AUTONOMOUS SYSTEMS CHALLENGE

U.S. COAST GUARD INNOVATION PROGRAM
July 2017

THE **PROGRAM**

The Commandant's Direction 2014 mandates **"As a Coast Guard, we will foster an organization capable of continuous innovation and learning."** Towards that goal, the Coast Guard Innovation Program oversees several initiatives designed to help the Service further grow a culture of learning and continuous improvement. The Innovation Program falls under the Office of Research, Development, Test and Evaluation (CG-926), and is overseen by the Coast Guard Innovation Council, a group of leaders and subject experts from across program and geographic areas.

CG_IDEAS@WORK is a web-based crowd-sourcing platform that the Coast Guard Innovation Program launched in June 2015. The platform allows the entire Coast Guard workforce (Active Duty, Reserve, Civilian, and Auxiliary) to provide and develop ideas to address enterprise strategic needs. Through the Coast Guard Innovation Council, Coast Guard programs sponsor challenges to the workforce through CG_Ideas@Work. Users can then present, discuss, and vote on ideas presented by fellow members of the Coast Guard community. Ideas are then presented to the sponsor program for further development and implementation. The site can be found here: https://cg-ideasatwork.ideascale.com.

THE **REPORT** is provided to the sponsor program following the conclusion of a sponsored challenge. The report contains all ideas, comments and vote tallies provided by participants during the course of the challenge. This report summarizes discussions intended to develop ideas more fully conducted with the sponsor, Innovation Council members and other stakeholders.

Lessons Learned from Crowdsourcing:

Idea Types: Generally, solutions provided to program challenges have proven valuable on three levels:

- New, revolutionary solutions, not yet considered by the sponsor program.
- Ideas unfeasible for implementation, but spur discussion helping sponsor programs generate new solutions on their own. These ideas illustrate the value of a dialog and collaboration between the sponsor program and the workforce.
- Ideas that the sponsor program is already working on, or that the program has already considered and dismissed. These ideas provide valuable validation of program work.

Votes: Program sponsors have found that while idea vote tallies are helpful for discussion, the high vote-getters are generally ideas that are evolutionary rather than revolutionary. Ideas with the most votes are often concepts that programs have already considered and have either been dismissed or are already in the process of implementation. **Often, the most interesting new ideas have a lower total vote count.**

OVERVIEW

On the 17th of Jan 2017, the US Coast Guard hosted the **Autonomous Systems Challenge** on CG_Ideas@Work, the Coast Guard's idea crowdsourcing platform. The challenge was co-sponsored by the **Evergreen and the Office of Research, Development, Test & Evaluation (CG-926)** and ran through 30 Apr 17. The challenge reads as follows:

HOW MIGHT THE COAST GUARD BEST USE UNMANNED AND AUTONOMOUS SYSTEMS IN THE FUTURE?

Unmanned and autonomous systems are increasingly becoming part of daily life. Unmanned systems are those without a person on board, while autonomous systems go a step further and operate with even less input from human operators. Last month Amazon conducted its first drone deliveries to customers in Europe, and driverless car legislation is being debated in State Houses across the United States. Autonomous vessels and aircraft may soon become the norm rather than the exception on the global Maritime Transportation System. As our stakeholders and adversaries adopt unmanned and autonomous systems, how might the Coast Guard best use these emerging technologies? How would you use autonomous systems in your mission? What considerations should we make as a service to position ourselves for success in a new autonomous landscape? Remember, this is a forum for UNCLAS discussion only. Please refrain from posting details about existing capabilities.

Submitted Ideas: In response to the Autonomous Systems Challenge, there were a total of:

33 Ideas

46 comments

138 Votes

PARTICIPATION

CG_Ideas@Work currently has over 5200 registered users throughout the Coast Guard workforce. It's important to note that users of CG_Ideas@Work are a self-selected sample of the CG community; users are not required to participate.

The Innovation Program can provide contact information for participants if needed. Online moderation was kept to a minimum to encourage the most creative user environment. Interaction was professional and respectful.

Full list of ideas and comments:

The following section is a verbatim report of all ideas provided by CG_Ideas@Work users. Ideas are ordered by number of votes received. Ideas and comments have been edited only for anonymity, spelling, grammar, and readability.

NOTES FROM EVERGREEN & INNOVATION

The Autonomous Systems challenge was co-sponsored by Evergreen and the Innovation Program as a means for continuing and expanding the Coast Guard dialog regarding autonomous systems. Within both government and the private sector autonomous systems are poised to become ubiquitous. DoD has been using autonomous and semi-autonomous systems to gather intelligence and launch kinetic strikes since late 2001. In February 2014 the FAA grounded the first commercial drone operation, a brewery using a large quadcopter to deliver beer to ice fishermen on the Great Lakes. Since then, auto manufacturers, computing giants, entrepreneurs, and hobbyists have seen the obvious utility of autonomous and semi-autonomous systems.

DARPA and the Navy have developed a ship-sized autonomous surface vessel called Sea Hunter. Two of the goals of the Sea Hunter program are to:

-Explore the performance potential of a surface platform conceived from concept to field demonstration under the premise that a human is never intended to step aboard at any point in its operating cycle. As a result, a new design paradigm emerges with reduced constraints on conventional naval architecture elements such as layout, accessibility, crew support systems, and reserve buoyancy. The objective is to generate a vessel design that exceeds state-of-the art platform performance to provide propulsive overmatch against diesel electric submarines at a fraction of their size and cost.

-Advance unmanned maritime system autonomy to enable independently deploying systems capable of missions spanning thousands of kilometers of range and months of endurance under a sparse remote supervisory control model. This includes autonomous compliance with maritime laws and conventions for safe navigation, autonomous system management for operational reliability, and autonomous interactions with an intelligent adversary.

Put simply, the goal of DARPA's uncrewed ship program is to use the savings generated by building a vessel without berthing areas, sewage systems, and coffee makers to design a more-capable platform; and then to push the performance of that platform far beyond what a human could endure. Minimizing the need for humans in the loop minimizes tooth-to-tail costs and eliminates design constraints. Several ideas submitted to this challenge reflect the workforce's recognition of the promise increased automation presents for enhancing our expeditionary missions and maritime domain awareness. Representatives from nearly every mission domain - from ATON to environmental response - provided ideas for using robotic technologies for enhancing missions. Examples include use of swarms such as the Perdix drone to rapidly flood a search area with sensors; and using long-range autonomous surface craft such as Saildrone and the Liquid Robotics Waveglider to provide persistent surveillance to requently-patrolled areas like the Mona Passage or fisheries closed areas. The possibilities for mission enhancement are endless. Several applied research projects assessing use of uncrewed systems for Coast Guard missions are currently underway within the office of Research, Development, Test and

NOTES FROM EVERGREEN & INNOVATION (Cont'd)

Evaluation (CG-926). RAMPS – Robotic Aircraft for Maritime Public Safety – is a survey of Group 1 and 2 UAS and associated sensor payloads across various CG Missions. Unmanned Maritime Systems Investigation is a look at the state of the market for robotic surface technologies. The Cutter STRATTON is pioneering the use of small UAS on the NSC in an operational environment. Most significantly, Congress has approved an appropriation of $18M for Coast Guard R&D to investigate long-range and ultra-long endurance UAVs. To align efforts in the uncrewed air domain, the Office of Aviation Forces (CG-711) has also recently prepared an Unmanned Aerial Vehicle Strategy.

Putting advanced sensors on autonomous space, air, surface, or subsurface vehicles and integrating them into operations may be more straightforward than processing the large amounts of data those systems generate. Persistent surveillance requires persistent monitoring. Artificial intelligence or machine learning may be essential in the back-end processing of sensor data, queuing potential sensor targets for human decisions. Another back-end concern is determining where to house the data; DoD or FedRAMP-approved cloud solutions may offer the superior security and accessibility than traditional data warehouses.

While Coast Guard operations could be enhanced by this technology, we are also responsible for governing its use on federal waterways. Autonomous systems present a governance challenge to regulatory agencies like the Coast Guard. Every component within the Department of Transportation is currently working through the considerations around increased automation within the transport system.

Transportation companies such as Uber and Freightliner have tested and demonstrated self-driving long-haul trucks, and Google has applied for a patent for an autonomous delivery vehicle. As a regulatory agency, the Coast Guard is also at work developing COLREGS and other regulations regarding autonomous and semi-autonomous ships. This is especially timely; last month in Copenhagen a tugboat recently got underway and moored at a different location, all while remotely piloted from the pier; and a Norwegian firm has announced plans to sail a zero-emission fully-autonomous cargo ship in 2018. As use of autonomous systems becomes increasingly pervasive within the Coast Guard and among our regulatory stakeholders, unity of effort will become crucial. Separate programs currently own governance over parts of the overall automated systems domain. CG-711 has managed aerial systems; CG-721, subsurface systems; CG-731, surface systems; with CG-2, CG-5, CG-6, CG-9, and geographic commands all having important roles as well. The Coast Guard may need to consider forming an autonomous systems working group, Integrated Product Team, or Center of Excellence to minimize redundancy and ensure harmony of purpose as we move toward adoption of this emergent capability.

Evergreen Program Manager: CDR Eric Popiel **Innovation Program Manager:** CDR Andy Howell

Spill Response
19☑

UASs for spill assessment and response would provide commands with a rapid and clear operating picture while simultaneously acting as a force multiplier for responders. A UAS operating on a spill site can identify the source, determine the extent of impact, and direct response efforts allowing for the prioritization of resources and personnel. These capabilities can translate into increased recovery rates and reduced impacts.

Compared to traditional over flights, UASs will provide considerable cost savings. The upfront cost of a UAS is only a few hundred dollars. With minimal upkeep, no additional base facilities, and minimal USCG training costs, UAS costs are much smaller when compared to traditional fixed wing or rotary aircraft.

Spill responses are inherently dangerous missions, they often occur in remote and unforgiving terrain where this risk is magnified. These systems can mitigate or eliminate significant hazards. Real time aerial views provide site evaluation, hazard identification, and responder orientation. With expanding payload potentials mission set opportunities increase dramatically, from remote air monitoring, infrared cameras, etc.…
UASs used for spill response will not replace the need for traditional over flights and observation methods on unique or complex incidents; rather they will fill the gap of unit level observation capabilities. Providing rapid deployment and site assessment, a clear operating picture, risk mitigation, and cost reduction, unit level UASs for spill response will pay dividends far beyond their purchase, upkeep, and training costs.

1. This would be especially helpful in areas that flood easily.
2. Unmanned systems seem especially fitting for this role. Check out cape.com for some info on remotely-operated UAS. Imagine that capability set up in a deployable application. The ICS at a major spill could deploy and constantly survey the site.
--> That website and business idea is amazing. I'd never heard of an approach like that. The idea of having a few pre-positioned once a spill reached ICS type III or higher and the SITU, OPs, or Planning could instantly gather onsite information with no time lag from the field. There are a lot of possibilities!
3. I have flown several missions to document these types of events. Typically, they are near shore in busy airspace or close to obstacles. There is no doubt that use of UAS puts the camera closer to the event, is safer, cheaper and the mission can be flown more often since presumably such systems will closer and more available than USCG main line air assets. One could image an active duty or aux crew, flying a mission before and after work providing details to investigators a couple times a day for relatively few dollars.
4. Aux UAS is an idea that's been brought up on this site a few times. It's another cool idea, even though it would take some good policy writers to make it happen!
5. I tested a real time over the horizon streaming link 8 years ago and it was noted as worthwhile then. A UAV sending real time pictures to the OpCenn or the Command Post is an important tool to leverage. Make it happen.
6. I believe this would be a perfect idea for an inter-agency collaboration project with NOAA's UAS Program. It can be similar to the following projects: http://response.restoration.noaa.gov/about/media/collecting-data-sky-oil-spill-response.html; https://uas.noaa.gov/library/presentations/Operational-Deep-Freeze-2016-Post-Mission-Review.pdf; https://uas.noaa.gov/
7. We are already seeing some OSROs use UAVs for spill response. Being stationed in an area with lots of bayous and marshland, the minimal cost and training investment would undoubtedly result significantly increased AOR access and response time. In a resource neutral billet environment, increasing our efficiency is critical. JKO Online already has training available for UAV operators. Combined with the standards set by the FAA, JOs and MSTs should be able to obtain a proper license for minimal costs.

Enlisted Rating for UAV operators

16 ☑

An enlisted rating should be developed for Unmanned Aerial Vehicle and Systems (UAV/UAS) operators in the Coast Guard. There are stringent legal requirements (FAA regulations, for example), which restrict commercial and government operations of UAVs to personnel who have UAV pilot licenses. There are numerous rules concerning where UAVs can be flown. We need a group of enlisted professionals who have the ability to both maintain and expertly operate UAVs, in accordance with all laws and regulations, or we will miss the opportunity that UAVs represent to the Coast Guard. UAVs and UAS will allow the Coast Guard to perform more missions (LE patrols, SAR, and oil spill response, for example) at lesser cost and with less risk to personnel. The use of UAVs will then allow the Coast Guard to better focus the use of its boat, cutter, and air assets, by coordinating with the intelligence and situational awareness gained by unmanned systems; this will be a great advantage to the Coast Guard when operating within a limited budget.

The development of a UAV/UAS rating would allow for a specialized workforce to deploy onboard cutters or with other units, to provide UAV mission expertise and ensure Coast Guard policy is followed.
Finally, an enlisted UAV rating would also be an outstanding tool for recruiting tech-savvy personnel into the Coast Guard.

1. This would ultimately save the USCG a great deal of money for all the reasons already given: SAR, ATON, Navigation, Oil Spills, aftermath of severe weather, etc. It would provide better use of all forces - deployment of aviation and cutters for response in all the above. And the cost of one drone would be a lot less then launching a helicopter and crew.

2. I've heard COMDT (CG-711) is looking into this; there's quite a bit of interest. It's my understanding that there will likely be restrictions on who can fly UAVs within the national airspace (i.e. over land), but I know once they are off shore the rules on who can operate the aircraft can be relaxed somewhat.

3. The USMC has a code they give to a Marine with an existing rating. So if a 0311 (Machine Gunner) goes to the Raven school for UAV operations, they earn that certification and keep their 0311 code. I don't think a new "rating" is a good idea at this point, but a competency that is earned with a formal school attendance.

Autonomous Drones for Search and Rescue

14 ☑

Utilize rapidly deployed autonomous drones to perform SAR patterns at a rate faster than our assets with a greater probability of detection. Picture deploying a series of 5 drones from a small boat that rapidly rotated and buzzed around an area to identify targets based on camera input and imagery analysis. This would be relatively inexpensive once developed, require little training (as drones would be required to be autonomous) and save countless hours searching an area. Similar systems are being developed for land-based

SAR: http://www.theverge.com/2016/2/11/10965414/autonomous-drones-deep-learning-navigation-mapping

1. Check out with particular attention to the swarm drones:
http://www.cbsnews.com/news/60-minutes-autonomous-drones-set-to-revolutionize-military-technology/
Drones that could swarm a search box could further take the S out of SAR!

2. I was thinking along the same lines. In terms of the autonomy if Coasties and Vessels were equipped with particular transponder an autonomous water or under water based drone (sub) could seek out and connect to the target based on that signal. Similar to swarm they could then either surface the target send out a flare, even perhaps deliver supplies or oxygen, etc.

3. These drones, if they were large enough, could also deliver a life ring or other flotation device (CO2 activated?) to a person in the water. This could be very useful if the small boat was unable to reach the individual (shoal water, etc.).

Unmanned Systems and ATON
12 ☑

There is an opportunity for the use of Unmanned Aerial Vehicles and Systems (UAV/UAS) in nearly every mission of the Coast Guard. Beyond the obvious SAR and LE uses, I see a potential for the use of UAVs and UAS within the Aids to Navigation field.

UAVs with remote sensors are currently being used to survey and map locations with extremely high accuracy. I believe that Aids to Navigation could accurately be "position-checked" using UAVs. Rather than moving a boat and crew, with the necessary cost in man-hours and fuel, an aid could be verified on position using UAVs-- at a significant cost savings to the Coast Guard. If an aid is found off-position, then a boat crew could respond.

As another use: with the majority of ATON being lit by modern LEDs (which are programmed by remote control), it would be fairly simple to attach the same remote-control technology to a UAV, allowing a UAV operator to remotely program or perform function checks on an offshore LED light.

UAVs equipped with video cameras could also be used to inspect ATON structures.

By introducing UAV/UAS into the ATON mission, we will be better prepared should a disaster (such as a tsunami or major hurricane) wipe out an essential waterway. An unmanned vehicle could photograph, survey, and map the affected area. And, to take this a few steps further, there is an opportunity now to begin leveraging modern ATON technologies such as virtual Automated Information System (AIS) into the use of UAVs. In the event of a disaster, this modernized approach to ATON could potentially allow larger military and commercial vessels to transit an affected waterway as soon as possible, even if every steel buoy was wiped out: the UAVs could set virtual aids, based upon the surveyed conditions.

The technology is available now for high-accuracy mapping with UAV/UAS, and numerous remote sensing tools should be tested for their use with the Aids to Navigation mission.

1. For an initial assessment of a waterway UAV could be helpful. But part of the assessment of a waterway is verification of channel depths.

--> Coordination with the Army Corps of Engineers will be essential in validating the depths of waterways. For the issue of water depth and using unmanned systems, I see two potential solutions: (1) utilizing surface-based unmanned systems, such as the surfboard-sized vessels being developed by companies such as Liquid Robotics; and (2), looking into the possibilities of remote sensors and Unmanned Aerial Systems... I don't know if there are any limits to what remote sensing technology can accomplish, but I wouldn't be surprised if remote sensors on UAVs could actually measure water depth, salinity, water temperature, and bottom type. LIDAR (Light Detecting and Ranging) technologies utilize lasers to map ground contours from airplanes and drones, and, although I don't know this for a fact, I think that LIDAR technologies could possibly be used for underwater sensing. I'll be transferring to ANT Honolulu this summer, and I've thought about the possibility of a tsunami wiping out Honolulu Harbor and other island ports... to the point where it's unsafe for our buoy tenders, if they're not already damaged, to conduct survey assessments. The entire population of Oahu is essentially dependent on shipping for daily goods. In that scenario, how quickly could the Coast Guard have that waterway open and running for medical evacuations, food, fuel, and other supplies? Other ports on the West Coast are just as vulnerable

to major earthquakes and tsunamis (the Cascadia Subduction Zone in the Northwest and the potential for earthquakes shutting down LA/LB and San Francisco ports, for example). I think that the technology available now is inexpensive enough for the Coast Guard to invest in, so we can be better prepared to repair a damaged waterway's ATON, quickly restore shipping, and save lives.

2. ATON verification with the use of an autonomous drone would prove very helpful in Alaska where it is often difficult at best to verify ATON within policy time constraints after groundings. With regards to checking depth of water, this can easily be done with current technology and the use of sensors.

3. This is an excellent idea and could possibly even leverage CBP's existing UAV systems.

4. Great post. ATON is perhaps the most prepared mission for these kinds of cool ideas. There's an interesting CG research idea open right now for automated buoy health monitoring. Combine "smart buoys" with unmanned vessels and aircraft and throw in electronic aids you've got an entirely new ATON mission.

5. Check out Cape.com. It's a company that provides remote drone flights from fixed bases, and allows you to fly them from your desk. Easy to see the usefulness of that kind of capability for the CG.

Autonomous Surface Vessels

11 ☑

The development of autonomous surface vessels could potentially provide a force multiplier that would create a significant increase in the effectiveness of Coast Guard operations in a wide variety of situations while practically eliminating personnel risk and endurance factors.
Potential capabilities for autonomous surface vessels might include, but would certainly not be limited to: Polar ice-breaking, high-seas SAR coverage and preliminary response and personnel recovery, resupply stations for supporting long-range operations, personnel evacuation or recovery during environmental incidents, and response to incidents involving HAZMAT spills or releases.

1. In the awards area, TWardwell posted this idea about Sail drone:
https://cg-ideasatwork.ideascale.com/a/dtd/Using-Autonomous-Sail-Drones-For-Oil-Spill-Monitoring/199998-32678

I recently visited DIUX and learned about Sail drone, which is exactly the kind of technology that could be a paradigm shift for us, an automated vessel that can sail 50K miles without human intervention. That capability could impact every one of our missions.

Whenever we add sensors to the environment, we also need to consider the back-end data processing, which automation could help with as well.

2. Such technology would seem to be an excellent for some of the picket work our patrol boats do now. In areas like the Mona pass unmanned surface assets could free manned assets from running the line and allow for a more dynamic force lay down.

3. Solar powered or wave powered unmanned vessels would be an outstanding solution to monitor restricted areas or be deployed outside the SAR pattern execution area (drift scans). (another example: monitor fishing zones).

4. Some ideation work was done on this a few years ago, looking at fisheries/OLE enforcement in all the large, highly remote EEZs out in D14 (ours and partner nations').

One of the unmanned surface vessel designs we explored was the Wave Glider: https://www.liquid-robotics.com/platform/how-it-works/

Between this and small/persistent solar-powered UAVs that could remain on station for days at a time (& combined with technology like Global Fishing Watch & AI software to sort through all the data), there's a lot of potential here for large productivity/mission accomplishment gains for the CG. ONR has done significant work & experimentation in this area. Highly recommend liaison with the Navy to leverage their millions of dollars/hours of research at minimal cost to the CG rather than reinventing the wheel.

Using Autonomous Sail Drones for Oil Spill Monitoring

9 ☑

Overview:

Automated Surface Vessels (ASV's) can be utilized for a variety of missions. Utilizing the oldest and newest of nautical technologies (Sail Power with built in solar panels) these ASV's could operate independently for 6 months or more depending on mission instrumentation and operating area. Sail drones Inc. makes one such ASV that has operated in both the Arctic and Antarctic for over a year without direct human interaction.

A present mission that the USCG has statutory responsibility for is conducting S.M.A.R.T monitoring during oil spills.

This is the collecting of scientific data before, during and after an oil spill using specialized monitoring of applied response technology (SMART). This is the topic focus of my idea, but there are countless other missions that this concept could be used for. VTS, ATON verification, Port Security, Anchorage Monitoring, and scientific data gathering to name but a few.

Topic:

Smart technology for S.M.A.R.T monitoring: Utilizing seaborne drones to monitor dispersants during oil spill response and reducing risks to responders.

Special Monitoring of Applied Response Technology (SMART) is the quantifying and data gathering resource that allows scientists and responders to make rapid, informed decisions during an oil spill cleanup effort. Whether it is dispersant drops from aircraft or preparations for a large scale in-situ burn, it has always been the SMART Teams who have worked tirelessly to ensure these methods are conducted effectively. As technology, has progressed, and instrumentation has gotten better, it is still members of these teams that bear the chemical and physical risks of placing themselves in and around spills or in-situ burns. SMART teams pilot small boats in an unpredictable environment under tight time constraints while donning respiratory protection and impermeable chemical suits. This presents a high risk to responders for often dubious gains in sampling and information. Technology has progressed far enough to remove the final element of risk from SMART: humans. Drones and robots are frequently being used for dangerous tasks; from space exploration to deep water salvage. It is time to add drones to our spill tools inventory for a safer and more effective SMART mission.

Introduction

There are very few members of the lay public that fully grasp the difficulty in responding to a large oil spill. The very nature of the ecological damage in relation to other types of disasters or responses, and the methods to combat oil spills are within the experience domain of a miniscule amount of first responders. At the heart of these difficulties is the problem of how anyone can quantify the size of a spill as it is amorphously moving on a vast featureless water body. In the broad-brush stroke of disasters such as tornados, storms, fires, earthquakes, toxic plumes, and even terrorism, these all have definitive geographic boundaries and hard numbers with which to quantify the nature of those challenges. It would be unheard of for someone to drill into the minutiae of those disasters to demand specific data from the responders themselves, and pass judgement on the quality of that response by those numbers. For example, very few residents of a neighborhood threatened by wild fire would question how much actual water the responders used to put out the fire, or whether the fire apparatus endangered any animals while fighting the blaze.

By their nature, oil spills are rarely threatening to human life, and as such, spill responders are made to operate under a very different set of standards than other emergency responders. It would probably be of great interest to other response disciplines, that during large oil spills, not only is the spill a challenge to quantify, but the methods used to fight the spill demand great amounts of field data collection just to grade whether certain response methods have fulfilled the purpose for which they were used. Special Monitoring of Applied Technology (SMART) is

is just one way to quantify and calculate the effectiveness of applying dispersants or in-situ burns to an oil spill and to make determinations of transport, dilution, and apparent trajectory of the remaining oil.

The decision to use or not use dispersants on oil spills is the purview of a highly educated and statutorily mandated Regional Response Team (RRT) as required in United States Code (USC) within the Code of Federal Regulations (CFR). It is not my intention within this paper to weigh any pros or cons about dispersant use, or amplify my opinion on their environmental impact. They are a tool that is held at the ready should the RRT deem their use is necessary in the resolution of a catastrophic spill.

The penultimate goal of this proposal is to enhance the safety of oil spill responders through the use of seaborne autonomous surface vessels (ASV) to ensure not only a minimization of personnel exposures, but to enhance the gathering of critical data that will be so coveted by responders and scientists alike in every phase of an oil spill.

Methods:

At present, there are 3 tiers of SMART monitoring. The specifics of these tiers are listed within the SMART protocols as published by National Oceanographic and Air Administration (NOAA). The first tier (Tier I) is accomplished by slow speed, low pass aircraft carrying a trained oil observer utilizing a NOAA photo job aid. This tier can be accomplished using standard spotter aircraft, either commercial or government. The risk to responders is minimal due to distance and altitude of the observers.

Tier II, consists of a crew within a small boat, who can conduct much closer up visual inspections of the dispersed or burned oil. The instrumentation on the small boat will consist of traditional fluorimeter technology usually sampled at around one meter. This crew can also take water samples through the pump attached to the fluorimeter for later analysis. Additional equipment may include a 4-gas meter with photo ionization detector (PID) for personnel monitoring, colorimetric air sampling tubes for benzene levels, and potentially a flame ionization detector (FID) to measure potential vaporization of oil light ends. In addition, the crew will be donning at a minimum a full-face respirator, chemical barrier suit and boots, and protective gloves. This is in line with the Occupational Safety and Health Administration's (OSHA) definition of Level C protection.

Lastly, Tier III would consist of all the items listed or potentially listed in the Tier II list, but with a hydro lab set up on the vessel that can measure PH, dissolved oxygen, conductivity, temperature, turbidity, and salinity. The fluorimeter will have the additional task of sampling at two simultaneous depths; 1 meter and 10 meters.

As mentioned in the SMART Protocol guide, in addition to these tiers, there may be call to deploy SMART teams to environmentally sensitive areas such as a coral reef or seasonal hatcheries. They would be utilized to alert an Incident or Unified Commander (IC/UC) of impending impacts on those sensitive areas, and to assist in response actions.

At present, and under the current protocol, the impetus of capturing the data from these myriad sources of technology is laid upon the monitoring crews and observers. Modern computers, and data-logging have improved the level of quality of data and the increased time scale of capture, but there is still an element of inaccuracy caused by time lags, potential latency, and data erosion interjected by human inclusion in the upload phase operating under physically and mentally taxing conditions.

Implementation:

Presently there is little interest in ASV's beyond Department of Defense missions, and possible narrow Department of Homeland Security roles within port security tasks. As such, ASV's do not enjoy the manufacturing depth, and development that their airborne brethren have spurred within the private sector. Beyond very small "one-off" specialty research projects, or high end oceanographic ASV's, there is very little middle ground within the extremes of these two communities. At the time of this paper, there are two companies that presently manufacture civilian ASV's with a specialty towards oceanographic research capabilities and customizable instrumentation payloads within a self-powered mobile platform. Marine Robotics LLC and Sail Drone Inc are manufacturers that have similar ASV's with different scalability options. Marine Robotics is a small company that produces on limited runs, ASV's around 1.75 meters long, with useful deployment times of around 4 to 6 weeks of constant

use. Sail Drone utilizes a much larger ASV (Illustration 2), which has a more robust built in sensor suite, and a useful deployment schedule of up to a full year of use with no need to return for servicing. The greatest strength of these devices is that they utilize a decidedly "low-tech" method of sail power for their primary propulsion. In addition, both vessels have built in solar panels that recharge onboard batteries for use with secondary active propulsion and instrumentation power supply.

Both vessels can also operate completely independent of human interface, and can stream data via a satellite feed from the onboard instruments. With a top standard operating speed of between 3 to 5 knots, and a collision avoidance system both ASV's can readily avoid other vessels operating nearby. All ASV's are equipped with Automated Identification System (AIS) which is an international standard for vessel detection via satellite interface. AIS adds an additional level of trackable location capability for data verification that can be transparent to all levels of operational responders. In addition, as Tier I monitoring is technically accomplished through aerial observation, all ASV's are completely compatible with Unmanned Aerial Vehicles (UAV) for conducting visual recording and documentation. In theory, all SMART tiers can be conducted with no human interaction beyond monitoring, emergency avoidance actions and maintenance to include decontamination. The logistical foot print of both ASV's and UAV's, their speed of deployment as well as their cost effectiveness to operate make this proposal very attractive to both planners and responders alike.

Under the present system of staffing a SMART Team, depending on spill size and complexity, the USCG and NOAA have primary responsibility for providing personnel and resources to conduct this mission. SMART teams can consist of up to 4 people just in the Tier II and III missions, not including air crew and actual dispersant drop personnel. These teams are limited in their mission deployments by boat hour endurance requirements as well as physical exhaustion limits imposed by the personal protective gear.

Presently the USCG maintains 3 ready teams that are extensively trained in SMART techniques at all tiers. These teams are located on the East, Gulf, and West Coasts of the US respectively. Each singular team can conduct operations only with large amounts of support equipment that is either located at the spill location, or transported to the spill site. Under present requirements for these teams, it would likely necessitate a vessel of opportunity (VOO) at the spill site. VOO's are typically selected based on the location of the spill, sea conditions, workable deck space for equipment and length of time requirements on the spill site.

In a study by IOGP in 2015, entitled: At-sea monitoring of surface dispersant effectiveness, specifically calls out the challenging environment that a SMART team must operate, and the logistical requirements that must be met. This is also a challenge, within (gratefully) limited opportunities to become proficient in both experience and comfortable with equipment use. From a deployment perspective, even a 24-hour ready SMART team operating from a close proximity to a spill could take hours selecting a VOO and getting equipment stowed onboard within a very limited operating window. This is to say nothing of sea states and the transit time requirements of the VOO.

At the outset of a spill response, these ASV's could be launched from land or a manned vessel, and given the general location of the spill. The ASV's would then make their way to the spill given GPS area estimates on the size and dispersal rates of that spill. Even if the decision to use dispersants was not made, the ASV's could utilize simple turbidity sensors to navigate in and around the spill (Illustration 1). The ASV's would then allow 24-hour monitoring with no supervision, and no interruption of data collection. Even using simple AIS tracks, these ASV's could visually display the size and pattern of the spill allowing an unprecedented level of oil spill forecasting that has not existed in any spill team's arsenal before.

<u>Challenges:</u>

The term ASV has not entered the vernacular of common terms at this time. The term "drone" has in recent years become connected to detrimental increases in lethal capabilities, and perceptions of privacy infringement. After the Gulf Oil Spill of 2010 large amounts of misinformation regarding dispersant use was posted within the media. The combination of using government unmanned autonomous drones to be entrusted with monitoring a publicly vilified response technique has a potentially damaging image within the public perception.

Additionally, there is no AIS specialty code that designates a ASV as a drone. This could lead to potential navigation confusion should the vessels chasing a spill become caught up in a large vessel traffic area. Future navigation requirements will need to be implemented to fully realize the potential benefits of surface ASV's for regular use by government and private agencies. In addition, the FAA as of 2016 has strict rules and licensing of UAV's and operating standards. No regulatory frameworks exist within the federal government regarding ASV's. Lastly, the cost of these ASV's at this time can be up to 100K US Dollars per unit fully outfitted. As it may take as many as 8 ASV's to be utilized for Tier III operations in a large spill, this would be a sizeable investment for private and government agencies alike.

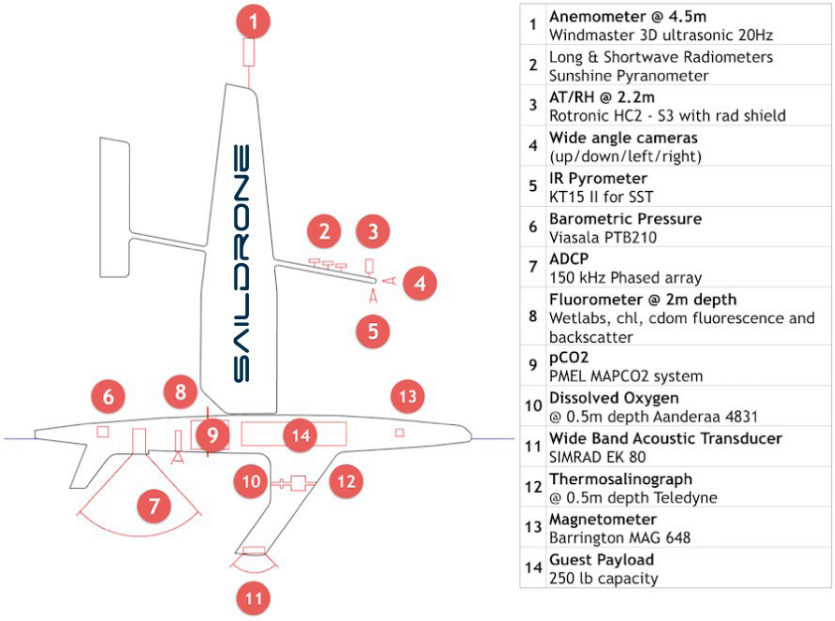
Conclusion:

There has never been a level of technological sophistication available that could operate in an ocean environment reliably and effectively without needing human intervention. It has always been the role of technology to mitigate risk, and improve capabilities that humans have traditionally shouldered the burden of. While drones and dispersants have, both received criticism in the past, upon further testing and development they could both become very common if not essential elements in environmental clean-up operations. It may be that the use of traditional sail propulsion coupled with solar power could make ASV's the very first zero carbon environmental response platform. Lastly and perhaps the best statement for change to these procedures comes from the NOAA SMART manual itself:

"SMART is a living document. We expect that changing technologies, accumulated experience, and operational improvements will bring about changes to the SMART program and to the document. We would welcome any comment or suggestion you may have to improve the SMART program."

References:

Deepwater Horizon Study: http://www.cdc.gov/niosh/topics/oilspillresponse/gulfspillhhe.html
Dispersant Use Background: http://masgc.org/oilscience/oil-spill-science-dispersant-bkgrnd.pdf
SMART Monitoring of Dispersants: http://docs.lib.noaa.gov/noaa_documents/648_SMART.pdf
Proposed Regulatory Change to Subpart J of 40 CFR: Mandatory Dispersant Monitoring
https://www2.epa.gov/sites/production/files/2014-12/documents/fact_sheet_sub_j_proposal_10_18_14.pdf
IEPCA At-sea monitoring of surface dispersant effectiveness: http://www.oilspillresponseproject.org/wp-content/uploads/2016/02/JIP-4-Surface-dispersant-effectiveness.pdf
Sail drone Company Website: http://saildrone.com/#Technology



1	**Anemometer @ 4.5m**	Windmaster 3D ultrasonic 20Hz
2	Long & Shortwave Radiometers	Sunshine Pyranometer
3	**AT/RH @ 2.2m**	Rotronic HC2 - S3 with rad shield
4	**Wide angle cameras**	(up/down/left/right)
5	**IR Pyrometer**	KT15 II for SST
6	**Barometric Pressure**	Viasala PTB210
7	**ADCP**	150 kHz Phased array
8	**Fluorometer @ 2m depth**	Wetlabs, chl, cdom fluorescence and backscatter
9	**pCO2**	PMEL MAPCO2 system
10	**Dissolved Oxygen**	@ 0.5m depth Aanderaa 4831
11	**Wide Band Acoustic Transducer**	SIMRAD EK 80
12	**Thermosalinograph**	@ 0.5m depth Teledyne
13	**Magnetometer**	Barrington MAG 648
14	**Guest Payload**	250 lb capacity

Oil Spill Response Monitoring
8 ☑

For places like Alaska, obtaining aerial pictures can be incredibly expensive in fuel and personnel costs. Having drones take video and pictures of reported environmental incidents would certainly help oil response personnel gain situational awareness in a less costly manner.

1. I see this a good test case using a solar powered drone which monitors the geo-fence around the oil spill and can send alerts when the spill is extended past the fence or vessels are entering/exiting the area.

2. I love the idea, but it looks like this idea is already in development.

Testing was done in June 2015 in Cartagena, Spain. http://www.maritime-executive.com/article/tests-for-oil-spill-response-drones-underway.

I don't have any information on how the testing went in the EU, but I know that NOAA is also working on a similar project.
http://response.restoration.noaa.gov/about/media/collecting-data-sky-oil-spill-response.html
https://uas.noaa.gov/

I would love to learn more on how NOAA's UAS program is being implemented by the CG. Does anyone else have info on these programs or any inter-agency collaborations with NOAA?

Navy has completed the homework 6 ☑

The Air Force will have the first class of enlisted airmen to graduate from pilot training in 2017, the enlisted pilots will only fly unarmed UAVs. The Army, Marines, and Navy have tackled UAV staffing by creating distinct new enlisted military occupational specialties for UAV operators and maintenance crews. Currently, the Navy has decided to make UAVs a Navy Enlisted Classification, in other words, a skill or job designator applied to specially trained personnel that already hold down a standard rating.

In the Navy it is not an entry-level job, like in the Army and Marines. Sailors must already be trained in one of several Navy ratings and achieve promotion to a particular rank: E-3 for UAV and MQ-8 maintenance technicians and MQ-8 payload operators, petty officer third class (E-4) for internal/external UAV pilots and UAV payload operators, and petty officer first class (E-6) for pilots

Those who want to work with winged and helicopter UAVs must start out in an Aviation Rating. Complete a 21-week course at Fort Huachuca, Arizona, where instructors with the Army's 2nd Battalion, 13th Aviation Regiment train soldiers and sailors on subjects including principles of flight, launch and recovery, maintenance, and aerial intelligence and surveillance.

The Navy has completed all the hard work with setting this program up and has success doing it. Why would the Coast Guard not take advantage of this current program?

1. Absolutely have to agree! Why reinvent the wheel, if the Navy has already done all the legwork?

Additionally, for those that already hold a 14 CFR Part 61 pilot's license with the FAA (most CG pilots who attended Naval Flight School in Pensacola do, as does anyone who already sought out an ATP license), the FAA offers an online course to earn a federal license as a Small Unmanned Aerial Systems (sUAS) operator. It's a commercial license good for UAS/UAVs up to 55lbs. www.faasafety.gov. Test required at completion of the training, and a $35 processing fee for the license.

Even if you don't have a pilot's license already, you can still earn the sUAS license - longer training and more comprehensive exam that covers many of the concepts required for a private pilot's beginner license. Same website.

2. First thing we have to do is identify a school we can send our personnel to.

3. This sounds like a great idea to save CG resources, while improving mission capability. And save funding.

Boarding Team Advantage and Oversight
6 ☑

UAVs and pocket drones could be utilized by cutters and boarding team members for oversight and video evidence during vessel boardings and inspections. Having "eyes in the sky" would increase the security of the members on board the vessel being inspected by producing a live video feed directly to the bridge. Similar to many police jurisdictions that wear body cameras for evidence and protection from litigation, the video could serve as evidence if allegations were made against the boarding team.

While on board the ship, in addition to having oversight by a UAV, boarding team members could carry rechargeable "wallet" size drones for boardings that require going below decks. This would allow the boarding team to visually inspect the environment they are about to walk in to and eliminate any surprises or possible threats waiting out of sight.

A combination of the two would allow the Coast Guard to have the greatest possible situational awareness, without having to potentially risk the lives of its members. Attached is a paper that I have written that further discusses the possible UAV applications within the Coast Guard.

(Abstract) While the other military services have adopted the usage of unmanned aerial vehicles (UAVs), commonly known as drones, the Coast Guard is lacking in this technological field. Many claim that UAVs are not suitable for the Search and Rescue focused mission that Coast Guard Aviators perform; however, drones can easily be used to supplement the safety of boarding teams. The use of drones would be beneficial to the Coast Guard and specifically boarding team members both before embarking and while aboard another vessel. UAVs would provide for better situational awareness for Coast Guard vessel inspections by implementing drone camera technology and GPS tracking systems, while being both economically and environmentally efficient.

1. I think this is a fantastic idea for uses of the smaller, commercial-size drones (as opposed to what most other proposals call for, which would utilize the DoD or industry developed drones, what the FAA classifies as "beyond a commercial license" by being more than 55lbs).

Additionally, with very few modifications, the "wallet-size" drones could be utilized for search onboard a vessel in addition to security. They could be used to see into void spaces where access is too small for a person or would otherwise require removal of material (i.e. - cutting tanks, bulkheads). It could also be used by Gas Free Engineers - with the right sensors and non-sparking parts, a wallet drone could be maneuvered into compartments to check the space without endangering any human life.

Open Idea Forum III: Drone Technology: A Safer and Cheaper Solution to Inspect ATON 5 ☑

For a number of years drone technology, also known as unmanned aerial systems (UAS), has been used extensively in defense and surveillance related missions by DHS branches. However, despite their incredible value proposition for higher quality inspections and better asset visibility, they are not being used by the US Coast Guard for infrastructure inspections or construction monitoring. My proposal is to begin using small UAS (sUAS) to conduct structural inspections of remote structures called Aids to Navigation (ATON). This will begin by adding a sUAS to the toolkit of structural engineers who are responsible for inspecting the 2000+ ATON structures throughout the West Coast of the United States.

Aids to Navigation Inspections

ATON are the equivalent of road signs for maritime commerce, and are maintained exclusively by the US Coast Guard. There are over 33,000 ATON assets in the Coast Guard inventory, all working towards allowing the $4.6 Trillion of maritime activity to pass safely through the 926 ports in the US (ASCE Infrastructure Report Card, 2016). Despite the introduction of GPS technology, this system of aids is still the trusted signal relied upon by international maritime commerce. Given the scale and geographic dispersion of ATON, one can imagine the challenge of maintaining visibility of this aging system.

I am the ATON Program Manager for the US Coast Guard's Civil Engineering Unit (CEU) on the West Coast, responsible for major construction on all West Coast fixed-ATON, approximately 2000 structures. Most of these structures are simple in nature, consisting of a steel pile stuck in the ground in the middle of a bay or river. They can also be more complex in nature; multi-pile structures, skeleton towers, jetty structures, and lighthouses. I have really enjoyed the responsibility, and have been fortunate enough to travel within my area of responsibility (AOR) extensively to conduct inspections and to plan and oversee maintenance projects. However, despite extensive travel over the past 12 months, I have only had the ability to conduct structural inspections of 7 ATON. When you compare that to the fact that I oversee a system of over 2,000 ATON structures, it is easy to understand why we have had unexpected catastrophic failures of several critical structures on the West Coast. One recent example of an ATON that had collapse was blamed for the life threatening grounding of a sailing vessel near San Diego in December 2016.

UAS technology can help to prevent similar incidents. In a 2016 Accenture report discussing the commercial value of drone technology it was stated:

UAVs [drones] and their sensors will bring a huge amount of data to global companies, multiplying capabilities and applications within a company's business processes. The analysis of the data will significantly improve operational intelligence and preventive or predictive maintenance.

If I had the ability to fly a sUAS while on my travels, I estimate that I could have conducted structural inspections of more than 100 different ATON. For civil and facility engineers who maintain large systems of structures, this is a tool that we must have!

The US Coast Guard does have ATON Teams (known as ANTs) strategically positioned throughout the country who are responsible for minor maintenance of ATON, to include replacing the signs, ensuring lights are lit, and to conduct basic inspections. However, it is extremely important to get eyes on from a trained civil engineer to be able to catch early warning signs of possible catastrophic failure, and to be able to monitor the system as a whole in a time and cost efficient manner.

Value Proposition

The real value here is in truly being able to maintain superior awareness of these remote assets. The entire gov-

ernment has suffered from budget cuts and decreased spending on infrastructure. UAS are a way to regain the awareness of how our remote structures are performing, and pass high quality media up the chain of command. More so than that, it is a way to put the competence of Structural Engineers on site without the time and cost of physically visiting each asset, and also in circumstances where it is not physically possible or safe to visit the assets due to remoteness and location. In the 2016 Accenture Report (cited above), it was stated that: ...UAVs now offer a high level of automation enabling operators to reach previously inaccessible areas, while capturing a large amount of data very quickly.

And in a 2017 Trends in Construction Report: A drone that is operating on highly sophisticated software and that has state of the art cameras onboard can do ven the most complex job in a fraction of the time, sometimes in minutes.

While our remotely based teams do put eyes on most of our structures in a recurring manner, they do not possess the training to complete a structural assessment. Structural inspections are critical to ensuring our systems are performing according to plan, and are our lifeline for catching warning signs of future failures. With the rapid increase in drone technology in recent years, and economies of scale bringing costs down, a commercially available drone could be purchased with sufficient capabilities to perform the discussed inspections. A drone, extra battery, travel case, and external hard drive for storage, could all be purchased for less than $2000 total. We currently sustain a formerly proud, wave-swept, lighthouse that is now only accessible by helicopter. It sits a quarter mile off the beach and has degraded significantly to nothing more than a helipad on top of a 50ft high concrete caisson. To put this in perspective, the Coast Guard charges $10,853 per hour of use for our H-65 Helicopters, and $2,872 per hour for our Trailerable ATON Boat (COMDTINST 7310.1Q, 2015). It is easy to see the cost savings of beginning to use drones for inspections, but I also want to enforce the safety component.

It is well known that flying helicopters is a dangerous job. But it is also dangerous to conduct inspections of, and maintain ATON. ATON are located in dangerous coastal locations, whose environmental conditions routinely require using full-face respirators and Tyvek suits while climbing ladders, not to mention the innate hazards of doing manual work in elevated locations high above the water. Even if a drone were to fail and be lost, it is still worth it to remove our sailors from dangerous roles, which can now be accomplished with easily accessible technology.

There have been tremendous advances in UAS (more commonly known as drones) in recent years which have made them much safer and easier to operate. As a result, they have been widely adopted throughout the private construction and facilities engineering industries for roles such as daily construction site inspections and material inspections of both remote and large structures, where it is difficult to get a person to. In a 2016 Report published by the Deloitte University Press it was stated that: “Goldman Sachs estimates that the global commercial drone market, the fastest-growing segment for unmanned aerial vehicles, will exceed $20 billion by 2021”

And that:
Smart companies are already tapping into the power of unmanned aerial vehicles to monitor cellphone towers, inspect turbine blades, survey fields of crops, and more.

The technology included in commercially available drones is truly remarkable. Commercially available drones, with estimated retail price of $999, can fold up to the size of a water bottle, feature true 4K fully stabilized cameras, obstacle avoidance, transmission ranges of over 4 miles, and include auto emergency return to home features. It was these same drones that were launched from moving speed boats during the recent America’s Cup Race in Bermuda (an elite global yachting competition), to track hydrofoiling sailboats travelling at over 40 mph. It was also the same type of drone used by engineers to monitor California’s Orville Dam spillway damage in February, an infrastructure failure that made national news. Others are recognizing the value proposition of drones, its time we did as well.

Challenges

The biggest challenge to my proposal is that the Coast Guard has not yet considered UAS use for any type of inspections. Having spoken to several Coast Guard Headquarters personnel about using UAS for inspections, I know there is excitement about the idea, but I would still need the support of my command to find the right project sponsor and funding allocation. Commercial drones, though they are air assets, are viewed as disposable within the civilian industry. While the goal is always to avoid crashes, they do happen, and the government is very risk averse when it comes to the possible loss of equipment. However, fortunately, the UAS industry has matured quickly, and commercial product prices have stabilized. Even the Government Services Administration (GSA) has added UAS to its catalog of products for purchase.

My second challenge will be securing the appropriate permits from the Federal Aviation Association (FAA) to use the UAS for inspections of ATON. There has been much discussion within the commercial drone industry about the 2016 FAA regulations that were developed to regulate commercial drone use. It appears that the regulations introduced by the FAA support the use of commercial drones and will lead to their increased use throughout the commercial industry. In order to legally fly UAS, the US Coast Guard (a government entity) has two options:

1. Adhere to the rules that apply to private civilian commercial organizations set out in 14 CFR Part 107;
2. Obtain a blanket public Certificate of Authorization (COA), which would permit nationwide flights and the option to obtain emergency COAs (e-COAs) under special circumstances.

Both options would require an operator to obtain a Remote Pilot Airman Certification from the FAA (a $150 exam), and limit UAS flight to Class G airspace, below 400 feet, and within line of sight of the operator (FAA-AC 107-2, 2016). These are not show stoppers. Most ATON fit within these limits, and after a few weeks of study, you will be prepared to sit for the certification exam. Prior to beginning a UAS program, thought would also need to be invested in developing administrative documents such as pre-flight checklists and safety/emergency procedures, with such procedures to be fully developed before the program is rolled out nationally.

Program Expansion

While the use of UAS will provide significant cost and time savings, as well as greater visibility of the network of ATON that I am responsible for, they also have the capability for more widespread use. Once the competency is developed, there are numerous opportunities for expansion within the Coast Guard. There are over 21,000 fixed ATON, and 25,000 floating ATON throughout the country, all of which are struggling with the same issues. The Coast Guard also has a vast network of communication towers, piers and waterfront facilities. Annually, we spend millions of dollars to inspect these structures. But it is not just remote structures that the Coast Guard inspects, we try to inspect all of our shore infrastructure on a regular basis, including roofs and other elevated structures. All of this is done manually, with a person walking around, or a diver entering the water. This is an incredibly time consuming, expensive, and often dangerous assignment.

By introducing UAV/UAS into the ATON mission, we will be better prepared for other applications as well. This includes construction monitoring and disaster response. The CEU is responsible for numerous construction projects, and the UAV could be used for project monitoring and/or daily status reports. Another responsibility of the CEU is running our West Coast Disaster Assessment Team (DAT). Should a disaster (such as a tsunami or major hurricane) wipe out an essential waterway, a drone could photograph and survey the affected area. Many organizations have recognized the performance capabilities of these new systems, it is time for the Coast Guard to do so as well.

Works Cited

1. ASCE's 2016 Infrastructure Report Card
2. Christophe, Gregory and Francois Laurent. 2016. "A business approach for the use of drones in the Engineering & Construction industries- Accenture."
3. Zack Jr, James G. December 2016. "Trends in Construction Technology - Navigant Construction Forum."

4. US Coast Guard COMMANDANT INSTRUCTION 7310.1Q, 16 OCT 2015
5. Schatsky, David and John Ream. “Drones Mean Business - Deloitte University Press.”
6. Federal Aviation Administration – Advisory Circular Part 107-2, 21 June 2016

1. I think the value proposition is well understood at CG-711, the challenge is fitting the operations under the existing FAA regulations without compromising the CG’s title 14 authority. That said, the USCG may be trying to do too much in the first pass on small UAS. A crawl, walk, run model where we start with a very limited mission set, basically a test and work up from there might be the better path forward.

--> I could not agree with you more, incorporating a new technology into a military organization always takes patience to wait for the right opportunity to pursue. Fixed ATON are the Coast Guard’s property, structural inspections of them are not a apart of our Law Enforcement capacity, thus do not necessarily apply to the CG’s Title 14 authority. Additionally, they all fall below the 400ft ceiling required by the FAA, and the vast majority of them fall within Class G (unrestricted) airspace. Given the tremendous success of commercial drones in the commercial inspection and construction industry...Fixed ATON are that ‘right opportunity’, it gives the Coast Guard the ability to initiate trials of commercial drone technology by identifying a competent pilot who needs the technology to inspect structures that have seen years of neglect due to their remote and hazardous locations. This is our opportunity to crawl with a very limited mission set, and a very motivated JO (myself). As I mentioned, there is plenty of room for growth...but lets start crawling first. Thank you for your comments sir.

2. Great cost savings idea. But beginning slowly will be a necessary process.

Open Idea Forum: Emergency Integrated Lifesaving Lanyard (EMILY) Rescue Robots

4 ☑

Recommend the Coast Guard take a look at the Emergency Integrated Lifesaving Lanyard (EMILY) rescue robots to determine if these devices will fit into the Coast Guard's rescue systems. Link to the EMILY Robot web site: http://emilyrobot.com/emily-boat/

Autonomous Tanker Vessel Inspection
3 ☑

Using coordinated drones the USCG could conduct tanker vessel inspections around the entire ship in a matter of minutes. 10-20 coordinated drones provided by Intel could simultaneously scan the outside of a tanker vessel and possibly even detect nuclear and other hazards prior to the vessel arriving in port.

https://techcrunch.com/2017/02/05/intel-powered-the-drones-during-lady-gagas-super-bowl-halftime-show/

1. Great idea. I'd add that Small Unmanned Aerial Systems (UAS) could be used to search/inspect the interior of large cargo holds, similar to the way these systems are currently being utilized in the petrochemical industry to inspect the interior of chemical holding tanks. This would greatly improve personnel safety and reduce or eliminate the need to gas free a space. Unmanned Ground Vehicles (like the PackBot) could also be used to inspect or search hazardous spaces, while Unmanned Underwater Vehicles (UUV), like the Bluefin Robotics/General Dynamics HAUV, could be used to conduct hull inspections.

Unmanned Systems Utilization and Framework
3 ☑

As other members have posted, the use of Unmanned Systems, particularly Unmanned Aerial Systems (UAS), represent the greatest force multiplier this organization has seen since the inception of Coast Guard aviation. UAS are idea platforms for performing aviation mission such as law enforcement (LE) (counter drug and migrant) and search and rescue (SAR). While UAS will have the greatest immediate impact, due to the widespread utilization of these systems, we will see future opportunities develop for Unmanned Ground Vehicles (UGV), Unmanned Surface Vehicles (USV), and Unmanned Underwater Vehicles (UUV). This could include using UGV's to search a vessel cargo hold, USV's to conduct armed patrols around a port or cargo ship, and UUV's to conduct hull inspections or sweep a pier for hazards.

As a helicopter pilot, UAS owner, and FAA certified UAS operator I've see multiple ways to utilize UAS to augment or replace some missions currently performed by manned CG aircraft. These can include surveying a pollution incident while providing real time imagery back to a command center, conducting living marine resources (LMR) patrols, conducting international ice patrol or domestic ice (DOMICE) missions, acting as a radio relay for helicopters conducting a SAR case outside of radio range, or providing an enhanced height of eye for a small boat crew looking for a person in the water. Small UAS could also be used to search the interior of large cargo holds, similar to the way these systems are currently being utilized in the petrochemical industry to inspect the interior of chemical holding tanks. Large UAS, such as the Guardian, which is the maritime version of the Air Force's Predator B, could be equipped with a self-locating data marker buoy (SLDMB) and/or pump carried on the wings (like missiles are carried by the Predator). The SLDMB or pump could then be delivered to a mariner in distress, similar to how they are currently delivered by fixed wing C-130, C-27, or C-144 aircrews. The use of Wide Area Airborne Surveillance (WAAS) systems, such as Gorgon Stare, will enable the operator to scan up to a 10km x 10km area at once, which would overcome the "looking through a soda straw" effect currently limiting UAS equipped with a single electro optical/infra-red (EO/IR) camera. This technology, coupled with advancements in software programs which can filter visual images, enabling the operator to filter visual imagery to look for a particular object such as a lift raft, could greatly reduce search time and would likely be more efficient than the currently employed human eye.

We should consider the following to best position the CG to benefit from the advantages offered by this new technology. First of all we should consider the creation of an Office of Unmanned Systems, incorporating key stakeholders from the maritime and aviation communities. The office could then be subdivided into departments focused on supporting individual classes of systems, such as UAS, UGV, USV, and UUV. Secondly, we need to develop a program to train operators. The biggest hurdle for UAS right now is the need to train UAS operators. As others have mentioned we should develop a program to train enlisted personnel to operate these systems, particularly small UAS (weighing less than 55 lb.), such as the fixed wing Wasp III and ScanEagle or the quadcopter Mavic. These systems can be programmed to fly a preprogrammed route and return to a given point, minimizing the skill level required (some systems are remotely piloted, some are autonomous, and some combine both aspects). Such a program could mirror the guidance found in 14 CFR Part 107, Small Unmanned Aircraft Regulations. Thirdly we should coordinate with the FAA to assist with developing regulations related to UAS operations within civil airspace, as the CG will need to operate UAS in civil airspace, and we conduct a high volume of manned aircraft flights in civil airspace, typically at low altitudes, placing our manned aircraft at greater threat of encountering small UAS. This joint venture would benefit the CG twofold: 1) we could assist with developing regulations that favored the use of CG UAS to conduct operational missions in US airspace, and 2) we could

ensure that controls are developed to protect manned CG aircraft operations. This venture should also include conducting maritime UAS testing in US civil airspace (the Great Lakes, particularly Lake Michigan, is one excellent option) to develop policy and procedures for the implementation of these systems within civil airspace. Finally, we need to engage the academic community, particularly colleges, to develop solutions to the questions we have and those we have yet to encounter. The CG will not use UAS in the same manner as other DoD services, so we cannot rely on their experiences to guide our own. We must look to the academic community, which is heavily engaged with this technology, to meet our future mission requirements. Similar to the competitions held by DARPA (the Defense Advanced Research Projects Agency), we should host an academic challenge to, for example, develop a system which can be launched from a small boat (25' or 45'), conduct a search for an individual in the water, provide the individual's position to the crew of the vessel, and then return to the vessel. These challenges would effectively enable the CG to test a wide variety of solutions while offering immense academic benefits to students and faculty alike. Any (reasonable) monetary award offered would offer an exceptional cost savings compared to the cost to research and design multiple solutions in house.

The incorporation of UAS and other unmanned technologies to perform CG missions is vital as these systems will greatly enhance the CG's current capabilities at low cost when compared to manned alternatives, which is particularly important in an age of shrinking budgets.

1. I'm sad that I can only up-vote your idea once. I've been banging the drum around HQ for an Unmanned Systems Branch, something like CG-7X1. In the near term, we at least need to establish a working group or IPT with cross-directorate membership, get everybody in the room and do this deliberately.

2. Agree absolutely - and it's critical to move forward in close collaboration with other DHS agencies as well as DoD when moving into the realm of unmanned systems (aircraft, surface, and subsurface vessels). There's a lot already in progress in this realm, and everything to gain from working closely with those who have already invented the wheel (so to speak) - whether we're talking R&D, policies and procedures, training, acquisitions, tactics, regulations, etc.

Engage the Academic Community
3 ☑

We need to engage the academic community, particularly colleges, to develop solutions to the unmanned questions we have and those we have yet to encounter. The CG will not use Unmanned Aerial Systems (UAS) in the same manner as other DoD services, so we cannot rely on their experiences to guide our decision-making process. We must look to the academic community, which is heavily engaged with this technology, to meet our future mission requirements. Similar to the competitions held by DARPA (the Defense Advanced Research Projects Agency), we should host an academic challenge to, for example, develop a system which can be launched from a small boat (25' or 45'), conduct a search for an individual in the water, provide the individual's position to the crew of the vessel, and then return to the vessel. These challenges would effectively enable the CG to test a wide variety of solutions while offering immense academic benefits to students and faculty alike. Any (reasonable) monetary award offered would offer an exceptional cost savings compared to the cost to research and design multiple solutions in house.

Increase Situational Awareness Horizon on Cutters

2 ☑

When cutters are deployed to “hostile” areas they typically have an aviation detachment onboard that can be called upon to perform searches of large swaths of areas relatively quickly. Unfortunately, these searches are time boxed to less than 6 hours and also cost a tremendous amount of money in aircraft repairs, personnel, and fuel. Small form factor UAV’s have been proven to work in coordinated flight, often times cooperating amongst each other to provide coverage of the chosen area or following a series of commands. These aircraft are cheap, dispensable, and require very little maintenance if any. Controlling these UAV’s is centralized software that can be easily deployed onto existing C2 systems such as Sea Watch and Sea Commander with a connection to VHF data links.

http://www.digitaltrends.com/cool-tech/perdix-drone-swarm/

Automated BNM Drafting with Direct IATONIS Linkage

2 ☑

Create a web based application linked with IATONIS to draft and validate Notice to Mariners and ATON Discrepancies. Analysis of BNM's in one of the largest CG Districts shows approximately a 3% annual error in BNM data. Closer analysis revealed of 450 BNM's released by one Sector Command Center, an error rate of 1.7%. While this may seem to be an acceptable error rate, it is rumored that some of the largest settlements against the CG (and perhaps easiest to prevent) are related to inaccurate reporting of discrepancies and hazards within the Marine Transportation System. The most common errors are discrepancies with position format, aid type (light vs day board), problem (extinguished vs missing vs destroyed), duplication of notices, and incorrect LLNR/Name. A web based form linked w/ IATONIS could easily validate and prevent, in most cases, ALL of these errors. Upon reporting a discrepancy in the application, an e-mail discrepancy message could be automatically released, another e-mail with BNM instructions could be sent to Sector comms unit and other interested parties, and because the data would be linked directly to IATONIS records for an aid it would reduce duplication of effort, and consolidate the data trail left by the current process. Development of this system would reduce error rates and subsequently reduce liability and risk to the organization.

1. Really interesting post! I'm going to move it over to the automation challenge.

2. Here's the original draft of a paper I was writing to address the issue before I found this site. Outlines the process a little bit and expands on errors and their correctability. Click here to view attachment: https://cg-ideasatwork.ideascale.com/a/idea-v2/200939

Open Idea Forum: Creating an AIS category for Autonomous Surface Vessels

2 ☑

Presently there is no identifier within the world of Automated Identification Systems (AIS) that would delineate a target as an unmanned autonomous vessel. While it is the ultimate responsibility of the organization or entity that deploys the ASV or drone to ensure navigation safety, it would make sense to allow a category within AIS for drones. This would be for the express purpose of allowing the operators of manned vessels a further degree of safety of navigation to have the knowledge that a particular AIS target was unmanned should an emergency arise. This would help keep operators from endangering a vessel with people on-board to avoid an otherwise unmanned vessel.

1. Two thoughts:

1) AIS is only meant for large vessels. There is already a shortage of MMSI numbers (due to the string length) that it is impossible for ALL vessels to use AIS.

2) If a vessel is truly autonomous then it should be indistinguishable from a manned vessel. The rules of the road must be followed regardless of how you are piloted. To that end, does there really need to be any distinction between an autonomous vessel and a manned one? I would hope not! This would imply there is a difference in how they are driven.

Bonus: It would be far easier (both software and notification wise) to simply append (UAV) at the end of the vessel name within AIS if it is autonomous.

2. Concur on navigation safety with respect to control of any vessel using colregs. Unmanned vessels should have redundant collision avoidance RADAR or small package LIDAR depending on vessel size scale.
While I do not pretend to know all the technical packaging of AIS, however possibly adding an alpha numeric character to its mmsi (the letter U for unmanned comes to mind). I totally agree that unmanned should definitely be somewhere in the vessel's name. Thanks so much for your comments.

3. Sonar should also be added to AIS vessels, avoidance of biological and organic matter should be paramount.

4. AIS is an internationally defined standard originally conceived for collision avoidance but now also being explored for electronic navigation purposes, such as virtual ATON and other uses. As an international standard, any changes to the use and/or MMSI structure would have to be coordinated through the international organizations of IMO and ITU.

As to the use of sensors (radar, LIDAR, SONAR, etc.,) you will need to refer to the international and national rules and regulations regarding the use of those systems to determine if they can be used on an autonomous 'non-crewed' vessel. A key component for any remote system is uninterrupted, continuous communications for both sensor data receipt and control functions. Anything less than 99.999% can be deemed unacceptable for collision avoidance and safe operation.

4 Tier UAV System

2 ☑

I call this one the 4 Tier UAV system because the implementation would best be used in such a fashion. But this would call for 4 different kinds of UAVs as well. I have just completed my UAV operators licensing so this is fun.
Tier 1 (FT >8 Hours): These are the large Fixed wing predator like Drones we see currently flying over the battlefields overseas. Except this one is set up more like our Coast Guard observation and surveillance aircraft. They are commanded and flown by the Sectors covering large areas of the nation's coast line constantly looking for (potential problems at sea). These drones would be maintained and launched from the Air Stations then control handed off to the CG Sectors who could at any time divert the drone to get eyes on any potential emergency or LE situation, or help search for missing persons.
Tier 2 (FT Classified): Air station Quad Rotor based manned/drones, these are the more Hypothetical style which might resemble a quad copter which would have the ability to be remotely controlled but be primarily designed for manned flight. These would potentially respond to emergency situations on the water.
Tier 3 (FT 45-120min or <): These are Small Fixed Wing Station Based Drones. Capable of short range aerial recon of their AOR's. These might be completely autonomous systems that have pre-programmed routes and SAR patterns pre-loaded into the aircraft that can be modified. This way the stations can conduct morning, afternoon, or night time AOR flights. These same units could also be on constant SAR standby status waiting for the CSP coordinates to be added. These drones would be mounted on a trailer able to Catapult said units into the air which can be towed to the nearest location and launched if needed. Most commonly these would be set up near the boat station with the drones pointed skyward ready to launch with fully charged batteries. When the Mayday comes in these launch and attempt to establish first eyes on scene if close into shore to give the Sector, Station Chiefs, and response Crews the best image of what the situation is and where the distressed boaters are.
Tier 4 (FT 20-30min OR <): Boat Crew Based Drones, these are small UAV quad copters which provide live video stream back to the boat crew themselves. With a short battery life span these would only be deployed once a search pattern was given or when better eyes on the scene were needed to look at where water hazards might exist ahead.
All of these with the possible exception of Tier 4 would have transmitters powerful enough to transmit the video signals to the nearest towers which can then feed the video live back to the Sectors. Each variety of drone would have its own pre-established flight height to deconflict the drones should multiple be launched on a single case. Drones of the upper classes let's say Tier 2 and up could possibly carry deployable lifesaving systems like inflatable life jackets or life rings which could be delivered to individuals found early by the drone.

1. Oops for those who did not understand what FT stands for its Flight Time possible.

Autonomous Land Rover for Base Security

1 ☑

Problem: Currently we have base security (or not) patrolling by driving around the base or have installed security cameras at strategic locations for access monitoring. There is a gap in this implementation - the availability of the base personnel to make the rounds, so we use base CDO or augmented personnel to perform the duties. In emergency, the security (personnel and supporting security infrastructure - cameras) are refocused to the situation to provide quick response, leaving the rest of the base in a less secure posture.

Recommendation: An autonomous land rover can be used to assist base security by driving around the base in a random pattern, taking live video which can be streamed to the base security office via local secured WIFI. Multiple secondary functions can be developed: configured to scan the license plates of all vehicles, notify when there is a vehicle blocking an access, send emergency supplies to an area where additional personnel will cause interference, etc. In an emergency, the rover could be tasked to be more aggressive in patrolling by changing the pattern of execution to cover the gaps. The rover should be completely electric powered with solar charge capability which roving.

BOA (Basic Ordering Agreement) for UAV Companies

1 ☑

SILC should add a UAV category for spill disaster response. Presently there are BOA's issued for land surveying companies, dive companies and miscellaneous categories. UAV's could be instrumental in pre-and post hurricane port surveys. This could occur even when air traffic controls and radio antennas are still crippled. Under the Waterways Protection Act of Dec 2016 the Army Corps is authorized to contract UAV companies for the purpose if waterways response. The USCG could easily replicate this authority with the issuance of BOAs to FAA licensed and registered companies using subsurface and air borne unmanned vehicles.

Pre-Programmed Missions
1 ☑

When thinking about unmanned systems it is important to consider capabilities beyond what we can do with human operators.

Imagine a SAR where small boats can't operate, for example marsh area, inland waterway, or inaccessible tidal area. Using google earth like imagery and clever flight planning system it is possible to program airborne or surface unmanned systems to enter such an area, conduct an autonomous search, stream live sensor data and return.

Such missions could be completed by one or more small unmanned systems.

Conducting regular inspection missions such as channel and shoal inspections is another example of how a pre-programed autonomous system could be used to conduct regular surveys of areas which may have changed and might present a higher risk to a manned crew or might be done at a lower cost. Once a flight plan has been created, the mission can be conducted regularly with relatively little up-front effort.

Using a similar approach night missions could be conducted to verify ATONs are on station and operating.
Of course, regulatory challenges remain to be overcome with respect to airspace or surface sharing with other manned and unmanned vessels.

Coast Guard UAS Training Challenges

1 ☑

UAS in the USCG represent some of the greatest opportunities for the service. Few programs offer the promise of so much capability for so few dollars. Deploying such capability can appear deceptively simple however even something as simple as training UAS operators in the USCG could be a challenge. Especially early on given the breadth of knowledge required by a crew and the relatively small size of the program. Here are some discussion points from a prior look at this problem which might be interesting to the group. Below are a couple of areas of training which will likely be required:

1) Regulatory Issues: Operators will need to know the rules of the road as defined by the FAA as well as any special provisions waived to the USCG. This will likely involve a great deal of training since many coastal areas are under the controlled airspace of nearby airports. Third party training may be available for much of this part of the program.

2) USCG Operational Procedures: In addition to #1, operators will need to know how to employ UAS technology as part of an existing force. For example operations from shore, a small boat, patrol boat, Cutter alongside other USCG/partner air assets. The tactics used to employ UAS and how they will complement our other capabilities adds an additional layer to the challenge.

3) Environmental Considerations: As with existing surface and air assets environmental prerequisites for operation in various area and their associated risk management elements will need considerable thought.

4) Platform capabilities: Finally to be used effectively operators will need to know the finer details of their systems. From an operational capability and risk management perspective operators are going to need to have a detailed knowledge of limitations, emergency procedures and an ability to address technical issues in the field.

There is no doubt we will address all of these challenges and execute some of the most exciting missions in the UAS space.

Attend the Autonomous Ship Symposium in the Netherlands in June

1 ☑

http://www.autonomousshipsymposium.com/conf_overview.php

The Autonomous Ship Technology Symposium continues to be the ONLY international conference in the world exclusively dedicated to discussing the challenges and possibilities presented by increasing automation in the marine industry, intelligent collision avoidance, autonomous navigation systems and unmanned ship technology.

1. Thanks for the heads up! I've forwarded this idea to interested parties.

Offer Graduate School Opportunities in Unmanned Systems

1 ☑

The Coast Guard should consider sending individuals to graduate school to receive a master in Unmanned Systems. This will help the organization build knowledge of these systems and educate leaders who are responsible for developing and administering unmanned system policy and overseeing their operation. Right now, individuals interested in this field are required to pay for these master's programs out of pocket and complete the training on their own outside of their normal duties.

Establish an Office of Unmanned Systems

1 ☑

We should consider the creation of an Office of Unmanned Systems, incorporating key stakeholders from the maritime and aviation communities. The office could then be subdivided into departments focused on supporting individual classes of systems, such as Unmanned Aerial Systems (UAS), Unmanned Ground Vehicles (UGV), Unmanned Surface Vessels (USV), and Unmanned Underwater Vehicles (UUV). The office would liaise with other government agencies to grow the Coast Guard's unmanned program, while also working with agencies to develop CG regulatory policy regarding the use of these systems in the maritime environment (CG regulations pertaining to the DOD's use of unmanned vessels in US waters, etc.).

Investigate the use of Wide Area Airborne Surveillance (WAAS)

1 ☑

The use of Wide Area Airborne Surveillance (WAAS) systems, such as Gorgon Stare (currently used on the Air Force's Predator B, which is similar to the CBP/USCG Guardian UAS), will enable the operator to scan up to a 10km x 10km area at once, which would overcome the "looking through a soda straw" effect currently limiting UAS equipped with a single electro optical/infra-red (EO/IR) camera. This technology, coupled with advancements in software programs which can filter visual images, enabling the operator to filter visual imagery to look for a particular object such as a lift raft, could greatly reduce search time and would likely be more efficient than the currently employed human eye. This technology could also be employed on manned fixed wing aircraft as it would be much more effective than using a single EO/IR camera.

Develop a UAS Training Program for Small UAS

1 ☑

One of the biggest hurdles for utilize UAS in the right now is the need to train small UAS (sUAS) operators. As others have mentioned we should develop a program to train enlisted personnel to operate these systems, particularly small UAS (weighing less than 55 lb.), such as the fixed wing Wasp III and Scan Eagle or the quadcopter Mavic. These systems can be programmed to fly a preprogrammed route and return to a given point, minimizing the skill level required (some systems are remotely piloted, some are autonomous, and some combine both aspects). Such a program could mirror the guidance found in 14 CFR Part 107, Small Unmanned Aircraft Regulations. Such a program would be a big step toward operating these systems from cutters and small boats.

Partner with the FAA

1 ☑

We should coordinate with the FAA to assist with developing regulations related to UAS operations within civil airspace, as the CG will need to operate UAS in civil airspace, and we conduct a high volume of manned aircraft flights in civil airspace, typically at low altitudes, placing our manned aircraft at greater threat of encountering small UAS. This joint venture would benefit the CG twofold: 1) we could assist with developing regulations that favored the use of CG UAS to conduct operational missions in US airspace, and 2) we could ensure that controls are developed to protect manned CG aircraft operations. This venture should also include conducting maritime UAS testing in US civil airspace (the Great Lakes, particularly Lake Michigan, is one excellent option) to develop policy and procedures for the implementation of these systems within civil airspace.

1. Great post. Since we're going to need to write policy for the use of autonomous or semi-autonomous surface vessels, we could probably learn from their experience in terms of developing policy for this new capability.

Deploy pumps and SLDMB's from a Large UAS

1 ☑

Large UAS, such as the Guardian, which is the maritime version of the Air Force's Predator B, could be equipped with a self-locating data marker buoy (SLDMB) and/or pump carried on the wings (like missiles are carried by the Predator). The SLDMB or pump could then be delivered to a mariner in distress, similar to how they are currently delivered by fixed wing C-130, C-27, or C-144 aircrews.

Conduct DOMICE and International Ice Patrol Missions

1 ☑

Small UAS (sUAS) could be utilized by the CG's fleet of small ice breakers while performing DOMICE missions to survey the condition of a track line and aid the cutter in finding the most efficient way through the ice, as these vessels only need to see a few miles ahead of their position at a time. This would be much more efficient than the current means which employs manned aircraft that are very costly to operate, cannot provide real time video data, have a limited on scene endurance, and must transit to the operational area (requires time, burns fuel, and can expose the crew to hazardous weather enroute). While manned aircraft can fly 100's of miles of track line, the information provided to the icebreaker can be of little use as the condition of the ice can drastically change, especially if it takes several days to reach the end of the track line. Larger UAS, such as the Guardian, could conduct International Ice Patrol missions. They could be equipped with side looking radar and dye markers to identify and mark icebergs.

Deliver Flotation Devices to Individuals in the Water

1 ☑

To utilize a life ring you must be relatively close to an individual in the water and the winds must be calm (or in your favor) as a strong headwind or cross wind can greatly reduce a life ring's range. An Unmanned Aerial System (UAS) equipped with a life ring or other floatation device (CO2 inflated collar) could be used to deliver flotation to an individual in the water. This would be especially helpful if a small boat crew were unable to reach an individual due to shoal water, breakers, or some other navigational hazard.

The instillation of similar UAS onboard merchant vessels would greatly simplify man overboard scenarios and save lives as such a system could rapidly be deployed to assist a mariner who had fallen overboard, providing a bird's eye view while delivering a flotation device to enable the victim to remain above water while the crew brought the ship around or launched a small boat. Alternatively, if the drone were made of structural, high impact foam it could land in the water and act as a flotation device and GPS tracker until the individual was rescued.

Mapping for shifting Inlets and Bars

0 ☑

In many coastal areas, inlets can shift weekly or monthly out of marked channels. This presents a challenge for Coxswains because there is a conflict between following command approved routes and not running aground. Besides the administrative challenges, in a SAR case, there is not time to find the best way through a shifting inlet or to find out how a stranded mariner got to their current position. If a UAV was equipped with a depth sounder and was on a search pattern type route that would survey an area every week or so and then download the data to a chart card, this information would be invaluable and possibly lifesaving. Furthermore, Stations that have the responsibility of making bar reports could use the same technology to make those reports without sending an asset out, saving many hours of maintenance and fuel. If a UAV was attached to a Station as an asset and someone was trained on its use, the crews would find countless ways to use it. From launching for a SAR case to checking HAZMAT spills to augmenting a boarding team to providing real time depth soundings of remote parts of an AOR, a UAV could pay for itself in a short amount of time and be crucial in certain missions.

END OF REPORT

For more information contact:
CDR Andy Howell
Innovation Program Manager
Thomas.A.Howell@uscg.mil