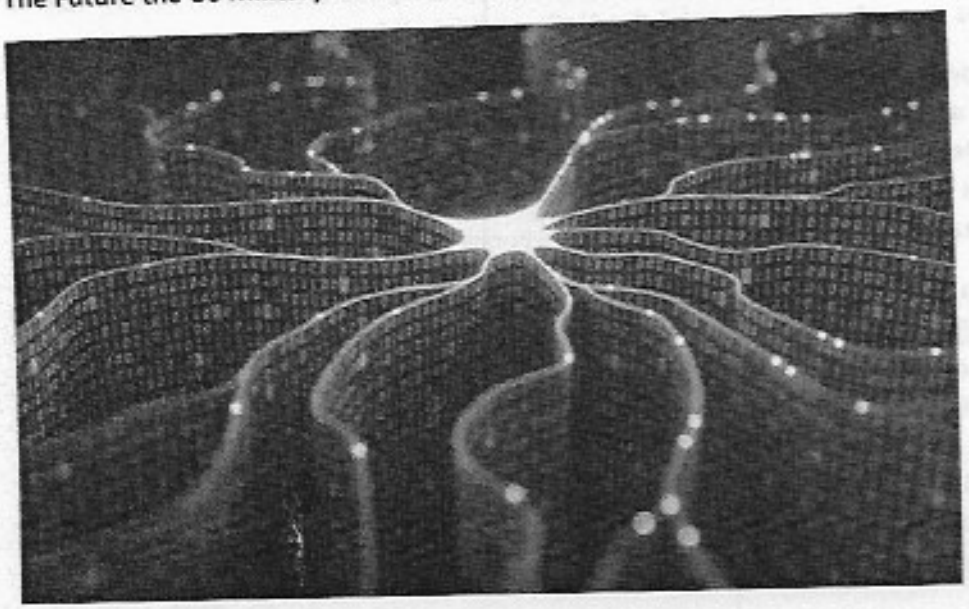
The Future the US Military is Constructing: a Giant, Armed Nervous System



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By Patrick Tucker Defense One 2:00 PM ET

Leaders of the Air Force, Navy, Army and Marines are converging on a vision of the future military: connecting every asset on the global battlefield.

That means everything from F-35 jets overhead to the destroyers on the sea to the armor of the tanks crawling over the land to the multiplying devices in every troops' pockets. Every weapon, vehicle, and device connected, sharing data, constantly aware of the presence and state of every other node in a truly global network. The effect: an unimaginably large cephapoloidal nervous system armed with the world's most sophisticated weaponry.

In recent months, the Joint Chiefs of Staff put together the newest version of their National Military Strategy. Unlike previous ones, it is classified. But executing a strategy requiring buy-in and collaboration across the services. In recent months, at least two of the service chiefs talked openly about the strikingly similar direction that they are taking their forces. Standing before a sea of dark-blue uniforms at a September Air Force Association event in Maryland, Air Force Chief of Staff Gen. David Goldfein said he had "refined" his plans for the Air Force after discussions with the Joint Chiefs "as part of the creation of the classified military strategy."

The future for the Air Force? The service needed to be more like a certain electric-car manufacturer.

"Every Tesla car is connected to every other Tesla car," said Goldfein, referring to a presentation by Elon Musk about the ways his firm's vehicles learn from their collective experience. "If a Tesla is headed down the road and hits a pothole, every Tesla that's behind it that's self-driving, it will avoid the pothole, immediately. If you're driving the car, it automatically adjusts your shocks in case you hit it, too."

Goldfein waxed enthusiastically about how Tesla was able to remotely increase the battery capacity of cars in the U.S.Southeast to facilitate evacuation before the recent hurricanes.

"What would the world look like if we connected what we have in that way? If we looked at the world through a lens of a network as opposed to individual platforms, electronic jamming shared

immediately, avoided automatically? Every three minutes, a mobility aircraft takes off somewhere on the planet. Platforms are nodes in a network," the Air Force chief said.

The idea borrows from the "network centric warfare" concept that seized the military imagination more than a decade ago. But what leaders are today describing is larger by orders of magnitude. It's less a strategy for integrating multiple networks into operations more efficiently than a plan to stitch everything, networks within networks, into a single web. The purpose: better coordinated, faster, and more lethal operations in air, land, sea, space, and cyberspace.

So the Air Force is making broad investments in data sharing. Maj. Gen. Kimberly A. Crider, the service's first data officer, issetting up a series of experimental tests in the Nevada desert at Nellis Air Force Base near Las Vegas, seeking to better understand "what happens when we actually connect into this resilient and agile network" said Goldfein. The Air Force's current experimentation with next-generation light tactical attack aircraft are as much about hardware as networks, he said. "Not only what can I buy and what can they do, but more importantly, can they connect? Can they actually share? And can we tie it to a new network that's based on sharable information that gets me beyond the challenges I have right now in terms of security?"

The Air Force is also fielding new connected devices. The handheld "Android Tactical Assault kit" or ATAK, designed with special operations forces, provides a common operational picture of everything going on — basically, doing what a huge command-and-control station used to do a few years ago. "What we determined was that there were so many devices on the battlefield that had information that we weren't collecting. Rather than build a system to pull that in, we actually went to a commercial entity and they created an algorithm. It's user-defined and it pulls in whatever data you need and puts it on Google Maps," said Goldfein.

The Air Force used the device during this year's hurricane relief efforts, sending rescue teams to people reaching out for help on social media, Goldfein said.

The Air Force Science Board is also launching a study into how to control a constellation of objects, some in the air, some in the sea, some on land, some piloted by humans and others more autonomous. James Chow, the board's new head, said the study would also consider how to connect to other services.

Importantly, although the study would come out of the Air Force, it wouldn't stop at just Air Force equipment but would extend to other weapons and vehicles in the battlespace, like Navy destroyers, said Chow.

"Our scope would be in helping the Air Force to think about operations they would be conducting that would incorporate joint sensors and platforms, like destroyers, I think that has to be part of it. And that is within the charter of the study," Chow said, adding that the study has "the highest priority level for Air Force leadership."

The Multi-Domain Army and Marine Corps

The U.S. Army, too, is investing big dollars into figuring out how to connect everything on the battlefield. An Army Research Lab program called the Internet of Battle of Things will be led by researchers at the University of Illinois, with help from the Universities of Massachusetts, multiple California State branches, Carnegie Mellon, and SRI International.

The Army is currently revising its Operating Concept for itself the Marine Corps for 2025-2040. It basically forms the framework for writing future Army doctrine, which in turn shapes training,

weapons acquisition, and operations. The final draft won't be available until the Association of the United States Army conference in October, but sources close to the drafting process said it will focus on networked, multi-domain battle.

The Marines are already conducting experiments along these lines. In April, the Corps' Warfighting Lab staged a beach assault, linking together robots, ships, satellites, amphibious assault vehicles to share targeting info and other situational intelligence.

The Marines are also looking at tanks that are digitally connected through their armor, according to Lt. Gen. Robert Walsh, who leads Marine Corps Combat Development Command and serves as Deputy Commandant for Combat Development and Integration. Speaking at a Navy event in July, Walsh recounted how he had recently emerged from a meeting with makers of new "reactive armor" for tanks.

Walsh said that the armor — he declined to name the vendor— could heal itself while sending information about the direction of the attack to other units and back to headquarters. "It's not, 'we defeat a missile with a capability,'" Walsh said. "It's 'we quickly figure out where that came from.' What I found was, after talking to Marines out there, that could bring out a much more offensive capability where we were originally talking about bringing a defensive capability to bear."

Read that to mean faster clobbering of the enemy immediately after they shoot at you, rather than cowering from them.

The Navy: "Network Everything to Everything"

Navy leaders, too, are eager to connect every object on the sea, land, air, space and cyberspace. This is no exaggeration. As Adm. John Richardson, Chief of Naval Operations, put it during theNavy's Future Force Expo in Washington, D.C., in July, "I want to network everything to everything."

This is necessary to preserve the U.S. Navy's advantage, even if Richardson gets the larger 355-ship fleet he seeks — hardly a given in today's industrial and budgetary landscape. Adversaries are building more and better ships and weapons, and even the U.S. superiority in orbital and terrestrial sensing is diminishing. The cost of launching a constellation of spy sats is dropping as the satellites become smaller and launches become cheaper.

"It's going to be more and more difficult to find ranges and places where we can do exercises and practice without being observed," the admiral said. "Think about the number of surveillance cameras that followed you on your way to this conference this morning. This idea of sensing is becoming ubiquitous and it's shifting the competitive space in this [observe, orient, decide and act] loop so that no longer are we superior in that first mode, in the ability to observe. That's becoming a very level playing field. Competition is shifting to 'what do I do with that information.' How do I manage...that avalanche of data?...The momentum of the game is not in our favor...We have to recapture that momentum."

Networking everything is the way to win that competition. "When you start linking these platforms together, [the rate of progress is] not exponential...it's factorial," he said, meaning orders of magnitude greater than a rate of progress that is even orders of magnitude greater than a linear progression.

The Navy has already made some important progress. Last year, an experimental datalink allowed the pilot of a Marine Corps F-35B strike aircraft to send targeting data to an Aegis destroyer, which shot down the target drone with an SM-6 missile.

Interconnections

This push is too new, and still too developmental, to have attracted much concern from the public or Capitol Hill. But that will change. When Richardson's remarks talk hit Twitter, arms-control watcher Jeffrey Lewis professed a touch of concern.

Certainly, "network everything to everything" sounds a bit like the setup for the Terminator franchise, wherein a fictional defense contractor, Cyberdyne Systems, convinces the Defense Department to link the U.S. arsenal to a single artificially intelligent entity. Skynet, of course, determines that humans are a threat to its existence and uses its ubiquitous command and control powers to launch a war on humankind.

Military leaders hate comparisons between their own tech projects and anything from the Terminator franchise. The reference usually comes up in discussions about individual drones with missiles or "killer robots." Defense Department watchers are always keen to remind people that official policy is to keep humans at the top of the command-and-control loop, overseeing —or at least retaining veto power — over the decision to take life.

But artificial intelligence will play an important supporting role in helping commanders and operators makes sense of what's happening on with all of these inter-linked devices and weapons, even as it steers and operates burgeoning fleets of near-autonomous drones, unmanned tanks, robot boats, and the like.

The effort to understand exactly how well all of these moving parts will co-ordinate has only barely begun. But it is the direction that the United States military is moving with both determination and speed.