



NOAA Unmanned Aircraft Systems (UAS) Program



Scientific Committee for Oceanographic Aircraft Research (SCOAR)

Robbie Hood-UAS Program Director
John "JC" Coffey – UAS Program Office

*Office of Oceanic and Atmospheric Research
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Missions for UAS



- **Goal to evaluate utility of UAS for NOAA operations and research**
- **Three focus areas**
 - **High-impact weather**
 - **Marine monitoring**
 - **Polar research**
- **Wide range of platforms evaluated**





Arctic Shield 2013-15

ISR, MDA, Oil Spill, Marine Debris & SAR

USCG/NOAA/Industry Partnership



- ✓ Sea ice ridge detection/monitoring
- ✓ Marine and marine mammal monitoring
- ✓ Usefulness in search and rescue scenarios
- ✓ Detection and monitoring of oil spilled from ship
- ✓ Detection and monitoring of marine debris from ship



Lat/Lon: N 73° 58' 14.84" W 155° 03' 20.64"
Alt: 266 ft MSL
Mag: 241°



Gimbal
FOV Data:
Slant Rng: 159 m
CFOV Hdg: 181°
CFOV Lat/Lon: N 73° 58' 13.34" W 155° 03' 20.81"
Horiz. FOV: 29.6°





Arctic Shield 2013-15 Milestones



- **Autonomous net recovery on helicopter deck**
- **BVLOS (5nm) operations by exercising “Due Regard”**
- **Real-time operations coordinated with two manned helicopters**
- **Long range communications for C2**
- **Ice-sensing and de-icing system**
- **Real-time data transmission to the Internet**
- **Success led to AV and NOAA supporting ODF-16 to Antarctica**





Arctic Shield July 2013-15 aboard the USCGC (Polar Icebreaker) HEALY



Milestones included:

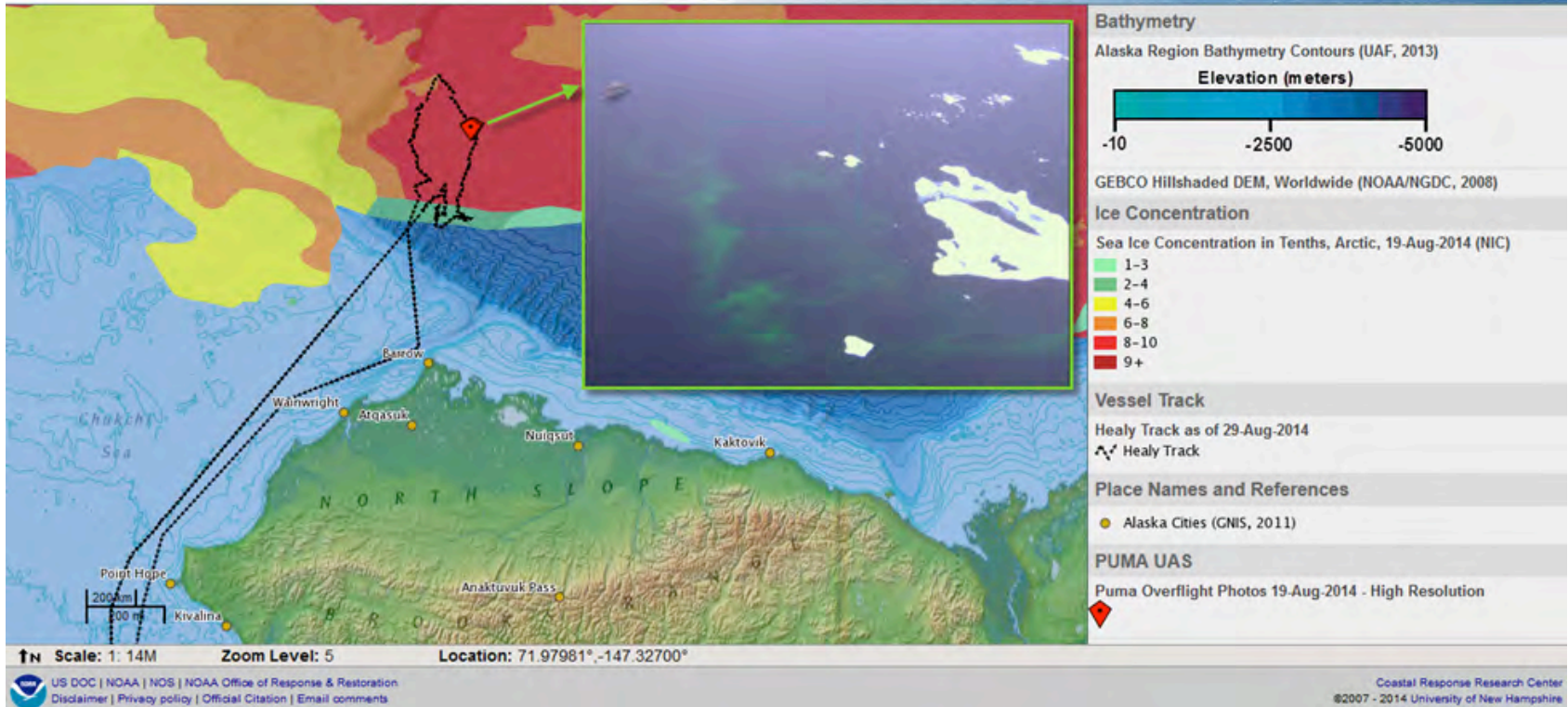
- Autonomous net recovery in rail-mounted triangular net and square net on helicopter deck
- BVLOS (5nm) operations by exercising “Due Regard”
- Real-time operations coordinated with two manned helicopters
- Testing of long range communications for C2
- Integration and testing of ice-sensing and deicing system
- Data transmission through aerostat with support from IGM Aerostatic and real-time to the Internet through satellite link with support from 2d3 and Inmarsat
- Success from this trip lead to AV and NOAA supporting ODF-16 to Antarctica.



NOAA Environmental Response Management Application



ERMA | Environmental Response Management Application
Arctic





Operation Deep Freeze 2016



- NOAA and USCG
- Annual resupply mission to US National Science Foundation's McMurdo base in Antarctica
- Coordination between National Science Foundation, Department of Defense and US Coast Guard
- Physical and environmental challenges:
- Interesting/impressive statistics:
- Administrative and regulatory challenges: number of organizations involved in planning, review and execution of UAS operations

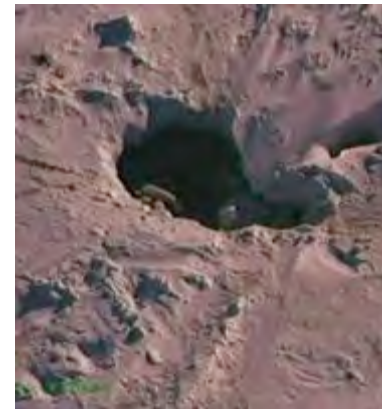




Deep Freeze 2016 Mission Objectives



- Forward scouting for icebreaking
- Collect ice data (images) to validate satellite-based forecasts
- Continue development of shipboard TTPs for small UAS operations in Antarctic and Arctic environments
- Demonstrate effective deployment of small UAS in extreme maritime operations
- Test new Puma UAS i45 camera payload and autonomous net capture system

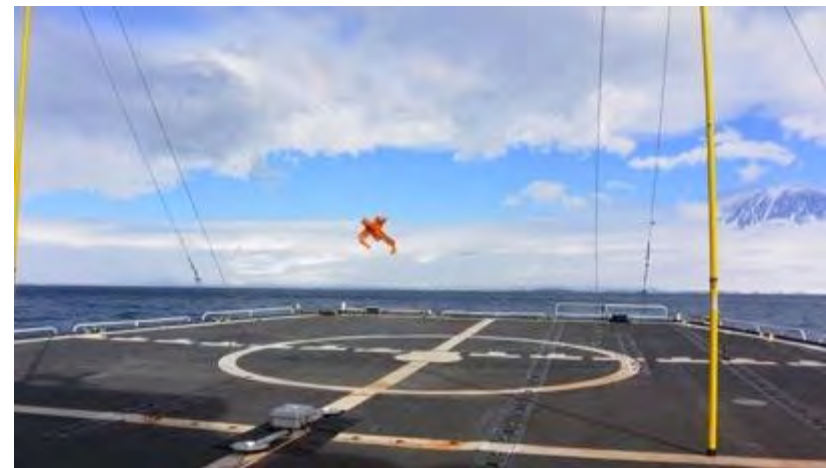




Deep Freeze 2016 Achievements



- 20 flights, including 46 kilometer flight (BVLOS)
 - “12”hours of video
 - i45 high resolution nadir images
- Autonomous shipboard landings
- Concepts of operation developed and tested
- Performed missions in conditions in which helicopters could not operate





Key Requirements for Future Small UAS Operations



- General maritime operations
 - Pre-programmed operations with autonomous capabilities for data gathering and recovery
 - High wind capability (greater than 25 kts, Puma granted 35 kts)
 - Safety and reliability
 - Range (BVLOS to 40+ kilometers)
 - Nadir mapping capability
 - Mode C or ADS-B transponder
- Polar maritime operations – most extreme conditions
 - Ice sensing and/or de-icing capability
 - Produce images and data of sufficient quality to support mapping



Contact Information

UAS Web Site: <http://uas.noaa.gov/>

Questions should be directed to:

Robbie Hood - NOAA UAS Program Director
robbie.hood@noaa.gov / 303-905-3411