

DARPA Pioneers Tactical Mobile Devices for Soldiers

AMERICAN FORCES PRESS SERVICE (DEC. 11, 2013)

Cheryl Pellerin

WASHINGTON—For the first time in any war, U.S. soldiers on foot patrol across Afghanistan can use secure mobile handheld devices and infantry-tailored apps to access digital maps, set up and share routes, execute sudden mission changes, and store critical information for use back inside the wire.

The capability, established step by exacting step over three years by experts at the Defense Advanced Research Projects Agency and with feedback from soldiers themselves, is the work of a program called Transformative Applications.

TransApps made possible the connection to a network over secure military radios of these hardened Android smartphones or tablets. A set of mission-planning tools can overlay user-defined data directly onto high-resolution digital maps already on the Android devices.

Dismounted patrols and company intelligence support teams are key users of the devices, which include custom-modified Android operating systems and Linux kernels, as well as security-stack-supporting data-at-rest protection, data-in-transit protection, authentication, and app vetting and control, DARPA officials said.

The TransApps program seeks to develop a library of secure military applications that are as easy to use as commercial smartphone apps and that troops can access on their military mobile devices. The program also wants to establish a business model for the apps that bypasses bureaucratic delays in acquiring and fielding new technology.

Doran Michels, DARPA's TransApps program manager, briefed reporters about the program during a Dec. 3 teleconference. A major DARPA effort in the program began in 2010, when smartphones were proliferating in the commercial sector, he said.

The agency wanted to "see if it would be feasible to leverage these commercial products to address the enduring situational awareness capability gap" between higher military echelons, he said, who during wars had increasingly impressive intelligence, surveillance and reconnaissance capabilities inside the wire, while ground troops outside the wire had few tools for sharing information or understanding their battlefield environment.

As a hardware platform, DARPA chose Android devices, which operate on an open system they could modify for their needs, Michels said.

"The first thing we needed to do to modify the devices was to address strict security requirements that are inherent to taking mission content to the battlefield, ... and many of the approved mechanisms for securing mobile devices don't apply in a battlefield environment," he added.

The practice of mobile device management assumes the network always will be available and the devices always will be on the network, Michels said, so the devices can be actively managed for security. "But in a tactical environment, soldiers are routinely without comms or they're in a patchy comms environment," he added, "so we needed security to be resident on the devices."

Also in that environment, he explained, high-resolution digital maps can't be downloaded in real time, so they must be resident and already configured on the handheld devices.

When soldiers do connect to a network, Michels said, it's not over commercial wifi or cellular. "It's over secure military radios," he explained, "so we had to make sure that we could adapt to those waveforms and also constrain our data throughput appropriately."

Most importantly, the program had to respond to soldier requirements, he said. "We wanted soldiers to drive the development of the applications so we knew the apps could evolve in real time with dynamic mission requirements," Michels said.

In 2011, the TransApps team began working with an infantry company, making apps based on their requirements. Initially, the soldiers wanted apps focused on high-resolution map imagery in the palms of their hands, Michels said, with interactive features that could help them navigate or follow their mission plans or track environmental elements.

"Once we had done that, the next thing they wanted was to be able to interact with the maps in a more complex way," the program manager said. "We saw that the handhelds made great collection platforms during their mission, and ... they wanted to be able to recompile critical elements of the mission and get those back into the system so other people could benefit."

Over a period of months, the team created apps tailored for infantry soldiers. Once they had a suite of apps in fairly high demand, they scaled up quickly, Michels said, growing from

enough apps for a company to enough for a battalion to enough for a brigade, and then enough for all brigades in Afghanistan.

Over 18 months, the program went from zero to 3,000 users, he added, supporting the entire Army in Afghanistan.

“While we were scaling, we weren’t just propagating out the capability that we’d established,” the program manager said. “We were actually improving it in real time as we went, so it was growing and getting better.”

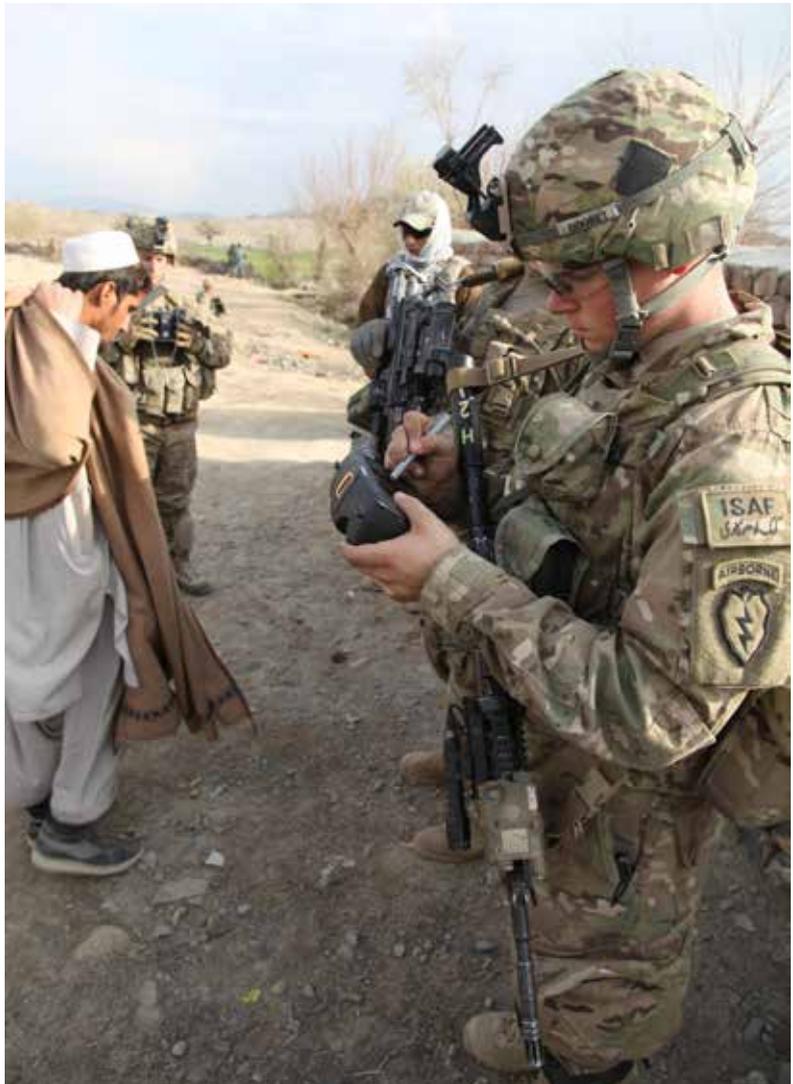
The suite now includes more than 50 applications and is growing, Michels said, adding that the team recently created an app in partnership with the National Park Service called SMART Triage. The app lets unit-level medics or first responders quickly document first aid for injured personnel, especially in a mass-casualty catastrophe, to effectively and accurately log injuries and treatments.

SMART Triage uses a 3-D mannequin that can be manipulated and marked up with injuries and annotated with things such as medications given, he said.

Another app, called TransHeat, has custom algorithms built in just for soldiers. The algorithms passively process travel routes and let the soldiers know by turning the routes different colors how often they’ve used each route, Michels explained. The app can help the soldiers take different routes and avoid becoming victims of roadside bombers or ambushes.

“Imagine having access to a developer who supported your organization and you could say, ‘Would you consider making a feature that can give me this output?’ And we try to be very responsive to that for soldiers. We understand that change is kind of a permanent element in their environment,” the program manager said.

Even for DARPA, populating what Michels calls the “very new landscape” of tactical mobile with processes and standards for battlefield-ready security mechanisms, exchanging high-resolution digital imagery and many other leading-edge elements can be a solitary undertaking.



An International Security Assistance Force soldier on patrol in a remote forward location in Afghanistan uses a secure mobile handheld device.

Photo courtesy Defense Advanced Research Projects Agency

“A lot of people tend to think that security for mobile is a given. We look at corollaries in enterprise [computing] where ... we’ve got mobile device management,” Michels said, adding that there were no maps for creating offline security for the handheld devices TransApps worked with.

“We had to develop a multi-tier solution that was very robust, ... and it’s actually a very popular solution now that has been adopted by a number of other organizations within DoD and the federal government,” he said.

Mobile device management, as it is known today and used in enterprise computing for the kind of mobile devices used

by the Defense Department's workforce, for example, is not possible in a tactical environment, the program manager added. In the tactical model, he said, "networks, if they exist, may be unreliable or controlled by the adversary. Networking over military radios requires special adaptation, and many users' handheld devices are often offline for weeks despite constant use in a standalone mode," Michels said.

"The enterprise device's security comes from the network, but the security of the tactical device must reside within [the device] organically," he added. "The two paradigms can't converge until a secure, reliable wireless network exists for tactical environments."

The TransApps team had to create its own process and promote a governmentwide standard to support the capability it needs on the handheld devices for high-resolution digital imagery, which for tactical mobile can't be pushed over a network, as is done in the consumer world, Michels said.

On one side of the problem are many high-resolution imagery products that are current and critically needed, he explained. On the other side is the operational community that relies on such products for survival and mission effectiveness.

In between is a chasm where the imagery products, collected by different platforms, have no fluid mechanisms by which to migrate quickly from the producers to the user community, he said.

During a recent meeting called the Mobile Imagery Technical Exchange, community members and stakeholders discussed this and other challenges related to sharing imagery. Attendees included representatives from DARPA, the Army Geospatial Center, the Naval Research Laboratory, the National Geospatial-Intelligence Agency and others, Michels said.

"We have a number of excellent relationships now with organizations like the AGC, NGA and NRL," he added, "and we would not have been successful without these thriving partnerships."

Today, Michels said, DARPA's focus is on transition.

"DARPA wants meaningful capabilities to be the yield here," he added. "All the Services are pursuing tactical mobile capabilities. So we spend a lot of time working with those partners and within their organizational and funding constraints to figure out how they can leverage what DARPA has achieved."

DARPA Takes Robots to Disaster Mitigation Trials

AMERICAN FORCES PRESS SERVICE (DEC. 12, 2013)

Cheryl Pellerin

WASHINGTON—Next week, 17 teams will take their multi-limbed, capable-looking robots through eight realistic disaster-response tasks that will make up the Defense Advanced Research Projects Agency's Robotics Challenge Trials Dec. 21-22 at Florida's Homestead-Miami Speedway.

The best performers will determine the baseline for the state of robotics, Dr. Gill Pratt, DARPA's Robotics Challenge program manager, said during a recent teleconference. And DARPA will fund up to eight of the highest scoring teams for another year as they move on to the DRC Finals in 2014, after which one team will receive a \$2 million prize.

"The purpose of the program is to develop technology that can help make us much more robust to natural and man-made disasters," Pratt explained.

"In particular," he added, "we're looking at robotic technology that can allow us to mitigate the extent of a disaster during the first hours and days while the disaster is still unfolding."

DARPA was directly inspired to create the program by the 2011 accident at Japan's Fukushima Daiichi nuclear power station, Pratt said, which was caused when an earthquake and tsunami knocked out backup power systems needed to cool the plant's reactors, causing three of them to undergo fuel melting, hydrogen explosions, and radioactive releases.

"During the first 24 hours there," he said, "if only human beings had been able to go into the reactor buildings and vent built-up gas that was accumulating inside the reactors, the explosions that occurred might have been prevented and the disaster would not have been as severe."

That's just one example, Pratt added.

"We don't know what the next disaster will be, so the technology we're trying to develop [will] allow human beings and robots working together to have an effect on evolving disasters in environments that are too dangerous for human beings to go into by themselves," he said.

DARPA is trying to improve robotic mobility and dexterity to achieve the following goals for disaster-response robots, Pratt said:

- The robots have to work in environments that are engineered for people, including environments that are degraded by an evolving disaster;

- The robots have to be able to use human tools, everything from screwdrivers to fire trucks that may be available in the disaster area; and
- The robots must have an improved human-to-robot interface to reduce the amount of training needed by personnel who are experts in handling disasters but not necessarily in handling robots.

“We started the program with over 100 teams and had a first event in June that was a virtual robotics challenge held in simulation,” Pratt said. Since then and through several design reviews, DARPA has narrowed the field to 17.

DARPA is funding 13 of the 17 teams, and four teams are funding their own work, the program manager said. Part of the funding includes a high-mobility humanoid robot called Atlas. It’s funded by the Defense Department and built by Boston Dynamics, an engineering company that began as a spinoff of the Massachusetts Institute of Technology.

The teams represent five countries and organizations that range from large and small businesses, and hardware and software firms to universities and government agencies like NASA, which has two teams participating in the trials.

Each of the eight tasks the robots must perform has a couple of steps. The first task is to drive a utility vehicle over a short course that requires turning, then the robot must get out of the vehicle and walk, Pratt said. Second is to travel over rough terrain that goes from easy to medium to hard. Third is to move rubble from in front of a doorway and go through the door.

The fourth task is to walk through three successively more difficult-to-open doors. Fifth is to climb a ladder. Sixth is to go to a wall, pick up a tool and use it to cut an access hole through the wall without damaging infrastructure drawn on the wall. Seventh is to find three valves and close them. Eighth is to pull a fire hose a short distance and connect it to a standpipe.

The DARPA Robotics Challenge Trials are free and open to the public—a public whose experience with robots may tend toward science fiction, Pratt worries, like the Terminator and R2D2, or lately even the Almost Human MX-263 combat-model android. And what will the public see next week at the Miami-Homestead Speedway?

Not all of the robots will be able to do every task, Pratt explained. Even those that can do most tasks will be getting a lot of help from their human operators. And the robots will be slow, he said.



Atlas is a high-mobility humanoid robot funded by the Defense Department and built by Boston Dynamics, an engineering company that began as a spinoff of the Massachusetts Institute of Technology. The robot is designed to negotiate rough outdoor terrain. Atlas is powered from an off-board electric power supply through a flexible tether, and its articulated sensor head includes stereo cameras and a laser range finder. Several copies of the robot are being provided as government-furnished equipment for the Defense Advanced Research Projects Agency’s Robotics Challenge program.

Photo courtesy Defense Advanced Research Projects Agency

"Right now, where we are is that robots are roughly at the same level of mobility and dexterity as a one-year-old child," Pratt said, adding that each robot will have 30 minutes to do each of the eight tasks.

"What we're doing with the DRC trials is we're getting a calibration point," he said. "We're trying to understand the state of the art of the field."

Today, Pratt said, real robots for the most part either work in or on stationary bases in factories doing very clearly defined repetitive tasks or they are used in laboratories in schools in controlled environments. If robots are used outdoors they're typically run through something called teleoperation, where a person dictates every move the robot makes each tenth of a second or more.

"We're trying to advance that technology and move things from teleoperation to something known as task-level autonomy, where rather than 'Move forward a tenth of an inch, move left a tenth of an inch,' you tell the robot, 'Open that door,' and the robot perceives the handle on the door, reaches out, turns the handle and opens the door."

Pratt said that's the level of supervision he and others believe will be most effective for people and disaster-response robots to use to interact with each other.

Based on DARPA's experience with its 2004 Grand Challenge for driverless vehicles, the program manager said robots that qualify for the 2014 DARPA Robotic Challenge Finals in 2014 should be much more capable than this year's contenders.

"Let me paint a picture of where we hope we'll get to," Pratt said.

Take the eight tasks from this year's trials—going through doors, going up the ladder, moving rubble out of the way — and imagine mixing the tasks into a single mission the robot must complete, he said.

"Let's say we have a site that is a mockup of a disaster and ... we give the robot a task: go rescue a person—actually a dummy—who's hidden under a pile of rocks," Pratt said. "To get to the pile of rocks there are ladders in the way, there are rubble fields, there are vehicles it can use."

The desire is to physically emulate such a scenario roughly a year from now, and to have human beings in a remote location, able to control the robot over a degraded communication link, he said.

Pratt said DARPA is also focusing beyond search and rescue on operations that can help mediate disasters—for example, if there is a chemical leak in a factory and the chemicals are too corrosive for people to deal with.

"One possibility is putting people inside protective suits, but that only works for a very short time until oxygen runs out or it gets too hot," he said. "A better idea is to separate the robot from the human being, have the person in a safe place and, despite having a bad communication level, allow the robot to do what a person in a suit would have done."

Pratt added, "That's our goal. How far we'll get, we don't know. Part of the purpose of the trials is to calibrate us as to where the field is now so we can design the finals to be a just-hard-enough test."

Air Force Leader Outlines Joint Strike Fighter's Value

AMERICAN FORCES PRESS SERVICE (DEC. 13, 2013)

Jim Garamone

WASHINGTON—On the day that Lockheed-Martin delivered its 100th F-35 Lightning II joint strike fighter to the Air Force, the Service's leaders today marked the milestone and outlined the aircraft's value.

The F-35 will be delivered to Luke Air Force Base, Ariz., where it will serve as the first training aircraft for pilots of the fifth-generation fighter.

Air Force Chief of Staff Gen. Mark A. Welsh III called the event "a big deal for the Air Force" during a Pentagon news conference this morning.

Welsh discussed the Service's need for the Lightning II, a need that became even more acute, he said, after the Defense Department truncated the total buy of F-22 Raptor fighters.

The F-22 was to provide theaterwide air superiority, the general said. But with too few F-22s to provide this umbrella, F-35s must pick up the slack. "You have to have the F-35 to augment the F-22 to do the air superiority fight at the beginning of a high-end conflict to survive against the fifth-generation threats we believe will be in the world at that point in time," he said.

Even with upgrades, Welsh said, current air superiority fighters—F-15 Eagles and F-16 Fighting Falcons—cannot survive against a fifth-generation threat.

"Operationally, it's just a fact," he added. "I am certainly not willing to go to my secretary or the secretary of defense or

to the chairman [of the Joint Chiefs of Staff] and say, 'I would recommend that we keep our old equipment and update it, and just accept more losses and count on the incredible ability of our aviators to win the fight anyway.'"

The joint strike fighter program is the most expensive in American military history. The Air Force will fly the F-35A variant, the Navy will fly the F-35C, and the Marine Corps will fly the F-35B. The initial operating capability for the Air Force is set for December 2016.

The program has had growing pains. Costs have risen, and the flyaway cost for the Air Force version is around \$150 million per aircraft.

But now, the production rate for the aircraft is rising and production costs are dropping, Welsh said. "Since 2011, the program has met milestones consistently," the general said.

"We have allies buying into the program and committing to purchasing aircraft, which will keep being more and more of a financial benefit for us over time."

Welsh said now is not the time to cut the joint strike fighter program.

"I don't believe this is a good time to talk about truncating the buy—capping it at some number," he said. "I think that will put the program at risk of financially costing us even more."

DoD Looks 25 Years Ahead in Unmanned Vehicle Roadmap

AMERICAN FORCES PRESS SERVICE (DEC. 23, 2013)

Jim Garamone

WASHINGTON—Strategy and budget realities are two aspects of the Defense Department's new Unmanned Systems Integrated Roadmap, released today.

The report to Congress is an attempt to chart how unmanned systems fit into the defense of the nation.



Air Force Chief of Staff Gen. Mark A. Welsh III discusses the future of the Air Force and the delivery of the 100th F-35 Lightning II joint strike fighter to the Air Force during a news conference at the Pentagon, Dec. 13, 2013.

DoD photo by Erin A. Kirk-Cuomo

"The 2013 Unmanned Systems Integrated Roadmap articulates a vision and strategy for the continued development, production, test, training, operation, and sustainment of unmanned systems technology across DoD," said Dyke Weatherington, the director of the unmanned warfare and intelligence, surveillance and reconnaissance office at the Pentagon.

"This road map establishes a technological vision for the next 25 years and outlines the actions and technologies for DoD and industry to pursue, to intelligently and affordably align with this vision," he continued.

Unmanned aerial vehicles have received the most press, but unmanned underwater vehicles and ground vehicles are also providing warfighters with incredible capabilities.

Although unmanned vehicles have proved their worth in combat operations throughout the Middle East and Central Asia, current technologies must be expanded and integrated into the sinews of the defense establishment, the report says.

It also calls for unmanned systems to be programs of record in order to achieve “the levels of effectiveness, efficiency, affordability, commonality, interoperability, integration, and other key parameters needed to meet future operational requirements.”

Of course, all DoD programs have to face the reality of the budget crunch. “Achieving affordable and cost-effective technical solutions is imperative in this fiscally constrained environment,” the report notes.

Strategy really drives the technology. Unmanned systems will be crucial as the U.S. military shifts its focus to the Asia-Pacific region and puts the air-sea doctrine into effect. In the future, unmanned vehicles will be required to operate in more complex environments involving difficult weather, terrain, distance, and airspace. All this will require extensive coordination with allies and host nations, the report says.

“The road map describes the challenges of logistics and sustainment, training, and international cooperation while providing insight on the strategic planning and policy, capability needs, technology development, and operational environments relevant to the spectrum of unmanned systems,” Weatherington said.

SOCOM Leads Development of ‘Iron Man’ Suit

AMERICAN FORCES PRESS SERVICE (DEC. 31, 2013)

Donna Miles

WASHINGTON—U.S. Special Operations Command is Using unprecedented outreach and collaboration to develop what its commander hopes will be revolutionary capabilities: a suit that’s been likened to the one worn by the “Iron Man” movies superhero that offers operators better protection, enhanced performance, and improved situational awareness.



Members of the Unmanned Underwater Vehicle (UUV) detachment, Commander, Task Group 56.1, guide a UUV as it is lowered into the water off the coast of Bahrain, June 5, 2013.

U.S. Navy photo by Mass Communication Specialist 1st Class Peter Lewis

The Tactical Assault Light Operator Suit, or TALOS, is the vision of Navy Adm. William H. McRaven, SOCOM’s commander. He challenged industry and defense representatives at a SOCOM conference in May to come up with the concepts and technologies to make the suit a reality.

Exactly what capabilities the TALOS will deliver is not yet clear, explained Michael Fieldson, SOCOM’s TALOS project manager. The goal is to provide operators lighter, more efficient full-body ballistics protection and super-human strength. Antennas and computers embedded into the suit will increase the wearer’s situational awareness by providing user-friendly and real-time battlefield information.

Integrated heaters and coolers will regulate the temperature inside the suit. Embedded sensors will monitor the operator’s core body temperature, skin temperature, heart rate, body position, and hydration levels. In the event that the operator is wounded, the suit could feasibly start administering the first life-saving oxygen or hemorrhage controls. Fieldson admitted that the analogy to the suit that the Tony Stark character wore in the “Iron Man” movies may be a bit of a stretch. The TALOS, for example, isn’t expected to fly.

But beyond that, there's little that Fieldson—or anyone else at SOCOM—is ready to rule out.

In a departure from past practices of introducing new products piecemeal, adding bulk and weight to operators' kit, the TALOS will be a fully integrated "system of systems," Fieldson said. To offset the weight of computers, sensors, and armor that make up the suit, operators will have an exoskeleton—a mechanism that carries the brunt of the load.

"The intent is to have this fully integrated system so you can provide the most capability at the lowest impact to the soldier," Fieldson said. "We think there is some efficiency to be gained if all the equipment is fully integrated as opposed to different components that are simply assembled on the human."

Keeping the systems and the exoskeleton powered will require more than today's batteries can deliver. So along with the TALOS technologies, SOCOM is calling on the scientific and technical community to come up with reliable and portable power sources.

"We are really looking at stretching the bounds of science and technology," Fieldson said.

That's led SOCOM to reach out to partners within DoD as well as industry and academia for help in pushing today's technological limits.

The command is working with the Defense Advanced Research Projects Agency, as well as U.S. Army Natick Soldier Research, Development and Engineering Center and the U.S. Army Research, Development and Engineering Command, among other DoD organizations, to tap into projects already underway.

DARPA, for example, is making headway on its Warrior Web project, designed to boost troops' stamina and carrying capacity without sacrificing speed or agility. The concept includes a lightweight undersuit that would augment the efforts of the wearer's own muscles.



"Many of the individual technologies currently under development show real promise to reduce injury and fatigue, and improve endurance," said Army Lt. Col. Joseph Hitt, DARPA's Warrior Web program manager. "Now we're aiming to combine them—and hopefully some new ones, too—into a single system that nearly every soldier could wear and would provide decisive benefits under real-world conditions."

The Natick lab is busy identifying high-technology armor and mobility technologies with plans to integrate them into a first-generation TALOS system ready for demonstration by the end of June, reported Greg Kanagaki, project engineer for Natick's Unmanned Equipment and Human Augmentation Systems Team.

Natick personnel also are serving as subject-matter experts for the TALOS project, particularly in the areas of mobility, human performance, and thermal management, Kanagaki said.

Meanwhile, officials at the U.S. Army Research, Development and Engineering Command say their programs have a direct application to TALOS as well.

"[The] requirement is a comprehensive family of systems in a combat armor suit where we bring together an exoskeleton with innovative armor, displays for power monitoring, health monitoring, and integrating a weapon into that—a whole bunch of stuff that RDECOM is playing heavily in," said Army Lt. Col. Karl Borjes, the command's science adviser.

"RDECOM cuts across every aspect making up this combat armor suit," he said. "It's advanced armor. It's communications, antennas. It's cognitive performance. It's sensors, miniature-type circuits. That's all going to fit in here, too."

SOCOM has called on the private sector, too, inviting not just its traditional industry partners, but also those who have never before worked with the command, to participate in the TALOS program.

"There is no one industry that can build it," SOCOM's Senior Enlisted Advisor Army Command Sgt. Maj. Chris Faris said during a panel discussion at the command's MacDill Air Force Base, Fla., headquarters, as reported by the Defense Media Network.

The outreach has generated a lot of interest. SOCOM's TALOS planning session this past summer attracted representatives of 80 colleges, 10 universities and four national laboratories. At a demonstration in July, 80 companies demonstrated technologies ranging from advanced body armor, some using liquids that turn solid on impact, to power supplies to exoskeleton mechanisms.

SOCOM's goal, Fieldson said, is to have a TALOS prototype within the next year and to have the suit ready for full field testing within five years. That timetable is revolutionary for the military research, development, and acquisition world, even for rapid-equipping programs.

As the only combatant command with acquisition authority, SOCOM is able to accelerate the TALOS project, Fieldson explained. The command's acquisition executive and research and development staff share a building at MacDill Air Force Base, which he said promotes close collaboration and speedy decision-making.

"We have access that is nontraditional and that absolutely helps us," Fieldson said. "We can bounce ideas back and forth against the leadership and ensure that what we are

doing makes sense ... I think that is critical to trying to develop this system within the timeline we are working toward."

Also, in a departure from traditional development projects, SOCOM's Acquisition Center staff established an innovation cell to lead the effort, advised by operators and focused on transforming business processes to solve the extreme integration challenges associated with TALOS.

"Because of the technical challenges and the compressed timeline, we are going to take more ownership on the government side than we typically take," Fieldson said.

"We are going to go in and make some decisions that we sometimes rely on industry partners to make for us," he said. "That allows us to reach out to a broader audience. That way, if there is a great idea in some nontraditional organization, we can integrate it" without relying on a commercial company to do so.

"We are really changing the process," Fieldson said. "And the reason we are doing that is to try to streamline the overall effort and drive down both the cost and the schedule. That way, we get the best possible equipment to our force as quickly as possible."

Although the TALOS is initially intended for special operators involved in high-risk missions, it has implications for the conventional force as well, Fieldson said.

"We have a long history at SOCOM of developing things first and then the technology moving out to the broader force," he said. "We fully expect that to happen with this one as well. I think there will be a lot of spinoff technologies that the broader force will be able to use."

Meanwhile, McRaven remains the suit's No. 1 proponent.

"I'm very committed to this," he told industry representatives at a July planning forum. "I'd like that last operator that we lost to be the last operator we lose in this fight or the fight of the future. And I think we can get there."

Digital Targeting Technology Increases Battlefield Effectiveness

AMERICAN FORCES PRESS SERVICE (JAN. 10, 2014)

Amaani Lyle

WASHINGTON—A new program enables controllers and combat aircrews to visualize, select, and employ guided weapons from a diverse set of airborne platforms, an instructor told the DARPA Congressional Tech Showcase here yesterday.

Marine Corps Maj. Thomas Short, an instructor at the Marine Corps Aviation Weapons School, Yuma, Ariz., describes DARPA's Persistent Close Air Support program as precise and prompt with its digital air-to-ground coordination and shared situational awareness.

Short said ground operators supporting multiple positions can now identify and target sectors and compounds, responding to the same information pilots see.

"I can get targeting data and information elevation off a specific compound ... add a point, start battle tracking and moving around," Short said. "This capability did not always exist in the battlefield; it specifically did not exist in a foreign factor."

The Marine Corps used a specially annotated map to coordinate battlefield actions, but Short noticed a way to enhance the grid's effectiveness by capitalizing on a tablet solution he'd seen downrange.

"There's a special series of these produced by the Marine Corps, and they're incredibly effective," Short said. "But there's so many of them and with limited aircraft, it's very difficult for us to manage those and get the right graphic."

So when Short returned from his tour in Afghanistan as a joint terminal attack controller air officer, he asked colleagues at the weapons school how to incorporate and standardize the imagery between pilots and ground operators.

Concurrently, DARPA was working on the PCAS program with Naval Aviation Weapons Center Development Lab in China Lake, Calif., developing similar software to be used by Naval Special Warfare, Short said.

The major contacted DARPA and the lab, and soon provided input to help shape the project with an operational impact.

"We installed a grid reference graphic originally developed by the Special Operations community, then the Marine Corps started using it in 2004 when they took Fallujah in Operation Phantom Fury," Short reported. "We outlaid a grid reference graphic for all of Fallujah to help Marines rapidly coordinate aviation support as well as ground support."

DARPA was developing the program for future use, but Short urged them to field the technology at the time to help Marines gain an operational advantage. "They recognized an opportunity to take our input from field use and make their program better [while providing] Marines the capability we need right now," Short said.

As such, DARPA funded for operational test evaluation of 1,500 devices that Marines are now using in Afghanistan.

"It has been a game changer for us," Short said. "It saves Marine lives on a daily basis."

Short said he hopes the program's future involves the standardization of graphics carried forward to each of the Services.

"We have graphics that are rapidly available and tactically function in digital formats on devices from which they can be pulled, distributed, and operated," Short explained.

The challenge, however, is to identify the security risks and find the right people to mitigate them.

"Since we have such a growth in mobile computing technology, we need to find a way to capitalize on that, mitigate those risks, and offer that to the operator," the major said.

The PCAS program will continue testing through 2015.

B-52 Upgrade to Increase Smart Weapons Capacity

72ND AIR BASE WING PUBLIC AFFAIRS (JAN. 10, 2014)

Mike W. Ray

TINKER AIR FORCE BASE, Okla.—Personnel here will update ground maintenance and mission planning software in support of a new Air Force contract that will increase the B-52 bomber's "smart weapons" capacity by 50 percent.

The \$24.6 million agreement stipulates that Boeing will develop a modification to existing weapon launchers so the aircraft can carry smart weapons in the bomb bay, which will enable aircrews to use the B-52's entire weapons capacity.

"With this modification, we're converting the bomb bay from dropping just gravity-type bombs to releasing precision-guided weapons," said Jennifer Hogan of Boeing Communications.

"When you combine that ability with the B-52's unlimited range with air refueling, you have an efficient and versatile weapon system that is valuable to warfighters on the ground," said Scot Oathout, Boeing's B-52 program director.

"This weapons capacity expansion joins the Combat Network Communications Technology program, a comprehensive communication upgrade that's being installed on the aircraft, to give the warfighter even more flexibility."



Maintainers at the Oklahoma City Air Logistics Complex will work with Boeing to perform an upgrade to the B-52, which will increase its smart weapon capabilities.

U.S. Air Force photo/Senior Airman Carlin Leslie

Boeing will produce three prototype launchers for test and evaluation. Initial capability is expected in March 2016, and potential follow-on efforts could add more weapons and allow a mixed load of different types of weapons.

Upon completion of the first phase of the upgrade, the B-52 will be able to carry two dozen 500-pound Joint Direct Attack Munitions or twenty 2,000-pound JDAMs. Later phases will add the Joint Air-to-Surface Standoff Missile and its extended-range variant, as well as the Miniature Air Launched Decoy and its jammer variant.

The bomb bay renovation will enable the B-52 to carry all of its weapons internally, thereby increasing fuel efficiency in flight. The modernization work will use parts from existing Air Force rotary launchers repurposed for conventional missions, as well as hardware and software already developed for the wing pylons.

Engineers from the B-52 Software Avionics Flight at Tinker are modifying the 1760 Integrated Weapon Bay Upgrade Ground Maintenance Computer Program to test the additional Integrated Weapon Interface Unit being added in the bay location on the B-52 in order to launch additional weapons from the weapons bay location.

In addition, engineers from the B-52 Software Avionics Flight are transitioning mission-planning software from a unix-

based Mission Planning System to a Windows-based Joint Mission Planning System. The B-52 JMPS Unique Program Component v1.0 software release will include conventional mission planning support for B-52 Software Blocks 04 and 05. It also adds capability for all variants of JDAM, JASSM, and MALD at the bay location to support capability added by the 1760 IWBU program. Formal Qualification Testing will be accomplished by July 2014, and the software will be fielded by July 2015.

The CONECT system will enable Stratofortress aircrews to send and receive information via satellite links, which will enable them to change mission plans and retarget weapons while in flight; currently, mission information must be uploaded to a B-52 before a flight. In addition, pilots will be able to interact better with other aircraft and with ground forces. Other improvements will include a state-of-the-art computing network with workstations at each crew position and an integrated digital interphone with increased capacity that will allow crew members to talk to each other on headsets equipped with noise-canceling technology.

The \$76 million CONECT upgrade installation will be performed during programmed depot maintenance by the 565th Aircraft Maintenance Squadron, while Boeing will provide the low-rate initial production of the first CONECT kits, along with spare parts and maintenance and service at Tinker.

DARPA Programs Create New Future for Space, Director Says

AMERICAN FORCES PRESS SERVICE (JAN. 13, 2014) Cheryl Pellerin

WASHINGTON—Space is critical to understanding the planet and how the United States safeguards national security, but the costs and difficulties of reaching the domain have slowed U.S. effectiveness in space, the director of the Defense Advanced Research Projects Agency said today.

Speaking at SciTech 2014, a technical conference hosted by the American Institute of Aeronautics and Astronautics, Arati Prabhakar explained that now is an important time to think in fresh ways about how to break that paradigm.

In many ways the situation takes Prabhakar back to 1958, she said, when DARPA was established partly because of the technological surprise delivered in 1957 by Sputnik, the world's first artificial satellite, launched by the Soviet Union and marking the start of the space age.

"I think we're in the middle of a self-inflicted surprise in some sense in space today," the director said. "It's a very different kind of surprise, but it's one that is rendering us ineffective and putting us in a place [where] we simply cannot afford to be."

DARPA, the Defense Department's research and development enterprise, has a portfolio that includes hypersonic technology in rethinking air dominance for the future, new ways to control the electromagnetic spectrum, new cyber opportunities, big data analytics, brain function, outpacing the threat of infectious disease, and accelerating the development of synthetic biology.

Another part of DARPA's portfolio is rethinking national security space, Prabhakar said.

"Today we are extremely effective at waging a kind of precise lethal war," she added. "It's something that is a core element of our national security today, but it is a kind of warfighting capability that's simply not possible without the assets that we have on orbit."

Around the national security environment, the director said, space is becoming increasingly congested as more commercial activity takes place in orbit and as other nations stake their claims in space.

"There's also something going on inside the national security community in space that's actually quite troubling," Prabhakar said. "That has to do with how slow and costly it is for

us today to do anything we need to do on orbit for national security purposes."

The director said the situation reminds her of living on a lake in Reston, Va., many years ago and watching ducks on the water in winter.

"I would look out at the lake, and ... these ducks would cluster at twilight, and they'd sit in the lake, and they would stop moving, and the lake would start icing up around them. Eventually, they would just freeze in place on this lake," she said. "Tragically, that's what it feels like to me when I think about where we are in terms of our ability to react and do what we need to do quickly, cost effectively in space for national security purposes."

At DARPA, scientists are working on three projects—involving space launch, satellites, and real-time domain awareness—that the director said she thinks will create a very different future for space.

It can cost tens of millions of dollars to get even a very small satellite to orbit, and years to schedule the launch, she said, because only a few fixed sites around the world can launch such craft.

"Today at DARPA, we're investing in programs that we hope will change that model and allow for the ability to launch on 24-hour call-up from anywhere around the world," Prabhakar said.

With DARPA's Airborne Launch Assist Space Access program, called ALASA, the idea is for an aircraft to carry a small satellite and its host-booster inside the plane or externally. At the right altitude and direction, the aircraft would release the satellite and booster and both would continue climbing into space.

A key benefit of the system is that, within a day of being called up, a satellite launch mission could be conducted from a runway anywhere in the world. Another advantage is the flexibility of an aircraft to deliver a satellite into any orbit at any time, according to DARPA.

"Our ALASA program ... aims to be able to get a [100-pound] satellite to [low-Earth orbit] for about \$1 million. Our new experimental spaceplane program, XS-1, aims to develop a reusable first stage that enables a cost in the range of \$5 million to get 3,000 pounds to 5,000 pounds to LEO," the director said.

These changes are dramatic, she added, because the price would be a revolution in capability and because of the flexibility and rapid call-up.

"These are important new dimensions and new ways of thinking about launch," Prabhakar said.

The second project involves satellites, she added.

"Today you assemble and create these very complex systems here on the ground. We launch them and when we get to orbit what we've got is what we've sent up, and it's a very inflexible capability in that regard," she explained.

DARPA's Phoenix program is working to create a future in which space robotics technologies can service satellites and even assemble them on orbit, and reuse components of old or nonworking satellites perhaps on orbit.

"As we develop those capabilities at [geostationary orbit, or GEO] we believe that we're going to start changing the fundamental dynamics and economics of what's going to be possible in terms of satellite capability," the director said.

The third project simply has to do with knowing what's going on in orbit, she added.

"Space is becoming a real-time domain, and it's no longer good enough to sort of know what's up there. We really need to start moving to a future of space traffic control, more like flight traffic control for the air domain," Prabhakar said.

DARPA has several programs that reach for this future, she said. One is the Space Surveillance Telescope, or SST, that can see very dim objects at geostationary orbit across a broad swath of the sky. DARPA has demonstrated this telescope capability in New Mexico and now is in the process of moving to Australia in cooperation with the Australian government.

"In addition to changing what we do, the director added, "I think how we work in space and how we work together to achieve these new capabilities is equally important. DARPA has a long history of working with a broad technical community, spanning universities, companies large and small, and labs of all different sorts."

In the national security space environment, she said, "I think all of us in DoD have had a tendency to focus in a narrower fashion on the capabilities we think are important for our missions. And today we're at a juncture where it's critically

important that we find new ways of working more broadly with the civilian and commercial space communities."

This is true, Prabhakar added, "first, because we have shared interests, and secondly because the challenges we face are so significant that we simply are not going to get there any other way."

Chief of Naval Research/Director Speaks on Impact of Upcoming Warfighting Technologies

NAVY NEWS SERVICE (JAN. 15, 2014)

Mass Communication Specialist 2nd Class Sean Hurt

CRYSTAL CITY, Va.—The Chief of Naval Research/Director, Innovation, Technology Requirements, and Test and Evaluation (N84) addressed attendees at the 26th Annual Surface Navy Association National Symposium, Jan. 15.

Rear Adm. Matthew L. Klunder spoke about upcoming warfighting technologies and what the impact will be on the naval mission.

"Think about it—we're coming into an age where the significance of naval power and the importance of naval capabilities is increasing every single day, and what I'm challenging to this group today...is are we ready," said Klunder.

The importance of technological supremacy was also a hot topic for Klunder.

"Who in this room wants to go into a fair fight with any of our threats," said Klunder. "We're here to make a difference and be relevant for the naval power and the partners we have in this world."

Klunder talked about the Navy's Laser Weapon System (LaWS) and its advantage on the maritime battlefield.

"This is an asymmetrical advantage," said Klunder. "Our threats may not even want to come out and fight us or have a conflict with us."

Klunder also talked about the high velocity projectile slated to be used in the electromagnetic railgun technology the Navy will be implementing in the future.

"This thing is working exceptionally," said Klunder. "Even if while we're getting the railgun put on our ships...[high velocity projectiles] give our existing five-inch guns...almost three times the distance."

Klunder also stressed the role that sailors play in the implementation of these new technologies.

"We can't just give tools to our sailors and Marines," said Klunder. "We're looking at optimizing the training efforts for those sailors and Marines...the ranges we're dealing with now on these systems are so extreme and so large that you almost require some simulation."

The Surface Navy Association was incorporated in 1985 to promote greater coordination and communication among those in the military, business, and academic communities who share a common interest in Naval Surface Warfare and to support the activities of Surface Naval Forces.

For more information about the SNA, visit <http://www.navysna.org/>.

Kendall: Military Technological Superiority Not Assured

*AMERICAN FORCES PRESS SERVICE (JAN. 17, 2014)
Army Sgt. 1st Class Tyrone C. Marshall Jr.*

WASHINGTON—The decline in research and development brought on by budget cuts is contributing to the erosion of the U.S. military's technological superiority at an alarming rate, the undersecretary of defense for acquisition, technology and logistics said.

"Technological superiority is not assured," Frank Kendall told a conference yesterday sponsored by the Center for a New American Society. "The United States came out of the Cold War, and demonstrated in the first Persian Gulf War, a very significant superiority in military technology and the application of those technologies. And we've sort of had an assumption [during] the last 20-plus years that [American] technological superiority would be a fact of life in the world."

The Defense Department has "a big part of sustaining the levels of [research and development] investment that I think we need," Kendall added.

Despite the relief provided by a trillion dollar plus spending bill approved by Congress for 2014, Kendall said the department still faces heavy budget cuts.

"We're still taking substantial cuts, and [2015] is much worse than '14 is," he said. "And then we don't know what will happen to us after that."



Rear Adm. Matthew Klunder speaks to attendees of the 26th annual Surface Navy Association National Symposium. Klunder spoke about up-and-coming warfighting technologies. This year's SNA Symposium focuses on "Surface Warfare-Warfighting First" and top Navy leadership will stress investing in sailors and systems to ensure our continuing advantage; ensuring surface warfare remains the center of the Navy's ability to deliver prompt, sustained combat power over time; and training persistent, capable surface forces—the key to combat readiness and prevailing in conflict.

U.S. Navy photo by Mass Communication Specialist 2nd Class Sean Hurt

"So with budgets heading in that direction," he continued, "and all the uncertainty we're dealing with, the Department of Defense has a very difficult planning problem." Part of that planning problem, according to Kendall, is the uncertainty of how much force structure DoD will be able to retain.

"There's always a tendency to hang onto force structure in order to do the things we need to do in the world," he said. "But if we do hang onto that force structure, the consequence of that is R&D has to be cut," in order to pay salaries and readiness.

"And that's what you're seeing even with the appropriations bill the Senate just passed," Kendall said. "And it gets much worse as we go further out."

Eventually, “if we know where the [budget] is going, we can get our force structure down to where we can get in balance between those different accounts that I mentioned,” he said. The undersecretary laid out three points supporting his concern for the erosion of U.S. technological superiority.

“[Research and development] is not a variable cost. There’s a tendency in the Defense Department, when we cut budgets, to kind of cut everything.

“But what drives R&D is the rate of modernization that we desire,” Kendall continued. “[It] is really not dependent on the size of the force structure.”

Kendall’s second point is time is not a recoverable asset. R&D really buys that time in something of a race for technological superiority, he said.

“I can buy back readiness, I can increase force structure, but I don’t have any way to buy back the time it takes me to get a new product,” Kendall said.

That timeline in the acquisition business is relatively long, Kendall said, noting how often he gets remarks about the length of an acquisition process, which hasn’t changed much over the years.

Essentially, Kendall said, it takes about two years before the department can get a budget to spend serious money on an idea.

“Then we have two or three years to four years of risk reduction where we develop the technology to where we’re confident we can put it into a product,” he said. “Then we have five or six years of development of making the product ready for production.”

Combine that with the “few years of buying enough numbers to make a difference militarily,” Kendall said, and the timeline easily becomes 10 or 15 years.

“So for that reason as well, I’m concerned,” he said. “I’m trying to do a lot of things now to hedge against these [challenges] and make people aware of these things and do more about them.”

Kendall reiterated how important he believes research and development is to maintaining DoD’s edge in technological superiority.

“It’s critical to the department, it’s critical to our future,” he said. “It is not ‘the wolf closest to the sled’ right now, neces-

sarily. But I think it is absolutely paramount that we keep our R&D budgets funded.”

DoD Official: Force Size Limits Modernization Efforts

AMERICAN FORCES PRESS SERVICE (JAN. 28, 2014)

Amaani Lyle

WASHINGTON—Two years into the pivot to the Asia-Pacific region and the concurrent drawdown in Afghanistan, Pentagon officials today related to Congress the Defense Department’s strategy to maintain U.S. superiority in military technology.

Frank Kendall, undersecretary of defense for acquisition, technology and logistics, told the House Armed Services Committee that until U.S. forces are reduced to sustainable levels, DoD will be forced to disproportionately reduce modernization, the very investments that yield technological superiority in the Asia-Pacific region and elsewhere.

“Uncertainty about future budget reductions make sizing our force problematic and encourages a slower drawdown in our force structure,” Kendall said. “This, in turn, causes even larger reductions in modernization.”

Still, Kendall indicated, DoD faces numerous challenges and opportunities in the Asia-Pacific region, particularly related to the increase of anti-access and area-denial military capabilities.

Current investments and technology are intended for the pursuit of America’s interests in the face of North Korea’s nuclear weapons and missile programs, Kendall told the House panel.

North Korea’s most significant developments are in medium- and long-range ballistic missiles that could be equipped with nuclear warheads, the undersecretary said, and U.S. investments to counter these threats are in national and regional missile defense. Plus-ups, Kendall reported, include ground-based interceptors at Fort Greeley, Alaska; the deployment of a Terminal High Altitude Area Defense System battery to Guam; and the in-progress introduction of a second ballistic missile defense radar system into Japan.

“These investments will enhance our ability to defend the homeland and Japan,” Kendall said, adding that the efforts complement ongoing initiatives to strengthen ballistic missile defense capabilities in general. And anti-access and area-denial capabilities run the gamut, he added, noting China’s space control investments, offensive cyber capabilities, conventional ballistic and cruise missiles, and air-to-air capabilities, including fifth-generation fighters.

While China pursues a long-term, comprehensive military modernization program focused on anti-access and area-denial capabilities, U.S. investments are limited by budget cuts that fall disproportionately on modernization, he asserted.

Despite resource constraints, DoD officials have taken steps to address the threats, Kendall said.

Since the publication of the Defense Strategic Guidance in 2012, the DoD has continued research and development and procurement investments focused on the Asia-Pacific region. Kendall cited examples of fiscal year 2014 investments requested by the White House and appropriated by Congress, including cyber defense, land-based key asset defense, maritime surveillance, air dominance, and precision strike capabilities.

The undersecretary acknowledged that DoD faces ongoing challenges in the Asia-Pacific region.

"Technological superiority is not assured, and we cannot be complacent about our posture," Kendall said. "This is not a future problem; this is a 'here now' problem."

Though DoD officials may wrestle with the uncertainties of spending cuts, he said, some aspects of the pivot nonetheless will continue to flourish, thanks to partnership building, senior leader retention, and relationship-building and increased exercises, Kendall said. "A lot of those things can happen even in a reduced budget situation," he added.