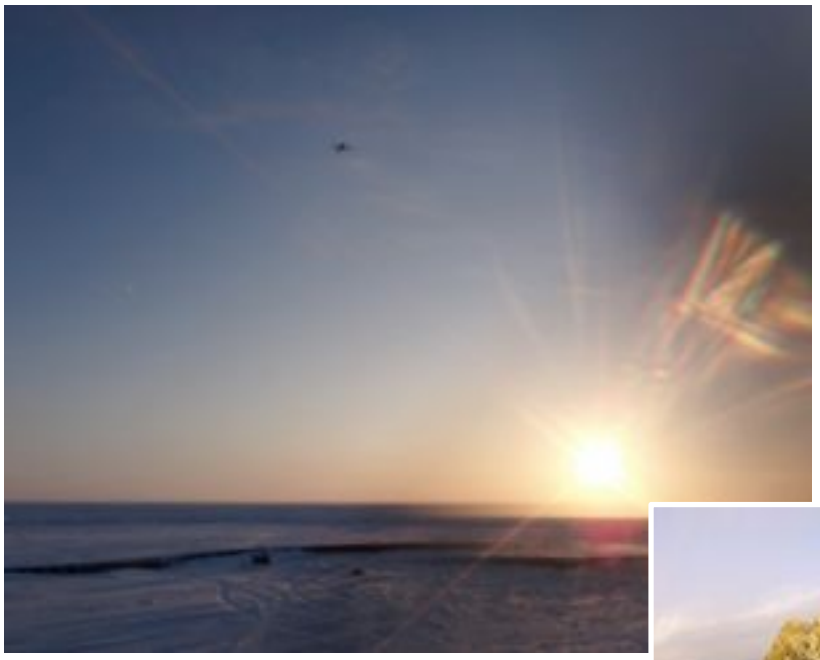
UNMANNED AIRCRAFT SYSTEMS FOR ALASKA



Ro Bailey

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Alaska Center for Unmanned Aircraft Systems Integration

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Roadmap

- University of Alaska UAS Program
  - Vision, mission, new developments
  - Alaska Center for UAS Integration - RDT&E
- Operations -
  - Recent & planned near term
  - Long term plans
- FAA Test Site Proposal
- Current Issues & Challenges
  - Privacy & Law Enforcement
  - Airspace

UAF's History of Unmanned Aircraft

- 2001 - Partnership with New Mexico State University
  - Tasked to develop applications within the Technical Analysis and Applications Center (TAAC)
- 2003/2004 - Funded to work with USAF and USCG
  - Maritime domain awareness
  - Wildfires in the Interior of Alaska
- 2006 - Acquired first ScanEagle with 50% loan from University Foundation
- 2007 to present - Multiple missions for science, emergency response, humanitarian needs, and engineering development
- Today our unmanned aircraft fleet is diverse and growing
  - Existing fixed wing systems
  - Existing rotor systems
  - Developing new systems

First UAF Launch

Altair "*Mariner*" Alaska July 2004

What Alaska Offers

- Vast open airspace with little traffic
- Wild, extreme, unpopulated, diverse terrain
- Access to large military ranges with data gathering ability
- History of pioneering aviation technology
- Culture of innovative use of aviation
- Close relationship with regional FAA
- Perhaps most important, willingness to be thoughtful and methodical in potential policy decisions
- Legislation setting Alaska airspace aside

Vision

Develop, test, and ultimately exploit emerging unmanned aircraft technology and its uses to create a positive economic and social benefit within the State of Alaska.

When the cost of the hardware is no longer a factor what will people do with the capability?

- **Plan today to prepare for the future**
- **Develop what is needed to support**
- **Participate in policy development for benefit and protection of Alaska & the nation**

Mission Statement

A research center for small, unmanned aircraft systems providing integration of unique payloads and supporting pathfinder missions within government and science communities, with a special emphasis on the Arctic region.

Conducted over 150 mission flight days worldwide in 2012

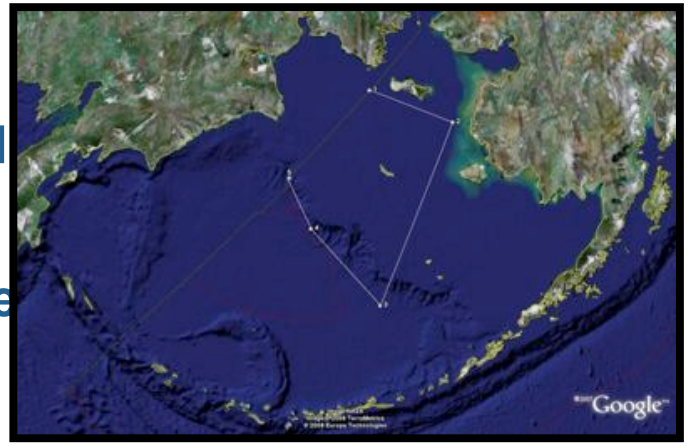
Alaska Center For UAS Integration RDT&E

- Created by Board of Regents Dec 2012
- Three integrated focus areas
  - Engineering - develops capabilities to meet new requirements
  - Application Development - drives system capabilities
  - Training & Education - develops humans to develop, maintain & operate systems
- Within GI & UAF, but named as overall for UA
- Situated to exploit FAA opportunities - Arctic airspace, FAA Test Site

Operations

Ice Seal Population Study

- Scientific Need
  - Marine Mammal Protection Act mandated
- Relevance
  - Large-scale, systematic ship-based surve
- Outcome
  - Safer (than manned aviation)
  - More effective (they do not startle seals)
    - vs. manned fixed wing or helicopters



2009 First Deployment
2014 Proposed Expanded Survey
Joint NOAA and US Navy Funded

Augmenting Steller Sea Lion Surveys
Western Aleutians

- **Problem: Biological opinion, based on limited observations, eliminated a commercial fishery**
- **Goal: Demonstrate a method to collect high quality imagery for population surveys in hard to observe areas**
- **Possible Benefit: Improved understanding of animal use of and movement through their habitat**

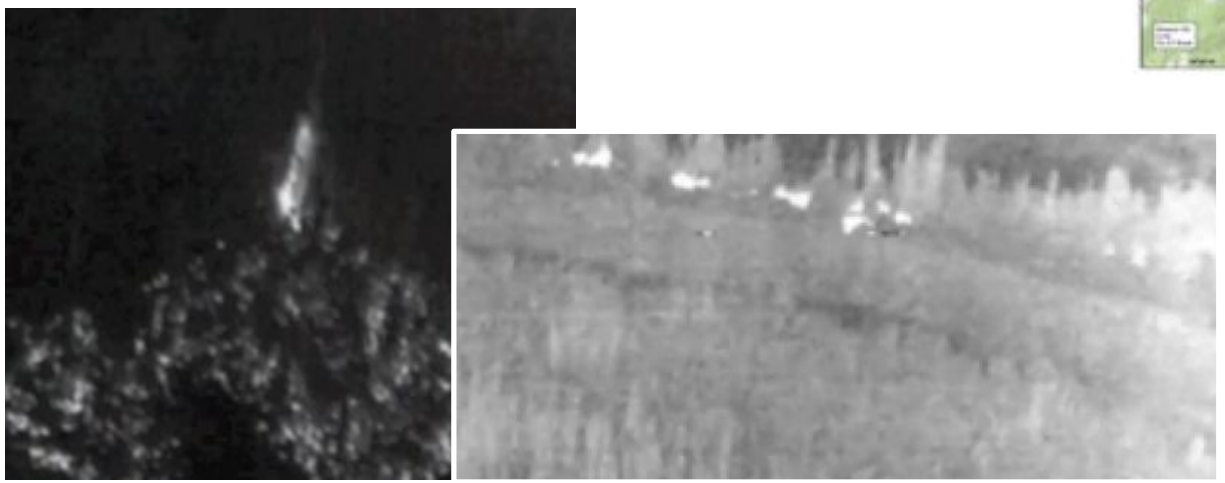
Steller Sea Lion Habitat Monitoring

Preliminary Findings
- Migration Patterns
- Transient Killer Whales

Crazy Mountain Wildfire

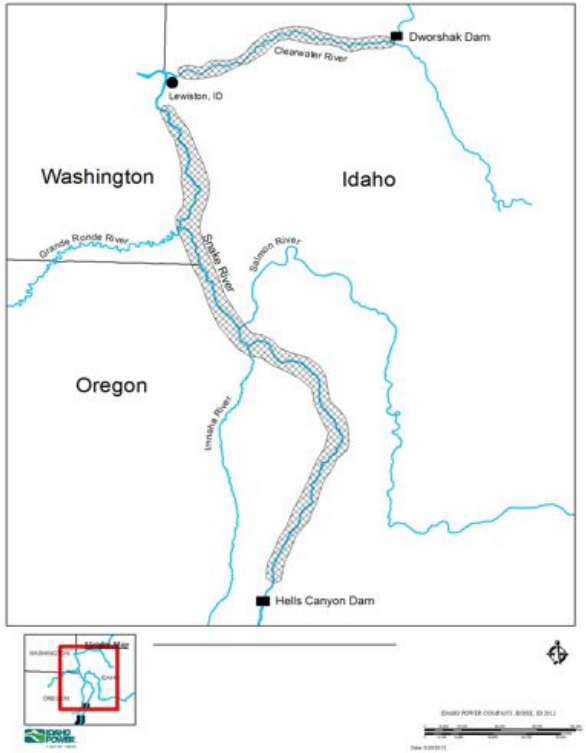
Alaska Fire Service Incident Command Team Support

- Tasked by Alaska Fire Service Incident Command Team
- Manned aviation not flown for 5 days due to the smoke and limited visibility
- Satellite imagery (MODUS) incapable of showing critical activity



Salmon Spawning Habitat
October - December 2012

- **Mapping Fall Salmon Nests along a 162 km of the Snake and Clearwater River in Idaho, Washington, and Oregon**
- **"THREATENED" under the Endangered Species Act**

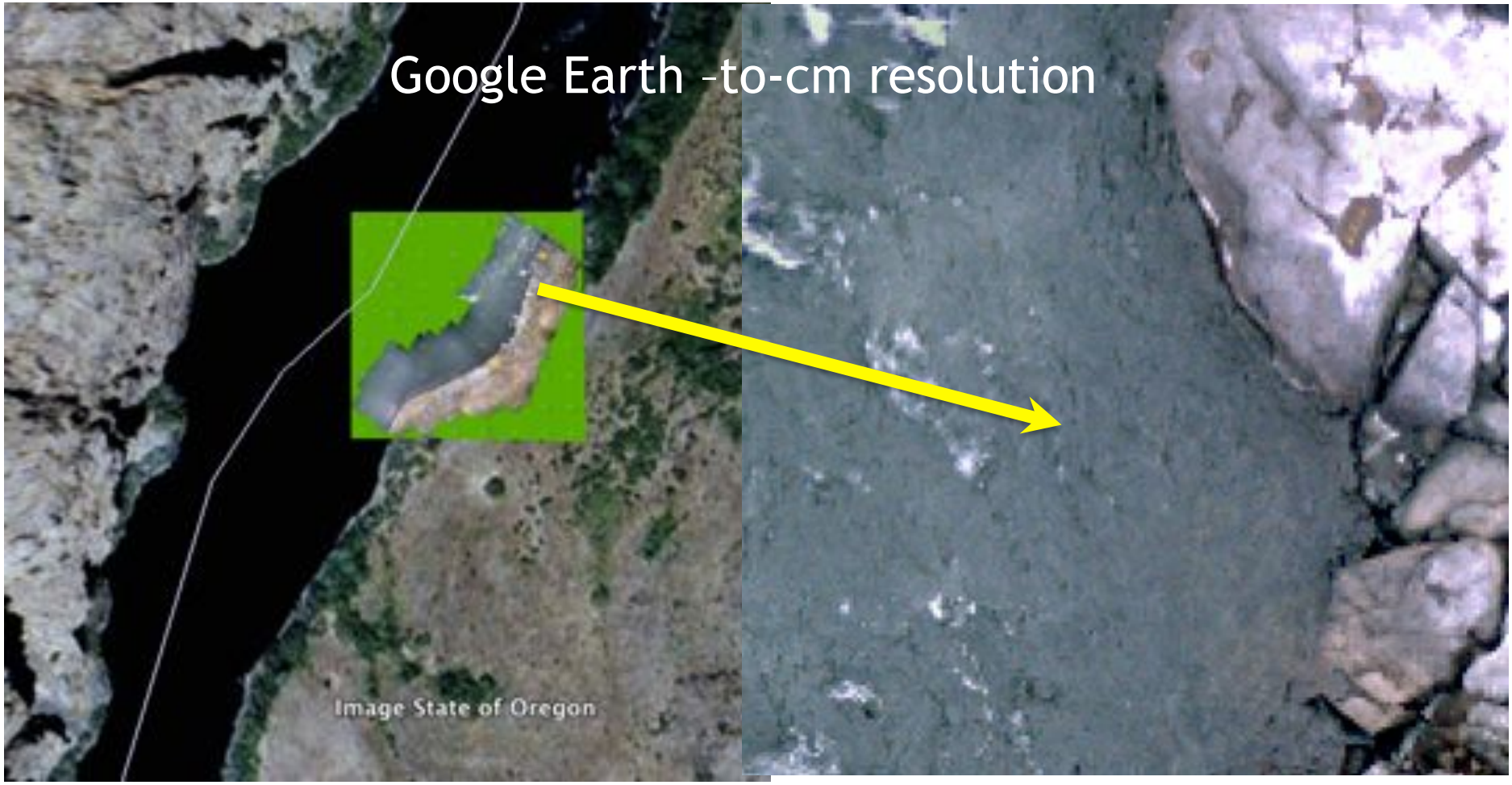



How many reds?


26
A female on each nest

Fish Habitat Data Products

Weekly Mosaic Images of Select Sites



Rx-CADRE

Prescribed Fire Combustion and Atmospheric Dynamics Research Experiment

- October 29 - November 17 2012
- Eglin AFB Florida

Bear Bite – SAREX

Mass Casualty Exercise 7-10 February 2013

"An aircraft crashed in the tundra roughly 20 miles outside Bethel Alaska many died with some survivors"

Deployed two unmanned aircraft systems with support team

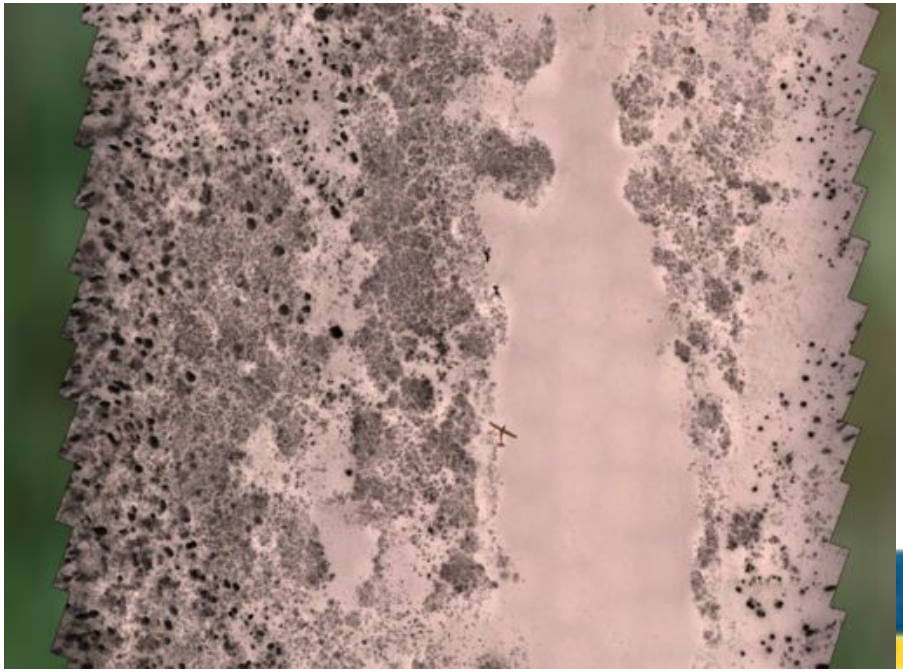
Coordinated with manned aviation on the scene

Mission:

- **Map scene for event documentation**
- **Real-time SAR response**

Bear Bite - SAREX

"I've worked with the MQ9 and the MQ1 before and when compared these products were pretty sweet" - SAR Duty Officer statement at after action review 11 Feb 2013. "Within just a couple hours imagery was collected and turned into mosaic products in the field"



Bear Bite - SAREX

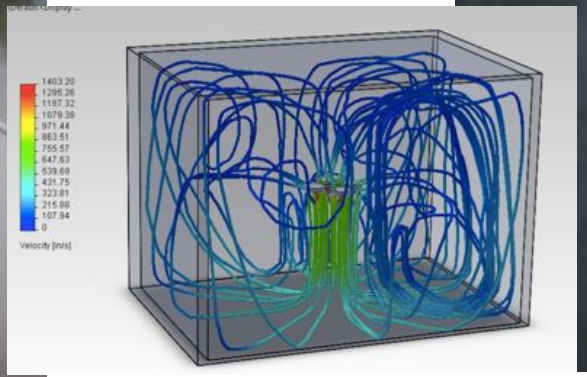
cold weather operations – our most challenging yet

Shoreline Clean-up Assessment Technique (SCAT) Evaluation

BP Exploration (Alaska) Inc. Partnership

Oil Infrastructure Monitoring Research

- Flare Stacks
- Pipelines
- Processing Facilities
- Access Roads



BP North America Partnership

BP Exploration (Alaska) Inc. Partnership

High Arctic Ship Piloting Experiments

Aboard the Canadian CCGS LOUIS S. ST. LAURENT

Phase I Research conducted by Capt Stephen Wackowski (USAF)

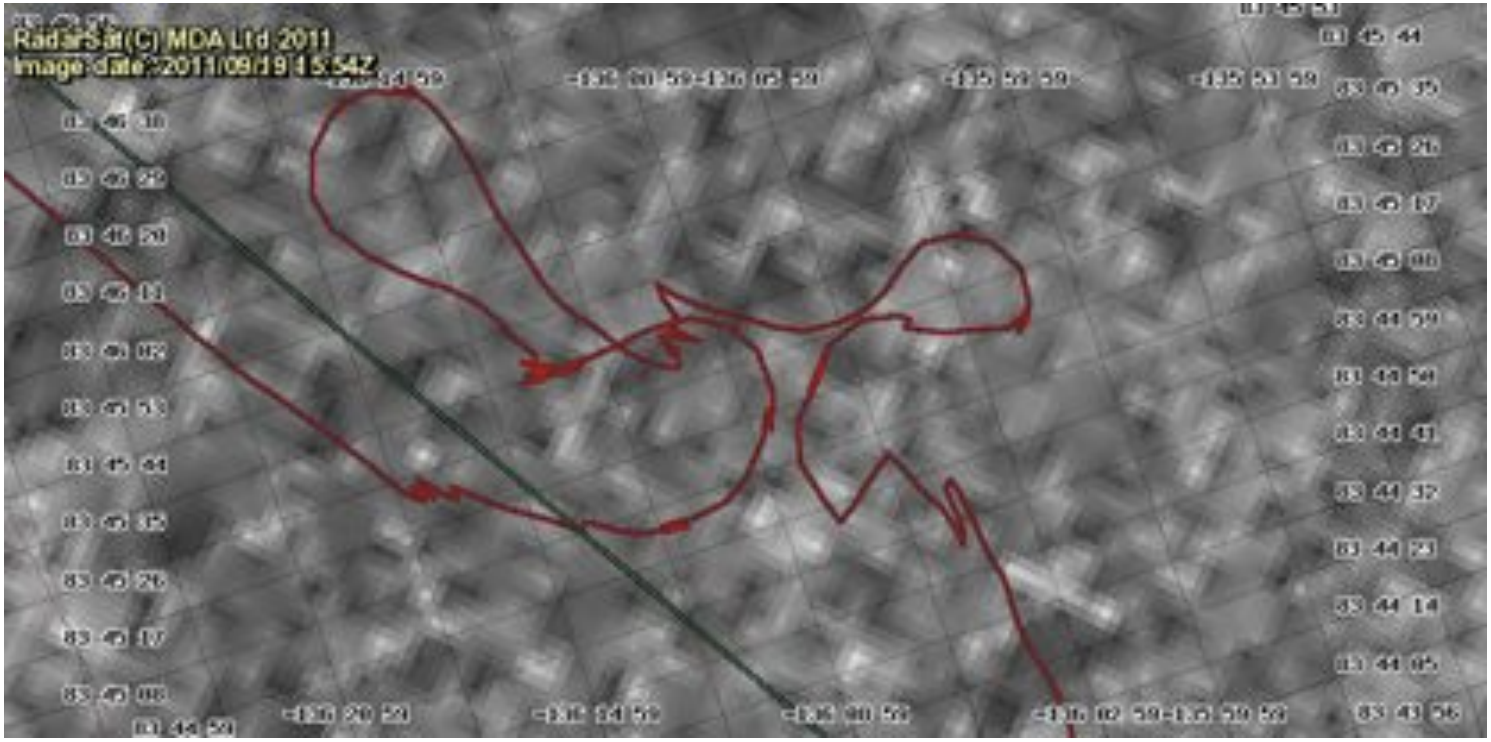
Phase II Ongoing with UAF graduate students with modified Raven systems acquisition

Imagery Used For Ship Piloting in Ice

Ship tracks superimposed (Sept 2011)

Background Image: National Ice Center highest resolution RADARSAT

- **Desired icebreaker track (green)**
- **Actual navigation track (red)**



Small UAS Imagery of Ice Ridges

IR image from RAVEN UAS (Sept 2011)

Navigating Sea Ice during the Nome Fuel Delivery

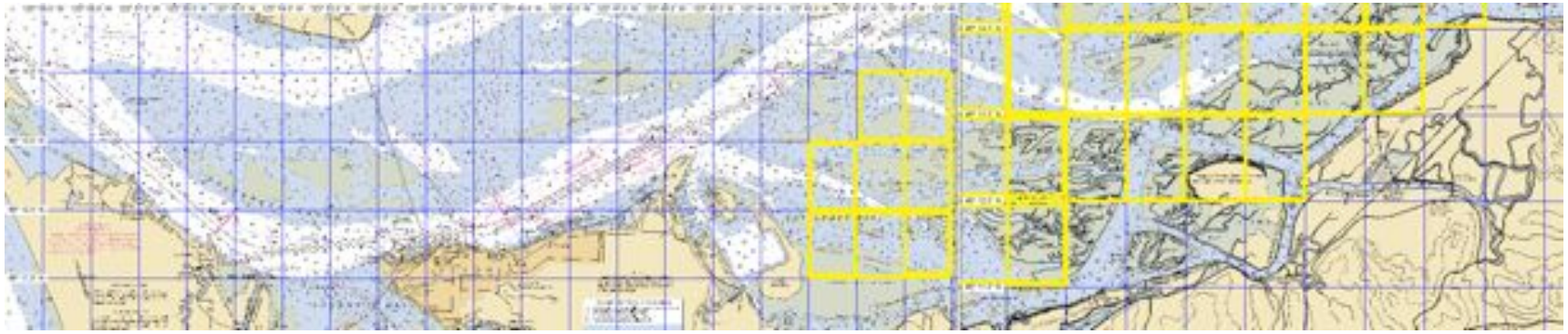
University Engagement and Decision Support

Mission

1. Identify potential safety concerns for those working on the ice
2. Document the site for mission response activity
3. Collect imagery for the USCG Public Affairs Officer

Most Recent ACUASI Project

Oil Spill Response Exercise – Columbia River Estuary



- 11-13 March 2013
- Puma AE Operation

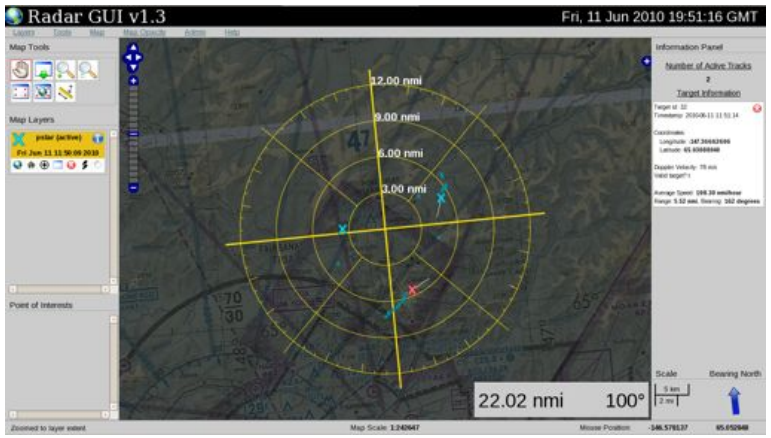
iPASS

UAF's Portable Airspace Surveillance System

Designed and built by UAF for Alaska's airspace monitoring needs

Status

Operational, used in Canada and NASA Certified



Airspace activity monitoring

Monitors airspace use patterns and validates traffic pattern assumptions

Enhanced situational awareness during aircraft or spacecraft operations

Provides real-time position and track of local airspace activity to assist in traffic avoidance

Ongoing UAS Survey of Marine Debris
Generated by 2011 Japanese Tsunami

NOAA Funded Effort

Partnering with a Wasilla Alaska based UAS Manufacturer Airborne Technologies Inc

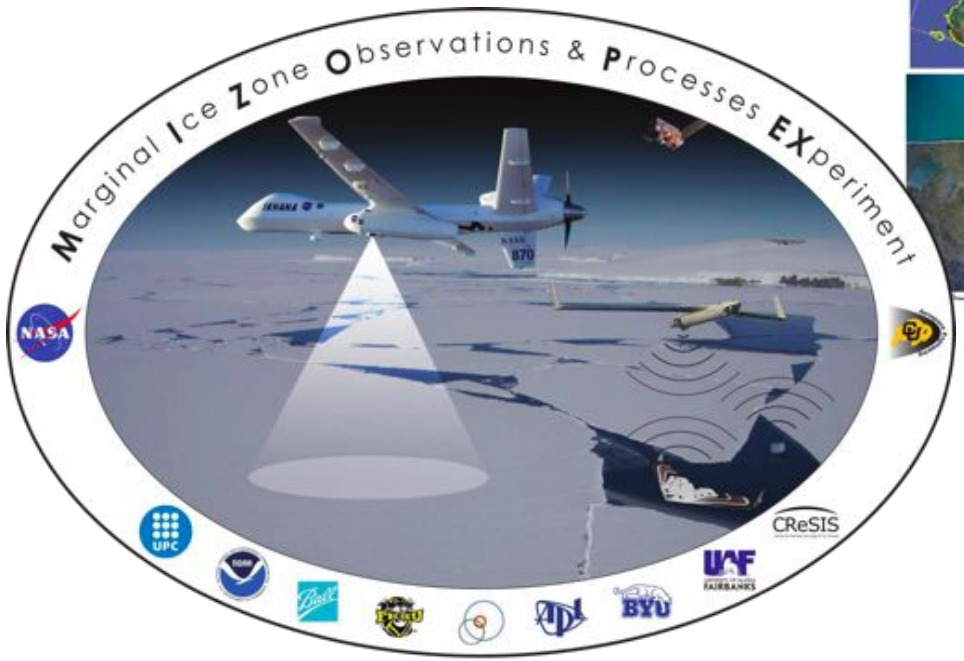
Upcoming ACUASI Projects

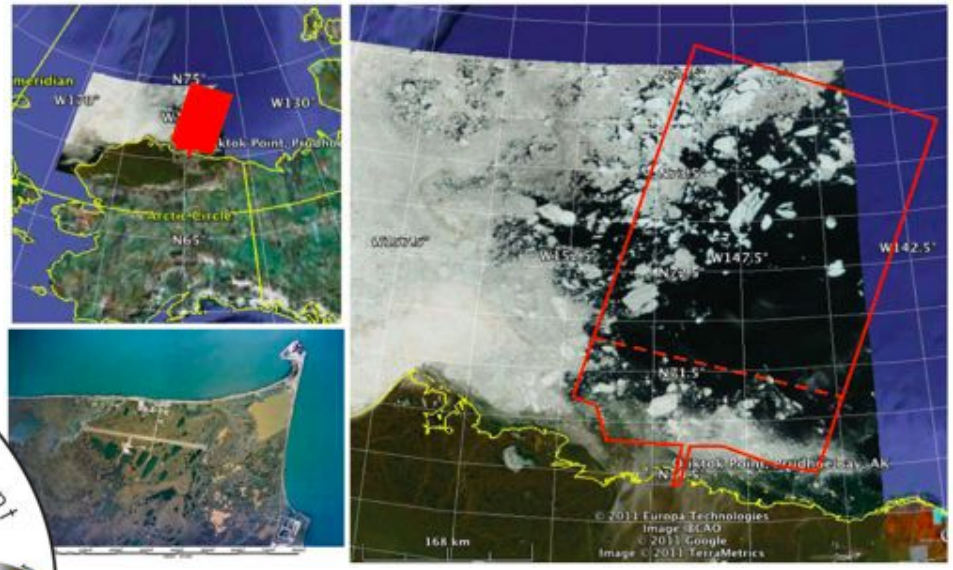
Marginal Ice Zone Ocean and Ice Observations and Processes EXperiment (MIZOPEX)

UAF deployments

NASA Exercise July 2013

Preparation May/June 2013





Multiple aircraft simultaneously

Many new scientific payloads

Alaska Department of Public Safety

- Provided demonstration of a vertical takeoff UAS
- Provided concepts in which a UAS could be used including:
  - Forensic evidence at crash or crime scene
  - Search and rescue
  - Wildlife protection
- Provide UAS subject matter expert as AST forms its concept of operations
- Possible development of UAS training package to train State troopers
- Supporting any FAA interaction needs
- Providing connections to legal experts on privacy

Joint Venture Iceland

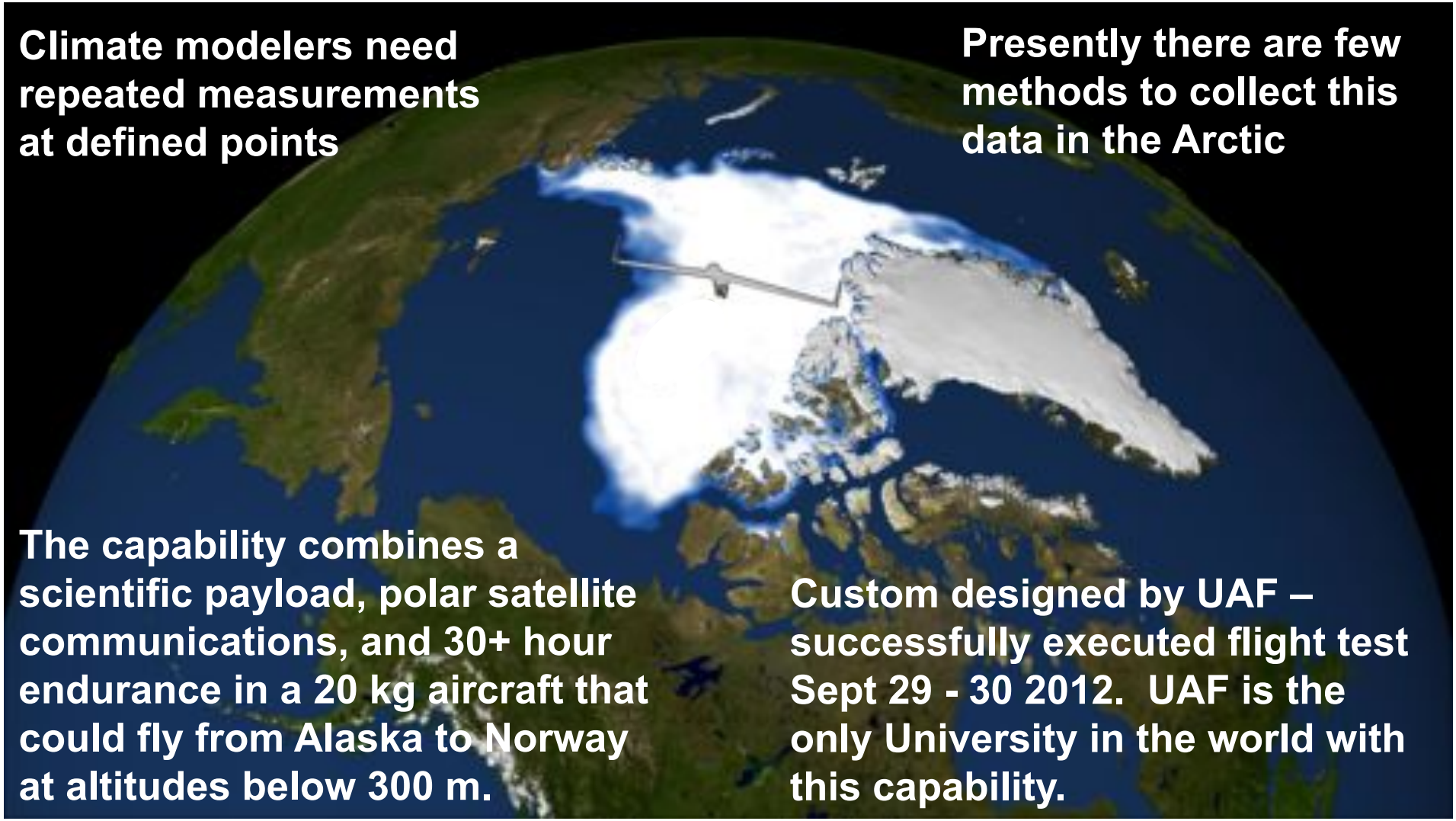
- Collaboration began at training in Belgium
- First formal visit to Iceland in Apr
  - Met with universities, agencies, companies, CAA, President of Iceland
  - Iceland CAA has no UAS rules, but many needs
    - We will assist to develop sensible, flexible rules
    - Will provide direct operational support & training until indigenous capability ready
- Three week operation visit in Jul-Aug

AMAP

- UAS Expert Group of Arctic Monitoring & Assessment Programme (Arctic Council)
- UAF new member (Ro is rep)
  - First in-person meeting was in Iceland in May
  - Assigned to subcommittee to develop UAS Handbook
- Focus on newly open Arctic seas security, search & rescue, standards for UAS operations

Low-altitude, over-the-pole capability

Fuel-injected, Iridium-communication-enhanced, long-endurance, small unmanned aircraft



Climate modelers need repeated measurements at defined points

Presently there are few methods to collect this data in the Arctic

The capability combines a scientific payload, polar satellite communications, and 30+ hour endurance in a 20 kg aircraft that could fly from Alaska to Norway at altitudes below 300 m.

Custom designed by UAF – successfully executed flight test Sept 29 - 30 2012. UAF is the only University in the world with this capability.

Volcanic Ash Analysis and Detection
USAF Small Business Innovative Research

- Collaboration between UAF researchers and new industry
- Opportunity to launch a business to capitalize on USAF funding with UAF Intellectual Property

Related ACUASI Research

Emergency Response and Environmental Monitoring

Ongoing (Past and Present) Successful Projects Involving

- Fisheries Research
- Oil Spill Research
- Sea Ice Research
- Environmental Protection and Monitoring Research
- Established on-call Emergency Responder

Many Federal, State, Industry, and International Customer Projects

- DHS S&T, USCG, NOAA, Navy, BOEM, F&W, EPA, NASA, FEMA
- NG, DPS, DOT, F&G
- Shell, ConocoPhillips, BP, Chevron, ExxonMobile, Cascades, IPC
- Chile, Finland, Iceland, South Africa

FAA Test Site

- Jan 2012: FAA Reauthorization Act directed FAA to select 6 Test Sites to research and test for safe integration of UAS into the national airspace
- Feb 14 2013: Solicitation was released
- UAF leads team for states of Alaska, Oregon, and Hawaii, plus 76 additional team members
  - Includes state agencies (DOT, DPS, Forestry of DNR, DHS&EM, National Guard
  - Universities, EDCs, corporations
- Proposals due multiple dates, last by May 6
- Selection targeted by FAA for Dec 31 2013

Pan Pacific UAS Test Range Complex

- University ACUASI is lead
- Fourteen specific spots around the three states
  - Strong link with military JPARC ranges
  - Forging links with manned aviation safety specialist
- Key questions to answer:
  - Procedures to protect manned aviation
  - Policies to protect privacy
  - Technical testing to assure control, see & avoid, lost link procedures work, etc

How is Privacy Protected?

- We're dedicated to protect privacy so beneficial uses can be obtained
- Current statutory/case law strongly protects privacy while defining legal airborne activities (manned)
  - Unmanned a new technology, but subject to same restrictions
  - DHS & National Institute for Justice have taken on task of defining specific UAS privacy rules
  - FAA committed to incorporating into Test Site and future rules once developed
  - DoD & Guard training on domestic privacy well underway

More on Privacy

- International Chiefs of Police issued guidelines for law enforcement use of UAS
  - Handout with full text available
  - The essence:
    - Follow FAA rules
    - Use strict supervisory accountability
    - Get warrants if any possibility of use for surveillance or investigation
    - Notify locals of intent to fly over them
    - Delete recordings not authorized by warrant, training use, or as required by law
- UAF working with DPS to assist with program, procedures, all to be set up before first flight

Other stuff

- Aviation Technology project
- First faculty member, working to get second
  - Joint between engineering & GI
  - Second pure research
- AK DHS & EM - taskable as first responders
- Northwest Compact - wildfire response
- Working to build operator & engineering staff
- Alaska legislature helps…
- Probably more…

Alaska Center for UAS Integration