NOVEMBER 2016

National DEFENSE

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Industry Braces for Insider Threat Rules

SPECIAL REPORT

Battlefield 2030

Threats driving technology investments

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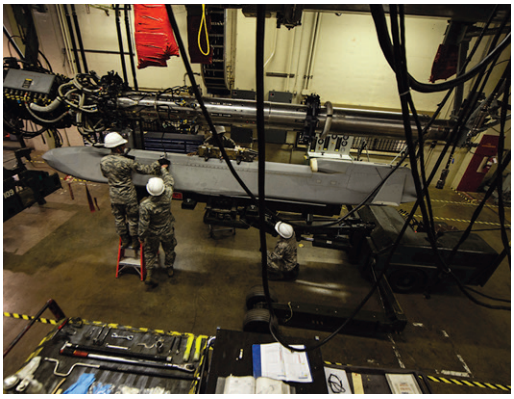
■ Defense companies were directed to have a program to counter insider threats by the end of November, but experts say this may not be enough to thwart potential spies.



Strategic Deterrence 19

■ A plan to field a nuclear-tipped cruise missile has garnered plenty of opposition from those who say it's not needed. Others argue that it is required to hold enemy targets at risk. **Cover images: iStock, Air Force**

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■ The year 2030 is just around the corner when it comes to procuring the battlefield equipment needed to fight tomorrow's wars. A slow acquisition process means the time to place bets on what new technologies will be needed in a decade and half is now.

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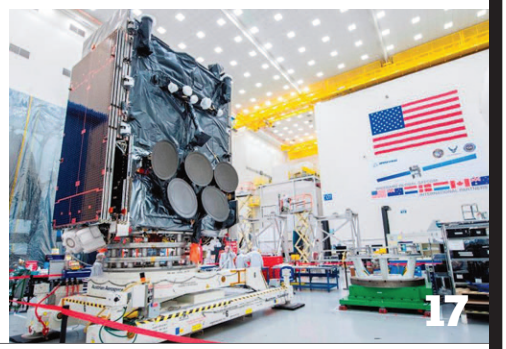

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By Craig R. McKinley

Industrial Base a Part of Force Structure

In this column last spring, I discussed the reflections offered by former Defense Secretary William Perry about the defense industry consolidation of the 1990s that he had encouraged, and to no small degree stimulated. I thought it might be useful to offer a reminder of what happened back then, what has resulted and what it might mean going forward.

It was clear in the early 1990s that with the collapse of the Soviet Union, the presumed end of the Cold War and the election of President Bill Clinton, that strategic circumstances had changed and with them the expectations and priorities of Americans. There was much discussion of a "peace dividend," and indeed the administration of President George H. W. Bush began crafting one. It established a new force structure construct called the "Base Force," and began canceling or reducing major programs — most notably the B-2 bomber and the Seawolf submarine. The B-2 shrank from a planned purchase of 132 aircraft to 75 and then to 21, while the Seawolf went from 30 ships to three.

Other programs were cut in similar scale, leading to a reduction in modernization spending of nearly 70 percent between 1989 and 1998. With such a significant market reduction, Perry thought it prudent to advise the leading defense industry players that a major consolidation combined with overhead reductions were necessary. Accordingly, between Perry's announcement to a group of industry executives at a 1994 dinner, which came to be known as the "Last Supper," the defense industrial base consolidated from over 30 companies down to five.

In comments given last spring that I referenced in an earlier column, Perry now fears this consolidation has been too drastic, too broad and too comprehensive. If the current aspirations of the Pentagon are to have increased technological innovation and increased cost control, a smaller industrial base is not conducive to achieving them in terms of simple economic behavior. More innovation and greater cost competition comes from a larger number of players in a market, not fewer.

The current Secretary of Defense Ashton Carter — a key advisor to Perry and an attendee at the "Last Supper," has frequently commented about the nation's defense industrial base. He has said having an innovative and world-class defense industry is not a "God-given right," and that the industrial base must be treated as a key "part of the force structure." In short, in some way and at some level, the Defense Department has to give serious thought to managing its industry.

Within that context, the comment I like the best is the reference to the defense industry as part of the "force structure." Carter is absolutely correct in this regard. The Pentagon, as it moves through strategic reviews and budget formulations, routinely makes adjustments to the military force structure, occasionally in major ways, but routinely in minor ones. Certainly the 1993 Bottom Up Review conducted by then Defense Secretary Les Aspin changed the force structure in major ways, reducing the Army from 18 to 10 divisions for example. But even within these changes, smaller force structure changes occur such as the reductions in the number of aircraft within fighter squadrons.

But what about the defense industry "force structure?" Obviously, unless we were to return to the old "arsenal system," one where the government actually owned and operated most of the defense industrial base, shaping an industry that exists primarily in the private industrial sector presents a different problem. It cannot directly be "dialed up" or "dialed down" as can the military force structure.

The size and shape of the defense industrial base has to be indirectly managed by the government's transmission of market signals to which companies, and their investors, will react. In other words, when the government takes steps that make the defense marketplace attractive, by offering market growth or the possibility of increased earnings, firms will enter the market with innovative and cost-competitive prices. When the government signals the marketplace will be less attractive, firms will exit.

This means the government can go one of two ways. It could take steps to in essence "nationalize" key parts of the industrial base, effectively recreating the old arsenal system in whole or in part. But such a step is not politically palatable, so it should be significantly discounted.

> "The defense industry is a vital strategic asset — a key part of the national 'force structure.'"

That leaves only one other option — making the defense marketplace more attractive by reducing regulations and requirements, lowering other barriers to entry that many companies perceive, and increasing the prospects of growth in revenues and earnings. In short, the government has to make the defense market more attractive.

Some may criticize such an approach as simply equivalent to a "jobs program," while others might say it is artificially propping up a market that would otherwise contract on its own. To some degree this is true, but it ignores the distinctive shape of the defense industry itself, one where a handful of suppliers sell to one customer — the Defense Department, which is both the customer and the industry regulator. And unlike truly commercial firms, the defense industry is a vital strategic asset — a key part of the national "force structure."

This is certainly a complex subject, one that easily carries with it a certain degree of emotionalism, but we have to get through any emotion down to the objective realities. And those realities are that the force structure must be overseen with attention and care. Carter certainly understands this, and a major part of our responsibility at the National Defense Industrial Association is to ensure that others do as well.

Email your comments to cmckinley@ndia.org

Defense Watch By Sandra I. Erwin

Talent Gap Concerns Loom Larger Than Ever

An innovation deficit in the Defense Department and the weapons-making industry has been a central focus of Pentagon chief Ashton Carter's agenda.

The topic for the most part has been treated as a footnote in the larger debate about national security priorities. Discussions on aging workforces and skills gaps frequently induce eye rolling inside the Washington Beltway and fall into the category of "problems that need to be solved" after we deal with more pressing concerns, like shooting wars, terrorism and budget sequestration.

Carter's push to reach out to millennials and tech startups around the country has been viewed with some skepticism, as an academic exercise that stands little chance against the Pentagon's entrenched culture and aversion to change.

During visits to military posts and forward bases, Carter likes to remind audiences that the United States has the best and most technologically advanced military in the world. He also argues frequently that the failure to attract fresh talent — both in the government and the defense industry — will eventually erode the competitive advantage the U.S. military currently has.

"One of my core goals as secretary of defense has been to push the Pentagon to think outside this wonderful five-sided box, and be more open to new ideas and new partnerships that can help our military remain what it is today — the finest fighting force the world has ever known — as we confront a changing and fiercely competitive world," Carter said at the inaugural meeting of the Defense Innovation Board, a group of prominent tech executives and academic advisers he brought in to infuse new perspectives.

Whereas the tech industry was once embedded in the defense establishment, they now live in separate worlds, which is worrisome to those who, like Carter, fear that the Pentagon has created an inhospitable environment for innovators and creative thinkers. "The world of technology is changing too fast," he said. "You'll fall behind and people won't want to work with you because they're not going to work with people who fall behind."

And oh by the way, the defense industry is in the same boat. Carter has warned Pentagon contractors that they are just as challenged in this area as the government. He has been frustrated by the defense industry's response to his outreach efforts — turning the debate into a turf battle between "traditional vs. nontraditional" contractors instead of joining forces with the Pentagon in the pursuit of new talent.

Carter's innovation initiative has been further sidetracked by the overwhelming focus on technology, instead of people. The industry talks about innovation in terms of research-and-development programs, and is not investing the resources Carter would have liked to see to recruit the next generation of researchers and engineers who can actually develop cutting-edge technology.

Growing concerns about the Defense Department's cybersecurity vulnerabilities are drawing fresh attention to the skills gap issue, transforming it from an academic exercise to an urgent crisis that demands action.

U.S. defense officials are becoming alarmed by Russia's information-warfare maneuvers, and by the hacking prowess of several other countries, and are scrambling to figure out how to respond and stay ahead of the threat.

Unlike past military rebuilding cycles in which the Pentagon would stock up on new hardware, skills shortfalls in cyber and electronic warfare can't be filled with expensive equipment or money alone. Reality has set in that the usual approaches to training and preparing forces for future wars are not enough.

"We need people who can help protect our networks and build offensive capabilities," said Lt. Gen. H.R. McMaster, of the Army's Training and Doctrine Command. "We need people who can understand complex networks, who have analytical skills, who can combine technological big data skills with contextual knowledge of societies, cultures and political dynamics."

Experts worry that the military, despite its best intentions, gets in its own way when it comes to recruiting young talent. Retired Lt. Gen. David Barno, a military analyst at the Atlantic Council, suggested that the Army needs a fundamental cultural shift so it can attract and retain leaders for this complex new world. The military has to accept more risk, decrease tolerance of bureaucracy, reduce excessive deference to rank and position and reject Army anti-intellectualism, Barno observed.

"When we talk about the future of the Army, it's not about technology," he said at an Atlantic Council forum. "We're trying to use tech to make humans more effective. The battlefield is changing but the Army is not keeping up."

The Air Force, where high-tech weaponry features much more prominently than in the Army, also faces people-related struggles. In his first address to the Air Force Association's annual meeting and technology expo, Chief of Staff Gen. David Goldfein declared his paramount goal is to revitalize combat squadrons, without mentioning a single weapon system. He sees it as an imperative to build a new generation of leaders who can take on the complex challenges of fighting in a data-driven battlefield.

The cultural shakeup that Carter may have envisioned to help attract the next generation of innovators is not going to happen any time soon. The Defense Innovation Board is hoping to get the ball rolling. The group, chaired by Google's parent company chief Eric Schmidt, will recommend that the Pentagon establish a "digital ROTC" program, or a career track for computer science. The Defense Department, the panel said, will have to take concrete steps such as offering bonuses, recognition, awards and other incentives for managers who promote innovation, give employees greater voice and encourage creativity and divergent views.

Defense watchers expect Carter's efforts to continue in the next administration although it is doubtful that any future secretary will match Carter's level of attention to this issue.

Email your comments to serwin@ndia.org

By Jon Harper

Budget Impasse Threatens Ohio-Replacement

An extended continuing resolution that funds Pentagon accounts at fiscal year 2016 levels could derail the Navy's top acquisition effort.

The Columbia-class ballistic missile submarine program — also known as the Ohio-class replacement — was expected to receive $773 million in advance procurement funding in fiscal year 2017. But budget gridlock led Congress to pass a continuing resolution to fund federal agencies from Oct. 1 through Dec. 9.

Continuing resolutions use the previous fiscal year's funding levels to determine the amount of money that may be expended while the resolution is in effect. The 2016 defense budget included research, development, test and evaluation funding but no advanced procurement money for the Columbia-class.

Defense officials fear that lawmakers will end up passing more continuing resolutions if they are unable to reach an agreement on appropriations after the November elections.

"The Navy during that time might not have authority to execute any [advanced procurement] funding for the program," said naval affairs specialist Ronald O'Rourke in a recent Congressional Research Service report on the program.

"This could put pressure on the Navy's ability to meet its currently tight schedule for having the first boat … enter service and complete testing in time to support its first scheduled deterrent patrol," he said. "The longer the Navy operates under a CR during FY 2017, the greater this impact on the program's schedule might be."

The service can mitigate the impact of a continuing resolution through the first quarter of the fiscal year with current funding authorities, the Navy said in an information paper provided to CRS.

However, advanced procurement funding would be considered a new start that could be prohibited under a continuing resolution scenario, according to the Navy.

"The program will not be able to transition from currently funded RDT&E … preliminary design to [shipbuilding account]-funded detail design until Congress either passes a FY 2017 appropriations bill or grants a CR anomaly" giving the service an exemption, the Navy said.

Failure to do so by January 2017 "will directly result in an increased risk to on-time ship delivery," it added.

The service plans to award a detailed design contract by the end of calendar year 2016.

A "delay in contract award will cause disruptions to both the shipbuilding design-build workforce and the supply base that will not be able to continue subvendor design efforts," the Navy said.

The service hopes to have the lead boat on patrol in 2030. Vice Adm. Terry Benedict, director of Navy strategic systems programs, warned that the service would face a capability gap if the new submarines aren't ready when the Ohio-class begins to retire in the 2030s.

"Any delay to the Ohio-replacement … would make it impossible to meet the strategic requirements," he said at a recent nuclear triad conference.

The Columbia-class program is estimated to cost $122 billion. Meanwhile, there are doubts that the Defense Department will have enough money to carry out its wide-ranging nuclear and conventional modernization plans in the 2020s.

"There have been discussions with national leadership on unique ways to drive down cost" for the Columbia-class, Benedict said. "We are exploring every opportunity whether it's in technology, whether it's in acquisition, whether it's in contracting, whether it's in the way that we fund … to try and find the right solution."

NAVY

DHS Contract Spending Set to Grow

The Department of Homeland Security is one of the few federal agencies increasing the amount of money it obligates to contractors, according to a recent report by market analysis firm Govini.

The growth is due to overall budget increases and the allocation of a larger share to contracts, said the report, "2017 Fiscal Year Outlook: Department of Homeland Security."

The department's discretionary budget authority increased 3 percent from fiscal year 2015 to 2016, from $39.8 billion to $41 billion. Additionally, the share of funds allocated to contracts increased to 36 percent from 35 percent.

"The topline trend means that DHS is prioritizing purchases of products and services over additional personnel and other internal resources," the report said.

The department is seeking to develop next-generation systems that leverage advancements in the "internet of things," digital transformation, data analytics and cybersecurity, it said. "These investments are intended to fill capability gaps, automate procedures that currently present security risk and bring about operating efficiency all while lowering personnel costs."

Customs and Border Protection, the Transportation Security Administration and the Office of Procurement Operations fueled a 16 percent increase in overall DHS contract obligations to $14.6 billion in fiscal year 2016, a $2 billion bump from 2013, the report noted.

ISTOCK

Obligations from each agency are projected to continue to increase by at least 3 percent in 2017, it said.

"Providers of advanced technology and technical services should target CBP as it plans to invest in next-generation detection devices that provide the operational advantages of automation," it said.

TSA is projected to spend $200 million on improving baggage screening technology. Support for the agency in the coming years is "likely to be strong," regardless of whether former Secretary of State Hillary Clinton or businessman Donald Trump becomes the next president, the report said.

The Coast Guard is undergoing a major recapitalization effort. Big-ticket items in the expected buy include: $240 million for fast response cutters; $100 million for offshore cutters; and $150 million to begin work on a polar icebreaker. Fiscal year 2017 will be a "strong year" for the Coast Guard's industry partners, the report said.

Cybersecurity has been identified as a key investment area for DHS and the Defense Department going forward. Cyber attacks launched by Russia, China and non-state actors are a growing concern among U.S. officials and politicians.

"The flood of cyber spending will continue under either a Trump or Clinton presidency," the report said. "The threat is simply far too large to ignore."

Pentagon Cautious About Arctic Investments

As ice caps continue to melt, Pentagon officials have grown increasingly concerned about the potential for great power competition in the Arctic. But the Defense Department remains cautious when it comes to investing in capabilities.

"Climate change has really focused a lot of attention" there, Chief of Naval Operations Adm. John Richardson said at a recent conference.

"That gives rise to transit lanes that are open more often now," he said. "It gives rise to continental shelves and the resources on those shelves that are accessible … that were not accessible before."

Recent Russian efforts to beef up its capabilities in the region have raised red flags among U.S. officials.

The United States needs to "make sure that we remain capable of operating up there, we remain aware of how things are changing and are ready to respond appropriately," Richardson said.

For fiscal year 2017, the Pentagon aims to spend about $6 billion on region-specific assets, according to a recent Defense Department report to Congress, "Resourcing the Arctic Strategy."

They include: Northern-based missile defense systems; the Joint Pacific Alaska Range Complex; the Arctic Submarine Laboratory in San Diego; and the National/Navy Ice Center in Suitland, Maryland.

The fiscal year 2017 Pentagon budget request includes: $296 million for projects to support the future use of the F-35A joint strike fighter at Eielson Air Force Base, Alaska; $47 million for construction of an unmanned aerial vehicle hangar at Fort Wainwright, Alaska; and $20 million for hangar modification and equipment at Keflavik, Iceland, to support P-8A reconnaissance aircraft deployments.

It calls for investing $461 million in research projects to improve surveillance of the northern approaches to North America; enhance communications with military units that may be operating in the Arctic; and to develop next-generation radar systems for the polar region, the report said.

The Coast Guard also aims to spend $150 million to begin procuring a new icebreaker. Some assets that might be relevant to future operations were not included in the cost analysis, the report noted. Investments in platforms such as submarines were not counted due to the difficulty of estimating the proportion of their life-cycle costs that could be attributed to Arctic missions.

While the Pentagon is working to improve its regional posture, officials are concerned about pouring too much money into the effort at a time when there are competing demands for U.S. military capabilities in other areas of the world.

"Significant uncertainty remains about the rate of climate change in the Arctic and the pace at which human activity will increase," the report said. "The department's challenge is to balance the risk of being late-to-need with the opportunity cost of making premature investments."

Richardson said there is no need to jump the gun. "It's not like there's … a gold rush up to the North Pole right now," he said. "There is some time to do this smartly."

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By Stew Magnuson

Imagining the Army of Tomorrow's Platforms

Imagine it's the year 2030.

The 75-year-old informal truce on the Korean Peninsula has ended and U.S. and Republic of Korea troops are pouring over the demilitarized zone and headed to Pyongyang in a deciding battle that may finally reunify the two nations.

Troops are carried to the frontlines in a twin-engine, tandem propeller helicopter called the Chinook. Overhead, close-air support and reconnaissance are provided by AH-64 Apaches, and an unmanned aerial vehicle outfitted with sensors and Hellfire missiles known as the Gray Eagle.

Coming from the south in columns are a series of fighting vehicles. One is called the Bradley. The other is the Stryker.

Firepower is provided by Paladin M109A6 mobile artillery and a tank troops affectionately call the Abrams.

Soldiers are equipped with the latest gear: the M4 rifle, M240 machine guns and the BGM-71 tube-launched, optically tracked, wire guided (TOW) missiles to take out North Korean tanks.

It's really not that hard to picture this battlefield of tomorrow. National Defense Magazine, for its 11th annual research-and-development issue, chose "Battlefield 2030" as its theme for two reasons: it's a nice round number, of course, but also because 14 years out is a good time to begin the technology development needed to field the battlefield platforms of tomorrow. But from where it stands in the year 2016, the U.S. Army's technology of tomorrow is likely to be the technology of today.

Case in point is the recent Association of the United States Army annual conference in Washington, D.C., where Army Chief of Staff Gen. Mark Milley in a keynote speech laid out his vision for the kind of battles the Army must prepare for over the next 25 years. His vision matched three of the four themes chosen for this issue: fighting in anti-access/area denied scenarios; fighting in urban areas and fighting in a world marked by climate change.

As far as A2/AD, he said the Army will have to soften up battle zones so the Navy and Air Force can have access to them. This flips around the way operations are normally carried out. In that respect, it will have to do its own air defenses and be able to secure harbors. The Army may even be called upon to sink ships, he said.

Battlefield command headquarters and troops will have to change locations every two to three hours because peer or near peer competitors will be able to quickly ascertain their locations.

He said fighting in wide open spaces such as rolling plains or deserts is coming to an end as most of the world's population will shift to cities. He wondered aloud if the service will have the kind of vehicles, communication systems, sensors and training needed to operate in urban areas.

The year 2030 is just round the corner, he noted. And many of these changes are already beginning to take place.

Absent from the one hour speech was any kind of announcement of new programs or technologies that will be needed to fight these future wars.

Other than asking if the tanks of the future will be able to shoot at high angles in urban canyons, Milley gave few hints as to what exactly the Army will need.

The list, as one can imagine, will be long. The Army is "at the cusp" of a new era in how ground warfare will be conducted, he said. "The ways and means of war are about to undergo fundamental and profound and significant change," he added.

But if the Army is going to be prepared to fight in this world of tomorrow, the time to develop the new technologies needed is today. It will mean "placing big bets" on research and development, he said.

There are two major impediments to this: money and an acquisition system that cannot produce big weapon systems in a timely manner.

The service is in a so-called "procurement holiday!" Hooray! A holiday. It sounds fun, but it's an almost Orwellian term for a pause in modernization that may come back to haunt the nation. It has been going on for quite some time, and no one knows how long it will last. But every year that passes by, means one more year the Army will not be prepared. Ideas for a new combat vehicle and next-generation rotary wing aircraft are plodding along as the "holiday" continues.

> "The U.S. Army's technology of tomorrow is likely to be the technology of today."

The Army will probably end up fighting with the platforms of today in 2030. The hope is that these Apaches, Strykers and so on will be equipped with new sensors, weapons and command-and-control systems to aid in this new type of warfare. Small robots could also help and are currently at a high technology readiness level. Maybe the Defense Advanced Research Projects Agency's plan to produce bullets that change trajectories after they are fired will increase the lethality of soldiers' rifles.

As for all-new platforms more suited for tomorrow's battlefields, it's easy to be cynical. The Army doesn't fund itself. That's Congress' job. But it can restore taxpayers and lawmakers' faith that it is a good steward of its acquisition accounts.

The Army is still dealing with the stigma surrounding the failed Comanche helicopter and future combat systems programs. It has gone some distance in redeeming itself with the success — so far — of the joint light tactical vehicle program. That was a relatively low-risk platform with no revolutionary technologies. The requirements first emerged in 2006 and the first models rolled off the production line this year.

A decade to produce a truck will not hack it if Milley's vision of a new Army is to come to fruition. Three years to produce a requirements document before a program can even proceed will no longer be tenable. As Milley said, change will come.

"Our potential adversaries are already moving out, so we have no choice," he said.

Email your comments to smagnuson@ndia.org

Ethics Corner By Jay Rosen

Translations Key to Global Investigations

The combination of increased globalization and intensified regulation presents complex risks for contractors doing business internationally. An essential part of a robust global ethics and compliance program will be the localization and translation of the code of conduct, policies, training and so on. The scale and urgency of translation needs can, however, balloon in the event of a multinational investigation.

The complexity of a global investigation involving translation presents a whole new set of challenges, even for companies familiar with the standard protocols employed in investigations, which may include document collection, processing and review. Thousands of documents could be involved. It is critical to leverage both technological and human translation solutions to meet the needs of the case in a cost-effective manner.

Consider a hypothetical multilingual investigation. The contractor has operations in Japan, Brazil, Germany and Estonia. It has engaged a forensics firm to identify custodians and image hard drives as part of the initial collection effort. The audit committee has hired outside counsel to run the investigation and each organization hits the ground running.

But what to do with any non-English language documents in the investigation has not been thought through.

What are the best practices for managing the non-English language portion of this type of case? Many companies consider translation to be something they can handle in-house. They may have a bilingual employee or a global office in a country that speaks the source language. In certain circumstances, these options have some validity, but for a mission critical investigation where accuracy and deadlines are paramount, these are not the best choices.

Multilingual ethics and compliance investigations demand a heightened level of sophistication and execution. For a large volume of non-English language documents and pending deadlines, language filtering solutions will bring order to the chaos while reducing the time and cost involved in discovering documents that are key to the investigation. These solutions are offered by most language solutions providers.

- A language identification tool analyzes a document and reports the language distribution as either an absolute value — English, German, Mixed, or unknown — or can deliver a percentage breakdown such as 5 percent German, 95 percent English. On a document level, this breakdown allows for granular workflows. On a case level, this knowledge determines the appropriate allocation of native speaking document reviewers necessary, and the most efficient use of these resources.
- Non-English keywords are first identified by the lawyers and then translated to allow for easy searching within non-English language text. Keyword translation must account for the nuances inherent in another language. For example, 20 English terms can easily become 100 non-English language terms. Filtering native language documents for non-English language keywords will increase the accuracy of the review and improve the results of responsive searches.
- Machine translation will provide reviewers with a basic understanding of large volumes of electronic documents. Machine translation quality correlates to the quality of the source document. Thousands of pages can be translated in a fraction of the time required by traditional methods. If viable, this process is 1/100th the cost of human translations.

Technology-based filtering solutions help the internal team to efficiently identify "hot" documents while eliminating those with no relevance to the investigation. This ensures that only those documents that are absolutely necessary will be submitted for human translation.

In addition to these technological solutions, most language solutions providers offer at least two or three levels of human translations, each of which plays a role in the filtering process.

If machine translation is not feasible then summary translations can be a solution. Summary translations convert a few sentences or coded fields, which can aid understanding of the content of the document. With this information, a decision can be made about which documents need a more complete human translation.

In basic translation, documents are translated by a linguist and then reviewed by a project manager at the language solutions provider. Although not as polished as a full translation, basic translations enable outside counsel to ascertain the complete content of a document. These documents are used by the investigation team for internal use.

Full translation starts with the basic translation process described above, but adds a formal editing stage and a thorough quality check. Documents that have gone through full translation processes may be certified upon request and a certificate of accuracy will be issued and notarized. This certification is often required for documents presented to governmental entities.

As far as budgeting for translation, bilingual review and translations involve different skill sets and different costs are associated with each service. For this reason, it is best to separate the two in most cases. Industry pricing for on-site review in the U.S. varies from $70 to $110 per hour, depending on the region. Translation is typically charged by the word and completed off-site by linguists who are trained to understand legal terminology and context.

The price per word will vary by language, subject matter, turnaround time and volume. In some cases, it may be most expedient to have the bilingual reviewers perform the translation, but this will usually result in a higher cost and slower delivery. The optimal solution would be to have the reviewers identify responsive documents and feed them to the off-site translators. This way, outside counsel will have a continuous workflow that will save precious time, match resources with their respective area of expertise and manage costs.

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Defense Sec. Ashton Carter and Japanese Minister of Defense Tomomi Inada

Japan Poised to Boost Defense Interests

The Japanese government is using its heightened defense budget to invest in maritime security technology, missile defense and stealth capabilities to combat growing regional threats — like China — and increase cooperation with the United States.

Japan's defense account has grown five years in a row. The country recently submitted a defense budget request for $51 billion for fiscal year 2017, a 2 percent increase over the previous year, said Nick Szechenyi, a senior fellow at the Center for Strategic and International Studies, a Washington, D.C.-based think tank.

"Prime Minister [Shinzo] Abe's government is not only spending more, but is trying to respond to regional security threats," he said. Those include nuclear weapon and missile technology from North Korea and uncertainty stemming from disputes with China in the East China Sea, he said.

Big-ticket purchases include Lockheed Martin's F-35A joint strike fighter. Japan's first F-35 recently rolled off the production line, he said. The country also plans to upgrade its PAC-3 missile launcher systems, and is co-developing with the United States upgrades to its standard missile 3 Block 2A ship-based missile defense system.

South Korea's recent announcement to adopt the U.S. Army's terminal high-altitude area defense anti-missile system has prompted speculation about whether Japan might also acquire the Lockheed Martin-developed product, Szechenyi said.

"It started the debate about whether that could happen in Japan, but it's still far off," he said.

Japan is also looking to invest in intelligence, surveillance and reconnaissance capabilities and maritime domain awareness, Szechenyi said. The 2017 budget request includes the purchase of a new submarine and upgrades to maritime surveillance aircraft. Long-term investments could include unmanned undersea vehicles to give Japanese defense forces "an operational idea of what's going on in its neighborhood," he said.

The island nation is also seeking to develop more joint training and contract opportunities between its defense forces and industries and those of other nations, including the United States, Szechenyi said.

U.S. and Japanese defense officials have recently renewed commitments to a joint defense strategy first established in 1979.

In 2015, the two countries released the updated joint defense guidelines, which laid out the areas of cooperation between the United States and Japan. They call for establishing an alliance coordination mechanism, which provides for military-to-military and government-to-government cooperation.

Japanese Defense Minister Tomomi Inada lauded the updated guidelines in September at a CSIS event ahead of her first meeting with U.S. Defense Secretary Ashton Carter.

"The newly established alliance coordination mechanism … was fully leveraged when the two countries dealt with a series of North Korean ballistic missile launches," Inada said.

The communist country conducted several missile launches this year, and fired a submarine-launched missile in August that flew more than 300 miles toward Japan. In response, the United States, Japan and South Korea have committed to joint exercises and increased cooperation.

The effects of Japan's increased defense investments may not be seen right away, but will benefit its relationship with the United States, Szechenyi said.

"Japan is stepping up and trying to do more, and this is monumental for Japan," he said. "That's what the U.S. needs."

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LOCKHEED MARTIN

Coast Guard Purchases Locator Beacons

■ To enhance crew safety, the Coast Guard recently ordered up to 16,000 personal locator beacons that can be used during land, sea or air emergencies.

The indefinite delivery, indefinite quantity contract — worth up to $3 million — was awarded to the McMurdo Group, of Lanham, Maryland.

McMurdo — a safety and security division of Orolia, a Sophia-Antipolis, France-based positioning, navigation and timing solutions company — will provide the Coast Guard with the FastFind 220 personal locator beacons over the next five years.

"We fully expect that they will reach the ceiling," said Mark Cianciolo, McMurdo's general manager for aerospace, defense and government programs.

The beacons, which are available commercially, are used across a variety of aircraft and ships, he said. While they may not always make headlines, two ships a week are lost at sea. Twenty-four of those large ships sink a year, he said.

In July, a commercial shipping vessel was sinking and under distress in the Bering Sea off the Aleutian Islands. Using McMurdo's beacons, the ship was able to notify search and rescuers and receive help.

"All 46 souls were saved," Cianciolo said.

The system operates on a 406 MHz frequency, he said. When activated, the beacon transmits a signal with location data and the device's unique identification number to an international search-and-rescue system known as Cospas-Sarsat. It uses a lithium battery that powers the device for six years. It weighs 5.4 ounces and can be kept in a special buoyancy pouch to enable it to float.

McMurdo has already delivered about 400 units to the service, he said. The company intends to supply the Coast Guard with around 3,200 systems each year of the contract, though that can be adjusted, Cianciolo said.

"The Coast Guard was very clear to us that that's not really a restriction," he said. "If they have an operational requirement that exceeds that during the first option year, that's not an issue. However, over the life of the contract they can't exceed the 16,000" personal locator beacons.

The company already works extensively with the U.S. government, he said. NASA and the National Oceanic and Atmospheric Administration are some of McMurdo's oldest customers, Cianciolo said.

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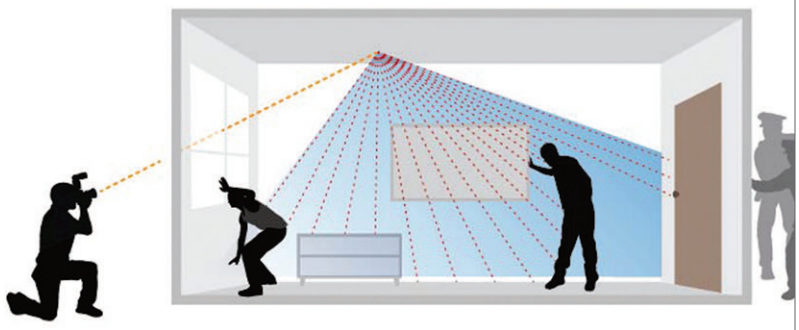
MCMURDO/UNIVERSITY OF WISCONSIN-MADISON



Researchers Developing Camera to See Around Corners

■ For a soldier patrolling a city street in a warzone, seeing what's around the corner of a building could be the difference between life and death.

The Morgridge Institute for Research and the University of Wisconsin-Madison are collaborating to make a camera that can recreate scenes that are out of sight using what is known as scattered light technology. The project is being supported by a $4.4 million grant from the Defense Advanced Research Projects Agency.

"Current imaging devices typically only look at direct light. So when you switch on the light, there are photons bouncing around the room and they usually undergo many reflections until they hit a surface that your imaging device is … looking at and from there they enter the imaging device," said Morgridge imaging specialist Andreas Velten. "The program is really about trying to find ways to extract information about the history of the light."

By understanding the history of the light's bounces, researchers could reconstruct images of people or items that are around a corner, he said. Velten at the Massachusetts Institute of Technology already demonstrated that idea in 2012.

The point of the program is to take that one step further and see how far it can go and what other kinds of information might be embedded in the light, he said.

"We have no complete theory of what kind of information is embedded there, what can we extract, how far can we go in terms of imaging or in terms of extracting other information," he said.

For example, it might be possible that a camera, using the history of the light's bounces, could recreate an image that is two corners away, he said. It might even be possible to image an entire building.

The program includes two phases. The first is a theoretical foundation that will look at how far the technology can go. The second is about experimental exploration and demonstration of what can be done in reality, Velten said.

At the end of the four-year project, the team will demonstrate the technology. But what that will look like exactly is not yet known, he said.

The work being done is basic research, and DARPA understands that, he said. "We are working continuously with the program offices to get to a demonstration, but what that demonstration is going to be, there we are fairly flexible," Velten said.

Other key researchers on the project include Mohit Gupta from the University of Wisconsin at Madison and Shree Nayar of Columbia University. Academic partners on the project include the Universidad de Zaragoza in Spain, Columbia University, Politecnico di Milano in Italy and the French-German Research Institute in St. Louis, France.

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Australia Investing in Unmanned Aerial Systems

■ Several companies have teamed up to deliver a small, unmanned aerial vehicle — currently operated by U.S. Air Force special forces — to the Australian military.

AeroVironment — working alongside Sentient Vision, General Dynamics Mediaware and Australia-based XTEK — is offering the Wasp AE micro air vehicle to the Australian army and special forces. XTEK is the preferred tenderer for the contract, which has not yet been awarded, AeroVironment said.

The Wasp AE — an updated version of the Wasp III — was jointly developed between AeroVironment and the Defense Advanced Research Projects Agency for the U.S. Air Force Special Operations Command to provide beyond-line-of-sight situational awareness. If selected, the Wasp AE will deliver intelligence, surveillance and reconnaissance capabilities for ground and maritime operations for the Australian military, the company said.

Dave Sharpin, vice president for business development at AeroVironment, said the Wasp AE can benefit the Australian armed forces' current unmanned aerial vehicles, like AAI's RQ-7B Shadow 200, which is used by the U.S. armed forces, among other nations.

The payload delivers advanced imagery, even in windy conditions, and can be operated manually or programmed for autonomous operations. It has a communications range of 5 kilometers and flight endurance of 50 minutes.

The Australian government has been looking to grow its unmanned systems capabilities for a number of years, said Charles Forrester, a senior defense analyst with IHS Jane's.

"With the Australia Defence Force having to operate across broad expanses at home, both on land and at sea, unmanned systems give the Australian military the flexibility and capability to carry out some difficult tasks at a reduced cost in testing environments," he said.

The government's 2016 defense white paper identified areas where UAVs could be useful in the future force, with planned procurements of drones across all domains, he said. Forecasters at IHS Jane's predict the Australian government could invest over $192 million in unmanned aerial vehicles across the forces through 2025.

The Royal Australian Air Force is also in the process of acquiring Northrop Grumman's MQ-4C Triton, an unmanned maritime surveillance and patrol aircraft currently being built for the U.S. Navy, Forrester said. It will be deployed alongside the Boeing P-8A Poseidon, which the Australian government recently began operating.

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Aerostat System Offers Cost-Effective ISR

■ A new integrated portable surveillance and communications system could offer enhanced situational awareness for border security and disaster relief missions around the world.

SES, a global commercial satellite operator based in Luxembourg, recently unveiled its modular tactical persistent surveillance (TPS) platform. The TPS system consists of an inflatable aerostat that flies at 1,000 feet, with a payload of advanced sensors and communications options that can identify targets more than 5 kilometers away and offer broadband connectivity up to 20 miles away.

Company executives are pitching the TPS as a cost-effective intelligence, surveillance and reconnaissance solution for governments and militaries worldwide, especially in areas of Africa and the Middle East.

"We saw that there was a gap in the suite of [ISR] capabilities available today, predominantly from a cost perspective," Nicole Robinson, head of SES government marketing solutions said at a demonstration in Reston, Virginia.

SES' aerostat-based platform

Unmanned aerial systems, which are often used for intelligence collection, can run between $2,000 and $10,000 per hour of operation. The TPS is in the price range of $50 to $75 per hour of operation, she said.

The system incorporates multiple input/multiple output radio technology. Up to 380 radios can transmit to the aerostat within a designated area, said David Codacovi, general manager for government technologies at SES. The satellite communication antenna can collect sensor video that supports voice messages, emails, fingerprints and even iris scans when connected to SES' downloaded applications, he said.

"We can fully enable any IP device in the field," he said.

TPS, which is available in both a lease and procurement option, is modular and can carry a range of sensors to suit the mission, he said. It is also easy to deploy: It takes two personnel about 20 minutes to inflate the aerostat with helium and put it in the air, he said.

It can operate on a battery for up to 24 hours via a generator or via solar technology for a "more stealthy option," Robinson said. It is deployed from a single-axle trailer. It is also suitable for oil rigs and other large vessels, she said.

Next for SES is the development of unattended ground sensors, which can be planted in a designated area and tripped acoustically, delivering data to TPS. That product is scheduled for release in 2017, Codacovi said.

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AEROVIRONMENT/SES

Condition-Based Maintenance Could Save DoD Money

By coalescing data pulled from sensors spread around a ship or other military systems, Defense Department officials may be able to save money on costly maintenance repairs, said one industry executive.

Under what is known as condition-based maintenance, OSIsoft, a San Leandro, California-based software company, is seeking to use big data to help the military keep up with the many repairs needed on weapon systems.

"At its essence, what OSIsoft has always been able to do is aggregate sensor data, store it … at high fidelity for long periods of time such that you can have operating profiles for the entire life of the asset," said Steve Sarnecki, vice president of U.S. public and federal sector at the company.

Using the company's PI system, OSIsoft works extensively with the energy sector.

The company maintains transformers, distribution networks and rotating equipment, "where the basic essence of our value to those customers is collecting the data, storing the data, and not just storing it away in Joe or Bubba's desk drawer as a … chart, but making it available to the people who understand the operation of that asset," Sarnecki said.

Essentially, OSIsoft's PI system can act like an EKG machine for a human, telling users the health of a platform.

The approach could be used on systems such as ships and helicopters, he said.

"If I have a fleet of aircraft and I see a problem, what I really want to do is not only have the data to investigate that problem and analyze what went wrong; what I really want to do is have the data and the insight that I can then apply to the rest of the fleet," he said.

Not only could the system determine mission readiness, but it could also help with cost savings and setting up best practices, he said.

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NAVY

By Herbert L. Fenster

Reining In the 'Qui Tam' Industry

It is hardly a mystery to government contractors that there is a False Claims Act attached to their contracts and it is no more of a mystery that there is a "qui tam" provision in that act making discontented employees, casual onlookers and even those on the margins of the government itself potential litigants against them.

Qui tam civil lawsuits allow whistleblowers to recover funds if the government prevails in a False Claims Act case.

Those who assume that the qui tam "relators" are occasional players and simply doing the government's work, may be living under a rock. A vast plaintiffs' bar industry has grown up to promote the private litigation of supposedly government claims.

And anyone who continues to believe that the presence of this industry is a minor matter has not recently visited the extensive advertising in which the industry engages.

Most understand that, supposedly, these qui tam "relators," having been endowed by an absurdly messy statute to litigate on behalf of the government, are simply doing the government's work. Such an assumption lacks every kind of reality.

First of all, 16 years after the question of whether the Constitution even permits these unappointed government agents to carry on executive branch functions was raised in the Supreme Court, that court still has not decided the question. One very thoughtful court has held that, absent statutory permission to attack the performance of a government contract, private parties have no such third party rights whatsoever.

Second, and equally important, the growth of this industry enabling third party attacks on the award and performance of government contracts is insidiously undermining the contract relationships between the government and its contracting communities. As a practical matter, the government elects to gain and retain virtually no control whatsoever over this growing qui tam industry and its litigation behavior. This inattention is very purposeful, political, lazy and incredibly short sighted.

Third, the omnipresence of the qui tam industry exists at a time when the government has a growing need to attract and retain contractors and other partners particularly in research and development, systems, supply chain and very specialized industries such as those supporting command, control, communications, computers, intelligence, surveillance and reconnaissance.

These efforts, vigorously pursued by the Defense Department are going to fail if high-tech companies, owing little or nothing to the department as a customer, realize that aggressive third parties are waiting around to attack contracts and other relationships.

Fourth, the presence of third parties with self-serving attack motives, is itself fundamentally inconsistent with the huge, unique and complex relationship between contractors and the government. While there may be some relative simplicity — enabling understanding by third parties — to a contract for off-the-shelf commercial goods — and even this is to be doubted these days — the very idea that a self-serving third party would be enabled to attack a complex, research-and-development contract for a weapons system is mindless. Just such an attack has been going on in the federal courts in California in a case that is now more than a decade old.

Where a critical part of the government's responsibilities to its contracting communities includes sophisticated judgments relating to award, design and development, the elements of performance, retention in the source base, and the most nuanced judgments even about how to treat misconduct, the increasing likelihood that the government will lose control over these considerations to self-serving third parties poses serious risks that have not been addressed: indeed, it is very clear that all elements of the executive branch are exercising a political judgment to avoid the subject entirely.

And to that, there is one exception: the Justice Department, which has gleefully given over most of the enforcement of the FCA to these intrepid third parties, is proud to announce the successes of the qui tam relators.

All government contractors know very well — as do their government counterparts — that within the contract envelop itself — including the incorporation of the Federal Acquisition Regulations — are entirely adequate remedies for even the most egregious contractor conduct.

> "All government contractors know very well ... that within the contract envelop itself ... are entirely adequate remedies for even the most egregious contractor conduct."

These include reference to the Department of Justice for criminal and civil prosecution — including the FCA, the application of the Program Fraud Civil Remedies Act — which the Defense Department does not even employ, suspension and debarment (the 'ultimate' remedies), termination for default, actions under warranty clauses, liquidated damages and a veritable menu of other remedies.

Recommendations:

- It is time for the Supreme Court to determine whether or not the qui tam provisions are contrary to Article II of the Constitution because they violate the "appointments" and "take care" provisions of that article.
- Repeal the qui tam provisions.
- Amend the FCA to require that qui tam relators first file "claims" with contracting departments and agencies and require those departments and agencies to make specific determinations as to whether the reported matters can be adequately addressed by contract and FAR remedies.

Herbert L. Fenster is senior of counsel at Covington & Burling LLP, Washington, D.C.

Engineering Model Improves Submarine Communications

Viewpoint

By Capt. Edward Anderson

The U.S. Navy is transforming integrated communications on submarines and submarine shore support locations by adopting new modeling and analysis techniques that take in information across the entire enterprise instead of individually from disparate locations.

The results are improved communications among all the partners who make submarine operations successful as well as lower costs.

Led by the Navy's undersea integration program office (PMW 770), the new approach is called model based systems engineering. It offers an innovative switch from more cumbersome legacy engineering methods by using a computer-model-driven technique to manage systems upgrades and to identify risks for submarine communications architecture. The office recently received the 2016 Navy Acquisition Innovation Team Award for this effort.

NAVY

PMW 770, one of 10 program offices within the Navy's program executive office command, control, communications, computers and intelligence is using model-based systems engineering to identify and resolve problems related to how a change in one location of the submarine communications architecture impacts the rest of the architecture.

Part of that work involves increasing efficiency and lowering costs — activities mandated in the current budgetary environment. To help address the challenges, the office contracted with industry partner G2 Ops to build a full modeling environment for the submarine communications architecture with the goal to produce more efficient system processes. The new more detailed model will help give better training to new operators, will provide more detailed troubleshooting references and enable a baseline that can be examined to ensure no unauthorized/unintended alterations have occurred within any part of the architecture.

The submarine communications architecture enables all of the communications for deployed submarines, playing a critical role in fleet operations and in the strategic communications necessary for the submarine force's operations, including the nuclear deterrent mission. PMW 770 used the system to conduct a detailed analysis of the submarine communication infrastructure's ability to support multiple functions critical for nuclear command, control and communications.

It employed the model to mine data by breaking down those critical functions to demonstrate how various components and interfaces support the communications at a detailed level not previously possible. In this way, not only will the model speed development, it will allow testing and certification to be done with greater accuracy and surety.

To ensure continued advantages and dominance in information delivery in the maritime domain, new technologies are frequently introduced and current systems undergo regular modernization upgrades. The rapid insertion of new capabilities, replacement of obsolete components and the infusion of increased cybersecurity create dynamic and seemingly unceasing cycles of technology injection. These advancements mean that systems have to be replaced more often and that submarine communications architecture continues to become more complex.

The costs associated with integration and modernization increase in correlation with the growing number of disparate systems, which are managed by geographically dispersed teams. Integrating new technologies and upgrades will never be a simple process — especially in the unique operating environment of subsurface vessels — but the model-based systems engineering technique will allow PMW 770 to more easily keep pace with the changing technology.

All partners now can analyze the impacts of newly proposed changes more effectively. Program managers, design engineers and support activities are able to assess quickly how a change at one point of the architecture affects other elements. Having this knowledge prevents costly and time-consuming issues from occurring during system integration or worse, during the fielding of these new platforms.

The model is already yielding both cost benefits and risk management returns by enabling a single analyst to mine a large data repository in minutes instead of requiring days of analysis by a knowledgeable group of engineers. This detailed portrayal positively impacts mission readiness and identification of modernization investments that will have the highest impact, while reducing risks.

Moving forward, PMW 770 will expand the use of model-based systems engineering to as many of its products and platform integration efforts as feasible, which is expected to benefit the fleet by delivering new technologies more quickly, potentially at lower costs, with greater synchronization across partners. **ND**

Capt. Edward Anderson is the program manager of the Navy undersea integration program office.

Hollow Force Is America's Greatest Threat

Viewpoint

By Harlan Ullman

America and its friends face an array of perplexing national security challenges and threats. The most obvious are Islamic violent extremism, a resurgent Russia, a more aggressive China, a nuclear North Korea, climate change and humanitarian catastrophes arising from failed governments in the greater Middle East.

A further security threat unique to the United States is "sequestration."

Sequestration mandates equal, arbitrary budget cuts across all Defense Department programs irrespective of impact. This means buying x-percent less of all weapons, logistics and personnel programs — an irrational, destructive and wasteful way to manage an enterprise as vital as defense.

And that is not the only budgetary challenge facing the Pentagon.

Continuing resolutions that replace approved annual budgets further exacerbate the damage imposed by sequestration. This year to year, last-minute funding process defeats any sensible long-range planning stability for the Pentagon and efficiencies to be gained from it. The destructive effects of sequestration and continuing resolutions are well understood. But neither Congress nor the White House has acted to reverse these impediments to America's defenses.

Yet, a graver, more immediate and less visible danger imperils the future capability and capacity of America's formidable military. If not addressed relatively quickly, America's military is at great risk of becoming a 21st century variant of the "hollow force" that so seriously crippled the nation's fighting capabilities after the Vietnam conflict ended.

In simple terms, a future "hollow force" is a military largely unprepared, unready and under equipped to carry out its peacetime and wartime missions because of insufficient funding for all of its programs, even if defense budgets are kept at current levels.

Uncontrollable internal cost growth that now infects almost all the Defense Department's programs will result in this hollow force.

Internal costs are growing in real terms at about 5 to 7 percent a year. For an annual defense budget of $600 billion, just to sustain that force at current levels of capability, readiness and modernization, yearly increases of $30 billion to $40 billion are required. And at a 7 percent annual increase, these costs double every 10 years.

As a consequence of exploding cost growth, nearly every item from people to precision weapons to pencils is becoming more expensive. Maintaining a highly trained, able and motivated all-volunteer force is extremely costly. Costs for health care, operations, maintenance, overhead and swelling numbers of retirees are soaring, often propelled by odious regulations that add expense without adding value. As weapons systems become more capable and technically advanced, costs go up.

A helmet for an F-35 pilot is a technological miracle. At nearly half a million dollars a copy — and pilots get two each — this shows how expensive systems are becoming. The Air Force is not alone. The new Zumwalt-class destroyer can fire a 155-mm round a hundred miles with extreme precision. The cost per round is about the same as an F-35 helmet.

For those who doubt the pernicious effects of internal cost growth or challenge this proposition, the Department of Defense Business Board has produced the most compelling analysis and proof of what lies ahead. But no one seems to be listening. Only marginal remedial action has been taken, such as in the National Defense Authorization Act that corrected some of these inefficiencies.

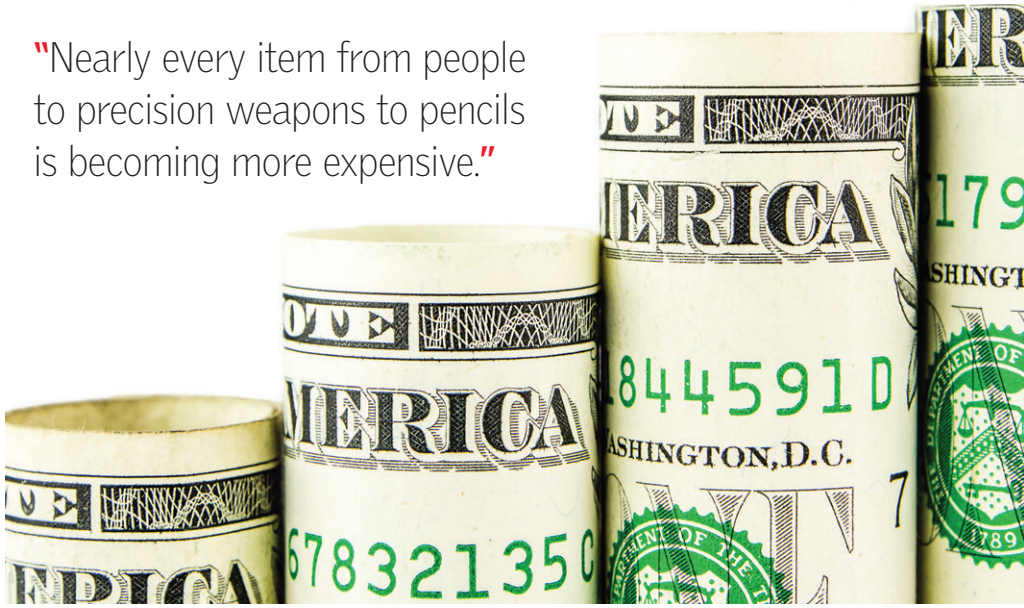
To use a medical analogy, sequestration is equivalent to a bad case of the flu. The patient feels awful and is incapacitated. But the flu is usually not fatal. Uncontrollable internal cost growth is cancer, and fatal to maintaining a highly ready, capable, well-equipped and well-motivated force.

What should be done? First, the election and change of administrations are mixed blessings. Neither candidate has seriously addressed national security beyond sound bites and superficial plans. And neither is remotely aware of this pending Damoclean cost growth sword descending on defense. So, informing the candidates and their key advisors is critical.

Second, the Pentagon is preoccupied with many simultaneous military operations while trying to manage a budget. That is an impossible task given the insanity of sequestration and the uncertainties created by the lack of long-term program budgeting. Hence, organizations such as the National Defense Industrial Association should make among its highest priorities alerting the public and its politicians to the risks and likelihood of a hollow force.

Third and toughest, the nation must balance the priority of maintaining a highly capable, ready and large enough

"Nearly every item from people to precision weapons to pencils is becoming more expensive."



military against national domestic needs including a national debt approaching $20 trillion, the size of America's annual GDP. Is the nation prepared to invest $650 billion a year on defense with annual increases to keep pace with internal cost growth, or even increase the size of our forces leading to annual military budgets approaching $800 billion a year? If not, a Plan B is vital. But no one is contemplating nor proposing a Plan B, C or otherwise.

Absent a catastrophic event such as another 9/11 or Pearl Harbor, $600 billion a year with modest annual increases will set the upper political limits for defense spending. While strategy should never be cut to fit the purse, the nation may have no other choice. And when interest rates rise, the increasing costs of debt servicing will impose great downward pressure on defense spending.

Theoretically, with limits on defense spending, the next administration will have the binary choice of a smaller, ready all-volunteer military that will be challenged as not sufficiently large enough to cope with the spectrum of threats, or a larger but unready "hollow force" with the expectation of rebuilding and rejuvenating it in time to deal with some future crisis or multiple crises.

Regardless of choice — even by default — unless serious action is taken now to minimize the pernicious effects of uncontrollable internal cost growth, a smaller, unready and far less capable force is inevitable.

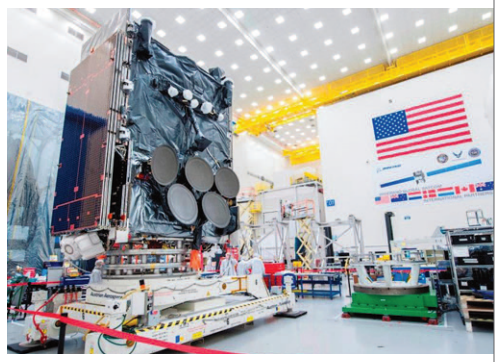
The critical questions are, who will listen and who will lead in preventing a 21st century variant of the hollow force from taking hold? **ND**

Harlan Ullman is UPI's Arnaud de Borchgrave Distinguished Columnist, serves as senior advisor at the Atlantic Council and at Business Executives for National Security, and chairs two private companies. His last book is "A Handful of Bullets: How the Murder of Archduke Franz Ferdinand Still Menaces the Peace." His next book is "Anatomy of Failure: Why America Loses Every War It Starts."

Commercial Satellite Firms See Uncertainty in Defense Market

Industry News

By Sandra I. Erwin



The wars of the past decade fueled a demand for satellite communications services from the commercial industry, as the military's own spacecraft could not keep up with commanders' gargantuan needs.

Business has fallen off sharply. At the height of the war, commercial suppliers filled nearly half of the military's bandwidth demand. Today, 24 percent of the Defense Department's satellite communications needs are met by commercial providers.

As they consider their future in the military market, satellite operators are watching an upcoming Pentagon review of satcom requirements over the coming decade. Industry executives said they are confident that the review will lead to more deliberate policies to encourage the use of commercial services, although it could take years to change current practices.

A major concern in the industry is that growing fears of cyber attacks and hostile attempts to disrupt U.S. satellites will motivate the Pentagon to build more military spacecraft rather than use commercial services. The commercial satcom industry for years has argued that this would be a wasteful approach, as commercial satellites are equipped with advanced encryption technology and can do the job at less cost. Conversely, a decision to increase dedicated military satcom would benefit companies like Lockheed Martin, Northrop Grumman and Boeing that produce multibillion-dollar military spacecraft.

The U.S. Air Force is expected to launch a study this fall on future satcom requirements. Known as the "wideband communications services analysis of alternatives," the review will look at future demand but also will dig deeply into security and how best to ensure systems are safe. The AOA will focus on "assured communications when operating in a contested environment by enhancing the protection of both space and ground segments against the current and emerging threats to our space systems," Air Force spokeswoman Capt. Annemarie Annicelli said in a statement. The Air Force will seek advice from a broad range of experts, including commercial suppliers and international partners.

The Air Force oversees much of the Defense Department's space programs. For satellite communications, it draws from a mix of military satellites, the multinational Air Force-operated wideband global sat-com known as WGS, and short-term service contracts with commercial providers. The Air Force Space Command operates the government-owned constellations and provides military satcom services to combatant commands around the world. Separately, the Defense Information Systems Agency oversees commercial satcom leases.

Commercial operators have a lot riding on the outcome of the AOA. For years they have called on the Defense Information Systems Agency to change its approach from short-term agreements to long-term deals in order to incentivize private-sector investment and negotiate better prices. The procurement methods for commercial satcom have been a sore issue for the industry, and executives have grown impatient.

"What we'd like to see is commercial built into the plan from day one, not as an afterthought when we need more bandwidth," said Rick Lober, vice president and general manager of satcom provider Hughes Defense and Intelligence Systems. "We want a long-term commitment, instead of having the government buy a transponder for three months."

The AOA presumably will shape future decisions on whether the Pen-

ISTOCK, BOEING

tagon should buy more WGS satellites. The expectation is that more communications capacity will be needed over the next 20 years as the military increases its use of big-data systems and requires large pipes to send data around the globe. An information-centric military that also wants to work with allies needs flexible systems like those offered in the commercial industry, Lober said. "The military doesn't want closed systems. They want interoperability. They want the cell phone model: Take a phone anywhere in the world and connect."

Commercial operators now worry that their military business is at risk because their systems are said to be less secure than government-owned networks.

"I believe all military users prefer to use milsatcom, including WGS, for their missions — it's almost like a security blanket," said Philip Harlow, president and COO of XTAR, a commercial services provider. "We understand that approach," he said. "They should look first to their own systems for any mission. If they have the capacity to support a mission on their own satellites, why would they pay for commercial bandwidth?" But when the military runs out of bandwidth and needs commercial support, "I believe we deliver advanced, highly effective service at a modest cost."

Defense officials have learned in the last few years that commercial satellites have "very advanced and efficient technology that the department can access now, and not wait until new military programs get in place," said Harlow. However, "a desire to employ these technological efficiencies does not often translate into procurement practice," he added. "Procurement staff are incentivized to reduce costs as much as possible, and decision-makers on one end of that equation are not the same people who are buying the bandwidth."

The security of satellite communications systems has been a central focus of congressional committees. Lawmakers two years ago directed the National Research Council to investigate the matter. The council's final report concluded that space systems used for national security missions are vulnerable to hostile hacking and disruptions. For the military, any intrusions into its satcom systems could prove devastating. "Satellites are nodes in a network, and their value is derived from their ability to collect and disseminate information on the network. … As part of cyberspace, space systems can be equally threatened from cyber attack. For instance, a virus can interrupt the function of a satellite handset. Likewise, a virus placed into a satellite could prevent the proper onboard processing of information or the proper operation of the satellite itself."


WGS satellite concept

A spokesperson at the Defense Information Systems Agency said in a statement to National Defense that commercial satcom providers are held to the same security standards as government systems. "DISA follows the security requirements listed in the DoD National Information Assurance Policy for Space Systems used to support national security missions," said the statement. "This policy is applicable to all national security system space systems and/or their components that are owned, operated, controlled, or leased either by the U.S. government or for the benefit of the U.S. government."

Suppliers contend that there are inconsistencies in the military's satcom security requirements. Harlow said companies need more clarity on this before they can invest in the appropriate technologies. "They're looking to have commercial satellites look more like military satellites so they're at higher levels of protection. We are trying to figure that piece out."

The military's most secure, nuclear-hardened constellation, the Advanced Extremely High Frequency system offers the highest levels of protection. WGS communications, either using commercial X-band or military Ka-band, are being upgraded with more secure features. "We can do much more in our new satellites," said Harlow. "But we want some assurance from DoD that if we put these features on satellites that we will get more business … that we are not going to be competing against a guy who doesn't have those features and offers lower prices."

The industry wants to have these discussions sooner, rather than later, said Harlow. "Without question DoD is concerned about the cyber threat. Time has proven that we have underestimated adversaries' capabilities. It scares a lot of people," he added. In satcom procurement decisions, "it's about the budget and the appetite for risk," Harlow said. "We have always said the secure missions should be put on WGS. We still believe that commercial satellites are a huge capability at a modest cost."

Hughes Network Systems this year signed an agreement with Airbus Defense and Space to provide secure satcom services using the U.K. government-owned Skynet X-band military communications satellite. Airbus is the operator of the constellation. Hughes plans to offer Skynet services to the U.S. government.

Lober, the vice president of Hughes, said the Defense Department "has reached out to industry." There will be

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"pilot studies over the next couple of years to see how commercial industry can play in a way that is a little more integrated than it has been in the past," he said. "In the past, DoD came to us when they ran out of capacity during war." But short-term buys are expensive and inefficient, he said. "The AOA is looking at using commercial technology more effectively as part of an overall military network. There will always be a need for WGS and AEHF protected comms, but commercial can go a long way in saving them money."

What tends to get in the way of using more commercial services are defense procurement laws, said Lober. "It's the type of money they have to use; they can't get into long-term leases. If they can get past these hurdles this will move quickly."

Satellite operators also are watching the Air Force's next move on whether it might outsource the management of the WGS constellation. Boeing Space and Intelligence Systems is the prime contractor. Seven of the planned constellation of 10 satellites are in orbit.

The Air Force Space and Missile Systems Center last month asked vendors to submit proposals on how the commercial sector would operate WGS. "That was a big step," said Lober. "That's kind of the Airbus model with the U.K. Ministry of Defence." This would be the first time that the Air Force is serious about outsourcing the operation and maintenance of WGS. "One of the motivators is cost," said Lober. "People are the most expensive portion of military operations."

Air Force Lt. Gen. Samuel Greaves, Space and Missile Systems Center commander and program executive officer for space, told National Defense that the decision to commercialize WGS is far from final. "The effort to potentially transition WGS spacecraft bus telemetry and commanding operations to a commercial operator is still in the acquisition planning stage," he wrote in an email. "An RFP has not yet been released." **ND**

Email comments to serwin@ndia.org

Future Nuclear Cruise Missile Faces Political Headwinds

By Jon Harper

The Pentagon's plan to acquire a new nuclear air-launched cruise missile could be in jeopardy due to budget constraints and political opposition.

In July, the Air Force released a request for proposals for the long-range standoff weapon, known as the LRSO. The service aims to replace the aging AGM-86B air-launched cruise missile inventory with about 1,000 next-generation missiles.

"The LRSO weapon system will be a cost-effective force multiplier for B-52, B-2 and B-21 aircraft to credibly deter adversaries and assure U.S. allies of our deterrent capabilities," the Air Force said in a statement when the RFP release was announced.

"Nuclear-capable bombers armed with standoff missiles provide the nuclear triad a clear, visible and tailorable deterrent effect, and deny geographic sanctuaries to any potential adversary," the service said.

The new weapon would also provide a "rapid and flexible hedge" against changes in the strategic environment, it said.

The RFP identified the contract requirements for the LRSO's technology maturation and risk reduction phase. The Air Force will conduct a source selection and award contracts to up to two prime contractors. The awards are expected in the fourth quarter of fiscal year 2017.

The winners "will execute a 54-month effort to complete a preliminary design with demonstrated reliability and manufacturability," the Air Force said. The service will subsequently carry out a competitive downselect to a single contractor.

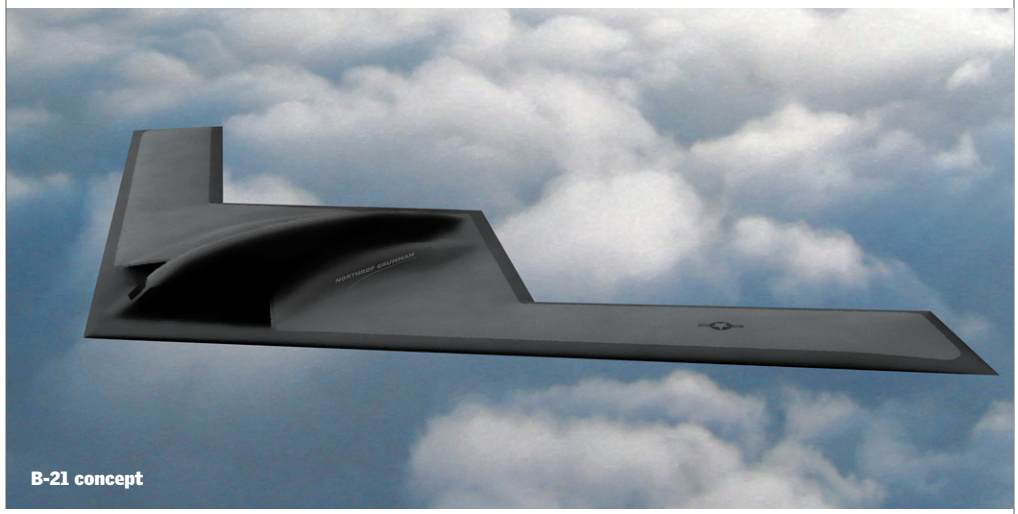
The Pentagon's nuclear modernization plans — which also include acquiring new stealth bombers, land-based intercontinental ballistic missiles and ballistic missile submarines — are estimated to cost hundreds of billions of dollars in the coming decades. In this context, some observers have questioned the need to buy a new nuclear cruise missile.

In a July 20 letter to President Barack Obama, 10 Democratic U.S. senators implored the commander-in-chief to axe the LRSO program.

The cost of nuclear modernization programs will put pressure on the defense budget at a time when non-nuclear systems are also slated for expensive modernization efforts, the lawmakers noted in the letter.

"We urge you to scale back plans to construct unneeded new nuclear weapons and delivery systems," they said. "In particular, we urge you to cancel plans to spend at least $20 billion on a new nuclear air-launched cruise missile, the long-range standoff weapon, which would provide an unnecessary capability that could increase the risk of nuclear war."

Steven Pifer, director of the Arms Control Initiative at the Brookings Institution, said buying a new nuclear cruise



B-21 concept

NORTHROP GRUMMAN

missile "does not make sense" because the Pentagon is developing the B-21 Raider.

"The Air Force plans to use stealth and electronic warfare capabilities to give the B-21 a penetrating capability as well. If these bombers can penetrate and defeat air defenses, that makes the LRSO redundant," he said in an op-ed before the RFP was released.

In an op-ed last year, former Secretary of Defense William Perry and former Assistant Secretary of Defense for Nuclear, Chemical and Biological Defense Programs Andy Weber, called nuclear cruise missiles a "uniquely destabilizing type of weapon."

Airmen work on an AGM-86B Air-Launched Cruise Missile

Canceling plans to acquire new ones "would not diminish the formidable U.S. nuclear deterrent in the least," they said.

During a fundraiser earlier this year, Democratic presidential nominee Hillary Clinton indicated that she might scrap the LRSO if she were elected.

"I certainly would be inclined to do that," she said in response to a question from an attendee, according to a leaked audio recording of the event that was posted on the Washington Free Beacon news outlet's website in late September. "The last thing we need are sophisticated cruise missiles that are nuclear armed."

The recording was reportedly first obtained by hackers who targeted the Democratic National Committee.

Weber, the former Pentagon official who has been critical of the LRSO, confirmed on Twitter that he asked the question that prompted Clinton's remarks.

As of press time, Clinton's campaign press office had not responded to a request for comment.

Fiscal year 2017 is a critical period for the program because the contract awards aren't expected until the fourth quarter, said Todd Harrison, director of defense budget analysis at the Center for Strategic and International Studies.

"Until the contracts are awarded … it's still possible to kill that program or delay it," he said during a meeting with reporters. "It's not too late on that program if Congress wants to step in and act, but the window is closing."

"Once they award the initial contracts for the TMRR phase, then you will see the funding profile start to grow over time," he added. "That's when real jobs start to be affected, that's when you start building a constituency on the Hill for these programs. That's when it gets harder to kill."

There has been speculation that Obama could move to scrap the LRSO before he leaves office.

"It's entirely plausible," Harrison said. "What that means in practical terms, though, is they would take it out of the [fiscal year] '18 budget request that they're currently building. But the Obama administration is just going to hand that budget request over to the new administration, [and] the new administration could put those things back in before they submit it to Congress."

An Obama attempt to nix the LRSO would be "more of a symbolic move at this point," he said.

Eager to avoid cost overruns and schedule delays, the Defense Department is proceeding cautiously as it seeks to acquire a new generation of nuclear air-launched cruise missiles.

Facing budget constraints, increasing modernization needs across the force and intense political scrutiny, Pentagon officials are taking steps to prevent the program costs from spiraling out of control.

Lt. Gen. Jack Weinstein, deputy chief of staff for strategic deterrence and nuclear integration, described it as "a model program" when it comes to setting up an acquisition process to keep the price tag down.

"We're going to be keeping contractors online for TMRR or a little bit longer," he said at a recent nuclear triad conference. Having multiple contractors competing against each other during that phase will encourage cost control, he said.

Waiting four-and-a-half years to do the downselect after the initial contracts have been awarded is "the biggest thing we will be doing with the LRSO program at the beginning," he added.

Jamie Morin, the director of the Pentagon's cost assessment and program evaluation office, said the Defense Department is focused on "getting things right early on" for LRSO and other nuclear modernization programs to avoid cost overruns and schedule slippage.

"We need to be conservative and cautious in a time of austerity," he said. "There's a large incentive to embrace wishful thinking, and that is not a recipe for success."

The Air Force intends to field the long-range standoff weapon by 2030. Morin said having a realistic, not overly ambitious timetable for program milestones would be key to controlling costs.

"We see a very high correlation between schedule slippage and cost growth," he said. "That's true in the nuclear program. That's true across the enterprise. So I would say that's the biggest common risk, and that's why we put such emphasis on understanding and getting good schedule estimates."

Morin declined to publicly disclose the cost estimate for the LRSO that his office provided to Undersecretary of Defense for Acquisition, Technology and Logistics Frank Kendall.

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Harrison estimated that the program would cost about $20 billion, not including the $8 billion to $10 billion that the Department of Energy would need to spend on nuclear warhead modernization for the weapon.

Secretary of Defense Ashton Carter, who previously served in Kendall's position, is optimistic that the Pentagon can bring down the price tag.

"If you look at the design carefully and how things are manufactured carefully, you can reduce costs in this and all of our other programs," he said in a recent interview with National Defense and online media outlet Breaking Defense aboard his plane.

"We've been able to do that with 'Better Buying Power' over the last several years," he added. "The statistics show that we are capable of undershooting … our own cost estimates."

Morin, who has been critical of major acquisition programs such as the F-35 joint strike fighter, gave a positive assessment of the way that LRSO and other nascent nuclear modernization efforts have been designed.

"We have to execute successfully on a series of important programs but I think they are on the right footing today," he said. "We're setting them up for maximum chance of success."

Major missile manufacturers are eager to compete for LRSO contracts.

Lockheed Martin is developing long-range standoff technologies and solutions that "will modernize our customer's air-launched leg of the nuclear triad deterrence system," the company said in a statement.

"We are focused on developing a complete solution including survivable airframes, mission planning, platform and payload integration, and logistics training. We believe our experience and forward-looking technologies will deliver the most reliable and effective solution to our nation's strategic deterrence approach," it said.

Raytheon intends to submit a proposal, according to Lorenzo Cortes, a spokesman for Raytheon Missile Systems.

"We're confident we will provide a capable and competitive offering that will meet or exceed requirements," he said.

Through a spokesperson, Boeing declined to comment and referred all questions about the LRSO program to the Air Force. The company was the prime contractor for the AGM-86B.

Air Force officials have been mum about some of the specific requirements for the new weapon such as range. But they have discussed the general capabilities that the service is seeking.

"We need a system that can penetrate airspace so there are no denied areas," Weinstein said. "That is the major item."

Potential adversaries are building more capable radars, missiles and other technologies that could potentially detect, track and shoot down U.S. aircraft, noted Gen. Robin Rand, the commander of Air Force Global Strike Command.

The long-range standoff weapon needs to have sufficient range to enable a nuclear-armed bomber to stay out of harm's way.

"It needs to be sufficiently far enough away that we can stay outside that [anti-access/area denial] environment," Rand said during a recent media roundtable with reporters.

He took issue with the argument that the B-21 would render the LRSO unnecessary, noting that the cruise missile would give the Air Force the ability to cut through enemy airspace without having to fly an aircraft directly to a target.

"I don't believe we should put 100 percent of our eggs all in one basket … [and] solely rely on stealth" bombers, he said. "This gives you the long-range strike capability."

Relying exclusively on ICBMs and ballistic missile submarines for nuclear deterrence would also be problematic, Rand said.

The air leg of the nuclear triad gives the United States important flexibility, he noted. Openly deploying a nuclear-capable bomber can serve as a warning signal to potential adversaries and potentially dissuade them from undesirable behavior, he said. Aircraft can also be recalled if a nuclear strike mission needs to be canceled.

"You can't recall a … sea-based missile or a land-based missile," Rand said. "Once it comes out of the hole, you ain't getting that bad boy back."

The AGM-86B was fielded in the early 1980s with a 10-year design life. Although maintainers have been able to extend its service life, keeping the legacy air-launched cruise missile in the force indefinitely to retain the standoff capability is not an option, he said.

"The ALCM is approaching 40 years old," he said. "That has made it very incumbent" on the Defense Department to replace it.

Carter believes that the Pentagon will ultimately receive the funding it needs to carry out its nuclear modernization plans.

"I'm confident that we will spend the money because it is a bedrock capability," he said. "Fortunately it's not one that we need to use but it's fundamental to our security." **ND**

Email comments to jharper@ndia.org

All-Electric, Hybrid Aircraft Engine Research Taking Off

By Stew Magnuson

While hybrid and electric engines are becoming commonplace for cars and trucks, that is not the case for aircraft.

However, basic and applied research on all-electric, turbo-electric and hybrid power sources for aircraft is ongoing in civilian agencies such as NASA, the private sector and at least in one Defense Department program.

"It is very similar to what is playing out in the automotive industry to some degree," said Richard "Pat" Anderson, professor of aerospace engineering and director of the Eagle Flight Research Center at Embry-Riddle Aeronautical University's Daytona Beach, Florida, campus.

"There is a desire to move toward lower direct operating costs … less dependence on fossil fuels and lower noise," he said in an interview.

The military may at some point benefit from some of these new ideas to power aircraft, experts said. The Defense Advanced Research Projects Agency has one program looking into the technology.

Brian German, associate professor at the Daniel Guggenheim School of Aerospace Engineering at Georgia Tech, said there are no distinct lines in the sand yet for aircraft categories, but generally researchers are looking at all-electric, or battery only, systems for smaller aircraft and various hybrid or turbo-electric systems to power the larger ones.

"You've got to be a little bit of a futurist and be in it for the long haul and say, 'I think 15 to 20 years from now, we might be able to do that,'" he said.

One of the ways the technology can be applied for larger aircraft is distributed power systems, German said. For example, the larger a gas-turbine engine is the more efficiency can be squeezed out of it. That's why there tends to be only a few massive engines hanging off aircraft such as the C-17. Researchers have known for many years that putting many smaller propellers or engine fans, distributed at key areas would be even more efficient.

Every aircraft has a boundary layer, an area of dead air above the wing that builds up and creates drag as the plane flies. By placing several smaller fans along the aircraft, the boundary layer is "ingested" and almost disappears, making the aircraft faster or more energy efficient, German explained.

Engineers look at this one of two ways. It's either making the engine fans more efficient, or creating less drag on the wing. Both effects are at play, German said.

This is the principle behind DARPA's LightningStrike vertical takeoff and landing X-plane that it is developing with Aurora Flight Sciences. An artist's rendering of the plane shows 26 hybrid-electric propulsion fans distributed on the aircraft. The program has flown a 325-pound scale model and expects to build a full-scale version within the next two years, the company said in a statement. Operating from austere landing zones is the requirement the program is seeking to fill, it said.

There are few efficiency penalties for doing this with electric motors, German said. "If you tried to do that around the plane with gas motors it would be terrible," he added.

Another possibility for larger aircraft is simply a charged battery that gives the aircraft additional power when it takes off and lifts. This would allow the gas-turbine engine to be smaller, German said. Traditional engines are most efficient when traveling at one consistent speed, and a battery could provide auxiliary power as it increases thrust.

Anderson said another flight profile might be an unmanned aerial surveillance aircraft that uses the gas engine for the flight to a targeted area, then switches over to the much quieter battery in order to be more stealthy, or extend its range.

The issue now is weight, Anderson added. The automotive industry — as it moves toward a world with all-electric cars — is supremely concerned about the batteries' price point. In the aviation world, it's all about making the batteries lighter.

The nation's center for battery research is currently Argonne National Laboratory in Chicago. When Congress mandated that the lab's joint center for energy storage research pursue battery technology, it didn't specify that aeronautics be part of the program. Embry-Riddle is working with the lab to create a consortium that would also look at aircraft batteries, which would free up some resources so research could be directed toward lighter technologies.

German said "specific energy" is the single most important metric for vehicle and aircraft batteries. That is defined as watt-hours per kilogram. The state of the art for automotive batteries is nearly 200 watt-hours per kilogram, about what it takes to power a Tesla.

Compare that to a typical gas-turbine aircraft engine that puts out some 10,000 to 12,000 watt-hours per kilogram. Compared to 200, that seems like a huge gulf, German noted.

LightningStrike X-plane concept

AURORA, NASA

However, the vast majority of energy in a typical aircraft engine is wasted. As much as 70 percent is heat exhaust. So the watt-hours-per-kilogram gulf is closer to 3,000.

Lithium-ion battery capacity is doubling about every seven to eight years, so 400 watt-hours per kilogram is foreseeable. Powering a general aviation, single-engine aircraft with current ranges can be practical at that density level, German said.

Anderson said: "There are those out there in the scientific community who think that the specific energy of batteries will never reach that of liquid fuels. And if that is the case, then probably the ultimate goal in airplanes is hybrid. …We will see some smaller, slower airplanes that are fully electric, but it is more likely that for larger aircraft, a hybrid system will be the end point."

X-57 concept

What everyone is trying to do is move up the food chain in terms of the aircraft size, he added. Small UAVs and small aircraft will be able to go all-electric.

However, "if you want to go supersonic on battery power that is not happening anytime soon," he said.

German said the trend in the military is for "more electric." That is, jets need more power to run its suites of energy-hungry electronics, radars, and so on. It wants less fuel being diverted to these systems.

The main player in the United States is NASA and its advanced air transport technology project.

Cheryl Bowman, technical lead of the hybrid-electric subproject for large planes at NASA's Glenn Research Center in Ohio said, "we are looking at technologies that are relevant to the single-aisle passenger aircraft design."

NASA's overarching goal is to reduce the carbon footprint of the aviation industry as it grows in the coming decades and to either reduce or maintain emissions on a steady line.

It is tackling the problem in several ways.

The agency is looking at the distributed power system described earlier to make major aircraft reconfigurations as well as investing in the underlying technologies such as lighter materials and additive manufacturing techniques.

"We know that the basic technology needs to be improved so we are really looking at it from the top down from the vehicle configuration aspect, but also from the bottom up where we are investing in basic technology," she said.

NASA is looking for a sweet spot in terms of size. It's already a given that all-electric systems could power small UAVs. The agency's X-57 demonstrator will attempt to fly an all-electric medium-sized aircraft, about the size of a two-seat general aviation plane that can fly at around 200 knots, Bowman said.

It has several universities assisting it, along with engine manufacturers Rolls-Royce America and United Technologies Research Center.

"The machine and power electronic and power architecture studies are informing our vehicle configuration designs, and the vehicle configuration designs are informing what we need for our technology development," she said.

The X-57's first flight may come in two to three years, she said with the equivalent of a single-aisle passenger aircraft coming in about 10 years.

Ralph Jansen, hybrid-electric technical integration manager at Glenn Research Center, said: "For this to close with a net benefit in fuel burn, and other parameters, we need to develop the technology to get the weight of the electrical system down a lot, and the efficiency up a lot."

He agreed that larger aircraft will probably still have to burn some jet fuel. Any aircraft with a range of 2,000 nautical miles or more will probably be a turbo-electric system.

"We have research that shows we are in striking distance of doing that," he said.

There is also private sector money going into all-electric aircraft power.

Europe's Airbus has E-Fan, a hybrid-electric powered aircraft that it recently flew over the English Channel. It brought the aircraft to display at the EAA AirVenture Show in Oshkosh, Wisconsin, in July.

"Airbus is using it to evolve electric propulsion as a possible alternative to fossil fuels in the development and powering of its defense drones and satellites within the next few decades," a statement prior to the show said. The company declined to make executives available to talk about the program.

Embry-Riddle's Anderson also noted that there is a movement afoot in Silicon Valley to develop small, personal vertical-takeoff and landing aircraft that will whisk passengers across towns and over traffic jams.

Ride share company Uber is looking into the concept. Start-up Zee-Aero said on its website that it is "working at the intersection of aerodynamics, advanced manufacturing and electric propulsion" to find better ways to get from point A to point B. Joby Aviation is developing an "electric vertical takeoff aircraft to revolutionize personal mobility," according to its website.

Outside California, a German company E-Volo is developing a similar "Volocopter" for personal transportation.

There are 100s of millions of dollars of private investment money going into these start-ups, and they all plan to employ electric propulsion, Anderson said. They will inevitably have some military applications, he added. **ND**

Email comments to smagnuson@ndia.org

Industry Prepares for New Insider Threat Regulation

By Yasmin Tadjdeh

Even as the Defense Department prepares to implement a new regulation to help mitigate insider threats, security breaches are continuing. Experts say more needs to be done to address the situation.

Years after the Edward Snowden and National Security Agency scandal, the Department of Justice announced that yet another NSA contractor had allegedly stolen classified information.

Harold Thomas Martin III was charged with the "theft of government property and unauthorized removal and retention of classified materials by a government employee or contractor," a Justice statement released in October alleged.

Martin — a 51-year old contractor from Glen Burnie, Maryland — had a top-secret security clearance and was arrested in August, according to Justice.

The announcement came less than two months before the Defense Department intends to implement a new policy that would require companies to establish individual programs to detect, deter and mitigate insider threats.

Under guidance from the department's defense security service, companies doing business with the Pentagon will soon be required to stand up a program to "gather, integrate and report relevant and available information indicative of a potential or actual insider threat."

The requirement — which has a Nov. 30 deadline — is part of a change to the Defense Department's "National Industrial Security Operating Manual," and was announced in a letter released in May.

The new rule, while basic, is a step in the right direction, said Bryan Ware, CEO of Haystax Technology, a security analytics company.

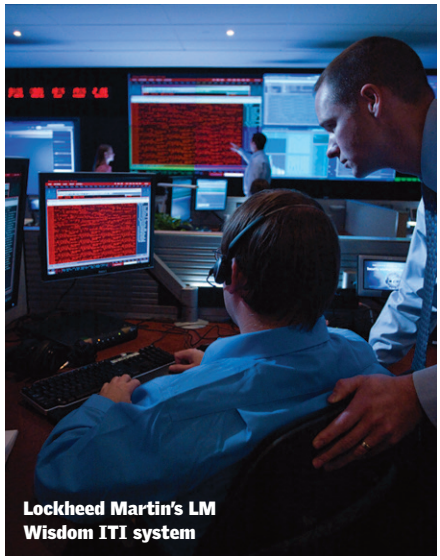
"Is it enough? I don't think so," he said. "To get to the place where industry really has good insider threat programs is not going to come from this change and it's not going to come quickly."

Though not particularly onerous, in general, industry does not want to be compelled to follow more regulations, he said.

"What I would love to see would be that having a strong insider threat program was a strategic advantage for winning government business, particularly sensitive government business," he said. "When it's just a security check-in-the-box, that's not going to happen. But when instead it gives you an advantage over a competitor winning a contract … then I think we'll see real, serious programs emerge that become the best practices."

Most defense companies don't have any kind of insider threat program, Ware said.

"Certainly when you look at … the largest defense contractors, the Lockheed Martins and such, they do have programs … but when you look at the whole defense contracting [industry] you have lots of companies that are $100 million revenue companies that don't even have a chief security officer," he said. "Those companies are not likely to have insider threat programs, and this conforming change will probably be the first time in which they do."



Lockheed Martin's LM Wisdom ITI system

Satisfying the rule can be met with minimal internal training and assigning a high-level employee within the organization the responsibility of managing an insider threat program, he said.

"Therefore, you can comply without having to do a whole lot, and because of that I think most organizations will comply. … But is that enough? No. That's not having a real insider threat program," he said.

Even with a good system in place, many companies don't have a great handle on data classification, said Scott Montgomery, chief technical strategist at Intel Security.

"What makes insider activity so damaging is that the insider is typically using the credentials he has to do activities that are allowed by policy — what the insider is doing looks like his day job," he said in an email. "Sorting out the parts of it that are for malicious purposes is really, really, really tricky."

Companies need to think harder about which employees have access to certain pieces of data and what they are allowed to do with it, he said.

"Organizations that have a good handle on this find that there is less to examine from the insider standpoint because they have a foundation of data hygiene," he said.

While it is important to have an insider threat program, many companies do not have the expertise to establish an effective one, said Terry Roberts, founder and president of WhiteHawk, a company that helps small and mid-sized businesses that don't have chief information officers or cybersecurity officers.

A better approach would be to require that companies receive a baseline assessment of their company and then tailor a program to their specific gaps and needs, she said.

"Unless you have a professional assessment done, you don't necessarily know where to start, so you put what you think is a governance approach in place and that may not be the most effective thing," Roberts said.

The new regulation will be especially difficult for small businesses to wrap their arms around, said Roberts, who is also a cybersecurity fellow at New America, a Washington, D.C. think tank.

"They really need enablement," she said. "It's unrealistic for the hundreds of small businesses that work in that space to have either the expertise or the resources to put their own programs in place."

While it wouldn't be something that could be regulated, it would be beneficial if bigger companies helped their small business partners with assessing the company and establishing programs, she said.

LOCKHEED MARTIN

Lockheed Martin — which has had a robust insider threat program for years — already does that, said Douglas Booth, the company's director of business development for cyber solutions.

Lockheed Martin "builds a lot of platforms and we don't build those platforms by ourselves. We have suppliers and before we establish a relationship with them and start exchanging data we want to make sure that they are as protected as we are," he said. "The same threats that we're concerned about, they need to be concerned about. So before we sign anybody up … they have to check those boxes."

The company currently uses a program that is based off of its LM Wisdom Insider Threat Identification tool, he said.

"It's an open source-based collections method to go out and do searches and understand what our employees are doing on the network or outside the network," he said. "We look at dozens of different variables."

Lockheed is then able to give ratings and rankings to employees and determine what type of risk they potentially could pose, he said.

"We're trying to train individuals, not scare people," he said. "We don't want it to feel like it's Big Brother monitoring or watching. It's protecting you and protecting your peers and protecting all the intellectual property."

The system may notice that an employee on a typical week prints out 100 pages of data, Booth said. A red flag would be if that employee were to print 2,000 pages in one day.

So far, the company has sold pieces of its system to different agencies and organizations, but not the complete product, he said. Booth believes the insider threat program requirement could drive sales. Lockheed's suppliers are not required to use the LM Wisdom ITI product, but are expected to have a program in place.

Insider threats, while a perennial concern, became a major issue after Snowden famously leaked classified National Security Agency data to various news outlets in 2013. The information leak showed that the agency had been collecting information from U.S. citizens via a bulk metadata program.

After the disclosure, Snowden fled the United States and settled in Russia. He recently began a campaign to seek a pardon from President Barack Obama. The effort coincided with the release of a biopic — directed by Oliver Stone — about the former government contractor who is in some circles looked at as a traitor and in others as a heroic whistleblower.

In a recently released congressional report, the House Committee on Oversight and Government Reform said that Snowden is no whistleblower.

"Under the law, publicly revealing classified information does not qualify someone as a whistleblower. However, disclosing classified information that shows fraud, waste, abuse, or other illegal activity to the appropriate law enforcement or oversight personnel — including to Congress — does make someone a whistleblower," the report said.

"Contrary to his public claims that he notified numerous NSA officials about what he believed to be illegal intelligence collection, the committee found no evidence that Snowden took any official effort to express concerns about U.S. intelligence activities — legal, moral, or otherwise — to any oversight officials within the U.S. government, despite numerous avenues for him to do so," the report said.

While details on the recent arrest of the other NSA contractor, Martin, are scarce, Erik Knight, a cybersecurity expert who has worked in the industry for two decades, speculated that it might have been new rules implemented post-Snowden that exposed Martin.

The NSA has "always had more intricate policies than the private sector, for sure, but I'm sure that it's some of the new policies" that revealed him, he said. They are "being very careful that one person doesn't have too much access or too much visibility into different sections … so I'm sure that those flags popped up and that's what brought it to their attention."

However, Morey Haber, vice president of technology at BeyondTrust, a cybersecurity company, said it is clear that rules are not being followed.

"There are enough government processes and policies and procedures that this should never have happened for Snowden and especially should not happen now," he said.

"In order to get the data out … [electronically] you had to have some sort of removable media or removable cloud access, and the indication from what I've seen are removable media," he said. "Removable media is not allowed, USB drives are not allowed, so how in blazes after three years were these loopholes not locked down and he [Martin] was still able to remove data?"

The House Oversight Committee report — which was released a few weeks before the second NSA breach — found that the agency and the wider intelligence community had not done enough post-Snowden to mitigate future unauthorized disclosures, it said.

"The committee remains concerned that more than three years after the start of the unauthorized disclosures, NSA, and the intelligence community as a whole, have not done enough to minimize the risk of another massive unauthorized disclosure," the report said. "Although it is impossible to reduce the chance of another Snowden to zero, more work can and should be done to improve the security of the people and computer networks that keep America's most closely held secrets."

The committee cited a recent Defense Department inspector general report that found that NSA had yet to effectively implement its post-Snowden security improvements. **ND**

Email comments to ytadjdeh@ndia.org

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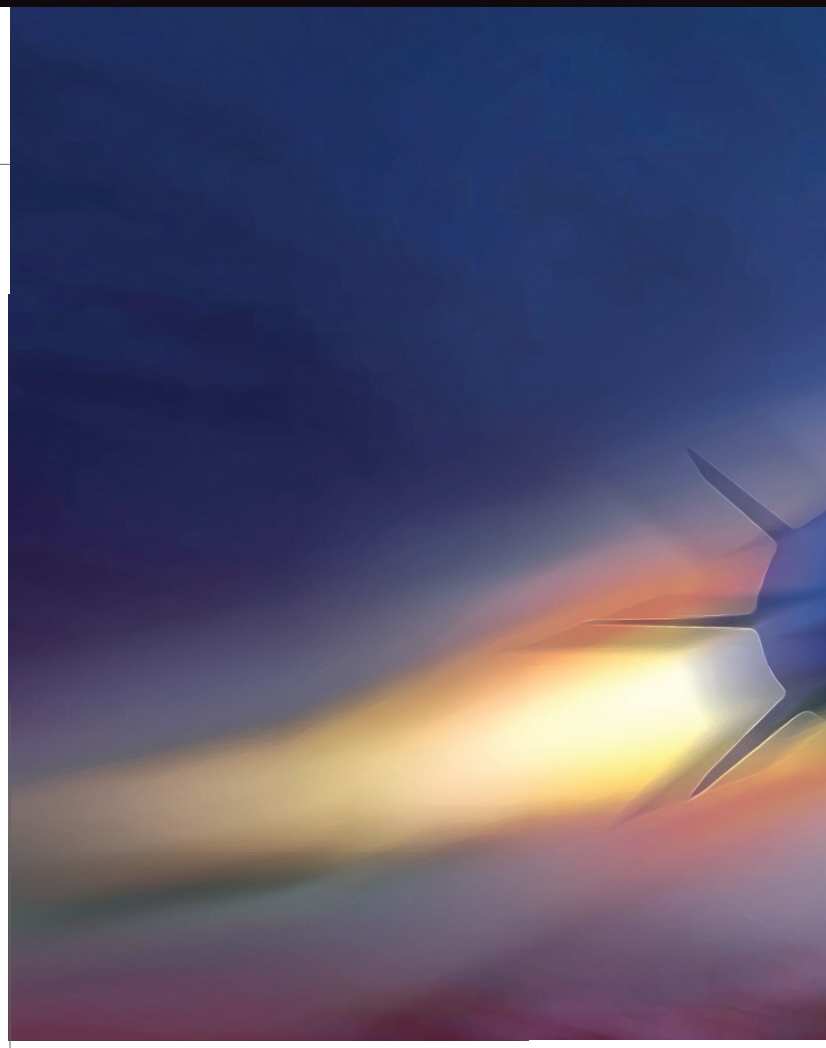

DENIED ACCESS

Pentagon Betting on New Technologies to Foil Future Adversaries

Predicting what wars to prepare for has always been a guessing game in the Pentagon — but one with high stakes.

Former Secretary of Defense Donald Rumsfeld's infamous — but often taken out of context — quote about a lack of armored vehicles at the beginning stages of the Iraq War, that "you go to war with the army you have" may have sounded brusque, but it remains essentially true.

In a perfect world, the military has exactly the right equipment, training and ingrained tactics, techniques and procedures in place when it is called to action. Often, that has not been the case.

That doesn't stop military leaders from trying to prognosticate. They call on a host of experts to determine the most likely scenarios in which they will be called to fight. Generals, admirals, historians, academics, futurists and think tank types all chime in with their opinions.

Army Chief of Staff Gen. Mark Milley at a recent conference said the service cannot say for certain what future battlefields will look like, but through rigorous analysis it can make some educated guesses.

"We can get the basics about right to develop the forces and the weapons and the equipment that we need to protect our great nation," he said.

The year most mentioned by senior military leaders of late is 2030.

Fourteen years is not so far in the future, Milley said. Looking back, 9/11 is more than 15 years ago.

Looking forward, the time to begin "placing big bets" on science and technology is now, he said.

For its 11th annual research-and-development issue, the staff of National Defense Magazine has identified four trends often mentioned by senior military leaders that will have an impact on the battlefields of tomorrow: fighting in anti-access, area denied scenarios; fighting in urban areas; operating in a world marked by climate change; and fighting in space.

While predicting the future can have many pitfalls, one safe bet might be that the military's painfully slow acquisition system will remain so. The process to field the technologies needed to survive and win in these environments needs to begin soon.

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AIR FORCE

By Jon Harper

The novel "Ghost Fleet" — which has grabbed the attention of senior Pentagon officials — describes a fictional high-tech war between the United States and China. Set around the year 2030, the book by military technologist Peter W. Singer and Robert Cole depicts U.S. forces bombarded by enemy robots, guided missiles, air defense systems, electronic warfare and cyber capabilities.

While science fiction, the story includes technologies and operational concepts that are a real-world concern for defense officials. The Pentagon is already taking steps to prepare for such a conflict where adversaries could use sophisticated weapons to rapidly attack U.S. military systems and keep its forces at bay, a strategy known as anti-access/area denial, or A2/AD.

At a recent industry conference, Deputy Secretary of Defense Bob Work envisioned an era of warfare where "operations, especially cyber, EW and guided munitions salvos, move really at high speeds."

The Pentagon sees autonomy, artificial intelligence and advanced missiles as key technologies that will enable the United States to counter these growing threats in the coming decades.

"We're going to have to go after these technologies to fight fire with fire and buy back the time for our humans to make decisions that will allow us to prevail at the tactical and operational level of war," Work said.

The Defense Science Board recently conducted a study on the military implications of autonomy. Countering A2/AD threats is "a primary example" of a Pentagon effort that could be enhanced by autonomous systems, the board said in its report, which was released in August.

The combination of autonomy and artificial intelligence technologies could enable the United States military to

improve the performance of its battle networks and operate faster than its enemies, the report said.

"DoD must accelerate its exploitation of autonomy — both to realize the potential military value and to remain ahead of adversaries who also will exploit its operational benefits," the report said.

Platforms equipped with the technology could conduct a range of missions now performed by manned aircraft in areas that are difficult to access such as aerial refueling, early warning, intelligence, surveillance and reconnaissance, it said.

They could also facilitate offensive strike, or play a defensive role by acting as decoys, sensors or emitters to confuse, deceive and attrite adversary attacks, it said.

From underwater systems to ground vehicles to aircraft, the Pentagon has efforts underway to push the technology envelope.

"When you talk about autonomous systems you're covering a wide, wide, wide variety and we're involved in almost all of it," Secretary of Defense Ashton Carter told National Defense.

"It's an important field and we intend to be a leader in it, and I think it will have applications in lots of areas," he added. "We're making big investments in it."

The Pentagon's strategic capabilities office, also known as the SCO, is aggressively developing a swarming micro-drone technology that could soon be transitioned to the Air Force.

The goal of the Perdix program is to enable the U.S. military to launch Coke bottle-sized unmanned aerial vehicles out of fighter aircraft to conduct swarm missions. The propeller-driven drones are equipped with foldable wings to enable them to fit into tight spaces on board the mother ship.

"When the pilot hits the dispense flare button, flares don't come out — the UAVs do," said William Roper, head of the strategic capabilities office, during a recent media roundtable.

"They have to wake up and boot as they fall, and then they have to find each other and then they go fly whatever mission that we've programmed them for," he said.

Once deployed, they are expected to act in concert by self-organizing and allocating tasks in an optimal way to carry out their assignment.

More than 500 Perdix test flights have been conducted. During one exercise, 20 Perdix drones were launched out of a single F-16 fighter.

The SCO is moving quickly to advance the technology. "We build 40 or 50 of one lot and by the time we've tested them, we already have the next design that we're building," Roper said.

The office hopes to mature the technology enough to be able to transition the program to the Air Force by the end of fiscal year 2017.

"This is a risky thing," Roper said. "There is nothing like this right now in the inventory — a tactical aircraft that can dispense a little expendable, fly-low surveillance asset."

The SCO has also been leading a study called Avatar looking at the possibility of teaming manned fighters with autonomous unmanned fighters.

"This is really the beginning of the intellectual work on this, having to think through how would you fight this way, what technologies are available to achieve it and … where on the autonomy spectrum do we need to be to get the [most] bang for the buck," Roper said.

Robotic wingman technology could offer major operational benefits, he noted.

"You could take risks with it that you wouldn't want to take with your manned aircraft," he said. "If you're in a hostile environment and you need someone to fly where it's risky, it should always be the unmanned system first."

The Air Force Research Laboratory sees great promise in autonomy, and officials are pondering which areas to pursue technology demonstrations in the coming years.

"There are multiple concepts" under consideration, said AFRL Commander Maj. Gen. Robert McMurry Jr.

The lab wants to "prove the technology in a high-confidence way and also secure operator buy-in," said in an interview. "It can be anything from a flying wingman to autonomous ground system vehicles. There are a lot of options in play right now."

While pop culture often focuses on the warfighting potential of killer robots, Carter sees autonomy as a critical capability in other battle realms such as electronic warfare and cyber.

"PRECISION HYPERSONIC WEAPONS WOULD BE MUCH FASTER THAN CONVENTIONAL CRUISE MISSILES OR BOMBERS."

"People tend to want to link autonomous systems to the use of lethal force, but their most likely applications in the near term and mid term are for such tasks as scanning networks for vulnerabilities, scanning incoming traffic and doing the kind of work that a cyber defense analyst needs to do today," he said.

"It takes a lot of the human work out of something that's very important to us in cyber defense," he added. "It doesn't involve the use of force but it's really critical."

The Defense Advanced Research Projects Agency recently hosted a Cyber Grand Challenge in Las Vegas. Seven teams built machines that were pitted against each other looking for cyber intrusions, according to DARPA Deputy Director Steven Walker.

When one of the autonomous systems found an intrusion, "it basically corrected for that intrusion, defended against it, and it actually tried some intrusions, some cyber offense against the other machine," he said at a recent conference.

DARPA is still analyzing the data, he noted. But one of the lessons was obvious.

"What was clear after that competition is that cyber effects … won't be counted in months or days," he said. "It's going to be down to minutes and seconds. We're not going to be able to defend our networks with lots and lots of people. We're going to have to automate our defenses and use machines to do that."

Autonomy and artificial intelligence will change the face of warfare in the coming decades, he said. It will entail "smart people working with more incredibly smart machines."

"Highly autonomous warfighting is certainly the future," he added.

But U.S. military personnel will always remain in the loop to

The Cyber Grand Challenge in Las Vegas

some degree when it comes to killing, even if adversaries don't operate under similar constraints, Carter said.

"Whatever the level of autonomy … there's always going to be human judgment and discretion involved in use of lethal force," he said. "It's important that we … continue to conduct ourselves in a way that reflects American values."

Work said the Defense Department will focus on several technology areas and operating concepts related to artificial intelligence and autonomy going forward including: learning machines; advanced computing and visualization to enhance human decision-making; combat teaming involving manned and unmanned platforms; and network-enabled autonomous weapons.

The Pentagon is developing next-generation technologies and platforms, but tying them together will be a crucial piece of the puzzle, Work noted. Artificial intelligence is expected to play a key role in any solution.

"It's the most important thing we have to understand," he said. "What is the brain that will make this work and what are the connections, the central nervous system that will allow us to wield this battle network effectively?"

The adoption of AI will likely be gradual in the coming years, he said. But the technology has revolutionary potential if the Pentagon can develop a learning network for command, control, communications and intelligence.

When "all of the narrow AI is contributing to better, faster knowledge and connecting the sensor grid to the effects grid, then that is when you will see the major revolutionary step" in warfighting capability, Work said.

Members of industry anticipate opportunities in this area.

"We are starting to see autonomy in the singular domains whether it be air or space or cyber. But the ability to tie the domains together and to be highly automated … to me that's the big thing," said James Dorrell, vice president of technology and product innovation for advanced development programs at Boeing's Skunk Works division.

When it comes to munitions, guided missile salvos are expected to be part and parcel of any great power conflict in the coming decades, Work said. The Pentagon is investing in many types of advanced weapons along these lines including the air and sea-launched long-range anti-ship missile, the joint air-to-surface standoff missile-extended range, and the standard missile-6 interceptor/anti-ship weapon.

But the cutting edge of missile technology lies in hypersonics. Traveling at speeds greater than 3,300 miles per hour, precision hypersonic weapons would be much faster than conventional cruise missiles or bombers.

"Hypersonic strike … could revolutionize military affairs by offering more effective, inexpensive and low-risk approaches to counter opponents attempting to foil U.S. forces via anti-access and area denial technology," said a report released earlier this year by the Mitchell Institute for Aerospace Studies, "Hypersonic Weapons and U.S. National Security: A 21st Century Breakthrough."

Walker said the technology has the potential to provide "a much more capable, much more survivable, much more effective system than we have today at some surprising ranges quite frankly."

DARPA and AFRL are partnering on two demonstration projects — the hypersonic air breathing weapon, and tactical boost glide, which would use a rocket engine to reach hypersonic speeds before the weapon glided down toward its target.

The first flight for both technologies is slated for 2019. "That's the path we're on. We feel good about it," Walker told reporters after a recent panel discussion.

"These are flight demos and we're demonstrating all the capability you would need in a weapon system," he added.

In August, DARPA issued a broad agency announcement about the advanced full range engine program. The aim is to develop a reusable propulsion system that future hypersonic air vehicles could use to conduct ISR missions over heavily defended territory.

The agency is interested in advanced manufacturing techniques to make engine technology more affordable.

"As part of one of our hypersonics studies, we've built an engine with additive manufacturing, tested it multiple times in relevant conditions, and it's doing very, very well," Walker said. "We think that's going to be a key to reducing cost of hypersonics for the future."

Such missiles could be fielded within the next decade, he said. The Defense Department is debating how to proceed with the acquisition process.

"Part of what we need to do in this country is get more rapid in how we get things into the field, and so there's all sorts of discussions now of whether we go the standard acquisition route after the flight demo or whether we do something that builds an early operational capability much like we're doing with the [long-range anti-ship missile] program with the Navy," he said.

"I would like to see that [expedited] option pursued," he added. "We'll see." ND

Email comments to jharper@ndia.org

AIR FORCE

URBAN WARFARE

Army, Marine Corps Prepare to Fight In Megacities

By Yasmin Tadjdeh

The bloody battles of Stalingrad in World War II, Hué City in Vietnam and Fallujah in Iraq conjure up images of infantrymen fighting in the streets of major cities. In the future, the U.S. military may have to fight in similar environments that will present soldiers and Marines with a slew of challenges.

In a report by the Atlantic Council's Brent Scowcroft Center on International Security, "The Future of the Army: Today, Tomorrow and the Day After Tomorrow," researchers said the rise of megacities will have major ramifications for the Army.

By 2030, over 60 percent of the world's population will live in urban areas. Additionally, there will be approximately 41 megacities with populations that surpass 10 million people, said authors David Barno and Nora Bensahel.

"The Army has traditionally sought to avoid the intense demands of operating in urban areas wherever possible, preferring the less problematic challenges of open terrain, but this demographic reality means that urban operations will increasingly dominate land warfare," the report said.

The service will have to beef up its capabilities in urban offense, defense, mobility and protection to successfully operate in environments with large civilian populations, the report said.

"Urban operations in the 21st century are not just another type of operation; they will become this century's signature form of warfare," the report said.

The Army is already planning for such a future, said Tom Pappas, director of Army Training and Doctrine Command's G-2 Futures division.

"The places that we've studied as typical megacities have been in Asia and have been in Africa," he said.

Culture plays a "huge role" in any megacity, irrespective of its location, he said.

"Culture tends to define the megacity. And then when you reach down into that, one of the challenges that we have … is [acquiring] the capability to help to understand that area, to understand the groups that operate within it," he said.

As Pappas looks toward 2030 he sees a number of significant challenges. The first is gaining situational awareness.

Jerry Leverich, a senior analyst with the futures office, said that will be particularly difficult in cities, as troops will face buildings that are dozens of stories high as well as subterranean structures, such as subways.

TRADOC is looking at technologies "that would enable terrain mapping," he said. "Radars of course would assist that significantly."

The Army would also likely employ unmanned aircraft or robots to peak around corners, Pappas said.

Another challenge would be communication, he said. Cities even today are known to have spotty cell phone reception, caused by what is known as the "urban canyon" phenomenon. The service will need to invest in technology that can operate in such conditions, he said.

One of the reasons that enemies move into cities is because they provide cover for insurgents, Pappas said.

"They can then move into populated areas and it creates a significant, multi-dimensional challenge for any armed force operating within there," he said. "When you have to attack … a 10-story building, that's significantly different than having to attack in an open and rolling terrain that we had envisioned in the past.

"If I was going to have to fight the U.S. or a superior foe, I would definitely go there just as a simple matter of protection,

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especially if I didn't have the capabilities, the precision, the communications infrastructure and logistics capability that the U.S. forces have," Pappas said.

Another reason cities give adversaries an edge is because they often have home field advantage, said Peter W. Singer, a strategist and senior fellow at New America, a Washington, D.C.-based think tank.

Cities are "the home turf for warring groups," he said. "It's their Sherwood Forest. They fight better there."

Humans are becoming more and more an urban species, he said. "Those trends only accelerate, those numbers only go up," he said. When there is a "mass movement of people to cities you see a breakdown in terms of the old social order, the relationships. The elders lose power. Conflict entrepreneurs do well … and you can see this pattern everywhere from Africa to Syria."

"BY 2030, OVER 60 PERCENT OF THE WORLD'S POPULATION WILL LIVE IN URBAN AREAS."

Cities are also places where anger among the population can bubble up and fuel civil wars or conflict, Singer said.

In order to fight successfully in an urban environment, more training is needed, the Atlantic Council report said.

"Current Army training for urban operations is grossly inadequate, since few virtual or physical training environments replicate the scale and complexity of modern urban warfare," the report said.

The service has built a small number of mock cities for tactical training, such as the Shughart-Gordon Village at the Joint Readiness Training Center, but they are limited in scope, the report said.

"As a result, the Army has no large-scale urban training sites, which means that Army units cannot realistically train in their most demanding and likely future combat environment," the report said. "The Army must aggressively seek innovative ways to overcome this major shortfall, such as holding tactical exercises without troops for leaders in large urban areas, conducting map exercises overlaid on actual cities and possibly even conducting full-scale exercises in abandoned parts of big cities."

The service must also invest in simulators or virtual reality gaming systems to bridge the gap, the report said. Additionally, using artificial intelligence could "help replicate the behavior of leaders, factions and the general population of a virtual city in order to better challenge units with the scope and complexity of large-scale urban operations," it said.

Cities are a "massive sprawl," and that makes it extremely difficult to train for, Singer said.

"The challenge is not just a couple of … two-story buildings put together — it's the potential of a downtown," he said. Sew-

ers are also a massive challenge. "If you lay out the underground it would literally be hundreds of miles. You can't build that on that scale."

Besides training, the Army must also look into the human factor of dealing with populations in urban environments, said Paul Scharre, director of the 20YY Future of Warfare Initiative at the Center for a New American Security, a Washington, D.C.-based think tank.

"The social-political aspect of urban environments is very difficult," he said. "You've got all these people living together. It's not just the physical environment … it's also the social environment which is really important."

In a future war in a city, it will be critical for the United States to get the local population on its side or at least not actively resisting it, he said. That will require soldiers to understand the unique dynamics of the location.

The Army will also have to contend with an evolving landscape that includes social media platforms, he said.

"Right now it's Twitter and Facebook … [but] it may be something different probably in five or 10 years," he said. "That's an area where the U.S. military is really disadvantaged."

Scharre pointed to the May 2011 raid that killed Osama bin Laden in Abbottabad, Pakistan.

"The Abbottabad raid on bin Laden was tweeted about in real time. People didn't know that it was U.S. personnel, but they tweeted about a helicopter," he said.

It is possible that in a city environment, people — whether they are adversaries, concerned citizens or the media — may expose the movement of U.S. forces, he said.

"I don't know that the military is ready for that kind of transparency into military operations where every single thing some soldier does on the ground is recorded and tweeted about," he said. That will have training and doctrinal implications, he added.

Soldiers at the National Training Center, Fort Irwin, Calif.

The United States will have to have a presence online, he said. The military "needs to be able to engage in that space and shape that narrative and engage in that sort of 'the war of the hashtags' to be able to make sure that … U.S. forces are explaining its actions."

There are tools currently available that could help Army forces better monitor and understand what's going on in social media so they are "not caught flat-footed," he said.

The Marine Corps is also planning for operations in urban environments. In late September, the service released a new operating concept titled, "How an Expeditionary Force Operates in the 21st century," which focuses on how Marines will fight in 2025 and beyond.

"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 report said.

To improve the service's ability to operate in urban terrain, it will have to properly train to "address the full degree and extent of compartmentalization." This will include city blocks, streets, sewers and tunnels.

Additionally, the Marine Corps will have to refine its ability to use open source data and human sources "to create accurate, mission-informed course of action analysis that reflects a nuanced sense of the conflict from the perspective of all parties and how that changes as the adversary adapts," the report said.

While the services will need to be ready for the possibility of a war being fought in a megacity, they may also find that for some large cities, the fight won't be too tough, said Mark Cancian, senior adviser at the Center for Strategic and International Studies' international security program.

"I would tell the Army, don't hyperventilate over megacities because just as there have been many huge fights, there have also been many … non-fights," he said. "In 2003, Baghdad fell relatively easily. … There was a sharp battle inside the city, but it only went on for a couple of days. Kuwait City fell easily. Kabul in 2001 fell easily."

It's "possible to take these megacities," he added.

As the United States military prepares for a future fight in large cities, so are its adversaries, Singer said.

"China is also amping up its urban training," he said. "Any smart military is."

In 2014, China, Russia and some Central Asian countries conducted a training exercise called "Peace Mission," Singer said. "They had helicopters doing an air mobile operation in a simulated urban environment," he said. "The helicopters were moving troops in and out of urban zones."

The exercise — which took place in Zhurihe, China — included 7,000 troops, with 1,000 of them coming from Russia. Kyrgyzstan sent 500 troops while Kazakhstan deployed 300 paratroopers. It also featured a mix of tanks, infantry vehicles, cargo aircraft and helicopters, he said.

Chinese companies are also investing in weapons that can be used in urban environments, Singer noted.

In 2015, HIT Robot Group — a Chinese company — unveiled three unmanned ground vehicles during the Beijing 2015 World Robot Conference, he said. They included systems that could be used for bomb disposal, reconnaissance or lethal force.

There "was an armed one that could mount either an assault rifle, a grenade launcher or a recoilless rifle," he said. "They explicitly marketed it as this is for urban" fighting. **ND**

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SPACE

Links to Earth to Make The 'Ultimate High Ground' a Battle Zone

By Stew Magnuson

It has been called both an Achilles' heel and the ultimate high ground for the U.S. military.

Space might be the final frontier for exploration, but the millions of square miles that extend from just beyond the Earth's atmosphere to geostationary orbit some 23,000 miles outwards will be a battle zone in any future conflict involving peer or near-peer competitors, experts and officials have said.

"No one would win a conflict that extended into space, but given how dependent modern life is on space — for the Air Force, Department of Defense and our allies, we will defend that way of life if threatened," Winston Beauchamp, deputy undersecretary of the Air Force for space, and director of the principal Defense Department space advisor staff, said at a recent Air Force Association conference.

Rear Adm. Brian Brown, deputy commander of the joint functional component command for space at U.S. Strategic Command, said: "What I am most concerned about is miscalculation in this area, because miscalculation leads very fast to unintended consequences. And that's the part that worries me the most."

Statements from the U.S. military have evolved over the last decade from acknowledgments that space had become more "congested, contested and competitive" to more martial rhetoric that is designed to send messages of deterrence to potential adversaries.

The fact that any major future conflict will extend into space should not be surprising since so many systems here on Earth depend on space-based applications. The U.S. military and intelligence community rely on space-based platforms to provide them with communications, precision guidance and navigation, reconnaissance and surveillance.

And increasingly, so do potential space-faring adversaries such as China and Russia. As they become more dependent on their space systems, they too are vulnerable.

Brien Alkire, senior researcher and professor at Santa Monica, California-based RAND Corp., said, "Of course, U.S. dependence on space will vary with the particular security concern. I think the same is true for our competitors. Their dependence may grow as the sophistication of their military capabilities increases."

Much of the U.S. offensive and some of the defensive technologies being developed for future conflict in space are classified. What is happening in China and Russia, and some of the lesser space-faring nations such as Iran and North Korea, is even more opaque. But a space race is seemingly on.

"In every other domain, we are seeing new weapon systems come up, then counters to that weapon system," Brown said. "It's the same in space, but the domain is a lot farther away."

U.S. space agencies need to understand what is happening in space, what a weapon can do and its intentions and attributions, he added.

Beauchamp said this new reality of a contested space environment will call for updated ways of carrying out missions and a revamped architecture.

Space situational awareness is complicated by long distances and the vastness of this area of operation. The upper atmosphere to geosynchronous orbit — where many stationary satellites are parked — comes to about 8.626 billion square miles to monitor.

And the orbits that spacecraft occupy are becoming increasingly congested. Euroconsult — in its annual 10-year forecast of the satellite market — predicted that 145 new satellites larger than 120 pounds will be launched each year through 2025. When small satellites, known as cubesats are included, the total comes to some 9,000 new orbiters over the next 10 years. To put this growth in perspective, there were only 1,450 new satellites launched over the previous decade.

"The proportion of military satellites in relation to other satellites is going to go down," said Brian Weeden, technical adviser to the Secure World Foundation, a Broomfield, Colorado-based think tank that focuses on space issues. "That is a big change." Even if a low-end estimate of 4,000 new spacecraft on orbit over the next decade is closer to reality, that still means space will be more crowded than ever, he said.

Discerning friend from foe and preventing collisions will be major technological needs for the U.S. military and intelligence community in the 2030s. More than 80 nations now have assets in space and that number will grow. Japan recently announced its intentions to boost its military space capabilities, as have the wealthy Middle East Gulf states. Future conflicts may break out between regional rivals, Weeden said, not just the three space superpowers.

Spacecraft that can maneuver may play a part in space conflicts. Much like a jet fighter that closes in on an opposing aircraft, these vehicles can move around.

They may not fire missiles, but so-called "proximity capabilities" could destroy or render useless satellites that cost billions to build and launch. The technology isn't new, Weeden pointed out, but there will be more of these maneuvering spacecraft in orbit.

In 2015, a Russian satellite was observed flying around the upper stage rocket from which it had just separated. Meanwhile, the U.S. Air Force has built four geosynchronous space situational awareness spacecraft that can drift above or below the belt to spy on rivals' satellites.

Congress' U.S.-China Economic Security Review Commission in its 2015 report, said China is developing several offensive capabilities, including spacecraft that can attack.

"China is testing increasingly complex co-orbital proximity capabilities. Although it may not develop or operationally deploy all of these co-orbital technologies for counterspace missions, China is setting a strong foundation for future co-orbital anti-satellite systems that could include jammers, robotic arms, kinetic kill vehicles and lasers," the report said.

Weeden said the 2030s will probably see a new wave of proximity spacecraft that can do a variety of missions, including salvaging drifting satellites, refueling and possibly replacing malfunctioning or outdated parts. That will make U.S. space systems more robust. However, it is not a stretch to imagine them doing "nefarious" tasks as well, he added.

Meanwhile, China's ground-based anti-satellite missiles "hold at risk U.S. national security satellites in every orbital regime," the report said.

U.S. Air Force officials have confirmed missile launches that have come close to geosynchronous orbit. In 2007, China demonstrated its ability to shoot down a spacecraft in low-Earth orbit when it destroyed one of its own defunct satellites. A year later, the Navy shot down a malfunctioning U.S. spy satellite using a Standard Missile-3. Such ground-based anti-satellite weapons date back to the Cold War era, Weeden noted.

Beauchamp said: "We know potential adversaries are investing in systems that can take our space capabilities away and that they are testing them actively."

However, the report pointed out that while China lags the U.S. in space capabilities, it is creating its own fleets of spacecraft that will do surveillance, navigation and communications in a time of war.

This "also increases [People's Liberation Army] vulnerabilities to U.S. deception, degradation and denial capabilities," it pointed out.

U.S. officials will not share what kinds of offensive capabilities they are pursuing in unclassified settings, but they assure audiences that work is ongoing.

Beauchamp said of Russian and Chinese counterspace efforts: "We have spent the last three years

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intensely analyzing the reporting that we are getting on those programs, understanding what strengths and weaknesses they have, and keeping the steps appropriate to ensure that our systems are survivable in the face of a threat and are able to operate."

Some of the adjustments to defend U.S. systems involve practices that can be altered today, he said, while others may require changes to how the Air Force acquires systems in the future. That might mean designing future satellites to be able to move out of the way of incoming missiles.

Another of these methods may be "disaggregation," a concept that calls for space assets or capabilities to be spread out among smaller satellites or placing payloads on other spacecraft. Large satellites are seen as more vulnerable and harder to replace.

Alkire said: "There are a lot of uncertainties regarding efforts by our competitors to develop and field offensive capabilities, but I believe we should work to dissuade competitors from further developing these capabilities as part of a broader effort to ensure freedom of access to space."

As the region becomes more contested in the coming years, Alkire said space architecture may have to evolve.

That might mean creating spacecraft that are more resilient to jamming and cyber attacks, Weeden added. Conflict does not necessarily mean kinetic operations using "killer satellites" or ground-based missiles. It's more likely to be meddling: cyber attacks, signal jamming or using lasers to blind spy satellites.

"There are multiple cases of real-world operations using jamming against space capabilities in a conflict setting. There is no example that I am aware of using a kinetic attack against a satellite," Weeden said.

Systems such as GPS-III will have more robust anti-jamming capabilities. It probably won't be completely fielded until the 2030s, he noted. Meanwhile, there are military satellites in orbit that are susceptible to cyber assaults because they are orbiting with outdated computer systems.

As for communications, laser-based systems that transmit digital signals using light instead of radio frequencies are said to be close to impossible to intercept and jam and are already in limited use now, Weeden said, although it would be difficult to apply the technology in tactical communications where ground troops need to have direct satellite links.

Part of the disaggregation concept calls for hosted payloads. Government systems can piggyback on commercial or civilian orbiters. There are some 300 commercial communications satellites on orbit at any given time. That gives an adversary a dizzying array of potential targets — almost too many to figure out which to attack, Weeden said.

Alkire added: "There are many concepts under development for enhancing resiliency to adverse effects and help ensure freedom of action in space, including active and passive protection measures, reconstitution and disaggregation," he said in an email.

Reconstitution measures call for quickly replacing damaged or malfunctioning spacecraft. Also known as "operationally responsive space," one part of this concept calls for small satellites to be launched aboard rapidly deployable systems so they can at least replace some of a lost satellite's capacity.

There have been many concepts over the years for launching small satellites within days or hours. Balloons, artillery and jet fighters have all been proposed, but never found a sponsor or commercial market. The idea may be gaining traction again as launch provider Orbital ATK announced a partnership in October with start-ups Stratolaunch Systems and Vulcan Aerospace to send spacecraft weighing 1,000 pounds or less to low-Earth orbit.

Alkire noted that there are many approaches to deterring adversaries in space. "I suspect that a multi-pronged approach would be more robust and effective than a single approach, such as developing offensive capabilities in hopes of deterrence."

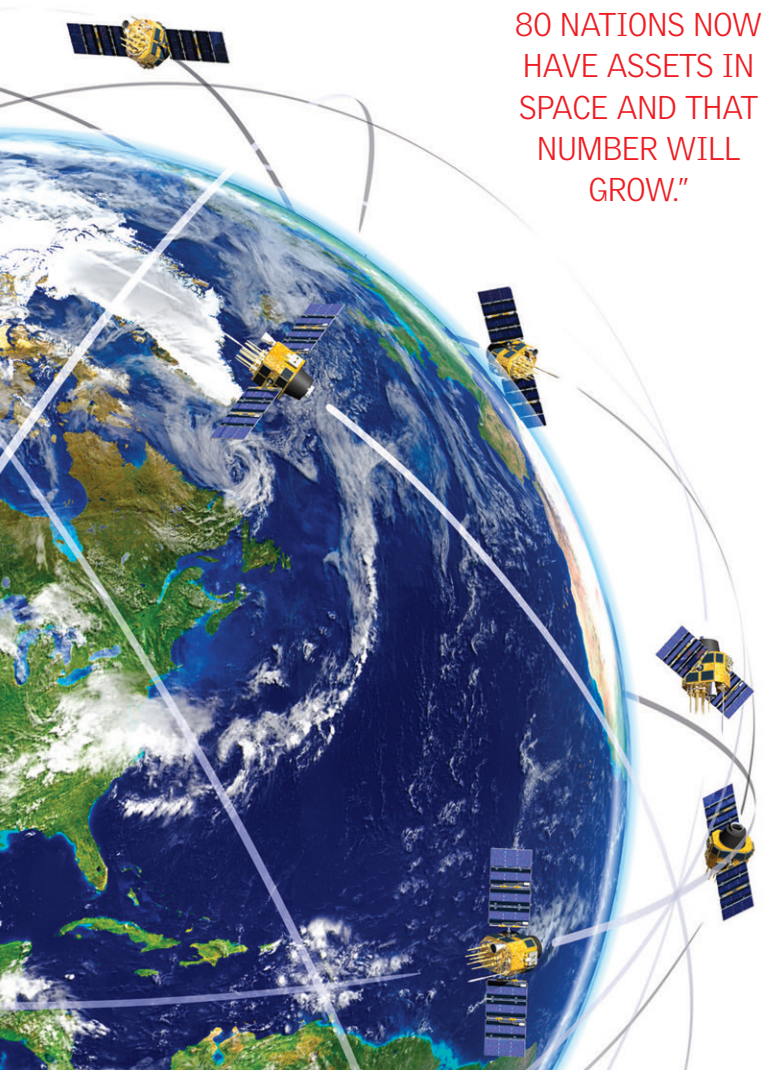
He noted that the Pentagon has proposed an increase in spending for space security and defense programs by $5.5 billion through 2020.

"There are defensive responses as well, including increasing the resiliency of our space systems to attacks in multiple domains, and training our forces to operate with degraded or denied access to space capabilities," he said.

Beauchamp added: "We have to shift our thinking from space being an enabler to space as an operational domain." ND

Email comments to smagnuson@ndia.org

"MORE THAN 80 NATIONS NOW HAVE ASSETS IN SPACE AND THAT NUMBER WILL GROW."



CLIMATE CHANGE

Extreme Environments To Require New Equipment, Tougher Ships

By Vivienne Machi

The cause of climate change may remain a contentious topic on Capitol Hill, but the Department of Defense must prepare for the challenges that rising sea levels, melting permafrost and prolonged heat waves present to operational readiness now and in the future, former military officials and security experts say.

Updated forecasting equipment, cold-weather gear and improved base protection are among the technology investments needed to combat the effects of climate change in the Arctic region, in the Asia-Pacific and on domestic and international coastal bases, experts say.

In 2015, former Defense Secretary Chuck Hagel in an op-ed in Time Magazine called climate change "a global threat multiplier" that could increase conflicts such as resource disputes, ethnic tensions and economic discontent.

"Preparing for climate change is about risk — even if we do not understand every aspect of the scientific predictions, we know that the consequences of not acting may be significant," he wrote.

The government this year released several reports that highlight the role its effects play on national and global security, and provide recommendations for new planning initiatives.

Earlier this year, the Pentagon published a directive on climate change adaptation and resilience that established policies and assigned responsibility across the department to assess and manage risks.

The department also recently released a report delivered to Congress in June called "Resourcing the Arctic Strategy," which noted where the Pentagon is making science and technology investments in the northern region. That same month, the National Intelligence Council published a white paper, "Implications for U.S. National Security of Anticipated Climate Change," that predicted where its effects are likely to pose wide-ranging security challenges over the next 20 years.

Monitoring equipment is "the biggest and most important" technology investment that the military could make to deal with the effects of climate change, said Andrew Holland, senior fellow for energy and climate at the American Security Project, a Washington, D.C.-based think tank.

"That goes to space capabilities, computer capabilities, weather satellites, predictive capabilities from weather forecasting and long-term climate forecasting," he said. "That's a significant investment that they should be making."

The Defense Department directive on climate change puts "a lot of onus" on each military base and station to conduct a risk assessment, he said. "The first step is they need to be able to predict [the risk]."

Intelligence, surveillance and reconnaissance assets and

cold-weather equipment will certainly be needed in the Arctic region, where melting ice caps and warmer oceans are opening up new opportunities for commerce and transport that countries like China and Russia are eager to seize upon. Defense officials including Chief of Naval Operations Adm. John Richardson have recently noted the growing need to focus on the region.

The Pentagon is looking to spend about $6 billion on new assets in the Arctic in fiscal year 2017, according to the department's Arctic strategy report to Congress.

That number includes developing anti-icing surfaces, testing Arctic propulsion systems and improving forecasting and prediction of sea ice, most of which would be overseen by the Navy, the report said.

After years of discussions, the Coast Guard has begun efforts to procure a new icebreaker, at an estimated cost of $1 billion. The service currently only has two such ships — the Polar Star and the Healy — in operation, while other countries have made significant investments in their icebreaker programs.

Other possible areas of investment include ice-hardening equipment for ships, weapons that can fire reliably in extreme weather conditions and new cold-weather gear for sailors, Holland said.

"You'll need things as simple as gloves that allow you to have full and complete range of motion," he said.

The Navy will need to protect propellers and rudders against ice, or develop new techniques to deal with freezing sea spray in a big storm, said retired Rear Adm. David Titley, a meteorology professor and director of the Center for Solutions to Weather and Climate Change at Pennsylvania State University.

"Right now, the Navy method of getting rid of the ice is a bunch of junior seamen out there with hammers and mallets, knocking the ice off," he said.

ISR technology will play an important role when a commanding officer needs to know where fresh ice may be lying in wait, Titley said. Maritime surveillance aircraft like the P-3 Orion or P-8 Poseidon, or an unmanned aerial vehicle could be useful, he said. The "Resourcing the Arctic Strategy" report recommends over $460 million to invest across the services in improved surveillance, enhanced communications and next-generation radar systems for the polar region.

Military personnel at home and abroad will need to contend with risks caused by rising sea levels.

"THE PENTAGON IS LOOKING TO SPEND ABOUT $6 BILLION ON NEW ASSETS IN THE ARCTIC IN FISCAL YEAR 2017."

The Center for Climate and Security, a Washington, D.C.-based think tank, recently released a report on the impact of sea level rise on the U.S. military. The report's authors — all retired military personnel — found that the domestic and international coastal bases face significant risks from sea level rise that could eventually impact readiness, operations and national security strategy.

"The complex relationship between sea level rise, storm surge and global readiness and responsiveness must be explored down to the operational level, across the services and joint forces, and up to a strategic level as well," the report's summary read.

Francesco Femia, president of the Center for Climate and Security, said the report looked at a range of sea level rise possibilities through 2035, and found that the impact "is only going to get worse."

"That is certainly the climate-related phenomenon that the U.S. military is concerned about over the next 10 years," he said.

Sea level rise could impact the military readiness of service

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An aerial view shows the effects of flooding in Valley Park, Missouri.

members stationed at coastline military bases, Titley said. If a Navy base is flooded, personnel can't train properly.

"When we train our people, they're being done on a schedule, and they have to be ready by a certain date," he said. "It's a whole chain of how we go from units that can keep themselves safe, all the way to combat readiness forces, and the bases are absolutely critical to that."

Looking at how sea level rise will affect military bases is not as easy as saying, the global sea level will rise an inch or two, because the seas won't all rise at the same rate around the world, Holland noted.

"Some predictions say that the American East Coast will see higher levels than other places around the world," he said.

An example is the Hampton Roads region of Virginia, where the world's largest naval station is located. Norfolk has become "the poster child" of the impact rising sea levels could have on military bases, Titley said. The Naval Support Facility Diego Garcia in the Indian Ocean is another example, he said.

That means Norfolk and other coastal bases will have to improve their sea walls, or invest in more adaptive and resilient protections, Holland said. Wetlands and marsh areas can act as natural sponges and slow the speed of flood waters. Naval Station Norfolk officials did not respond to interview requests.

Hotter temperatures in the United States can impact how often or thoroughly servicemembers are trained on base, Titley said. If a base has an excessive number of "black flag days" where troops can't train to full exertion, that can have a negative impact on their readiness when they are deployed to hot climates, such as the Middle East or Africa.

If a base in California chooses to cancel training for the day because the weather is too hot outside, that affects how prepared a soldier could be for a similar climate in Iraq, Holland said.

"You can't choose not to go into battle because it's too hot today," Holland said. Lighter body armor will be a necessary investment, he said.

"I had a buddy who spent a year in Iraq, and he said they outfit you with so much stuff, and are telling you to go out in 120 degrees and do things when it's hard enough just to think, and you're trying to drink enough water to make it through the patrol," he said.

The Army has been investing in lighter body armor materials and new technology like the soldier protective system, which aims to achieve at least a 10 percent weight reduction. Academic institutions are also developing lighter armor prototypes, as is the rapid reaction technology office, which is housed under the deputy assistant secretary of defense for emerging capability and prototyping.

More frequent periods of severe drought, significant fires or chronic smoke conditions will also impact how the services operate fire support, especially in bases in California or Alaska, Titley said.

Disaster response and humanitarian assistance are areas that could see more demand as warming ocean temperatures cause more frequent and intense tropical storms in areas like the Caribbean and the Asia-Pacific, experts said.

"Just about every major exercise we do with other countries now has some HADR [humanitarian assistance and disaster relief] exercises, which is pretty new. It used to be kind of an ad-hoc thing," Holland said.

U.S. Pacific Command is working to implement guidance from the office of the secretary of defense on climate change, especially in the disaster relief area "as Pacific storm seasons intensify and low-lying islands face significant impacts," said Navy Cmdr. Dave Benham, a spokesman for Pacom.

New technology may not be the whole answer, however. Better planning and more risk management could give military leaders more time to consider where to make long-term changes, at a lower cost than acquiring new equipment, said Army Lt. Col. James Brindle, a Defense Department spokesman.

Areas where planning could be improved include disaster relief, emergency response, weapon system acquisition, theater campaign and installation master planning, he said in an email.

"We need to build resiliency into our efforts to adapt to a 'normal' that will continue to change over time," he said. "Climate is not stationary and neither is national security."

The Defense Department is working with the office of science and technology policy, and the interagency science and technology community through the department's research and engineering organizations to bring a "whole of government approach" to identifying technology needs and how they may be satisfied, he said.

"Preparing for climate change, it's actually not as much about the equipment; it's about the mindset," Holland said. "It requires foresight and thinking and planning." **ND**

Email comments to vmachi@ndia.org

DEFENSE DEPT.

Women In Defense Announces 2016 HORIZONS Scholarship Recipients

Through its HORIZONS scholarship program, Women In Defense offers scholarships to female students in undergraduate or graduate programs related to international relations, political science, national security and defense.

The 2016 recipients, their schools and field of study are as follows: Elisabeth Whitbeck, Harvard University John F. Kennedy School of Government, national security policy; Kathryn Morisy, Johns Hopkins University School of Advanced International Studies, strategic studies and international economics; Linnea Johnson, George Washington University, data science; Lindsay Gabbert, Pennsylvania State University, homeland security/agricultural biosecurity, food defense; and Hannah Lyness, Carnegie Mellon University, robotics.

"We congratulate this year's scholars and look forward to following them as they prepare to serve in defense and national security," said René Carbone Bardorf, WID executive director and chief communications officer for NDIA. "Furthering one's education in national security studies not only shapes an individual's understanding of our nation's values, interests and challenges, but it strengthens their character and dedication to a higher calling."

Past HORIZONS recipients have secured careers in the State and Defense Departments as well as organizations like BAE Systems, Booz Allen Hamilton, Goldman Sachs, RAND Corp. and SAIC.

National Defense Industrial Association affiliate Women In Defense took part in America's Warrior Partnership's Warrior Community Integration Symposium, which was held in September in Atlanta, Georgia.

René Carbone Bardorf, WID executive director and chief communications officer at NDIA, moderated a panel on "The Force of Women," which examined the opportunities and challenges associated with military service and post-service life. America's Warrior Partnership is a collaborative organization committed to supporting, mentoring and improving community services to empower warriors.

Panel participants from left to right were: Col. Erika Cashin, Lean In; Rene Bardorf, NDIA; Kate Germano, Service Women's Action Network; Dr. Jacqueline Maffucci, Iraq and Afghanistan Veterans of America; retired Army Capt. Leslie Smith, Department of Veterans Affairs advisory committee on women veterans.

Georgia Chapter Tours Meggitt Training Systems

Meggitt Training Systems in Suwanee, Georgia, hosted a tour of its facilities Sept. 20 for the National Defense Industrial Association-Georgia Chapter. Meggitt Training Systems produces a full spectrum of range and virtual training systems for the military, law enforcement, federal agencies and commercial operations.

The company recently completed the system verification test and site operational test for the Army's next-generation small-arms trainers, obtaining certification as the program of record for Army small-arms training. Completion of these tests confirms that Meggitt has met all requirements set forth by the Army's program executive office for simulation, training and instrumentation to deliver the Engagement Skills Trainer II system to active U.S. Army, National Guard and Reserve units worldwide.

Meggitt Training Systems is an NDIA corporate member and a Gold Sponsor of the NDIA-GA Chapter.

McKinley Presents Small Business Award to Gronberg

NDIA President and CEO retired Air Force Gen. Craig McKinley on Sept. 29 presented the Kathleen P. Sridhar Small Business Executive of the Year Award to Jeffery Gronberg, president of deciBel Research.

Under Gronberg's leadership, deciBel Research has grown to one of the most successful and highly regarded defense contractors in the small business area, and has been recognized by Inc. magazine as one of the top fastest growing private companies.

The award is presented in recognition of the late Dr. Kathleen Sridhar, who founded and served as the president of INDUS Technology Inc.

The award was presented to Gronberg during a ceremony at the 2016 NDIA Tennessee Valley Chapter awards dinner in Huntsville, Alabama.

NDIA Calendar

NOVEMBER

1 Army Cyber Innovation Challenge V
Orlando, FL
www.afei.org/events/7A30

1-2 Gulf Coast Chapter 42nd Air Armament Symposium
Fort Walton Beach, FL
www.ndiagulfcoast.com

2-3 How Washington Works® – Navigating the DOD
Reston, VA
www.ndia.org/meetings/743A

3 Picatinny Chapter Annual 36th Firepower Awards Luncheon
Randolph, NJ
http://www.ndiapicatinny.com/

8-10 Aircraft Survivability Symposium 2016
Monterey, CA
www.ndia.org/meetings/7940
See our ad on p. 42

10 CyberForwardDC
McLean, VA
www.cyberforwarddc.org
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14-16 2016 Joint Annual NDIA/AIA Fall Industrial Security Committee Conference
San Antonio, TX
www.ndia.org/meetings/7ISF

15 Cybersecurity For Advanced Manufacturing Workshop
DETAILS COMING SOON
Arlington, VA
www.ndia.org/meetings/787J

28-Dec 2 I/ITSEC 2016
Orlando, FL
www.iitsec.org
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DECEMBER

1 S&ET Executive Breakfast Featuring Dr. Melissa Flagg, Deputy Assistant Secretary of Defense for Research
Washington, DC
www.ndia.org/meetings/772B

6 Combating Terrorism Technical Support Office (CTTSO) APBI
NEW LOCATION
San Jose, CA
www.ndia.org/meetings/7090
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6-8 Security Cooperation Management Course for Industry (DISAM)
Washington, DC
www.ndia.org/meetings/7625

7 Executive National Security Forum: Reforming the Security Cooperation Enterprise
Washington, DC
https://7ld1.eventbrite.com/

8 NDIA Robotics Division Quarterly Meeting
Arlington, VA
www.ndia.org/meetings/738A

13-14 NDIA Mastering Business Development Workshop
Los Angeles, CA
www.ndia.org/meetings/707A
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FEBRUARY '17

7-8 NDIA Mastering Business Development Workshop
St. Petersburg, FL
www.ndia.org/meetings/707B

9 714S - TRIAD
Orlando, FL
www.ndia.org/meetings/714S

13-16 28th Annual SO/LIC Symposium & Exhibition
Bethesda North Marriott Hotel & Conference Center
North Bethesda, MD
www.ndia.org/meetings/7880
See our ad on p. 43

20-23 NDIA Gulf Coast Chapter International Air to Ground Symposium
Miramar Beach, FL
www.ndia.org/meetings/C100

MARCH '17

6-8 32nd Annual National Test and Evaluation Conference
San Diego, CA
www.ndia.org/meetings/7910

6-10 Pacific Operational Science & Technology Conference
Honolulu, HI

7-8 2017 Human Systems Conference
Springfield, VA
www.ndia.org/meetings/7350
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7-8 Michigan Chapter Cybersecurity: Defense Sector Summit
www.ndia-mich.org/

21-23 NDIA Ground Robotics Capabilities Conference & Exhibition
Springfield, VA
www.ndia.org/meetings/7380

24 Greater Los Angeles Chapter 67th Annual West Coast Dinner & Acquisition Forum
www.ndia-lachapter.org/

26-27 Michigan Chapter Defense Exposition (MDEX)
www.ndia-mich.org/

27-29 Munitions Executive Summit
Parsippany, NJ
www.ndia.org/meetings/7650

28 Michigan Chapter Membership Social
www.ndia-mich.org/

28-29 Precision Strike Annual Programs Review (PSAR-17)
Springfield, VA
www.precisionstrike.org/Events/7PPR/7PPR.html

APRIL '17

7 Michigan Chapter ROTC Awards Banquet
www.ndia-mich.org/

19-20 33rd Annual National Logistics Forum
Tampa, FL
www.ndia.org/meetings/7730

MAY '17

1-4 2017 Joint Service Power Expo
Virginia Beach, VA
www.ndia.org/meetings/7670

1-4 2017 Armament Systems Forum
Fredericksburg, VA
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9-11 60th Annual Fuze Conference
Cincinnati, OH
www.ndia.org/meetings/7560

15-17 2017 Tactical Wheeled Vehicles Conference
Reston, VA
www.ndia.org/meetings/7530

22-24 2017 Joint Annual NDIA/AIA Industrial Security Committee Spring Conference
Scottsdale, AZ

JULY '17

21 Michigan Chapter Annual Dinner Meeting
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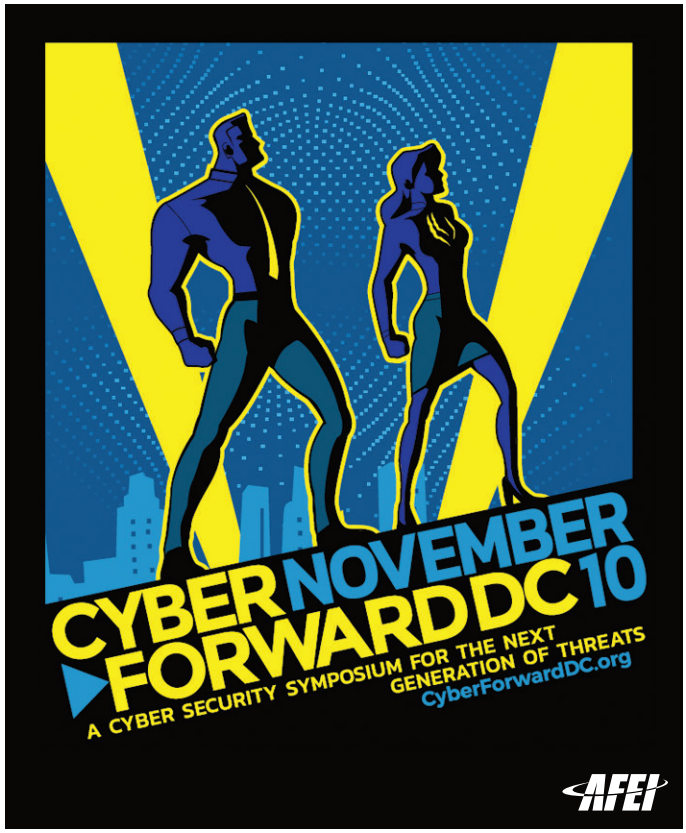

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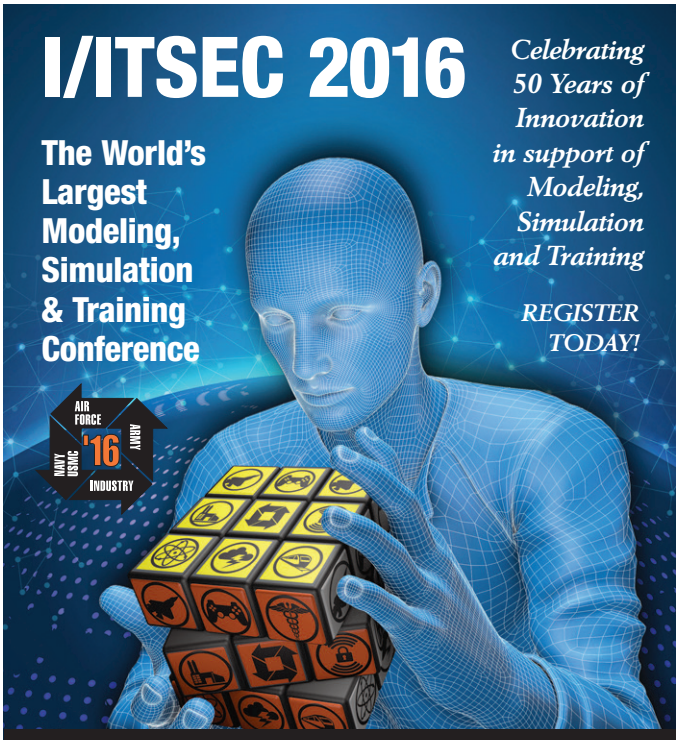

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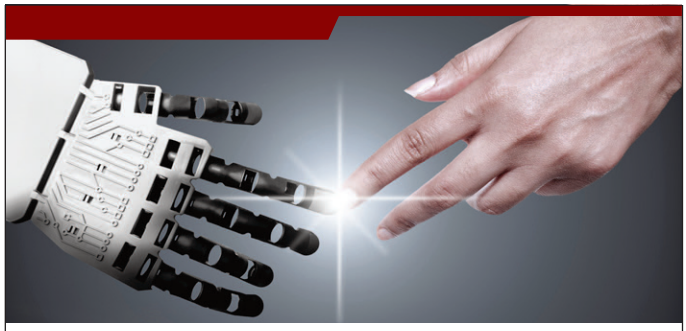

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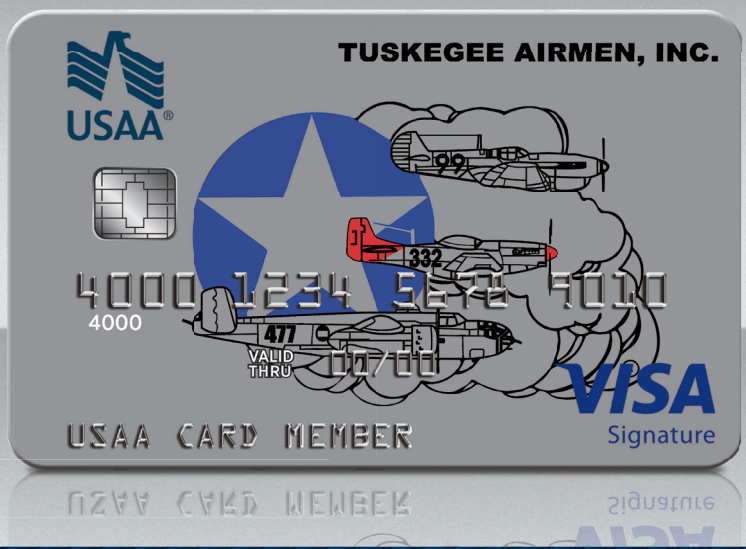

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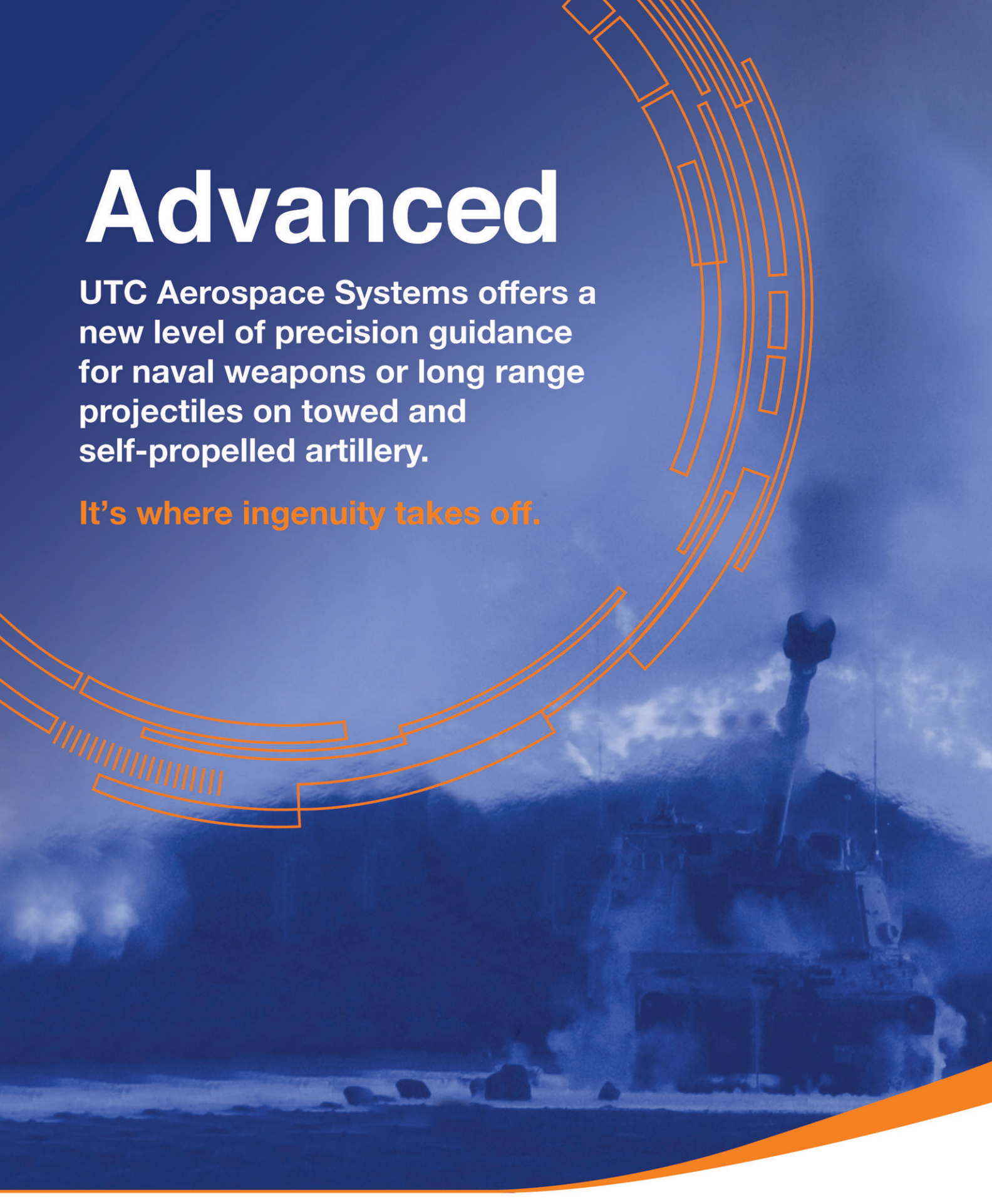

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