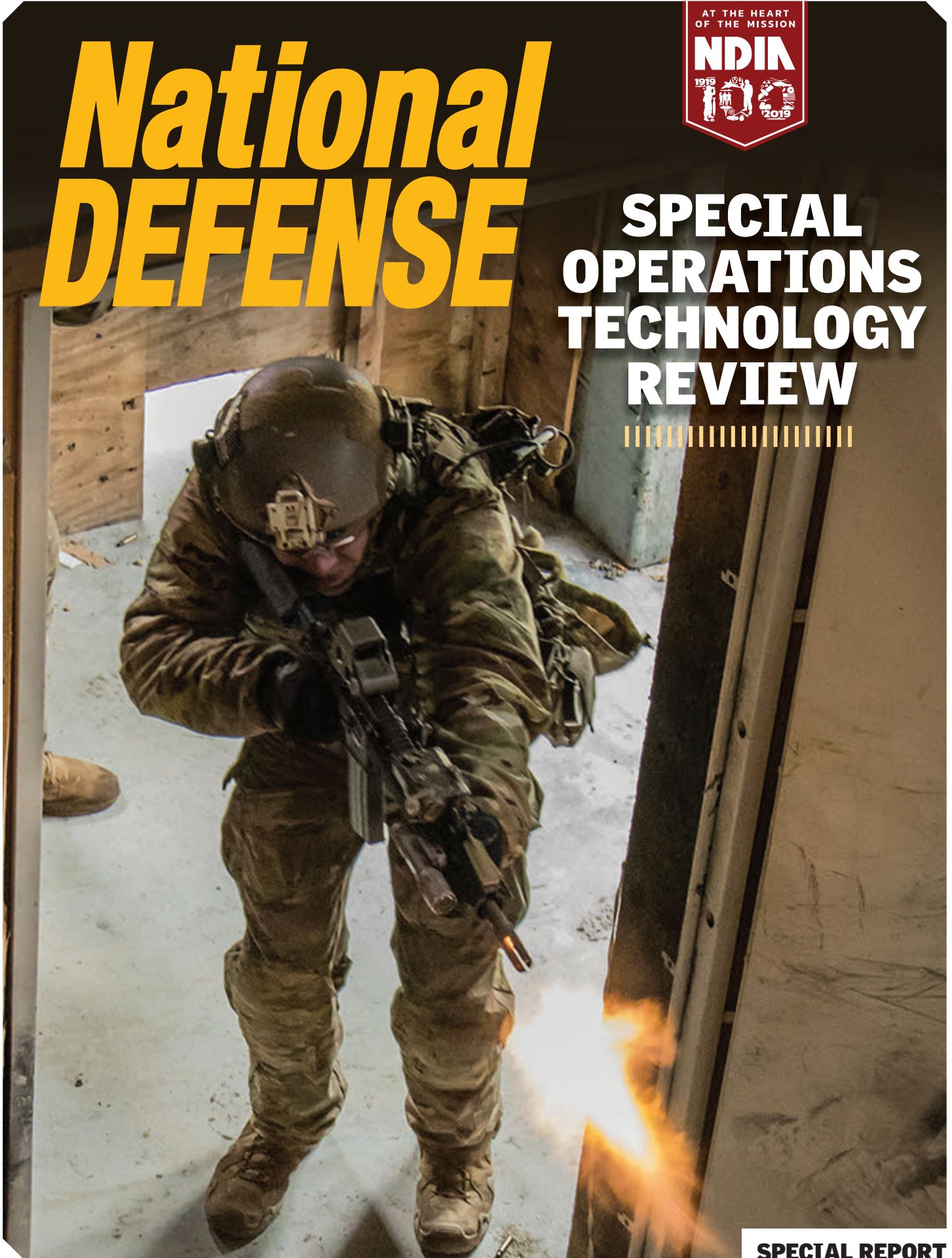
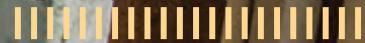


National DEFENSE



SPECIAL OPERATIONS TECHNOLOGY REVIEW



SPECIAL REPORT

Special Operations Technology Review



It is no longer news that the U.S. military is shifting from fighting insurgents in the Middle East and South Asia to preparing for so called “Great Power” competition with rivals such as Russia and China. Yet troops — including special operations forces — remain in countries such as Afghanistan and Syria, and they are “on call” for a variety of missions big and small, anywhere in the world.

Delivering the force where it needs to be quickly and with a modicum of stealth is a top priority for Special Operations Command. *National Defense* in this eBook looks in-depth at the platforms special operators rely upon to make sure they arrive where they need to be whether it is by land, sea or air. After arriving at their destination, SOCOM’s hyper-enabled operator concept is designed to give commandos a tactical edge over their adversaries and new body armor promises better protection.

These stories, along with numerous other topics including a rundown of SOCOM’s budget prospects for 2020, can be found in the following pages.

Stew Magnuson
Editor in Chief
National Defense

DEFENSE DEPT 1

Table of Contents

SPECIAL REPORT ON SOCOM MOBILITY

4 Land: Special Ops Community Chasing New Ground Mobility Systems

By Jon Harper

10 Air: Special Operations Command Upgrades Air Delivery Vehicles

By Connie Lee

14 Sea: New Special Operations Undersea, Surface Vehicles on Horizon

By Yasmin Tadjdeh

OTHER FEATURES

18 ‘Hyper-Enabled Operator’ Concept Inches Closer to Reality

By Yasmin Tadjdeh

22 SOCOM Aiming for Big Boost in R&D Funding for 2020

By Jon Harper

23 Ground Troops to Receive Lighter, Tougher Body Armor

By Jon Harper

VIEWPOINTS

26 SOCOM Must Tie Operational Data to Virtual Reality Training

By Lt. Brian Shubsda

28 SOCOM’s Iron Man Suit: A Worthy Moonshot

By Stew Magnuson

29 Communication Key to SOCOM’s Success

By James C. Boozer



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SOCOM VEHICLES

**SPECIAL OPS COMMUNITY
CHASING NEW GROUND
MOBILITY SYSTEMS**





DEFENSE DEPT.

BY JON HARPER

Officials from U.S. Special Operations Command are pursuing new ground vehicles and enabling technologies to help commandos roll into battle.

More funding is expected for cutting-edge capabilities, noted Logan Kittinger, deputy program manager for the family of special operations vehicles.

“We’ve typically been focused only on incremental improvements to the vehicles ... due to the budget,” he said at this year’s annual Tactical Wheeled Vehicles conference in Monterey, California, hosted by the National Defense Industrial Association. “But the budget is increas-

ing for us in our ground mobility office, so we need to start moving away from incremental only approaches [and] start looking at game-changing technology.”

Marine Lt. Col. Raymond Feltham, program manager for the family of special operations vehicles, noted that the president’s fiscal year 2020 budget request calls for more than a five-fold increase in research, development, test and evaluation funding for the command’s tactical vehicles.

“What we are trying to do is really leverage our RDT&E,” he said. If “we leverage all the goodness that you’re doing out here in industry and our sister services, I think really we can go a long way,” he added.

Artificial intelligence and autonomy are key capabilities that SOCOM wants for its trucks.

“By 2030, 2035, you’re really going to be seeing a difference in the way we fight,” Feltham said.

AI could assist with a variety of tasks including operating platforms in environments where satellite-based navigation could prove challenging, he said.

“That is going to ... get [forces] in autonomously through machine learning, but also get ‘em out when things have gone maybe not the way we wanted them to go in a GPS-denied environment,” Feltham said. “That’s probably the battlefield that we’re going to be facing.”

Autonomy could also reduce manpower requirements for logistics and resupply missions, especially when special operations forces are spread out over large areas, noted Army Col. Joel Babbitt, program executive officer for SOF Warrior.

“Let’s get out of the paradigm of lots of little vehicles with lots of support people running around vulnerable on the battlefield,” he said during a panel discussion at this year’s annual Special Operations/Low Intensity Conflict conference in Arlington, Virginia, hosted by NDIA. “Let’s instead get vehicles driving themselves.”

The first ground mobility platform that SOCOM aims to equip with autonomous capabilities is the light tactical all-terrain vehicle, or LTATV, Kittinger said.

The system is used for a variety of missions including infiltration, reconnaissance and medical evacuation. The two- and four-seat variants can be transported via V-22, H-53 and H-47 aircraft, according to a product description.

Polaris currently holds a five-year indefinite-delivery, indefinite-quantity contract to provide its MRZR trucks. The deal is set to expire in fiscal year 2020, at which point Special Operations Command plans to hold a full and open industry competition for that type of platform, Kittinger said.

The command hosted an LTATV industry day in November, and released a draft request for proposals on FedBizOpps in February.

The special ops community will also be keeping a close eye on the Army’s efforts to pursue autonomous capabilities for its next-generation combat vehicles, he said. In March, the Army released an RFP for an optionally manned fighting vehicle.

SOCOM is often the proving ground for new technologies that the larger services are interested in, Kittinger noted.

“We will look to leverage their capabilities to put out in our



operators’ hands a little bit early to get some operational feedback [and] help define our requirements with that upcoming RFP for this new contract,” he said. “We’re just really trying to ensure that we embed hooks into the [next LTATV] vehicle to make it autonomy-ready when we’re ready to start deploying that capability.”

Hybrid-electric technology is another item on SOCOM’s wish list. Dedicated funding is already in place for the ground mobility vehicle 1.1 when the platforms are upgraded in fiscal years 2020 and 2021, Kittinger noted.

Babbitt described the GMV as “an oversized dune buggy” that carries small assault teams. A system that can utilize electric propulsion could help commandos be stealthier as they close in on their targets, he noted.

“When it comes to the hybrid technologies, it’s really about the last 15 minutes as you’re approaching the objective,” he said.

DEFENSE DEPT.



“If a Prius can sneak up on you, then certainly something that SOCOM has should be able to sneak up on you.”

This fiscal year, the command will conduct an analysis of alternatives for new propulsion systems, Kittinger said.

“Is it fully electric? Is it series hybrid [drivetrain where a gasoline engine helps power the electric motor that turns the wheels]? Or is it some combination of something else? And what are the tradeoffs of each?” he said of the options that will be explored. “We’ve got to do that with our operators to better inform their requirements so we can execute those dollars in FY ‘20.”

Other platforms such as the LTATV could also utilize hybrid-electric technology, officials noted.

Meanwhile, Special Operations Command has several types of vehicles in the concept development stage. One is the next-generation armored ground mobility system, or AGMS.

The legacy armored personnel carrier is based on General Dynamics and Flyer’s Pandur platform. It has been in the force for about 30 years, and SOCOM is looking to replace its aging fleet.

Officials would like the next-generation platform to offer protection similar to today’s heavily armored mine-resistant, ambush protected vehicles, but still be able to fit in a C-130 transport plane, Kittinger said.

“We’re still going to have our base requirement of the transportability,” said a SOF official who asked not to be identified by his full name. “That’s key for us.”

The legacy platform “has been used here in the last couple of years to go out from Fort Bragg in a hurry to other locations in the world,” he noted.

The truck can carry about 10 passengers. Operators would like a future system to be of similar size and dimensions, he said.

The next armored personnel carrier also needs to be more survivable. The current AGMS is “lagging” when it comes to ballistic protection and blast protection, he said.

Other desired improvements include enhanced situational awareness, heavy weapons capability and improved power generation for communications equipment and other electronic devices.

Officials hope to start the program in the fiscal year 2022-2023 timeframe after they finalize requirements. SOCOM might leverage other transaction authority agreements for prototypes, which could lead to a follow-on production contract, Kittinger said. OTAs are a contracting mechanism provided by Congress to help cut through bureaucratic red tape and speed up the acquisition process.

However, while vehicles such as armored personnel carriers and MRAPs provide important capabilities, they aren’t the most inconspicuous trucks. When commandos want to blend in with the population in their areas of operation, they drive around in non-standard commercial vehicles, or NSCVs, such as heavily modified Toyota Hilux and Land Cruiser SUVs.

“We have a very aggressive payload and a very aggressive off-road mission profile for these vehicles, so that drives a number of different modifications to the platforms,” Kittinger said. Those include armor, electric modifications, radios and other communications equipment, and electronic countermeasure systems.

“By the time we’re done with these vehicles they are well over 10,000 pounds after we put four SOF operators and their kit and mission payload in there,” he said.

The heavy weight burden on the original equipment manufacturer’s frames — combined with the pounding they endure during overseas operations — results in the trucks having short lifecycles, officials noted. To get at the problem, SOCOM wants to acquire purpose-built platforms for these types of missions.

“Those things are actually rather expensive, yet we’ve been treating them more like ... disposable” items, Babbitt said. “We are shifting away from that model into a more purpose-built model. In other words, don’t buy a vehicle, up-armor it, etc., but rather purpose-build it from the beginning.”

The command wants NSCV trucks that will last 10 to 15 years, whereas today’s systems last just three to five years, he said.

While the upfront costs of a purpose-built vehicle may be higher, sustainment costs will be significantly lower, resulting in a reduced total lifecycle cost, Kittinger said.

“We’re going to move away from the complex engine and vehicle electronics that exist on these Toyota platforms, and ... get out of the cyclic nature of OEM model year changes that drive new designs and new testing and ultimately drive our costs

and our schedule on an annual basis,” he added.

SOCOM wants lighter armor solutions and equipment, a common chassis and drivetrain, and interchangeable exteriors to mimic different types of vehicles commonly found in various areas of operation around the world.

“We’re looking for a flexible vehicle type that can change vehicle skins and allow it to change colors on a quick basis, as well as also change ... maybe from a truck to an SUV or from one truck to another,” Kittinger said.

“This provides us mission flexibility,” he explained. “When shifting a vehicle from one [area of operation] to another, I can still have it look like what it needs to look like.”

The command plans to leverage OTA agreements for prototyping efforts, and conduct testing and evaluation during fiscal year 2020. A follow-on production contract award is slated for 2021 if the initiative is successful, Kittinger said.

Another concept that is less well defined is a new vehicle that could be internally transported by a V-22 Osprey tiltrotor aircraft. While the LTATV is V-22 transportable, it’s basically a commercial system and has a relatively short lifecycle, Kittinger said.

“We’re looking at trying to go to a more durable, rugged platform that has some increased capabilities, increased payload, heavy weapons capable” that could fit in a 60-inch space on an aircraft, he said.

The Marine Corps is pursuing a similar capability, he noted. “At the moment, we’re not really trying to drive the train on that. We’re monitoring [what the Marines are doing]

and we’ll go from there.”

Looking more broadly, capabilities desired across SOCOM’s ground mobility portfolio include: lightweight armor; lightweight vehicle components/modifications; advanced tires; low size, weight and power/high output alternators; hybrid-electric systems; alternative fuel sources; autonomy/semi-autonomy; semi-active suspensions; advanced situational awareness; and telepresence for remote vehicle operation and/or situational awareness, according to Kittinger’s slide presentation.

“That doesn’t always mean that SOCOM is going to be the one driving the train” in these areas, Kittinger said. “But we want to be the proving ground to adopt some of that capability, and we’ve got the money to do so now.”

There is a SOFWERX facility near the command’s headquarters in Tampa, Florida, that allows industry to come in and meet with program officials and special operators, he noted. The organization was established in 2016 to connect the SOF community with innovative, nontraditional partners who could offer technology solutions to meet warfighter challenges.

“On a lot of these [ground mobility] capabilities, that’s where I see us employing their expertise and their manpower to set up these types of events and learn what industry has to offer,” Kittinger said. **ND**



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SOCOM AIRCRAFT

SPECIAL OPERATIONS COMMAND UPGRADES AIR DELIVERY VEHICLES

BY CONNIE LEE

Facing an evolving threat environment, Special Operations Command is modifying its fleet of rotary- and fixed-wing platforms to ensure commandos can reach their destinations around the globe.

Militaries worldwide are increasing their reliance on special operators, and the demand for airlift capabilities is expected to rise, said Matthew Beres, airborne retrofit and modernization analyst at Forecast International, a Newton, Connecticut-based marketing consulting firm.

“The airlift platforms must be able to align with special operations needs such as stealth, while being capable of sustaining high [operational tempo] ... meaning they need to be maintained properly and available for missions,” he said in an email.

For rotary wing aircraft, SOCOM may leverage the Army’s future vertical lift work to replace its mission-enhanced Little Bird helicopters. As a nimble unarmed system, the MH-6M troop transport variant is used to deliver special operations forces in and out of tight spaces and can also be used for reconnaissance.

However, the service’s legacy fleet is aging, said Navy Lt. Phillip Chitty, a spokesperson for the command.

“Sustaining the current capability presents readiness challenges due to the age of the current fleet,” he told *National Defense* in an email. “Many of the airframes have been in service since the 1980s with some dating back to Vietnam.”

SOCOM Acquisition Executive Jim Smith said the command is eyeing the Army’s future vertical lift capability “set one” for a potential replacement. The Army is pursuing the future attack reconnaissance aircraft to meet





DEFENSE DEPT.



this need. FVL is the Army's push to replace its current rotary fleet with modernized systems in the 2030s. Capability set one refers to the lightest platform in the effort.

"We haven't passed the point of no return where we don't think that [future attack reconnaissance aircraft] is potentially the replacement" for the mission enhanced Little Bird, Smith said during remarks at the Special Operations/Low Intensity Conflict Symposium and Exhibition in Arlington, Virginia, hosted by the National Defense Industrial Association.

Key requirements for a future replacement include improving the aircraft's range, speed, aerial refueling and strategic airlift capabilities, Chitty said.

Until a replacement is available, SOCOM is performing block 3 upgrades on the Little Bird. The modifications include a new airframe shell, a performance enhancement kit and upgrades to the cockpit avionics, Chitty noted.

Contracts for the components were awarded in fiscal years 2018 and 2019, with production slated to begin in early fiscal year 2021. The earliest date the service plans to make a decision on additional upgrades for the aircraft is fiscal year 2024, he said.

"We're changing out all the infrastructure for the [mission enhanced Little Bird] to add life to those programs in the eventuality that we're going to need to have those on the battlefield longer," Smith said.

Boeing was awarded a \$48 million maximum indefinite-delivery/indefinite-quantity contract to produce upgrade kits for the aircraft — which is known as the Killer Egg — in December. The work is slated to be completed by December 2026 and the majority of it is being performed in Mesa, Arizona, according to a Defense Department announcement.

The command is also looking to integrate more aircraft with the Silent Knight radar, a system that provides a terrain-following/terrain-avoidance capability that displays weather patterns and terrain features. President Donald Trump's fiscal year 2020 proposed budget calls for the installation of the radar on MH-47G Chinooks, MH-60 Black Hawks, CV-22 Ospreys and MC-130J Commando IIs.

"This new radar provides mission-essential capabilities while addressing obsolescence issues associated with today's legacy

radar systems," budget documents stated.

SOCOM is also upgrading its Black Hawks from a block zero to a block one configuration, Chitty said. Upgrades include common infrared countermeasures and vibration reduction of direct fire weapons systems, according to budget documents. The command hopes to procure multiple kits and integrated logistics and test support for the modifications, according to the proposal, which must be approved by Congress.

For a future Black Hawk replacement, the Army is leading an effort called the future long-range assault aircraft, which will also provide systems for SOCOM and the Marine Corps. The aircraft is for the FVL program's capability set three. The contract award for preliminary designs is slated for the fourth quarter of fiscal year 2021 and a critical design review is scheduled for the fourth quarter of fiscal year 2024, according to a request for information posted on FedBizOpps in April. First unit equipped is scheduled for the second quarter of fiscal year 2030.

SOCOM-specific requirements for the new platform include the ability to be transported in a C-17 and an in-flight refueling capability, the RFI stated.

CV-22 Osprey tiltrotor aircraft are undergoing modifications as well, Chitty noted. These are focused on improving situational awareness with technologies such as a color helmet-mounted display and an automated enhanced situational awareness suite.

The command is also recapitalizing all of its Boeing MH-47G Chinooks as part of its "renew" program. The effort is in collaboration with the Army's block two CH-47 Chinook upgrades.

The legacy MH-47Gs are the oldest in the Chinook fleet, said Randy Rotte, director of global sales and marketing for cargo helicopters and future vertical lift at Boeing. The effort provides SOCOM with an opportunity to add modifications that the Army's Chinooks have already received, he noted.

"They have a lot of aircraft that started life as A-model Chinooks, whereas when the Army went to F-models, the MH-47G didn't get all of the same improvements at that time," he said. "This is their opportunity to go back and to capture those as well as the ... improvements that big Army is getting."

The most significant part of the effort is replacing existing airframes with machined airframes, Rotte said. Traditional sheet-metal frames experience more vibrations, which lead to cracks and stresses. The machined versions are more robust and reliable because they are able to tune to the same frequency of the aircraft to reduce these vibrations, he explained.

"That's probably the No. 1 thing the Special Forces folks are looking for and why they are actually going to get aircraft before big Army," he said. The MH-47G upgrades are scheduled to be delivered before the CH-47 modifications, he noted.

Additionally, the upgrades provide a new rotor blade and an improved drivetrain. The rotor blade is a new design that allows the system to get additional capability at the same engine power, he added.

With the drivetrain, Boeing was able to "beef up some of the components" to provide 10 percent additional torque from the engine into the rotor system, Rotte said.

Having robust Chinooks is especially important for special

operators because they are often required to fly for long hours in difficult conditions, he said. The new airframe is expected to be easier to sustain, which could increase the amount of available aircraft or reduce the amount of people needed to maintain them, he noted. Additionally, they are anticipated to be more reliable and have a longer lifespan, he said, noting that the first Chinooks installed with the frames are still operational.

When comparing a sheet-metal frame CH-47D Chinook with a machine-frame CH-47F, the amount of hours required for maintenance was “significantly less,” Rotte said.

Boeing received the lot one \$139.8 million contract for the first four MH-47G block II aircraft in July 2018, according to a company announcement. Rotte said the first aircraft of the lot is scheduled to be loaded on the final assembly line this year and is slated for delivery at the end of 2020.

Another goal is to develop a larger number of system parts that can be used by the Army as well, which would reduce supply chain costs, Chitty said.

Beres said the Chinook upgrades are likely to increase the performance and decrease the operating cost of the helicopters. The modifications are also meant to improve operations in hot and high-altitude environments, he noted.

However, those improvements may not be as relevant as the military pivots toward great power competition with Russia and China, he added.

“Our National Security Strategy is moving focus to Eastern Europe and Southeast Asia — it’s a legitimate question to ask how much these improvements will be realized in a completely different climate and operating environment than they are

designed for,” Beres said. “Billions of dollars in improvements will mean nothing if fleets are grounded due to salt water degradation of components or extreme cold temperatures.”

For all airlift capabilities, Beres said there are multiple “trends” being pursued that differentiate special operations platforms from general military transport aircraft. These include electronic warfare, electro-optical sensors, human interface-helmet mounted displays, secure communications and improved engines.

Electronic warfare in particular is “one of the fastest growing and probably most important sectors in the defense market,” he said, noting that Russia could potentially outmatch the United States in this area. SOCOM must adjust its airlift capabilities to prepare for these threats, he added.

“Special Operations airlift aircraft must be able to protect against EW threats that may knock out the spectrum of airlift electronics systems,” he said. Additionally, the command could make small changes, such as changing aircraft position, “in ways that get unnoticed, but profoundly affect mission effectiveness,” he said.

SOCOM must also keep operating costs down while increasing the availability of its aircraft, Beres noted.

“Less frequent maintenance and less man-hours needed per maintenance interval significantly increases the availability of airlift resources,” he said.

Top capabilities on SOCOM’s airlift wish list also include increased situational awareness to “hyper-enable” its aircrews and assault forces; resilient communications; virtual reality mission simulation; and data science to support predictive maintenance and sustainment strategies, Chitty said. **ND**



AIR FORCE



SOCOM WATERCRAFT

**NEW SPECIAL OPERATIONS
UNDERSEA, SURFACE VEHICLES
ON THE HORIZON**



BY YASMIN TADJDEH

On a deserted beach half a world away, Navy SEALs — elite commandos tasked with completing some of the United States’ most sensitive military missions — silently emerge from the waves and approach their targets. Their mode of transport, an underwater vessel capable of being ferried by submarine, loiters in the sea awaiting their return.

Watercraft — both underwater and on the surface — provide special operators with a key technological advantage: the ability to quickly, efficiently and covertly conduct missions from the sea. While commandos as of late have become closely associated with conducting operations on land thanks to the wars in Iraq and Afghanistan, a command-wide pivot to great power competition will increase the need for these maritime systems as operators turn to the water, experts have said.

Special Operations Command is currently undergoing two major modernization efforts for its underwater systems — the shallow water combat submersible and the dry combat submersible. Both platforms are key to moving SEALs through oceans and seas.

Capt. Katherine Dolloff, program executive officer for maritime systems at the command, said SOCOM has over the past year taken delivery of the first two production systems for the shallow water combat submersible program which is meant to replace aging MK-8, Mod 1 SEAL delivery vehicles.

“The SWCS represents a significant improvement over the legacy ... [system] in several areas,” she told *National Defense* in an email. “SWCS brings increased payload and range, updated sensors, an improved navigation system and a modernized command-and-control architecture to permit the rapid integration of new technologies.”

SEALs are transported “wet” with the system, requiring the use of protective suits. The vehicles can be transported via a dry dock shelter attached to a submarine.

The first two production platforms were used to conduct the program’s initial operational evaluation, Dolloff said. Three more systems are in production with delivery of the next two scheduled later in fiscal year 2019 and the fifth following in early fiscal year 2020, she added. In total, Special Operations Command plans to purchase 10 shallow water combat submersible vehicles.

Bryan Clark, a senior fellow focusing on naval issues at the Center for Strategic and Budgetary Assessments, a Washington, D.C.-based think tank, noted the platform is a one-for-one replacement of the legacy systems. Additionally, there have been a number of improvements in terms of speed and loitering time.

"The battery is a major innovation," he said. The system uses lithium-ion batteries which are considered to be efficient but have also been a cause for concern due to the possibility of them catching fire. For the Navy, it has long been cautious about such systems, particularly for submarines.

However, "the battery in the new version of the SEAL delivery vehicle ... [is] approved for maritime use and is approved to be carried in the vehicle on the submarine," he added. "It went through a pretty rigorous certification process."

SOCOM is also in the production phase of the surface-launched dry combat submersible vehicle, or DCS, Dolloff said.

Jim Smith, acquisition executive for the command, noted that the program — which includes the procurement of three systems — is going "extremely well." The vessel is being manufactured by Lockheed Martin and United Kingdom-based Submergence Group.

"It's actually on its way across the Atlantic right now from Great Britain over to Florida," he told members of industry during the National Defense Industrial Association's annual Special Operations/Low Intensity Conflict conference in February. "We're going to put it in the water here in Florida and get SEALs on it and start testing out the first one."

Navy Lt. Phillip Chitty, a spokesperson for the command, confirmed that the vehicle has since arrived in the United States but declined to specify the exact location where it is currently being tested.

The system provides an advantage over the shallow water combat submersible in that it allows operators to remain dry while within the vehicle, said Tom Callender, a senior research fellow for defense programs focusing on naval warfare and advanced technologies at the Heritage Foundation, a Washington, D.C.-based think tank.

"Even just sitting there [in a SWCS], you can get easily fatigued from the fact that you're just sitting in this cold water," he said.

The dry combat submersible is bigger than the shallow water combat submersible, he noted. SWCS is roughly 7 meters long and the dry combat submersible is about 12 meters long and four times as heavy.

The dry version "allows them to be warmer, more ready, less fatigued," Callender said. It also has an increased range over the SWCS.

Smith noted that the requirements document for the dry combat submersible was written four to five years ago. While the command has received much of the technology it desired with the new system, the vessel still needs more interoperability with Navy submarines.

"We're still interested in that," he said. "We're still teaming with the Navy on that. That's a long-term objective that we haven't lost sight of."

In the future, the command may need to approach how it buys such systems in a different way, Smith noted.

The dialogue the command had with industry as it pursued the DCS was, "Hey, I want you to build me a submersible and then we'll kind of put some stuff inside of it," he said. However, "the dynamic has got to change in the way you think about our requirements and the way that we propose our requirements."

The next time SOCOM buys a dry combat submersible it needs to convey that it wants a system that is primarily a sensor that can operate underwater while also carrying SEALs, he noted.

"It fundamentally changes our design



Navy

paradigm if we think of this thing as a computer that happens to operate underneath the surface of the water,” he said. The key performance parameters “for the dry combat submersible were all about ‘Iron Triangle’ and capacity for a number of crew people.” Iron Triangle refers to the military’s need to balance payload, performance and protection.

“If I were writing the KPPs for the next dry combat submersible I might change that around to be much more about what information am I trying to get out of that vessel?” he said.

SOCOM is also pursuing new surface watercraft, Dolloff noted. It is currently looking for a replacement for its combatant craft heavy vessel which is used for the insertion and extraction of special operators.

“The current combatant craft heavy grew out of a technology demonstrator effort by the U.S. Navy,” she said. “Incorporating lessons learned from the operation of this craft over the past five years, U.S. Special Operations Command determined that an improved version of this platform could greatly increase USSOCOM’s capabilities in the maritime domain.”

The command is looking for a craft that is capable of launching and recovering larger payloads and possesses an enhanced command, control, communications, computers, cyber-defense, combat systems, intelligence, surveillance and reconnaissance suite, or C6ISR, she said. It would also like the system to have improved range while incorporating a state-of-the-art hull design and power plant.

The command has not yet decided on a replacement plan timeframe, she added.

In February, SOCOM released a solicitation on FedBizOpps for a combatant craft heavy mark 2, or CCH MK2, capability collaboration event that would “assess the current state of the art and industrial capability to design a new craft or modify an existing design to meet the requirements” for the new vessel.

“The CCH MK2 is expected to be a diesel-powered craft capable of open-ocean transit and well-deck interoperability with the ability to insert and extract SOF forces and host, clandestinely launch, and recover smaller manned and unmanned surface and subsurface systems,” the document said.

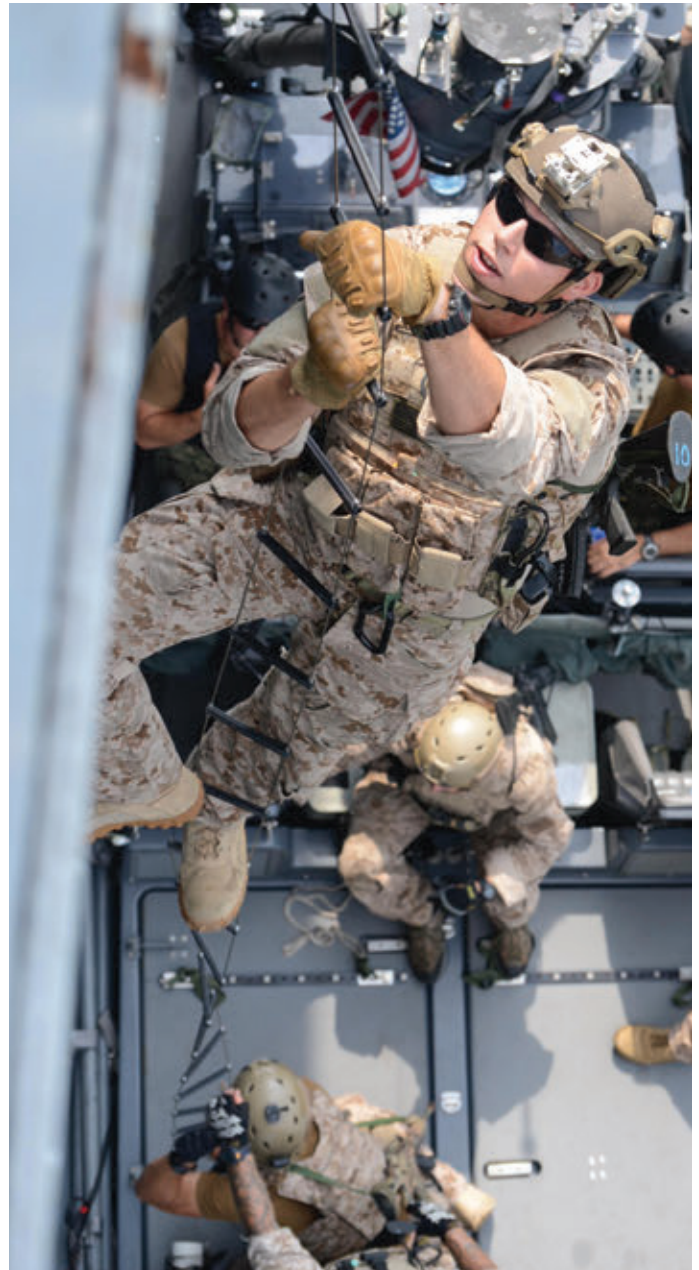
The solicitation noted that the outcome of the event could result in additional collaborations focused on the development of the platform.

The command is also upgrading the medium-variant of its combatant craft, Dolloff noted.

The modifications will provide enhanced situational awareness to the operators as well as upgraded communications and computer systems, she said. “Future upgrades include enhancements to improve operator environmental control and integration of enhanced deterrent capabilities.”

President Donald Trump’s fiscal year 2020 budget request asked for \$58.9 million in procurement funding and \$45.2 million in research, development test and evaluation funding for SOCOM underwater systems. Additionally, it included a request for \$33 million for combatant craft systems procurement and \$27.4 million for RDT&E.

Undersea and surface vehicles will be critical for Special Operations Command as it pivots toward great power competi-



tion, Clark said.

SOCOM “is coming off its highs in terms of investment after the wars in Iraq and Afghanistan,” he said. “They’re trying to rebalance now to ... deal with the challenge that Africa is posing and trying to make themselves more relevant to ... great power competition.”

The 2018 National Defense Strategy indicated that both Russia and China are now peer competitors with the United States.

Much of the Pentagon’s RDT&E investment is focused on countering Moscow and Beijing, he noted. The longer range, longer endurance next-generation underwater SEAL delivery vehicles could be useful against China as operators would have to launch from farther away.

However, “a lot of this investment in new combatant craft might be more focused on ... the Russia scenario where you’re dealing with operations in the Baltics, for example,” he said. **ND**

SOCOM WARRIOR

'HYPER-ENABLED OPERATOR' CONCEPT INCHES CLOSER TO REALITY

BY YASMIN TADJDEH

Nearly a year after announcing a new effort to “hyper-enable” commandos with a slew of new technologies, Special Operations Command is making progress, officials have said.

“Hyper-enabling the operator could mean a lot of things — getting them better body armor, getting better boots, get them better helmets,” said Jim Smith, the command’s acquisition executive. But “when you hear U.S. SOCOM talking about hyper-enabling the operator ... we’re really talking about the cognitive space.”

The concept — which focuses on four pillars of technology including communications, computing, data/sensors and human-machine interfaces — is about pushing tailored information to a dismounted operator or unit at the tactical edge, he said during remarks at the National Defense Industrial Association’s annual Special Operations/Low Intensity Conflict conference.

The command intends to look at multiple technology areas including data, presentation and computation, he said.

Having readily available information for warfighters on the battlefield mirrors technology found in self-driving cars, Smith said.

“[You have] got to have a lot of computing power on the car” itself, he said. “You can’t be reaching back to the cloud every time you’re trying to figure out if something is a stop sign or a pedestrian.”

It’s “the same thing for our operators. How do I get them computing power at the edge, the right comms pipe?” he said.

The initiative spans across all of SOCOM’s forces, he added, to include logisticians, medics and psychological ops personnel. “I’m talking about the full spectrum of SOF operations,” Smith said.

Already today, people across the world carry “exquisite” personal devices that can tell someone exactly where they are, he noted.

“None of us worry about maps anymore,” he said. “When we go into a new city, we’re not carrying any of that information with us. We count on our device to tell us, ‘Hey, here’s the best restaurant. ... Don’t stay in that





DEFENSE DEPT.

hotel, try this one instead.”

Such on-demand information technology would be enormously useful for an operator in Eastern Europe or in the Indo-Pacific region, he noted. A commando would be able to instantly tap into social media feeds to gauge nearby threats or to see what kind of criminal activity is going in the area, Smith said.

Right now, operators who want that kind of information first have to wait for it to be distilled by analysts in potentially a far-off location and then provided as products to the individual warfighter, he said.

“How do we get that to be a real-time information feed at the edge?” he asked. “That’s where we’re going with hyper-enabled operators, [and we’re] looking for your help on that one,” Smith told members of industry.

The command sees the concept as the next natural progression after its extensive work developing the tactical assault light operator suit, Smith said. TALOS, which was popularly known as the “Iron Man” suit, was originally envisioned as a way to protect vulnerable commandos that broke down doors during dangerous raids. However, after years of development Smith announced that the command would fall short of its original goal and the suit was not ready for prime time. (See Editor’s Notes on page 10)

“It will not be something that our operators would feel comfortable putting on in a close-combat environment today,” he said. “So moving, shooting, communicating in the face of enemy fire, not quite there yet.”

While the command has spent a great deal of time focusing on physical capabilities, it plans to place more emphasis on cognitive ability now, he said.

“We don’t see a clean break between TALOS and the hyper-enabled operator,” he said. “We see it more as a seamless transition from the physical domain to the cognitive domain.”

Smith noted SOCOM has established a task force within its science-and-technology division to focus on the hyper-enabled operator, ensuring that it has the “extra manpower” to drive the technology forward.

Col. Alex MacCalman, director of the hyper-enabled operator joint acquisition task force, said multiple program offices are participating in the effort.

“The team is conducting applied research and experimenting with prototypes and architectures to evaluate whether a prototype solves a clearly defined problem,” he told *National Defense* in an email. “This informs our future investment decisions.”

While SOCOM announced the concept last year during NDIA’s annual Special Operations Forces Industry Conference, the command has been working on related technologies for a

long time, MacCalman noted.

“Some could say that we’ve been hyper-enabling the operator since we fielded the Android tactical assault kit services on a phone,” he added. Previous research in areas such as visual augmentation, biomedical monitoring and embedded computing environments are providing the command with prototypes to test concepts.

The hyper-enabled operator idea emerged from the need to adapt to an evolving operating environment, MacCalman said.

“Special operators, along with the rest of the military, will have to operate in a cross-domain environment involving not only the physical domain of land, air, maritime and space but also the virtual domain within computer-generated environments or cyberspace, and the cognitive domain that involves optimizing the human/machine interface,” he said.

SOCOM officials have noted that the command intends to move from a focus on counterinsurgency operations to great power competition in support of the 2018 National Defense Strategy.

The biggest technological hurdles the command will have to overcome as it pursues the hyper-enabled operator concept

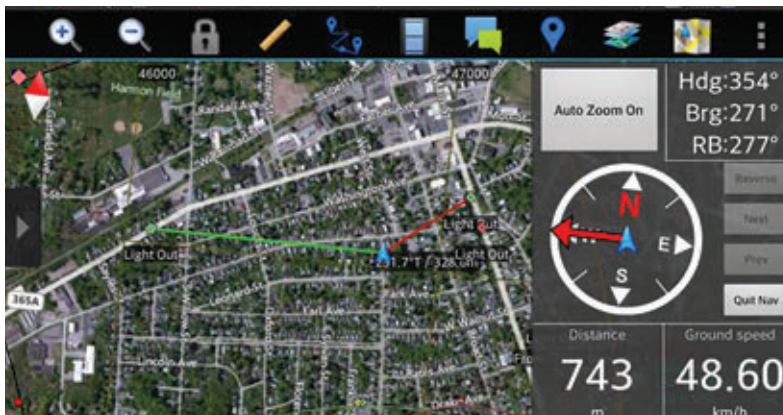
are long-range communications and optimizing data throughput in contested environments and denied areas, MacCalman said.

“The management and distribution of computer processing from the cloud down to edge devices is another area of continuing development, as well as research to understand how immersive technologies affect and benefit human cognition,” he said.

In November, Special Operations Command successfully hosted a technical experiment at Avon Park Air Force Range, Florida, he noted. A total of 41 technologies from 39 companies were evaluated.

“Technology experimentation events provide an opportunity for respondents to interact with operational personnel to determine how their technology development efforts and ideas may support or enhance SOF capability needs,” he said. It also brings together government, industry and academia.

In May, during the annual SOFIC show in Tampa, Florida, the command plans to hold a “disrupter event” to seek out new approaches to further the hyper-enabled operator concept, MacCalman said. Technologies of interest include: edge computing and analytics; tactical communications and navigation; tailorable human-machine interfaces and protocols; adaptable and flexible sensors; biometric and forensic tools; social network mapping and sentiment measurement tools; interoperability and integration standards/models; heuristic or probabilistic techniques or applications that can speed and enhance decision-making; intuitive mobile applications that support data



aggregation and interoperability; and enhanced stand-off identification and characterization, he said.

There are active efforts within SOCOM to develop a data strategy, data governance processes, cloud architecting strategy and next-generation communications in support of the initiative, MacCalman said.

“These efforts will foster a data-centric culture and enable the HEO concept by getting the right information to the right person, in the right place at the point of need,” he said.

Industry is already working to advance technology such as the internet of things, smart cities, artificial intelligence and machine learning algorithms for the hyper-enabled operator concept, he noted.

“Technologic advancements, such as AI, ML, computer vision and natural language processing are directly correlated to the requirements levied by the HEO concept,” he said. SOCOM’s ability to efficiently and effectively leverage these capabilities across hundreds or thousands of potential use cases requires input from SOF professionals to deliver an end-to-end digitization of business and warfighting processes, MacCalman said.

Increased digitization would reduce operators’ workloads for a variety of tasks, allowing them to focus their attention on more high value activity, he noted.

Artificial intelligence will be key for achieving these goals, and the hyper-enabled operator joint acquisition task force intends to embrace it by conducting a variety of experiments with prototypes to rapidly test ideas that can eventually be scaled, MacCalman said.

Additionally, Special Operations Command’s establishment of a chief data office and chief data officer solidified the command’s commitment to assisting operators through advancements in technology such as AI, he said.

“Fostering data-driven and novel concepts in anticipation of emerging and scalable technologies across the battlefield, SOCOM will foster a continued culture of experimentation and deployment of advanced capabilities to meet a rapidly changing digital environment,” he said.

Lisa Sanders, SOCOM’s head of science and technology, noted that developing AI technology for the hyper-enabled operator could take a significant amount of time.

The command will need to work through policy questions as it develops the technology, she said. In some cases, it could take



10 years for capabilities to get approved, she said at last year’s SOFIC show.

“I do think you are going to see a fairly substantial amount of products that are coming out in the two- to five-year window of time, and then it’s the ones that are policy constrained that are going to take us longer” to field, she said.

Smith noted the command is taking advantage of other transaction authority agreements as it pursues the hyper-enabled operator concept. OTAs have become popular contracting mechanisms that help cut through acquisition red tape through authorities granted by Congress. Last year, the command facilitated about eight agreements, he noted. **ND**

SOCOM Aiming for Big Boost in R&D Funding

President Donald Trump's fiscal year 2020 budget request would give U.S. Special Operations Command a major increase in research, development, test and evaluation funding, as it pursues new capabilities to take on advanced adversaries.

The fiscal blueprint calls for \$820 million in RDT&E investment, a 34 percent bump over the enacted 2019 budget. It would remain at relatively high levels across the future years defense program.

The proposed ramp-up comes as the U.S. military is carrying out the 2018 National Defense Strategy, which prioritizes preparing for great power competition with China and Russia.

Steven Bucci, a national security analyst with the Heritage Foundation and a former Special Forces officer, said the funding request for SOCOM reflects that strategic shift.

"It's totally in line with the larger budget priorities" that Pentagon leaders have set, he said. "While eventually that will lead to procurement [of new systems], right now you've got to figure out what it is you want to buy" by going through the RDT&E process, he added.

During a change-of-command ceremony in March, departing SOCOM Commander Army Gen. Raymond Thomas III emphasized the need to acquire new capabilities. He was especially keen on artificial intelligence and machine learning. "It applies to everything we're doing and everything we could consider doing in the future," he said. "I am an absolute zealot. We are trying to drive SOCOM in that direction."

Targeting, predictive maintenance, logistics and information warfare are just a few examples of areas where AI could be applied to aid special operations forces, he noted.

Bucci expects more investment in new unmanned systems. "You'll see that ... [technology] get much more sophisticated," he said.

He also anticipates more spending on offensive cyber weapons. Special operators need the tactical ability to "turn off enemy capabilities or to tap into their intel and their communications, and in some cases to intrude on those things in ways that provide deception and cover for our folks," he explained.

New SOCOM Commander Army Gen. Richard Clarke has said he will prioritize modernization and developing capabilities aimed at threats posed by great power adversaries.

In an email to *National Defense*, SOCOM Acquisition Executive Jim Smith noted that the command's funding priorities shift dynamically in response to the changing operational environment.

The 2020 proposal "does very clearly allocate resources to address the challenges presented in the National Defense Strategy," he said. "Our budget request includes funding for precision strike, directed energy and man-machine interface automation while also ensuring our existing platforms have the ability to operate across the spectrum of competition."

Under the 2020 budget blueprint, there would be major RDT&E spending increases across the portfolio including: applied research \$41 million, up 14 percent; advanced technology development \$89 million, up 13 percent; aviation systems \$246 million, up 40 percent; maritime systems \$73 million, up 74 percent; intelligence systems \$15 million, up 36 percent; tactical vehicles \$11 million, up 450 percent; and classified "special programs" \$22 million, up 1,000 percent.

The total request for the command was \$13.8 billion, approximately 2 percent of the total Pentagon budget.

"SOF has proven itself to be pretty darn useful for relatively little cost," Bucci said. Nevertheless, SOCOM might not receive the funding it's asking for from Congress.

"You would think well, heck, just give them their 2 percent ... [because] their 2 percent is not going to make much difference" in controlling federal spending, he said. "But what tends to happen is because their projects are smaller they have fewer advocates on the Hill."

The degradation of terrorist groups like the Islamic State and al-Qaida might cause some lawmakers to see less of a need for special ops. They also might not appreciate the imperative to help the force modernize to compete with countries like China and Russia, he added.

"It's a lot easier for the legislators, particularly those who are not huge military proponents anyway, to say, ...

"I don't see a need for this stuff right now. Why should we fund it?" Bucci said.

The withholding of R&D money would be problematic because there can be a significant lag time between the initiation of new projects and the fielding of capabilities, he noted.

"If we don't reach for these things now and get them authorized and appropriated and start developing them, it's really hard to get them quick" when they're urgently needed on the battlefield, Bucci said.

He said he's cautiously optimistic that lawmakers will recognize the value of SOF and appropriate the amount of money requested, but "you never know how these things are going to go." **ND**





Ground Troops to Receive Lighter, Tougher Body Armor

Eager to reduce the weight burden for dismounted troops, Pentagon researchers and others are working on new body armor that is expected to be lighter than legacy systems, without sacrificing survivability.

Ground troops sometimes carry upwards of 90 pounds of gear, according to a recent report by the Center for a New American Security titled, “The Soldier’s Heavy Load.” Much of that stems from personal protective equipment.

“Modern body armor has given U.S. troops an unparalleled advantage on the battlefield, improving survivability and reducing casualties,” defense analysts Lauren Fish and Paul Scharre wrote. “This protection comes at a price, however. ... Heavy loads reduce mobility, increase fatigue and reduce mission performance.”

Military leaders are well aware of the problem.

“Armor is not solely a function of protection. Armor is also a function of being able to move under that protection,” Brig. Gen. David Hodne, director of the Army’s soldier lethality cross-functional team, said at a convention in October. “A soldier who can’t move, a soldier who can’t shoot ... is not as lethal as the soldier who can move freely on the battlefield.”

To get at the problem, the service is in the process of replacing its legacy equipment with a new soldier protection system.

“The Soldier Protection System is modular, scalable and replaces multiple current systems,” Lt. Col. Ginger Whitehead, product manager for soldier protective equipment at program executive office soldier, told *National Defense* in a written response to questions.

“The SPS improves the level of mobility, form, fit and function

ARMY

for male and female soldiers and provides a significant reduction in weight” while enhancing protection, she added.

The equipment will include subsystems and components manufactured by a number of industry partners including: protective inserts for vital torso protection; a modular scalable vest, ballistic combat shirt and blast pelvic protector for torso and extremity protection; an integrated head protection system; and transition combat eye protection.

The Army will continue to procure and field the soldier protection system components in fiscal years 2019 and 2020, while working with industry and academia to assess and mature new technologies that could reduce weight and improve survivability, Whitehead said. In fiscal year 2020, the service anticipates moving forward with the next-generation integrated head protection system, she noted.

Meanwhile, the Marine Corps is looking for better ways to protect its dismounted troops. A key component of that effort is the development of the Plate Carrier Generation III.

Today, a Marine will typically carry approximately 25 to 28 pounds of body armor including the carrier, soft armor and hard armor plates, according to Flora “Mackie” Jordan, lead engineer for the infantry combat equipment team at Marine Corps Systems Command.

Nick Pierce, individual armor team lead at MCSC, said the PC Gen III is 25 percent lighter than legacy equipment. The new plate that will accompany it will make the total system about 38 percent lighter.

“When you put those together, you’re really taking almost 10 pounds off of a large-size Marine,” he said in an interview.

Despite weighing less, the PC Gen III soft body armor offers more ballistic protection, noted Jordan.

“The soft armor actually stopped some additional rounds that the old armor didn’t stop,” she said. “We really capitalized on a lot of technological improvements that were made in industry in the past couple of years.”

Marine Corps Systems Command used upgraded materials when developing the PC Gen III, including new laminate laser cut materials. It also looked at the design of old armor and removed unnecessary material that added bulk but didn’t offer Marines better protection.

For example, “they didn’t need these super wide shoulders, so we cut it out so they could have a better rifle stock when firing their weapons,” Jordan said.

Two companies — Vertical Protective Apparel and Armor Express — are manufacturing the components of the new plate carrier. Last year the Marine Corps awarded an indefinite-delivery/indefinite-quantity contract for up to 225,000 systems.

Fielding will start in the summer of 2019, and all Marines are expected to eventually transition to the PC Gen IIIs, Pierce said.

A separate solicitation went out in November for a lightweight plate insert to go in the new carrier. The Marine Corps expects to begin fielding it in the summer of 2020, Pierce said.

“We’re also already looking forward to a new helmet that we’re doing research and development on now that would better integrate a lot of the new [head-worn] systems” that are available such as hearing protection, communications and optics, he said.



The Marine Corps has been examining prototypes. A new solicitation for the helmet is expected in 2019, and the service aims to begin fielding the gear in fiscal year 2022. The Marine Corps expects the systems to be lighter weight and offer better protection than current helmets, he said.

Meanwhile, officials at the Army Research Laboratory and Natick Soldier Research, Development and Engineering Center, are looking further down the road at other technologies that could play a key role in future systems.

ARL conducts basic research that could lead to major breakthroughs.

“Our No. 1 goal has been lightening body armor,” said Chris Hoppel, chief of the laboratory’s soldier protection sciences branch.

A major focus of research efforts is to develop ways to reduce weight while improving ballistic protection against advanced threats that currently overmatch body armor, he said. Officials at the lab are also working on increasing blunt impact protection for the head to prevent traumatic brain injuries.

Lionel Vargas-Gonzalez, team leader for ARL’s ceramic synthesis and processing team, said researchers are looking at novel development methods, materials and designs.

“Ceramics are probably the most important material for body armor right now because they have a couple of unique features,” he said. One is that they are lightweight. For example, a ceramic plate made out of boron carbide is about one third the weight of steel, he noted. Ceramics are also hard, meaning they are effective at stopping incoming rounds.

“Hardness and compression strength are two big things that we have to have in this ceramic material, and that’s what makes them useful for body armor,” he added. “That light weight, that density [characteristic] is really what’s also a big key thing that ceramics can give you that metals can’t.”

However, the technology currently has some downsides, such



as low fracture toughness, which puts them at greater risk of being damaged because they aren't as good at absorbing energy from incoming projectiles, he explained.

Researchers need to find a way to increase the toughness of ceramics without sacrificing hardness and compression strength, he said.

The Army Research Lab is also investing in new materials such as boron suboxide.

"It's theoretically harder than boron carbide, which is the material that we currently employ for body armor," Vargas-Gonzalez said. "It's about the same density, the same weight. So we're looking at potentially a 30 percent improvement in hardness."

A substance commonly associated with high-end jewelry is also of interest.

"Diamond is the hardest material that we have known to man that's available. So there could be cases where we might look into actually including diamond particulates into body armor materials ... to maybe enhance the hardness," Vargas-Gonzales said.

Commercial investment in synthetic diamond material is pushing the price down to the point where it might be cost effective for body armor use, he noted.

Blending materials could offer major advantages, Vargas-Gonzalez said. This has been demonstrated by industrial partners when they mixed materials such as boron carbide and silicon carbide together, he noted.

"The real function there is to be able to modify the material to improve its performance beyond the intrinsic behavior of the individual components," he said. "Increasing the toughness, increasing the hardness, doing something that's going to change the mechanisms of how the bullet interacts with the body armor — those are reasons why we want to go down that route and we are actively investing" in that area.

The Natick Soldier Research, Development and Engineering

Center, which focuses primarily on applied research, is also looking at hybridized ceramics, new fibers and composite material development, noted Rob DiLalla, infantry combat equipment team leader at the soldier protection and survivability directorate.

"If there's something that shows promise at a basic research level, we will invest in it," he said.

Natick is currently looking at new experimental materials with three industry partners that could offer greater strength, he said. He declined to identify the companies or the new materials.

The technology could potentially maintain the same level of protection that current body armor offers, while reducing weight.

Natick has also funded an MIT effort to develop a new process for manufacturing ultrafine, tough fibers.

"Our goal was to produce fibers which are competitive with the commercially available materials, but which are in a different size range with respect to the fiber diameters," said MIT professor of chemical engineering Gregory Rutledge.

His research team has developed a technology called "gel electrospinning" that introduces electrical forces to conventional fiber spinning processes. These electrical forces provide another way to draw the fibers out so that they're ultrafine, down to just a few hundred nanometers in diameter, he explained.

"When we measure their properties, they are pretty remarkable" in terms of strength, he said. "This is still very early stage research, but in the context of body armor if we can get the same performance with smaller fibers, then we may need fewer layers or at least thinner layers" to achieve a specific level of protection, he explained.

Army researchers are also looking at bio-inspired materials.

Natick had an effort that was looking at genetically modified silk worm that had spider DNA to improve fiber tenacity, DiLalla said. While that technology ultimately didn't show great promise, it is an example of the avenues that Natick is looking to explore, he added.

Other things in nature like nacre shells are extremely tough because of their structures, Vargas-Gonzalez noted.

"If we see that happening in naturally-inspired materials, we would expect that at some point there would be some design aspects that we could probably employ in body armor to maybe achieve some of our goals," he said.

Natick is also making a big push in the area of head protection. The center wants a helmet that can address next-generation ballistic threats from enemy rifles, without exceeding the weight of legacy systems. There are also initiatives to improve blunt impact protection.

"One of our big thrusts is looking at graded 3D-printed structures ... optimized for the types of impacts that a soldier might see," DiLalla said. Natick has contracts with vendors that are looking at that type of technology, he noted.

Army officials have emphasized the importance of collaborating with industry to advance their body armor initiatives and transition them into production. "Ultimately, they're going to be the ones that make these body armor parts," Vargas-Gonzalez said. **ND**

VIEWPOINT:

SOCOM Must Tie Operational Data to Virtual Reality Training

BY LT. BRIAN SHUBSDA

Today, the nexus of U.S. military advantage is rooted in the effective integration of new and disruptive technologies. The modern digital transformation is a strategic investment into the lethality value chain of U.S. Special Operations Command as well as the overall cognitive performance of its operators.

As today's digital revolution continues to reshape the character of war, the command's ability to maintain a persistent state of preparedness will require the agile acquisition of disruptive commercial technologies to synthesize the design, development and expedited delivery of immersive digital training tools.

With the exploitation of technological discoveries, the expansion of their military capabilities and the rapid transition of prototypes, Special Operations Command has identified the accelerating technology trends which possess the greatest potential to deliver superiority.

These areas define propensities for repetitive and customizable on-demand training, digital planning and immersive mission rehearsals to sustain a global future force capability defined by precision lethality.

To that end, this transformation must be rooted in the cultivation of an ecosystem approach which emphasizes the vitality of the collection, synthesis, storage and management of the command's most valuable asset: its operational data.

Former Secretary of Defense James Mattis said, "virtual reality solutions will allow our close-combat soldiers to fight 25 'battles' before the first battle begins."

With its global market now expected to exceed \$35 billion by 2022, virtual reality has reached a state of maturation which, once adopted, will deliver SOCOM digital tools for repetitive, on-demand, immersive training. Training at each of the four Special Operations Command components will no longer be constrained by funding, resources, assets and risk to their personnel. To prepare for the certainty of conflict posed by advancing global competition, the command must be diligent in its implementation of digital tools that far exceed the capabilities of legacy platforms currently being utilized to satisfy traditional training requirements.

The commercialization of virtual reality has resulted in countless tools for military advantage. In addition to the technology solutions being offered by industry, commercial gaming has advanced to a degree which now requires developers to adhere to principles defined in their recent publication of commercial industry standards.

These standards, which can be easily leveraged and adopted by the Defense Department, have been formulated to ensure



that the open-standard for gaming results in the delivery of best-in-class applications to consumers. Users and developers would be provided a capability platform that is standardized, centralized and readily accessible.

These standards, derived from commercial gaming engines, fully encompass principles associated to hardware/software, data/security and communications that will be needed for secure and remote employment across special operations training. This process, once adopted, will enable the command to streamline its digital transformation, beginning with the modernization of training systems via an application programming interface, or API-based, architecture.

By leveraging tools to assist in breaking down the traditional bureaucratic barriers, leaders possess tools to better inform decisions with the individual operators now being able to better understand themselves, how they perform, and which areas can be improved upon.

The cultivation of a "Digital SOCOM" requires the alignment of technology investment with a modern data strategy, ensuring business units are structured to keep pace with the speed of development. With the adoption of new technologies, expansion of institutional knowledge and generation of an adaptive future strategy, the command will be able to synthesize the rapid delivery of objective metrics to its leaders for their evaluation of team and individual performance during training evolutions.

Currently, the inability to capture and codify training data results in a lack of performance knowledge, making it extremely difficult to capture individual operator readiness. As warfighters are provided with modern virtual reality tools for personalized learning, quantified digital data is unveiled to leaders.

The delivery of quantifiable, digital data to today's leaders will be their first opportunity to capture how efficiently their men and women process data and take decisive action when faced with stressors similar to those endured in combat. Against this backdrop, the term Chief of Naval Operations Adm. John



Richardson coined, “high-velocity learning,” can be applied to both humans and intelligent machines, uncovering opportunities for advantage not yet realized. In turn, virtual reality will deliver the ability to capture and codify priceless data into artificial intelligence systems while learning methods for interaction across environments that will deliver solutions at a fraction of the cost and at significantly less risk to the warfighter.

In short, the term high-velocity learning is rooted in SOCOM’s ability to extend and accelerate the reach of modern human capabilities.

Big data is not just about managing more or varied data. It is about asking new questions, formulating new hypotheses, exploration, exploitation and discovery to drive more effective and efficient data-driven decisions. Ultimately, these efforts employ new analytical techniques to determine overall mission effectiveness. With the implementation of virtual reality solutions into all phases of individual and team training blocks, leaders are enabled to employ a future force that can win and maintain presence across multiple fronts, no matter the environment or the capabilities posed by our adversaries.

As for future implications, commercial industry has recently matured technologies around an innovation solution referred to as digital reality, which is a combination of tools such as augmented reality, virtual reality, mixed reality, 360-degree video and immersive technologies, that convey data and intelligence information across digital visualizations. These tools have already presented tremendous value to multiple government entities, transforming data mining, warfighter performance and business unit efficiencies.

Although extremely beneficial, the cross-cutting nature of digital reality will present challenges for agile development and quick integration, as these tools touch multiple Defense Department program offices.

Leaders across special operations possess the requisite knowledge and authorities to improve upon existing methods associated in the collection, codification and protection of SOCOM’s

proprietary user and team data. To that end, the individual and team data from training and operations, captured while using digital technologies must be protected with modern, not legacy, controls.

As these technologies continue to develop, leaders must further expand upon their understanding of modern security protocols, standards and concerns to ensure data is captured and protected. This focus must be driven from the top-down, with leaders ensuring security is key during the adoption of commercial industry standards for virtual reality and digital learning platforms.

Defined as a company of historic bureaucratic processes and systems, one of the largest roadblocks for the command’s software plans is its inability to expedite software interoperability measures. The ability to network new technology, data capture, virtual environments and associated software tools with the suite of legacy training platforms has become an extremely cumbersome process. This will become increasingly difficult as commercial technology readily becomes more advanced and the future battlefield requires teams to conduct virtual interoperability training, planning and rehearsals with partner nations to prepare for uncertain conflict.

Innovation processes, organizational ambidexterity and technological fluency will be required to seize the advantages provided through the rapid adoption of accelerating commercial technology. Real-time digital capture of our most valuable data — advanced tactics, operational inputs and warfighter decision-making — is the first step toward operationalizing artificial intelligence.

Embedding AI and machine learning algorithms into virtual reality will provide us with the insight needed to identify the measures of effectiveness for the human-machine team, highlighting former SOCOM Commander Army Gen. Raymond Thomas III’s vision for tomorrow’s hyper-enabled operator. The lethal combination of human and machine will provide capabilities that far exceed the effectiveness of platforms or humans operating separately.

With this understanding, the dedication of special operations teams and the ability to leverage their experiences and skillsets must continue to be the foundation of the command’s future strategy.

Digital technologies are fundamentally shifting the expectations and behaviors of the modern warfighter. It is incumbent on leaders and innovators to aggressively pursue new technologies to enhance how they train and fight in 2019 and into the future. They need to meet the warfighters where they are and engage with them to better understand modern needs and anticipate those of the future.

The speed at which warfighters expect the right information to be delivered to them will only continue to accelerate throughout the digital age. SOCOM must build for that today.

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Lt. Brian Shubsda is assigned to Naval Special Warfare Command’s future concepts and innovation directorate, while also attending Georgetown University in pursuit of his MBA.

VIEWPOINT:

SOCOM's Iron Man Suit: A Worthy Moonshot

BY STEW MAGNUSON

It was six years ago at SOFIC in Tampa, Florida, when then-Special Operations Command Commander Navy Adm. William H. McRaven first mentioned a technology development program that would go on to be popularly known as the “Iron Man suit.”

While there were few details at the time, six months later at the National Defense Industrial Association's Special Operations/Low Intensity Conflict conference in Washington, D.C., the command's science and technology enterprise had a slick, animated feature of a commando, crashing through a door and standing there as bullets bounced off his suit of armor as if they were nothing more than a swarm of pesky mosquitoes.

The tactical assault light operator suit, TALOS, made it in the main stream press as McRaven himself likened it to the popular Marvel super hero. The YouTube video was replayed widely on news sites and had thousands of hits. Placing the words “iron” and “man” in a headline created clickbait for military technology reporters, and the association with a popular movie character brought SOCOM publicity it could never buy.

McRaven's vision for the technology was exactly as shown in the video. It was an independently operating suit of armor that would protect the first commando in a raid to enter a room where insurgents might be holed up.

Special operators for the good part of a decade had been carrying out missions in Iraq and Afghanistan that required them to track down and — if possible — capture insurgent leaders, bomb-makers and other assorted bad guys. That often required raids taking place in buildings.

The first special operator to go through a door was left vulnerable to bullets and bombs. McRaven wanted TALOS to protect that commando. Unlike the Iron Man character, this suit would not shoot energy beams or fly.

McRaven asked Congress for \$80 million to develop the suit and he set a deadline of five years for a working prototype.

Six years later at a SO/LIC talk, Acquisition Executive James Smith went through an entire presentation on the command's science and technology priorities but never mentioned TALOS. A year prior, officials announced that TALOS' working prototype would be delayed a year, but they expressed confidence that it would be done.

With no TALOS update forthcoming, *National Defense* asked Smith in the Q&A for an update.

Smith said TALOS had fallen short of its goals. “It's not ready

for prime time in a close-combat environment,” he replied.

While not ready for the mission McRaven envisioned, when the final prototype is delivered this year, it will be the best exoskeleton in the Defense Department, he added.

“It will not be something that our operators would feel comfortable putting on in a close-combat environment today. So moving, shooting, communicating in the face of enemy fire — not quite there yet,” he said.

The lower half of the exoskeleton is particularly robust, he said. One operator put on the legs and was able to run a four-minute mile. So it could be used in other missions such as logistics and during long-distance marches, Smith said.

Army Col. Joel Babbitt, program executive officer for SOF Warrior, said TALOS has spun off several technologies. “We are leveraging the vast majority of that technology,” he said at the conference. The funding is in place to bring about nine technologies derived from TALOS to the command's various components for them to integrate, Babbitt said.

“There are a lot of success stories coming out of this, but you're not going to hear about it under the banner of TALOS.

You're just going to see a lot of cool stuff coming to SOCOM over the next few years,” he added.

While TALOS was never a formal program of record, the science and technology push to develop its underlying technologies will continue, Smith said. “We're not going to stop looking for better body armor, better situational awareness, better lethality. ... We're going to keep looking at all those things.”

TALOS would turn out to be one of the command's highest profile and most watched technology development programs. Smith said the video might have been a mistake for raising expectations. We disagree. It excited the public and brought in nontraditional contractors who had never worked with the military before, as SOCOM officials noted.

So was TALOS a boondoggle or a worthy moonshot?

“I think we have pushed physics as far as we are going to get in the near term,” Smith said. The key words here are “near term.” Five years was always an arbitrary number. Technology may catch up and special operators may someday have their Iron Man suit.

This is also a case of “nothing ventured, nothing gained.” For too long, dismantled troops have gotten the short shrift when it comes to high-profile military technology development, yet they are the most vulnerable warfighters. A fighter pilot is wrapped in the best protection and stealth technology available, and the amount of money to pay for it goes unquestioned. Meanwhile, the Army nickel and dimes it when it comes to developing new squad weapons, lighter armor and better batteries.

Marines, foot soldiers and special operators bravely busting down doors deserved their own moonshot technology development program, and this should not be the last one. **ND**



VIEWPOINT:

Communication Key To SOCOM's Success

BY JAMES C. BOOZER

The National Defense Industrial Association believes war-fighters must collaborate with industry throughout weapons system development to deliver capabilities that provide the U.S. with the competitive advantage it needs to win future conflicts.

Thus, reforming acquisition and accelerating innovation for conventional and special operations forces requires closely integrating operators into the acquisition cycle from conception through sustainment. NDIA's Special Operations Forces Industry Conference (SOFIC) provides indispensable in-person collaboration opportunities for operators and industry innovators, to deliver decisive advantage for our warfighters when defending the homeland and its freedoms. Why do this? Because we want the nation's warfighters to fight with a clear and overwhelming advantage.

When we fail to bring operators and innovators together, we risk misunderstanding, which can lead to opposition to collaboration. For example, employees from both Google and Microsoft recently expressed concern about their companies' engagement with the Defense Department. The opposition likely stemmed from a fundamental misunderstanding about the military's mission and the motivations driving its uniformed members to serve. While Microsoft's leadership made clear their commitment to support service members and actively participate in critical discussions about responsible technology use, Google responded to the pressure by declining to renew a defense contract.

A big part of NDIA's mission is to provide forums where operators and innovators can learn they share common values and to avoid situations where lack of shared experience and context leads to misunderstanding. Service members choose military service because they believe in the American creed of life, liberty and the pursuit of happiness, and they regard equal opportunity and justice as civil rights. The people of America's high-tech companies choose their careers to help make their customers' lives easier, more interesting and more enjoyable. Fundamentally, the professional goals of both groups align; service members secure and defend freedom, and innovators help Americans make the most of their freedom. Bringing the two groups together helps them share information and ideas in ways that will protect and strengthen freedom for everyone.

Protecting freedom requires service members to hedge against anticipated threats. Military officials worry about Russia interfering in elections and increasing its influence in Ukraine and the Baltics. They worry about China building military outposts in the Spratly Islands along key sea lines of communication and amidst rich fishing grounds. And they worry about terrorist organizations establishing permanent training facilities in the Middle East, from which they can threaten the homeland. These threats

potentially impact all Americans as well as many allies, driving service members to pursue capabilities to assure allies of the nation's commitment, deter unwanted action and, if necessary, defeat adversaries.

This is why convening events bringing together warfighters and industry strengthens American defense. Allowing junior military members to interact, and maybe even "interhack," with defense industrial base employees allows the two groups to share context and perspective, as well as knowledge, skills and experience.

Bringing together more senior members of each type of organization exposes operators to the current state of the art in technology and provides a forum for them to explain their missions and working conditions with inventors, innovators and developers who can help shape the outcome during future missions.

Under the current acquisition process, requirements development generally depends on field-grade operators identifying shortfalls and working to determine whether services should address gaps using doctrine, organization, training, materiel, leadership, personnel or facilities. When considering materiel solutions, acquisition professionals conduct market research to understand the art of the possible, both now and in the near-to-mid-term. It is critical for acquisition officers to share market research responsibilities with operators and to emphasize in-person interactions with industry innovators and developers to determine how American industry can leverage new and nascent technologies to deliver decisive advantage to warfighters.

"Accelerating innovation requires getting smart people in the same room."

With 29 divisions and 29 chapters, NDIA creates educational opportunities and convenes legal forums across a broad spectrum of topics, catalyzing collaboration between government and industry. In-person engagement allows participants to share more than facts and requirements, it allows them to share context. Warfighters can share hard-earned training and combat experience, emphasizing the equipment that worked better than

expected and highlighting shortfalls.

Industry can share their recent successes and extrapolate to characterize what they believe the art of the possible will be in the near-, mid- and far-term. As we've seen with DevOps, an enterprise software development phrase used to describe an agile relationship between development and IT operations, providing context with requirements drives better outcomes.

Accelerating innovation requires getting smart people in the same room and encouraging them to share expertise. Pairing developers with operators to shorten development timelines and deliver capabilities that closely align with existing and emerging requirements accelerates innovation.

NDIA is excited to again partner with U.S. Special Operations Command to bring the best in defense industry capabilities and innovation to Tampa to enable in-person engagement focused on tackling current and emerging challenges. **ND**

James C. Boozer is the executive vice president of the National Defense Industrial Association.