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Unmanned Systems Sentinel

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Please keep in mind that in most instances the below summaries are excerpts from the original article. The full articles can be viewed at the accompanying hyper-links. The inclusion of these links does not represent an endorsement of the organization, service, or product. Immediately below are this edition's highlights with links to the respective articles:

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NAVY/USMC:

GPS Doesn't Work Underwater

So the U.S. Navy is developing a new kind of system – built specifically for drone submarines

To prepare for the possibility that it will one day deploy swarms of uncrewed drone submarines, the U.S. Navy is developing a system that will allow the global positioning system (GPS) to function deep below the ocean's surface. If successful, the technology could start to appear as soon as the 2020s.

The global positioning system is a marvel of accurate clocks and simple physics. A GPS receiver, like the kind in smartphones or car navigation systems, is little more than a radio antenna tuned to satellites. It listens for signals from the three GPS satellites that happen to be closest (there are more than 50 satellites in total, all constantly broadcasting their time), then it triangulates its own location from where it knows those satellites to be. Though composed only of silent listeners and a constellation of passive beacons, GPS can tell someone where they are on or above the planet's surface.

But take heed of the prepositions – on or above. Right now, GPS signals can barely go below.

"Radio signals do not propagate very far underwater," says Joshua Niedzwiecki, the director of sensor processing at BAE Systems. BAE is researching and developing the new technology for the government. "If you put your cellphone in a waterproof case and went into the ocean, as you start getting deeper and deeper, you'd very soon lose connectivity."

And since GPS radio signals don't reach very far underwater, they're basically useless for any submarine below the surface. The Navy solves this problem now by outfitting each sub with a "very large and very expensive inertial measurement unit," says Niedzwiecki. (Imagine a tricked-out, military-grade version of the accelerometer in your phone.) By remembering the submarine's last known surface position, as

measured by GPS, then keeping close track of its forward movement and diving depth, these units can give a high-accuracy estimate of where the submarine is in space.

But they are still very expensive and very large. If the Navy wants to deploy dozens or even hundreds of them to drone submarines, then it will soon run out of both budget and available cargo space. It needs something closer to GPS, a set of lightweight passive beacons that can help something deduce location through triangulation alone. Hence the new BAE Systems project: the Positioning System for Deep Ocean Navigation, or POSYDON.

"We want to use signals that propagate very well underwater," says Niedzwiecki. "And it turns out that acoustic signals propagate extremely well."

POSYDON wants to install acoustic speakers in buoys throughout the ocean, where they will broadcast the time like GPS satellites. "They will be heard across very, very wide swaths of ocean," he told me. "And now our underwater vehicles will be able to listen to those acoustic signals and measure the time difference of arrivals of each one of them."

There's one big problem. GPS radio signals are electromagnetic waves, so they move at the speed of light – always, through any atmospheric medium. This makes it extremely straightforward to back-compute the location of a beacon from its signal.

"Underwater acoustic signals, it's a much more challenging problem," says Niedzwiecki. "How fast they travel is a function of the salinity of the water [and] the temperature of the water." The POSYDON team is working off complex academic models of the oceans and their currents to learn how to estimate signal arrival time.

Before it's deployed, POSYDON will have to pass a separate Navy test to make sure it is safe and nondisruptive for marine mammals like humpback whales, which communicate through acoustic signals. Niedzwiecki said BAE Systems was working in frequencies which should be safe for the animals.

http://www.theatlantic.com/technology/archive/2016/06/its-gps-underwater-forrobots/486656/

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Navy in Dayton: A Top Admiral Says Drones Are Future of Aviation

Excerpt: The Naval Medical Research Unit at Wright-Patterson has collaborated with the Air Force to solve oxygen generation problems on both the Air Force's F-22 and the Navy's F/A-18 fighter jets, Haley said. ... The Navy is in the midst of fixing those problems on F-18s, a process that could take about a year to a year and a half to complete, he estimated. Oxygen loss-related incidents in the cockpit have been cut in half in the past year, he said. ... The naval research unit relocated to Wright-Patterson from Pensacola, Fla., as part of the base realignment and closure process a decade ago. The move, Haley said, has "reaped huge benefits." ... "We're getting a lot of benefit, both Air Force and Navy, from the research that's being done from the units out there," he said.

Full story:

DAYTON - A top Navy leader says unmanned aerial vehicles are an "imperative" for the future of naval aviation.

Rear Adm. John R. Haley, a two-star admiral and commander of the Naval Air Force Atlantic fleet in Norfolk, Va., said he not only sees a future for UAVs on aircraft carriers, "I see an imperative for it in the future."

Carrier Drone

Flight test demonstrations of the Northrop Grumman X-47B in recent years showed a UAV could autonomously take-off and land on an aircraft carrier, something the admiral described as a "force multiplier."

"If you ask a naval aviator about unmanned drones a lot of them will say, 'Oh, that's a threat, they're going to put us out of business,' or something like that. And I think folks that think that way are pretty myopic," he said. "...It's a force multiplier and it's doing so without putting another guy in harm's way and also allowing you to link (sensor) systems together."

The Navy could use a UAV as an aerial refueling tanker at sea and to hoist surveillance sensors into the skies, among future uses, he said.

The naval research unit relocated to Wright-Patterson from Pensacola, Fla., as part of the base realignment and closure process a decade ago. The move, Haley said, has "reaped huge benefits."

"We're getting a lot of benefit, both Air Force and Navy, from the research that's being done from the units out there," he said.

"...Sailors have to be better trained in a shorter period of time," he said. "It has to be relevant to what we're doing and they have to be ready for combat when we get there."

"I think that this area is very cognizant of the Navy more so than most landlocked Air Force-centric areas and so I have no problem coming into the land of Air Force and trying to recruit some great Americans to come into the Navy," he said.

http://www.daytondailynews.com/news/news/local-military/navy-in-dayton-a-top-admiralsays-drones-are-futur/nrgyM/

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Smallest of Navy's 3 Advanced EOD Robots Passes Critical Design Review – UGV

The successful Critical Design Review determined that Northrop Grumman's final design for the Advanced Explosive Ordnance Disposal Robotic System dismounted operations variant satisfies cost,

schedule and mission performance requirements and demonstrates the maturity for proceeding with system fabrication, assembly, integration and test.

The first increment in the Navy's Advanced Explosive Ordnance Disposal Robotic System (AEODRS) passed its Critical Design Review (CDR) and is going into low-rate initial production, Northrop Grumman announced.

The Increment 1 system, produced by Northrop Grumman, is the smallest of three proposed robotic systems to help Navy and Marine Corps EOD technicians find, identify and disable improvised explosive devises and other threats while the operator remains at a safe distance.

Increment 1, called the man-portable or "back-packable" version, will be used for dismounted operations. It is a remotely controlled compact tracked vehicle with cameras and a manipulator arm, and it weighs less than 35 pounds, including the handheld operator control unit and communications link.

"The CDR provided an in-depth assessment, by a government team of experts, managers and Navy and Marine Corps users, that the final design for the AEODRS dismounted operations variant is programmatically and technically realistic and achievable," according to a company statement last week.

The successful CDR "clearly shows the commitment of the Navy and Northrop Grumman team to fill this key gap for EOD robotic operations," Dan Verwiel, vice president and general manager for missile defense and protective systems division at Northrop Grumman Mission Systems, said in the statement.

With the CDR approval June 7, the company entered the low-rate initial production phase and will deliver four units and a spare, a spokeswoman said.

The AEODRS program, managed by Naval Sea Systems Command, began as a joint program to develop a family of EOD robotic systems in three sizes, with as much commonality as possible. But the Air Force and later the Army dropped out of the joint effort and are acquiring commercially available systems for their EOD operators.

The Navy is continuing its development efforts for the other two increments: a mid-size robot weighing less than 165 pounds that will have a robotic arm able to disarm an explosive device, and a 750-pound unit with manipulator arms strong enough to lift heavy explosives.

https://news.usni.org/2016/06/17/advanced-eod-robot-passes-critical-design-review

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Navy's Triton UAV Passes Full-Motion Video to P-8 During Flight Test

The Navy is continuing operational testing of its future unmanned long-endurance maritime surveillance aircraft, the MQ-4C Triton, demonstrating its ability to share critical mission information with the manned P-8A Poseidon multi-mission maritime patrol aircraft.

During a June 2 flight test at Naval Air Station Patuxent River, Md., a Triton successfully exchanged fullmotion video with a Poseidon for the first time via a Common Data Link system, Naval Air Systems Command announced today. The test demonstrated the Triton's ability to track a surface target with its electro-optical/infrared (EO/IR) camera to build situational awareness for a Poseidon crew flying many miles away, further establishing the interoperability of the two aircraft that will be essential to their combined mission of controlling vast areas of ocean.

"In an operational environment, this would enable the P-8 aircrew to become familiar with a contact of interest and surrounding vessels well in advance of the aircraft's arrival on station," Cmdr. Daniel Papp, Triton integrated program team lead, said in the NAVAIR news release.

Separately, the Triton test aircraft also has conducted a series of heavy weight flight tests that will expand significantly the UAVs' expected time on station by flying at higher altitudes with a full load of fuel, the NAVAIR statement added. In separate tests, the Triton flew the heavy load to 20,000 and then 30,000 feet altitude. The program will continue the heavy weight tests up to the Triton's top operational altitude of 60,000 feet, NAVAIR spokeswoman Jamie Cosgrove told USNI News.

The Triton, a heavily modified version of the Air Force's RQ-4C Global Hawk, is a product of the Navy's Broad Area Maritime Surveillance (BAMS) program. It is designed to fly at very high altitudes for up to 24 hours, covering thousands of miles of ocean with its AN/ZPY-3 radar, tailored for over water reconnaissance; its EO/IR sensors; and an Automatic Identification system that monitors the required recognition signals from commercial ships. By scouting large areas, the unmanned aircraft can allow the manned P-8s to fly only when its capabilities are needed.

The BAMS program calls for buying 69 operational aircraft to team with 117 P-8s, replacing 196 of the aging P-3C Orions.

To provide early operational experience, the Navy bought two early model Global Hawks from the Air Force and, after modifying their sensors to provide better over water performance, deployed one to the U.S. Central Command area in 2008 as a BAMS Demonstrator. One of the BAMS-D aircraft was lost in a crash. Cosgrove said the remaining aircraft has passed 21,000 flight hours and still is conducting operational surveillance missions.

Northrop Grumman announced Feb. 17 that Triton had passed its Operational Assessment in a series of test flights conducted by Navy squadrons and the company. That cleared the way for a Milestone C procurement decision to begin production. Cosgrove said the Navy and Northrop are in negotiations to start the low-rate initial production of operational Tritons. The Navy now plans to reach initial operational capability for Triton in 2018.

When the full fleet is operational, the Navy plans to station Tritons at five bases: Naval Air Station Jacksonville, Fla.; NAS Whidbey Island, Wash.; Anderson Air Force Base, Guam; somewhere in the Mediterranean; and in the Middle East, Cosgrove said.

https://news.usni.org/2016/06/22/triton-uav-passes-full-motion-video-p-8-flight-test

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GM fuel cells to power Navy's underwater drones

General Motors Co. said Thursday it will provide automotive hydrogen fuel cells to power the nextgeneration of unmanned undersea Navy vehicles through a new partnership with the Office of Naval Research and the U.S. Naval Research Laboratory.

Karen Swider-Lyons, head of the alternative energy section, chemistry division for the Naval Research Laboratory, said the Navy is looking for "weeks, if not months of endurance" power for its self-piloting undersea vehicles. The systems also need to be highly reliable and have a goal of 60 days endurance, she said.

Hydrogen fuel cells convert hydrogen into electricity, and provide longer range and endurance than battery power. Recharging or refueling takes just minutes.

"Hydrogen has very high energy and fuel cells are very efficient and together you can get very high endurance and that's what we're looking for in our program," Swider-Lyons said.

The Naval Research Laboratory recently finished testing a prototype underwater drone at the Naval Surface Warfare Center in Carderock, Maryland, with a GM fuel cell serving as the base of the power-train.

"Our in-water experiments with an integrated prototype show that fuel cells can be game changers for autonomous underwater systems," Frank Herr, the Office of Naval Research department head for ocean battlespace sensing, said in a statement. "Reliability, high energy, and cost effectiveness — all brought to us via GM's partnering — are particularly important as Navy looks to use UUVs (unmanned undersea vehicle) as force multipliers."

"The collaboration with the Navy leveraged what we learned in amassing more than 3 million miles of real-world experience with our Project Driveway fuel cell program," Charlie Freese, executive director of GM global fuel cell activities, in a statement. "Our customers will benefit from additional lessons we learn about the performance of fuel cells in non-automotive applications that will be useful in GM's drive to offer fuel cells across consumer markets."

GM has experience in fuel cell technology, working in the space for decades. In 2007, it launched a fleet of 119 hydrogen fuel-cell Chevrolet Equinox vehicles that were driven daily.

The Detroit automaker also has a long-term agreement with Honda to co-develop fuel cell system and hydrogen storage technologies that the companies have said could be available around 2020.

http://www.detroitnews.com/story/business/autos/general-motors/2016/06/23/gm-fuelcells-power-unmanned-undersea-navy-vehicles/86287384/

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Marines to Pair Laser Weapon With Stinger Missile for Mobile Ground Unit Protection

The Marine Corps is moving towards a future in which small dispersed units can protect themselves from incoming enemy drones with laser weapons and from missiles and aircraft with Stinger missiles, with both weapons netted into a detection system and mounted atop Humvee's, Joint Light Tactical Vehicles and other combat vehicles.

Lt. Gen. Robert Walsh, deputy commandant of the Marine Corps for combat development and integration, said a Ground-Based Air Defense (GBAD) Directed Energy On-The-Move concept demonstrator with the Office of Naval Research is nearing the start of Phase 3, moving from firing a 30-kilowatt laser at a target from atop a stationary ground vehicle to firing while on the go. Upon completion of the ONR program, around 2022, the GBAD DE OTM system would transition into a program of record in the Marine Corps and likely reside alongside the Stinger missile system as a ground unit self-protection system – giving those units a much-needed upgrade after operating with the Stinger for decades.

"So we look at our air defense capability as certainly a weak area that we have not upgraded in a long time because we haven't had to deal with that in the operating environment we've been in," he told the audience at the second-annual Directed Energy Summit, co-hosted by Booz Allen Hamilton and the Center for Strategic and Budgetary Assessment.

In the short term, the Marines are fielding the new Ground/Air Task Oriented Radar (G/ATOR) to detect incoming threats and the Common Aviation Command and Control System (CAC2S) to integrate all the data into a single operating picture. That data will be pushed to the the Direct Air Support Center (DASC), who could in turn give low-altitude air defense (LAAD) batteries specific information about incoming threats.

"But the laser would tie right into that," Walsh said, noting that the GBAD DE OTM laser system could be installed alongside the Stinger launcher, giving the LAAD batteries the option of using the laser for smaller threats – Group 1 through 3 unmanned aerial vehicles, for now – or using the missile for highaltitude UAVs, cruise missiles or manned aircraft.

"Eventually if you could transition away from the missiles to go directed energy-only, we would do that" if the laser technology improved sufficiently, he added.

The Army is also pursuing a mobile laser weapon, and Walsh said that though their efforts are separate for now, "once we see where we're coming out of that, working closely with the Army, we see ourselves paralleling into a joint program of record on this." The hope is that this joint program could push the Marines' current 30kw laser into something smaller and more powerful, enabling it to take on larger UAVs and eventually rockets, artillery, mortars or even larger threats.

Walsh said that DIRCM is fielded now, counter-UAV lasers are getting close and counter-artillery lasers are farther out, but all the technologies are maturing well. What he'd like to see next is a field exercise to "get comfortable with the technology, and I think everything is moving to how quickly can we get out

there and use it. And I would push, from my standpoint with the commandant would be, let's look at what the Navy did with Ponce," Walsh said, referring to the USS Ponce (AFSB(I)-15), the converted afloat forward staging base that hosts the Navy's Laser Weapon System (LaWS).

"Now, people will say that's a different environment, it's over water, it's not over land where you might have collateral damage and things like that," Walsh told reporters.

"We could work through those things, and the Navy's kind of broken some trail on that already with Ponce, so I think we'd be willing to get that out, obviously experiment with it, and then get it out there and field it and see where we go."

https://news.usni.org/2016/06/23/walsh-directed-energy

http://breakingdefense.com/2016/06/lasers-vs-drones-directed-energy-summit-emphasizesthe-achievable/

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ARMY:

The Army has a 'critical gap' stopping drone swarms. Now it's doing something about it.

The U.S. Army has identified a "critical gap" in its ability to face swarms of drones that could attack small units of soldiers on the battlefield by confusing radar systems, overwhelming larger aircraft or simply exploding when they reach an assigned target.

The service has been examining the issue for years, but Gen. Daniel B. Allyn, the service's vice chief of staff, said Tuesday that defeating such attacks will be essential in the future. Initially the Army must be able to stop single drones from carrying out surveillance and reconnaissance against the United States, but the service must evolve from there to stopping swarm attacks using both new technology and old-school techniques, he said.

"For how the Army operates, we expect that we're going to have to be very, very effective in distributed operations in small units as we move forward," said Allyn. "The idea that you don't present a welcoming target to an adversary is something that has served us well from the early days of warfare, and will remain critical. The ability to leverage denial and deception and effective maneuver is going to be equally important as any technological advances we come up with."

It's another sign that the Pentagon is preparing for combat in which adversaries have access to drone and other cutting-edge technologies. Drone swarms have not yet appeared in combat against the United States, but individual unmanned systems are in use by China, Iran and Russia, among other nations.

Allyn, speaking at a breakfast in Washington with journalists, said the Army could counter drone swarms with some combination of directed energy or "kinetic" means, which typically means conventional

ammunition. But he hesitated to get specific, an indication that aspects of the research may be classified.

The Army has been carrying out experiments on drone swarms in several locations, including White Sands Missile Range in New Mexico and Fort Bliss in western Texas. Allyn said he recently visited Fort Bliss and came away impressed with how soldiers are using a combination of commercially available equipment with undisclosed operational maneuvers to take on drones.

"You put capability in the hands of soldiers and they're going to make it sing in ways that we cannot envision from up here at the Department of the Army," he said. "And that's why we leverage those opportunities as best we can."

Last year, the Army tested a system known as the Counter-Unmanned Aircraft Systems Mobile Integrated capability at Fort Bliss. It uses both live fire and other means, such as electronic jamming, to bring down the craft before it can do harm.

Another possibility to stop drones is the C-RAM, short for Counter Rocket, Artillery, and Mortar. The system is in use in Afghanistan to protect large bases such as Bagram Airfield from Taliban rockets and uses a combination of radar and 20mm Gatling guns to destroy incoming fire.

Last summer, the Defense Department also held a counter-drone exercise known as Black Dart 2015 at the Naval Base Ventura County and Sea Range west of Los Angeles. U.S. troops who participated used the Avenger Air Defense System, which is mounted to a vehicle and launches surface-to-air Stinger missiles.

https://www.washingtonpost.com/news/checkpoint/wp/2016/06/21/the-army-has-acritical-gap-stopping-drone-swarms-now-its-doing-something-about-it/

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USAF:

Langley AFB promoted as home for drone pilots

Langley Air Force Base is being touted as a top candidate to host a new group of drone pilots, tapping into the insatiable demand for skilled operators who fly unmanned aircraft around the globe.

The effort to put Langley in the forefront is ongoing, and it involves John M. Simmons of The Roosevelt Group, who lobbies Congress on behalf of the region's defense community. Simmons spoke at the Hampton Roads Chamber of Commerce Thursday and included the Langley item in a larger presentation about the defense budget.

The Air Force in April released criteria for basing new MQ-9 Reaper units at two potential locations. The first would include MQ-9 crews, but the aircraft would be based elsewhere. That's where Langley could come in.

The crew unit is called a "mission control element" in Air Force speak, and Langley would be well-suited for it, Simmons said.

The Air Force has realized "they need to bring these unmanned systems to high-profile bases like Langley," he said.

The Air Force plans to identify candidate installations this summer. Preferred alternatives would follow this coming winter. A final decision could come in fiscal year 2018.

Langley is already home to hundreds of intelligence analysts who process and interpret data from manned and unmanned aircraft that fly around the globe. That creates a synergy with unmanned aircraft operators.

The base also serves as headquarters for Air Combat Command (ACC).

"I believe Langley is going to get a mission control element," Simmons said, "and we're working hard to make that happen. And that is where it should be, to take advantage of all the ISR capabilities there."

Ideally, he said the unmanned aircraft would be based nearby, possibly at Seymour Johnson Air Force Base near Goldsboro, N.C.

Besides the base, living in Hampton Roads could be a major draw, according to Simmons and Sturk, a retired Air Force colonel who is the city's director of federal facilities support.

The Air Force is looking for bases surrounded by good schools, recreational opportunities and other amenities attractive to airmen and their families.

The nerve center for controlling Reaper flights is now at Creech Air Force Base outside of Las Vegas.

"The folks doing these missions right now in the middle of the desert in Nevada, they're not getting promoted and their quality of life isn't very good — and they leave," Simmons told the chamber audience. "Not a good position for the Air Force."

Gen. Herbert J. Carlisle, commander of Air Combat Command, told a Senate committee in March that the Air Force is losing too many skilled people in this field.

To get a handle on the problem, ACC last year conducted nearly 1,200 interviews and received 1,164 survey responses from Remotely Piloted Aircraft (RPA) airmen and their families.

"Our RPA airmen are over-tasked, their communities undermanned and are lacking adequate support on their bases," Carlisle said in prepared testimony. "This materializes as increased stress, reduced motivation and a general reduction in job satisfaction, even though the airmen fully understand the incredible impact they have on our combat mission."

These factors, combined with long hours and irregular schedules, have prompted RPA pilots to leave the force at a high rate, "which threatens the sustainment of our essential RPA mission," Carlisle said.

He told the Senate panel that he was about 200 pilots short.

If Langley lands this new group, Sturk estimated it would be in excess of 100 personnel. But raw numbers don't tell the whole story. Bringing the capability to the region opens up the potential for more RPA pilots and, in the future, actual unmanned aircraft taking off from the century-old air base that serves as a vital cog in the region's economy.

http://www.dailypress.com/news/military/dp-nws-defense-budget-briefing-20160623story.html

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US Air Force develops new ISR payload adapter for RQ-4 Global Hawk

The US Air Force Life Cycle Management Center has developed a new intelligence, surveillance, and reconnaissance (ISR) payload adapter (IPA) for the Block 30 RQ-4 Global Hawk unmanned aircraft system (UAS).

The IPA was developed as part of a cooperative research and development agreement.

Developed in partnership with Northrop Grumman and Air Combat Command, the IPA will help the aircraft to adapt and advance its current sensor capabilities.

The IPA will allow Block 30 air-frames to gain further capability to support future and current information gathering sensor systems availability.

Using some or all of the 17 physical attachment points on the IPA, crucial data exchanges with the aircraft can be made.

USAF Global Hawk program director colonel Darien Hammett said: "Opening up the architecture of the air system will provide added sensor technology opportunities through increased competition, which is our goal."

Currently, the USAF's fleet of Global Hawk aircraft are capable of carrying an enhanced integrated sensor suite and airborne signals intelligence payload.

In March this year, Northrop Grumman flight tested Senior Year Electro-Optical Reconnaissance System-2 (SYERS-2) intelligence gathering sensor on-board RQ-4 Global Hawk at its facility in Palmdale, California, US.

The air force plans to fly an optical bar camera sensor, and fully integrate UTC Aerospace Systems MS-177 on the Global Hawk.

The RQ-4 Global Hawk UAS is designed to provide field commanders with high-resolution, near real-time imagery of large geographic areas in support of military, humanitarian and environmental missions.

The USAF has used the remotely piloted UAS during wars in Iraq, Afghanistan and Libya, and in addition to intelligence gathering and reconnaissance efforts after the earthquakes in Haiti and Japan.

http://www.airforce-technology.com/news/newsus-air-force-develops-new-isr-payloadadapter-for-rq-4-global-hawk-4928346

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NATIONAL AIR SPACE:

As Drone Rules Near, More Debate Looms

FAA takes narrow, cautious approach, as unmanned-aircraft industry grows quickly

When the Federal Aviation Administration perhaps early this week unveils its first rules permitting businesses to fly drones for limited uses, the move is likely to spark broader demands for loosening restrictions on unmanned aircraft.

In recent days, agency officials have said the announcement-allowing drones weighing roughly 50 pounds to fly at low altitudes only in daylight and within sight of operators-is imminent. Some industry officials say the specifics could come as soon as Tuesday.

But according to manufacturers, trade associations and government drone experts, the FAA's expected narrow scope and cautious approach likely won't satisfy many segments of an industry seeking to grow exponentially faster than regulators can cope. The FAA's final rule, they predict, will rev up debate about how to more quickly phase in rules covering more uses and types of unmanned aircraft.

Commercial drone operations are projected to attract millions of new users annually in the U.S. alone, with drone champions targeting uses ranging from inspecting buildings and bridges to spraying crops to searching for downed power lines.

Regulators emphasize the historic nature of what they are about to issue, with the FAA's top drone official describing the impending rules as a bright "line in the sand." But privately and increasingly publicly, agency leaders acknowledge they are playing catch-up with an industry that can roll out a new drone model in barely a few months.

The FAA's move-which would allow restricted flights for drones of up to 50 pounds-could spark broader demand for loosening rules on unmanned aircraft.

FAA Administrator Michael Huerta has said some observers liken the drone revolution to "the Wright Brothers moment of our time." But Mr. Huerta also told an international safety conference last week that regulators no longer can afford to "act at the [traditional] speed of government."

Future FAA rule-making efforts envision allowing certain drones to fly at night, hover over densely inhabited areas, or inspect train tracks while people on the ground remotely monitor progress through cameras or sensors.

But those applications all require technical and regulatory advances that might not be ready until the end of the decade. Still further out is revising collision-avoidance systems such as those airliners use today and installing them on the largest category of drones.

On some days, the FAA already receives roughly 4,000 registration applications for small drones, primarily from hobbyists. As an interim measure, the agency has issued more than 5,000 exemptions for small-drone commercial operations under 400 feet and within other strict limits.

The FAA is poised to issue the rules after assessing some 4,500 comments prompted by its initial proposals in early 2015. But most experts see the latest development as the start, rather than the culmination, of a broad, intense regulatory battle lasting many more years.

The world's largest drone maker, SZ DJI Technology Co. of China, sees the new regulation as "long overdue" and "very welcome," according to the company's vice president of policy and legal affairs, Brendan Schulman, although he already is focusing on options that won't be permitted under this announcement: night flying, cruising beyond a drone operator's line of sight, and exempting operators of the smallest drones from needing a pilot's certificate to fly their aircraft.

Airware, a company that creates an operating system for commercial drones and is incorporated as Unmanned Innovation Inc., tests beyond-line-of-sight operations, but has had to conduct these tests in other countries because of the lack of regulation in the U.S. "I would much rather do something here than fly a team of people to Kenya," said Jesse Kallman, Airware's government-affairs director.

Even with the new rules, companies that hope to use drones for more futuristic reasons, such as package delivery, will remain grounded for now. Amazon.com Inc., which hopes to set up what it calls Prime Air to offer home delivery of packages via drone, said in a 2015 letter to the FAA that the proposed rules "would not establish a regulatory framework to permit Prime Air operations."

Still, a segment of startups that serve smaller users in more limited settings say the regulations address their basic requirements and bring legitimacy to their burgeoning industry. Slantrange Inc., a San Diegobased company that makes software and sensors for agricultural drones, is already manufacturing more inventory in anticipation of a drone-buying boom after the rules are official, according to Chief Executive Mike Ritter.

http://www.wsj.com/articles/as-drone-rules-near-more-debate-looms-1466379413?utm_source=Sailthru&utm_medium=email&utm_campaign=Defense%20EBB%2 006-20-16&utm_term=Editorial%20-%20Early%20Bird%20Brief

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FAA Announcement - Small Unmanned Aircraft Regulations (Part 107)

The new rules for non-hobbyist small unmanned aircraft (UAS) operations – Part 107 of the Federal Aviation Regulations (PDF) – cover a broad spectrum of commercial uses for drones weighing less than 55 pounds. Here are the highlights of the new rule.

Operating Requirements

The small UAS operator manipulating the controls of a drone should always avoid manned aircraft and never operate in a careless or reckless manner. You must keep your drone within sight. Alternatively, if you use First Person View or similar technology, you must have a visual observer always keep your aircraft within unaided sight (for example, no binoculars). However, even if you use a visual observer, you must still keep your unmanned aircraft close enough to be able to see it if something unexpected happens. Neither you nor a visual observer can be responsible for more than one unmanned aircraft operation at a time.

You can fly during daylight or in twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time) with appropriate anti-collision lighting. Minimum weather visibility is three miles from your control station. The maximum allowable altitude is 400 feet above the ground, and higher if your drone remains within 400 feet of a structure. The maximum speed is 100 mph (87 knots).

You can't fly a small UAS over anyone who is not directly participating in the operation, not under a covered structure, or not inside a covered stationary vehicle. No operations from a moving vehicle are allowed unless you are flying over a sparsely populated area.

Operations in Class G airspace are allowed without air traffic control permission. Operations in Class B, C, D and E airspace need ATC approval. See Chapter 14 in the Pilot's Handbook (PDF).

You can carry an external load if it is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft. You also may transport property for compensation or hire within state boundaries provided the drone – including its attached systems, payload and cargo – weighs less than 55 pounds total and you obey the other flight rules. (Some exceptions apply to Hawaii and the District of Columbia. These are spelled out in Part 107.)

You can request a waiver of most operational restrictions if you can show that your proposed operation can be conducted safely under a waiver. The FAA will make an online portal available to apply for such waivers.

Pilot Certification

To operate the controls of a small UAS under Part 107, you need a remote pilot airman certificate with a small UAS rating, or be under the direct supervision of a person who holds such a certificate

You must be at least 16 years old to qualify for a remote pilot certificate, and you can obtain it in one of two ways:

You may pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center.

If you already have a Part 61 pilot certificate, other than a student pilot certificate, you must have completed a flight review in the previous 24 months and you must take a small UAS online training course provided by the FAA.

If you have a non-student pilot Part 61 certificate, you will immediately receive a temporary remote pilot certificate when you apply for a permanent certificate. Other applicants will obtain a temporary remote pilot certificate upon successful completion of a security background check. We anticipate we will be able to issue temporary certificates within 10 business days after receiving a completed application.

UAS Certification

You are responsible for ensuring a drone is safe before flying, but the FAA does not require small UAS to comply with current agency airworthiness standards or obtain aircraft certification. Instead, the remote pilot will simply have to perform a preflight visual and operational check of the small UAS to ensure that safety-pertinent systems are functioning properly. This includes checking the communications link between the control station and the UAS. The UAS must also be registered.

Respecting Privacy

Although the new rule does not specifically deal with privacy issues in the use of drones, and the FAA does not regulate how UAS gather data on people or property, the FAA is acting to address privacy considerations in this area. The FAA strongly encourages all UAS pilots to check local and state laws before gathering information through remote sensing technology or photography.

As part of a privacy education campaign, the agency will provide all drone users with recommended privacy guidelines as part of the UAS registration process and through the FAA's B4UFly mobile app. The FAA also will educate all commercial drone pilots on privacy during their pilot certification process; and will issue new guidance to local and state governments on drone privacy issues. The FAA's effort builds on the privacy "best practices" (PDF) the National Telecommunications and Information Administration published last month as the result of a year-long outreach initiative with privacy advocates and industry.

Other Requirements

If you are acting as pilot in command, you have to comply with several other provisions of the rule:

You must make your drone available to the FAA for inspection or testing on request, and you must provide any associated records required to be kept under the rule.

You must report to the FAA within 10 days any operation that results in serious injury, loss of consciousness, or property damage (to property other than the UAS) of at least \$500.

https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=20516

https://www.faa.gov/regulations_policies/advisory_circulars/index.cfm/go/document.infor mation/documentID/1019962

http://www.bna.com/commercial-drone-uses-n57982074585/

https://fcw.com/articles/2016/06/22/faa-drone-rules.aspx

http://www.manufacturing.net/news/2016/06/faa-announces-first-rules-commercial-drones https://www.washingtonpost.com/local/trafficandcommuting/white-house-rolls-out-rulesfor-drone-operations/2016/06/21/0508557a-3763-11e6-9ccdd6005beac8b3_story.html?utm_campaign=Defense%20EBB%2006-22-16&utm_medium=email&utm_source=Sailthru

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Louisiana Governor Signs UAV Restrictions Bill

BATON ROUGE, La. (AP) — Gov. John Bel Edwards has signed into law new limits on drone use in Louisiana.

A bill by Rep. Stephen Dwight, a Republican from Lake Charles, will restrict drone use near schools, school property or correctional facilities. It includes exceptions for police, situations where the landowner grants permission and for pre-agreed recordings like sporting events.

The law takes effect Aug. 1.

A second bill approved by Edwards will cover drones under criminal trespassing laws. The measure by Sen. Dan Claitor, a Baton Rouge Republican, makes an exception for anyone flying the unmanned aircraft system for commercial agricultural use. It takes effect immediately.

The governor's office announced this week that Edwards had signed the measures.

House Bill 19 and Senate Bill 141: <u>www.legis.la.gov</u>

http://www.chron.com/news/article/Edwards-agrees-to-new-restrictions-on-drones-in-8316965.php

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Reno Fire Helicopter in Drone Incident

A helicopter operating during Wednesday's Hawken Fire in Reno had a near miss with a hobby drone as the remotely-operated device flew underneath the aircraft.

Doug Russell, chief pilot and deputy for the Washoe County Sheriff's Office's Special Operations Division, was headed back to the airport around 8 p.m. after making a water drop when his co-pilot spotted the drone as it flew below their Regional Aviation Enforcement Unit or RAVEN helicopter.

"My co-pilot didn't even have a chance to jump on the controls," said Russell, who did not see the drone at first. "It happened that fast."

Russell was eventually able to locate the drone, which he says had the familiar red markings of a DJI Phantom quadcopter. Russell watched as it landed at Village Green Park near Caughlin Ranch Elementary School and continued visual contact until authorities arrived on the scene to talk to a teenager and older man who were operating the drone. First-time offenders of drone safety laws usually get a warning.

Tracking and confirming the drone's location was important because of its potential impact on air operations in the area, Russell said.

"At a minimum, it could have shut down aircraft operations for the fire," Russell said. "Now you're putting firefighters' lives and people's homes and property in jeopardy."

The incident also could have been far worse if the drone made physical contact with the helicopter. At the time, the HH-1H Huey helicopter was traveling at a speed of 80 knots, or about 90 miles per hour, Russell said. Even if it was just a glancing blow, hitting a drone at that speed would "probably ruin your day," Russell quipped as he referenced the many moving parts of a helicopter.

"Because the rotors are spinning at a high RPM, things will start catastrophically failing once the system is out of balance," Russell said. "It will start taking itself apart."

Reports of sightings and near misses between aircraft and unmanned aerial systems have accelerated at a significant pace in the last year as drones become more popular. In 2014, the Federal Aviation Administration saw less than one close encounter per day between drones and aircraft. By 2015, the number jumped to 3.5 per day.

The FAA now receives more than 100 drone sighting reports per month from pilots, law enforcement and citizens. The agency logged in more than 580 drone sighting reports between August 21, 2015 and January 31, 2016. The reports include sightings around airports and firefighting locations. The close encounters involve a variety of aircraft, including commercial airlines as well as hospital and law enforcement helicopters.

"Operating drones around airplanes, helicopters and airports is dangerous and illegal," according to the FAA. "Unauthorized operators may be subject to stiff fines and criminal charges, including possible jail time."

California so far has accounted for the majority of close encounters between drones and aircraft. FAA data show close to 200 reports of such encounters in the state in the last couple of years. In April, pilots for a British Airways flight thought they were struck by a drone while landing at Heathrow Airport in London. Government officials, however, ultimately ruled the contact was not a drone incident, citing lack of evidence. One government official said it could have actually been a plastic bag.

Russell says drone issues typically boil down to one thing: lack of education. Drones may look like toys but operating them is serious business. The FAA has several regulations regarding drones, including registration requirements. Standard operating procedure also calls for contacting an airport if one is flown within five miles of its location. The drone that nearly collided with the RAVEN helicopter, for example, was definitely within five miles of Reno-Tahoe International Airport when they encountered it, Russell said.

"Whether you're a hobbyist or a commercial or governmental operator, you have to abide by the rules because ignorance is not an excuse," Russell said. "It doesn't matter whether you're flying 1 foot or 400 feet off the ground — you are operating on national airspace."

http://www.uasvision.com/2016/06/21/reno-fire-helicopter-in-droneincident/?utm_source=Newsletter&utm_campaign=d805c1fda4-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_799756aeb7-d805c1fda4-297560805

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Drone Company Delivers Medical Supplies to Boat Off of New Jersey Coast

New Application for Drones: Disaster Relief

Government-approved delivery is still a ways off, but some industries could see immediate benefit from the FAA's new guidelines.

New Application for Drones: Disaster Relief

A flying robot buzzed along the beach of Cape May, New Jersey, on Wednesday afternoon, carrying medical samples and emergency supplies between an onshore camp and a boat floating just off the coast.

The mission – conducted by a small Australian company that managed to add to its growing collection of "firsts" in the U.S. – served as another step forward for U.S. drone operations during what's already been a blockbuster week for the industry.

Flirtey – the company that last year conducted the first Federal Aviation Administration-approved unmanned drone delivery near rural Wise, Virginia, and which earlier this year launched the first sanctioned delivery in an urban setting – became the first outfit to oversee a successful ship-to-shore delivery in the U.S. in what amounted to a mock-crisis situation.

"Eight out of the 10 most populated cities in the world are along a coast, so this is applicable for all of those cities and all of the populations along the coast," says Kyle Ryan, a partner at Ryan Media Lab – a Delaware-based drone communications outfit that was involved in organizing Wednesday's event. "[Drone delivery] allows for instant humanitarian relief within minutes and without having to worry about logistics."

Flirtey also partnered with Dr. Timothy Amukele, a professor at Johns Hopkins University School of Medicine, to help get the mission off the ground. Notably, the effort flew onto the radar of officials at

the United Nations, who attended the event and said they hope to use unmanned drones to revolutionize crisis response worldwide.

Andrew Billow, an officer at the U.N.'s humanitarian affairs branch, said in a statement that his organization wants to "engage with drone developers and operators in ensuring the principled application of game-changing technologies in response to humanitarian crises around the world."

Flirtey's flight was a first on U.S. soil, but it doesn't necessarily mean the company now has free reign of the skies. Unrestricted drone-operated delivery of any kind in the U.S. – be it humanitarian relief or postal delivery – is still obstructed by layers of legislative red tape. And although Flirtey has received approval in the past for big-name events like these, experts tend to believe practical commercial drone delivery in any capacity is still a ways off.

"I know Flirtey and I know what they're doing, and it's great. ... But that's not where the economic benefit of drones is going to come from," says Colin Snow, CEO and founder of Skylogic Research. "It's going to be a long time before we see any kind of drone delivery or package delivery in the United States. And that's simply because of the complexity of our airspace, the complexity of what it takes to get a regulation in place."

To be fair, the Obama administration did lighten the drone industry's legislative burden on Tuesday when it unveiled new guidelines that would, among other things, allow drones that weigh 55 pounds or less to be used for certain commercial purposes. The lengthy series of guidelines, which aren't expected to be implemented until later this summer, will allow some commercial operators to bypass formal exemption requests with the FAA that Snow says "just stifled innovation."

But the new government regulations – known colloquially as Part 107 – mandate that commercial operations can only be conducted by an approved pilot and within that operator's visible line of sight. The operation of multiple drones at the same time raises legislative red flags, and that doesn't even begin to touch on the complications associated with piloting drones over private or government property.

Altogether, this means the skies probably won't be darkened anytime soon by unmanned Amazon deliveries.

"I try to make the point that this is the new normal," Snow says, indicating that any domestic drone operation "beyond visual line of site is a pretty big, long roadway." "There will be exceptions ... and those will make the press, but the new normal we're on is a plateau."

Repair and maintenance operations, for example, could become significantly safer through the use of drones. Fixing cell and radio towers would be less risky if a drone could be sent up first to take pictures, allowing experts to figure out what – if anything – needs to be repaired before sending a worker to begin a dangerous climb.

"It's those dangerous jobs that will see an immediate impact," Snow says. "The largest impact, though, is film, photo and video. This is the largest market for commercial drones. People don't think about it, but it is."

FAA Eases Flight of Small Drones

He says everything from wedding photography to small-scale topographical mapping to cinematography could be advanced by the advent of drones – a reality that will now be possible commercially thanks to Part 107.

The FAA projects the eased regulations could generate economic returns of more than \$82 billion over a 10-year window, while potentially creating more than 100,000 new jobs.

"We are part of a new era in aviation, and the potential for unmanned aircraft will make it safer and easier to do certain jobs, gather information, and deploy disaster relief," Transportation Secretary Anthony Foxx said during a conference call Tuesday.

Snow indicates that safety is the "No. 1 concern for the FAA," which is part of the reason why unrestricted drone delivery seems like it is still so far off. It's worth noting, though, that Part 107 likely wouldn't have been approved in the first place if the FAA hadn't allowed companies like Flirtey to conduct controlled tests using what is still a fairly nascent technology in the world of domestic commerce.

So although Wednesday's event doesn't necessarily open the skies around the world to easily accessible disaster relief, it's certainly a step in the right direction.

"[The FAA is] getting a little more lenient. We're moving further into 2016," Ryan says. "The perception is the U.S. is catching up, and it's about time."

http://www.usnews.com/news/articles/2016-06-23/new-application-for-drones-disasterrelief

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PUBLIC SAFETY:

NASA reaches out to industry to determine state of the art in UAV sense and avoid avionics

U.S. aviation authorities are reaching out to industry for help in formulating avionics performance standards for medium-sized unmanned aerial vehicles (UAV) that must be able to sense and avoid other aircraft in controlled airspace.

Officials of the National Aeronautics and Space Administration (NASA) issued a sources-sought notice Friday (NND16828627L) for the Alternative Airborne Surveillance Systems for Beyond Visual Line of Sight Unmanned Aircraft Systems (UAS) Detect and Avoid project. This survey -- part of the NASA UAS Integration in the National Airspace System (UAS-NAS) project -- seeks to determine industry's ability to design and integrate airborne sensors of relatively small size, weight, and power consumption (SWaP) for medium-size UAVs.

Of primary concern are unmanned aircraft operating under instrument flight rules (IFR) at altitudes higher than 500 feet at beyond-line-of-sight distances from their control centers.

These unmanned aircraft are not able to carry large surveillance sensors, yet still need to watch their surroundings for other aircraft. Candidate sensors include electro-optical/infrared (EO/IR), light detection and ranging (LIDAR), relatively small radar systems, or small Automatic Dependent Surveillance-Broadcast (ADS-B) avionics.

NASA experts will use industry responses to help formulate RTCA Special Committee-228 Minimum Operational Performance Standards (MOPS) for medium-sized UAVs. The request for information was released on behalf of the NASA Armstrong Flight Research Center at Edwards Air Force Base, Calif.

Of particular interest to NASA are UAVs expected to operate side-by-side with manned commercial and general-aviation aircraft flying in FAA Class D, E, or G airspace.

FAA Class D describes controlled airspace that extends from the surface to 2,500 feet surrounding airports with operational control towers. In this airspace each aircraft must establish two-way radio communications with tower.

Class E describes airspace between 14,500 and 18,000 feet over the U.S. and over the ocean within 12 nautical miles of the coast. It also describes U.S. airspace above 60,000 feet. Class G, meanwhile, is uncontrolled airspace. NASA experts also would like to hear from manufacturers of optionally piloted aircraft expected to operate in these kinds of conditions.

Makers of relevant airborne sensors or aircraft should respond to NASA no later than 27 June 2016 by email at afrc-uas-nas@mail.nasa.gov, or by post at NASA-Armstrong Flight Research Center, P.O. Box 273 M/S S323, Edwards, CA 93523.

For questions or concerns contact NASA's Rosalia Toberman by email at rosalia.toberman@nasa.gov, or by phone at 661-276-3931.

More information is online at https://www.fbo.gov/spg/NASA/DFRC/OPDC20220/NND16828627L/listing.html

http://www.militaryaerospace.com/articles/2016/06/uav-sense-and-avoid.html

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MIT - Study shows inconsistent public opinion on safety of driverless cars

Driverless cars pose a quandary when it comes to safety. These autonomous vehicles are programmed with a set of safety rules, and it is not hard to construct a scenario in which those rules come into

conflict with each other. Suppose a driverless car must either hit a pedestrian or swerve in such a way that it crashes and harms its passengers. What should it be instructed to do?

A newly published study co-authored by an MIT professor shows that the public is conflicted over such scenarios, taking a notably inconsistent approach to the safety of autonomous vehicles, should they become a reality on the roads.

In a series of surveys taken last year, the researchers found that people generally take a utilitarian approach to safety ethics: They would prefer autonomous vehicles to minimize casualties in situations of extreme danger. That would mean, say, having a car with one rider swerve off the road and crash to avoid a crowd of 10 pedestrians. At the same time, the survey's respondents said, they would be much less likely to use a vehicle programmed that way.

Essentially, people want driverless cars that are as pedestrian-friendly as possible — except for the vehicles they would be riding in.

"Most people want to live in in a world where cars will minimize casualties," says Iyad Rahwan, an associate professor in the MIT Media Lab and co-author of a new paper outlining the study. "But everybody wants their own car to protect them at all costs."

The result is what the researchers call a "social dilemma," in which people could end up making conditions less safe for everyone by acting in their own self-interest.

"If everybody does that, then we would end up in a tragedy ... whereby the cars will not minimize casualties," Rahwan adds.

Or, as the researchers write in the new paper, "For the time being, there seems to be no easy way to design algorithms that would reconcile moral values and personal self-interest."

The paper, "The social dilemma of autonomous vehicles," is being published today in the journal Science. The authors are Jean-Francois Bonnefon of the Toulouse School of Economics; Azim Shariff, an assistant professor of psychology at the University of Oregon; and Rahwan, the AT&T Career Development Professor and an associate professor of media arts and sciences at the MIT Media Lab.

Survey says

The researchers conducted six surveys, using the online Mechanical Turk public-opinion tool, between June 2015 and November 2015.

The results consistently showed that people will take a utilitarian approach to the ethics of autonomous vehicles, one emphasizing the sheer number of lives that could be saved. For instance, 76 percent of respondents believe it is more moral for an autonomous vehicle, should such a circumstance arise, to sacrifice one passenger rather than 10 pedestrians.

But the surveys also revealed a lack of enthusiasm for buying or using a driverless car programmed to avoid pedestrians at the expense of its own passengers. One question asked respondents to rate the

morality of an autonomous vehicle programmed to crash and kill its own passenger to save 10 pedestrians; the rating dropped by a third when respondents considered the possibility of riding in such a car.

Similarly, people were strongly opposed to the idea of the government regulating driverless cars to ensure they would be programmed with utilitarian principles. In the survey, respondents said they were only one-third as likely to purchase a vehicle regulated this way, as opposed to an unregulated vehicle, which could presumably be programmed in any fashion.

"This is a challenge that should be on the mind of car makers and regulators alike," the scholars write. Moreover, if autonomous vehicles actually turned out to be safer than regular cars, unease over the dilemmas of regulation "may paradoxically increase casualties by postponing the adoption of a safer technology."

Empirically informed

The aggregate performance of autonomous vehicles on a mass scale is, of course, yet to be determined. For now, ethicists say the survey offers interesting and novel data in an area of emerging moral interest.

"I think the authors are definitely correct to describe this as a social dilemma," says Joshua Greene, a professor of psychology at Harvard University, who has written a commentary on the research for Science, noting, "The critical feature of a social dilemma is a tension between self-interest and collective interest." Greene adds that the researchers "clearly show that people have a deep ambivalence about this question."

The researchers, for their part, acknowledge that public-opinion polling on this issue is at a very early stage, which means any current findings "are not guaranteed to persist," as they write in the paper, if the landscape of driverless cars evolves.

http://news.mit.edu/2016/driverless-cars-safety-issues-0623

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Drones with radiation detectors designed for nuclear emergencies

They resemble miniature Reaper drones, but the nimbler Sandstorm's mission will veer sharply from its weapons-laden cousin as the Department of Energy explores using unmanned aircraft to respond to nuclear emergencies.

Instead of laser-guided missiles and bombs under its wings, the Sandstorm payload consists of radiation detection sensors and optical imagery gear. Named for designer Justin Sands of Henderson-based Unmanned Systems Inc., these sleek machines are more maneuverable, but like Reapers they have retractable nose gear and pneumatic brakes.

The National Nuclear Security Administration wants Sandstorms to augment its fleet of helicopters and fixed-wing aircraft. Nuclear emergency responders are being trained to fly the drones and assess

radioactive plumes under such scenarios as what occurred in the earthquake-triggered reactor meltdowns during the 2011 disaster at Fukushima, Japan.

The logic is akin to not risking pilot lives for reconnaissance missions in a war zone.

"We know there are going to be areas where we don't want to put our aircraft or our personnel or equipment in harm's way," said Karen McCall, Unmanned Aerial Systems program manager for National Security Technologies, prime contractor for Department of Energy's Nevada Field Office.

"So by having unmanned platforms available we would actually go out and determine a situation before we send in our first responders."

Sandstorms have a 15-foot wingspan — compared with 66 feet for a Reaper — and can zip through the sky at clips of 40 mph to 110 mph, depending on whether they are powered by lithium-polymer batteries, gasoline or jet fuel for turboprops.

At the Nevada National Security Site, just down the road from Creech Air Force Base and about 65 miles northwest of Las Vegas, pilot Mike Toland recently honed his skills on takeoffs and landings, controlling a Sandstorm with the joystick on a hand-held control box the size of a dictionary.

Much of the "proficiency training" on a calm Monday morning at the site's Desert Rock Airport was easy to grasp for Toland, who also flies manned aircraft and has flown remote-controlled model airplanes since he was 12 years old.

"When you're flying an aircraft from the ground looking at it," he said, "if you want to turn left, you have to move the stick to the right. It's counter-intuitive. It's not a natural thing, especially for a manned pilot. You have to relearn how to fly the airplane," said Toland, a captain pilot for National Security Technologies.

Hovig Yaralian, pilot and flight test engineer Unmanned Systems Inc., said battery-powered Sandstorms can fly up to "a couple thousand feet," depending on the payload. It weighs 40 pounds without added gear or up to 70 pounds with sensors and optical equipment.

Turboprop Sandstorms have an altitude range up to 10,000 feet with four hours of endurance.

"There's a lot of redundancy taken into consideration with these aircraft. Whether it be manual control or automated control, it overrides the manual control for safety features," he added.

Unmanned Systems Inc. was awarded a \$240,000 contract to provide National Security Technologies with two Sandstorms. The package includes training, maintenance and operational support.

Unmanned Systems Inc. also has a facility in Montana to train civilian contractor pilots to fly drones for the Air Force.

McCall said the Sandstorm effort is aimed at research and development of the platforms and to train 11 pilots for NSTech's remote-sensing laboratory teams stationed at Nellis Air Force Base in Las Vegas and Joint Base Andrews in Maryland.

"Having a team of experienced aviators makes us one of a few organizations that this (training) hurdle will be kind of easy for us," she said.

http://www.reviewjournal.com/news/military/drones-radiation-detectors-designed-nuclearemergencies

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PVCC small unmanned aerial systems program for EMS first responders continues to grow

Piedmont Virginia Community College's small unmanned aerial systems (sUAS) program continues to grow with the acquisition of an additional drone that can fly at night and support from the Virginia Unmanned Systems (UMS) Commission.

In April, PVCC became the first college in the nation to receive blanket approval from the Federal Aviation Authority (FAA) to conduct research and development of aircraft and sensors, including sUAS vehicles, for public safety. The college held its first course for emergency services personnel and first responders in May.

PVCC's UAS fleet now consists of nine drones, including the college's most recent acquisition, the "Endurance," manufactured by Straight Up Imaging. According to Darren Goodbar, principal instructor for the program and the director of aerial services at Draper Aden Associates, the Endurance drone is equipped for night flight and includes thermal imaging, which can be used for search and rescue, situational awareness and fire assessment research.

Last week, the Virginia Unmanned Systems (UMS) Commission approved its recommendations to the Governor to increase business opportunities for the use of unmanned systems in the Commonwealth. These recommendations include funding the continued expansion of sUAS to be used by first responders in life-saving applications throughout Virginia.

"Our curriculum for emergency services and public safety personnel will advance the use of sUAS technology, which will improve the safety of our first responders while lowering the cost of operations."

To learn more about PVCC's program, contact the PVCC Workforce Services Division at 434.961.5354, or by emailing workforce@pvcc.edu.

http://www.cvilletomorrow.org/news/article/24188-pvcc-small-unmanned-aerial-systemsprogram-for-ems/

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SENSORS/APPLICATIONS:

Sikorsky uses tablet to complete autonomous flight

Here's another use for your tablet device — piloting a helicopter.

Test pilots for Sikorsky recently used tablets to fly one of the firm's S-76 commercial helicopters, part of a Pentagon look at installing autonomous, or self-piloting, systems into existing helicopter models.

The chopper flew from the company's Stratford, Conn., facility to Robertson Airport in Plainville, Conn. — a distance of about 30 miles — in January, a press release from the firm said. Pilots used a tablet to load the flight plan and initiate take-off, leaving system software to handle the flight controls and make adjustments.

The test completes the \$8 million first phase of an autonomous cockpit program run by the military's Defense Advanced Research Projects Agency, or DARPA. Dubbed the Aircrew Labor In-Cockpit System, or ALIAS, program, it aims to fit autonomous systems into existing helicopter models such as the company's UH-60 Black Hawk. Pilots and trainers would have the option of using the system instead of flying the aircraft manually.

In a video of the flight released by Sikorsky, a pilot is shown tapping a button on the tablet to initiate take-off. He repositions the aircraft by touching and dragging an icon and chooses a flight path by selecting a pre-loaded plan or entering a new plan. The autonomous system then adjusts flight controls to compensate for factors like wind.

"What Sikorsky and DARPA are demonstrating is the successful and affordable integration of advanced technology onto existing legacy aircraft to not only set the stage for autonomous operations down the road, but also to immediately improve aircraft performance, reduce maintenance costs, and increase crew and passenger safety," Chris Van Buiten, Vice President of Sikorsky Innovations, said in the press release.

Sikorsky recently began the project's second phase, funded at \$9.8 million by DARPA, which aims to improve the system, known as Matrix Technology.

The DARPA program is part of the military's broader interest in autonomous aircraft, ships and submarines. Designed to act without instruction from pilots, the vehicles can be deployed for longer periods of time and used in more dangerous situations or to reduce the risk of pilot error.

http://www.stripes.com/news/us/sikorsky-uses-tablet-to-complete-autonomous-flight-1.414523

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Startup Builds Seed-Planting Drone for Replanting Forests

DroneSeed predicts its tree-planting drones can perform in an hour the same task that takes a human worker a full day.

If you look to the forests in the Pacific Northwest, you might see something that looks like a Frisbee flying through the air. But this Frisbee is blasting fertilizer and seeds into the ground at 350 feet per second, faster than paintballs fly out of a gun.

Beaverton, Oregon-based drone startup DroneSeed created a drone with a device that fires seeds into the ground using compressed air in an effort to reforest the Pacific Northwest, and eventually forests around the world.

The \$200 billion forestry industry depends on manual labor to plant seeds in the ground, with work crews using shovels for the chore. One human worker typically can plant 800 seeds in a day, but DroneSeed predicts its device can plant 800 seeds per hour.

Each year, 1.5 billion trees are planted in the U.S., according to the Southeastern Lumber Manufacturers Association. Planting those trees by hand is arduous and dangerous, however.

Most workers on the ground in the U.S. are migrant labor, while in Canada it's primarily seasonal workers and college students. Labor is still hard to find because the job is physically demanding. Workers have to move trees around the site, hauling trees like mountaineers in bags up hills in work that could mean a thousand back bends a day. One study says a day spent planting trees is equivalent to burning two times more calories than one would by running a marathon.

Logging has consistently been one of the most hazardous industries in the United States. In 2010, the logging industry employed 95,000 workers and accounted for 70 deaths, resulting in a fatality rate of 73.7 deaths per 100,000 workers, according to the Centers for Disease Control and Prevention. That is 21 times higher than the overall fatality rate in the U.S.

While the agriculture industry has developed tractors and other machinery to automate difficult processes, the forestry industry has struggled to develop a similar technology due to harsh and uneven terrain. Drones could be the solution, as terrain is less of a concern.

DroneSeed's clients include Clean Water Services, a wastewater utility in parts of Oregon, which regularly plants trees to lower temperature of the waterways. It is also working to cover several million acres for one of the Northwest's top five foresters and works internationally in Canada.

DroneSeed says its solution is good for the environment, worker safety and investors. DroneSeed's drones currently have a flight time of about 30 minutes; after changing batteries, the drones can cover an acre within 1.5 hours.

Goldman Sachs estimated in a March 2016 report that agriculture would be the second-largest commercial application for drones behind construction. Farms are currently using drones to monitor crop health and identify potentially problematic areas in the field, often using mounted thermal cameras.

Forestry never made the list, but likely because no one realized the potential application of drones for planting seeds. Only one other startup is similarly working to replant trees with drones: U.K.-based startup BioCarbon Engineering, led by former NASA engineer Lauren Fletcher, plans to plant 1 billion trees a year using a similar technology.

The agricultural robot market is expected to grow to \$16.3 billion by 2020 from \$817 million in 2013, according to a 2015 Bank of America Merrill Lynch Global Research report. The agricultural drone market has the potential to generate an additional 100,000 jobs in the U.S. and \$82 billion in economic activity between 2015 and 2025, according to the report.

"There is so much parallel with what happened to precision agriculture and what is happening with us in the forestry industry with drones," Canary said. "We see drones as forestry's tractor."

http://www.marketwatch.com/story/the-drone-taking-on-one-of-the-hardest-jobs-on-theplanet-2016-06-15

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First U.S. ship-to-shore drone delivery test

Tue, 2016-06-21 09:31 PM

On Thursday, a drone will take off from a ship off the coast of southern New Jersey and conduct the first ship-to-shore delivery in the United States by an unmanned craft.

But it's not just the drone's flight that will be tested. An innovative system proven in more than a decade of use in the military will be deployed for civilian purposes to provide information to pilots and other stakeholders about unmanned systems operating in their area.

The event brings together organizations such as the United Nations, the American Red Cross and numerous other groups – including the Field Innovation Team and Simulyze – to conduct research on how drones can be used during disasters and emergencies. During the Thursday's test, called a "Do Tank," the drone will drop off a package in Cape May County and then will be given a new package to take back to the ship.

Simulyze provides operational intelligence solutions allowing its clients – both public- and private-sector organizations – to make the best available decision with information they receive in a real-time environment. As the drone, provided by Luftronix, conducts its flight, Simulyze will gather and transmit data from it to the key stakeholders, even providing them with visual data from the unmanned craft.

"Our role in it is... to be able to integrate and show how in flying a drone you can integrate in with other systems," said Kevin Gallagher, president and CEO of Simulyze. "We're also going to unveil a new capability. The Federal Aviation Administration has a flight service station for overall aviation. Pilots can go to this portal, Lockheed Martin Flight Services does this, they can pull up their flight plans. They can pull up reports. They can see what else is going on in the area. We've built an interface to work with

that, so we can take our plans and automatically put them into that system so that the manned aviation community can have insight into what the UAS operations are going to be."

This new capability, Gallagher said, will have a far reaching impact on the aviation industry, including the manned and unmanned planes, in the United States. It comes at a time when representatives from both communities have worked with the FAA to improve safety in the skies for all flyers.

In the last year, the FAA has seen a dramatic increase in the number of close calls between unmanned and piloted craft. While most of the headlines regarded close calls with commercial planes as they approached airports, the agency did note that drones interfered with planes engaged in battling wildfires and caused some delays in getting water and other supplies to responders on the ground.

FIT Founder Desiree Matel-Anderson said "Do Tanks" bring together experts from various industries and groups to create innovative solutions to the challenges posed by disasters.

"It's pivotal that in disaster and crisis we look to support our relief efforts with cutting edge technology," she said.

"The flight is critically important for moving the drone to more of a commercial reality to support various missions," he said. "From our perspective, we're excited about putting our operational intelligence platform out there to be able to help safe and efficient operations. We're excited to be able to show some really good integration with both the UAS community and the overall aviation community. We think that's really key to enable UAS regulations to allow commercial operations."

http://gsnmagazine.com/article/46712/first us ship to shore drone delivery test bolster

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Detect Drones ? - Now There's an App for That !

DeTect has announced the release of the free public version of the DroneWatcher app that makes smartphones and tablets using the Android operating system into detectors for consumer drones and small unmanned aerial vehicles.

The DroneWatcher app detects, tracks, alerts and records information on 95% of commercially available drones using advanced signals intelligence technology developed by Panama City based DeTect. The app alerts the user when a drone is detected within ¼ to ½ mile recording the drone type and ID which can be used to document incursions and support apprehension and prosecution by local law enforcement if needed.

In addition to personal use to protect privacy for homes or small businesses, the DroneWatcher app can be used for drone control and security at public events (indoor and outdoor concerts, fairs, rallies, etc.), sporting events (NASCAR, stadium sports, golf tournaments, tennis and other outdoor and indoor competitions), airports, prisons, power plants, government facilities, industrial sites, and for general law enforcement. Combined with DeTect's DroneWatcher RF and HARRIER Drone Surveillance Radar, the technology provides the most comprehensive level of drone protection and interdiction available on the market. The DroneWatcher app can be downloaded for free on Google Play[™].

http://www.uasvision.com/2016/06/24/detect-drones-now-theres-an-app-forthat/?utm_source=Newsletter&utm_campaign=7cf14f8dcc-RSS_EMAIL_CAMPAIGN&utm_medium=email&utm_term=0_799756aeb7-7cf14f8dcc-297560805

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COUNTER UAS:

West Point Cadets are Shooting Down Drones with Cyber Rifles

Tall grass hid the advancing cadets from my perch in building 7. The tall grass hid nothing from the drone the defenders flew over their position, a Parrot AR 2.0, a common model used by civilian fliers. A minute later, after the drone pilot filmed the crawling cadets, instructors called in mock artillery fire. The cadets' position was compromised, and while the rest of their platoon advanced to take the buildings, these 10 cadets instead spent an hour in the sun contemplating what they could have done about the drone.

The answer was standing right behind them. As the smoke grenades denoting artillery landed nearby, a supporting electronic warfare officer aimed a rifle-shaped antenna at the drone. The drone crashed to the ground instantly, its camera going fuzzy and then only showing the pilot a close-up of asphalt.

Part of the Army's larger cyber complex, the Institute is a sort of internal think-tank at West Point, trying to figure out what the cyber component of warfare looks like in practice. "Cyber" is a broad term, and it mostly brings to mind people sitting at desks slinging code across the internet.

"Cyber electromagnetic activities," says the definition in an Army field manual on the same, "are activities leveraged to seize, retain, and exploit an advantage over adversaries and enemies in both cyberspace and the electromagnetic spectrum, while simultaneously denying and degrading adversary and enemy use of the same and protecting the mission command system."

What does that actually mean in practice? Sometimes, it means the people at desks on computers. But this day, it meant an antenna on an airsoft M-4 rifle stock, hooked up to a Raspberry Pi computer, spitting code over WI-Fi at an unlocked toy quad-copter (the Parrot AR drone).

This specific cyber rifle only works with a specific type of drone, so don't expect soldiers to go into battle with code rifles the next time they deploy. That's almost beside the point. Most of the exercise traced a familiar point to soldiers for decades: spend a few hours marching to a village, and then dislodge the defenders holed-up there.

Military Operations Urban Terrain

This scenario is termed a MOUT, or "Military Operations Urban Terrain." "Urban" is defined pretty loosely -- the site had eight small buildings, one of them two-stories, and a couple of trucks. It was urban in the sense that it wasn't an empty field.

C2 is "command and control," so this just means that the person in charge of the defense can use the drone to scout.

Added to the danger: this drone wasn't just a scout, but in the scenario they had to treat it as a deadly weapon too, one packing an explosive punch. While bullets are of some use against drones in the real world, for this scenario they were deemed ineffective, so the attacking cadets had to use different means to shoot them down.

That meant the cyber rifle. Here's how the cadet's orders described it:

The CEMA enabler task is to neutralize ENY drones to allow PLTs freedom of movement. O/a 0600, CEMA TM conducts L/U with 1 st PLT and integrates into platoon's scheme of maneuver in support of counter-UAS.

CEMA is "cyber-electromagnetic activity," ENY is enemy, and PLT is platoon. At 6 a.m. in the morning, the cyber rifle team linked up with the platoon, and they marched for several hours to get into position. I, escorted politely to the mock battlefield, arrived a little before 10 a.m., and was sent into the woods to watch the attack.

The cadets choose to assign Captain Waage to the weapons squad, whose medium machine guns would provide covering fire as the squad advanced. A few minutes after my arrival we heard the drone, and Captain Waage knocked it out of the sky. Then I saw the machine gunners open packs ear plugs. All guns for the training used lasers and sensors in the cadet's uniforms to signal hits, but they were still loaded with blanks, so the exercise got really loud, really quickly.

The Army Cyber Institute is one small part of the Army's larger cyber apparatus. In Fort Meade, Maryland, there's the 780th Military Intelligence Bridge, which focuses on defending networks at a much higher level. There's also the Cyber Center of Excellence at Fort Gordon in Georgia, which focuses on growing institutional knowledge of cyber within the Army. This, again, is a broad range, from protecting information on secure networks from outside intrusion to just making sure that when troops in the field use their radios, they only say what's necessary.

With an android tablet and a toy quad-copter, aerial scouting has never been cheaper,

After the first platoon went through, there was some time to process the lesson. Cadet Austin Neal, in charge of the exercise, had never fired the cyber rifle before, so Captain Matthew Hutchison, today's drone pilot, got the drone in the air and Captain Waage showed Neal how to shoot it down.

In a moment the quad-copter buzzed to life, then hung low in the air above the cinder block-andplywood buildings. Neal, positioned on a small hill about thirty feet away, pointed the cyber rifle's antenna at the drone, and it fell to the ground with a clattering of plastic. The cyber rifle is an example of what an elegant solution to cheap drones might look like. Commercial drones with cameras have prices in the low hundred of dollars (the Parrot AR 2.0 costs south of \$200 these days), with more elaborate ones available at a couple thousand.

Both Ukrainian forces and the Russian-backed separatists in Donetsk are using commercial drones, but the Russian-backed side is better equipped, and are developing drone doctrine: one quad-copter flies over a trench, where Ukrainian troops shoot at it, and then the second drone watches the muzzle blasts, training artillery on the target. It's brutal and it's relatively cheap.

If a future anti-drone weapon is as simple and subtle as the cyber rifle, soldiers will be more than capable of using it with just a moment's training.

Captain Cliff McClung, the cyber-rifleman attached to the squad, decided to make this a teachable moment. He called the officer piloting the drones for the defenders, and in a moment the quadcopter was overhead, filming soldiers advancing on arms and knees. The instructors looked at the footage, called in the artillery, and the weapons team was out, their advance undone by the drone. McClung then knocked the drone out of the sky, and the lesson proceeded as planned.

http://www.popsci.com/west-point-cadets-shoot-drones-cyber-rifle#page-8

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Raytheon counter-UAV electronic attack demonstrator garners DoD interest

Key Points

•The Raytheon HPM was designed to counter UAVs for the US Army

•The system could be part of an integrated air defense, but may also have other applications

A high-powered microwave (HPM) demonstrator originally developed for the US Army has also received attention and interest from a number of other US Department of Defense (DoD) organisations, according to company executives.

An unnamed number of observers from those organisations expressed interest in the technology after watching it disable small unmanned air vehicles (UAVs) during a 2013 demonstration at Fort Sill, Oklahoma, Steve Downie, Ktech site director for Raytheon Missile Systems, told reporters in Washington, DC, on 20 June.

http://www.janes.com/article/61709/raytheon-counter-uav-electronic-attack-demonstratorgarners-dodinterest?utm_source=Sailthru&utm_medium=email&utm_campaign=Defense%20EBB%2006-

23-16&utm_term=Editorial%20-%20Early%20Bird%20Brief

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COMMENTARY:

Put the X-47B Back to Work – As a Tanker

Before the U.S. Navy spends another billion dollars on prototype UAVs, it should wring more lessons from its existing fleet.

Salty Dog 501 and 502 sit silent in their hangars, their expected contributions to naval aviation unfulfilled. Before the Navy spends time and money ginning up another expensive new UAV, it should put its X-47Bs back to work.

Authorized for construction in 2007, the X-47B prototypes represent a billion-dollar investment by naval aviation to investigate how unmanned aircraft can be integrated into aircraft carrier operations. Their glory days included the first autonomous landing on an aircraft carrier and the first mid-air refueling by an unmanned aerial vehicle, and with just 80 percent of their designed flying lives expended, the two airframes were slated for yet more pioneering tests. Instead, naval aviation leaders have consigned the X-47B to museums, even as they struggle to define the next step in unmanned carrier aviation.

The Salty Dogs were built as prototypes for an unmanned attack aircraft, with a low-observable design, 4,000-pound internal payload, and range beyond 1,500 miles. But once they arrived, naval aviation leaders had a surprising change of heart. Instead of long-range strike, they said, the capability most needed on the carrier was long-range surveillance. Yet the Navy had just finished buying 68 unmanned MQ-4C Triton broad area maritime surveillance vehicles, enough to serve the fleet's carrier strike groups, according to the program's requirements documents. Moreover, the decision seemed to ignore the rising threat of anti-access/area denial (A2/AD) weapons, such as China's DF-21D carrier-killing ballistic missile, which are designed to force carriers back beyond the range of its airwing, which presently has an average unrefueled range of around 500 miles. Objective analysis suggests that the airwing requires a long-range, strike asset similar to the X-47B's design.

It is important to note that the original test plan of the Salty Dog aircraft is far from complete. As approved by Chief of Naval Operations Adm. Gary Roughead, the plan also includes:

• Refueling from the Air Force's boom/receptacle system (as opposed to the Navy's hose-and-drogue).

- Navy night launch and recovery, plus moving the aircraft around the flight deck under low light.
- Flight operations amid bad weather and crosswinds.
- Integration with other aircraft, including manned aircraft under the full range of recovery conditions (what aviators call Case I, II, and III landings).

• Allowing the carrier air traffic control center to bring a Salty Dog in for a landing using its installed radios.

• A total of more than 100 carrier takeoffs and landings; to date, they have made fewer than 20.

One billion dollars and 80 percent of a test program designed to determine how unmanned aircraft will integrate and operate around aircraft carriers ironically sit idle in hangars while the Navy struggles to determine just what role unmanned aircraft should serve in and around the aircraft carrier.

Not surprisingly, other voices inside the Pentagon have become involved in the conversation. In fact, they have ordered the Navy to stop planning to acquire an unmanned surveillance vehicle and to look instead at developing an unmanned aircraft that can serve as a mission tanker with an eye towards extending the range of current manned aircraft to overcome the A2/AD pushback. Such a decision makes sense if the design represents a tanker that can subsequently evolve into a strike aircraft, the ultimate capability required, but would make no sense if the design represented a basic surveillance aircraft that also serves as a tanker. Such a design would not match the normal mission profile (altitude and airspeed) of strike aircraft, nor would it be optimized to carry heavier loads and hence adequate fuel "give" to other aircraft to effectively extend their range.

So here is a suggestion: Do something crazy and complete the original X-47B/Salty Dog test plan, checking off each of the evolutions originally called for when the aircraft were purchased, but also adding an additional test. Take one of the Salty Dog aircraft and install a 4,000-pound fuel bladder into its bomb bay and then a hose-and-drogue buddy store on a hard point to allow the Salty Dog to serve as the test platform for the concept of an unmanned tanker. The X-47B's mission profile, 40,000-plus feet in service altitude and its high subsonic airspeed, will allow it to naturally integrate with the current array of manned carrier aircraft. What's more, it can begin testing now.

Times are fiscally tight, the enemy is moving out, and we have two airframes sitting in hangars that can help the Navy figure out its future. It is time to use them – right here, right now.

Jerry Hendrix is the director of the Defense Strategies and Assessments Program at the Center for a New American Security. A retired U.S. Navy captain, he is a former director of the Naval History and Heritage Command.

http://www.defenseone.com/ideas/2016/06/put-x-47b-back-work-tanker/129029/

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At DoD, Building Autonomy into the World of War

At the Defense One Tech Summit in Washington last week, the topic was future warfare technology. Some of DoD's top experts were there, including Strategic Capabilities Office Director Dr. William Roper.

They discussed lots of technologies, but one of the most interesting was autonomy.

Autonomy — according to the 2012 Role of Autonomy in DoD Systems by the Defense Science Board — is a capability or a set of capabilities that enables the action of a system to be automatic or, within programmed boundaries, self-governing.

It's Not Automatic; You Have to Push the Button

But, the experts say, all autonomous systems are supervised by human operators at some level, and autonomous systems' software has designed-in limits on actions and decisions delegated to the computer. And, they added, unmanned systems are having a significant impact on warfare worldwide.

Examples of autonomous systems include drones, the Defense Advanced Research Project Agency's robot warship Sea Hunter and other robots of all kinds, to name just a few.

Sea Hunter, a prototype of a new class of unmanned oceangoing vessel, conducts on-water tests in Portland, Ore., recently. The Defense Advanced Research Projects Agency held a christening ceremony for the ship April 7, 2016, in Portland. DoD photo

Sea Hunter, a prototype of a new class of unmanned oceangoing vessel, conducts on-water tests in Portland, Ore., recently. The Defense Advanced Research Projects Agency held a christening ceremony for the ship April 7, 2016, in Portland. DoD photo

During the tech summit, Roper, whose SCO office takes systems that do one thing and modify them to do another thing to create strategic surprise for U.S. adversaries, discussed a range of topics in autonomy, including challenges.

"The biggest challenge for national security in the 21st century, as opposed to the 20th century, is that things that are most likely to affect the future the most will be developed outside the Defense Department," he said.

Historically, the nation has developed technologies with worldwide impacts: stealth technology, submarines, the internet and others, Roper added.

Today, technologies such as ubiquitous networking of all systems, big data analytics and machine learning all are helping users not only to find needles in haystacks, but also to begin to understand whole haystacks, the Rhodes scholar said, noting that while DoD isn't driving many of these investments, the department still has opportunities.

"The challenge that comes with the opportunity is that those in the department will have to become fast adapters, especially in the near-term sphere where I work," Roger said. "We're going to have to be fast adapters of things that are developed without a single DoD requirement and its initial thought process."

"Our processes are built around developing systems organically by the department, and we don't have a very good process for determining what is good enough — good enough for the next step, for the next move in the chess game. So we're going to have to be able to do that or we're going to find ourselves developing things a generation behind where the corporate world is," Roper said.

Such commercial technologies are available to anyone who has the resources to invest in them. For the department and for other militaries, that commercial tech will have to be adapted for military use, Roper added.

"There's no reason that any country can't do it as well as we can," he said, "but I think there's one significant advantage we have in the immediate and the foreseeable future that other countries don't have, and that's extremely proficient and experienced operators."

He added, "A lot of times we talk tech in the department and we don't emphasize that our ability to adapt is based upon human proficiency. That's a strategic advantage for us, and right now I'd put our operators up hands down against anyone else in the world. So I think if it's properly invested in, we can win this rapid adaptation because of that human backbone it's going to be built on."

Roper said one aspect of autonomy that gets the least amount of attention is the kind that's behind the scenes, under the hood.

"I think [that's] likely to be one of the most game-changing things that's going to happen, not just to the world, but to national security. It's this confluence of big data, analytics and deep learning," he said.

What has a lot of promise for the nation is the ability to take massive amounts of data and not just process it but understand it, getting to a higher-level understanding of what it means, what the connections are and what pattern of life is behind the information, Roper said.

DARPA's Collaborative Operations in Denied Environment, or CODE, program seeks to help the U.S. military's unmanned aircraft systems conduct dynamic, long-distance engagements of highly mobile ground and maritime targets in denied or contested electromagnetic airspace, all while reducing required communication bandwidth and cognitive burden on human supervisors. In a step toward that goal, DARPA recently awarded Phase 2 system integration contracts for CODE to Lockheed Martin Corp. in Orlando, Fla., and the Raytheon Co. in Tucson, Ariz. Six companies -- all of which had Phase 1 contracts with DARPA to develop supporting CODE technologies -- will collaborate with the two prime contractors:

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"The thing that's scary about it, and it's going to be challenging for us, is that there's no reason the processing time and the reaction time from this will not continually speed up beyond human ability to interface with it," Roper added.

"It may not be a path that the U.S. wants to go down," he continued, "but if other countries have the option to pull in massive amounts of data, process it, and, say, interface it with automatic cyber tools or

other things that take a response, and that's happening at a sub-second level, then there's going to be a whole level of conflict in warfare that will take place before people even understand what's happening."

That hasn't happened before, he said, "but it's something that needs to have more highlight, needs to have more investment, and we need to get ready for it. It's something that we've put quite a bit of emphasis on in our office over this year, trying to get practical with today's data-driven technology."

http://science.dodlive.mil/2016/06/14/at-dod-building-autonomy-into-the-world-of-war/

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Three Questions We Should Ask about the Drone War, But Don't

It is discouraging that in a country that justly prides itself on producing great scientific minds and creative thinkers, that on a few key substantive issues we fail to ask—much less answer—crucial questions. Drone strikes are one of the most glaring and egregious examples of this.

These acts—which are sometimes called targeted killings, UCAV (unmanned combat aerial vehicle) strikes, or precision targeting—are at their most elementary level, killing human beings via remote control at a great distance from the target. In that sense, they are no different than an infantryman firing a rifle at an enemy combatant from three hundred meters away, a tank gunner destroying an enemy vehicle and its crew from four kilometers out or firing an artillery piece at enemy troops from a distance of over thirty kilometers. The justification for using drones, however, can be radically different from the standard we apply to ground combat.

The Laws of War govern the behavior of ground troops, airmen and sailors in armed conflict. The laws were designed to keep otherwise violent and bloody wars from descending into barbarism, which sometimes strips victors of their humanity. The Department of Defense has strictly enforced these laws on our troops during Desert Storm, the long Iraq conflict and the ongoing struggle in Afghanistan.

When troops are caught violating the strict DoD-crafted Rules of Engagement, they are punished, sometimes severely. That high standard seems to evaporate, however, when the violations are carried out from aerial platforms, controlled from a secret, remote location. The unwillingness to apply the same rules of engagement and standards of conduct to the use of drones is damaging America's hard-fought reputation and, emotional arguments aside, is ineffective in accomplishing U.S. objectives. In fact, it is usually counterproductive.

Chas W. Freeman, one of America's most experienced living diplomats, gave a speech at The Center for The National Interest last week stating that the decision to begin expanding the use of drone warfare in 2002 was one of the nation's greatest strategic blunders since 9/11. He remarked, "This turn toward robotic warfare has evolved into a program of serial massacres from the air in a widening area of West Asia and northern Africa. It is a major factor in the metastasis of anti-Western terrorism with global reach."

Freeman added that, "The terrorist movements U.S. interventions have spawned now have safe havens not just in Afghanistan, but in the now-failed states of Iraq and Syria, as well as Chad, Lebanon, Libya, Mali, Niger, Nigeria, Pakistan, the Sinai, Somalia...and a toehold among Muslim Americans...We are creating more terrorists than we are killing."

The application of any element of national power—whether it is the use of the military, an aggressive diplomatic effort or providing humanitarian assistance—must pass three tests. First, a successful outcome of the action contemplated must advance American strategic interests; second, the action must have a plausible chance of accomplishing the objectives sought; lastly, the application of the military must not violate American law or ethical standards. If a contemplated action cannot pass all three tests, it must be abandoned.

Based on an analysis of United States' actions abroad during the last fifteen years, it appears a different standard has been applied. In practice, our leaders have asked these three questions before deciding to take action: first, do we have the resources and technology to actually do it; second, can it tactically hurt our opponents or help our allies; third, how will this play politically at home and diplomatically with our allies? The decision to use drones to conduct targeted killings can pass all three of these tests; it utterly fails the three-question test that actually matters.

Drones are very effective. They can see, be piloted, and attack targets effectively from the other side of the world. Killing enemy targets no doubt tactically damages some terror network's ability to function for a time. Sometimes the attacks help domestically, as it makes the leaders who ordered it look tough on terror and gives the impression they are not standing idly by.

But it is now clear that even successful drone strikes do not advance American strategic interests, they almost never cause more than temporal harm to the enemy, and usually result in hardening their resolve and making them more violent. Finally, they unequivocally damage our reputation and prestige, especially in quarters of the globe where we seek to influence people away from using violence.

America is a country filled with remarkable people who have done much good around the world for decades, sacrificing our own blood and treasure in the defense of others. We have some of the brightest minds and kindest hearts. But until we begin reigning in our use of technology that do not advance American interests or values, we will continue doing more harm than good to our own national security.

http://nationalinterest.org/blog/the-skeptics/three-questions-we-should-ask-about-thedrone-war-dont-

<u>16590?utm_source=Sailthru&utm_medium=email&utm_campaign=Military%20EBB%206-15-</u> <u>16&utm_term=Editorial%20-%20Military%20-%20Early%20Bird%20Brief</u>

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Drones and Privacy Just Got More Complicated (Table Included)

As businesses seek to integrate into their workflows data collected from Unmanned Aircraft Systems (UAS), commonly known as drones, they are confronted with a very sensitive and complex issue: privacy.

Currently, there is no federal law that specifically governs the collection, use, storage, or distribution of data collected from UAS. In the absence of federal rules, several states have passed laws that do regulate UAS-collected data. While a number of other states have considered similar legislation, most states still have not passed UAS-specific privacy laws and are relying on existing laws and regulations to address any perceived privacy concerns.

Unmanned Systems

This newsletter contains general, condensed summaries of actual legal matters, statutes and opinions for information purposes. It is not meant to be and should not be construed as legal advice. Readers with particular needs on specific issues should retain the services of competent counsel. For more information, please visit our website at www.williamsmullen.com or contact Kevin Pomfret at kpomfret@williamsmullen.com.

President Obama issued a Presidential Memorandum on February 15, 2015 directing the National Telecommunications and Information Administration (NTIA) to convene a multi-stakeholder group with a goal of developing voluntary best practices for protecting privacy, civil rights, and civil liberties while using UAS. The group, which consisted of a number of UAS trade associations, civil liberty groups, academics, and a few potential users of UAS-collected data, held multiple meetings beginning in the summer of 2015. This past month, the NTIA announced that a consensus had been reached among a number of the participants. A copy of the "Voluntary Best Practices for UAS Privacy, Transparency, and Accountability" ("Voluntary Best Practices") document can be accessed here. The NTIA website also contains comments from several participants both supporting and disagreeing with the final document. These comments can be found here.

The "Voluntary Best Practices" document contains recommendations that would have a significant impact on how businesses collect, use, and share data collected from UAS. For example, a business could be required to implement information security measures to protect an image inadvertently captured by a UAS of an individual in a public place. In addition, some businesses would be required to develop and post policies to receive, and presumably respond to, requests to "delete, de-identify, or obfuscate" an image of an individual. Most of these provisions would not apply to the same data collected from sensors mounted on other platforms, such as manned aircraft, mobile devices, or security cameras. As a result, businesses could have to develop separate information security policies and procedures for similar data collected from different platforms.

It is also important to note that while the recommendations in the "Voluntary Best Practices" document are voluntary and not intended to have the force of law, some of the provisions could be integrated into law in the future at the federal or state level. For example, The Federal Aviation Administration (FAA) Reauthorization Act of 2016, passed by the Senate on April 19, 2016, would require the NTIA to report to Congress on the multi-stakeholder process and include legislative and regulatory policy recommendations.

As a result, businesses that are considering using UAS to collect data should review the "Voluntary Best Practices" document to determine which provisions they can integrate into their existing workflow. If there are provisions that would be overly difficult to implement, businesses should consider documenting why the provisions should not apply to them. They may also want to consider implementing alternative measures that could provide adequate privacy protection. In addition, if a business hires a third party UAS operator to collect data, it should understand the steps the third party is taking to protect privacy during the data lifecycle – collection, use, storage, and distribution.

Key Takeaways - How Businesses Can Address Privacy Concerns Related to Drone Use

1. Determine if there are any state/local laws that restrict collection of data from UAS.

2. Train UAS operators on privacy concerns associated with UAS and data collected from UAS.

3. Consider developing internal processes and controls for integrating data from UAS into business workflow while avoiding potential privacy concerns.

4. Continue to monitor UAS privacy legislation, regulation, and policies at federal, state, and local levels.

5. Make sure that agreements with vendors and customers contain applicable privacy-related terms and conditions.

https://sites-williams-mullen.vuturevx.com/68/1295/june-2016/drones-and-privacy-just-gotmore-complicated-(table-included)(1).asp?sid=311a4123-e0ac-4a70-96bc-7dfce43554d8

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Robots, swarming drones and 'Iron Man': Welcome to the new arms race

In his quest to transform the way the Pentagon wages war, Defense Secretary Ashton B. Carter has turned to Silicon Valley, hoping its experimental culture, innovation and sense of urgency would rub off on the rigid bureaucracy he runs.

Carter has made several trips to the Valley and appointed Eric Schmidt, the chairman of Google's parent company to an advisory board. And recently he sat down at the Pentagon with Elon Musk to see what suggestions the billionaire founder of Tesla and SpaceX might have to make the nation's military more efficient and daring.

Musk's answer? "Having an incentive structure that rewards innovation is extremely important," he said in an interview after the meeting. "It's economics 101. Whatever you reward will happen."

The Pentagon finds itself in a new arms race, struggling to keep pace with forms of combat that are fought with bytes as well as bullets.

The technological advancements disrupting established business sectors are now shaking up the world of war — where robots, swarming drones and weapons enhanced by artificial intelligence might one day rule the skies and seas. And just like in industry, the advantages may be fleeting.

The Pentagon is seeking "an enduring competitive edge that lasts a generation," said Loren Thompson, a defense consultant who serves at the Lexington Institute, a think tank based in Arlington. "But generations in technology these days are measured in months."

Harnessing the latest technology to upgrade the Defense Department's arsenal is a top priority for Carter, who recently said, "The race now depends on who can out-innovate faster than anyone else."

The effort has a renewed energy in the waning months of the Obama administration, which is trying to embed the effort into the bureaucracy — and budget. The Pentagon is turning to start-ups and steering billions of dollars to its own laboratories and project teams to develop prototypes for the kind of promising technologies it may need in the future.

It is testing autonomous ships that can remain at sea for months without a crew, an electromagnetic railgun that fires a projectile that can travel at seven times the speed of sound, and increasingly powerful laser weapons that sizzle their targets.

The Pentagon speaks of its "Third Offset Strategy," a way to offset shrinking budgets and transient technological superiority. The first offset was the use of nuclear deterrence to keep the Soviets at bay starting in the 1950s. The second was the advent of new precision munitions and stealth to overwhelm robust air and ground forces of adversaries.

[The killer robot threat: Pentagon examining how enemy nations could empower machines]

The Pentagon hopes that this is the dawn of a third technological revolution, even if the conditions are markedly different. Instead of trying to offset the advantages of a single, traditional adversary, the Pentagon faces challenges on multiple fronts, including large, technologically advanced nations. As part of the earlier offset campaigns the Pentagon adopted military capabilities that emerged from its own labs. But big advances in robotics, biotechnology and computing are coming out of the commercial sector, much of which wants little to do with the Pentagon.

This round has gotten off to a fitful start, if for no other reason than the skepticism aroused by the lateterm push of an outgoing administration. There are also doubts about nurturing a start-up mentality in a bureaucracy that must hew to drawn-out and unpredictable budget cycles.

Some companies are "watching to see how serious this is," said Rep. Mac Thornberry (R-Tex.), chairman of the House Armed Services Committee. "Is this a fad? Is this going to last beyond this administration? And part of the problem is the acquisition system impedes this sort of development."

Musk said he and Carter had a "high-level" discussion not about procurement programs but about innovation. One of Musk's suggestions was that the Pentagon needs to embrace failure.

"Whenever you do try to do things that are new, and you're in unchartered territory, there will be failures because you don't know the path," Musk said. "There should be no penalty for a failure where it was thoughtful and considered."

But in a massive and often risk-averse bureaucracy, that might be easier said than done.

New warfare for a new era

Nevertheless, the Pentagon plans over the next five years to invest \$18 billion in the Third Offset, including about \$6 billion in the classified "black" budget, according to Mackenzie Eaglen, a fellow at the American Enterprise Institute who focuses on defense issues.

The Defense Department opened an outreach center in Silicon Valley to encourage some of the most innovative start-ups to turn their attention to national security. And when that effort showed mixed results in its first year, Carter moved unusually fast to overhaul it, installing new leadership that reports directly to him. He also announced that the Pentagon would open a similar office in Boston.

The shake-up in Silicon Valley was done specifically "to signal to the bureaucracy that this is of the highest priority to the department," Eaglen said. "The entire president's budget was built around the Third Offset and the threats that Carter believes the U.S. military should be prepared to confront."

After decades of unmatched superiority, the Pentagon fears that potential adversaries have benefited from the proliferation of commercial technology and have caught up with the United States. The Pentagon is preparing for what Deputy Defense Secretary Robert Work called "network-on-network warfare" against more traditional rivals, such as China and Russia, after more than a decade of counterinsurgency warfare in Iraq and Afghanistan.

The idea is that "advances in artificial intelligence and autonomous systems [are] going to lead to a new era of human-machine collaboration and combat teaming," he said during a recent event at the Atlantic Council, an international-affairs think tank.

The goal is not "killer robots that roam the battlefield," said Work, a self-proclaimed science fiction fan. "I think more in terms of 'Iron Man' — the ability of a machine to assist a human, where the human is still in control in all matters, but the machine makes the human much more powerful and much more capable."

Much of the work is being done in the Pentagon's top-secret labs, at places such as the Defense Advanced Research Projects Agency (DARPA), the Office of Naval Research and the secretive Strategic Capabilities Office.

[Veil of secrecy lifted on Pentagon office planning 'Avatar' fighters and drone swarms]

The ONR is based in a nondescript office building in Arlington, Va., just down the block from DARPA. The low-profile agency employs 4,000 scientists around the world and funds research at universities and throughout industry. At any given time, about 12,000 projects are underway, and the agency produces 350 to 400 technical patents a year, said Rear Adm. Mathias Winter, the chief of naval research. In 70 years in existence, the agency has funded 60 Nobel laureates.

"We want to do the impossible, can't-be-done, there's-no-way-that'll-ever-happen problems," Winter said in an interview. "That's what scientists do. We do magic. And the engineers have to do the miracle."

Next month, the magic will come in the form of a swarm of 30 small drones that will fly together like a flock of birds, "break off a cadre to be able to potentially go attack something . . . and then come back and regroup and go," Winter said.

Lasers — yes, think Star Wars — are another priority. In 2014, the Navy deployed a \$40 million, 30kilowatt laser that was mounted on the deck of the USS Ponce in the Persian Gulf. Service members practiced taking out drones and small boats using a video-game-like controller. Now it is fully operational, and the Pentagon could record its first kill with a laser.

The technology is moving fast, and by 2018, DARPA plans to test a 150-kilowatt laser on a ship that will be five times more powerful than one on the USS Ponce.

At DARPA, the Third Offset is viewed differently from the previous offset strategies, which gave the United States a firm lead over its adversaries for decades. This time, the effort is seen as much more dynamic, using technologies that evolve quickly over time, said Arati Prabhakar, the agency's director. Sometimes that will come through software that's easy to upgrade. Or through artificial intelligence, so that machines will be able to learn and adapt on their own.

"Where are the breakthroughs going to come from?" she said. "A theme is if you combine access to leading-edge commercial technology and deeply integrate it with DOD [Department of Defense] secret sauce, that's where you get phenomenal advancements in capabilities."

One example is DARPA's 132-foot-long autonomous ship. From the outside, it looks like another military ship. But without a crew, it can venture into hostile territory without the risk of human casualties, and it is "designed to go many thousands of nautical miles and has a tiny fraction of the operating cost of a destroyer," Prabhakar said.

Raytheon, a big defense contractor based outside Boston, has advanced artificial intelligence by creating small robots, Hercules and Athena, that run on solar power but are programmed to stay out of the light. That conflict created what scientists likened to hunger, and a life-death balance that the machines had to sort out on their own.

The company also has developed a tablet computer that could call in an airstrike with as few as three clicks — when not engaged in more familiar tasks, such as enabling soldiers in the field to chat as if they were sitting at their desks or share maps and video. Another version of the software, Jump Master, is designed to give paratroopers information on wind direction and targets on the ground.

But to provide innovative technology with a secure pipeline to the battlefield, the Pentagon has to institutionalize the program so that it can survive a change in administration, analysts said. That is why the senior leadership has given speech after speech about the strategy, and why they have rushed to get these technologies in development.

https://www.washingtonpost.com/news/checkpoint/wp/2016/06/17/robots-swarmingdrones-and-iron-man-welcome-to-the-new-arms-race/

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FAA Issues Final Rule for Businesses to Use Drones

The Federal Aviation Administration (FAA) has issued its final rule on how businesses may use small unmanned aircraft systems (UAS), often referred to as drones. The rule, which will be commonly known as Part 107, is expected to take effect in late August, will make it much easier for the wide range of businesses that wish to use UAS in their operations. For example, the FAA will no longer require operators of UAS to be certified pilots. Instead, operators will be required to pass an initial aeronautical knowledge test at FAA-approved sites and apply for a remote pilot certificate or be directly supervised by someone with a remote pilot certificate. In addition, businesses will not be required to go through the lengthy Section 333 exemption process for routine operations.

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Another important development is that the final rule also allows businesses to seek waivers from current restrictions, such as beyond visual line-of-sight operations, nighttime operations, and operations over people not participating in the activity. These waivers will be issued on a case-by-case basis and likely will serve as the foundation for future rules allowing broader and more permissive operations.

A copy of the FAA press release with links to the final rules and a helpful summary can be found here.

http://www.faa.gov/news/press_releases/news_story.cfm?newsId=20515

https://sites-williams-mullen.vuturevx.com/68/1306/june-2016/faa-issues-final-rule-forbusinesses-to-use-drones.asp?sid=063e3417-2f96-4755-b8fb-d7867c2934d8

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