the factories will be located, they could be outside Ukraine, which gives them more immediate potential for exports. Or they could be located in Ukraine, but located far away from hot zones, near the border with Western Europe, far away from Russia's reach, he noted.

By day three of the four-day show, Voronin said Spets had signed a couple of cooperative agreements with other companies, but hadn't yet attracted any investors.

Meanwhile, Global technology company MARSS debuted several new systems at the trade show designed to combat the ever-growing threat of unmanned aircraft.

The use of unmanned aerial systems by both sides has been a significant element of the war in Ukraine, and developing counter-UAS solutions has become a focus area for militaries across the globe.

MARSS — which has offices in England, Monaco and Saudi Arabia — unveiled a new, short-range version of its counter-UAS Interceptor drone, as

well as a "drop-and-forget" expeditionary solution called NiDAR X-SCOUT.

Interceptor is an AI-enabled autonomous UAS that offers an intelligent, cost-effective and low collateral alternative solution to short-range missiles when it comes to neutralizing hostile drones, a MARSS press release said.

The new short-range variant, named Interceptor-SR, is smaller and lighter than the original model the company launched in 2022, and was developed "in direct response to customer demand," Stephen Scott, the company's head of research and development for defense, said in the release.

"When we launched the Interceptor



... last year, many customers commented on the need for a portable organic CUAS solution that mounted and dismounted infantry could successfully use to defeat Class 1 threats at shorter ranges," Scott said.

Interceptor-SR is MARSS' answer, about half the size of the original version but with many of the same features, the release said.

In an interview at the show, Scott said: "It's all meant to be really cost-

effective from an end-user perspective. ... If you compare it to the price of a short-range missile,” which can cost hundreds of thousands of dollars, “we’re a fraction of that.”

The Interceptor is survivable as well, he added. “It can be reused, or if you fire it and decide to abort the engagement, it will just fly and return home and you can just reuse it again, so actually you’re getting more than one shot out of it as well,” making the “economics from a customer perspective ... kind of disruptive actually in the countermeasure space.”

Also introduced at DSEI, the NiDAR X-SCOUT is a highly mobile, flexible

nect to other counter-UAS effectors such as MARSS’ Interceptor drones to neutralize a hostile craft, and can operate independently as a standalone unit or as part of a mesh network.

“We listened to the needs of our customers who wanted an expedition-ready, drop and forget solution — capable of operating autonomously, meshed into a network of other sensor stations,” Frederik Giepmans, manager director at MARSS Safety and Security, said in the release. “An operator with minimal training can get X-SCOUT deployed remotely in under five minutes.”

In other DSEI news, A U.S.-made

RTX’s subsidiary in the United Kingdom, Raytheon UK, was contracted in 2021 to develop and install the laser system on the Wolfhound. The technology transfer is part of the U.K. Ministry of Defence’s Land Demonstrator program.

Julie Finlayson-Odell, managing director of weapons and sensors at Raytheon UK, said, “This system is a culmination of decades of investment, research and innovation, and its arrival reflects our continued commitment to help fulfill a key strategic objective of the U.K.’s Integrated Review, which is to understand how directed energy weapons can safely and effectively operate alongside other elements of the U.K.’s armed forces.”

The weapon system has performed in multiple field tests, including in difficult weather conditions with extreme heat, cold, rain, sleet and snow. During four days of live-fire exercises earlier this year in the United States, the system successfully acquired, tracked, targeted and destroyed dozens of drone targets in short-range attack, swarm attack and long-range threat scenarios, the statement said.

Raytheon UK touted the laser weapon system as compact and portable, as well as the fact it can be installed on a variety of platforms and can connect to other air defense systems. Directed energy weapons have a deep, rechargeable magazine and minimal logistics, the statement said.

“This laser weapon is an affordable and viable option to protect military and critical infrastructure, and rapidly defeat threats. The system offers a nearly infinite number of shots and precision accuracy with very low collateral damage, making it an affordable alternative to traditional munitions,” the statement said.

A total of eight high-energy laser weapons have been delivered to the U.S. military. These systems have defeated more than 400 targets over 25,000 operational hours, Raytheon UK stated.

The delivery of the first system to the United Kingdom comes as Raytheon UK officially opens its new, advanced laser integration center in Livingston, Scotland. The center, first announced in July 2022, focuses on the testing, fielding and maintenance of Raytheon’s defensive laser weapons and is a regional hub established to ensure that laser weapons can be quickly fielded, maintained and repaired, the statement said. **ND**



and easily deployable counter-UAS system that can be transported by pick-up truck, military vehicle, or even air-dropped to any location and remotely operated as a standalone unit for over a week, a press release stated.

The system features cutting-edge cameras and radio frequency detection, capable of detecting a Category 2 drone from over 15 kilometers away, along with jamming capabilities, the release said. X-SCOUT can also con-

laser designed to shoot down aerial threats such as small drones is being sent to the United Kingdom for further testing.

RTX, formerly known as Raytheon Technologies, is sending its counterpart in the United Kingdom a 15-kilowatt high-energy laser that will be installed on the British army’s Wolfhound armored vehicle, according to a statement distributed at the DSEI trade show in London Sept. 12.

# Army Transforms Integrated Air, Missile Defense Capabilities

BY SCOTT GOURLEY

**H**UNTSVILLE, Alabama — Few arenas in the Army are witnessing more significant transformation than integrated air and missile defense, according to service officials.

Col. Pat Costello, director of Army Futures Command's Air and Missile Defense Cross Functional Team, said, "Nowhere during my career have I seen such transformation across a branch."

From new approaches to defending against small handheld drones to the well-established Patriot missile defense system, the Army is changing the way it defends its troops from airborne threats, he said at the Association of the U.S. Army's Global Force symposium in Huntsville, Alabama.

The Army is "doing it all simultaneously, and then making it all fit together and work together by eliminating some of the long-standing stovepipes we've had. And that's why I really use the word 'transformation,' instead of 'modernization,' because yes, we are modernizing the materiel solutions, but this is going to fundamentally change the way that we are organized and employed as a branch," he said.

Col. Curtis King, commandant of the Air Defense Artillery School at the Fires Center of Excellence at Fort Sill, Oklahoma, highlighted the growing threats to troops.

"One thing we've seen is no longer do we have one system focused on one threat. We're seeing this play out in Ukraine, in real-world time now," he said. "We have to have layered and in-depth defense. In many cases, you're having to use some of your air and missile defense capability to protect some of your other systems against some of your more advanced threats."

"This is not just an air defense fight," he added. "This is not just an Army fight. This is the joint fight."

Costello said the transformation of

air and missile defense is going to not only open new opportunities for the Army but is also going to expose new gaps that it will have to address in the future.

There are five distinct lines of effort that the air and missile defense enterprise is supporting for the delivery of Army 2030 goals and paving the way for the Army of 2040, he said. They are: integrated air and missile defense; counter-unmanned aircraft systems; maneuver-short range air defense; indirect fire protection capability; and lower tier air and missile defense sensors.

The number one priority is the integrated air-and-missile defense, underpinned by its battle command system, which is designed to break down the long-standing stovepipes "not only within the Army, but within the joint force," Costello said.

The battle command system "serves as the cog for interoperability with the joint force right now through the different experiments that we've been doing as a service and with the joint community. And this open systems architecture is really opening our eyes to utilizing data in a much different way," he said.

Data previously for an air defense soldier was about putting an icon on a screen telling him what a radar sees. "This system really allows us to turn that data into actionable intelligence, where we're able to develop fire control quality solutions, to communicate and really enable the concept of 'any sensor and best shooter,'" he added.

Jon Ferko, senior director of mission solutions and strategy, combat systems and mission readiness for the battle command systems at Northrop Grumman, said, "When you think of modernization, you think of something that represents next generation; perhaps faster or better," he began. "But ... this really changes and transforms not only how the Army is going

to fight in their missile defense, but it transforms how the joint force will fight and how we'll fight with our international coalition partners in the future."

The creation of a single command-and-control system for integrated air and missile defense will allow "plugging in" any sensor, any type of shooter or effector, including directed energy, high power microwaves, electronic warfare systems and conventional weapons, Ferko added.

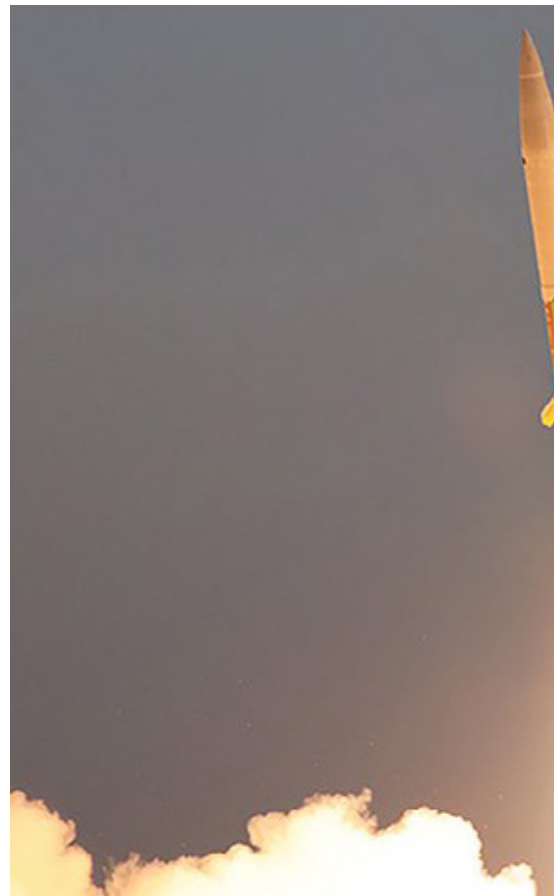
The system was slated for its full-rate production decision in April, with the previous low-rate initial production systems poised to provide an initial operational capability declaration later in the month.

Meanwhile, Costello said counter-UAS is a concern. He spends "most of his days and nights" right now "thinking about the way that we're adapting to this evolving threat."

Countering drones is a problem without one single solution, he said. The Army needs "to be agile in our processes and in our thoughts to keep up with the rapidly evolving threat," he said.

"It's going to require us to be able to integrate electronic warfare, directed energy, kinetic energy and cyber capabilities together to provide commanders a layered and tiered defense against the UAS threat," he said.

"But we've got to be agile, and we've



got to find a process that really helps us bridge the gaps between rapid prototyping, procurement at scale and then being able to reset quickly when the threat continues to evolve,” Costello said.

He added: “Being on the right side of the cost curve has always been a problem for air and missile defense and counter-UAS is a great example of where that is going to continue to be a struggle.”

For example, firing a million-dollar missile to take down a small drone that may have cost its maker \$50 is not a viable way to get at the problem.

Another transformational line of effort focuses on maneuver-short range air defense, better known as M-SHORAD, and bringing air and missile defense formations back into the force.

Costello pointed to the activation of three short-range air and missile defense battalions and the delivery of the first two batteries of capability to Europe over the last year. And there are additional technology development efforts to support subsequent M-SHORAD increments, such as a 50-kW directed energy solution developed by the Army Rapid Capabilities and Critical Technologies Office that has been provided to Fort Sill, Oklahoma, for range testing, a next-generation, short-range interceptor and a new 30mm proximity round “to give us

some additional capabilities.”

The service’s strategy is to deliver four M-SHORAD battalions, totaling 144 systems, by the end of fiscal year 2023, with an existing mix of guns, missiles, rockets and onboard sensors integrated on a Stryker A1 vehicle platform.

Follow-on battalions will be equipped with enhanced effectors emerging from those technology development efforts, he said.

Another line of effort is the Indirect Fire Protection Capability Increment 2. The first launcher — scheduled to be delivered at the end of this year — will bridge a gap between short-range air defense — currently Stinger based — and the Patriot weapon system. This will focus on the cruise missile threat, which has been one of the enterprise’s biggest challenges, he said.

Dynetics received a three-year other transaction authority agreement to build the indirect fire protection capability prototype in the fall of 2021. The agreement covers the development and delivery of 16 fieldable launcher prototypes, 60 interceptors and associated all-up-round magazines. The company displayed the first of the fieldable launchers in a nearby parking lot at the symposium.

The final line of effort, the lower tier air and missile defense sensor, will replace the Army’s aging Patriot radar.

“It will really enable us to not only have 360 degree [air and missile defense] capability with a single battery, as opposed to deploying two batteries to do 360 degrees, but also allow us to fully realize the kinematic capabilities of the interceptors that we have that can outrange how far we can currently see with the legacy Patriot radar,” Costello said.

Army 2030 documents call for the service to address air and missile defense capability gaps, support high operational tempos, move from interoperability to integration with other services and multinational partners, create affordable solutions and increase the complexity for potential adversaries.

As for Army 2040, the goals are to create scalable and tailorable units to enhance operational flexibility, enable multiple options against future adversaries, achieve full integration of air and missile defense with other services and multinational partners and develop and maintain capability against advanced threats.

Brig. Gen. Frank Lozano, the Army’s

program executive officer for missiles and space, said, “In any given timeframe, when you look at one of [the Army] branches, whether infantry or armor or aviation, if you had one or two significant modernization efforts, that was pretty huge for that community. To have five modernization efforts going on simultaneously is significant. It’s important. It’s also incredibly challenging.”

Specific challenges range from successful completion of developmental and operational test activities to the timely obligation of funds to help mature manufacturing production capacity, he said.

Lozano also emphasized the criticality of ongoing activities with the Fires Center of Excellence at Fort Sill from an integrated fires perspective.

“What we’re realizing is that our threats across the globe have invested in capabilities to maximize their strengths against some of our perceived weaknesses,” he said. “The ability to leverage multiple sensors on the battlefield, have that data fused and managed ... and then simultaneously being able to ensure that the right effector is applied against the appropriate threat, in a relevant, meaningful timeframe, is key to what we’re trying to achieve across the globe,” he said.

The Army’s integrated fires test campaign is focused on ensuring that the individual programs all work together, he added.

“That, in and of itself, is an incredible challenge,” he said. “It drove a reorganization within PEO Missiles and Space. We have project offices focused on sensor management. We have project offices focused on mission command assets. And a project office focused on effectors. And when you do that, somebody has to do the hard system engineering,” he said.

The PEO reorganized and created an Integrated Fires Rapid Capabilities Office that provides overarching system integration, he said.

Moreover, the system development and focus on systems integration is supporting the development of future tactics, techniques and procedures while also leveraging test data to inform doctrine, manning decisions and organizational decisions, he added.

“That’s all very challenging within the community, and we’re working very tightly and close together with the Fires Center of Excellence to figure those things out,” he said. **ND**



# Russian Aggression Fuels European Air Defense Market

BY STEW MAGNUSON

**P**ARIS — Like many contractors at this year's Paris Air Show, Israel's Rafael Advanced Defense Systems Ltd. brought its latest air and missile defense concept to sell to potential customers.

The advanced interceptor Sky Sonic is intended to take down hypersonic missiles, which travel at speeds of more than Mach 5 and are highly maneuverable, making them difficult to defeat.

Russia claims to have fired multiple hypersonic Kinzhal missiles at Ukraine, but such weapons are still considered an "emerging technology," as are the systems being developed to defeat them.

Ori Eyal, marketing and business development manager at Rafael's lower-tier air and missile defense directorate, admitted that the picture in the company's booth had little to do with what the system might look like. It has a lot of development remaining, including the seeker and maneuvering technology.

"But some of these ideas are starting to get an audience because of the events in Ukraine," he said.

Israel is adept at developing air and missile defense technology because it faces threats daily, he noted in an interview on the sideline of the air show.

But European nations — with a couple of notable exceptions — had not prioritized deploying or upgrading their systems until the Russian invasion of Ukraine changed their thinking, he said.

Europe was "asleep," he said. "They knew that they were facing a problem, but they kept ignoring it. Now, they want it fast.

They want it right away. But in this business when you order something, it's not that fast," he said. It can take two to five years to build and deliver

an air defense system, he noted.

From systems designed to protect ground forces from small drones to high-altitude ballistic interceptors, the market for air and missile defense technologies in Europe is burgeoning, said Dan Darling, director of military and defense markets at the business intelligence company Forecast International.

Poland, as NATO's eastern vanguard, started the trend when it kicked off its Shield of Poland program in 2014. It has historical fears of Russia that played into its decision to bolster its air and missile defense. The Ukraine invasion has only served to stoke the market further, he said.

"Where you're going to see the next frontier is up in the Nordics, the Scandinavia Peninsula — Norway, Sweden, Finland," he said in an interview at the air show.

Russia can attack them from any angle, from the East and with its navy operating in the Arctic and the North Sea, he added.

"When you look across the European landscape, you have obviously the Brits and the French. ... They've always invested heavily in air defense systems," he said. They also share the multinational MBDA defense contractor, a leader in missile defense that was formed out of the merger of U.K., German, French and Italian companies.

As far as the nations that have MBDA subsidiaries, they are going to be protective of their labor markets and keep work on major air and missile defense upgrades in their borders, he predicted.

The Scandinavian countries, plus a few former Warsaw Pact countries from Central Europe — the Czech Republic, Slovakia, Hungary and



Poland — constitute the major European air and missile defense market up for grabs to outside companies, Darling said.

"They're a mixed bag because they have legacy systems. So, what you look for in procurement is something nearing the end of its lifecycle — and if it is — is there a new generational leap in air defense systems that they might want to purchase?" Darling said.

"The Israelis really are fantastic on missile defense," he noted.

U.S. defense contractor Raytheon Technologies, meanwhile, has eight European customers for its Patriot surface-to-air defense system, with Switzerland joining in the coming years as the ninth.

As far as leap-ahead technology, Raytheon, which recently rebranded as RTX, brought its GhostEye radar to the air show to make its international debut. The technology grew out of the Lower Tier Air and Missile Defense Sensor developed for the U.S. Army, also known as the Patriot replacement radar, said Joseph DeAntona, executive director of business development — defense capabilities and solutions at Raytheon.

"As we were developing it, one of the things we wanted to keep in mind was the ability to modularize this technology so we could apply it to a host of different situations," he said in an interview at the company's pavilion at the air show.

The overall market for such systems has exploded, he said. "I think there are a lot of industry folks that saw and



anticipated the demand signal for air and missile defense, and whether they were in it for a long period of time or not, they realized that they probably needed to get into that.”

The GhostEye employs the lower-tier system’s gallium nitride active electronically scanned array radar, which is easy to use and maintain and has better performance than traditional radars, he said.

The lower-tier system has one large stationary array in front and two smaller arrays in back to give it a wide view. Raytheon took the gallium nitride radar from one of the back arrays — which has already been tested and certified — and put it on a rotating platform to give it a 360-degree view, he said.

It is used in tandem with the National Advanced Surface-to-Air Missile System, or NASAMS, a short-to-medium-range missile produced in partnership with Norway’s Kongsberg Defense and Aerospace.

“The GhostEye is going to be our pathway to take our current NASAMS customers well into the 21st century,” he added.

The war in Ukraine has brought the need for more robust air and missile defense systems in Europe to the fore, but the new radar had been in the works for almost a decade, DeAntona said.

The most high-profile NASAMS customer is Ukraine, which now has two of the systems it is using in its fight against Russia. The complete system is 100 percent NATO compliant, he

added. Five other European nations are NASAMS customers.

“We started [development] well over 10 years ago anticipating that these threats were on their way ... we used the last decade to our advantage to develop this,” he said. “You just don’t develop something like this in a year or 18 months.”

The company has a built-in market for the new radar, as 13 nations in Europe, the Middle East and the Indo-Pacific use NASAMS already, he noted.

The company decided the Paris Air Show was the best venue to make its debut. “We’re not only talking about it from a PowerPoint or from a cool video perspective, we are here to say, ‘This is real.’ We are experimenting with it. We are taking it to ranges, we’re showing it to customers,” DeAntona said.

Darling said certain types of countries need help from U.S., Israeli or Western European manufacturers.

“It’s really a dynamic, disparate market,” he said.

The countries that need the most help are the ones with smaller, less robust defense industries such as the former Warsaw Pact nations, he said.

Poland does, however, have an active, growing defense industry, so it is looking at tech transfer deals that tie up with its local vendors to transfer know-how, he said.

These nations could join and tap into money provided by the European Defence Agency’s Permanent Structured Cooperation pooled fund, but often don’t so they can protect local

jobs, he added.

Germany has big plans and a big pot of money to spend on air and missile defense with its new \$107 billion defense fund, Darling noted. It’s looking at a new ground-based air defense system. They are also fielding the new IRIS-T SLM for medium-range threats and Israel’s Arrow 3 missile defense system to intercept high targets outside the Earth’s atmosphere.

These are big ticket programs, but not to be ignored is the accelerating market for air defense systems capable of protecting ground forces from low-end threats such as small drones, loitering munitions, incoming mortar rounds and small rockets, Darling said.

“Right now, it’s really about protecting ground troops to counter UAS wherever they are. That’s a developing area of air defense ... and what a lot of the European countries are looking at,” he said.

During the air show, the French MBDA subsidiary announced that Belgium, Cyprus, Hungary and Estonia would be joining its Mistral 3 ground-based air defense program, a short-range system that can be fired by dismounted troops and can detect low-signature threats such as small drones.

Darling said despite the success of MBDA subsidiaries and the Israeli companies, Europe is rife with opportunities for American contractors. The cache of a system being used by the U.S. military is important. A country like Romania will want to have a U.S. system as it comes with some degree of interoperability, he said.

“They want to stay with someone that’s a partner. They’re not going to be looking at an air defense system from Singapore or South Korea. They want a European solution or a U.S. solution,” he said.

“That’s where the United States by default has an opportunity to pick up business in every single country,” he added.

Europe is not the only hotspot for air and missile defense systems, DeAntona noted. Business is good in all three major theaters: Europe, the Middle East and the Indo-Pacific.

“All three major theatres are — I don’t want to say singularly focused — but I would say almost primarily focused on their air and missile defense capabilities and what they need and what are the gaps that they have to fill,” he said. **ND**



# Joint Office Predicting, Preparing for Future Small Drone Threats

BY STEW MAGNUSON

**T**he Army-led Joint Counter-small Unmanned Aircraft Systems Office on Sept. 20 wrapped up a two-day “large-scale combat operations tabletop” exercise that looked ahead at the near- and far-term small drone threat.

The exercise’s purpose — part of a year-long learning campaign — is to inform senior leaders about future counter-small drone development, investment and policy decisions, the organizers said in a conference call with reporters.

Small class 1 to 3 unmanned aerial systems are an increasing threat to all the services and are being used by nations, terrorists and insurgents in all domains — land, sea and air — for surveillance as well as munitions delivery, Army Col. Glenn Henke, military deputy in the Joint Counter-sUAS Office, or JCO, said. And then there are just the reckless hobbyists flying too close to military assets, he added.

“If we just look from the last few years, as we move forward, the threat will get smarter. I think we absolutely have to understand what artificial intelligence and machine learning brings to threat capabilities,” he said.

Adversaries are also looking to deploy small drones in “complex ways,” he added. That could include large swarms.

“We’re seeing that play out all around the world in terms of the volume of threat that can be sent against

us and our allies. It is only going to trend upwards,” he added.

The exercise — carried out with the assistance of the RAND Corp. — sought to “explore the interplay of and seams between the services’ operational concepts to identify specific C-sUAS doctrine, organization, training, materiel, leadership and education, personnel, facilities and policy gaps,” a JCO statement on the exercise said.

The exercise looked as far ahead as 2031 and used fictional adversaries employing Class 1 to 3 drones with various emerging trends in attack vectors, unique tactics and “evolving technical capabilities across the expanding battlefield and different operating environments,” the statement said.

Army Lt. Col. Rich Brennan III, strategy branch chief in the strategy and policy division of the office, said the eight-year mark was intentional.

The Defense Department does a five-year projection of its budgets so “we have to look pretty far out,” he said.

The JCO serves as an advisor to the services and combatant commands and makes recommendations about technologies. The recipients of their advice want to know where to invest their research-and-development and acquisition funds, the statement said.

The question for them is: “what do we need to get ahead of the threat now — or today — rather than waiting

around [until it’s] too late,” Brennan said.

While the office could not share its conclusions yet, Henke was asked if the U.S. military was prepared to meet the small UAS threat if it were to go to war the next day.

Between the recommendations the joint office makes, and the technologies being deployed by the services, “we’re meeting a lot of the threats that we’re facing now,” Henke said, adding he would defer to Central Command, which is currently the “most active theater for attacks against us.”

“We are learning every day. We’re continuing to add capability. But again, the threat is not going to sit still,” he noted.

Vignettes explored a critical strategic location experiencing and responding to a variety of escalating small drone incidents, from surveilling to differing forms of direct attack, it added.

Brennan said the tabletop exercise looked at everything from near-shore scenarios to mountains and dense urban cities. “One of the major take-aways is that we are on a good path. And I do feel more comfortable with where we’re at and where we’re heading based on this learning,” he said.

The next event of the Future Force Study is scheduled for March 2024 and will focus on scenarios and vignettes exploring interoperability with allies and foreign partners as part of studying a “Host Nation Support” tabletop learning event, the statement said. **ND**



# Handheld Detector IDs Chemicals, Explosives On the Spot

BY ALLYSON PARK

**A**RLINGTON, Virginia — Thermo Fisher Scientific recently introduced a handheld device that carries a library of hazardous chemicals with it, allowing users to quickly know what kinds of threats they are facing.

The Defender Omega Handheld Raman Analyzer uses light-scattering technology to observe and analyze molecular structures for defense, security and law enforcement applications.

“The really cool thing about this product is that it does all of that scientific work for you, right in the palm of your hand,” said Irene Richard, product manager for the chemical identification safety and security portfolio at Thermo Fisher Scientific, in an interview. “Raman spectroscopy looks at [a substance’s] molecular structure. It’s got this whole [data] library of different components, and we actually make those libraries using the Defender Omega device, and they’re extremely accurate.”

And the libraries are what differentiates the Defender Omega for military and defense applications, Richard said. “Not only does it have those narcotics and hazmat libraries, it also has [data on] explosives and chemical warfare agents. ... Defender Omega is really good for both identification and response situations.”

The Defender Omega is specifically designed for front-line deployment with dimensions a little larger than a standard brick. The 3.5 pound device has removable rechargeable batteries, IP68-level water resistance, WiFi connectivity and an easy web user interface, according to a product brief.

It also features GPS capability and a digital camera for time and location stamping and instrument logs, which



keep track of who scanned what substances and when.

In addition to the library on the device, the Defender Omega’s algorithm interprets data differently than other devices do, Richard said.

“It’s not only looking at the spectra

that comes off the sample, but it’s also looking at how the spectra comes off of the sample,” she said. That’s a patented technique the Massachusetts-based company has been building upon since it was a startup, she added.

**ND**

# Editor's Notes: Explosive Disposal Sector to Need A Lot of Funds, Innovative Tech

BY STEW MAGNUSON

When it comes to landmines, unexploded ordnance and the deadly debris that wars and conflict leave behind, it looks like the world is taking one step forward, and two steps back.

From the jungles of Colombia to the arid lands of Yemen to the once productive wheat and sunflower fields in Ukraine, there are probably more landmines and unexploded bomblets in the Earth's soil than ever.

Three decades after Princess Diana helped bring the world's attention to the topic and the International Campaign to Ban Landmines won the Nobel Peace Prize, Russia is seeding Ukraine with landmines every day and dropping cluster munitions. These are bombs that explode and spread smaller bomblets, often with high dud rates.

Ukraine, deciding that it needed every tool available to kick out the Russians, asked the United States for — and received — its own cluster munitions.

And the Biden administration — one would think after vigorous internal debate — agreed. The cold hard calculus: kill Russian soldiers today, bring a quicker end to the war — worry about the cleanup later.

But there will come a “later” and a big bill to pay.

Russia was already using cluster munitions in Ukraine and now the U.S.-made bomblets will be added to the mix.

But the decision has been made. So, going forward, what now?

It will take a lot of funding to clean up the messes in Ukraine and Yemen — and to continue clearance operations in Afghanistan, Cambodia and Colombia — and the defense research and development community should be called upon to invent new, innovative ways to detect, dismantle or destroy unexploded ordnance and landmines. Developing more advanced robotics, sensors and protective gear to help the brave men and women

tasked with clearing fields needs to begin now.

There are three streams that need to be funded: demining, or the cleanup; advanced technologies to detect, defeat and protect; and money to help victims.

It was depressing to listen in on a recent NPR report on a clinic in Yemen that is trying to fit bomb victims from its civil war with prosthetic limbs. Like many nongovernmental organizations, the nonprofit needs funds.

Sad. There's always enough money to drop bombs on people, but when it comes to helping the victims, the NGOs have to go around with their hats in their hands.

The three main players in the Yemen conflict — Saudi Arabia, Iran and the United States — are oil-rich countries and need to do what's right.

If you can spend \$400 million to bring a soccer player to your nation, you can spend a little to buy an eight-year-old girl a prosthetic leg.

I ran all these thoughts by my friend Ken Rutherford, one of the world's foremost experts on the history of landmines. I've known Rutherford since 1985, but we lost touch for a few years. During that time, he lost both his legs to a landmine in Somalia — and as a result — became deeply involved in the issue. He now teaches at James Madison University in Virginia.

Yes, the victims of landmines in Somalia will need help, and lots of it, but these nations need a modicum of stability before the real work can

begin, he noted.

As for Colombia, when he first began being active in the landmine topic, that country was not even on the top 10 list of places of concern. Now, due to internal conflict, it's one of the most infested countries in the world, he said.

But the bigger issue is Ukraine.

The Biden administration made several points after the decision was made to supply cluster munitions to the country's military, he said.

One is that the dud rate for U.S.-made munitions is low, at around 2.3 percent. That's still a lot, Rutherford noted, but it pales to Russian cluster bombs that have a dud rate between 30 to 40 percent.

These duds are volatile and deadly, and some legal experts believe they should fall under landmine treaties, Rutherford said. Cluster munitions do have their own accords, though. Some 160 nations have banned them, including most NATO nations.

Another valid point Rutherford mentioned is that the United States — by orders of magnitude — spends more on landmine and ordnance cleanup than any nation in the world.

“The United States will be providing — and they already are providing — huge amounts of financial aid for clearance. So, these are the kind of arguments [the Biden administration] is using to defang the accusations that they are breaking international humanitarian law,” he said.

A few things have to happen going forward, he said.

One, the United States has to continue showing leadership in conventional weapon destruction.

As soon as the Ukraine conflict ends, it needs to start activities to clear farms ASAP. The best way to do this is to shore up local capacity to deal with the problem, he said.

As for research and development, there is a schism in the community between those who said money is needed for clearance and humanitarian relief, and those who want to invest in advanced technologies, Rutherford noted.

In the future, there should be no such false dichotomy.

Wealthy nations such as the United States, Saudi Arabia, — and hopefully one day — free and democratic Russia and Iran have enough resources to do both.

But the time to start the R&D and advanced planning is now. **ND**



Defense Dept. photo

# Q&A: Capt. Steven Beall, Commanding Officer, U.S. Naval School Explosive Ordnance Disposal

BY JAN TEGLER

**C**apt. Steven Beall has been commander of the Naval School Explosive Ordnance Disposal since August 2021. Located at Eglin Air Force Base, Florida, the school conducts common basic training for Navy, Air Force, Army and Marine Corps EOD technicians who graduate from the school at the apprentice level.

Beall spoke with Jan Tegler via phone about the challenges of keeping the school's curriculum current as technology evolves. The article has been edited for brevity and clarity.

**Q. Explosive ordnance disposal is an inherently risky mission. How do candidate EOD technicians come to Naval School Explosive Ordnance Disposal, and is the school facing any challenges in recruiting enough students to satisfy requirements?**

A. We are a joint-like school, meaning that we get initial accession Air Force, Army and Navy personnel [from boot camp] through their respective pipelines. Marine Corps personnel are not initial accession. They have a requirement to be E-5 or E-6 before they're able to come to the program.

Currently the school is 143 training days. Those training days [apply to] all four branches of service. When that is completed, the Navy will continue on for an additional 63 training days. That is so that they can pick up the underwater side.

We start a new class here every four days with both enlisted and officers mixed together in the same class. We have about an 80/20 split on that. So, 80 percent will be initial accession regardless of branch of service. About 20 percent have fleet experience.

Right now, we're programmed at just shy of 1,100 quotas per year — 1,096, I think. In terms of our flow through the school, we are on task to meet all of our quota requirements for this fiscal year. We're on the receiving end of manpower. The respective



services make their determination on throughput. From a schoolhouse [perspective] we program in those requests, and we execute training for those that walk through our front door.

**Q. New technologies, including directed energy, multi-domain drones and expanded use of robotics paired with artificial intelligence and machine learning are in-service or in prototype phases currently. How does the school keep abreast of developing technologies relevant to EOD?**

A. We have several mechanisms in place that support that. The EOD Program Board has representation from all four branches of service and really kind of keeps us all communicating and working across one another's technology and training and where we're driving the community to the future.

Supporting those pieces, you have two separate groups that convene. You have the Military Technical Acceptance Board, commonly referred to as the MTAB. They focus on all of our technology. Then you have the Technical Training Acceptance Board, which really looks just at training. There's a representative from each branch of service that sits on those boards.

That's what keeps the EOD community cross-talking. That's that sharing opportunity as we all look through the problems from a different lens. How do we bring those pieces together?

Those two groups also communi-

cate on a routine basis to talk about, 'Hey, here's my training deficiency based on this emerging threat, and I need a technology solution to help me defeat that threat.' Those groups are in constant communication to work through those pieces.

Some problems are really long term, and the technology side will work an issue and work an issue. That training piece on what it's going to look like is why we get way ahead on that. Is this [technology] relevant and is this the right place to teach it?

That's also a question that gets asked. Is Naval School EOD at the apprentice level the appropriate place to deliver the training? We have training sites outside of the school that can also deliver training.

**Q. Where do instructors come from? And do they help keep the school's curriculum current by bringing knowledge of new ideas or EOD technology with them?**

A. Our instructors are from all four branches. Instructors are determined by how many quotas the individual services request. If the Army determines that they want 350 quotas, there's a formula and they will provide X-number of instructors. We have a good mix of instructors here based on those quota requirements all coming from operational units.

They've had the opportunity to operate in the field. They bring that operational experience back here. The

experience and their ability to talk to students and teach them how it applies in real life transcends some of the learning hard spots. Each branch here has a service commander and they're also a wealth of knowledge, all O-5s. They provide guidance and oversight to their staffs and students.

Are they a source of information on new technologies and new ideas? Absolutely, we hold working groups here amongst the instructors to coordinate things like that. How do we improve our training processes and what have they seen in the operational environment?

**Q. How are emerging technologies integrated into the school's curriculum?**

A. We do a continual training relevance review on the curriculum. As new technology arrives, the first thing we want to do is get our instructors trained on what's emerging. They will go through that process and then we'll see what the end state looks like.

Through that training relevance review process, we'll begin to adjust the curriculum so that we can make changes to align with new technology and make sure our instructors are up to speed on what we're going to be adding to the curriculum as a tool and then change the curriculum to support that flow and that testing. We develop a plan to evaluate if we're imparting the right capabilities to the students for utilizing a new tool.

The schoolhouse always focuses on the basics first. We do that in spite of our technology.

As new technology is fielded, we plan way ahead because the curriculum changes slowly to make sure we don't make mass rudder movements in what we do. We interlock ourselves with the Naval Explosive Ordnance Disposal Technology Division, with what's coming online in industry.

We lean into that generally about two years out to get it in place. So, while it's still in production we're already having conversations about how we're going to implement it [in the curriculum].

**Q. What are some of the new technologies that have entered the school's curriculum recently?**

A. Probably the most recent thing we implemented here was the use of our [unmanned aerial vehicles]. We

put the UAVs in our advanced training site that's here. We are authorized to fly and operate them and have incorporated that into a tool. We're still incorporating our tactics, techniques and procedures on how we're going to employ that.

Students leave the school as an apprentice. By the time they become a journeyman they will come back for advanced training, and they will get the opportunity to actually use the drones.

One of our newest technologies that applies to our core training, specifically to the Navy, would be our underwater systems that we are beginning to incorporate. Those are long lead times as we add those into the curriculum. Sometimes we look at adding days to our curriculum to support that.

**Q. Even as technology advances, there seems to be a greater demand for creativity and improvisation from EOD technicians today to meet new threats. How does the instruction reflect this?**

A. The key piece for an EOD technician regardless of branch of service is critical thinking so that they can holistically look at a situation and evaluate risk. But they also have to project out as they kind of play the tape through. If I do this, this is what will happen.

In terms of technology and how we look down the road, we look at what our potential threats are and we're playing that tape through. How does that look? It's critical thinking that makes EOD techs successful.

We start with a crawl, walk, run approach to [training] so that we can give students the building blocks. They will start putting the different divisions of training they go through together as they go through ground

ordnance and continue to grow into air ordnance. By the time they get to [improvised explosive devices] that critical thinking is switched on.

When you look at a state-sponsored ground or air ordnance item, once you can figure out what it is, it's kind of a methodical approach. When you start getting into improvised explosive devices you really start to expand your way of looking at a problem and we see [students] have that "ah ha" moment.

**Q. Does the school also emphasize low technology solutions or past methods that may become relevant again in a peer conflict?**

A. That is truly the nail on the head. When I talked about the basic principles of how we defeat an explosive device, that always applies. The technology is just a tool. The basic mechanical tools that they learn, and their basic understanding is fundamental to using the latest technology.

We talk about directed energy sources for runway clearance. All of those things are just tools in the bag. That critical thinking EOD techs learn is that they will evaluate the whole environment, that threat assessment and decide which tool is appropriate for the problem they can see at that moment.

**Q. What is your biggest challenge leading the school right now?**

A. We recruit very talented, very well-educated individuals. As we've evolved over time, the students see life through different lenses. We've found that we have to meet them where they're at in terms of how they digest information, how they're able to take it on and teach them to think critically about an EOD problem. Our instructors adapt to that. **ND**



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