



Calhoun: The NPS Institutional Archive

Consortium for Robotics and Unmanned Systems Education and Research (CRUSE) Operations

2016-03-17

Unmanned Systems Sentinel / 17 March 2016

Naval Postgraduate School (U.S.)

<http://hdl.handle.net/10945/48897>



Calhoun is a project of the Dudley Knox Library at NPS, furthering the precepts and goals of open government and government transparency. All information contained herein has been approved for release by the NPS Public Affairs Officer.

Dudley Knox Library / Naval Postgraduate School
411 Dyer Road / 1 University Circle
Monterey, California USA 93943

<http://www.nps.edu/library>



Unmanned Systems Sentinel

Thanks to Robin Alexander, Mark Rindler, Jeff Ratcliffe and 'Fess' Parker for providing many of the below articles. 17 MAR 2016

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. All opinions expressed are those of the respective author or authors and do not represent the official policy or positions of the Naval Postgraduate School, the United States Navy, or any other government entity. Immediately below are this edition's highlights with links to the respective articles:

NAVY/USMC:

[Skunk Works Head: Navy Should Consider a Flying Wing Design for MQ-XX Stingray](#)

[US Navy descoping stealth requirement for Stingray tanking UAV](#)

[Navy's Future Attack Sub Will Need Controls for Multiple UUVs](#)

ARMY:

[Unmanned Aerial Systems: Further Actions Needed to Fully Address Air Force and Army Pilot Workforce Challenges](#)

USAF:

Above Army article also germane to the Air Force

NATIONAL AIR SPACE:

[Parity for Tribal Governments Operating Drones](#)

[UND gets federal OK to collect data with UAVs](#)

[Federal Government Expands UAS Partnerships](#)

[Drone rules remain up in the air for now](#)

PUBLIC SAFETY:

[Drones could solve gas-leak detection issue](#)

[Unmanned Aircraft Systems—Coming to Your Planning Department Soon](#)

[30-Acre Drone Park Could Be Coming to Florida](#)

[Drones becoming more popular in the Arctic - US State Department](#)

[Report: UAVs Pose Infinitesimal Risk to Aircraft](#)

[Small Drones Could Enhance Local Weather Forecasts](#)

[Coast Guard Wants to Use Drones to Navigate Ice in the Great Lakes](#)

[Orchestration of systems of mobile robots for border protection, search and rescue, and personal security](#)

SENSORS/APPLICATIONS:

[Avoid obstacles and navigate at high speeds through busy airspace](#)

[Multispectral sensor fusion embedded computing for UAVs](#)

[Pentagon proves air-launched UAV swarm ability](#)

[Lockheed Martin Investing in Autonomy, Manned-Unmanned Teaming Technology](#)

[A Drone That Can Map the World in 3D](#)

[Miniaturized fuel cell makes drones fly more than one hour](#)

[Looking to Birds for UAS Inspiration](#)

[High-resolution imaging via quantum remote sensing](#)

COUNTER UAS:

[Shoulder-mounted, net-firing bazooka can down a rogue drone at 100 meters](#)

INTERNATIONAL:

[Swiss Company Develops Blimp-Like, Crowd-Friendly UAV](#)

COMMENTARY:

[Have Lethal Swarming Drones Made Submarines Obsolete?](#)

[You know Area 51, but just what in the world is Area 6?](#)

[How the Reagan-Era CIA Predicted Our Drone Dystopia](#)

[UAV Industry Concerned About Upcoming FAA Regulations](#)

NAVY/USMC:

Skunk Works Head: Navy Should Consider a Flying Wing Design for MQ-XX Stingray

ARLINGTON, Va. – To meet the Navy’s new set of requirements for its unmanned MQ-XX Stingray carrier tanker, the service should consider a design that could expand into a stealthy, high-end strike platform, the head of Lockheed Martin Skunk Works told reporters on Tuesday.

By selecting a basic flying wing design for Stingray, the Navy could add weapons, sensors and stealth technology using the existing airframe without creating an entirely new platform, Skunk Work’s Rob Weiss said during Lockheed Martin’s 2016 Media Day.

“If you start with a vehicle shape that will allow it to penetrate into a contested environment, you can get a low-cost tanking capability upfront without putting all the capability into that vehicle ... you can do it at low cost but stay on that same path to use that vehicle design to operate in a penetrating environment,” Weiss said.

Under direction from a 2015 Office of the Secretary of Defense review, the Navy moved back from the higher requirements of its Unmanned Carrier Launched Surveillance and Strike (UCLASS) program to a more basic unmanned aerial vehicle (UAV) that would primarily function as an aerial tanker to ease the burden of the carrier air wing’s Boeing F/A-18 E/F Super Hornet fleet.

Navy officials have said the UAV would likely accomplish the refueling mission via drop tanks hung from pylons underneath the aircraft.

The concept that emerged shed much of the expected strike and surveillance missions to get a basic UAV on the carrier faster and at a lower cost with the same connectivity and control systems planned for UCLASS. USNI News understands the connectivity and control segments would be then used for what would follow Stingray.

The tanker change was thought to give the two Stingray competitors that plan to submit a more traditional wing-body-tail design for the work – General Atomics and Boeing – an edge for constructing a more basic UAV, aviation experts have told USNI News.

Lockheed and Northrop Grumman have indicated they would pursue more of a flying wing design like the Northrop B-2 Spirit stealth bomber or Lockheed's RQ-170 Sentinel. The flying wing has an inherently lower radar cross section since the planform has fewer edges to reflect back a radar signal. While less detectable, flying wing designs have traditionally been more complicated to build and fly than the traditional wing-body-tail design.

“We believe [that a flying wing] will be just as affordable as a wing-body-tail configuration. But a wing-body-tail will not be able the requirements for penetrating strike in the future,” he said.

“You can take the flying wing and not put on all the coatings and other capabilities in that initial version and be competitive on the cost but have a growth path forward ... that same path to use that vehicle design to operate in a [contested] environment.”

The Navy is currently waiting on DoD approval for the new Stingray concept – to which it was briefly referred as the Carrier Based Aerial Refueling System (CBARS) – ahead of an expected draft request to proposal to industry sometime later this year and a full RFP in Fiscal year 2017 and a contract award in Fiscal Year 2018, USNI News reported in February.

The service has said it plans to field the Stingray in the mid-2020s.

<http://news.usni.org/2016/03/15/skunk-works-head-navy-should-consider-a-flying-wing-design-for-mq-xx-stingray>

[Return to Top](#)

US Navy descoping stealth requirement for Stingray tanking UAV

US Navy plans to “descop” the stealth requirement for its future carrier-based aerial refueling unmanned air vehicle, which is now called the MQ-25 Stingray.

Formerly known as unmanned carrier-launched airborne surveillance and strike (UCLASS), the program has been rejigged following “strategic portfolio review” by the Pentagon in 2015.

The changes shift emphasis from remotely controlled surveillance and strike missions to replacing overworked Boeing F/A-18 Super Hornets in the aerial tanking role. The Pentagon also imposed the

designation RAQ-25 CBARS to reflect the unmanned aircraft's evolved mission, but the name is not popular among mariners.

Speaking at a defense programs conference in Washington DC on 10 March, navy officials confirmed their "MQ-25 Stingray" will be less stealthy and more tanked-up than previously imagined and a request for proposals (RfP) for the air vehicle segment could emerge later this calendar year ahead of an evaluation and fly-off through 2017.

The newest plan, revealed in the navy's fiscal year 2017 budget submission, would award an air vehicle contract to one prime contractor in the second quarter of 2018 for first delivery by 2021.

The navy has earmarked \$2.16 billion for the MQ-25 effort through fiscal year 2021, as well as \$350 million that has been gifted by Congress for continued air vehicle demonstrations in fiscal 2016.

"UCLASS is dead, but the money that was appropriated by Congress in the line is still usable," says Vice Adm Joseph Mulloy, deputy chief of naval operations for integration of capabilities and resources. "We headed to Congress and talked to all the lawyers."

A multi-mission tanker is certainly not what Congress was expecting to come from the defense secretary's top-level intelligence, surveillance and reconnaissance portfolio review, especially after successful ship-based demonstrations of the low-observable Northrop Grumman X-47B unmanned combat air vehicle.

US lawmakers have been pushing for a "penetrating, air-refuelable, unmanned carrier-launched aircraft capable of performing a broad range of missions in a non-permissive environment", but Mulloy says congressional staffers, at least, are interested in Stingray.

He says by reducing the low-observable requirement, existing UCLASS competitors Northrop Grumman, Lockheed Martin, Boeing and General Atomics Aeronautical Systems "all have a better leg to stand on". The competition is also open to new entrants, he says.

Mulloy confirms that the aircraft will also be capable of firing missiles and dropping bombs because the pylons on navy aircraft are engineered to carry both drop tanks and weapons, but spying and destroying targets will not be its main mission.

The navy is still firming the final set of CBARS requirements with navy acquisition chief Sean Stackley ahead of an acquisition "gate review" in April. Those needs will then be validated by a multi-service joint capability review board ahead of an eventual RfP release.

"We want some of the other requirements in there, like we may expand the fuel requirement, but we know all four vendors have air-bodies that will meet those requirements."

Northrop will probably base its offer on the X-47B demonstrator as Lockheed pushes its solution based on RQ-170 and F-35C technologies. Boeing also participated in the design phase for UCLASS. Finally, General Atomics will likely put forward its Predator C-based Sea Avenger.

<https://www.flightglobal.com/news/articles/us-navy-descoping-stealth-requirement-for-stingray-t-423039/>

[Return to Top](#)

Navy's Future Attack Sub Will Need Controls for Multiple UUVs

The Navy won't begin buying its next-generation attack submarine until 2034, but researchers are already hard at work on two key components of the SSN(X) program: an advanced propulsion system for quieter operations, and the ability to control multiple unmanned underwater vehicles at once for extended influence.

These attack boats will operate through the end of the 21st century and perhaps into the 22nd century – and Program Executive Officer for Submarines Rear Adm. Michael Jabaley believes there will still be a place for submarines in naval operations as long as the boats can keep up with changes in the operating environment.

“There's been a lot of discussion about the future of submarines and the future of stealth and the future of anti-submarine warfare – and we take all of that into account and still firmly believe there's a significant role for the submarine in the United States Navy well into the heart of this century and beyond,” Jabaley told USNI News in a March 3 interview.

“It's still got a nuclear reactor, it still uses that reactor to generate heat and generate steam, but ever since we went to the nuclear reactor we've used that steam to drive turbines to generate electricity and turbines to generate main propulsion,” he said.

“This is one area where the significant improvements in stealth, quieting and sonar performance have gotten us to the point where we felt that in order to make the ship survivable over its entire lifespan we had to get away from those gears and pinions and reduction gears, because no matter how well you make them, they're still heavy pieces of metal turning each other, and that generates a noise you just can't completely quiet. So going to an electric drive system — still you'd have turbines to generate electricity, but now instead of turning gears and pinions and reduction gear, you're turning an electric motor. So that's a significant advance in quieting.”

An advancement in propulsion would, hopefully, bring about defensive advantages, making the submarine harder for a potential adversary to locate. To boost the submarine offensively, Jabaley said deploying multiple UUVs simultaneously would be a must for SSN(X).

“We have done a reasonably good job of designing UUVs that can be deployed using existing interfaces, we've deployed them out of torpedo tubes, out of the 3-inch countermeasure launcher, out of the trash disposal unit, but it's almost always one at a time and limited time and it requires the entire focus of the ship to do that at that time. We've got to get beyond that,” he said.

“So the SSN(X) has to have UUVs as a key part of expanding its reach so the affected domain of that submarine grows from just the immediate area that its sensors interact with to something much much larger.”

Jabaley said this vision would take advances in command and control to accommodate working with multiple vehicles at once, communication, data relay, and even energy – with UUVs constantly deploying, they would need to be quickly recharged, which could take place by bringing the vehicles back to the submarine or by directing them to chargers on the seafloor.

“This new submarine is going to have to lock into a system that allows its impact to be felt in a much much greater sphere than we have now,” Jabaley said.

As the Navy works towards that goal, there may be an opportunity to test incremental advances in future Virginia-class subs instead of waiting for the SSN(X) program to start. The Virginia-class attack subs have been built in blocks – Block III lowered the cost per boat to about \$2 billion, and the current Block IV tackled total ownership costs by eliminating the need for a maintenance period and adding an additional deployment in its place. Block V, which will begin in Fiscal Year 2019, will insert the Virginia Payload Module to help mitigate the reduction in firepower when the four SSGNs – which carry 154 Tomahawk missiles each – retire in the mid-2020s.

<http://news.usni.org/2016/03/09/peo-subs-navys-future-attack-sub-will-need-stealthy-electric-drive-controls-for-multiple-uuvs>

[Return to Top](#)

ARMY:

Unmanned Aerial Systems: Further Actions Needed to Fully Address Air Force and Army Pilot Workforce Challenges

What GAO Found

In April 2014, GAO reported on several issues the Air Force faced in managing its UAS pilots, and while the Air Force has taken some actions since then, it has not fully implemented GAO's recommendations to strengthen its management.

- **Personnel Requirements** : GAO reported that the Air Force had not accurately identified the number of UAS pilots required to accomplish its mission nor had it established a minimum number of pilots needed. As of March 2016, the Air Force had not updated personnel requirements and until it does, the Air Force will not know if it is assuming unacceptable levels of risk to accomplishing the mission and ensuring pilot safety.
- **Recruiting and Retaining** : GAO reported that the Air Force had faced challenges recruiting UAS pilots and might also face retention challenges in the future. The Air Force has taken steps to recruit more UAS

pilots and offers a monthly assignment incentive pay to help retain pilots, but issues related to recruiting UAS pilots may warrant the Air Force's attention.

- **Alternative Sources** : GAO reported that the Air Force had not evaluated the use of alternative personnel populations such as enlisted or civilian personnel to help it sustain required UAS pilot staffing levels. In 2015, the Air Force announced it would test using enlisted personnel but has not formally evaluated using DOD civilian personnel as UAS pilots and thus may lack information on potential options for meeting personnel requirements.
- **Training** : GAO reported that the Air Force had faced challenges training its UAS pilots due to UAS pilot shortages, which impacted its ability to produce new pilots. Fully implementing GAO's recommendations pertaining to management of UAS pilots would better position the Air Force to address its training challenges.
- **Promotions** : GAO reported that the Air Force monitors the promotion rates of UAS pilots but had not analyzed factors that may relate to their low promotion rates. Until the Air Force does this analysis, it is unclear whether its actions to raise promotion rates are appropriate.

The Army has initiated steps to address challenges related to UAS pilots completing their required training and its use of less experienced instructors, which could affect training quality. In May 2015, GAO found that Army unit status reports did not require UAS pilot training information, and thus the Army did not know the extent pilots had been trained and were ready to deploy. GAO recommended that the Army require unit status reports to include UAS pilot readiness information. In March 2016, officials stated that the Army had taken steps to implement the recommendation, but its efforts are ongoing and thus it is too early to know their impact. Also, the Army had waived course prerequisites for about 40 percent of the UAS pilots attending a course to become instructor pilots from the beginning of fiscal year 2013 through February 2015. As a result, Army UAS pilots may not have been receiving the highest caliber of training to prepare them for UAS missions. GAO recommended in May 2015 that the Army mitigate risks posed by waiving prerequisites for less experienced UAS pilots, and in March 2016, Army officials stated that they have addressed the underlying causes that led it to waive the prerequisites, but they did not provide information for GAO to be able to determine whether they were continuing to waive these prerequisites.

Why GAO Did This Study

In recent years, the size, sophistication, and cost of the Department of Defense's (DOD) UAS portfolio has grown considerably, as has the demand for trained UAS pilots.

This testimony discusses, among other things, DOD's progress in (1) taking actions to strengthen the management of Air Force UAS pilots and (2) addressing challenges the Army faces to ensure that its UAS pilots complete their required training and receive high-quality training.

What GAO Recommends

In April 2014 and May 2015, GAO made ten recommendations to DOD to improve the Air Force's management of UAS pilots, address Army UAS pilot training challenges, and enhance DOD coordination of UAS pilot training. DOD initiated action on most of these recommendations.

For more information, contact Brenda S. Farrell at (202) 512-3604 or farrellb@gao.gov.

<http://www.gao.gov/products/GAO-16-527T>

[Return to Top](#)

USAF:

NATIONAL AIR SPACE:

Parity for Tribal Governments Operating Drones

In 2012, unmanned aircraft systems (UAS) legislation left tribal governments out of the definition of governments eligible to use UAS by means of Section 334 Certificates of Waiver or Authorization (COAs).

As a matter of basic parity, tribal governments should have the same access that all other governments have to the latest tools and technology serving public safety purposes.

H.R. 4441, the Aviation Innovation, Reform, and Reauthorization Act of 2016 pending in the U.S. House of Representatives, contains a technical provision that would expressly include tribal governments among all governments treated as public safety agencies operating UAS "public aircraft" for purposes of Section 334 COAs.

When Congress first authorized the domestic use of unmanned aircraft systems (UAS) in the Federal Aviation Administration (FAA) Modernization and Reform Act of 2012 (FMRA), it created special, streamlined provisions for the use of UAS by governmental agencies for public safety, hazardous and natural resource management, and property protection. Unfortunately, Congress did not expressly include federally recognized tribal governments among the governments authorized to make use of Section 334 Certificates of Waiver or Authorization (COAs), forcing tribal governments to conjure up a "commercial" purpose under the more restrictive Section 333 authority.

Most tribal governments, like almost all other governments, carry out law enforcement, firefighting, emergency medical, search and rescue, natural disaster response and other activities that promote the public safety of those who reside on or are the guests on their lands. Tribal governments also typically cross-deputize their public safety officers with their governmental neighbors, as threats to public safety do not respect jurisdictional boundaries. But under FMRA, tribal governments are not permitted the same UAS tools available to their neighboring partners, leaving those on tribal lands at a disadvantage.

Congress has been responsive to the concerns of tribal leaders seeking governmental parity and access to the latest tools and technology serving public safety purposes. H.R. 4441, the FAA Aviation Innovation, Reform, and Re-authorization Act of 2016 pending in the U.S. House of Representatives,

includes a technical provision that would expressly define tribal governments among all governments treated as public safety agencies operating UAS "public aircraft" for purposes of Section 334 COAs. Section 437 amends 49 U.S.C. 40102(a)(41) to add a provision extending Section 334 authority to unmanned aircraft operated by tribal governments as follows:

(a) Public UAS Operations by Tribal Governments.—Section 40102(a)(41) of title 49, United States Code, is amended by adding at the end the following:

"(F) An unmanned aircraft that is owned and operated by, or exclusively leased for at least 90 continuous days by, an Indian tribal government, as defined in section 102 of the Robert T. Stafford Disaster Relief and Emergency Assistance Act (42 U.S.C. 5122), except as provided in section 40125(b)."

(b) Conforming Amendment.—Section 40125(b) of title 49, United States Code, is amended by striking "or (D)" and inserting "(D), or (F)".

Senate staff involved in drafting the Senate's emerging FAA re-authorization legislation have indicated that their offices are giving serious consideration to including similar language in the Senate bill.

https://www.hklaw.com/publications/Parity-for-Tribal-Governments-Operating-Drones-03-09-2016/?utm_source=Mondaq&utm_medium=syndication&utm_campaign=View-Original

[Return to Top](#)

UND gets federal OK to collect data with UAVs

UND can now take pictures and video from unmanned aircraft for commercial use, but federal officials aren't ready to let the school to get into the business of unmanned flight training just yet.

The university submitted a petition in August asking the Federal Aviation Administration to grant it permission to collect data using the aircraft, also known as drones, and conduct unmanned aircraft systems flight training.

As commercial operation of unmanned aircraft is prohibited, operators must receive an exemption—known as a Section 333 exemption—from the FAA in order to proceed legally.

A response letter dated Feb. 26 from John Duncan, director of the agency's Flight Standards Service, informed UND's John D. Odegard School of Aerospace Sciences it has received authorization to collect data but not to offer commercial training services.

"At this time, the FAA is unable to authorize UAS operations for training until a further assessment is completed," Duncan wrote. "When the FAA completes its review, we will proceed accordingly, and no further action will be required by the petitioner."

An unmanned flight training program would mirror the school's manned flight training, UAS Program Director Al Palmer told the Herald in December, with students starting on simulators before moving on to flying actual aircraft.

Under the exemption, the school still can fly unmanned aircraft to collect imagery, take measurements and gather any other sort of data using instruments attached to the aircraft.

The exemption terms are similar to thousands of others granted by the FAA. UND's unmanned aircraft cannot fly above 400 feet above the ground, must remain 500 feet away from vehicles, structures and people not participating in the flight, and cannot operate at night or beyond the pilot's line of sight.

The university's commercial exemption is one of 3,900 that have been approved since the process began last year. More than a dozen companies saying they intend to fly in North Dakota have been granted an exemption by the FAA.

<http://www.grandforksherald.com/news/education/3984904-und-gets-federal-ok-collect-data-unmanned-aircraft-commercial-purposes>

[Return to Top](#)

Federal Government Expands UAS Partnerships

The Federal Aviation Administration (FAA) and key government agencies involved in unmanned aircraft operations are expanding participation in the Unmanned Aircraft Systems (UAS) Executive Committee (EXCOM). The committee provides federal agencies with a forum to share information and reduce redundancies on UAS research and development, and resolve policy and procedural issues on safe UAS integration into the nation's airspace.

The UAS ExCom includes senior executives from the Department of Homeland Security (DHS), National Aeronautics and Space Administration (NASA) and the FAA. Membership is being expanded to include the Departments of Interior, Justice and Commerce that operate unmanned aircraft for uses such as firefighting and law enforcement, and are involved in technology challenges.

Speaking at the South by Southwest (SXSW) Festivals and Conferences in Austin this week, FAA Senior Advisor for UAS and UAS EXCOM Chairman Marke "Hoot" Gibson said that "the key to innovation is partnerships with the industry, academia and federal agencies."

"Although NASA operates unmanned aircraft as part of its flight test mission, NASA's primary role in the UAS EXCOM is focused on our research and development efforts. We look forward to the exchange of ideas with our UAS EXCOM partners" stated Robert Pierce, Deputy Associate Administrator for Strategy, Office of the Associate Administrator NASA Aeronautics Research.

The ExCom was established by the 2009 Duncan Hunter National Defense Authorization Act to focus on DoD's UAS access into the NAS. It is expected to meet quarterly.

<https://www.faa.gov/news/updates/?newsId=85125>

[Return to Top](#)

Drone rules remain up in the air for now

MELBOURNE, Fla. — Twice in the past year, pilots from Patrick Air Force Base have had incidents with drones. Those drones could have been operated by hobbyists or people taking photos over the Banana River, which borders the Air Force base.

Either way, the remotely piloted vehicles entered restricted air space setting up possible tragedies.

“It could put a hole in a wing, it could shut down an engine,” said Lt. Colonel John Lowe, chief of safety for the 920th Rescue Wing at Patrick. “It could be devastating.”

Welcome to the more crowded skies. Drones – remote-controlled, unmanned aerial vehicles – are no longer just a tool of the military.

Special delivery: Ground drones coming to America

Smaller and less expensive drones are buzzing with civilians and business activities. Often about the size and weight of a 2-liter bottle of Coke, these new class of drones being used by farmers, real estate agents, insurance adjusters, event promoters and numerous others.

Equipped with cameras, the drones are able to take photos and videos from angles all but impossible just a few years ago.

And they’re also new raising questions with regulators, lawyers and privacy and property rights advocates. It’s an issue that’s not going away.

“The market for unmanned aircraft in the United States is expanding rapidly, and companies, public entities, and research institutions are developing newer, faster, stealthier, and more sophisticated drones every year,” said Jennifer Lynch, a senior lawyer with the Electronic Frontier Foundation, an organization that works on privacy and civil liberties issues in new technologies.

A specialty law practice

Melbourne-based law firm of Widerman Malek recently started a specialty line in its practice to cover the numerous issues regarding commercial drones – from registering the small aircraft with the Federal Aviation Administration to working through the legal maze of property, copyright and liability laws.

It’s believed to be one of a few law firms in the country to specialize in drone regulations.

The law firm said last week it was going to be working with the city of Palm Bay to develop an ordinance regulating drones within that city. The Widerman Malek team also will be addressing area real estate agents, who are using drones more and more to showcase properties on the market.

FAA and drones

Last December the FAA released a 195-page document outlining drone regulations. A few notable requirements:

- Commercial drone operators have to be licensed pilots.

- Generally, commercial drones should weigh less than 55 pounds, fly only during daylight hours and in good weather, fly no faster than 100 miles per hour, stay at least five miles away from airports, and remain within line of sight of the operator.
- Hobby drone operators, or non-commercial users, must register their drones with the FAA and have the numbers clearly visible or accessible. In case there is an accident involving a drone, authorities can use the number track down the drone's owner.

The regulations mean that licensed pilots must operate drones if they're being used for a commercial purpose, such as taking video or photos of a 5K race or music event.

"I'm just holding off on doing commercial work until the dust settles on the FAA rules on commercial flying," he said.

A growing commercial field

A handful of commercial drone operators have popped up in Brevard and they say they're in compliance with the new regulations.

They include Space Coast Aerial Surveillance in Viera, Planet Inhouse in Melbourne and Digital GIS in West Melbourne.

The company's biggest clients have been in agriculture. That includes owners of orange groves in Brevard and Indian River counties, and also strawberry fields in Plant City.

"I think there are a lot of different industries now looking at this technology that really haven't thought of it in the past," Beard said. "Drones are able to do things that haven't even been dreamed of."

Beard, who uses student pilots at the Florida Institute of Technology to operate the company's drones, has monitored the growth of citrus canker in orange groves. Drone technology is much easier and less costly for the growers people walk the fields and examine crops.

"If you've got a grower that has 10,000 acres of land out there and they have, let's say, a 200-acre block of trees that are having an issue, it's much easier for us to throw this in the air and get aerial pictures and multi-spectral images of it to find problems rather than scouting," Beard said

"So it's a time saver and a money saver."

Privacy rights

What would you do if a walked outside onto your patio and saw a drone filming down on your backyard? Could you shoot it or a throw a rock at it do disable it?

Almost two years ago, Florida Gov. Rick Scott signed the "Freedom from Unwarranted Surveillance Act" which restricts local or state law enforcement agencies, and individuals, from using surveillance drones without a judge's order.

Still disabling a drone might not be the best approach.

“If somebody parks their car on your property you can’t vandalize it,” said Kelly Swartz, one of the lawyers at Widerman Malek. “You call and have it towed away, or you call the police and have them deal with it because it’s a criminal violation.”

And, she said, it’s possible the property owner might be liable for the damaged drone.

For now, the best remedy is to have someone charged under the state unwarranted surveillance act.

“There isn’t a great remedy for someone filming on your property,” Swartz said. “You can have them exposed to criminal sanctions, but there is no immediate way to make it end. You just have to go inside.”

<http://www.floridatoday.com/story/tech/nation-now/2016/03/06/drone-rules-remain-up-air-now/81423274/>

[Return to Top](#)

PUBLIC SAFETY:

Drones could solve gas-leak detection issue

A methane leak at a Southern California Gas (SoCalGas) storage facility has shone a spotlight on how unmanned aerial vehicles can be used to inspect utilities. The massive three-month leak — temporarily plugged on Feb. 12 — chased thousands of Los Angeles residents from their homes.

At least 2 percent of natural gas is wasted through methane leaks at production sites, according to the U.S. Department of Energy (DOE).

UAVs are already being used for some electrical grid and pipeline inspections, mostly in pilot programs, but their potential for hands-off long-distance monitoring is just starting to be realized.

Along with criminal charges, SoCalGas is facing regulatory mandates to improve air-quality monitoring at its facilities. Nationally, the DOE’s Advanced Research Project Agency-Energy is funding a program to accurately locate and measure methane emissions associated with natural gas production.

Bridger’s proposed leak detector uses lidar in combination with range and gas absorption measurements.

The program has given one company, Bridger Photonics, a \$2 million grant to develop a leak detector. Bridger plans to build a mobile methane sensing system capable of surveying a 10 x 10 meter well platform in just over five minutes with precision that exceeds existing technologies used for large-scale monitoring.

Bridger's detector uses laser beams to generate 3D images that show the distance and concentration of a gas leak, even showing the types and concentration of the hydrocarbons.

Mounted on a UAV, the sensor would give inspectors access to complicated or obscured infrastructures at processing plants, drilling rigs and pipelines. The sensor could also be mounted on a vehicle.

Bridger's goal is for its devices to be able to service up to 85 sites, and cost \$1,400 to \$2,220 a year to operate per wellsite. Bridger plans to field test its technology this year and make it available commercially in 2017.

<http://gpsworld.com/inspector-gadget-drones-could-solve-gas-leak-detection-issue/>

[Return to Top](#)

Unmanned Aircraft Systems—Coming to Your Planning Department Soon

An unmanned aircraft system includes the aircraft (model airplane, helicopter, quadcopter, etc.), platform, payload and autopilot, communications, avionics (the on-board intelligence, communications, radio transmissions), along with the human pilot. Transformative technologies like unmanned aircraft systems (aka UAS or drones) are identifying and creating new applications in planning every day, for both research and practical applications. The Federal Aviation Administration requires registration of UAS and is currently developing regulations governing their use.

UAS can be found proliferating all over the world. Facebook currently has a project underway to create a map of every building on earth through the use of UAS and satellites in remote areas of the world. China is using UAS to measure air pollution. The United Arab Emirates hosted a design competition seeking ideas about how UAS could be used to deliver government documents.

UASUAS are cropping up particularly on college campuses, where students and faculty are eager to experiment. For example, at my own institution I was part of a team responsible for developing a policy for UAS. On my campus, UAS are being used for all kinds of purposes, from monitoring crops, measuring forests, and capturing photographs and video for master planning purposes. I found an interesting Master's Thesis from a planning student exploring zoning and land use implications of UAS, and I started thinking about how could I incorporate UAS into my teaching. How could planners use this new technology tool?

Ric Stephens, in the Toulon School of Urban Studies and Planning at Portland State University, was one step ahead of me. Last year he offered a course to planning and students in majors across the campus examining the current and future uses of unmanned aircraft systems. His course provides a wealth of resources for planners as they consider the role of UAS technology in their community.

The students studied diverse uses such as aerial photography for urban design, journalism and entertainment videography, emergency management operations, and many others. Students learned UAS fundamentals and research topics relevant to their individual fields of study. This course focused on

multi-copters, remote controlled UAVs with multiple rotors (propellers). Students considered topics such as:

Laws and ethics of UAS use

Aerodynamics and aviation

Flight planning and operations

Aerial photography and videography

Environmental, social, and economic applications

Artificial intelligence and robotics

Guest speakers talked about their use of UAS for emergency services, 3D mapping, and natural resources. Aerial Technologies International (ATI) conducted a drone "field day" to demonstrate a variety of UAVs at the Oregon Museum of Science and Industry (OMSI). In compliance with Federal Aviation Administration regulations (FAA AC 91-57A), the course did not include flight training, although some students met with the instructor outside the class to develop flight techniques as a non-commercial or hobby use.

The course was supplemented by an active Facebook group webpage. Many of the course materials are in the "Files" section. In the intervening year since this course was introduced, there have been numerous developments in UAS, including technological advances in sense and avoidance, expanded passive and active applications from ~40 to +400, hybrid UAVs, and pending legislation for both small and micro UAVs. Eventually the vast majority of large, higher educational institutions will include UAS in their curriculum. Portland State's course could be a model for other universities and colleges that wish to provide an introduction to UAS prior to students engaging in more concentrated research and applications.

Want to learn more about UAS and its implications on Planning? Here are a couple of articles to get you started. One of my favorite articles is "The Future of Urban Planning: Zoning for Drones – How we can make our lives with flying robots not suck." The author of the article argues that drones are approaching their Model-T moment and soon will proliferate everywhere. This article gives ideas for how zoning for drones could work. And this article "Zoning and Urban Land Use Planning for Drones" gives ideas about fly and no fly zones. Another interesting article, titled "Drones Will Elevate Urban Design" argues that we'll achieve greater image ability by being able to more easily capture photographs and videos of spaces. For example, in a matter of minutes a team was able to capture high resolution imagery of a neighborhood in Mexico City.

<http://www.planetizen.com/node/84868/unmanned-aircraft-systems%E2%80%94coming-your-planning-department-soon>

[Return to Top](#)

30-Acre Drone Park Could Be Coming to Florida

Palm Bay, about an hour southeast of Orlando, could be the new home of a 30-acre drone park, reports Florida Today, designed for drone use by hobbyists and the Florida Institute of Technology's unmanned aerial vehicles program.

"Economically, it makes sense," James Marshal, the city's Bayfront Community Redevelopment Agency administrator, told Florida Today. "Academically, it makes sense. From a high-tech economic development standpoint, workforce attraction, it makes sense.

The city is waiting to hear back from FIT, the FAA, and Brevard Multirotor before developing a detailed plan.

There are no "drone parks" currently in South Florida and users are limited when and where they can fly their UAVs -- above sporting events and near airports are obviously big no-nos.

However, drones are booming in popularity, and their use has bled over to the real estate world. They've become useful tools for brokers looking to have photographers capture unique angles of their properties.

<http://miami.curbed.com/2016/3/14/11225752/30-acre-drone-park-palm-bay-florida>

[Return to Top](#)

Drones becoming more popular in the Arctic - US State Department

U.S. State Department official Julie Gourley told a crowd at the Carlson Center Monday that the use of unmanned aircraft systems has grown widespread in the circumpolar north in recent years because they serve as the perfect platform for surveying the vast expanse of the Arctic for such purposes as research and environmental monitoring.

"They allow for the ability to measure environmental conditions that currently pose a challenge for manned aircraft," she said. "...Challenges such as bad weather and lack of airfield facilities. And the high cost of operating aircraft in the Arctic."

"All of these things can be overcome by unmanned aircraft systems."

Gourley says to carry out their missions, the unmanned aircraft often must fly across national borders or in international airspace. So developing guidelines for operating in the region is best done by an international organization – in this case, the eight-nation Arctic Council, the intergovernmental forum that studies circumpolar issues and advises national governments and other organizations on its findings.

"So all eight Arctic states came together to approve this set of guidelines," she said.

Gourley says the unmanned aerial systems, or UAS, guidelines are among the most important accomplishments of the two-year U.S. chairmanship of the Arctic Council.

“It’s completely groundbreaking. It exists nowhere else on the planet. This is the first time that UAS guidelines for safety of operations for scientific research have ever been done.”

Gourley is the U.S. representative to the Senior Arctic Officials, a group that carries out the day-to-day work of the Arctic Council. She was in town to talk about the council during one of many events being held around town in conjunction with the University of Alaska-Fairbanks’ Arctic Science Summit Week.

She said in an interview later an Arctic Council working group developed the guidelines because academia, industry and governments all are increasingly using unmanned aircraft systems in the far north.

“This is a new technology that we want to deploy in the Arctic. And we needed to have some kind of way of ensuring that using this technology wouldn’t interfere with civil aviation,” she said.

The U.S. Federal Aviation Administration led the effort to develop the guidelines, with help from the International Civil Aviation Organization, she said.

<http://www.alaskapublic.org/2016/03/15/drones-becoming-more-popular-in-the-arctic/>

[Return to Top](#)

Report: UAVs Pose Infinitesimal Risk to Aircraft

A fatality "once every 1.87 million years of operation"

On January 15th, two unseen assailants disabled the engines of an Airbus 320, sending it crashing into the Hudson River. Thanks to the design of the airplane, the heroic work of the pilot, and luck, everyone on board the flight survived. The assailants perished in the crash, and the whole affair was dubbed “The Miracle on the Hudson.” Was it foul terrorists that conspired against an airliner, hurtling drones to destroy the craft? No, it was geese, migrating in the wrong place at the wrong time.

Bird strikes, the most common type of encounter between airplanes and birds, are worst when the birds are large and in flocks. They’re also, according to a new report from the libertarian Mercator Institute of George Mason University, much deadlier than any risk posed by similarly small drones. The short report was published yesterday, and argues that because drones are small and their encounters with airplanes are so infrequent, they pose even less risk to aircraft than birds do.

From the report:

Our analysis has been based on actual bird strikes, not near misses or simple sightings. We find in general that small UAS under 2kg [4.4 lbs] pose a negligible risk to the safety of the national airspace. We estimate that 6.12×10^{-6} collisions will cause damage to an aircraft for every 100,000 hours of 2kg

UAS flight time. Or to put it another way, one damaging incident will occur no more than every 1.87 million years of 2kg UAS flight time.

.The paper's authors, Eli Dourado and Samuel Hammond, note that they used birds as a metric instead of actual drone strikes because there simply haven't been any reported drone collisions with aircraft yet. (In an earlier paper, Dourado noted that airplanes have hit more turtles than drones). Dourado and Hammond call into question the numbers of drone near-misses provided by the FAA, noting that "the FAA had been counting simple sightings as near misses." They reference a report from the Academy of Model Aeronautics, a drone hobbyist organization, that also called into question the FAA's metrics on drone near-misses.

Dourado and Hammond's main caveat to their research is that they assumed the drones would be operating individually, as is common now. Flocks of birds pose more risk than individuals, and similarly, if drone swarms become more common, it'd be worth revisiting the study. And Dourado and Hammond aren't the first to explore bird strikes as a way to understand risks from drones; in December 2014, another study examined the same question and came to a similar conclusions.

As Congress debates a reauthorization bill for the FAA, many pro-drone groups are hoping the FAA provides more exemptions for small drones. Studies like this one are a strong argument that the FAA could allow an almost unlimited number of small drones in the sky, without risk to the people flying above.

<http://www.popsci.com/new-report-drone-risk-to-airplanes-is-miniscule?dom=rss-default&src=syn>

Ars Technica (3/15) explains that Dourado and Hammond examined 25 years of "wildlife strike" data from the FAA, and determined that on average, "only 3 percent of reported small-bird strikes ever result in damage, compared to 39 percent of large-bird strikes," while also suggesting that the true strike rate may in fact be lower due to under-reporting. Noting that in 2014, "there were 13,414 reported collisions with birds and flying mammals," the researchers postulate that since "there are on the order of 10 billion birds in US airspace, this means that plausibly 1 bird in 1 million collides with an aircraft every year." The researchers compared UAV usage statistics to bird behavior, to determine that for UAVs, "one damaging incident will occur no more than every 1.87 million years of 2 kg UAS flight time."

<http://arstechnica.com/tech-policy/2016/03/researchers-say-faa-is-really-overblowing-risk-posed-by-small-drones/>

[Return to Top](#)

Small Drones Could Enhance Local Weather Forecasts

The Earth's atmosphere has layers like a cake, and it follows that forecasting the weather is more accurate if information is coming from a lot of sources and from all of those layers. That is why we have weather satellites, high-flying drones and weather balloons all operating at different altitudes.

Scientists at Oklahoma State University are developing new drones that will help forecasters operate at all different levels and should increase the quality of computer models that are tracking local weather patterns.

Atmospheric measurements provided by radar, weather balloons and towers are good for forecasting a few days ahead, but not so good at predicting dynamic, hour-to-hour weather changes.

“Oklahoma is a really good example because even that we are already a very weather-dynamic state, Oklahoma only has two balloon launches a day, one at dawn and one at dusk, from a single location in the state and that is where all the weather forecasting information comes from. So that data is really sparse and it's difficult for meteorologists that are developing these forecasting models to get very good idea about how that weather is changing from these very limited number of data points,” said Jacob.

Small weather drones

Scientists at Oklahoma State University — where Jacob is director of the Unmanned Systems Research Institute — are developing small, affordable weather drones that can spend hours in the air taking measurements from many points.

The goal — as Oklahoma University meteorology professor Phillip Chilson explained via Skype — is to give researchers an inexpensive way to better understand storm physics and improve the accuracy of computer model-based forecasting.

“Part of what is going to drive the price down is the scope of the measurements. Whereas some of these larger platforms are focusing on almost transoceanic flights or things of this variety, we are really focusing on the lower atmosphere and so our platforms can by design be much smaller,” he said.

'Atlas'

The spherical drone called Atlas can fly, hover, roll on the ground and take to the air again, which makes it ideal for flying in stormy weather. In addition to taking measurements, it can send real-time video of storms, and help search and rescue missions.

“Our real goal is to try to develop systems that really, I do not want to say replace but there may be that possibility of replacing weather balloons, but currently augmenting them, so increasing the capabilities,” said Jacob.

Researchers say there are still many engineering challenges to be met, such as how to make the weather drones automatically stay away from other air traffic. They expect a drone capable of sampling the lower atmosphere may be available in about two years.

<http://m.voanews.com/a/small-drones-could-enhance-local-weather-forecasts/3231761.html>

[Return to Top](#)

Coast Guard Wants to Use Drones to Navigate Ice in the Great Lakes

Every year, huge portions of North America's Great Lakes freeze over, often in gigantic, treacherous ice packs. The ice, in different parts of the lake, can be both thin enough for humans to fall through or thick enough to obstruct, or even sink, ships trying to force their way through in the winter. That's where the USCGC Mackinaw comes in. The Mackinaw is the only heavy icebreaker on the great lakes, responsible for ramming, plowing, and crunching through the ice pack to open shipping lanes in the depths of winter.

Previously, the Mackinaw has used satellites to take overhead pictures of the ice pack, which they can use to map out weak spots in the ice. The satellite pictures can be slow, sometimes delaying the process of charting the safest and quickest path through the ice. Instead, the ship's crew has suggested using drones to get a live-streamed aerial view of the waters ahead, especially with the increasing air-time of high-tech UAVs.

"As this video comes into the ship we get an idea of the features, the ice features, and whether there are leads, which are areas of open water, or ridges or something that is a more difficult ice type to navigate through," George Leshkevich, a physical scientist with the NOAA Great Lakes Environmental Research Laboratory, told WCMU Radio.

The Mackinaw wouldn't be the first ship to use unmanned aerial vehicles for reconnaissance. In February, the Coast Guard's Polar Star icebreaker used a Puma AE UAV to scout the ice around it on a resupply mission to the National Science Foundation's McMurdo Station in Antarctica. Back in 2014, a Coast Guard cutter launched and landed a UAV far above the arctic circle, and NASA regularly uses the incredibly sophisticated Global Hawk drone to monitor weather patterns, so the Mackinaw's crew would be in good company with a force of flying ice-monitors to help them out.

<https://www.inverse.com/article/12718-the-coast-guard-wants-to-use-drones-to-navigate-ice-in-the-great-lake>

[Return to Top](#)

Orchestration of systems of mobile robots for border protection, search and rescue, and personal security

(Nanowerk News) Modern mobile robots have increasingly practical capabilities. Amazon.com is developing unmanned aerial vehicles (UAVs) or drones for package delivery. Autonomous cars can safely navigate our streets without a driver. Yet, while the capabilities of such mobile robots are impressive, how useful is a single mobile robot? What is required for mobile robots to contribute to applications

that directly benefit society – social applications – are systems of robots working cooperatively to address large-scale opportunities. A UAV lands on an energy recharge depot Figure 1. A UAV lands on an energy recharge depot. To support large-scale social applications such as border patrol, search & rescue, and city-wide security services, hundreds or thousands of mobile robots must work in tandem to jointly pursue the system objectives. In addition to the robots themselves, a truly autonomous system must be supported by automatic fuel/energy replenishment depots. If the mobile robots are to deliver relief supplies, these depots must also replace the depleted supplies. Figure 1 depicts a UAV landing on an energy depot. While rudimentary methods can be used to plan the activities of all of these resources, in the context of social applications, efficiency is essential. Well-coordinated border patrol systems will improve national security. Efficient search & rescue will cover more area quickly so that more survivors can be located. See Figure 2 for a concept of UAV search & rescue at sea. UAVs are dispatched to support search & rescue operations at sea Figure 2. UAVs are dispatched to support search & rescue operations at sea. Highly productive security escort systems will improve the security coverage provided to the customers (see Figure 3). In this context, intelligent allocation of system resources drives improved security and even saves lives. At KAIST's xS3D lab, Professor James R. Morrison and his students are developing methods to efficiently orchestrate the activities of systems of mobile robots together with fuel and supply depots. They have employed the mixed integer linear programming (MILP) model to characterize the physics of such systems. As the social applications they are targeting are best served by large scale systems with many robots and depots, they have developed fast algorithms to solve the MILP models and determine efficient task plans for the system resources. text Figure 3. Multiple paths for UAV security escort across a city are to be served simultaneously by a system of UAVs. Future systems of mobile robots will use such task orchestration methods to enable efficient operation. As a consequence, UAVs can work in concert to keep our borders more secure. In the event of a disaster, colleagues, friends, and loved ones may be found and rescued more quickly. Our cities and campuses can be made safer by a more efficient and organized system of UAVs.

<http://www.nanowerk.com/news2/robotics/newsid=42791.php>

[Return to Top](#)

SENSORS/APPLICATIONS:

Avoid obstacles and navigate at high speeds through busy airspace

On a recent bike ride through the woods near Menlo Park in California, Adam Bry, CEO of a company called Skydio, and his coworkers were joined by a small, nimble drone. As they rode along a dirt track, the drone followed close by, weaving expertly around tree trunks and branches in a series of deft maneuvers.

What's amazing is that the drone wasn't piloted by a person, but by Skydio's technology. It lets an unmanned aerial vehicle (UAV) use several video cameras not only to avoid obstacles but also to navigate at high speeds through busy airspace as expertly as a human pilot.

That kind of autonomy could transform the consumer drone market by making aircraft much harder to crash. It could also make it easier for drones to do tasks autonomously even in busy settings. Skydio, founded last year, has so far raised \$25 million in funding in a round led by Andreessen Horowitz and Accel Partners. Bry declined to say when Skydio's first product would appear or how much it might cost.

The kind of sensing and navigation demonstrated by Skydio's aircraft is challenging to perform on a cheap and lightweight platform.

Flying autonomously is more difficult than driving because the hardware needs to be compact and light, and because even the slightest miscalculation can result in disaster. "There's essentially no margin for error," Bry says. "You can't stop and turn everything off, because if you do that, you crash. In fact, if anything goes wrong on any part of the system, the most likely outcome is that you crash."

The drone developed by Skydio uses a camera together with vision-processing software that lets the aircraft determine where it is in space, and to identify and avoid obstacles. Bry developed the algorithms that enable this with Abraham Bachrach, who is now Skydio's chief technology officer, while both were students at MIT. The techniques they came up with made it possible for drones to navigate through unfamiliar indoor spaces safely and for a plane with a two-foot wingspan to weave its way around a busy garage without crashing.

Nick Roy, a professor of robotics who advised Bry and Bachrach at MIT, expects aerial vehicles to become more common for surveillance and inspection tasks. But he adds that reliable autopilot, which Skydio is a significant step toward, is a key missing piece of that picture. "If we want these things to provide all the services people are hoping for in terms of infrastructure inspection, precision agriculture, filming in various ways, that's going to require autonomy," Roy says. "It's going to be really important."

Today, most drones are either controlled remotely, or are only capable of basic automation. A few drones are starting to come with more advanced obstacle identification and avoidance, but none are as sophisticated as Skydio's prototype. The latest drone from Chinese company DJI, the Phantom 4, uses several cameras to spot impediments, and it will override the controller's actions if it seems likely to run into something. The Phantom 4 can also track moving objects using its vision system. But it doesn't perform the kind of mapping and navigation that Skydio's drone does.

"Navigation is absolutely crucial, especially in flight" says Lora Weiss, chief scientist of the Georgia Institute of Technology's Institute for Intelligent Machines, a nonprofit that contracts with the U.S. Department of Defense on various projects involving automated vehicles.

Weiss is working on projects involving UAVs with even more advanced autonomy. Some of the systems she is developing are, for example, able to deviate from a given course if they spot something of interest, and then call for help from other aircraft with surveillance of the new target. "The nimbleness in navigation is really going to be crucial for where these things are going," Weiss says.

<https://www.technologyreview.com/s/600925/daredevil-drone-flies-through-the-trees-like-an-ace/>

[Return to Top](#)

Multispectral sensor fusion embedded computing for UAVs

FITCHBURG, Mass., 9 March 2016. Headwall Photonics Inc. in Fitchburg, Mass., is introducing the HyperCore embedded computing unit for unmanned aircraft applications that require multispectral sensor fusion.

Using Hyperspec III, Headwall's powerful spectral imaging application software, HyperCore serves as the central connection point for remote-sensing instruments such as multiple hyper-spectral sensors, LiDAR, thermal cameras, RGB instruments, GPS/IMU units, and many more.

The small size and weight of combined with its powerful data processing and high capacity storage connections offers a processing platform for fusing hyper-spectral sensing data with many other sensor payloads on the aircraft.

Designed for harsh airborne environments and only the size and weight of a Rubik's Cube, HyperCore stores 500 gigabytes of incoming airborne data and features two Gigabit Ethernet connections -- one base Camera Link connection, and a multi-purpose I/O port -- to handle GPS/INS, sensor commands, and similar tasks.

"The convergence of small UAVs [unmanned aerial vehicles] and the need for different but complementary instruments such as LiDAR, GPS, thermal, and others led us to develop a single point of fusion for the data streams from each instrument," explains Headwall CEO David Bannon.

The product weighs 1.4 pounds, measures 3.5 by 3 by 3 inches, and draws 12 Watts of power. It is designed to work with Headwall's Hyperspec family of sensors, plus a wide range of instruments from third-party vendors.

<http://www.militaryaerospace.com/articles/2016/03/embedded-computing-multispectral-sensor-fusion.html>

[Return to Top](#)

Pentagon proves air-launched UAV swarm ability

Just what the Pentagon plans to do with its newly proved ability to launch swarms of tiny unmanned vehicles from moving fighter jets remains classified, but the Defense Department's recently released video documenting such a launch shows some of the potential.

The video was made as part of experiments over Alaska in 2015, according to the Washington Post.

<https://www.washingtonpost.com/news/checkpoint/wp/2016/03/08/inside-the-secretive-pentagon-office-planning-skyborg-fighters-and-drone-swarms/>

The micro-drones are launched from the flare dispensers of F-16 and F/A-18 fighters. The UAVs, encased in canisters and slowed by a parachute, launch while on the way down.

The Pentagon's Strategic Capabilities Office ran the experiment. The Post notes that potential uses of drone swarms include confusing enemy forces and flying surveillance missions.

The unmanned craft, developed by students at the Massachusetts Institute of Technology, is called a Perdix, <https://beaverworks.ll.mit.edu/CMS/bw/projectperdixcapstone> and is made with a 3-D printer and cell phone electronics.

"Just imagine an airplane going in against an [integrated air defense] system and dropping 30 of these out that form into a network and do crazy things," said Deputy Secretary of Defense Robert Work, quoted in Breaking Defense. <http://breakingdefense.com/2016/02/high-tech-seed-corn-for-next-president-bob-work-on-2017-budget/>

"We've tested it and it works."

<http://www.c4isrnet.com/story/military-tech/uas/2016/03/15/pentagon-proves-uav-swarm-ability/81803256/>

[Return to Top](#)

Lockheed Martin Investing in Autonomy, Manned-Unmanned Teaming Technology

As advancements in autonomy come to fruition, manned/unmanned teaming between humans and advanced robots will play a key role in the future of warfare, Lockheed Martin executives and researchers said March 15.

There is "often a misconception that autonomy ... means taking power away from a human. Here at Lockheed Martin we take the exact opposite approach. It's about enabling the human to do what the human really does best," said Bartlett Russell, senior research scientist for human systems optimization at Lockheed's Advanced Technology Laboratories. "Ultimately the human is our best asset in the field, our most adaptable asset in the field."

Lockheed is working on technology such as cognitive exoskeletons that can monitor and sense the state of a human and subsequently augment performance, she said during a briefing at Lockheed Martin's annual media day in Arlington, Virginia.

While wearable devices like Fitbit — which monitors a user's steps per day and health data — are well understood, Lockheed wants its systems to be even more personalized, she said.

"Using our computing power we can highly individualize these algorithms," she said. "It's taking what we can do on a sort of coarse level with our commercial sensors and ... bringing it to the high fidelity level that we would need to make it reliable, predictive."

"In an operational environment, things get messy very quickly. We need to make sure that it really is tuned to the person," she said.

Advancements in autonomy go hand-in-hand with the Defense Department's third offset strategy, said Bill Casebeer, research area manager for human systems and autonomy at the lab.

"The third offset ... is the idea that we'll be able to use certain revolutions in technology to help both reduce cost and increase capability for our warfighters. The previous offsets being our nuclear strategy and the development of stealth and precision guided munitions technology," he said. "If we are ... to realize that third offset, we need to focus on technologies that allow human beings and their autonomous machines to work together synergistically as an effective team."

For example, it takes about 270 people to coordinate the flight and data collection of an MQ-9 Reaper unmanned aerial vehicle, Casebeer said. "Is there any way we can invert that so that one human being can control many remotely piloted vehicles to help drive down costs and increase capability?"

For manned/unmanned teaming to work, researchers have to tap into a concept known as the "theory of mind," he said. Essentially, it's the idea that humans have the capability to understand the mental state of others through observation, he said.

"Building a theory of mind layer into our autonomous teammates will allow them to interpret our commands, our intention so that we can realize that third offset," he said.

For example, Casebeer pointed to the fictional character of Rosie the Robot on the popular show The Jetsons.

"What made her such an effective teammate for the Jetsons family was her ability to know that when she was handing you the plate, you were going to take it from her and wipe it with a towel," he said. "She had a theory of mind capability and so if we can give our autonomous teammates theory of mind then they will be able to be more effective than Rosie the Robot, not just in helping us clean up around the house but also in accomplishing very difficult tasks on the battlefield."

<http://www.nationaldefensemagazine.org/blog/Lists/Posts/Post.aspx?List=7c996cd7-cbb4-4018-baf8-8825eada7aa2&ID=2125&RootFolder=%2Fblog%2FLists%2FPosts>

[Return to Top](#)

A Drone That Can Map the World in 3D

3DR has teamed up with Autodesk and Sony to make a drone that can record 3D mapping for the cloud.

3DR has announced Site Scan, their software for aerial data aggregation for the cloud. Site Scan was developed to save money and keep workers safe when surveying tall building structures and dangerous terrain. 3DR cited that falling is the leading cause of construction-related deaths in the United States, averaging 349 people each year. Site Scan can bridge the gap between safety and quality that has

plagued construction surveyors for years; satellite images keep workers out of harm's way, but their quality is often lacking. A drone with cloud-based 3D mapping in real time gets the best of both worlds.

While this development is great progress for construction safety, how does this bad boy work? Site Scan has a Sony UMC-R10C 20 megapixel camera that sits on an open SOLO gimbal bay, which allows it to maintain a steady shot even while zooming. The drone plans its flight path based on geotagged data uploaded to the 3DR cloud and the Autodesk Recap that is then processed into 2D maps, digital elevation models, 3D point clouds, and 3D mesh. After this data is processed, it is cross-referenced with other cloud systems for analysis. Once all of this data is compiled, the drone has a flight-path, and users can move and zoom the camera by swiping on a tablet screen. Below you can see a video of a drone with Site Scan in action.

https://www.youtube.com/watch?v=b_oXZ-llwA8#action=share

The whole kit is really expensive, and has several different packages. Unfortunately, it will be a while until this type of mapping software is available for hobbyists, but we can dream. Drones with 3D mapping ability will see a rise in the commercial sector soon, however. Drones are already being used for agriculture, and will probably move into other sectors where manned vehicles and satellite imagery are less cost-effective. Google Maps is one thing that comes to mind, although a drone equipped with Site Scan is pricey, it's cheaper than paying for a car and driver, and can cover a lot more ground. Forest Services and mining companies can also make use of technology. We're sure that the most interesting use, however, has yet to be invented. After all, 3DR's Site Scan has an open platform with bays for additional accessories, and will have software updates as new analytics technologies come out. The realm of possibilities for Site Scan is vast, and we can't wait to see what you engineers come up with.

<http://www.allaboutcircuits.com/news/a-drone-that-can-map-the-world-in-3d/>

[Return to Top](#)

Miniaturized fuel cell makes drones fly more than one hour

Drones are used for various applications such as aero picturing, disaster recovery, and delivering. Despite attracting attention as a new growth area, the biggest problem of drones is its small battery capacity and limited flight time of less than an hour. A newly developed fuel cell can solve this problem.

Drones are used for various applications such as aero picturing, disaster recovery, and delivering. Despite attracting attention as a new growth area, the biggest problem of drones is its small battery capacity and limited flight time of less than an hour. A fuel cell developed by Prof. Gyeong Man Choi (Dept. of Materials Science and Engineering) and his research team atPOSTECH can solve this problem.

Pohang University reports that Prof. Choi and his Ph.D. student Kun Joong Kim have developed a miniaturized solid oxide fuel cell (SOFC) to replace lithium-ion batteries in smartphones, laptops, drones, and other small electronic devices. Their results were published in the March edition of Scientific Reports.

Their achievement has been welcomed because it can be utilized not only for a small fuel cell, but also for a large-capacity fuel cell that can be used for a vehicle.

The SOFC, referred to as a third-generation fuel cell, has been intensively studied since it has a simple structure and no problems with corrosion or loss of the electrolyte. This fuel cell converts hydrogen into electricity by oxygen-ion migration to fuel electrode through an oxide electrolyte. Typically, silicon has been used after lithography and etching as a supporting component of small oxide fuel cells. This design, however, has shown rapid degradation or poor durability due to thermal-expansion mismatch with the electrolyte, and thus, it cannot be used in actual devices that require fast On/Off.

The research team developed, for the first time in the world, a new technology that combines porous stainless steel, which is thermally and mechanically strong and highly stable to oxidation/reduction reactions, with thin-film electrolyte and electrodes of minimal heat capacity. Performance and durability were increased simultaneously. In addition, the fuel cells are made by a combination of tape casting-lamination-cofiring (TLC) techniques that are commercially viable for large scale SOFC.

The fuel cells exhibited a high power density of $\sim 560 \text{ mW cm}^{-2}$ at 550 oC. The research team expects this fuel cell may be suitable for portable electronic devices such as smartphones, laptops, and drones that require high power-density and quick on/off. They also expect to develop large and inexpensive fuel cells for a power source of next-generation automotive.

With this fuel cell, drones can fly more than one hour, and the team expects to have smartphones that charge only once a week.

— Read more in Kun Joong Kim et al., “Micro solid oxide fuel cell fabricated on porous stainless steel: a new strategy for enhanced thermal cycling ability,” Scientific Reports (1 March 2016) (DOI: 10.1038/srep22443)

<http://www.homelandsecuritynewswire.com/dr20160309-miniaturized-fuel-cell-makes-drones-fly-more-than-one-hour>

[Return to Top](#)

Looking to Birds for UAS Inspiration

Birds could teach unmanned systems a thing or two about flying—which is why UAS researchers and manufacturers are starting to turn to them for inspiration for their designs.

In the latest issue of Inside Unmanned Systems, we take a look at the research being done in this area and the benefits of that research. Some of these UAS come complete with adaptive wing structures for enhanced maneuverability and energy efficiency, as well as sense and avoid capabilities.

Ty Hedrick, a biologist at the University of North Carolina at Chapel Hill, studies birds and recently worked with researchers from MIT and the University of Washington in Seattle to design a UAS with

detect and avoid capabilities similar to a bird's. They were successful, developing an aircraft that successfully avoided man-made and natural obstacles as it flew.

https://www.youtube.com/watch?v=_gah8olzCwk#action=share

Manufacturers also see the benefits of a bird-inspired UAS design, which is why the team at Blue Bear Systems Research developed the iMorph a few years ago. The iMorph is a small UAS with bio-inspired wings that change span and area like a bird, Blue Bear Product Engineer Mike Snook said.

“There are a lot of times you see birds flying when UAVs can't because it's too windy. We wanted to understand what birds do that is so much better than existing fixed-wing aircrafts,” Snook said. “We wanted to understand how this could be applied to improve our current technology.”

While there's still more research to be done before bird-inspired drones will be a common sight in our skies, there's a lot of promise in this area. Platforms like the iMorph give us a glimpse into what this technology will be able to do, with capabilities that could benefit a variety of industries.

<http://insideunmannedsystems.com/video-looking-to-birds-for-uas-inspiration/>

[Return to Top](#)

High-resolution imaging via quantum remote sensing

The resolution of images obtained using a coherent light source is limited as a result of the classical limit imposed by diffraction. This limit can, however, be overcome by taking advantage of quantum fluctuations in the electromagnetic field of light, also known as quantum noise, to enable an increase in image resolution. One effective method is to make these fluctuations less than the standard quantum limit without violating the principle of uncertainty. When the quantum fluctuations of light are less than the fluctuations of a coherent light source, the light is referred to as squeezed light or, more precisely, quantum optical field squeezed light.^{1,2}

After 10 years of experimental research, we have developed a method of generating squeezed light using a dual-wavelength laser and an injection pump. The signal is split into two beams, of which one beam passes through a beam splitter into a mode cleaner cavity to act as the local source in balanced homodyne detection. The other beam passes through an optical isolator and then a mode-matching lens. The pumped light passes through an optical isolator and is then mixed with the light from the lens and the signal light in an optical parametric amplifier to generate squeezed light, using balanced homodyne detection for monitoring. A nonlinear crystal is used to tune the optical parameters of the squeezed light.

In our efforts to develop an imaging device based on quantum remote sensing,^{3, 4} we have produced a complete prototype that operates by quantization of the light field. This prototype consists of a control module, a module for generating squeezed light, and an optical beam expander to generate a homogenized beam for transmission to the target. The received signal is processed via an optical imaging system, a detector, and a signal acquisition system for subsequent display on a computer. The

prototype uses near-IR radiation, provides a spatial resolution twice as high as is possible with classical imaging, and has a noise compression of 6dB and a continuous working time of more than 60min. It has a length of 1.3m, a width of 0.8m, and a height of 0.3m, and weighs less than 50kg.

Figure 1 shows a comparison of the imaging resolutions obtainable at the same distance with the prototype and a conventional coherent light source of equivalent power. Figure 1. Experimental results show that quantum imaging provides higher resolution than coherent optical imaging at the same distance.

In our next step, we propose using quantum optical field squeezed light in satellite-borne applications for long-distance transmission through the atmosphere, because quantum noise in a vacuum can reduce the energy loss due to compression of light, which affects the image quality. In designing an imaging system for satellite-borne sensing, we aim to use an injection of squeezed light, which is coupled with a laser that enters the optical receiver. By this method, the noise spectrum of the weak signal is modulated by the high-voltage squeezed light, which improves its signal-to-noise ratio. Our proposed system comprises a quantum remote sensing imaging system, a data preprocessing system, a computer and external equipment, and a controller. The quantum remote sensing imaging system includes a transmitter, a receiver, a quantum enhancement module, and a detector. The quantum enhancement module consists of a device for injecting squeezed light and a device for amplifying quantum noise (see Figure 2).

The quantum noise of the weak echo signal is suppressed by injecting squeezed light via the device in the receiver and using the squeezed light field instead of the vacuum field. The device for amplifying quantum noise solves the problem of low detection efficiency. By using a phase-sensitive amplification method, we expect to obtain an imaging effect that is close to that of an ideal detector, so that imaging with high detection efficiency can be achieved by amplifying quantum noise.

<http://spie.org/newsroom/technical-articles/6298-high-resolution-imaging-via-quantum-remote-sensing>

[Return to Top](#)

COUNTER UAS:

Shoulder-mounted, net-firing bazooka can down a rogue drone at 100 meters

Along with severe turbulence, birds in the engine, inebriated passengers, dolts with laser pens, bomb-carrying terrorists, and missiles from war zones, pilots now have the additional worry of a quadcopter getting sucked into the engine of their aircraft, the consequences of which you really don't want to imagine.

The challenge of ensuring restricted airspace is kept clear of the increasingly popular remotely controlled flying machine has seen a string of firms offer up a wide range of high-tech gear that includes everything from anti-drone death rays to electromagnetic defense shields.

However, plain old-fashioned nets appear to provide the basis for many of the proposed solutions, the targeted copters rendered inoperable the moment their spinning blades become snagged in the net's web of crossed threads. The latest creation along these lines is a net-launching bazooka called the SkyWall 100.

Related: FAA to test anti-drone tech for pinpointing illegal operators near airports

Created by a team of UK-based engineers, the shooter is as awesome as it sounds, and may have its operator actually hoping for a stray drone to fly by just so they can get to use it.

Weighing 22 pounds, the shoulder-mounted cannon uses compressed air to fire a net at a rogue drone up to 100 meters away. Once it's nabbed the machine, the system deploys a parachute to bring it safely back to terra firma in one piece, important if law enforcement needs to conduct a forensic examination of the device or locate a serial number to identify the owner.

The SkyWall 100, designed by Open Works Engineering, incorporates a "smart scope" display that uses predictive algorithms enabling the operator to more easily engage with the target, whether it's hovering in one spot or moving at speed. Also, the highly mobile system can be quickly reloaded so the shooter can, if necessary, deal with multiple drone threats.

Related: Rapere is a drone that hunts and drops tangle lines on bothersome drones

Cops in Japan were one of the early adopters of this somewhat low-tech solution, last year unveiling a large net-carrying multi-rotor flying machine that chases after suspicious drones before ensnaring it and returning with it to base.

More impressive is a modified octocopter from students at Michigan Tech University which, similar to the SkyWall 100, shoots a net at the target drone. The net is tethered to the octocopter, enabling it to fly its catch back to the operator.

As for the SkyWall 100, we don't yet have any details on how much the contraption will cost, but the company aims to have it on the market by the end of the year. Rogue drones, beware.

Along with severe turbulence, birds in the engine, inebriated passengers, dolts with laser pens, bomb-carrying terrorists, and missiles from war zones, pilots now have the additional worry of a quadcopter getting sucked into the engine of their aircraft, the consequences of which you really don't want to imagine.

The challenge of ensuring restricted airspace is kept clear of the increasingly popular remotely controlled flying machine has seen a string of firms offer up a wide range of high-tech gear that includes everything from anti-drone death rays to electromagnetic defense shields.

However, plain old-fashioned nets appear to provide the basis for many of the proposed solutions, the targeted copters rendered inoperable the moment their spinning blades become snagged in the net's web of crossed threads. The latest creation along these lines is a net-launching bazooka called the SkyWall 100.

Cops in Japan were one of the early adopters of this somewhat low-tech solution, last year unveiling a large net-carrying multi-rotor flying machine that chases after suspicious drones before ensnaring it and returning with it to base.

More impressive is a modified octocopter from students at Michigan Tech University which, similar to the SkyWall 100, shoots a net at the target drone. The net is tethered to the octocopter, enabling it to fly its catch back to the operator.

As for the SkyWall 100, we don't yet have any details on how much the contraption will cost, but the company aims to have it on the market by the end of the year. Rogue drones, beware.

This anti-UAV octocopter uses a ballistic net cannon to disable smaller drones

<http://news.yahoo.com/shoulder-mounted-net-firing-bazooka-111527369.html>

[Return to Top](#)

INTERNATIONAL:

Swiss Company Develops Blimp-Like, Crowd-Friendly UAV

A new breed of unmanned aerial vehicle that is safe to fly at close proximity to crowds has been developed by a spin-off team from Swiss university ETH Zurich. The helium-filled flying machine, known as Skye, combines the manoeuvrability of a traditional quadcopter with the energy efficiency of a blimp.

The makers say their safe and 'friendly' drone offers a new and innovative way for brands to interact with their audiences in public settings. Where current advertising is often limited to displays and billboards, Skye can float safely around and interact with people.

"It's a unique flying machine which is safe enough to interact with. So you can touch it in flight; it's basically filled with helium which provides most of the uplift," said Daniel Meier, co-founder of company Aerotain which developed the Skye drone.

Despite being around three metres (approx. 10 ft) in diameter, Skye is extremely agile and able to perform almost any movement instantaneously thanks to its four small electric motors. Its engineers designed algorithms that keep it on course, even when performing a range of aerial tricks.

"This is where the magic happens; four motors are allowing it to perform any movement, so you can really move it in the air like a flying eye," Meier told Reuters while demonstrating Skye's operation.

"There is a computer on board which knows exactly how it's orientated in the world, and then it gives commands to the motors to actually align it to where you want it to be. And there are four motors on it

which can rotate around their axis and with them you can precisely control it in any environment, basically."

Skye is lightweight, which combined with its small energy requirements, give it a flight time of about two hours on a single charge.

By eliminating exposed rotor blades typical of most drones, Skye makes it possible to operate around crowds without fear of injury.

Meier added that regular drones could also be dangerous if they malfunction. "There is even one bigger issue; that is if the electronics fail it will just fall down to the ground. This can't happen with Skye because helium is providing the buoyancy, so if ever something goes wrong it becomes a huge balloon and people could play with it," he said.

Aerotain says its technology could disrupt the advertising industry by allowing companies to engage directly with the public in a way never seen before. At public events, such as a sports game or concert, Skye can autonomously float above the crowds or with a pilot at the controls. Skye's surface can be designed individually, for instance to depict a product or to show the name of a brand, with its uniqueness naturally attracting people's attention. It's also strong enough to carry on-board cameras for live streaming and aerial cinematography.

<http://www.reuters.com/article/us-drone-blimp-idUSKCNOWH2E3>

[Return to Top](#)

COMMENTARY:

Have Lethal Swarming Drones Made Submarines Obsolete?

Submarines can run—but they can't hide—from drones.

That's the contention of a new report by a British think tank, which argues that the growing numbers and sophistication of drones are depriving submarines of their stealthiness.

The report points out the century-old method of hunting subs is changing:

"In the past, antisubmarine warfare (ASW) has been carried out by a small number of highly capable ships and manned aircraft. Their task has been like that of a handful of police looking for a fugitive in a vast wilderness. Lacking the manpower to cover the whole area, they have to concentrate their forces on the most likely paths and hideouts, and hope for a lucky break."

Now, highly expensive subs must contend with an expanding array of cheap robot sub-hunters that can blanket the ocean, sort of in the same way that German U-boat "wolfpacks" ganged up on Allied convoys in the North Atlantic. These include small handheld drones that the U.S. military is designing to operate in swarms, air-launched drones like the U.S. Coyote that can be dropped by ASW aircraft, and sonar-equipped underwater robot gliders that quietly search the ocean.

"Small unmanned platforms can carry many types of sensors active and passive sonar, magnetic anomaly detectors, wake detection LIDAR, thermal sensors, laser-based optical sensors capable of piercing seawater and others," Hambling writes. "A submarine which can be seen by any one of these will cease to be invisible. A submarine whose location is exposed is highly vulnerable to instant attack. If submarines are easily detectable, they lose all their advantages as strategic weapons platforms."

Drones versus subs is essentially an arms race, a contest between an expensive but fragile weapon pitted against hordes of cheap sensor and weapons platforms. It parallels the race between the development of stealth aircraft, and the development of sensors to detect them.

Unfortunately for the subs, it's not an equal contest. A U.S. Virginia-class attack submarine costs nearly \$3 billion: a small unmanned aircraft might cost \$5,000, and a swarm of thirty drones just \$150,000. The drone isn't as capable as the sub, but that's not the point. Nuclear missile submarines have always been considered the invulnerable backbone of a nation's nuclear force, able to hide in the ocean unlike land-based ICBMs or bombers. If the United States, Russia, China, Britain or France—not to mention Israel—fear that their ballistic subs are vulnerable to a surprise drone attack, this could make decision-makers much more ready to pull the trigger in a crisis.

On a more human level, it would be interesting to go back in time to World Wars I and II, where a constant refrain of the sailors and airmen who hunted subs was the sheer tedium of the search. Hour after hour after hour of scanning the oceans, in the hope that a needle in the haystack would reveal itself as a sonar contact or a tiny periscope peeking above the surface. If nothing else, farming out sub-hunting to the robots will make chasing subs a bit less dull.

Either way, antisubmarine warfare will never be the same. "The oceans are becoming a 'sensor rich' environment full of drones, with eyes and ears everywhere," writes Hambling. "This will leave no hiding place for submarines."

<http://www.nationalinterest.org/feature/have-lethal-drones-made-submarines-obsolete-15412>

[Return to Top](#)

You know Area 51, but just what in the world is Area 6?

The asphalt runway stretches for a mile on Yucca Flat, deep in the Nevada National Security Site about 80 miles northwest of Las Vegas.

Built in 2005, the runway covers a dirt landing strip from the 1950s, when the wide, flat valley was used for atomic bomb test shots. A small complex of buildings dominated by a large hangar with unusual clamshell doors dominates the southern end of the asphalt strip.

The complex has no official name. Not many people even know it's there.

As secret airbases go, the single runway in the test site's Area 6 is easily overshadowed by the world's most famous secret military base, Area 51, a dozen miles northeast. Area 51's existence was only recently acknowledged, even after decades of speculation by UFO enthusiasts that the aircraft development and test facility also houses space aliens and extraterrestrial technology.

Unlike Area 51, which is protected by shoot-to-kill security and shielded from outside view by mountain ranges, Area 6 has only fences and visitor checkpoints. It can be seen at a distance from tour buses on the highway to historic bomb craters at the northern end of Yucca Flat.

But exactly what goes on at the much smaller and much newer Area 6 is still top-secret defense research-and-development work. It's so hush-hush that the security site's spokesman can say little about it.

LITTLE-KNOWN OPERATION

Other than a few "Above Top Secret" forum posts from 2009, and a Wikipedia blurb that cites a 2011 Flightglobal story saying the runway is part of an unmanned aerial vehicle test facility, little has been written about the Area 6 runway.

"The purpose of this facility is to construct, operate, and test a variety of unmanned aerial vehicles. Tests include, but are not limited to, airframe modifications, sensor operation, and onboard computer development. A small, manned chase plane is used to track the unmanned aerial vehicles," reads the report Energy Department contractor Bechtel SAIC prepared in 2008 for the Yucca Mountain repository license application.

The National Nuclear Security Administration is a semi-autonomous branch of the Energy Department. Its Nevada field office, based in North Las Vegas, runs the security site.

The program's activities include research and development of sensors for detecting explosive materials, deadly gases and chemicals, and radioactive sources that could be used in "dirty bombs."

Biological weapon sources aren't allowed at the security site, according to its environmental impact statement.

Portable radiation monitors and some sensors used in airports and at ports of entry have evolved from the program.

Morgan said agencies in the Strategic Partnership Program take advantage of the security site's restricted airspace to test sensor-equipped aircraft work without public interference or spying from space.

Most of the strategic partnership money comes from Defense Department branches: the Air Force, Army, Navy, Marines, Defense Threat Reduction Agency and the Defense Advanced Research Projects Agency.

As seen from above on Google Earth, the complex is dominated by the clamshell-door hangar and four smaller outbuildings connected by what appear to be covered walkways. Two smaller modern hangars and an older one used during atomic test days round out the facility. Morgan said antennas were installed to allow ground operators to control the flight of unmanned aerial system aircraft.

The National Nuclear Security Administration has kept Area 6 so low profile that even defense industry experts were unaware of it.

But Pike's associate, imagery analyst Tim Brown, has estimated the hangar complex could hold about 15 MQ-9 Reaper remotely piloted spy planes.

Pike said the length of the runway suggests Area 6 is used for small planes or remotely piloted aircraft such as Predator and Reaper reconnaissance drones.

Bigger spy planes, such as the jet-powered RQ-170 Sentinel unmanned aircraft system, are flown from the Tonopah Test Range by the 30th Reconnaissance Squadron assigned to a Creech Air Force Base wing. It's unclear if the Sentinel or smaller versions would be flown from Area 6, but Pike said the runway is too small for large jets and bombers. Takeoffs and landings would be tight for an F-16, for example, and an F-15 would need an even longer strip for safe maneuvers.

Pike said aircraft likely in use at Area 6 are best suited for surveillance of hidden targets, weapons or personnel on the ground, particularly in sparsely populated areas. The security site's high-desert terrain is similar to what might be found in the "boondocks" of Libya, he noted.

So what would stray civilians see if they could stumble in?

Pike offers an educated guess: Sensor arrays made up of more than 350 smartphone cameras mounted on an MQ-9 Reaper that can record and archive movements of people and vehicles over an area of about 40 square miles.

It is known in the unmanned aerial vehicle community as the "Gorgon Stare," derived from Gorgon monsters of Greek mythology whose gaze was so dreadful it was said to turn a person into stone. While the sensors can't do that, they can keep terrorist targets from evading the sights of U.S. weapons.

According to the Defense Advanced Research Projects Agency website, sensor development has soared to new heights under ARGUS, or the Autonomous Real-time Ground Ubiquitous Surveillance program.

The goal is to "provide at least 130 independently steerable video streams to enable real-time tracking of individual targets throughout the field of view. The ARGUS-IR system will also provide continuous updates of the entire field of view for enhanced situational awareness," the defense tech agency website says.

Pike said improving ARGUS and similar sensor capabilities might be among the activities taking place at Area 6.

“The thing you get with ARGUS is time-lapse photography. If there’s a rock out there that’s moving, maybe that’s a rock you ought to be paying attention to. Maybe it has to do with evildoers,” he said.

“If they would let me run the thing, I’d tell (special operation troops) to go out and do the best in terms of infiltration,” he said. “Then turn loose the sensors and see if we could find them, play hide-and-seek.”

<http://www.reviewjournal.com/news/nevada/you-know-area-51-just-what-the-world-area-6>

[Return to Top](#)

How the Reagan-Era CIA Predicted Our Drone Dystopia

As far back as 1986, the agency saw a future of proliferating drones that would be used for ‘attack missions’ by armies and terrorists alike, according to a now-declassified report.

The drone craze has set off a wave of pundit hand-wringing about the global spread of unmanned technology and its consequences.

But a declassified report from the CIA’s analytical arm shows that the agency was predicting a wave of drone proliferation as far back as the mid-1980s, at a time when the iconic Predator drone was only a glint in Langley’s eye.

The 1986 intelligence assessment, “Remotely Piloted Vehicles in the Third World: A New Military Capability,” prepared by the CIA’s Office of Global Issues, shows that the trickle of unmanned technology into the developing world first began decades ago.

The CIA’s assessment argued that advances in technology had made drones a more capable, accessible, and popular purchase than ever before—a trend the agency expected only to continue in the years to come. Israel’s innovative use of drones in the 1982 invasion of Lebanon, in particular, had “heightened Third World interest in [unmanned aerial vehicles (UAVs)].”

The growing interest in unmanned systems around the world, according to the assessment, was a sign that “a number of other Third World nations with relatively large and professional militaries will become users of RPVs by the mid-1990s, especially with the development of inexpensive and easy-to-use systems.”

According to the agency’s analysis, lighter air-frames, made possible by new composite materials, were increasing drones’ ability to carry heavier and heavier payloads. Cheaper solid state television cameras coming onto the market would also make basic video cameras a go-to sensor for smaller, more affordable drones, while a new crop of faster chips would help speed up the processing of videos feeds.

Until the 1980s, militaries used drones almost overwhelmingly for intelligence and surveillance. But by 1986, there were already signs that drones would take on a strike role.

These developments helped convince the CIA that a new generation of drones would be used for “attack missions” and could “deliver standoff munitions.”

Back then, as now, the declining barriers to drone ownership raised the specter of their use as a terrorist weapon. Given terrorists’ prior use of gliders and other small transport vehicles in attacks, they might see drones as a kind of poor man’s missile, “effectively converting the [UAV] into a guided bomb capable of surprise attacks at short and medium ranges.”

The report warned that “a bomb-laden [UAV] provided to a terrorist group by a patron state could be used against a US embassy or target in a dramatic fashion.” Libya and Iran loomed as the largest threats for terrorist use of UAVs, with the report judging larger Palestinian terrorist groups as the most capable of employing them in kamikaze fashion.

Overall, though, the agency viewed drone proliferation in the “Third World” as mostly a good thing that could “help prevent conflict and maintain stability in tense Middle Eastern and Asian areas.” It argued that the intelligence the drones collected in conflict-prone regions could provide transparency about neighbors’ intentions and reduce the kinds of miscalculations that can lead to larger wars—all without the escalatory risk of losing a flesh-and-blood pilot.

Today that trend has only intensified, as at least 86 countries’ militaries have some kind of UAV, according to a study by the New America Foundation. Even armed drones, once an exclusive preserve of a handful of advanced militaries, are an ever more common sight in the developing world, with Iraq, Pakistan, and Nigeria becoming the latest armed forces to use them in combat.

And as the CIA feared, terrorists have made use of bomb-laden drones, albeit not to great effect. During the 2006 Israeli-Lebanon war, Hezbollah strapped explosives to a crude Iranian-made Ababil-II drone and flew it over Israel, where it was shot down by an F-16. Jihadist groups in Iraq and Syria like ISIS and the al Qaeda-affiliated Nusra Front have also used small commercial quad-rotor drones for propaganda and limited reconnaissance.

The report did miss in a few key areas, however. “It’s not so much their assumptions of the technology, it’s their assumptions of geopolitics,” said Peter Singer, a strategist and senior fellow at the New America Foundation.

On the technology side, improvements in the size, weight, and power of drones and their sensors were key to the success of UAVs, but “it wasn’t until unmanned systems were married up with GPS that they became truly useful,” said Singer. He told a story of an unarmed Air Force Predator drone scouting for Serbian military targets hiding among civilians during the war in Bosnia. The UAV managed to find a Serb tank, but the lack of precise coordinates for either the tank or the Predator prevented U.S. forces from being able to do much about it.

While views on the merits and morality of unmanned systems in war are by no means uniform, some of the CIA’s cautious optimism about drones is shared by analysts today.

“A lot of conflict happens because of uncertainty and fear about what adversaries might be doing,” Horowitz, an associate professor of political science at the University of Pennsylvania who has written extensively about U.S. drone and technology policy, told The Daily Beast. “To the extent that UAVs increase the information that both sides have about a given situation, it makes them less likely to inadvertently stumble into a conflict.”

<http://www.thedailybeast.com/articles/2016/03/10/how-the-reagan-era-cia-predicted-our-drone-dystopia.html>

[Return to Top](#)

UAV Industry Concerned About Upcoming FAA Regulations

Are drones a useful tool or toys that need to be regulated?

The Federal Aviation Administration said there were 764 drones sighted near airplanes last year. (Rick Bowmer/AP)

Drones: a useful business tool or playtime toy?

The question will arise again Wednesday on the floor of the Senate as lawmakers consider how much regulation is needed for a burgeoning industry that is projected to supply 2.8 million drones this year, with a bottom line rapidly approaching \$1 billion in annual sales.

The risk drones pose to people and privacy has unfolded gradually as the fun-to-fly gadgets have become a must-have item for those who can afford them. Drones have buzzed planes in flight, endangered military aircraft and peered over the neighbor’s hedges with mini video cameras.

The counterbalance to drones as a hobby is a multitude of commercial uses as mapping and construction tools that speed projects along and save workers from risky tasks, such as climbing cell towers for inspections. The prospect that they will be used for package deliveries is on the drawing board.

As the technology moves at warp speed, state and federal lawmakers and regulators have sprinted to keep up. Calculating the correct dose of regulation to rein in the exuberant hobbyist without stifling commercial use or industry growth has been the challenge at the Federal Aviation Administration and on Capitol Hill.

Drone “technology is developing rapidly, much faster than our country’s capacity to develop the necessary regulations,” Brian Wynne, president and chief executive of the Association for Unmanned Vehicle Systems International, told the Senate Committee on Small Business and Entrepreneurship last week.

The FAA’s new drone registration program has recorded 400,000 drone owners, and the agency’s B4UFly app continues its effort to educate operators about the rules for flying them. Now the Senate

will consider directing the FAA to do more, including requiring an online test for drone operators and requiring manufacturers to install uniform safety features.

The Senate, in a larger bill that would renew authorization for the FAA, also wants to provide funding for better drone enforcement and clarify the role of state and local lawmakers who have stepped in with their own laws.

Giving the FAA supremacy to dictate drone regulations would give manufacturers and companies that want to use drones for deliveries a single agency for their proposals, rather than requiring state-by-state submissions.

“The patchwork of state and local laws under consideration in many jurisdictions will create additional hurdles for small businesses,” Wynne said last week.

“Industry just wants rules,” said Nancy Egan, general counsel for the drone manufacturer 3D Robotics. “People want rational rules, but the fact is that at this point they want any rules, because there are so many amazing things that can be done with a drone to make the world safer.”

The FAA this spring is expected to issue regulations covering drones weighing up to 55 pounds. The agency said there were 764 drones sighted near airplanes last year, despite current guidelines against flying drones near planes or within five miles of an airport unless the control tower has been contacted first. Drones also are supposed to fly below 400 feet, stay away from stadiums and remain in sight of the operator.

Biggest obstacle for delivery drones isn't the technology: It's you and me

There are industry concerns that lawmakers, eager to corral the handful of hobbyists who misuse their drones, will inhibit their development and use.

Egan worries that the Senate bill will require the FAA to begin its regulatory process anew.

“My concern with the Senate bill is that it ignores what the FAA has already done,” Egan said. “It essentially says, ‘FAA, you need to start over.’”

She co-chairs an FAA panel working on regulations specific to drone flights over people who have no relationship with the drone operator.

“What the FAA’s already studied, and taken public comment on and considered in depth, is what kind of flight is safe,” she said. “I’m not sure why we’re starting over.”

https://www.washingtonpost.com/local/trafficandcommuting/are-drones-a-useful-tool-or-toys-that-need-to-be-regulated/2016/03/15/a07a75c4-eab0-11e5-a6f3-21ccdbc5f74e_story.html

[Return to Top](#)