

# USCG SCOAR Report, Aug. 16-17, 2017

## Scripps, La Jolla, CA

P. McGillivary, USCG PACAREA Science Liaison

email: [philip.a.mcgillivary@uscg.mil](mailto:philip.a.mcgillivary@uscg.mil)



CGC HEALY & CG RDC Unmanned Surface Vessel “MINION” test, July 30, 2017, Beaufort Sea

# CG C130 use for NAVY Seasonal Ice Zone Reconnaissance Surveys (SIZRS) Project 2016/2017 Results, Jamie Morison, PI

Flew 7 days in 2016 season: June 15, July 13, Aug. 18 & 19, Sept. 14 & 15, Oct. 6

- Generally trying to fly sections at 140oW and 150oW from coast to ice edge
- June 2016 data reported on in SCOAR 2016 meeting
- July 13 2016 flight at 150oW was from 72-76oN; operated CULPIS-X ice profiling lidar for first time
- Aug. 18 flight was at 140oW, and Aug. 19 flight was at 150oW, reaching 77oN
- Sept. 14 flight was at 150oW, from 72-78.25oN; Sept. 15 flight was at 140oW from 72-78oN
- Oct. 6 flight was at 150oW, from 72-77oN

Flew 1 day so far in 2017, June 14

- June 14 flight was at 150oW, from 72-74oN, but flight was cut short before reaching ice edge due to aircraft engine problem.

# CG C130 Use for NAVY Seasonal Ice Zone Reconnaissance Surveys (SIZRS) Project 2016/2017 Results, Jamie Morison, PI

- 2012-2014 SIZRS data showed the effects of marginal ice melting in producing a freshwater boundary around the central Beaufort gyre.  
Results are in: Dewey, S., J. Morison and J. Zhang. 2017. An Edge-referenced Surface Freshwater Layer in the Beaufort Sea Marginal Ice Zone. *J. Phys. Oc.* 47(5):1125-1144.
- Collected SIZRS data in combination with CryoSat2 sea surface elevation data has allowed computation and modeling of effect of ice-ocean stress, ie difference ice velocity and surface geostrophic current velocity. Found Beaufort Gyre 'doming' is reduced by these currents, thereby stabilizing the gyre.  
Results are in:  
Zhang, J., et al. 2016. The Beaufort Gyre intensification and stabilization: a model-observation synthesis. *JGR Oceans*, Oct.2016. DOI: 10.1002/2016jc012196.

# CG C130 Use for Navy SIZRS Project 2016/17 Results

## CU Lidar Profiler Instrument Package (CULPIS-X)

- Originally supported by NASA
- Currently supported by ONR
- Instruments:
  - ULS LIDAR (904 nm – eye-safe)
  - Canon G10 digital snapshot camera
  - Ocean Optics Spectrometer
  - Everest Pyrometer (IST)
  - IMU, GPS



# CG C130 Use for Navy SIZRS Project 2016/17 Results

## CULPIS-X Sea Ice Photos along SIZRS C-130 tracks, 2016



Grease ice – 77N, 150W  
– Oct 6



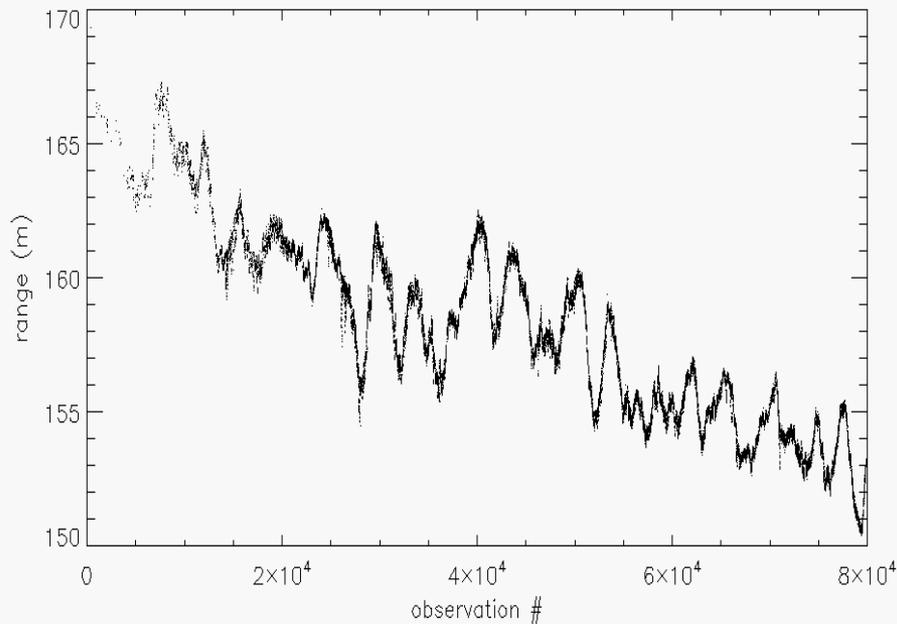
Pancake ice – 77.5N,  
150W – Oct 6



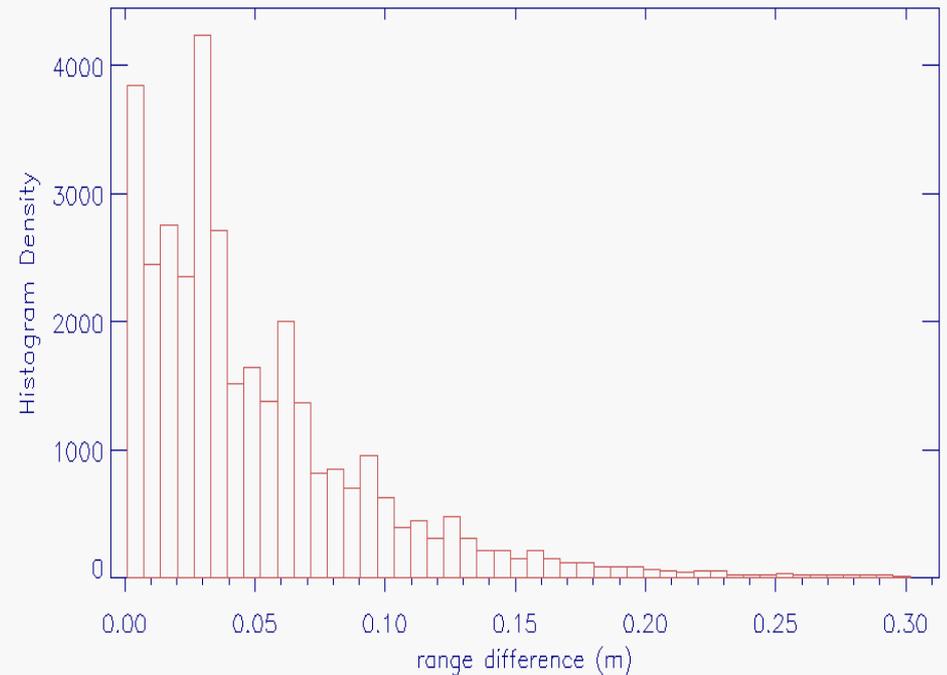
Melt ponds, 76N,  
150W, Aug 18

# CG C130 Use for Navy SIZRS Project 2016/17 Results

## CULPIS-X ULS LIDAR Data



Raw data over sea ice,  
Sept 15, 2016  
Observations every 4m

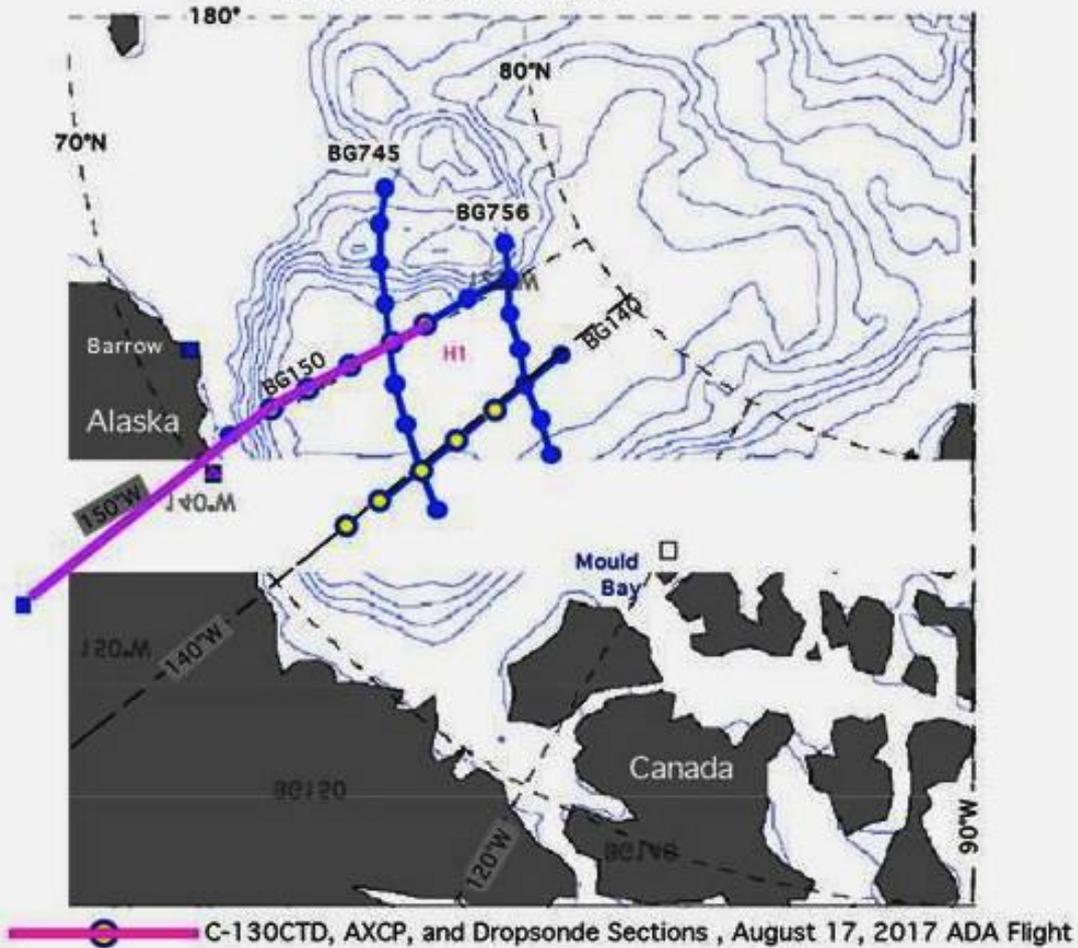


Difference between  
successive observations  
Yields a “roughness” estimate  
at 4m scale

# CG C130 Use for NAVY Seasonal Ice Zone Reconnaissance Surveys (SIZRS) Project

## 2017 Plans, Jamie Morison, PI

Proposed AXCTD, AXCP, and Dropsonde Surveys on August 17, 2017 ADA Flight  
distances from Fairbanks, AK



August 17, 2017 Flight with ocean stations at:  
N72°, 150°W; N73°, 150°W; N74°, 150°W; N75°, 150°W; N76°, (possibly 77°N, 150°W)  
Dropsonde sampling along 150°W from 10,000 feet at N72° to northernmost station northbound  
AXCTD and AXCP drops from 200' to 500' at each ocean station southbound

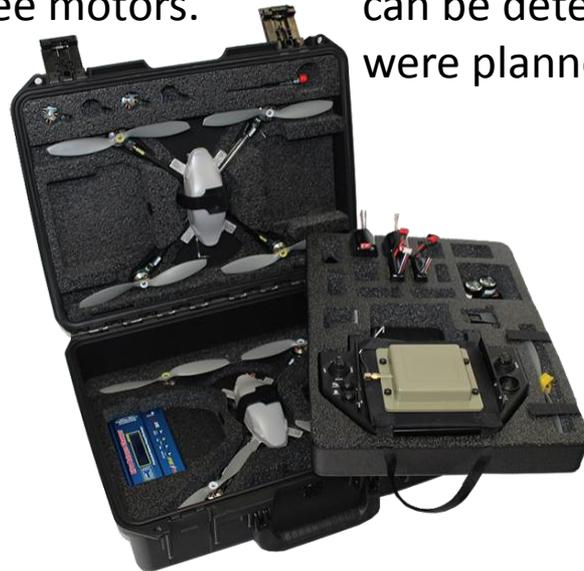
# CGC HEALY: RDC use of InstantEye UAS to image deployment of NOAA buoy, July 29, 2017 Beaufort Sea



# CGC HEALY RDC 2017 InstantEye UAS performance issues

The InstantEye was first used on July 29, 2017, concurrently with testing of an autonomous underwater vehicle (AUV) and unmanned surface vessel (ASV). Difficulties were encountered with the magnetic navigation directly over the ship which resulted in the loss of four propellers and three motors.

The InstantEye was flown again July 30, with flight time exceeded 20 minutes and initially good control. However, upon returning to the flight deck for landing, the InstantEye experienced compass failure and endured a hard manual landing. Sufficient spares remain to replace damaged parts, however, until the cause of the failure can be determined, no further flights were planned.



# CG RDC UAS Projects

## Robotic Aircraft for Maritime Public Safety (RAMPS)

**Mission Need:** Better understanding the risks, benefits and limitations of operating existing Commercial off the Shelf Small Unmanned Aircraft System (sUAS) technology in a maritime environment for cutter forces other than the National Security Cutter.

### Project Objectives:

- Develop requirements, standards and Concept of Operations.
- Evaluate realistic maritime security and first responder scenarios.
- Create a knowledge resource database.
- Guide future platform and sensor development to meet maritime first responder requirements.
- Evaluate sUAS payloads in different environmental areas focusing on logistics, maintenance, and data dissemination with CGC assets.
- Conduct an assessment for potential demonstration and evaluation facilities with special use air space establishing an Federal Aviation Administration approved Certificate of Waiver or Authorization for Department of Homeland Security (DHS) use.



### Key Milestone / Deliverable Schedule:

Project Start.....	30 Oct 13 ✓
RAMPS Request For Information (RFI) Release.....	10 Oct 14 ✓
RAMPS Course Validation Phase I-A .....	28 Apr 15 ✓
RAMPS Phase I-A Demos 01-05 .....	10 Jun 16 ✓
★ RAMPS Compilation Report Phase 1A .....	3 Oct 16 ✓
RAMPS Phase I-B Issue Payload RFI.....	21 Feb 17 ✓
RAMPS Phase I-B Re-Issue Payload RFI.....	Aug 17
RAMPS Phase I-B Payload Demo.....	Nov 17
Robotic Aircraft Sensors Program-Maritime (RASP-M) Capabilities Demos 01-05.....	Oct 18
★ RASP-M Compilation Report Phase 1B .....	Jan 19
Project End.....	Feb 19

★ Indicates RDC product.

**Sponsor:** DHS S&T, CG-711  
**Stakeholder(s):** CG-751, CG-761, CG-771, CG-931, JTF-E

**Project #:** 7807  
**Expected Benefit:** Direct Acquisition Support (MAR, MNS, CONOPS, ORD, AA, LCCE, T&E, etc.)

- Notes:**
- Partnership with DHS Science and Technology Borders and Maritime Division.
  - Establish Cooperative Research and Development Agreements with industry partners for sUAS demonstrations.
  - Supports the Western Hemisphere Strategy.

**RDC POC:** Mr. Stephen Dunn  
**CG-926 Domain Lead:** LT Steve Hager

*For more information, call (860) 271-2600 or e-mail RDC-Info@uscg.mil*



# CG RDC UAS Projects

## Advanced sUAS Sensor Investigations

**Mission Need:** Small Unmanned Aircraft System (sUAS) advanced sensors to meet USCG Wide Area Surveillance needs.

### Project Objectives:

- Evaluate current and near term state of the market sensor capabilities using RDC sUAS Final Report Modeling and Simulation supplement as a baseline.
- Obtain and test applicable sensor technologies from shore based test site.
- Conduct analysis of results to determine impact of improved sensor capabilities on USCG mission performance.
- Validate modeled results that NextGen sUAS sensors can significantly increase the target detection capability of National Security Cutter over baseline sUAS sensor configurations tested in 2014.



### Key Milestone / Deliverable Schedule:

Project Start.....	30 Jul 15 ✓
Review NextGen Modeling Results Government Furnished Information.....	12 Oct 15 ✓
Select NextGen Sensors for sUAS Integration.....	9 Nov 15 ✓
Integrate NextGen Sensors on Test Assets.....	10 Aug 16 ✓
Evaluate NextGen Sensors on Target Set.....	29 Sep 16 ✓
Post Test Modeling.....	25 Apr 17 ✓
★ <b>Advanced sUAS Sensors Investigations Final Report.....</b>	<b>Jul 17</b>
Project End.....	Aug 17

★ Indicates RDC product.

**Sponsor:** CG-711  
**Stakeholder(s):** CG-931, CG-761, FORCECOM, JTF-E, JTF-W, CBP

<b>Project #:</b> 7810	<b><u>Expected Benefit:</u></b> Improve operational performance/efficiency/mission execution/resiliency
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**Notes:**

- Supports the Coast Guard Western Hemisphere and Arctic Strategies.

<b>RDC POC:</b> Mr. Evan Gross	<b>CG-926 Domain Lead:</b> LT Steve Hager
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*For more information, call (860) 271-2600 or e-mail [RDC-Info@uscg.mil](mailto:RDC-Info@uscg.mil)*



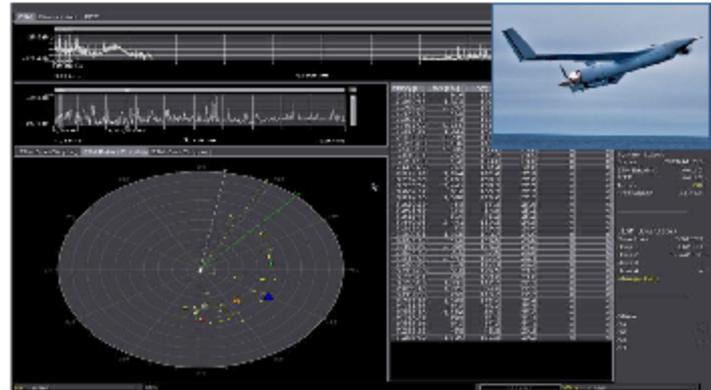
# CG RDC UAS Projects

## sUAS Direction Finding (DF) Payloads

**Mission Need:** Small Unmanned Aircraft System (sUAS) advanced sensors to refine USCG Wide Area Surveillance needs and expand Beyond Line-Of-Sight communications/signal exploitation.

### Project Objectives:

- Evaluate the applicability of DF payloads on increasing sUAS capability to self cue to targets of interest.
- Determine market availability of needed capabilities and determine extent that this capability has been employed.
- Obtain capability and conduct field evaluations of technology using USCG mission scenarios.
- Analyze and report results with recommendations for potential employment.



### Key Milestone / Deliverable Schedule:

Project Start.....	6 Oct 15 ✓
Capability Needs for sUAS DF Payloads Kick-off Meeting.....	2 Mar 16 ✓
NSWC Stiletto Demonstration and After-action Report.....	17 Nov 16 ✓
NSWC Dahlgren Demonstration and After-action Report.....	13 Feb 17 ✓
RDC Cape Cod Demonstration and After-action Report.....	28 Apr 17 ✓
Post-Demonstration Modeling Report.....	Jun 17
★ <b>Final Report: sUAS DF Payloads.....</b>	<b>Aug 17</b>
Project End.....	Sep 17

★ Indicates RDC product.

**Sponsor:** CG-761  
**Stakeholder(s):** CG-711, CG-SAR, CG-931, CG-2

**Project #:** 7811  
**Expected Benefit:**  
 Improve operational performance/efficiency/mission execution/resiliency

**Notes:**

- The project is to collaborate with Project 7526 VHF Hoax Location and Methods to enhance the effectiveness of the other projects technologies while demonstrating sUAS DF capability.
- Supports the Coast Guard Western Hemisphere and Arctic Strategies.

**RDC POC:**  
 Mr. Donald Decker

**CG-926 Domain Lead:**  
 Ms. Holly Wendelin

*For more information, call (860) 271-2600 or e-mail [RDC-Info@uscg.mil](mailto:RDC-Info@uscg.mil)*



# CG RDC UAS Projects

## Maritime Counter Unmanned Aircraft Systems (cUAS)

**Mission Need:** Methods to search, detect, classify, identify, mitigate, and defeat illicit use of unmanned aircraft systems in a maritime environment.

### Project Objectives:

- Collect Key Performance Parameters (KPP) for cUAS for the non-Transport Protection System (TPS) and Ports, Waterways, and Coastal Security (PWCS) missions.
- Identify technologies that satisfy KPPs & assist Directorate and Defense Advanced Research Project Agency (DARPA)/Department of Homeland Security (DHS) Science and Technology (S&T) in market research, including advances from the academic community.
- Design, build, integrate and test a maritime cUAS prototype with U.S. Army's Aviation and Missile Research Development and Engineering Center (AMRDEC).
- Conduct a limited user evaluation of RDC/AMRDEC cUAS prototype at an operational PWCS unit.
- Support DARPA's Mobile Force Protection (MFP) Phase III initiative.
- Influence Tactics, Techniques, and Procedures development in collaboration with FORCECOM.



### Key Milestone / Deliverable Schedule:

Project Start.....	3 Oct 16	✓
<u>Maritime cUAS Test w/ CG-MSR, DARPA, AMRDEC, and DHS S&amp;T</u>		
Conduct cUAS Commercial Off the Shelf Assessment.....	14 Apr 17	✓
Conduct land-based Test & Evaluation of cUAS prototype.....	Dec 17	
Conduct Limited User Evaluation overseas.....	Apr 18	
Conduct Test & Evaluation of cUAS prototype at Black Dart.....	Sep 18	
Conduct Operational Test & Evaluation.....	Jan 19	
★ cUAS Test & Evaluation Report for PWCS Mission (interim)....	Jul 19	
Conduct Test & Evaluation in support of DARPA MFP.....	Jun 20	
★ cUAS Test & Evaluation Report for PWCS Mission (final).....	Nov 20	
Project End.....	Dec 20	

★ Indicates RDC product.

**Sponsor:** CG-MSR  
**Stakeholder(s):** CG-731, CG-721, CG-751, DCMS-34, CG-2, CG-6, C3CEN, SFLC, AREA-3, DARPA, DIUx, DHS S&T

<b>Project #:</b> 7812	<b>Expected Benefit:</b> Improve operational performance/efficiency/mission execution/resiliency
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- Notes:**
- This effort will leverage partnerships with DHS S&T Directorate and DARPA.
  - Supports the Western Hemisphere and Cyber Strategies.

**RDC POC:**  
LT Joseph DiRenzo

**CG-926 Domain Lead:**  
LT Steve Hager

For more information, call (860) 271-2600 or e-mail RDC-Info@uscg.mil



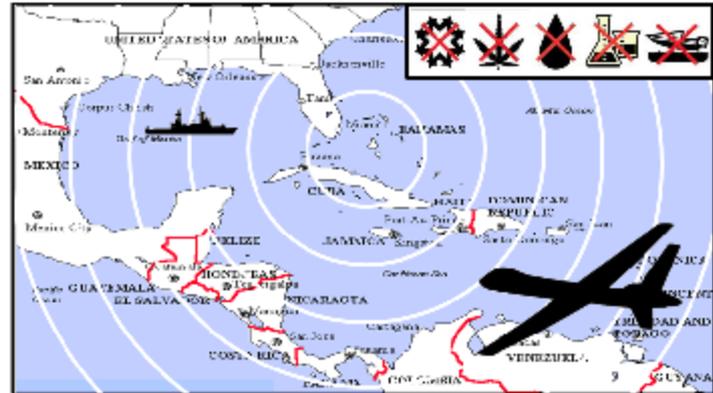
# CG RDC UAS Projects

## Long-Range/Ultra-Long Endurance UAS Analysis

**Mission Need:** Efficient and effective means of conducting persistent Intelligence, Surveillance, and Reconnaissance (ISR) in transit zones.

### Project Objectives:

- Examine the feasibility, costs, and benefits of conducting intelligence, surveillance, and reconnaissance missions in transit zones using Long Range (LR)/Ultra-long Endurance(U-LE), land-based, Unmanned Aerial Systems (UAS).
- Perform an Analysis of Alternatives (AoA) on available LR/U-LE UAS and mission equipment packages.
- Conduct a proof of concept demonstration of selected LR/U-LE UAS.



### Key Milestone / Deliverable Schedule:

Project Start.....	5 Jun 17 ✓
Key Decision Point: Market Research Review.....	Sep 17
Brief AoA Plans to Congress.....	Sep 17
LR/U-LE UAS AoA Draft.....	Dec 17
Technology Demonstration Plan.....	Aug 18
Airspace/Spectrum Authorization.....	Dec 18
Conclude Demonstrations.....	Aug 19
★ LR/U-LE UAS AoA.....	Oct 19
★ LR/U-LE UAS ISR Final Report.....	Oct 19
Brief Demonstration Results to Congress.....	Nov 19
Project End.....	Nov 19

**Sponsor:** CG-711  
**Stakeholder(s):** CG-2, CG-4, CG-5, CG-6, CG-7, CG-8, CG-9

**Project #:** 7814  
**Expected Benefit:** Inform follow-on acquisition/enterprise deployment

- Notes:**
- Joint assessment in collaboration with Customs and Border Protection and Department of Homeland Security Science & Technology.
  - Supports the Coast Guard Western Hemisphere Strategy.

**RDC POC:** Mr. Evan Gross  
**CG-926 Domain Lead:** Mr. Scott Craig

*For more information, call (860) 271-2600 or e-mail RDC-Info@uscg.mil*

★ Indicates RDC product.



# Univ. Alaska Arctic Domain Awareness Center (ADAC) DHS/CG & CG Academy CAPSTONE UAS projects

Three proposals for CG-ADAC were put forward by CG PACAREA:

- 1 – data transmission from a UAS to a CG C130-J aircraft
- 2 – coordinated/networked operation of two UAS for SAR ops, with one remaining to track PIWs (Persons in Water) while a second continued search efforts
- 3 – improving/demonstrating data processing of imagery onboard a UAS to automatically detect and transmit only images of objects of interest.

None of these projects was selected for follow-up by CG HQ for submission to DHS in 2016, however these projects are being re-submitted for 2017.

In the meantime there is also discussion of submitting these projects, and a project to improve UAS landing methods to make them compass independent for consideration as USCG Academy CAPSTONE senior honors group projects.

CG & NOAA present at CSU Channel Islands  
3rd Annual AVUSI Symposium  
of the Channel Islands AUVSI Chapter  
Oct. 21, 2016

- CG PACAREA (McGillivray) participated in conjunction with NOAA UAS (Todd Jacobs) in this Symposium.
- US Navy has established a Mechatronics Masters program with specific goals of training technicians for their UAS operations at Pt. Mugu.
- Navy has provided two sets of 3D printers, one for use by college and Masters students at CSU-CI, and a second set for use by the nearby High School Robotics Club and interested members of the public.
- The program is now entering its third year. The High School students are allowed every other Friday to work on campus, exposing them to higher education. They self-select to join the program for college, and self-select again to stay for a Masters. The Navy can then select to hire the best of the Mechatronics Masters students.
- Students have 3D printed & operated several different UAS, including for whale studies off Maui, and coral reef studies in the Cook Islands.

# NASA Ames SAR UAS X-project

P.I. Dr. Frank Aguilera

([frank.j.aguilera@nasa.gov](mailto:frank.j.aguilera@nasa.gov) ; PH 650-604-0108)

## What is SAR UAS X-project?

- Advanced High Altitude Long Endurance Unmanned Aircraft System (HALE UAS)
- Mothership to deploy, control and recover @20 smaller SAR UAS
- Use optical comms and onboard image processing for automated PIW detection



## PACAREA Goals

- Take advantage of \$5Million investment by NASA Ames in new SAR technology
- Develop SAR UAS capabilities for Arctic areas as part of Arctic Council mandates for international SAR and oil spill response collaboration
- Stay abreast of developing UAS technology, including optical comms

## PACAREA Role

- Coordinate with NASA Ames on development of SAR UAS optical communication capabilities
- Provide PIW teaching imagery for machine learning processors
- Develop integrated test plan with NASA
- Develop plan for coordinated operation with NASA

# Arctic Domain Awareness Unmanned Aircraft Systems

*Status and Requirements for Progress*



**Findings from the NOAA Arctic Requirements Workshop**

January 31 – February 01, 2017

NOAA Center for Weather & Climate Prediction College Park, Maryland

Jan.31/Feb. 1, 2017

## UAS Arctic Domain Awareness Requirements Workshop, NOAA, Greenbelt, MD

- Organized by NOAA's UAS office & attended by NASA, NOAA, USCG, USGS, DoE, ONR & representatives from Norway, Denmark & Canada, and Universities including UAF ACUASI, U. Kansas, and U. Colorado. Northrup-Grumman personnel briefed on Ikhana/Predator.
- Talks were divided between Predator and s-UAS ops.
- Talks reviewed existing & planned field programs in the US & abroad, including the International Year of Polar Prediction (YOPP) in 2018.
- Talks reviewed existing sensor programs.
- A review of sensors needs was conducted based on pre-meeting surveys.
- Consensus was reached on program & sensor needs, and to improve effectiveness of field programs by combining land and ocean efforts.
- Consensus was that top needs were for: (1) Sea Ice Mapping; 2) Oil Spill mapping; and, 3) Collection of Planetary Boundary Layer data. Uses include ice roughness via fan beam lidar; snow thickness & moisture content data on steep slopes to improving flooding prediction; and, marine mammal detection software was also a priority.

# NASA, NOAA, CG Wind Tunnel UAS Icing Tests (and anti-icing tests)

- One outcome of 1/31-2/1/17 UAS Arctic Domain Awareness Requirements Workshop to prepare for UAS deployments during Arctic Shield, 2018, was a decision that UAS icing & anti-icing coating tests were needed to reduce risk of loss.
- Tests will be conducted Nov. 13-17, 2017 at the NASA Glenn Icing Research Wind Tunnel (run by Jack Oldenburg) , which varies temperature and droplet size with a 6'x9' chamber with rotating table that varies wing/aircraft incidence angle.
- NASA Ames is developing 'universal mount' for various aircraft/wings.
- A PEMDAS icing detection system will be included in the chamber for all tests.
- One goal will be to test predictive performance of the Lewis AFB LewICE3D icing model software, which requires aircraft tested submit 3D models as STEP files.
- Aircraft planning to participate: DataHawk & SuperSwift (U. Colo.); SeaHunter (UAF) (motor cowling); Arctic Shark (wing); PUMA (wing), WASP.
- Conditions and number of runs for temperature and drop size TBD; will depend in part on LewICE3D model results, including alpine (low rH) and arctic (high rH).
- Aircraft that may participate: Latitude Engineering HQ50, Twister (UAS USA), Talon
- Aircraft unavailable to participate: FlexRotor.

# Univ. Hawaii Navy Applied Research Lab UAS facility

- After several years of discussion, the Hawaii part of the Pan-Pacific UAS CoE managed by ACUASI at UAF has stood up an official organization as part of Univ. Hawaii's Navy Applied Research Lab under the Direction of Dr. Margo Edwards
- Ted Ralston (email: [tedralston@arl.hawaii.edu](mailto:tedralston@arl.hawaii.edu) ; PH 808-7386814 ) was hired in spring to direct the UH ARL UAS facility
- Josh Levy (email: [levyjosh@hawaii.edu](mailto:levyjosh@hawaii.edu) ; PH 914-217-4283), who recently completed his MS using UAS to monitor coral reef bleaching and recovery in Kaneohe Bay, was hired this summer to direct UAS field operations.
- UAS operations at the lab with initially be focused on emergency response uses both in Hawaii and across the Pacific Islands.
- Planned operations include projects mapping topography and areas for emergency response in the Marshall Islands where the highest land is only 9' above sea level.

# NAVY/CG ICE-PPR Cooperation

- The Navy has signed an International Collaborative Engagement Program for Polar Research (ICE-PPR) to coordinate fundamental international research on issues important in the arctic.
- This includes research on use of UAS for maritime surveillance, oil spill response, and search and rescue in the arctic.
- This effort is being undertaken in part as part of the re-activation of Keflavik AFB in Iceland.
- An ICE-PPR Workshop is being conducted in cooperation with the DHS Arctic Domain Awareness Center in Anchorage, Alaska Oct. 23-27, 2017 to further discuss coordination of ONR, CG, DHS along with University & industry participants to improve UAS use in the arctic.

# Arctic Council Unmanned Aircraft Expert Working Group Past Meeting Results



## Implementing Scientific Data Collection across the Arctic Oceanic Region Utilizing Unmanned Aircraft Systems (UAS)

*Arctic Monitoring and Assessment Programme (AMAP) Unmanned Aircraft Expert Group (UASEG)*

**Citation:** AMAP, 2015. *Implementing Scientific Data Collection across the Arctic Oceanic Region Utilizing Unmanned Aircraft Systems (UAS)*. By: C. Sweatte, R. Storvold, P. Ruel, M. Wuennenberg, K. Tarr, A. la Cour-Harbo, B. Feldberg, J. Kivinen, H. Hólmi, M. Raustein, E. Jangren, B. Mulac, J. Adler, D. Davis, L. Cary, S. Lesenkov. Arctic Monitoring and Assessment Programme, Oslo.  
5 pp. ISBN – 13 978-82-7971-089-9

Available as an electronic document from [www.amap.no](http://www.amap.no)



ARCTIC COUNCIL



# Arctic Council Unmanned Aircraft Expert Working Group Past Meeting Results



## ARCTIC SCIENCE REMOTELY PILOTED AIRCRAFT SYSTEMS (RPAS) OPERATOR'S HANDBOOK

Arctic Monitoring and Assessment Programme (AMAP)  
Unmanned Aircraft Systems Expert Group (UASEG)

**Citation:** AMAP, 2015. *Arctic Science Remotely Piloted Aircraft Systems (RPAS) Operator's Handbook*.  
By: R. Storbvold, C. Sweatte, P. Ruel, M. Wuennenberg, K. Tarr, M. Raustein, T. Hillesøy, T. Lundgren, M.  
Sumich. Arctic Monitoring and Assessment Programme, Oslo. 25 pp. ISBN – 13 978-82-7971-090-5

Available as an electronic document from [www.amap.no](http://www.amap.no)



ARCTIC COUNCIL



# Arctic Council Unmanned Aircraft Expert Working Group Future Plans

- Last Meeting Arctic Council UASEG was March, 2016 (when I was voted on)
- As presented at SCOAR 2016, main UASEG issues remain:
  - 1 - Establishing protocols for UAS radio communication across the 8 FIRs (Flight Information Regions) of the arctic nations; and,
  - 2 - Establishing safety and operational standards for various airframes to allow for a single certification for operations in the airspace of all arctic countries.
- May 11, 2017 in Fairbanks, Finland took lead of the Council from US. A program to track all ship activity in the Arctic was established. Finland's four focus areas include environmental protection, and expansion of meteorological data collection to improve shipping safety & monitor climate.
- Also in May 2017 the AMAP committee (under which UASEG falls) Chair changed to Marianne Kroglund, the first Norwegian in this position, a marine biologist focused on ocean acidification.
- Next AMAP meeting is Sept. 11-13, 2017 in Reykjavik, Iceland
- We are planning a UASEG Workshop to move forward with Finnish focus on maritime UAS activities in Feb. 2018 in Reykjavik, Iceland

# NTNU (Trondheim, Norway)

## AMOS (Autonomous Maritime Operating Systems) Lab

### UAS Projects

Kim Sorensen ([kim.sorensen@ntnu.no](mailto:kim.sorensen@ntnu.no)) finished his PhD on carbon nano-tube anti-icing systems for small UAS under Dr. Tor-Arne Johansen, and has continued as a post-doc at NTNU to set this up as a business

Kasper Borup ([kasper.borup@ntnu.no](mailto:kasper.borup@ntnu.no)) is Tor-Arne Johansen's new PhD student who is working with command and control UAS software to calculate wind speed and direction by studying intended and actual path-over-ground of UAS.

# Standup of Navy Task Force Ocean (TFO)

- On July 5, 2017 CNR (RADM David Hahn) and CNO (RADM Tim Gallaudet) signed into existence Navy TFO, which CNO Directs.
- The mission of Task Force Ocean (TFO) is to advance ocean science in the U.S. in order to ensure that the U.S. Navy maintains a competitive advantage in our ability to understand the ocean environment and to capitalize on this knowledge.
- TFO has 5 program elements, listed below, the 1st of which is relevant to UAS:
  - 1 - Sensing & Observations  
Lead: NMOC
  - 2 - Understanding, Modeling and Prediction.  
Lead: ONR
  - 3 - Naval Applications & Decision Aids  
Lead: CNO, Dir. Undersea Warfare (OPNAV N97)
  - 4 - Human Capital  
Lead: NRL
  - 5 - Strategic Communications (with national ocean science enterprise)  
Lead: OPNAV N2N6E