

US DOD developing many innovation models to sustain and advance America's military dominance for the 21st century

CHINESE leader Xi Jinping has laid out his plans for world domination with a 30-year plan to transform the country and surpass the US to become the biggest global superpower. China is making rapid advancements in many technologies thus narrowing its gap with western world. Former US energy secretary Steven Chu has even observed that China is ahead of America in areas ranging “from wind power to nuclear reactors to high-speed rail”. China is also catching up fast in artificial intelligence, genetic engineering, 5-G broadband technology and the “Internet of Things.” Some of its achievements include a gigantic 500m-aperture spherical telescope, the launch of the world's first hacker-proof quantum satellite and the development of world's fastest supercomputer – the new Sunway Tianhe-1A. China is also challenging US in many critical military domains like Space, Cyber, Air and Sea.

In November 2014, then-Secretary of Defense Chuck Hagel announced a new Defense Innovation Initiative, which included the Third Offset Strategy. Hagel said, “This new initiative is an ambitious department-wide effort to identify and invest in innovative ways to sustain and advance America's military dominance for the 21st century.” The goal of DII was identifying new and innovative technologies that will be agile, flexible and ready to confront and defeat aggression from any adversary anytime, anywhere—with a smaller and leaner force structure. It aims to “pursue innovative ways to sustain

and advance our military superiority for the 21st Century” by finding “new and creative ways to sustain, and in some areas expand, our advantages even as we deal with more limited resources.”

Department has launched two programs, DIUx [Defense Innovation Unit Experimental] and In-Q-Tel, intended to strengthen its collaboration with tech firms, entrepreneurs, and start-ups. DOD also launched crowdsourcing initiative to try to inspire creative thinking inside and outside the department on some key operational challenges that face the U.S. military, and to try to contribute to the department’s ongoing third-offset efforts,” she explained.

ONR has launched an initiative , the Concept Challenge, under which the organization is asking literally anyone who believes they have an idea for a technology that could help the Navy and Marine Corps deter conflict and win wars to submit one-page summaries for possible adoption into ONR’s research portfolio. Rear Adm. David Hahn, head ONR said the criteria for the challenge is broad, by design: candidates could include anything from a brand new technology the Navy has not yet examined to new ways of combining existing systems that fit into future war fighting concepts.

The U.S. Naval Air Systems Command (NAVAIR), Naval Air Warfare Center – Aircraft Division (NAWCAD) and the Georgia Tech Research Institute (GTRI) are working to address that challenge through a new effort – dubbed IMPAX (Innovation and Modernization Patuxent River) – that aims to accelerate the transfer of new technology to meet U.S. Navy and U.S. Marine Corps needs. IMPAX staff members are empowered to work outside the standard acquisition process to find, develop, and prototype new technology more quickly.

IMPAX (Innovation and Modernization Patuxent River)

MPAX was launched in 2017 as an initiative of Rear Admiral Mark Darrah, program executive officer for Unmanned Aviation and Strike Weapons at NAVAIR, by working closely with the Technology Transfer Office at NAWCAD. The first initiative with the Navy is to identify technology that will help integrate unmanned aerial vehicles into air control systems by providing miniaturized identification friend or foe (IFF) systems. IFF systems are already used in piloted aircraft, but the much smaller unmanned aircraft lack the space or power for conventional systems.

“Traditionally the Department of Defense (DoD) has been limited in the means and speed at which it could bring new technologies to the warfighter,” said Rob “Radar” Winston, a GTRI principal research engineer who directs the IMPAX program near Pax River Naval Air Station in Maryland. “Our adversaries aren’t constrained by cumbersome procurement rules and regulations. Through this effort, we want to ensure that our nation’s warfighters get the best technology in the shortest time.”

IMPAX is empowered to seek out technology from sources the government doesn’t usually work with. These can include small- and medium-sized businesses, companies that don’t traditionally work with the military or bid on billion-dollar DoD procurements. Winston and his team work on the Navy’s behalf, matching warfighter needs with technology that may already exist – or that can be developed to meet the needs.

In one aspect, IMPAX team members will serve as technology scouts, scouring many sources of information to locate technologies of interest. They’ll be readily approachable, and won’t require extensive paperwork from companies and others wanting to pitch their technology for potential military

applications. The overall activities will be directed by a joint GTRI/NAWCAD/NAVAIR team.

“If an individual or company has a great idea but they have never worked with the government before, that barrier to entry is very tall now,” he said. “They don’t know who to talk with, how to get involved in a program, or even how to get through the front gate of a military facility. We are going to be able to talk with these people to assess what they can contribute to the warfighter and do it all outside the gate and without the customary barriers.”

DoD agencies have their own research laboratories to help develop new technology, of course, but Winston’s group will tap other sources of innovation. For technology that’s promising but not quite ready for DoD use, IMPAX will fund brief research and development (R&D) initiatives – as short as three or four months – to determine whether a technology is worth pursuing. Pathways from there could include the traditional agency R&D laboratories.

The IFF capability for unmanned systems is just one example of an ongoing IMPAX project. Another initiative is looking at the use of augmented reality to support maintenance and training programs. By combining 3-D computer-aided design files with mixed reality glasses, the technology could help maintainers identify a problem, locate components hidden within an aircraft, and train new personnel more quickly.

“Technology already exists for these projects, but it would take a long time to actually get them to the fleet using traditional acquisition timelines,” said Winston. “We can help develop the capability, get it to the Navy who can then get it out to the warfighter quickly. We’ll run as fast as we can with a project and give our warfighters the edge by getting the latest technology to them – today.”

DoD Crowdsourcing Effort Produces Innovative Operational Approaches

The Operational Challenges Crowdsourcing Initiative was launched to inspire creative thinking inside and outside the Defense Department on key operational challenges has produced two primary submissions and several others that will be presented for consideration directly to top officials in the department.

“We knew that there was a lot of creativity and experience out there amongst operators, academics, technologists, researchers and others that wasn’t being drawn upon because there’s not really a mechanism for [getting] their ideas directly to senior leaders inside the Pentagon,” Mara E. Karlin, deputy assistant secretary of defense for strategy and force development said.

The project was intended to provide that access, she added, to take the best ideas, wherever they came from, and connect the ideas to leaders who are in a position to effect change. “We pulled these together based on our thinking about the challenges the U.S. military will face as we look to future conflicts – the things that worry us – and we posed five questions,” she said.

The questions were as follows:

1. How can the U.S. military more effectively and efficiently project power in the face of massed or mobile precision attacks – for example, cruise and ballistic missile salvos and swarming?
2. Given current U.S. global military posture and potential changes in the character of war, how must future U.S. operational battle networks change to accomplish counter-power projection operations in contested theaters against large state adversaries?

3. How must joint force operational and organizational constructs change to allow combat operations involving multi-domain battle against adversaries with battle network/guided munitions parity?

4. How must joint force operational and organizational constructs change as adversaries exploit crowdsourced information and commercially available intelligence, surveillance and reconnaissance technologies such as drones and commercial space systems?

5. How can the U.S. military ensure that the speed of its decision-making continues to keep pace with the accelerating speed of action on the battlefield due to automation, artificial intelligence, hypersonics, cyber weapons and other factors?

The two top proposers met with senior departmental leaders yesterday, and, she added, “we’ve told [Deputy Defense Secretary Bob Work] about their work and have given their proposals to him.”

One proposal was developed by two researchers at the Center for Strategic and Budgetary Assessment. Timothy A. Walton and Ryan Boone proposed specific changes in posture and investment priorities that could improve the U.S. military’s ability to conduct sustained operations in the Asia Pacific.

“This fell into that first operational challenge, Karlin said, adding, “At the strategic level we say the U.S. military must be able to project power and win decisively, must be able to go anywhere, be anywhere at any time, and their proposal very much focused on that as they were thinking about logistics throughout the Asia-Pacific [region]

The second proposal, by Army Maj. Christopher M. Baldwin and Army Capt. Nicholas W. Cimler, was for an innovative

operational concept for amphibious assault.

“What was neat about theirs is that they were thinking about how you modernize amphibious assault, how you project combat power over the shore, and they were thinking about autonomy and how we can use it smartly ... particularly as we think through denied or degraded environments,” Karlin said.

“Using autonomy for logistics makes a lot of sense and ... what’s particularly interesting about that is it doesn’t just have an operational impact, it can influence how you think strategically about a challenge,” she added. This proposal straddled the first and second operational challenges, projecting power and thinking about future operational battle networks because logistics is such a key node in battle networks, Karlin said.

Defense Innovation Initiative

Many of the technologies the DoD will depend on in future will come from outside the DoD. The declining military budgets, the industry is investing less in new technology and increasingly depend on the global market for innovation. “We must be open to global, commercial technology as well, and learn from advances in the private sector,” Defense Secretary Ashton B. Carter told the House defense appropriations subcommittee.

The DII was launched to harness the brightest minds inside and outside the DoD to identify current and emerging technologies, or projections of technology-enabled operational concepts. The goal is to accelerate the critical thinking, technical excellence and the business practices to support them that will allow us to improve our “speed to market” in the following areas: People, Wargaming, New Operational Concepts, Business Practices, and a Long-Range Research and Development Program Plan (LRRDPP).

Defense Innovation Unit Experimental, or DIUx.

The military has formed new group under the U.S. Department of Defense, called Defense Innovation Unit Experimental, or DIUx. With an office in Silicon Valley and in several other tech hubs across the U.S., the mission of DIUx is to bridge the different cultures of tech startups and the U.S. military to meet national security needs.

Many of these small innovative commercial firms lack knowledge about defense systems, organizations, and problems that could benefit from their products and technology, and that is why we have made investments in activities like DIUx in Silicon Valley as a way to help match DOD customers with some of those potential sources of advanced capabilities that are rising from the commercial enterprises, says DOD.

Since its inception 18 months ago, DIUx has worked with more than 30 tech companies from across the U.S. and the globe. The technology ranges from robot sailboats to small satellites.

“As a broad statement, government systems are very poorly secured. As a broad statement, government systems are not using the latest forms of operating systems, encryptions and mechanisms,” said Eric Schmidt, executive chairman of Google’s parent company, Alphabet. “Technology is always changing and if you have only legacy equipment, that actually gives the bad guys more time to figure out what the vulnerabilities are. If we’re constantly evolving, it’s a cat and mouse game between attackers and defenders and we want to be on the winning side of that,” said Shah.

An immigrant from Iran, Banazadeh builds a special kind of satellite that allows its user to take imagery, even through clouds and at night. What makes it unique is its size. It is

just a bit bigger than a shoebox. Unlike the military that builds massive satellites, Capella Space can build satellites that are smaller, cheaper and faster than traditional military satellites. “We like to work with the government because we think we can help the government save money, bring a capability that doesn’t exist, and through that hopefully save some lives,” said Payam Banazadeh, co-founder and chief executive officer of Capella Space.

“The innovative ecosystems will be very good at certain types of technologies and products and we should play to their strength. They’re not the answer to everything. We don’t expect the next company out here to build the next fighter jet. But they may build some of the software that sits on it,” said Shah.

Long-Range Research and Development Program Plan (LRRDP).

US DoD has turned to grassroots innovations by developing a Long-Range Research and Development Program Plan (LRRDP). The LRRDPP wants to attract IDEAS from across the defense industrial base, commercial industry, government and individuals to identify the “art of the possible” for future National Security systems.

Stephen Welby, the Deputy Assistant Secretary of Defense for Systems Engineering said, “We’d like to think now about how we could prepare, how we would think about harvesting science and technology to enable new systems. We’re trying to imagine the systems that the department will need in the future, and then asking “what do we need to do to identify and accelerate technologies that will help us get there.”

The five main focus areas of the program are Air, Missile and Precision Guided Munition Defense, Air Superiority, Space, Undersea and Emerging Technologies. Teams of government

technology experts will assess ideas leading to new capabilities that can provide the U.S. with significant advantages to the Department's capabilities in the 2025-2030 timeframe.

This idea has to fall into one of three categories:

1. Relatively mature technologies that may be applied in novel or unique ways to field a fundamentally different type of system capability
2. Emerging technologies that can be rapidly matured to offer new military capability
3. Technologies under development for, or being applied in, non-defense applications which can be repurposed to offer a new military capability

The LRRDPP team consists of five small, AGILE teams of government technologists to identify critical technologies and drive materiel concepts with the potential to contribute to our technology offset strategy. The teams will consider all responses, and a report is scheduled in 2015. The Pentagon received more than 300 responses, Defense Department spokesman Maj. Eric D. Badger told National Defense. Badger said. "In fact, it's likely that the LRRDP report will be classified

"The accelerating pace of change and the impacts of globalization have created significant changes in the global technology landscape that compel a strategic evaluation of the Department's R&D investment strategy. This new long-range R&D study seeks to identify opportunities for enduring defense innovation to sustain the future of our nation's military capabilities in an era of rapidly evolving technology, and tightening budgets," according to US DOD.

References and Resources also include:

<https://www.defense.gov/News/Article/Article/1035881/dod-crowd-sourcing-effort-produces-innovative-operational-approaches>

<https://www.voanews.com/a/us-military-taps-into-innovations-in-startup-tech-world/3852647.html>

<http://www.news.gatech.edu/2017/12/06/impax-program-accelerate-s-technology-transition-navy>