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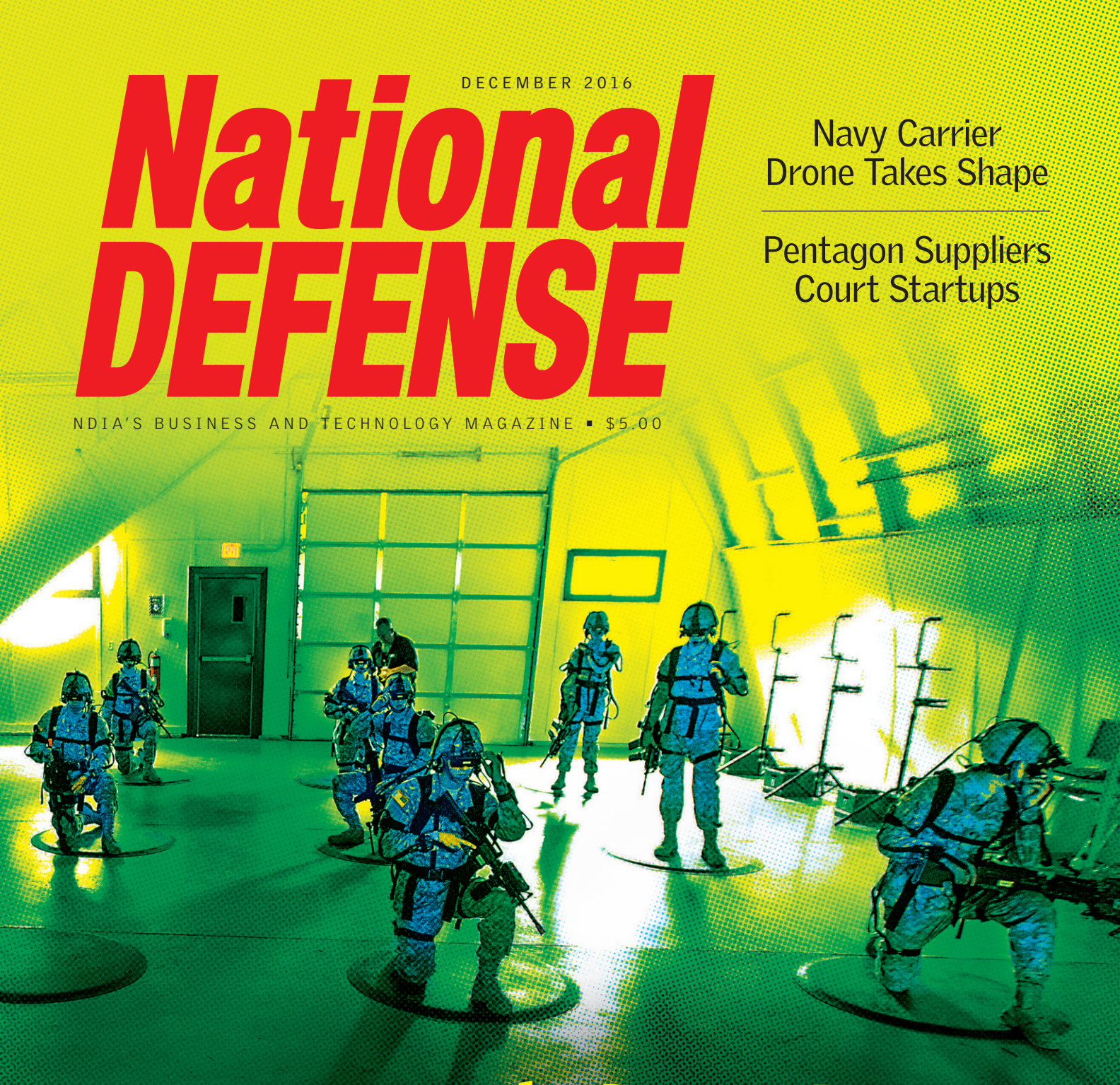

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LOCKHEED MARTIN

By Craig R. McKinley

Trump's Military Plans Require Deft Hands

Historians will record the 2016 presidential campaign as memorable in many ways, even though in some ways its actual conduct made most Americans happy to see it conclude. But, conclude it did and on Jan. 20, 2017, Donald J. Trump of New York will be sworn in as the next president of the United States.

He will face many challenges. But certainly one that will need immediate attention involves the budget situation. Trump will find that the budget regime established by the Budget Control Act (BCA) of 2011, which includes caps and the potential for sequestration, is still in place. Moreover, the issue of raising the debt ceiling, which largely precipitated the BCA, will return to the stage after having been pushed beyond the Obama administration. It will be interesting to see if the Tea Party wing of the Republican party will resist raising the debt limit.

Why is this important to the defense industry? Simply put, eliminating or significantly raising the BCA caps, which only apply to discretionary spending in the federal budget, will have to be enacted before any major programs, either defense or domestic, can be pursued. In addition, increased spending combined with a major tax cut will certainly explode the current deficit levels, which have been slowly declining over the past few years. Such an outcome will be hard for the "fiscal hawks" to accept, even if they would prefer to be "defense hawks" given the strategic situation.

As a candidate, Trump identified several very specific defense steps he would take as president. He advocated increasing the Army's active duty manpower from 490,000 soldiers to 540,000 — close to the levels the Army had at the height of Operation Iraqi Freedom. Such an increase would expand Army force structure by a third, from 30 to 40 brigade combat teams.

Trump advocated increasing the Navy from the currently planned 310 ships to 350, and presumably continuing recapitalization efforts of the nuclear submarine deterrent. He has embraced adding about 100 fighters to the Air Force, and increasing the number of Marine Corps infantry battalions by 50 percent while increasing the number of Marines to the highest levels since the Vietnam War.

All of this, of course, costs money — a lot of it. Cost calculations indicate that executing this program would require an increase to the defense budget of over $100 billion annually, a level $60 billion above President Obama's proposed defense spending level, one that is itself $30 billion above the BCA caps. Getting to these levels will require considerable heavy lifting in the political domain.

But let us assume that Trump succeeds in lifting the caps, and securing support for what will clearly be a major defense buildup with significant modernization and recapitalization well beyond that currently planned. Executing this will require experienced and dedicated management from a Pentagon acquisition team that understands both the myriad details and requirements of the acquisition process as well as the capabilities and capacities of the defense industry. But identifying these people and attracting them to government service will be a challenge.

Under Secretary of Defense for Acquisition, Technology and Logistics Frank Kendall has served in his position for nearly seven years and has done a tremendous job. For the coming effort, should it materialize, the Defense Department will need personnel with senior executive experience in industry — hopefully who also have an understanding of government. However, current ethics rules generally require that job candidates largely divest themselves of assets earned in industrial careers and to take other steps reducing conflicts of interest — or even the appearance of conflicts of interest. Such executives, therefore, have to take a significant loss of net worth or income to serve the government, and they must also accept a lengthy prohibition from employment in the industry even after leaving government.

These rules, which have been driven by the office of government ethics, the White House — where presidential nominations are vetted — and the Senate Armed Services Committee — where presidential nominations are confirmed — currently present a major barrier to service.

Several great industrial leaders have served as defense secretary and deputy secretary over the years including Charles Wilson, Robert McNamara, David Packard and Donald Atwood. We will need individuals with backgrounds similar to that represented by this group as we go forward with this coming defense expansion — should it happen.

Whether we want to accept it or not, our military forces have entered a new era. Each of the military services, in their own way, has entered into a period of capital and technological intensity that has substantially altered the old "American way of war." We no longer seek to overwhelm an adversary with numbers, we now seek to do so with technology. And, as has been demonstrated frequently over the past 30 years, our armed forces have mastered this approach.

But since our potential adversaries have noted this change, and are taking steps to either match or counter it, the search continues for the next discontinuous advancement in military technology, which may originate in the commercial world. In essence, this is the search for the "third offset strategy" that DoD has been seeking.

Finding the third offset has been and will remain a challenge and a work in progress, but I am certain we will find it. But once it is in the target reticle, it will have to be purchased and fielded, and that will require increased funding distributed and managed by talented acquisition leaders capable of representing the Pentagon while understanding and communicating with industry.

Securing the funding will require the Trump administration to reset the nation's badly frayed budget process. But, it will also require it to attract the right people to government service, those having the skills and backgrounds to turn ideas that are now largely residing in the heads of scientists and engineers into operational reality.

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By Sandra I. Erwin

How Trump Might Reform Defense Business

An oft-repeated line of President-elect Donald Trump's presidential campaign was a promise to "drain the swamp in Washington, D.C." It's a recycled cliché that other politicians have used over the years and, in Trump's case, it has implied a desire to tear down established "big government" institutions.

If the pledge is honored, the Defense Department could be in for a shakeup.

The Pentagon prides itself on being more apolitical than most agencies. Secretary Ashton Carter informed defense workers the day after the election that he is "committed to overseeing an orderly transition." A Pentagon advisory panel, known as the Defense Business Board, already published a detailed guidebook to help ease the handover of power. Notably, the board cautions the new team that defense is serious business and that this is not the time or place for political gamesmanship.

"At noon on January the 20th 2017, the president-elect will be sworn in," the report says. "While the president is feted with an inaugural parade and many formal balls, the new secretary of defense immediately begins a day filled with briefings, staffing decisions, war-plan reviews, and meetings with the chair and vice chair of the Joint Chiefs of Staff and the combatant commanders."

The business board also will present to the incoming leadership a menu of proposed reforms that members believe are necessary to reduce costly bureaucratic bloat at the Defense Department. They warn the new administration that it should take action right away to tackle overhead spending — slow the rising cost of military and civilian personnel, shed aging facilities, jettison unneeded stocks of spare parts and other inventory and eliminate layers of management in many defense agencies.

"We're prepared to pitch these proposals to the new administration team. They are going to be looking for savings," said Defense Business Board member retired Marine Corps Maj. Gen. Arnold Punaro. "Every administration coming in looks at how they can do things more efficiently," he said. "If you look at the arithmetic of defense, you can't spend our way out of these problems."

The board's suggestions are not new by any means. Many were proposed to the incoming Obama administration in 2009 but have proved tough to implement due to political pressures from Capitol Hill or simply because of bureaucratic inertia.

There is much speculation that Trump, a real estate developer with no government experience, will be far more aggressive than past presidents at challenging the status quo. His reform agenda should become clearer once he names a secretary of defense and other senior members of the Pentagon team.

The Defense Business Board for more than a decade has sought to inject a corporate culture into the department's operations and financial management, but often has seen proposals fall by the wayside. Military and civilian leaders have pushed back on many initiatives, arguing that national security is a sacrosanct mission that should not be managed like a corporation.

In a letter to the incoming transition team, DBB Chairman Michael Bayer, urges the new leadership to "run the department like a modern business." The Defense Department is an "enterprise that is too costly, too slow and often unable to devote the resources required to enhance modernization and readiness," Bayer added. The Pentagon can't assume a future of ever increasing budgets, and "must confront the growth of overhead, personnel and benefits, and unnecessary work," he noted. "Without major surgery, our overhead and personnel costs will continue to eat away at our modernization and readiness. This is not about policy; it is about running the department like a modern business."

On the legislative front, much of the focus will be on Trump's and the Republican-controlled Congress' efforts to repeal Obama's healthcare law. Many Pentagon contractors are contemplating the possibility that they might also move to undo some of the Obama regulations introduced over the past eight years that specifically apply to companies that do business with the federal government. Trump will need to work closely with Congress on this, said Roger Zakheim, a partner at Covington's public policy and government affairs practice and former general counsel and deputy staff director of the House Armed Services Committee.

Federal contractors have been unhappy with Obama's executive regulatory actions over the past eight years. Many companies have chosen to exit the government market because of the regulatory burdens, said Todd Overman, chair of the government contracts practice group at Bass, Berry & Sims. The compliance obligations have piled on, he said. "An enormous amount of regulation has been thrust upon defense contractors, particularly in the labor employment space, fair pay, executive orders on sick leave and all that sort of stuff," said Overman. "This is especially concerning to service companies that may have a small federal footprint and are saying 'this isn't worth it.'"

Industry groups will be calling on Trump not only for regulatory relief but also for help creating a more collegiate environment for contractors in the government market. "Expand public faith in governing by delivering results through partnership and collaboration between government and its supporting contractors," urged the Professional Services Council. Other recommendations: Bring competent people into government. "We need experienced, competent leaders who can produce results," PSC said. "America's problems need all the talent we can get to work on them."

For years the Pentagon and other agencies have operated in a controlled chaos, with short-term funding and under a hostile working relationship with Congress. The voting public made it known in this election that they dislike government dysfunction. So do federal agencies and their contractors, which will be looking at Trump and his team for clues that they will be able to work with Congress. That would be welcome change.

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By Stew Magnuson

Unpacking the Idea of Armed Ground Robots

It was the summer of 2007 when National Defense Magazine caught wind that the Army had sent three armed ground robots to Iraq.

This scoop and milestone in military history was important enough, the editors felt, to put the special weapons observation remote reconnaissance direct action system, or SWORDS, robot on the September cover. It included the teaser headline: "Will gun-toting machines replace soldiers?"

With the U.S. military embroiled in a largely urban war at the time, the application for a remotely controlled robot with a machine gun mounted on it seemed obvious: it could be used to reduce the exposure of ground troops by going around corners or entering buildings first. Gunshot wounds then were second only to improvised bombs when it came to battlefield casualties.

The Army had a requirement for 80 more armed robots, but they were never built or fielded.

Almost a decade later, armed ground robots are not in the U.S. military inventory and are, in fact, rarely discussed publicly. There are no programs of record in the Army or Marine Corps, although the latter seems to be more predisposed to the idea.

What happened?

First of all, the big news in 2007 didn't turn out to be so big. As the months went on, the magazine uncovered that they hadn't been used as intended. The story was that shortly before deployment, there was a demonstration for Army brass, and one of the robots displayed "involuntary movement." In other words, the chassis moved on its own without the operator commanding it. And understandably, that made the officers nervous.

The three SWORDS were sent to Iraq under a cloud of mistrust, and as this column spelled out in the October issue, a lack of trust between humans and robots can kill off a technology. This was an early example.

By the time SWORDS arrived in Iraq, the battlefield commander ordered that they be used as remote weapons stations. The chasses were weighed down by sand bags and they never moved from their fixed locations.

Armed robots since then have popped up in demonstrations every once in awhile. They drew big audiences at the so-called Robotics Rodeo at Fort Benning, Georgia, in 2010, when the newly rechristened modular advanced armed robotic system, MAARS, demonstrated its firepower in a mock village. Funded by the Marine Corps Warfighting Laboratory and built by QinetiQ North America, MAARS did what it was supposed to do: move out and lay down suppressive fire without exposing troops to the same.

Then apparently, MAARS was literally put in mothballs, or whatever the military uses to pack up demonstration models of technologies that don't bridge the "Valley of Death" between labs and programs of record.

That's where Col. James Jenkins found them about a year ago when he began his tenure as director of science and technology at the Marine Corps Warfighting Laboratory.

They were packed in crates, he said at the recent Association for Unmanned Vehicle Systems International annual program review. His predecessors were told "to keep them in a box and keep them under wraps. 'You don't want to go there.'"

But unpack them, he did. He sent them out in May and June to be used by Marines at the Marine Air-Ground Task Force Integrated Experiment at Twenty-Nine Palms, California.

One of the goals of the five-day exercise was to experiment with manned-unmanned teaming. The service has acknowledged in documents that it will be fighting in large urban areas in the future and it needs all the help it can get from robotic systems, whether they are in the air or on ground.

"I can send a force of UGVs out, let them do things, and have the Marines sit back in a covered and concealed position, never leave the wire, and do the mission," he said.

During the first few days, the Marines using the armed robots saw it more as a conveyance for the .50 caliber machine gun. When they were ready to fire, the Marines stood behind it to pull the trigger. But as the exercise continued, they began to use it as intended, Jenkins said.

"Over time as they got more comfortable with the reliability — and the reliability wasn't perfect, these are still prototype systems — but more comfortable with the potential. You saw more and more that they were willing to poke these things out in a remote environment, use them to suppress targets and at least gain local fire superiority, then maneuver with your manned team once they got the bad guys' heads down," Jenkins said.

The lab, along with its Navy counterpart, is revamping its robotic modular, core vehicle so it can be converted from a logistics to a target acquisition/recognition, or a fires platform within 10 minutes, he said.

The idea of armed ground robots is finally taking hold, he added. "Just in the last year, there is a real willingness across the Marine Corps and across the services to recognize the potential benefits that those systems bring and start experimenting with them," Jenkins said.

SWORDS was at a high technology readiness level in 2007: high enough to be fielded. Nine years later, the robotics industry has made great strides in mobility, autonomy, controllers and vision.

In light of this history, the words of Deputy Secretary of Defense Bob Work are real head-scratchers. "I'm telling you right now," he said at the Reagan Defense Forum a year ago. "Ten years from now if the first person through a breach isn't a friggin' robot, shame on us."

Ten years? Do U.S. ground forces have to wait that long?

Their potential adversaries don't. Enter the words "Russian armed ground robots" on YouTube and readers can watch in action about 10 different models ranging in backpackable sizes to those that resemble small tanks.

So "will gun-toting robots replace soldiers?" The answer is "yes," but whose?

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By Tom Fox

Wells Fargo: The Lessons of an Ethics Failure

What is one to make of the Wells Fargo cultural miasma that led to the bank paying a $100 million fine to the Consumer Finance Protection Board, the largest in the agency's short history?

Add to that another $35 million to the office of the comptroller of the currency and $50 million to the City and County of Los Angeles and the fines total $185 million. The fines were assessed based upon the bank's conduct of opening over 2 million phantom bank and credit card accounts, usually without customers' knowledge.

The scandal was as straight-forward and pedestrian as one can imagine. It involved the sales of simple-to-understand, simple-to-use products such as credit and debit cards, coupled with traditional banking services such as car and home loans. These products were cross-sold to customers with an aggressive sales incentive program, which determined not only employees' compensation, but whether they even kept their jobs.

What began as a legitimate, legal and beneficial business strategy became not only high-risk but illegal, because of the way Wells Fargo administered its approach to cross-selling. As with any sales initiative, if a company wants to push it, it will set up incentives to engage in such behavior, increasing commissions around the service or product being emphasized. Almost any product or service can present a substantial legal and reputational risk, if not properly managed.

Moreover, Wells Fargo seemed to have forgotten that a bank's reputation is built on a basic cultural value: trust. People trust that their money will be there when they go to take it out. From the earliest days of banking in the west, the institutions succeeded because customers believed their money was safe. One need only consider the run on the bank scene from Walt Disney's film version of Mary Poppins.

Banks and banking have certainly changed since 1890s England or even the 1930s Great Depression in America. Before the scandal, Wells Fargo was worth some $240 billion, a far cry from a neighborhood bank; it is a worldwide financial services organization. Yet many people still ascribe the values of our parents and grandparents to how we think a bank should conduct itself. This seems to be a lesson which was lost on Wells Fargo senior executives and its board of directors.

Former CEO John Stumpf seemed as out of touch as the head of a multi-billion-dollar corporation could be when he announced that the fraud was the fault of some 5,300 employees who were terminated. He initially failed to accept any responsibility for creating a culture where employees had to cheat, by creating false accounts, just to keep their jobs. It was not until the Senate Banking Committee hearing that Stumpf admitted responsibility for the failure. Unfortunately, he admitted that he had known about the scandal since 2013 and the company's board had known about it since 2014. Wells Fargo had not even suspended the sales compensation plan that led to this fiasco, keeping it open until the end of the year. It was not until much later, when public pressure mounted after the House Banking Committee grilled Stumpf that the bank suspended its cross-selling sales incentive program.

One of the more remarkable facets of the Wells Fargo case is that the company had been aware since at least 2009 of the fraudulent cross-selling by its employees. In 2010 the bank found, from employee satisfaction surveys, that employees were uncomfortable with the sales targets of the product cross-selling. In 2012, the bank further internally investigated the fraudulent practices. In 2013, the Los Angeles Times broke the story publicly. This is when former CEO Stumpf stated he was first informed of the scandal, yet he waited a year to inform the company's board of directors. Then in 2014, outside counsel and PwC were retained to perform additional investigations. Yet despite awareness of the problem, the cross-selling program was not changed.

Wells Fargo made less than $400,000 on its fraudulent cross-selling. The reported fines and penalties of $185 million, pre-settlement investigation costs of $60 million, post-resolution remediation costs of $50 million and loss of market cap of over $6 billion, put the loss to the company at significantly higher. One out of every seven Wells Fargo customers will or has plans to leave the bank as a customer. The SEC has announced they are investigating the bank and finally Wells Fargo has announced it has reserved $1.7 million for legal costs.

For every company the clear message is that if a problem arises, no matter how small or how localized, it must be dealt with before it rages out of control and consumes an organization. Wells Fargo also demonstrates that employees at all levels have a responsibility to keep the ship upright, from the board to the CEO to senior management to the front-line employees. If cross-selling of debit cards can lead to a more than $6 billion loss, what could happen to other companies?

Every manager should study the Wells Fargo case for the valuable lessons to be learned. Some of the simplest and most effective are:

- If employees raise their hands to speak up, they must be taken seriously.
- Letting any problem, no matter how insignificant or non-material, fester over many years is a recipe for disaster and may well also draw increased regulatory scrutiny.
- Design incentives with care; the company will get the behavior it incentivizes.
- Risk management is an ongoing, not an annual or one-time, process.
- It is not simply tone at the top but also tone in the middle and at the bottom that drive culture.

The impact of the Wells Fargo scandal will continue for some time. It should be studied by every manager and compliance professional going forward for important lessons about ethics and compliance.

Tom Fox is the compliance evangelist and compliance ambassador for the Red Flag Group. He can be reached at tfox@tfoxlaw.com.

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By Susan B. Cassidy, Ashden Fein and John Sorrenti

Final Rule Issued on Cyber Incident Reporting

The Department of Defense Oct. 4 issued a final cyber rule addressing mandatory cyber incident reporting requirements for companies that enter into "agreements" with the department. The rule also highlights the department's desire to encourage greater participation in the voluntary defense industrial base cybersecurity information sharing program. This rule is effective Nov. 3.

The department confirmed that the cyber rule was not retroactive and that contract specific requirements would take precedence over the rule's requirements. Thus, the language in current procurement contracts will continue to govern unless modified.

The department clarified the applicability of the cyber rule in some respects. Specifically, the it applies to "all forms of agreements (contracts, grants, cooperative agreements, other transaction agreements, technology investment agreements and any other type of legal instrument or agreement)." Currently the defense federal acquisition regulations (DFARS) clauses at 252.204-7012 and 252.239-7009 apply only to procurement contracts. Thus, companies that enter into agreements beyond procurement contracts should expect to see terms and conditions implementing the requirements for reporting cyber incidents. When that will occur, however, remains unclear.

On the other hand, the cyber rule does not address whether certain entities — such as an internet service provider —qualify as subcontractors under the DFARS clauses. Lack of clarity in this area makes the flow down requirements for DFARS 252.204-7012 challenging for prime and subcontractors alike.

The cyber rule previewed revisions that the department made on Oct. 21 to the clauses in the DFARS that implement cybersecurity requirements for defense procurement contracts. For example, the definition of "covered defense information" was modified consistent with this cyber rule. Rather than the four categories of information that appeared in the December 2015 version of the clause, the October version defines covered defense information as any data in the "controlled unclassified information" registry that requires "safeguarding or dissemination controls pursuant to and consistent with law, regulations, and government wide policies," so long as the information is either marked or identified in the contract, or received or created during performance of a contract.

Although reliance on the registry expands the scope of information that requires safeguarding, it also provides common nomenclature across the government for defining data.

This rule provided further clarity on certain requirements for reporting incidents. First, the 72-hour deadline for reporting cyber incidents currently in DFARS 252.204-7012 is here to stay. In response to a comment that 72 hours was not "practical," the department responded that the "72 hour period has proven to be an effective balance of the need for timely reporting while recognizing the challenges inherent in the initial phases of investigating a cyber incident."

In addition to reporting cyber incidents that impact covered defense information and the systems on which that information is processed, stored, or transmitted, contractors also must report a cyber incident if it affects the contractor's ability to perform work that is designated as "operationally critical support." The department intends to issue new procedures for notifying contractors if they are providing "operationally critical support," thus clarifying their reporting obligations.

The cyber rule provided insight into the information that the department will require a contractor to produce once an incident is reported. The department characterized the information sought from contractors as "carefully tailor[ed]." Nonetheless, the department acknowledged this could be an area of contention and clarified that any disagreement should be resolved pursuant to the disputes clause in each individual contract.

The cyber rule highlighted the difference between submitting information pursuant to the DFARS clause versus voluntarily sharing information under the Cybersecurity Information Sharing Act of 2015. Under the act, shared information can only be used for cybersecurity purposes. In contrast, information submitted to the Department of Defense pursuant to the DFARS clause can be used by the government for any lawful purpose, including "law enforcement, counterintelligence, and national security."

The department confirmed that the information shared by contractors as a result of a cyber incident should be protected by the government, but contractors must mark appropriately "to the maximum extent practicable." Such marking is often difficult given that a breach may include vast amounts of data.

Finally, the department failed to recognize the cost impact on commercial companies that do not operate on a cost reimbursement basis with the government. Although it appears that defense contractors that operate under cost reimbursement contracts can recover the reasonable costs related to these incidents through their overhead rates, commercial contractors simply do not have that option.

The final rule does not address the third-party liability protections for the reporting of cyber incidents included in section 1641 of the Fiscal Year 2016 National Defense Authorization Act for certain defense contractors, which are now incorporated in 10 U.S.C. § 391 (operationally critical contractors) and 10 U.S.C. § 393 (cleared contractors). In general, these sections provide that no cause of action will be permitted against "cleared defense contractors" or "operationally critical contractors" for complying with the cyber reporting requirements imposed by the department.

The liability protections, however, do not extend to contractors that engage in "willful misconduct" in the course of complying with such requirements. These liability protections are the subject of a separate DFARS case currently under regulatory review, and the department will address this issue in a future rulemaking.

Susan B. Cassidy is a partner, Ashden Fein is a senior associate and John Sorrenti is an associate with Covington & Burling LLP in Washington, D.C.

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By Jon Harper

Lawmakers Seek to Boost F-35 Purchases

A group of 70 lawmakers is pressing appropriators to fund significantly more joint strike fighters than the Pentagon asked for in its fiscal year 2017 budget request. But a contract disagreement has raised concerns about the future of the program.

The Defense Department requested about $8.3 billion to procure 63 F-35s for the Air Force, Navy and Marine Corps in 2017. The House defense appropriations bill added 11 joint strike fighters to the planned buy. The Senate version added just four aircraft.

In an Oct. 4 letter to the leaders of the House defense appropriations subcommittee, representatives from both parties prodded them to stick with the House blueprint in upcoming budget negotiations.

"As you head into conference [with Senate lawmakers], we write in strong support of the F-35 joint strike fighter and urge you to continue supporting increased production rates at this critical juncture for the program," they said.

The letter was signed by 41 Republicans and 29 Democrats.

"Increasing the production rate is the single most important factor in reducing future aircraft unit costs," they said. "Additionally, significantly increasing production is critical to fielding F-35s in numbers needed to meet the expected threats in the mid-2020s."

The lawmakers expressed concern about cuts to follow-on modernization that were included in the Senate bill.

"These cuts would delay critical … capability upgrades needed to ensure the F-35 stays ahead of increasing future threats. We urge the conferees to restore as much of this funding as possible," they said.

Loren Thompson, a defense industry consultant and the chief operating officer of the non-profit Lexington Institute, said increasing the production rates would help reverse a negative trend.

"The Air Force has slipped off of its production ramp for F-35, and as a result each plane is going to cost more," he said. "That is not the way the business plan was supposed to be implemented."

Thompson believes there is enough support in Congress to fund additional F-35 buys beyond the level requested by the Pentagon.

"The most likely approach would be to take money out of other items" in the budget, he said. One option would be to scale back upgrades of legacy fighters, he noted.

But a contract spat could potentially upend future production of the F-35.

In November, the Defense Department announced a $6.1 billion low-rate initial production contract for 57 F-35s in lot 9. In a statement, Lockheed said it was "disappointed" by the Pentagon's "unilateral" move, and noted that the contract was "not mutually agreed upon."

The company could potentially take legal action and appeal the decision. Lockheed executives "will evaluate our options and path forward," the statement said.

Roman Schweizer, an industry analyst at the Cowen Washington Research Group, said in a note to investors: "The government's decision to use a bazooka on LRIP 9 could signal turbulence ahead as the program ramps into a potential block buy."

The spat could make it more difficult for the Pentagon and Lockheed to reach large production deals in the future, he said.

The next "inflection point" in the program is a potential three-year block buy deal for 450 or more aircraft that would start with international customers in 2018, he noted.

"We have been optimistic that deal would really kick the program to another level but are concerned now that … rolling up a deal three times the size [of LRIP 9 and the anticipated LRIP 10] may be extremely difficult," Schweizer said.

DEFENSE DEPT.

Pentagon Paying More to Be Hacked

■ The Defense Department will spend more money to encourage non-malicious hackers to probe its IT systems, as part of a larger effort to boost cybersecurity.

The Pentagon requested $6.7 billion for cyber capabilities and operations for fiscal year 2017. Analysts expect such spending to continue rising in the coming years.

The Defense Department recently awarded contracts with a total value of $7 million to two crowd-sourcing firms — HackerOne and Synack Inc. — to expand a "bug bounty" pilot program known as "Hack the Pentagon," which was launched in April and ended in May.

Bug bounty initiatives provide monetary prizes to vetted friendly hackers who find cyber vulnerabilities that can then be remedied before hostile actors can exploit them.

Secretary of Defense Ashton Carter wants the services and other defense agencies to adopt this approach and pay outsiders to probe their systems. These latest contracts are expected to help fund at least 14 different hacking competitions known as "challenges."

The ultimate objective is to "normalize the crowd-sourced approach to digital defenses," the Pentagon said in a recent press release.

The expansion of the bug bounty program is "fantastic news for eligible hackers who will have an opportunity to hunt bugs and earn hundreds of thousands of dollars in bounties," HackerOne CEO Marten Mickos said in a company press release.

"HackerOne is by far the largest bounty-driven marketplace for white-hat hackers, and Synack has developed a powerful proprietary model for … vetted crowd-sourced vulnerability testing," he added. "Both companies harness the power, diversity and creativity of the outside hacker community to the benefit of the security teams on the inside."

HackerOne will create a new contract vehicle for hackers to help the Defense Department secure its publicly accessible systems, while Synack will focus on securing more sensitive IT assets.

The original pilot program cost $150,000, about half of which was paid to hackers who discovered vulnerabilities. During the trial period, 138 previously undisclosed vulnerabilities were identified and remedied. More than 1,400 registered hackers participated, according to the Defense Department.

"Considering the tremendous cost-benefit of outsourcing talent, it's proven that you'll get more bang for your buck than with some other traditional security tools we've used in the past," Lisa Wiswell, a member of the Pentagon's Defense Digital Service, said in a news release.

Defense officials and other parties interested in the expanded bug bounty initiative were advised to email their contract inquiries to hackthepentagon@dds.mil.

ISTOCK

RAYTHEON

GPS Control Program Survives Extra Scrutiny

■ The Defense Department is pushing forward a key satellite control program, despite major cost overruns and schedule delays.

The next-generation GPS operational control system, known as OCX, has been under increased scrutiny since it sustained a Nunn-McCurdy breach in June. Following a program review required by law when such a breach occurs, Undersecretary of Defense for Acquisition, Technology and Logistics Frank Kendall recertified OCX in October.

Kendall determined that the "capabilities provided by the OCX program are essential to national security, [and] that no alternatives exist which would provide acceptable capability to meet requirements at less cost," Defense Department spokesman Mark Wright said in an email.

The acquisition chief also affirmed that remaining costs for the restructured OCX program are "reasonable and higher priority than programs whose funding must be reduced to accommodate the growth, and that the management structure for the program is adequate," Wright added.

Todd Harrison, director of defense budget analysis at the Center for Strategic and International Studies, said it's not surprising that Kendall signed off on it. "There really aren't that many good alternatives, and this is a must-have capability to keep the GPS constellation running and modernize it for future threats."

The latest total program cost estimate is $5.46 billion, which is billions of dollars more than earlier projections. Raytheon is the lead contractor for the program.

In its version of the fiscal year 2017 National Defense Authorization Act, the Senate Armed Services Committee removed all of the $393 million from the Air Force's budget request for OCX due to cost concerns. The Senate Appropriations Committee cut $260 million in its appropriations bill.

SASC Chairman Sen. John McCain, R-Ariz., has been highly critical of the program and its cost overruns, featuring it in one of his "America's Most Wasted" newsletters.

But canceling the OCX would be counterproductive, Harrison said. The next-generation operational control system would provide a critical cybersecurity component for GPS, he noted.

"We would be forfeiting a much larger investment here in our GPS system and an important strategic capability for the United States — and not just for the military, for commercial [entities] as well," Harrison said.

"If Congress really doesn't like OCX and it wants to kill this … it has to then restart another program to take its place," he added. "That won't really save you any money and it's not going to be any faster."

Harrison expects lawmakers to continue bankrolling OCX despite their concerns. "At the end of the day they're going to have to grudgingly come along with the program … because of the strategic importance of the GPS constellation and this particular capability."

Email comments to jharper@ndia.org

A Hellenic Air Force F-16 jet fighter

A Hellenic Air Force C-130 military transport aircraft

Greek Defense Industry Seeks Global Partners

As Greece continues to fight the effects of a lasting economic recession, its defense industry is looking to partner with foreign nations — such as the United States — to stay afloat, industry leaders and a defense official said.

The country is focusing on upgrades and maintenance of its current military systems, while increasing cooperation among its public and private companies and those abroad, said Alternate Defense Minister Dimitris Vitsas at the Hellenic Pavilion during the Association of the United States Army's annual conference in Washington, D.C.

"We have plans to upgrade our armaments," including the Greek army's Patriot surface-to-air missile system and rolling airframe missile systems — both produced by Raytheon, he said. The Raytheon-built Sea Sparrow anti-aircraft and anti-missile weapon system — used by the Greek navy — is also targeted for an upgrade or replacement, as is the service's Harpoon over-the-horizon anti-ship missile system, which is manufactured by Boeing.

Additionally, Greece plans to modernize its P-3 Orion maritime surveillance aircraft, Vitsas said.

The defense industry is still reeling from the effects of the 2008 global economic crisis, industry leaders said.

"It's very hard … to go through what happened in 2009," said Sotiris Paraskevopoulos, sales manager for TurboMed, a Perama, Greece-based manufacturing and ship repair company.

Many companies that invested in expensive equipment when more development was occurring are now closed due to the crisis, he said. "Everyone else is a little bit afraid to take a step forward, because it's still an unstable situation," he added.

The country's largest defense company, the Athens-based Hellenic Aerospace Industry, recently signed a multi-year contract with Lockheed Martin to provide maintenance on Greece's fleet of F-16 fighter jets and C-130 military transport aircraft, said Zacharias Gkikas, the company's chairman of the board. "We are looking to extend this contract for an additional five years," he said.

Despite the economic pressures, Greece has continued to be one of the top defense spenders in Europe, contributing about 2.4 percent of its GDP toward its military, said Magnus Nordenman, deputy director of the Brent Scowcroft Center on International Security at the Atlantic Council, a Washington, D.C.-based think tank.

But only about 30 percent is spent on infrastructure, operations, maintenance and procurement, while the rest goes to personnel, he said.

Mandatory military service in Greece forces the country to support a significant number of personnel, Vitsas said.

"We are trying to [meet] our obligation to NATO," Vitsas said. "It is a balance — what NATO needs and what we need."

The country has also stepped up its defense spending in response to a global refugee crisis. Vitsas said the country has invested in identification systems, night vision cameras and search-and-rescue equipment to help with the influx of refugees from Syria, Afghanistan, Iraq and elsewhere. Over 1.2 million refugees have crossed by sea into Greece since 2015, according to the United Nations Refugee Agency.

Though little has changed for Greece's economic situation in the past year, Vitsas is optimistic that the tide will turn, and is pushing for the country to be more self-sustaining when it happens.

"We have a target: 20 percent of the needs of the Greek army to be covered by our defense industry," he said. "At this time, it's 9 percent. So I'm trying — me, my colleagues and so on — to cover this gap."

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HELLENIC AIR FORCE

Federal Workers Tired Of Security Protocols

■ Every day, workers are showing signs of sustained "security fatigue" — or a reluctance to deal with cyber hygiene — which could negatively impact national defense, industry representatives said.

A recent study conducted by the National Institute of Standards and Technology (NIST) found that many typical computer users have experienced security fatigue "that often leads users to risky computing behavior at work and in their personal lives," according to a NIST press release. Computer users "got tired of being on constant alert, adopting safe behavior and trying to understand the nuances of online security issues," it said.

Representatives from the software companies Dell and Alfresco said they see many federal workers — including in defense agencies — affected by this.

"I can't imagine a defense agency or institution that doesn't have this level of fatigue today because of all of the additional ways in which information is distributed," said Andy Vallila, Dell's security sales leader for the Americas.

If an agency has too many security approaches that have not been integrated or coordinated, or if a worker tries to send data on a device that has not been issued by a defense agency and lacks the proper encryption, field operatives may not receive crucial information in time to make key decisions, he said.

Austin Adams, vice president of the public sector for Alfresco, which provides content management for operating systems like Microsoft Windows, said federal employees are "the more vulnerable aspect of the security defense posture."

The study recommended three ways to ease security fatigue and help promote secure online habits: limit the number of security decisions users need to carry out; make the process simpler; and design the process for consistent decision-making.

Agencies could benefit from investing in new equipment with anti-virus and anti-malware software installed, and by reorganizing their data, Adams said.

Dell offers what Vallila called a "holistic approach" to provide better security to defense agencies, that provides specific capabilities and adapts policies to suit the agency's needs, whether it's on a secure office network, on a home laptop or a mobile phone.

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ISTOCK

QinetiQ, Milrem Unveil New Ground Robot

■ A new unmanned ground vehicle could provide relief to soldiers by reducing some of the weight many have to carry during missions, one company executive said.

The modular, hybrid system — known as Titan — was unveiled during the Association of the United States Army's annual conference in Washington, D.C., said Kuldar Väärsi, the CEO of Milrem, an Estonian company.

"The purpose is to support the squad," he said. "It can carry the rucksacks, the water, the ammunition, whatever the squad is carrying."

Removing some weight from a soldier's load — which can sometimes exceed 100 pounds when on patrol — allows for troops to move faster and farther, he said.

Milrem partnered with QinetiQ to produce the system. The vehicle is based off Milrem's tracked hybrid modular infantry system, and QinetiQ provided the vehicle's robotic control technology, he said.

The company plans to enter the vehicle into the U.S. Army's forthcoming squad multipurpose equipment transport program competition, Väärsi said.

During a recent industry conference, the Army announced that it would be putting the program on an accelerated acquisition path. The service plans to focus on the development of one robot that can carry 1,000 pounds, as opposed to a family of small, medium and large systems, officials said. (See story page 26.)

The Titan has a payload capacity of 1,500 to 2,000 pounds. It can operate for more than 100 kilometers and more than 72 hours when operating with diesel and its electric-hybrid system, which is powered by batteries. It can run on a silent mode for two hours when only electrical power is used.

The system can be used for a variety of missions besides transporting cargo, Väärsi said. It can also be used fully autonomously, Väärsi said.

One goal is to "take the soldiers out of the danger zone," he said. "You can equip this vehicle … with a sensor package, you can equip it with a weapon station, you can equip it with a CRBN [chemical, biological, radiological and nuclear defense] system."

The vehicle would be manufactured in the United States.

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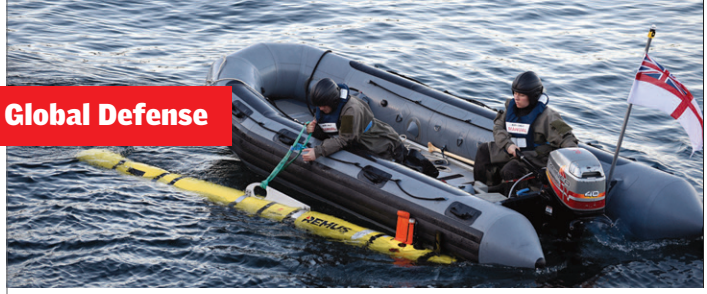

United Kingdom Hosts Underwater Drone Exercise

■ Unmanned underwater and surface vehicles made a splash at a recent military exercise hosted by the United Kingdom.

Known as Unmanned Warrior, a number of countries came together in October to test underwater drones in the choppy and treacherous seas of western Scotland.

This "has been an ongoing exercise between a whole host of allied nations," said Derrick Marcus Tepaske, who works for the Office of Naval Research's global division as a science advisor to U.S. Fleet Forces Command. "Here on site we have the Brits, Canadians, Australians and Americans with their unmanned underwater vehicles and for the first time they have been able to have them collaborate and demonstrate autonomous behaviors.

"These systems are able to work in platoons and squads, task each other to conduct unmanned surveillance of targets of interest, and the engineers … have been working to make all those connections possible from a multi-national perspective," he said during a phone call with reporters.

The countries deliberately tried to push the envelope with the technologies they brought to the exercise, said Cmdr. Peter Pipkin, the Royal Navy's fleet robotics officer.

Collaboration during the exercise was key, he said. The United Kingdom worked closely with ONR to execute a variety of experiments.

"I have been hugely enthused by how much the U.S. Navy and ONR in particular have lent … [to] the U.K. and Unmanned Warrior," he said. "It's not a trivial thing to lift up the number of people and the amount of equipment that they have [brought] over to demonstrate."

That collaboration is particularly important to the United Kingdom because the country does most of its operations with partner nations like the United States, he said.

Out of 50 technologies brought to the exercise, 10 were from the United States, Tepaske said. The multi-national teams conducted a variety of missions including mine countermeasures, command and control, intelligence, reconnaissance and surveillance, and port security operations, he said.

Systems such as Liquid Robotics and Boeing's sensor hosting autonomous remote craft platform were tested. The unmanned surface vehicle was used over the two-week demonstration and successfully detected and tracked an advancing UUV and a manned diesel submarine, Liquid Robotics said in a statement.

Capt. Beth Creighton, the U.S. officer in charge of the exercise said: "We've accelerated our learning about autonomy to advance that collective naval war fighting advantage. We've definitely enjoyed tremendous collaboration in the science and technology realm and improved U.S. and coalition interoperability."

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Wearable Tech Could Ease Soldiers' Battery Load

■ Soldiers and Marines will soon test a wearable charging system that could reduce the number of batteries troops must carry, by harnessing the user's body movements to generate energy.

Bionic Power, a Vancouver, Canada-based technology company, is working with the U.S. Army Natick Soldier Research, Development and Engineering Center on the PowerWalk kinetic knee energy harvester. The brace-like system attaches to the user's legs and takes advantage of natural braking movements to help charge electronic devices.

The PowerWalk — which has been in development for about eight years — could remove some of the weight associated with battery packs without impeding the user's movements, said Daryl Musselman, chief operating officer for Bionic Power. The company received a $1.25 million contract for the system as part of the joint infantry company prototype program, managed by the Marine Corps' expeditionary energy office, he said.

"It's not an assistive device; it's just letting the soldier walk normally while charging their electronic systems," he said. The product is strapped onto each leg with the generator going on the inside of the user's knee, and then a cable connects to a power manager — worn by the user — that charges the battery.

"By the motion of walking, a pivot will move, power the generator, recharge the battery and power your electronic systems, so it makes the soldier more self-sufficient from a power perspective," he said.

The batteries are charged using the energy the user's body generates while performing braking movements. If the user is accelerating, the device won't impede movement, he said.

"An algorithm monitors where you are in your step and only pulls energy out in those points in your step where your body is trying to brake," Musselman said. "We can get the most recharging energy when you're going downhill and on level ground."

The harvester weighs about 2 pounds per leg, and offsets the weight of redundant batteries that a soldier carries — sometimes up to 30 pounds. At 3 miles per hour, or an average soldier's marching pace, it can generate around 10 to 12 watts of energy, Musselman said.

The harvester was designed to work with specific chargers and connectors used by the military, but a commercial version could be designed with a USB hub or another popular connector, Musselman said.

Field experiments with the Army and Marines Corps are planned for 2017, which will test the ruggedness, impact on the user's backpack weight and operational costs, Musselman said. Bionic Power expects the harvester to be ready to field in 2018. The company is also in talks with several foreign military services to possibly adopt the technology, he said.

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NAVY, BIONIC POWER

Surveillance Company Increasing U.S. Footprint

As threats from terrorist organizations continue in the homeland and around the globe, one company believes that sales of surveillance equipment to help thwart potential attacks will flourish.

"It's a growing market," said Mark Patrick, chief technology officer at Digital Barriers, a surveillance and security company based in the United Kingdom.

The company — which works with countries around the world — expanded its footprint in the United States after it purchased a Virginia-based company called Brimtek earlier this year, he said.

"We see significant expansion within the U.S. market," he said. The acquisition has "allowed us to service a much more increased demand."

Much of the company's technology can be used to counter asymmetric threats posed by lone wolf attackers or plots concocted by terror group cells, Patrick said.

"What we're able to do is give an early warning and allow the appropriate response for that," he said. "We're also able to provide surveillance technology that allows our security teams here and abroad to be able to perform more effective surveillance on what unfortunately is a growing number of people that you need to watch."

The company offers a wide range of technologies, including a camera that can tell if someone in an airport or train station is carrying items such as guns, money, drugs or powders, he said. The system — called ThruVis — can see through layers of clothes but can't see anatomical details of a person. It can be used as a complementary system to the scanners often found at airports around the world, he said.

The system can also be combined with the company's face recognition software, he said. Users can create a list of certain people who the system should flag if they enter a building, he said. It can collect this information from "non-compliant" sources, he added.

When someone goes to a passport gate, they "stand very compliant to get the lighting perfect, to get the camera angle perfect," he said. However, Digital Barrier's software can collect information from subjects as they are moving and with imperfect poses, he said.

One trend the company sees is the need for more affordable management of various video data streams, Patrick said.

"What we're seeing more and more with defense and law enforcement and the general security world is there is just more and more video being collected at all times," he said.

However, the bandwidth needed to move all that data is not increasing fast enough, he said.

Digital Barriers offers its EdgeVis Live system to make use of low bandwidths. Instead of streaming video at 500 kilobytes or 1 megabyte a second, the company can send secure video anywhere using as little as 9 kilobytes a second, he said.

Users are then able to pinpoint certain video streams and enhance the quality into a high-definition picture, he said. "This allows you to make video useful regardless of that bandwidth."

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Opaque Restrictions Hurt U.S. Sales Abroad

Congressional Perspective

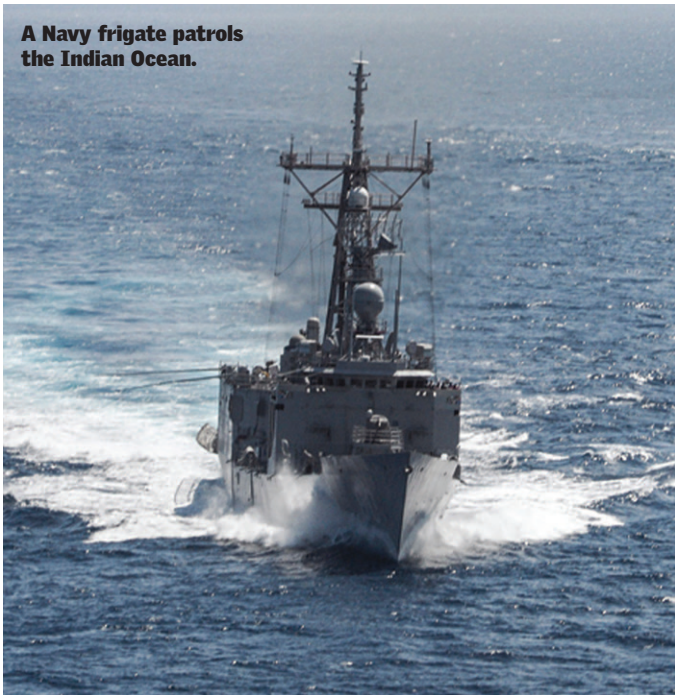
By Rep. Vicky Hartzler

Recent media reports noted that India intends to procure military equipment from "strategic partners" that are able to provide cutting-edge weapons and equipment without major restrictions. Meanwhile, the United States foreign military sales program, while justifiably deliberate in its policies, suffers from opaque processes and burdensome restrictions, forcing countries like India to search elsewhere for equipment.

When the United States provides our allies the opportunity to acquire U.S.-made military equipment and services, it improves our own security, benefits coalition operations, solidifies bilateral relationships, and creates a more cost-effective Defense Department already impacted by an austere fiscal environment. Considering the powerful advantages foreign military sales bring to the United States, it is important to understand the competitive nature of the international marketplace. We need to acknowledge we're not the only country out there looking to reap those benefits and we need to address our competitive disadvantages.

A customer-centric business is more likely to gain market share in a competitive environment. Unfortunately, according to a report from the Aerospace Industries Association, the U.S. market share in the aerospace and defense export business was roughly the same in 2014 as it was in 2009. We must make our FMS system transparent, efficient and predictable to ward off concern that other international suppliers will leverage their own system's flexibility to grow their own market share with sales to previously consistent U.S. customers.

India, a strategically located South Asian nation, has been recognized as one of our major defense partners. At the same time, according to India's Prime Minister Narendra Modi, his country is also laying the "foundations for deeper defense and economic ties in years ahead" with Russia through the aforementioned agreement worth $10 billion in air defense systems, stealth frigates and utility helicopters. These are assets the United States defense industry is just as, if not more capable of producing and delivering to our strategic and vetted international defense partners.



A Navy frigate patrols the Indian Ocean.

The Philippines, a key ally in the United States' rebalance to Asia and the Pacific, has recently made a rebalance of its own, moving away from us in favor of China and Russia. To announce this change in foreign policy, Philippine President Rodrigo Duterte cited arms sales as the first tangible shift away from the United States, stating he would only seek military equipment and services from Russia and China. When President Duterte recently said "The U.S. has lost," it would be appropriate to also infer the United States has lost its ability to influence the military actions of the Philippines through arms sales.

> "If we don't take advantage of these opportunities to cement relationships, someone else will."

A single sale of military equipment offers years of relationship building and strengthening between nations. U.S. security cooperation officers engage in their country station to help that country find solutions to its equipment or service needs. U.S. procuring contracting officers negotiate the sale terms on behalf of the purchasing nation, building trust by acting in its best interest. U.S. defense industrial base companies deliver world-class products and maintain them for years after. If we don't take advantage of these opportunities to cement relationships, someone else will. As we are seeing in Russia and China, other countries will fill the void left by an absence of an American presence and seize the opportunity to foster bilateral trust and mutual economic reliance.

In the case of foreign military sales, as in business, countries that can adapt and respond to the ebbs and flows of the geopolitical landscape can best maintain or increase their own positions and security. Our foreign military sales program is no different. China saw its weapons exports double between 2011 and 2015. Russia is steadily increasing its capability to match ours. These increases are, at least in part, due to our rigid and outdated foreign military sales program.

There are opportunities for reform in the foreign military sales program — and we must make those changes in an ever-adapting marketplace for defense sales before we lose even more international influence than we have the past eight years. We have the opportunity to create a modern, responsive and "situationally aware" process, complemented by an adequately trained and equipped acquisition workforce to execute FMS contracts. If we don't, the Russias and Chinas of the world will. **ND**

Rep. Vicky Hartzler, R-Mo., serves on the House Armed Services, Agriculture and Budget Committees. In the 114th Congress she was named chairwoman of the oversight and investigations subcommittee of the Armed Services Committee to oversee the administration's defense policies.

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Defense Companies Courting Startups: Fad or Lasting Trend?

By Sandra I. Erwin

During a closed-door meeting with top industry executives last month, Defense Secretary Ashton Carter once again sought to drive home the message that companies need to break out of their cocoon to help the Pentagon bring the next wave of innovation.

The conversation touched on familiar topics, according to participants, but Carter seemed especially animated by one executive's comments about a recent industry "speed-dating" event where commercial startups were invited to hear about business opportunities with defense contractors.

"His eyes lit up when Raanan talked about this," recalled Bob Edmonds, vice president of Elbit Systems of America.

Elbit CEO Raanan Horowitz gave Carter a brief account of the matchmaking event, hosted by tech startup SwitchPitch, where major defense contractors sought to attract commercial innovators that typically do not do business with the government.

This sounded like the type of outreach Carter had been wanting to see in the defense industry as Pentagon officials have grown increasingly worried about the military's eroding technology edge and the cultural divide between the commercial and defense sectors. The most innovative industries in decades past were embedded in the defense establishment, but they now live in separate worlds. Carter and others fear that the Pentagon and its top contractors have built walls around the sector, keeping out innovators and creative thinkers.

The SwitchPitch model is one of many avenues that defense contractors are pursuing to "see what's out there," Edmonds told National Defense.

A four-year old venture, SwitchPitch was created to offer scrappy startups and small businesses an opportunity to break into corporate America. The meeting the company hosted in September in Arlington, Virginia, was the first one that focused on the defense and aerospace markets.

About 50 startups attended from across the country. Seven projects were pitched by BAE Systems, Harris Corp. and Elbit Systems, and 98 speed-meetings were held between large contractors and startups. Jerry McGinn, the Defense Department's principal deputy director of the manufacturing and industrial base policy office, spoke at the event about the Pentagon's desire to create new paths into the defense market.

Everyone seemed pleased by the results, said Michael Goldstein, president of SwitchPitch. The positive reaction speaks to the vast appetite for innovation in defense and aerospace, he said. The company provides a software-as-a-service platform for large companies to manage their startup and small-business engagements.

Glacier Point, a defense industry consulting startup, was hired to help organize the meeting and vet the participating startups. "We were seeing a major demand signal for non-traditional sources of technology," said CEO Jeff Ryder.

The conventional wisdom that the defense sector is not appealing to the tech world does not apply in this case, Ryder said. "Startups were thrilled to be able to get into targeted conversations with multibillion dollar companies. It wasn't abstract. They asked for specific things."

The aerospace and defense companies are "getting the message that we need to spend more time outside of our world and participate more broadly in the technology ecosystem," Ryder said. There are products out there that defense contractors don't even realize exist, he noted.

Beyond the initial "discovery" phase, the next step is to figure out the business model for injecting startups into a "repeatable process in a defense company," said Ryder. "That part is still in development."

In the wake of Carter's initiatives to court tech firms around the country, Ryder sees a huge opportunity to spread the SwitchPitch matchmaking model across defense agencies and military services.

BAE, Harris and Elbit pitched projects that were grouped in several major categories: precision navigation in GPS-denied environments; detection, identification, tracking and presentation of battlefield data coming from multiple sensors; tracking and classification of commercial drones; reducing size, weight, power and cost of electro-optics devices; public safety communications; cockpit and avionics solutions to reduce helicopter crew workload; and machine learning algorithms for radio-frequency spectrum analysis.

These are areas where the Pentagon is seeking "discriminating advantages in the future," said Edmonds.

After hearing the presentations, the startups introduced themselves to the large contractors in a round of nine-minute "speed dating" sessions.

It was an eye-opening experience, said Elbit's Chief Innovation Officer Doug Sandklev. "We heard about technologies we didn't know were available."

One such surprise was a product to help identify legitimate 3D-printed parts from counterfeits. A company named InfraTrac offered it as a solution to the aerospace industry's growing anxiety about the proliferation of rogue components. A chemical "fingerprint" is inserted into the layers of material, and companies can detect it using a commercial chemical analyzer.

Sharon Flank, founder and CEO of InfraTrac, said the company has worked primarily in the medical devices and athletic footwear sectors, and is now becoming aware of promising opportunities in aerospace and defense. "I've seen printers that print circuit boards and connectors," she said. "Counterfeit electronics is a big issue."

Following the SwitchPitch event, Flank was invited to follow-up meetings at Elbit and BAE Systems, she said. "We'll see what happens."

Sandklev said many of the startups are wary of working with defense companies for fear of inadvertently giving away trade secrets. "Intellectual property issues are a top concern," he said. There is no clear-cut answer to protect small businesses from the "big integrator taking his idea and running with it."

The solution is probably a combination of teaming and licensing arrangements, Edmonds said. "We try to create a win-win." There are times when large defense contractors will decide to buy a company so they can take ownership of

Defense Secretary Ashton Carter

DEFENSE DEPT.

the IP. "Do we look for targets to buy? Yes," he said. "If there's a conversation where the company entertains acquisition, it can happen."

Ryder agreed that, of all the headaches that startups try to avoid in pursuit of government contracts, none is more daunting than the protection of IP. "Depending on the level of engagement, the barriers are not that bad," he said. "Government contractors could do a better job articulating how they could work better with commercial companies."

He expects more of the Pentagon's large contractors will be motivated to work with startups, not only because of potentially lucrative IP but also to help change established companies' culture and business models, Ryder said.

"Startups can move very quickly," he said. "Having startups in your portfolio should have a cultural impact in terms of learning how to do things more quickly." Commercial tech companies, unlike what some analysts have speculated, are not a threat to defense contractors, said Ryder. "A lot of contractors need to think about fundamental changes to their business models."

John Kelly, vice president of business development at BAE Systems, said he found the SwitchPitch approach "quite effective." What they offer are not "exquisite DoD needs" but technologies that the military is eager to acquire to modernize aging systems. "I went looking for three things and found five."

He does not see IP issues as deal breakers. "We can license the IP, perhaps we can acquire the company. There are legal frameworks for that. Those problems have been solved."

There are however unresolved questions about how the defense industry will integrate commercial technology and whether companies are truly committed to an "open systems" approach.

The issue was raised recently by Air Force Gen. Paul Selva, vice chairman of the Joint Chiefs of Staff. "For those of you in industry, I can't tell you how many times I've asked the following question: 'Will your widget subscribe to an open architecture?' Answer is always, 'Oh sir, of course.'" But when the government asks for a new upgrade to make the system more useful to the military, the response is, "Oh, sir, we can't do that. It is an open architecture but only inside of our company or only inside of our proprietary IT," Selva said at a Center for Strategic and International Studies forum.

The innovation sought by the Pentagon, said Selva, requires "resilient open architecture to which all of our systems can subscribe, and we've only scratched the surface on that."

Kelly said the industry is well aware of these demands, and he cautions that commercial startups are just as leery of open systems as defense firms because they want to protect their IP. "DoD doesn't want proprietary systems any more," Kelly said. "But small companies, as they transition from commercial to defense, have to understand DoD doesn't want to buy significantly IP-restricted systems."

The massive flow of private investment into startups has created expectations in the Pentagon of faster, less costly development, Kelly noted. "But some of the constraints in the federal acquisition regulations are challenging when it comes to leveraging commercial technology," he said. "DoD is trying to work through those issues."

The push for innovation that Carter has championed, meanwhile, has spawned a broader debate about the Pentagon's rigid ways and whether change also needs to happen from within. That has been the theme of an annual gathering of military officers and industry executives at the University of Chicago dubbed "Defense Entrepreneurs Forum."

The forum's executive director, Jim Perkins, is an Army engineer who has long been frustrated by what he describes as hidebound thinking across the Defense Department that stifles innovation.

"Our mission is to change the culture in the military," he said. "We are incredibly bureaucratic and risk averse." When the military is overseas fighting wars, commanders are allowed to take risks with technology if it might help win or save lives, he said. "But when we come back to the United States, no matter what your idea is, we categorically tell you, 'No.'"

One encouraging development was the creation of the Defense Digital Service, he said. A Carter initiative, the DSS was set up to fix technology problems and was given authorities to cut through the bureaucracy. "It's very empowering, and has made a lot of impact so far," said Perkins.

In the grand scheme of things, the key is to develop leaders who are not afraid to innovate, he said. "We are not cultivating 'out-of-the-box' thinkers." ND

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Navy Puts Procurement of Carrier Drone on Fast Track

By Jon Harper

The Navy is expediting its effort to acquire a carrier-launched unmanned tanker, as service officials seek to usher in a new era of naval aviation.

The MQ-25 Stingray would enable carrier-based strike aircraft such as the F/A-18 Super Hornet to have greater range.

"We need to get [the MQ-25] to the fleet as quick as we can so we can start learning about that manned-unmanned teaming and integrate that into the air wing," Naval Air Systems Command Commander Vice Adm. Mike Shoemaker said at a recent conference.

The plane is also to be equipped with intelligence, surveillance and reconnaissance capabilities.

Four companies — Lockheed Martin, Boeing, Northrop Grumman and General Atomics — were recently awarded contracts to conduct risk reduction activities in support of the program. The work includes refinement of concepts and development of trade space for requirements generation in advance of the engineering and manufacturing development phase.

Boeing, Lockheed and General Atomics were awarded $43 million each. Northrop Grumman received a $35 million contract. The work is expected to be completed by October 2017.

The concept refinement work will inform the request for proposals for engineering and manufacturing development. An RFP release is slated for the summer of 2017, and a contract award is expected in 2018, according to Navy officials.

"The tanking mission will govern the aircraft configuration design trades, which will prioritize better tanking capability over the secondary … ISR mission," Chief of Naval Operations Adm. John Richardson said in an Aug. 24 memo clarifying the aim of the program.

The main objective in the early phase is to identify key system technologies, attributes and approaches that balance cost, schedule and performance, he added.

"We'll go through the development of the alternatives looking at what capabilities different vendors might bring to address that operational need," Robert Kimble, the deputy program executive officer for unmanned aviation at NAVAIR, said at a recent industry conference.

There is a sense of urgency. The service has created a maritime accelerated capabilities office, or MACO, to provide "a speed lane" in the acquisition process. Richardson and Assistant Secretary of the Navy for Research, Development and Acquisition Sean Stackley function as "the board of directors" and will provide direct oversight of the office's activities.

The MQ-25 is one of two initial programs under the office's purview, along with the large displacement unmanned underwater vehicle program.

The projects "will be conducted on accelerated timelines, require unique industrial interactions and leverage related activities of other government agencies and organizations," said Vice Adm. David Johnson, Stackley's principal military deputy.

"We must continue to innovate and improve the speed at which we field these systems," he added.

The Navy hopes to have an operational MQ-25 by the early 2020s. The service is keen to use the Stingray to hone its manned-unmanned teaming operating concept, whereby drones would partner with manned platforms to conduct various mission sets.

Designing a drone that could perform both tanking and intelligence-gathering missions shouldn't be too difficult, said John Vinson, the manager of next-generation unmanned aircraft systems at Lockheed Martin.

"I don't see huge challenges in being able to do an ISR capability on an aircraft that has the payload capacity to do tanking," he said.

Lockheed's manned S-3 Viking carrier-launched aircraft was capable of conducting reconnaissance missions while on anti-submarine patrol. It could also deploy weapons and was used as a tanker, he noted.

"It was, if you will, a truck that we could hang a lot of capabilities on," Vinson said. Similarly, Lockheed could design an unmanned aerial vehicle "that has the capacity to hang a lot of systems that the Navy may want to use in the future."

The ability of an unmanned plane to land and take off from a carrier has already been demonstrated. In 2013, Northrop Grumman's X-47B prototype performed the feat. But integrating a UAV into the Navy's day-to-day carrier operations is likely to be a much more difficult task, Vinson said.

Unlike drones flown from long Air Force runways, carrier-based systems must land and takeoff from relatively short flight decks jammed with personnel and other aircraft.

"Operating an unmanned aircraft safely in that environment is a challenge," he said.

Industry must produce a drone that can fly without interfering with other carrier operations. Software development will be a critical component of the effort, he noted.

Lockheed has a long history of developing UAVs, including work on the now-defunct unmanned carrier-launched aerial surveillance and strike project, which was a precursor to the MQ-25.

"All of that technology is fair game when we go to do something new," Vinson said. "All of that knowledge of how an unmanned vehicle would be operated on the carrier, we're bringing forward into this program."

The Navy isn't being overly ambitious with its acquisition timelines, he said. "We're very comfortable with all the schedules the Navy has shown us."

As the U.S. military buys more drone technology, there are opportunities to break away from the design constraints that have been imposed on the Navy by manned systems, Johnson said.

"The number of traps on a carrier, the number of vertical accelerations that you can have … all these things — if you really trace them back and find the root, they go to having a man in the cockpit," he said. "If you're working in the unmanned air game, that stuff is negotiable."

Designing UAVs along the lines of traditional aircraft would be folly, especially at a time when the cost of manned platforms is growing, Johnson argued.

"We can be our own worst enemy," he said. "We can design our unmanned systems to essentially be a manned thing

A drone demonstrator launches from the aircraft carrier USS George H.W. Bush.

NAVY

without a man, and that will be unaffordable."

Experts working on the next wave of equipments need to make sure that the Navy isn't being bound by unnecessary technical requirements, he said.

The service will rely on industry "to go back to these first principles and find out why the heck do I have to do that" with a drone, he said. "Does it make technical sense? Does it map back to something that an unmanned vehicle has to deal with, or is there a derived requirement [from manned platforms] hiding in there's that's driving up the cost, weight and lowering the utility of our systems?"

The MQ-25 program is an example of this approach, he added. The Navy is "having industry help us through concept requirement studies … and get at the actual need to develop some of the pieces that we call our specs or our iron bars."

In addition to being unmanned, the Navy wants the Stingray to have autonomy, including for landing and launching, that would eliminate the need for a human to directly pilot it, Kimble said.

"We want to be able to put the aircraft in a mode to be launched or set up for an arrestment, and then be hands off and allow it to take the input from the GPS systems or whatever you have on the aircraft, and bring it on board without an interaction from somebody sitting in a control room," he said.

Similar to the way commercial airliners operate, Navy personnel could preprogram flight paths and designate waypoints. The tanking process should also be largely autonomous, he added.

"When it's in a tanking scenario, you want it to hold a course and a speed and not have to have pilot input," he said. "You program that in and let it react to the environment that it's around … [while] retaining that altitude and airspeed."

Even the user interface would likely be much different than those for existing Air Force drones, Shoemaker told reporters. Rather than use a "joystick and throttle," Navy controllers would probably use computers with "point and click" features, he said.

The Stingray will be designed to operate in permissive environments with limited enemy counter-air capabilities, Richardson said.

But as potential adversaries develop more sophisticated fighter jets and anti-aircraft weapons, the survivability of the proposed tanker has been called into question. For now, stealth capability is not a key performance parameter. But the Navy is still interested in designs that would make the aircraft less observable to the enemy.

"If you look at where we've been with many of the industry partners, there are some shapes that they have designed already that help in that survivability piece … even though we've not said survivability is a key parameter this time around," Shoemaker said.

Nevertheless, Shoemaker is still concerned that the aircraft could get shot down in contested airspace. Other assets in the fleet would likely be needed to protect the drone, he said.

Later versions of the Stingray or a follow-on system might incorporate more low-observable technology, he said.

"During the UCLASS program we looked at those kind of capabilities in great detail, and if the Navy were to choose that sort of a platform [Lockheed] is well positioned to provide the kind of technologies that are required to do that," Vinson said.

In addition to worrying about enemy missiles, Navy officials are also looking at ways to counter cyber and electronic warfare threats.

"We will be thinking about that in this program from the very beginning all the way through," Vinson said, noting that it would be part of the systems development effort.

As threats and technologies evolve, so too must the MQ-25.

"The system must sustain its relevance over time with an architecture of open systems and modularity enabling flexibility, adaptability and modernization," Johnson said.

Vinson expects Lockheed to draw on the work the company has already done on open systems architectures to be able to interface future systems with the Stingray.

National Defense asked Rear Adm. Robert Girrier, the Navy's director for unmanned warfare systems, whether strike capabilities might be added to the aircraft down the road.

It's "anybody's guess," he said. For now the service is focused on optimizing it for the tanking mission. "Will there be possibilities once we have that ironed out to see what else we can do with that system? Absolutely, … but I won't surmise what those might be."

From a technology and operational perspective, Navy and industry officials view the MQ-25 program as having long-term implications larger than the fate of a single program.

"This will be the first of many unmanned platforms that the Navy fields in the future," Vinson said. "It's always good to be in on something new that sets the wave for the future, and that's part of the reason why we are interested … in participating in MQ-25."

He believes the Stingray will set the trend for future carrier-launched UAV products in the same way that the company's F-117 Nighthawk set the trend for stealth.

Boeing, Northrop Grumman and General Atomics declined to comment beyond providing short statements acknowledging their participation and interest in the program.

Deputy Assistant Secretary of the Navy for Acquisition and Procurement Elliott Branch views budget constraints as the greatest threat to the MQ-25 effort.

"Modernization requirements and sequestration are going to constrain our topline if we don't get relief," he said.

A new administration will also be in power next year and policies could change as a result, he noted.

"When you put all these things together … they all impact acquisition," he said. "The threat changes, the requirement changes, the budget changes and the technology changes.

"Our biggest challenge … is to make sure that we are dynamic enough to respond to all those potential challenges on a relatively new program." ND

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Ground Robot Programs Finally Getting Underway

By Stew Magnuson

After years of stagnation, the market for U.S. military ground robots is set to grow as a handful of programs enter their final development stages.

The Army is acquiring two new multi-purpose robots just as the Navy is finally proceeding with its long-delayed explosive ordnance disposal systems, officials said at a recent industry conference.

Meanwhile, the Army has put a much talked about robotic vehicle, designed to carry heavy loads for troops, in an accelerated acquisition program.

The new wave of ground robots is intended to replace the approximately 7,000 commercial-off-the-shelf systems procured since the beginning of the Iraq War, Bryan McVeigh, force protection product manager at the Army program executive office for combat support and combat service support, said at the Association for Unmanned Vehicle Systems International annual program review in Arlington, Virginia.

The near-term goals for the Army is to use such systems to lighten soldier loads, increase standoff distances from threats and to improve situational awareness, McVeigh said.

It has kicked off two programs of record: the common robotic system-individual (CRSI) and the man transportable robotic system (MTRS).

The CRSI will weigh between 25 to 30 pounds and is intended to give dismounted troops and explosive ordnance disposal teams a tool to see into risky places without exposing themselves. A request for proposals will be issued in the second quarter of fiscal year 2017 with a contract award expected in the first quarter of 2018, according to Shonneil Severns, the Army's deputy product manager for unmanned ground systems.

The MTRS is intended to replace the thousands of medium-sized, off-the-shelf robots fielded over the past 15 years that are in the 130 to 165-pound range. Along with EOD applications, it will be designed to incorporate a variety of mission packages, including chemical and biological threat sensors. The RFP was expected by the end of this year with a contract award in the third quarter of 2017, Severns said.

In addition, his office is working on a common controller that will guide both these robots as well as the Army's two main, tactical unmanned aerial vehicles — the Puma and Raven.

"Just imagine if you had one common controller that you could use for all these platforms. Imagine how much you can save just in the logistics area alone," Severns said.

As for the Navy, the advanced explosive ordnance disposal robotic system, or AEODRS, has three increments: one small 35-pound backpackable robot, a medium-sized one that can be carried in a truck and a large 750-pound towable system that can deal with large pieces of ordnance for route or runway clearance. The Navy is the executive agent for EOD technologies.

Navy Capt. Aaron Peters, program manager SEA 06-EXM, said, "There are multiple areas where industry can help out, with increment 1 and also with increment 2 and increment 3."

The program was designed with modularity in mind so companies can compete for the five to nine modules on each system such as the chassis, manipulator, sensors, powerpack and so on. They must be able to easily integrate their devices into its common operating system. The concept calls for plug-and-play systems that can be upgraded as needed, or when new technologies come along.

For example, the Navy would like to go from its single manipulator, to two manipulators, to highly dexterous ones that are as good as hands, Peters said. "That's a little far off, but there are some highly dexterous things you can do today," he added.

The program is developing a cyber-secure radio to ensure no one can take over the robot. It would also like help from industry to develop chemical sensors that could detect the signatures of bombs buried in the soil, he said.

Northrop Grumman was chosen as the prime system integrator. As such, it cannot compete for the module contracts.

The request for proposals for increment 2 — the size most commonly used by bomb disposal teams in the field — was issued in early October with contract awards expected in the fourth quarter of 2017. Initial operating capability is scheduled for 2020.

The increment 2 prime system integrator may also be chosen to do the increment 3 robot without holding a competition, Peters said. The Navy is shooting for full-rate production for the final robot in 2022.

Increment 1 is set for a critical design review in February, with a Milestone C decision on whether to proceed with limited manufacturing in September. Initial operating capability is scheduled for the first quarter of fiscal year 2019 and full operating capability in the third quarter of 2020.

The number of increment 1 robots to be procured is unclear as the Air Force bowed out of the program and went its own way to acquire an off-the-shelf robot after it ran out of patience with the Navy, which began the program in

2007.

Despite the Navy and Army apparently going their own way on the small and medium robots, McVeigh said the door was open for cooperation. Since their robots will use standard operating systems, if the Navy were to acquire, for example, a dual-arm manipulator for AEODRS, the Army if it had the same requirement, could leverage that investment.

"If the Navy has developed a product that meets our requirement, I can go through his contract to buy that capability to significantly reduce our acquisition time and vice versa," McVeigh said.

A Roboteam technician boots up the company's Probot squad support vehicle at its Gaithersburg, Maryland, headquarters.

STEW MAGNUSON

Meanwhile, the Army is placing its squad mission support transport robot in a new program that is designed to accelerate the pace of acquisitions, he added.

The SMET, as it is also known, is a tracked or wheeled platform intended to lighten the load for dismounted troops by carrying their rucksacks, water or ammunition. A similar vehicle was once a part of the canceled Future Combat Systems. A similar robot was tested with troops in Afghanistan and the Army had previously announced its intention to acquire more of the systems as part of its robotics roadmap. A previous plan to develop three sizes of the robotic vehicles — small, medium and large — has been scrapped. It will now focus on one robot capable of carrying 1,000 pounds, McVeigh said.

One of the new methods to speed its acquisition will be to invite industry into the process of writing specifications.

"In the past it has taken my program office — good, bad or indifferent — six to nine months, to develop a performance" specification, McVeigh said.

Currently, the Army develops specifications on its own. It then releases them for comments, which takes a month before receiving feedback — the opinions of several different contractors — who state what they think is reasonable. The Army then rewrites the specs, and sends it out again to repeat the whole process. "We can't afford that much time in this process," he said.

For SMET, his office will establish a collaborative board comprising industry engineers who are part of the National Advanced Mobility Consortium, to write and refine realistic specs. After about two weeks, it will produce a draft performance specification document, which is expected in January.

"I'm a firm believer that if you get five engineers around a table to discuss a problem, they will forget within three minutes what company they work for and they will focus on what is the challenge ahead of them," McVeigh said.

Industry can help decide what performance specifications are executable and how they can be reasonably tested, McVeigh said.

"Instead of going through multiple iterations with industry where I'm getting individual feedback, we as a group can determine what is a fair and reasonable approach," he said.

The government will retain the right to make the final call and the request for proposals will then go out to the broader industry, he noted.

He said this process may cut the timeline down from six to nine months to three months. "More importantly, we will have a better product and a better understanding from industry as we move forward."

Lt. Col. Cory Berg, product manager for appliqués and large unmanned ground vehicles, said the SMET program was chosen for this new accelerated acquisitions program because it was already in the long-term budget plans. Officials at the same conference last year said the Army was shooting for an engineering, manufacturing and development milestone in 2019.

Berg said a revised timeline hasn't yet been worked out. But the new regime it falls under seeks to shave a month or two off each step of the acquisition process. At the end of the road, the Army may be able to move the schedule forward by a year.

One of the companies anticipating the SMET program is Roboteam Defense Inc., the U.S. subsidiary of an Israeli manufacturer. It will enter its Probot platform.

CEO Shahar Abuhazira said the company is bullish on the U.S. military robot market. It anticipates orders for 6,000 to 7,000 systems in the next two to three years. "These are big numbers," he told reporters at a media day at the company's Gaithersburg, Maryland, headquarters.

The company recently received $150 million in private capital to help it gear up for the competitions. It will invest some of this money in a new research-and-development center, Abuhazira said.

The market was "dead" for several years after the rapid acquisition of large numbers of EOD robots. There was little work other than sustainment of the off-the-shelf robots made by iRobot and Foster-Miller, now Endeavor Robotics and QinetiQ North America, respectively.

The military's "big programs are on track and I think that is very good news for the industry," he said.

Roboteam raised eyebrows in 2015 when it beat out more established companies for the Air Force's increment 1-type EOD robot. It has delivered 200 of the 250 contracted systems in the last nine months.

"We felt that what happened to the UAVs in the late 1980s would happen with the UGVs these years and I'm happy to say that we were right," he said. **ND**

Email comments to smagnuson@ndia.org

Army to Build Synthetic Training Environments

By Jon Harper

To save money and boost readiness, the Army plans to develop a new training model to prepare soldiers for future fights.

The "synthetic training environment," or STE, would harness new gaming and augmented reality technologies to improve war simulations that take place in the live, virtual and constructive realm.

Live training is the traditional method where soldiers practice warfighting on a range or other physical training areas. Virtual training entails the use of simulators that personnel operate to improve their skills, while constructive training simulates enemy forces or other elements that a warfighter might encounter in combat.

While the Army already uses live, virtual, constructive, or LVC, training elements today, it falls short of what the service needs, officials said.

"We now have a program called the live, virtual, constructive integrating architecture that helps to bond all those simulations together into one program that we can use to train on," said Col. Jay Bullock, capability manager for the integrated training environment. "However, the LVCIA doesn't address all of our issues and we do still have quite a few problems."

Difficulty with interoperability and a limited ability to conduct repetitions creates major headaches, officials said during a briefing about plans for the STE at a recent industry conference.

"All of these stovepiped technologies we're trying to bring together so that they will function and provide a collective" training environment, said Brig. Gen. Maria Gervais, deputy commanding general of Army Combined Arms Center — Training.

"It's a technically complicated solution requiring its own contractor support team," she added. "It requires the integration of legacy systems speaking all kinds of different protocols, [and] it operates on a closed, restricted network limiting connection with our mission command information systems."

For the new synthetic training environment, the Army wants a common architecture that would facilitate multi-domain and multi-echelon training, and allow other services and foreign allies to participate.

Currently, the Army conducts a number of simulations that must operate together in "a federated manner" to provide large-scale training, Gervais noted.

In the future, Army officials hope to be able to combine these activities into just one or two simulations. They also want systems to use the same operating protocols to eliminate the need for a separate integrating architecture.

Many existing simulators have high overhead requirements and are not easily moved, which makes it difficult to use them in remote areas where soldiers might be deployed, service officials noted.

"For decades we have consolidated training at our mission training complexes and our other brick-and-mortar facilities," Gervais said. "This limits training throughput and also facility availability. Commanders may not be able to train when they need to, where they need to and with who they need to train."

The Army is looking for simulators that require less overhead. Today, they are often housed inside tractor-trailers. In the future, the service wants to be in a position where "a company commander can take this stuff, unbox it, set up a couple of chairs, put some guys in a [virtual] environment and do it deployed," Lt. Gen. Michael Lundy, the commanding general of the Combined Arms Center, told National Defense.

He envisions using Google Glass-like technology and advanced software to enable such soldier training.

"You can put a black curtain around them, put them in front of a couple of screens and give them haptic touch so they can actually see and it looks like a cockpit and they're touching the things" that would be in a real Army helicopter, he said.

"This is how we can save a lot of money. We can go from [needing] a tractor-trailer truck to a couple of hard and tough boxes," he added.

Many simulators in the Army's inventory are old and expensive, Lundy noted.

"Today we have imagery generators that are in some of our simulations … [where] the bulbs cost $1,000 because they're '80s technology, and we've got companies that still have to build these things," he said. "If somebody tried to go back and replicate Edison's first light bulb and you told a factory, 'Hey go build one of those,' they would charge you about 1,000 bucks to do that."

Scalability is also an issue that Army training leaders are grappling with. Buying and operating large numbers of simulators can be cost-prohibitive, Lundy noted.

The Army can only use about six aircraft simulators at a time at a division level, he said. "It needs to be cheaper so we can have more of them."

The Army hopes to overcome these numerous problems with the synthetic training environment.

"We really have an opportunity to impact how the Army is going to train for the next 10, 20, 30 and 40 years," said Bullock, adding that the STE could "revolutionize" the process.

The aim is to enable troops to have the most realistic training possible by equipping them with interoperable simulators or other training aids that can be easily linked with other devices and personnel located elsewhere.

"We envision a training environment where you can train anywhere in the world and train on the terrain that you are going to fight on," Gervais said.

Imagine soldiers maneuvering in a real Hawaiian jungle to attack a mock enemy position. They are supported by virtual helicopters flown by pilots in simulators at Fort Campbell, Kentucky, and virtual cannons operated by an artillery battery at Fort Sill, Oklahoma, who are participating in the battle on their laptops. All the while, a commander based at Fort Drum, New York, sees all of the action in real-time and directs the fight from his mission command systems.

That is just one potential STE-enabled training scenario envisioned by leaders at the Combined Arms Center.

Being able to replicate any type of terrain that soldiers might encounter is a key goal for the service.

ARMY

"Imagine the power of a program that allows your entire unit to immerse itself in its future operational environment before it even leaves its home station," Bullock said.

Advanced game engines and cloud-based technologies are expected to be a critical enabler of this training construct.

"Think of the [game] engine as sort of like the operating system" on a computer, said Amy Kruse, the chief technology officer at Cubic Global Defense. The company adapts the systems for military purposes.

There are opportunities for the Army and industry to take advantage of commercial gaming technologies, she said. Building a game engine from scratch is "a very expensive proposition," she noted.

"It's just such an awesome time in terms of how that world has matured," she said. "When somebody builds a game engine and we're able to use it, we're leveraging hundreds of millions of dollars in investment … [by] putting the operational and military-specific pieces in place."

Acquiring such technology isn't the same as purchasing a PlayStation system and playing "Call of Duty" or similar military-themed video games, she noted.

"It's not like we're just buying it off the shelf at Best Buy. We're in [commercial companies'] developer programs and giving them input on how it would be best for our customers," she said.

Lundy is especially keen on improved virtual training technology. It makes it easier for soldiers to simulate cyber attacks, electronic warfare and nuclear, chemical and biological incidents, he noted.

"We would be shutting down airports and stuff if we did that here in the States," he said. "If you do

it in the virtual world, you can do anything."

Synthetic training could potentially save the Army significant money in an era of constrained budgets.

"It's very expensive to conduct live training and bring everybody and everything to the battlefield and marshal those resources," Kruse said. She anticipates greater use of simulators and other high-tech training aids such as augmented reality.

But creating the kind of highly realistic gaming environment that the Army envisions is no easy task, Lundy noted. Ground warfare is generally more difficult to simulate than aerial or naval warfare in terms of the level of fidelity required, he said.

"If you're flying in a fixed-wing aircraft [in a simulator] you can have a two-dimensional look at the ground and be OK," he said. "You just need to see some semblance of recognition to go, 'Yeah, OK, there's a tank down there.' But when you actually get down on the ground you've got to see the tank, you've got to see the turret, you've got to see it move, you've got to see road."

Designing a system for urban warfare training adds extra challenges, Lundy noted. The Army expects to fight in megacities in the coming decades. Trying to simulate such an environment on a large scale with a gaming system could prove difficult.

"Now we're talking about doing 100 square kilometer cities," Lundy said. "It's really a challenge."

High fidelity is a double-edged sword, he noted. Some existing simulation systems provide outstanding visuals but they are relatively expensive.

"Because fidelity directly correlates to cost … we need to get the fidelity at the right level," he said.

Gervais said the Army would have to make "hard decisions" in this regard for both air and ground platform simulators.

Lundy envisions major savings from the new synthetic training environment relative to legacy systems, perhaps as much as hundreds of millions of dollars in lifecycle costs.

If the Army successfully develops and integrates the technology, it could have major implications for industry.

"I want to eliminate contractors" to save money, Lundy said. "Our soldiers today can go in and work in any gaming environment. There's no contractor standing over their shoulder going, 'Hey you need to do this, you need to do that.' But today our sims are so complex" to operate that they require a lot of contractor support.

The synthetic training environment could potentially make contractors less necessary, he said.

Cubic is keeping an eye on where the Army decides to go with the STE concept. The company's new training strategy is to bring together systems that cover multiple domains.

"We have an advantage … because we're able to integrate our ground assets with our own air assets," Kruse said.

To drive the Army's initiative forward, the service will conduct an evaluation of alternatives over the next 12 to 18 months, Gervais said.

"That will inform not just our requirements but also the technology that is available and also the approach that we should take to bring … the synthetic training environment to reality," she said. "Through that analysis that we do we will determine … what should we go after and how we bring all of this technology to bear."

The Army hopes to have the synthetic training environment in place in the 2020 to 2030 timeframe, while some capabilities may come sooner than expected, Gervais said. **ND**

Email comments to jharper@ndia.org

Medevac Training System Preserving Life-Saving Skills

By Stew Magnuson

DOBBINS AIR RESERVE BASE, Ga. — If a combat medic makes it to a wounded U.S. service member on today's battlefield, the victim has a 98 percent chance of survival.

That number is unheard of in the history of warfare, said Lt. Col. Chad Corliss, the Air Force's 94th air evacuation squadron director of operations.

In World War II, it was a 30 percent mortality rate. For the Korean War, Vietnam War and first Gulf War, it remained at about 25 percent. And that's where it was when hostilities began in October 2001, he said. The last four years have seen a tremendous leap to where only two of 100 of those who survive long enough to see a combat medic, die of their wounds.

"We want to chase zero. We want zero percent to die of wounds. I don't think that is going to happen but what I don't want to happen is for us to go back to 24 percent," Corliss said.

To that end, the Air Force has acquired a simulator that reproduces the long missions medical flight crews must endure while taking care of patients in the back of transportation aircraft.

Corliss said there is a risk as operations wind down that some of the vital skills that have kept that survival figure so high might be lost.

"We want to keep those skills. We've got them right now. We have learned a lot in 10 years of combat," he said in an interview with reporters.

"What we don't want in our next conflict with new nurses, new med-techs coming in, is not knowing what we have learned and having to learn it all over again," he said.

The Aeromedical Simulation and Training Center at Dobbins Air Reserve Base received the first aeromedical evacuation training device in the spring. Built by CAE Health USA, a division of the Canada-based modeling and simulation company, it reproduces in high detail the back of a C-130 E or H models' fuselage where medical flight crews care for mock patients in the form of realistic manikins.

It reproduces the lighting, sounds, intercom, breathable air stations and configurations of a medevac aircraft. The idea is to mimic the high-stress scenarios that such flight crews experience in the real world, Corliss said.

Since such aircraft also resupply forward positions, loadmasters must be able to push pallets off after landing. The medical technicians and nurses then have about 10 minutes to reconfigure the back of the aircraft to receive patients.

This is often done at night in hot zones, which requires crews to wear night vision goggles as they perform their tasks. The goal is to be on the ground for 30 minutes or less.

The nurses and med-techs are considered members of the flight crew and do not serve under any of the services' surgeon generals. The vast majority are Guard members or Reservists, meaning they have limited time for training, Corliss said.

As members of the aircrew, they have to understand the aircraft in which they are working. They must be qualified to serve on any KC-135, C-17 and C-130 and requalify for their wings every 17 months by passing a series of stringent

tests, he said.

The simulator is not being used for basic training, which is a different course that takes some 60 days to complete. Participants here are looking to hone and keep up their skills in a refresher class.

"The medical world is a bit behind on understanding the value of simulations, but we are getting there. We know that this can improve patient safety and we know it improves our clinical performance when we are in the simulator," Corliss said.

Aeromedical evacuation training system

Training in the medical world most often involves embedding in hospitals where new doctors or nurses "experience by chance" whatever occurs on that particular shift.

The center creates reproducible, standardized and validated scenarios.

"We don't want experience by chance. We want guarantees that every crew member that comes through this facility will get a chance to put hands on and go through each one of those experiences," Corliss said.

This is where they can make mistakes without harming a patient. Most of the learning takes place during debriefs, where the crew learns from their errors, he added.

The trainer allows for a variety of scenarios that cannot be reproduced with live training such as loss of cabin pressure, power failure, smoke in the cabin, and in the future, a crash-and-ditch scenario.

Base commander Col. Steven Parker, who is also commander of the 94th air wing, said: "You can shut engines down. You can do all sorts of emergencies that you can never do in an airplane, or you hope you will never see them in an airplane. But if you do see them at least you have seen them in a simulator, and you know how to handle it."

To do the crash-and-ditch scenario, and to provide even more realism, the trainer will be receiving a motion table late this year. It will be able to do about six degrees of movement. It will not be able to reproduce the G-forces, or egress, but it will be able to simulate "a very bad day," Corliss said.

When training in the air, the "bad day" scenarios are not very realistic, he noted. An instructor would just point at a cabin door to indicate that a red light has come on for a loss of cabin pressure. Now, a real red light comes on and it's up to the crew to take notice, put oxygen masks on their patients and remedy the situation.

If there is a loss of power for some reason they also have to figure out what is wrong with the electrical system and reboot it — all while making sure the patients stay alive, Corliss said.

Members of the medical flight crews are put through a series of tasks in smaller rooms during the course before they put all they have learned together and go in the larger simulator.

The "patients" are actually realistic manikins that breathe, talk and bleed. And not all of them are war fighters.

The crews take on a variety of missions that are not combat related such as disaster relief. Other federal agencies can call them in to evacuate their personnel. Military family members with medical emergencies at remote bases have been airlifted as well.

"I tell my nurses, 'You're going to move everything from pediatric to geriatric,'" Corliss said.

The manikins respond physiologically to what ever is done to them. They have pre-set scripts to tell the staff what is wrong. An instructor running the simulation in a control room can also improvise and speak for the manikin, although it will come through with a different voice.

Manikins replace real people who once acted the parts of patients.

"The difference is I can stick a tube in [the manikin] 10 times a day and he doesn't complain," Corliss said.

Reporters at a media day witnessed a pregnant manikin mother giving birth to a manikin baby with the help of a medical technician.

Corliss noted that there are many reasons for today's high survival rate other than the work of medical evacuation crews. The mine-resistant ambush protected vehicle and body armor are better at protecting troops. Combat care has also moved far forward on battlefields.

"The combat medic that is moving forward with troops is receiving training that they never would have received previously," he said.

Attitudes toward the tourniquet have also changed. It was widely used in the Civil War, then fell out of favor because it was believed that it did more damage than good. Today, it's known that a well-placed tourniquet can stop bleeding and remain in place for up to eight hours without damaging the limb. Every servicemember in a battle zone must carry at least two of them at all times.

During an operation, a spot where doctors can perform damage control surgery is set up nearby to receive any patients brought there by helicopter or other means. After they do what they can to stabilize the patient, an air evacuation coordination cell is called, which brings in the medevac aircraft. Corliss said a patient can now make it back to a stateside hospital within 72 hours. That took up to 30 days during the Vietnam War.

The five-member crews as they fly long distances are pretty much on their own, although they can radio doctors for advice.

One item on the wing's want list is satellite communications links so some telemedicine can be performed. The Air Force is requesting this upgrade, he said.

The plans are for six more such simulators, including ones for the C-17 and KC-135 variants, with some on the West Coast so Guard members and Reservists don't have to travel too far to refresh their skills.

Parker said the goal is for Dobbins to become a "center of excellence" for medical flight crew training, similar to the way Rosecrans Air National Guard Base in St. Joseph, Missouri, has become a world-renowned airlift center of excellence where new tactics, techniques and procedures are worked out.

"To get that next level of training, I think that's what we can do here," Parker said. **ND**

Email comments to smagnuson@ndia.org

CAE

Airframers Pull Out All Stops in Fight for Air Force T-X Contract

By Vivienne Machi

The stakes are high for four major military jet manufacturers as the Air Force prepares to formally kick off the competition for its new jet fighter training system, analysts said.

A final request for proposals is expected by the end of December for the T-X jet trainer program. Four teams — led by industry giants Boeing, Lockheed Martin, Raytheon and Northrop Grumman — are vying for the $628 million contract, which will initially call for 350 aircraft, along with a number of ground training systems.

But that's just the beginning, said Ray Jaworowski, senior aerospace analyst at Forecast International, a Newtown, Connecticut-based marketing and consultant firm.

"You have this big export market that could add 200 units, 300 units on top of the Air Force buy," he said.

The T-X program aims to replace 431 T-38 aircraft, with initial operating capability scheduled for 2024 and full operational capability expected for 2034, according to the Air Force.

Any country that operates an advanced jet trainer — such as the German and Turkish air forces — could be a potential customer for T-X, Jaworowski said.

The world trainer market is valued at about $3 billion per year, and the T-X program is "easily the most important competition" in the high-end jet market, according to a recent report by the Teal Group, an aerospace and defense market analysis firm.

"It's almost impossible" for the Air Force not to proceed with replacing the T-38 fleet, said Richard Aboulafia, Teal Group vice president of analysis, citing "the sheer age of the T-38" as a main factor. The Air Force continues to perform upgrades on the aircraft, which will be over 70 years old by the time it is retired.

"They announced recently that the T-38 would be re-winged again, the cockpits are all new … but you're still talking about half-century-plus" aged aircraft, he said.

Fewer than 800 Western high-end jet trainers have been delivered worldwide over the past 20 years, according to the Teal Group report.

"In other words, for any major U.S. airframer and anyone in the world building a trainer in this class, it is impossible to not compete for this requirement," the report said.

The competition is balanced between two teams with off-the-shelf aircraft — Lockheed Martin with Korean Aerospace Industries' T-50A and Raytheon and Italian manufacturer Alenia Aermacchi's T-100 — and two clean-sheet designs from a Boeing-Saab partnership and Northrop Grumman with BAE Systems and L-3.

In theory, an off-the-shelf product could be less costly, since you don't have the development expenses that a clean-sheet design would have, Jaworowski said.

"Since it has been in service, it has proven reliability, you know what it's going to do, whereas with a clean-sheet design, you have to prove that all out in flight testing," he said.

On the other hand, one advantage of a clean-sheet design is a company is able to "optimize it specifically to the Air Force program," he noted.

More than one defense contractor's future in the tactical aircraft market hangs upon the contract award, Jaworowski said.

"Northrop or Boeing's future in the tactical aircraft business is, in a certain sense, up for grabs with the T-X contest," Jaworowski said. As production slows over the next few years on the Boeing-produced F-15 Eagle and the Boeing/Northrop-developed F/A-18 Hornet, those companies may be in jeopardy of no longer holding a prime contract in the tactical aircraft market, he said.

"Lockheed is going to be in the tactical aircraft business whether it wins or loses, because of the F-35 [joint strike fighter]," he said.

Northrop will be the prime contractor on the B-21 long-range strategic bomber. Boeing has floated designs for a Super Hornet replacement, but "the Super Hornet's going to remain in service for years now," he noted. "If Lockheed wins, you could see a situation where [it] really is the sole U.S. manufacturer of tactical military aircraft."

The T-X program will ensure the next wave of pilots can learn to fly fifth-generation aircraft, like the F-35.

Pilot training gaps widen and continue to do so every year as the service brings on more fifth-generation aircraft, said Lt. Gen. Darryl Roberson, commander of Air Education and Training Command, which oversees the T-X program.

The T-38 has been a "formidable, reliable trainer, but to provide some perspective, 1961 is the year that John F. Kennedy entered office," Roberson said via email. "Today, the T-38 lacks capabilities we absolutely need to prepare our pilots for fifth-generation aircraft."

As industry awaits the final RFP release, funding remains the biggest hurdle to the T-X program, Aboulafia said. Concurrent Air Force programs including the F-35, the B-21 and the KC-46A tanker come with their own extensive funding challenges, and the T-X will have to compete with them in congressional budgets.

"We know we have to fit all of these

The T-X program aims to replace 431 T-38 aircraft

important programs into our limited budget," Roberson said.

The T-X is one of four Air Force "Bending the Cost Curve" initiative pilot programs — along with the B-21, the multi-adaptive podded system and the space-based infrared radar system — to optimize program value, Roberson noted. Air Force Secretary Deborah James introduced the initiative in 2015 as a way to work with industry to keep from inadvertently contributing to rising costs, stifling innovation and slow processes.

On the eve of the competition, the four manufacturers were still touting their aircrafts' merits.

The Raytheon-Alenia Aermacchi and Lockheed Martin-KAI teams are making their cases for established aircraft, citing prior records, hundreds of thousands of flight-testing hours and an easy transition to what the Air Force needs for the T-X.

Jim Hvizd, Raytheon Space and Airborne Systems vice president of business development, said the T-100 is "a simple block upgrade from the [Alenia Aermacchi-developed] M-346, which is already training fourth and fifth-generation pilots from Israel, Italy, Singapore and Poland."

"There are very few changes needed to customize our solution for the Air Force mission," he added. "That means in addition to ensuring affordability and cost certainty, we also aren't going to face the delays associated with full development programs."

The T-100 has been flying since June and flight tests continue to progress well, according to Raytheon.

The Lockheed Martin-KAI T-50 was always meant to be a replacement for the T-38, said Mike Griswold, Lockheed director of business development and capture lead. Minor changes in the Air Force requirements led to what became the T-50A design — notably in the larger cockpit display that can switch between F-16 and F-35-style interfaces, he said. "When a student first gets into the T-50A, we don't want to overwhelm them with a varsity-level F-35 [display], so the displays will get more and more complex." Flight-testing is currently wrapping up, he said.

Timing is really what the T-50A offer is all about, Griswold said. The aircraft is already fully operational, with over 100,000 flight hours and a supply chain in place in Greenville, South Carolina.

"We're ready to move out now, and we think we'll be ready much quicker" than the competitors, he said.

T-50 chief test pilot Mark Ward said at a recent Air Force Association conference that the company continues to perform testing on the aircraft in order to spot-check specific modifications.

"Every bit of testing we do now to gather data, subtracts from what the Air Force will have to pay" later and will shorten the length of post-contract test time, he said.

An off-the-shelf's potential to shift the IOC timeline to the left might not be so relevant for the T-X because the Air Force has already issued a preliminary schedule timeline that each team's aircraft must meet to win the award, Jaworowski said.

"No matter which approach they're going to take, they're going to have to try and meet that timeline," he said.

Boeing recently unveiled its T-X prototype at its St. Louis, Missouri, facility. Ground testing for the Boeing T-X is going "exceptionally well," and flight tests are expected before the end of 2017, Ted Torgerson, Phantom Works director and T-X program manager at Boeing said in an email.

"We invested our own resources to give the [Air Force] exactly what it asked for, in a new design, without the cost of a Milestone A competition," he said, adding that in doing so, Boeing "significantly reduced the risk and cost" of the aircraft.

"Off-the-shelf competitors will experience weight issues from day one, created by the modifications they need to make to meet requirements," he said. Older designs will also be more expensive to maintain in the future, he noted.

Northrop Grumman's Model 400 aircraft was recently unveiled in Mojave, California.

The incumbent contractor did not make an executive available for interviews, but T-X program communications lead Katherine Thompson said the company has been in an exclusive teaming with BAE Systems and L-3 on T-X since 2011, with Northrop Grumman serving as the prime program integrator and manufacturer.

BAE Systems is providing embedded training capability and manufacturing support, and L-3 is responsible for ground-based training and simulation.

"It is evident [the Air Force needs] a new aircraft and training system to meet their needs for the next 50 [years]," Thompson said in an email. "They've spent the last several years preparing for this necessary acquisition, as have we, and we want to be the team that gives the Air Force what they ask for."

Despite the cost challenges and changing program requirements, the four competitors need to "aggressively pursue this program," as there are few other aircraft competitions out there, Aboulafia said.

Based on its current forecast, the Teal Group expects the T-50A to have the best chance of winning the competition, according to its report.

"This looks an awful lot like a heavily cost-driven program," Aboulafia said. "There's not a lot to differentiate [the clean-sheet versions] on the basis of cost."

"But with at least three other players, we can't assume anything," he added. ND

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Lockheed Prepares to Launch Global F-35 Training Facilities

By Yasmin Tadjdeh

The F-35 joint strike fighter has been pegged as one of the most advanced aircraft to ever fly. To train pilots and maintainers, students go through rigorous coursework and then use advanced simulators. Manufacturer Lockheed Martin is now preparing to expand the aircraft's training centers abroad.

Over the next two years, Lockheed will stand up nine international training sites and centers, said Mike Luntz, F-35 training director at the company.

That will "extend and expand the reach of the training" the company can provide, he told National Defense in an interview.

The sites will include: Marine Corps Air Station Iwakuni, Japan; Amendola Air Base, Italy; Royal Australian Air Force Base Williamtown, Australia; Cheongju Air Base, South Korea; Misawa Air Base, Japan; Ørland Air Base, Norway; Marham, United Kingdom; Grottaglie Air Base, Italy; and Nevatim, Israel.

It aims to stand up all of the facilities by the end of 2018, he said.

Not only will the sites provide each respective country with on-demand training, but eventually the simulators could connect with those in the United States for coalition exercises, Luntz said.

"We are in the process of developing the capability to link the simulators over the wide area network," he said. Lockheed will first start with the Air Force, then the Navy, Marine Corps and the United Kingdom, in that order, he said.

The ability for other countries to access this network would be subject to approval from the United States, he said.

In the case of the Air Force, the network is called the distributed mission operations network, or DMON. Each service and the United Kingdom will have their own network with their own protocols. They will be released in a phased timeline, he said.

Creating such a network for other countries should be relatively easy depending on how much their requirements differ from that of the U.S. services' networks, Luntz said.

"If they come up with a different network protocol than, for example, the protocol with the United States …. then that would require us to modify the software based on their requirements," he said. "So from that perspective, we have not received all the requirements from all the different countries."

A recent study conducted by the F-35 joint program office found that many of the countries did not have numerous unique requirements, Luntz said.

"We're anticipating that they're going to be similar to one of the U.S. services, but that's really a requirement that hasn't been" fleshed out yet, he said.

Before the foreign nations can connect to this network, Lockheed must first connect all of the U.S. training sites, he said.

In March, Lockheed signed a contract with the Air Force to develop its distributed mission operations network, which would allow it to seamlessly connect its F-35 simulators with others around the nation, he said.

"It will also allow us to connect into other simulators, other platforms that are on that network as well," he said. "In a typical training scenario, you would have F-35s and other platforms training together."

That could include a refueling tanker or a Boeing E-3 Sentry airborne early warning and control aircraft, he said. "They would all … be able to play in that game space."

Lockheed currently has simulators at

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PLANNED F-35 TRAINING SITES

- Marine Corps Air Station Iwakuni, Japan
- Amendola Air Base, Italy
- Royal Australian Air Force Base Williamtown, Australia
- Cheongju Air Base, South Korea
- Misawa Air Base, Japan
- Ørland Air Base, Norway
- Marham, United Kingdom
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seven different locations in the United States: Eglin Air Force Base, Florida; Luke Air Force Base, Arizona; Hill Air Force Base, Utah; Nellis Air Force Base, Nevada; Edwards Air Force Base, California; Marine Corps Air Station Yuma, Arizona; and Marine Corps Air Station Beaufort, South Carolina. It plans to stand up another training facility at Naval Air Station Lemoore, California, for Navy training, he said.

Simulators located at the same training facility can network together, he added.

Lockheed is in talks with the joint program office to lock down a specific timeline, but fielding is targeted for 2018, he said. The first location to receive the networking upgrade will be Nellis, he said.

The upgrade will require a hardware component modification, he said.

"That would be something that would have to be rolled out," he said. "It would be a relatively easy integration."

That connectivity will be critical for not only training among the U.S. services, but with coalition partners, said Lt. Col. Rhett Hierlmeier, 56th training squadron director of operations for the F-35 at Luke.

"You're able to share information, cross talk, practice basically with pilots that aren't necessarily at your base. That's a huge advantage of distributed mission training," he said.

Besides better training, it also saves the services money, he added.

There are savings to be had by "not having to fly the sorties, mainly because you've got geographically separated units," he said. "There's just a lot of travel time that would be involved in moving airplanes from one base to another just to participate in training."

And when it comes to training with coalition partners, connecting via a network is key, he said.

"We have a motto, train like you fight. And we don't go fight on our own, we do it as a team," Hierlmeier said. "The more we have the ability to practice and train together, both in the actual … airplanes via exercises like Red Flag and then in the sim, that's a great benefit."

That type of cohesive training is part of the reason why the military wanted the F-35, he said. "We bought this airplane so that we could fight together in future wars, and a key portion of that is not just to have the same equipment, but to actually practice together, to train together."

"We do that regularly at exercises like Red Flag and others, but to have the ability to really on demand be able to synch up the training virtually, I think that's a significant capability," Hierlmeier said.

Luke Air Force Base currently has four simulators on site, he said. They are able to connect together, and F-35s can fly in a four-ship configuration. Getting beyond that by connecting to other systems around the country or the globe would allow for more complex mission rehearsal training, he said.

The base will receive two additional simulators this fall. By the summer of 2017 it will have 12 simulators installed, which is the full complement needed, Hierlmeier said.

Luke serves as an international training hub for the F-35. Currently Australia, Italy and Norway train their pilots at the facility. Israel also has pilots training there, but the country isn't an F-35 partner nation and is instead a foreign military sales customer.

Turkey will bring pilots to the base starting in 2018, he said.

The simulator offers pilots the ability to practice maneuvers that they cannot do in live training.

"For example, we don't regularly shoot missiles against other airplanes. We don't see the effects of those missiles hitting other airplanes," he said. "There are complex environments … [that are] very difficult to recreate on a training range but we can easily create those virtually. So we're able to get much … higher fidelity training, I would say, in the simulator at times from a threat standpoint."

As countries stand up their own native F-35 training facilities, some may no longer train at Luke, Hierlmeier said.

It "varies by each country," he said. "Some have plans to remain at Luke and continue training and others will train up an initial cadre and then take their airplanes with them … to do their training organically."

However, there are benefits to being at Luke, he added.

"There's good cross talk and sharing of information and tactics and procedures as we learn how to operate and employ this airplane, and that really comes from training together and being in one place," he said.

Fifty-seven pilots in fiscal year 2016 trained at the base, Hierlmeier said. For pilots who have previous experience flying a fighter jet, they use the trainer for 30 missions, which comes out to about 45 hours, he said. For an inexperienced pilot, they would perform 45 missions over 70 hours.

Luke will receive its first pilot right out of flight school this December, he said. It "is a pretty big milestone" and shows that "the training system is mature enough and we're competent in the simulator to take a pilot that hasn't flown a fighter before and put him in a single-seat airplane."

Overall, Lockheed has trained 345 pilots and 3,368 maintainers at its training centers at Eglin, Beaufort and Luke, Luntz said.

Lockheed plans to install two simulators at Iwakuni in December, he said. It will be equipped with an advanced version of the airplane's software known as 3i. It "is kind of our latest and greatest pilot training device software load," he said.

The company will soon begin rolling out the 3i software to other simulators, he said. The entire upgrade process will take less than a year, he added.

This December will mark the delivery of Lockheed's 50th simulator, he noted. The event is a milestone for the company and shows that "the F-35 training system is really kind of expanding its reach and expanding the capability that we're delivering," he said.

The system would be a full-mission simulator for pilots, he said. The company also offers a maintenance simulator and a weapons load trainer. **ND**

Email comments to ytadjdeh@ndia.org

DEFENSE DEPT.

Marines to Modernize Training Facilities

By Yasmin Tadjdeh

The Marine Corps will need to modernize its training facilities and equipment as it prepares for future battles.

As outlined in the Marine Corps' new operating concept, "How an Expeditionary Force Operates in the 21st Century," the service will rely heavily on maneuver warfare and fighting as a combined arms force as it looks toward battles of 2025 and beyond, said Lt. Gen. Robert Walsh, commanding general of the Marine Corps' Combat Development Command and deputy commandant of combat development and integration.

The service will have to "distribute our force in smaller units to be able to disperse, to be able to be less targeted by the enemy and be able to continuously move, because if we're not moving you're going to be targeted very quickly," Walsh said during an industry conference in Portsmouth, Virginia.

Smaller units will need to move rapidly and come together quickly if needed. Marines will have to fight in a variety of contested environments including the littorals and in megacities, which are poised to rapidly grow by 2025, he said.

All of this will have an affect on how Marines train.

In the Marine Corps operating concept — or the MOC — the service said it would need to better train and educate Marines to deal with multi-faceted and complicated environments, including urban environments.

"We recognize that operations in urban areas are the most likely to occur and the most dangerous. Urban areas are complex terrain, which emphasizes the need to maneuver in the human dimension of conflict. This requires a thorough understanding of the relationships, culture, politics and objectives of the people and organizations that populate the battle space," the operating concept said.

Urban environments can "soak up personnel resources in labor-intensive ground" missions, it said.

The service will need to train to address the full degree of compartmentalization, including city blocks, streets, buildings, sewers and tunnels, it said.

Capt. Joshua Pena, a spokesman for Marine Corps Training and Education Command, said the service would have to "evolve" to dominate urban environments.

"Our approach to training must account for all aspects of complex terrain and we will have to be creative in how we combine the physical and cognitive domains to maximize our current training venues at all levels," he said in an email.

Marines will face asymmetric threats, nonlinear battlefields and unclear delineation between combatants and noncombatants in these environments. TECOM has addressed these training needs by investing in 63 military operation in urban terrain systems and 25 live-fire shoot houses over the past 12 years, Pena said.

"These systems provide training capability from the squad level, facilitating individual proficiency and competency, through the battalion level, to accommodate larger, combined arms training," he said.

Squad-level training can also be accomplished using infantry immersive trainers that "provide high-fidelity training venues with enhanced battlefield realism including exposure to operational complexities, mental and physical stress and challenging tactical, moral and

ethical decision-making," he said.

Because of these investments, the Marine Corps does not have immediate plans to build larger, more comprehensive mock villages than already exist, he said. However, current ranges will continue to be modernized, including adding video and audio capabilities to "enhance after-action review capability," Pena said.

Peter Haynes, a senior fellow at the Center for Strategic and Budgetary Assessments, a Washington, D.C. think tank, said training in such a complex terrain is easy on a small scale, but will present the service with challenges as it grows larger.

"When you get to above the battalion level and into the regiments and so forth, … it's almost logarithmic … because you really need to train for more dispersed, bigger forces," he said.

Red forces have to put an enormous amount of pressure on the troops in order to properly train them for what happens when GPS is degraded and a Marine has to use a compass, for example.

"Training to scale and training to difficulty from a holistic overall basis … will be a challenge," he said.

The MOC emphasized that the Marine Corps will need to continue to refine and exploit the use of live, virtual and constructive training. LVC, an emerging concept that is gaining traction, combines simulation, live training and computer models to create a comprehensive virtual environment.

"Exploiting this combination of training is important as we look to incorporate maneuver warfare in every dimension while utilizing combined arms in all domains," Pena said. "The combination of live, virtual and constructive training provides opportunities to train to that end and maximize resources to the greatest … [extent] possible; while concurrently expanding the training audience to commands and maneuver units that are geographically separated and that may not have been able to participate otherwise."

The Marine Corps plans to combine existing LVC systems into an integrated and interoperable live, virtual and constructive training environment, according to TECOM's G-3 operations team.

"LVC-TE can be characterized as an interoperability effort with existing applications and programs, with some procurement of exercise design and exercise control capability for planning, preparation, execution and assessment of unit/collective training events," Pena said.

This will help the service provide enhanced service-level training and exercise capability, he said. It will also link geographically separated Marine Corps installations, he added.

The service also plans to take advantage of simulators and devices to better train Marines, Pena said. Such systems can offer efficiencies. The intent is not to replace live-fire testing, but to complement it by increasing repetition and expanding the complexity of the scenario before live training, he said.

The Marine Corps is preparing to field the augmented immersive team training system in the next three to five years, Pena said. The system was developed by the Office of Naval Research and transitioned to the Marine Corps' program manager for training systems office.

"AITT will provide highly realistic training for force-on-force call for fire, joint fires observers and joint terminal attack controllers, avoiding reliance on live aircraft, ordnance and availability of live-fire ranges for mortars, artillery and

air-delivered fires," he said.

When it comes to joint terminal attack controllers, the service is constrained by limited availability of flight hours for close-air support-capable aircraft and virtual trainers, he said.

"AITT will be able to provide observers and controllers realistic training that is not reliant upon live aircraft or tethered to a fixed infrastructure simulator," he said.

The service also wants to invest in virtual reality headsets, Pena said.

"As virtual reality continues to pervade the commercial sector and become cheaper, there is great potential for individual and perhaps even small unit collective, procedural training events," he said.

At the moment, there isn't much software catering to the military training market, he said. Most of it is geared toward the entertainment industry, he added.

"Training and Education Command has looked into the commercial VR sector for training applications, and is exploring potential options for procuring low-cost systems to put in Marines' hands for garnering ideas and feedback on potential training use cases," Pena said.

While hologram technology is emerging, it presents a number of challenges for the Marine Corps, he said.

"First, it would require tethering training to a fixed location, which the Marine Corps would prefer to move away from in favor of bringing the training systems to the Marines as in with augmented reality systems," he said. "Secondly, the technology associated with holograms is not advanced enough to support a capability that the Marine Corps would likely invest in."

However, the service is looking at emerging man-worn systems that project a holographic image in front of a user, he said.

The Marine Corps is historically known as an austere branch of the armed forces. That will require the service to be creative as it goes about procuring systems, Haynes said.

"Out of the services, I think the Marine Corps will think most creatively about what is required to train," he said. They won't necessarily go after the most highly technological systems available, he noted.

The service will also need to train for information warfare, the MOC said.

"An ever-increasing part of people's lives is taking place in the information space, adding informational and human dimensions to the battle space. Globally networked and information-enabled populations now react to viral versions of events and ideas moving at the speed of the internet, complicating our ability to gain and maintain an accurate, up-to-date, intelligence-driven understanding of conflicts," the MOC said.

Already, adversaries are exploiting the environment to "mask their actions, mislead unwitting publics and undermine the legitimacy of their opponents," it said.

However, when it comes to the battle of narratives and perception side of information warfare, that might be difficult for the Marine Corps, Haynes said.

"As Americans we are all profoundly ethnocentric. We have very little understanding of how profoundly different other folks, other societies think," he said. "But by the same token, the Marine Corps has always been kind of understanding of that and you see them over the last 14 years lean heavily on a lot of the [cultural] experts." **ND**

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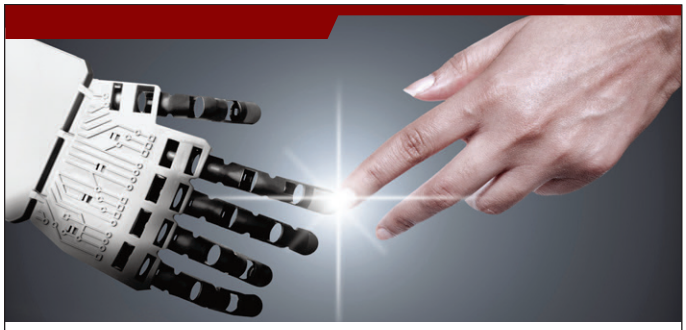

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Navy Satellites

■ The Navy's mobile user objective system satellite program cleared a hurdle recently when MUOS-5 finally reached its operational orbit after experiencing difficulties. What are the prospects for the program going forward? And what is the Navy doing to ensure secure, resilient satellite communications in future conflicts?

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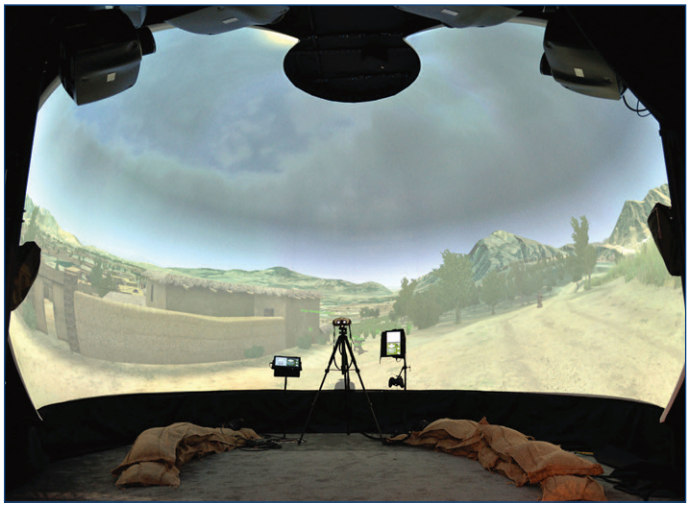

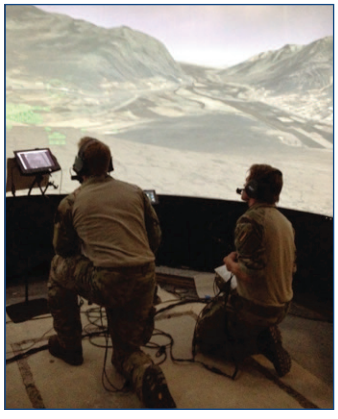

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