

Flying to the Future:
UAS Advancements at the
University of Alaska Fairbanks
November 2, 2023



Photo courtesy of Brian Doben (www.atworkproject.com)

ACUASI

- ACUASI is the University of Alaska's drone Center of Excellence
- Our missions include:
 - Assisting the FAA in the safe integration of drones into the National Airspace System
 - Supporting Alaskan drone users and industry
 - Conducting scientific research

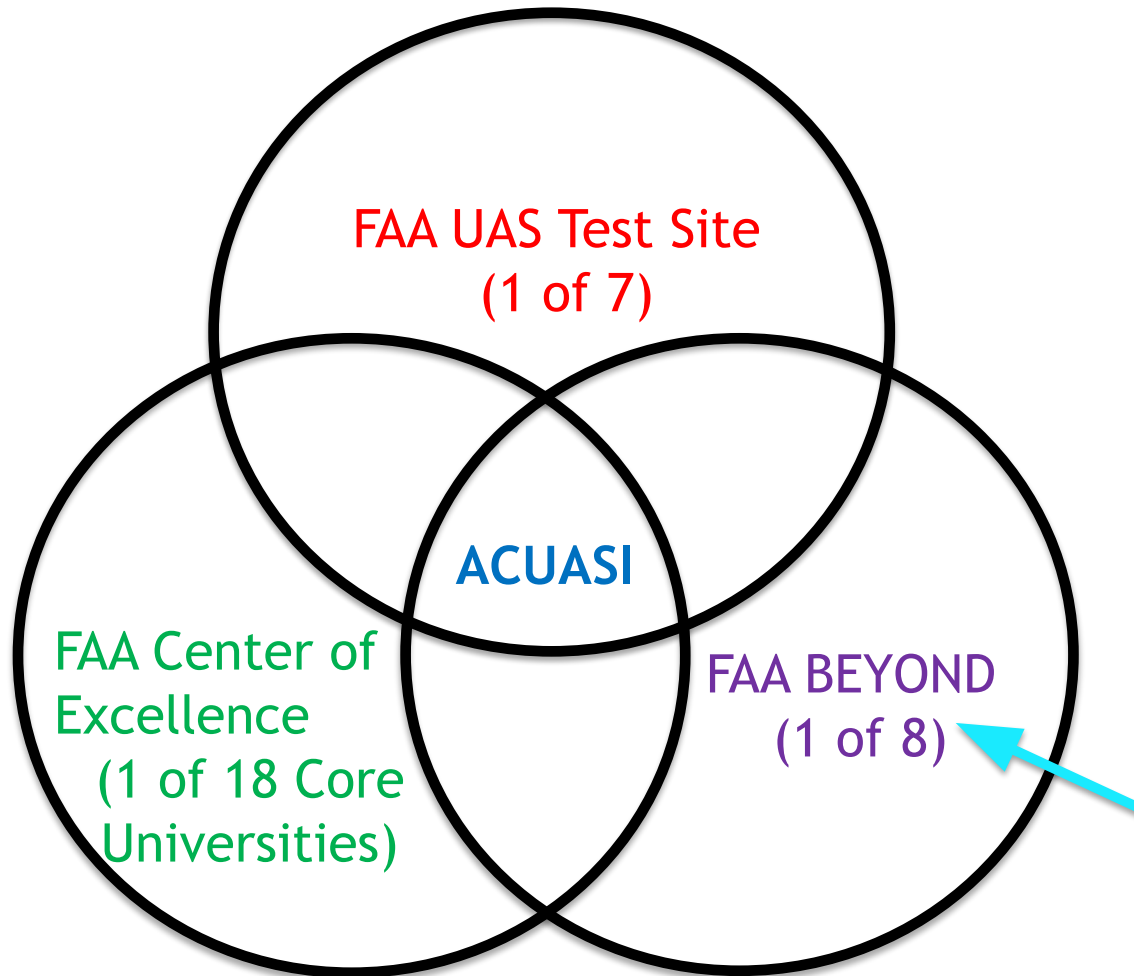


Goal - Complete Integration of Drones Systems with Traditional Aircraft in the National Airspace System



SeaHunter in Inuvik, Canada

FAA Recognition of ACUASI's Expertise



Designed to enable Beyond Visual Line of Sight (BVLOS) operations

What Really Makes Us Different

- Real-world use cases
 - Diapers and milk to the villages
- Agnostic about what technology we use
 - We just want something that works
- Beyond Visual Line Of Sight (BVLOS) is a requirement for most of our use cases
- We don't fly a box

Cargo Delivery

- Goal - To deliver cargo, including medical supplies, more frequently to remote communities via large drone
- Alaska's last 'hundreds of miles' problem
- Partnership with local air carriers
- The technologies being developed and tested are appropriate for ship-to-shore or remote location resupply



Unmanned Cessna 208 Grand Caravan
<https://evertsair.com/about/our-fleet/cessna-208-grand-caravan>

Autonomous Aircraft

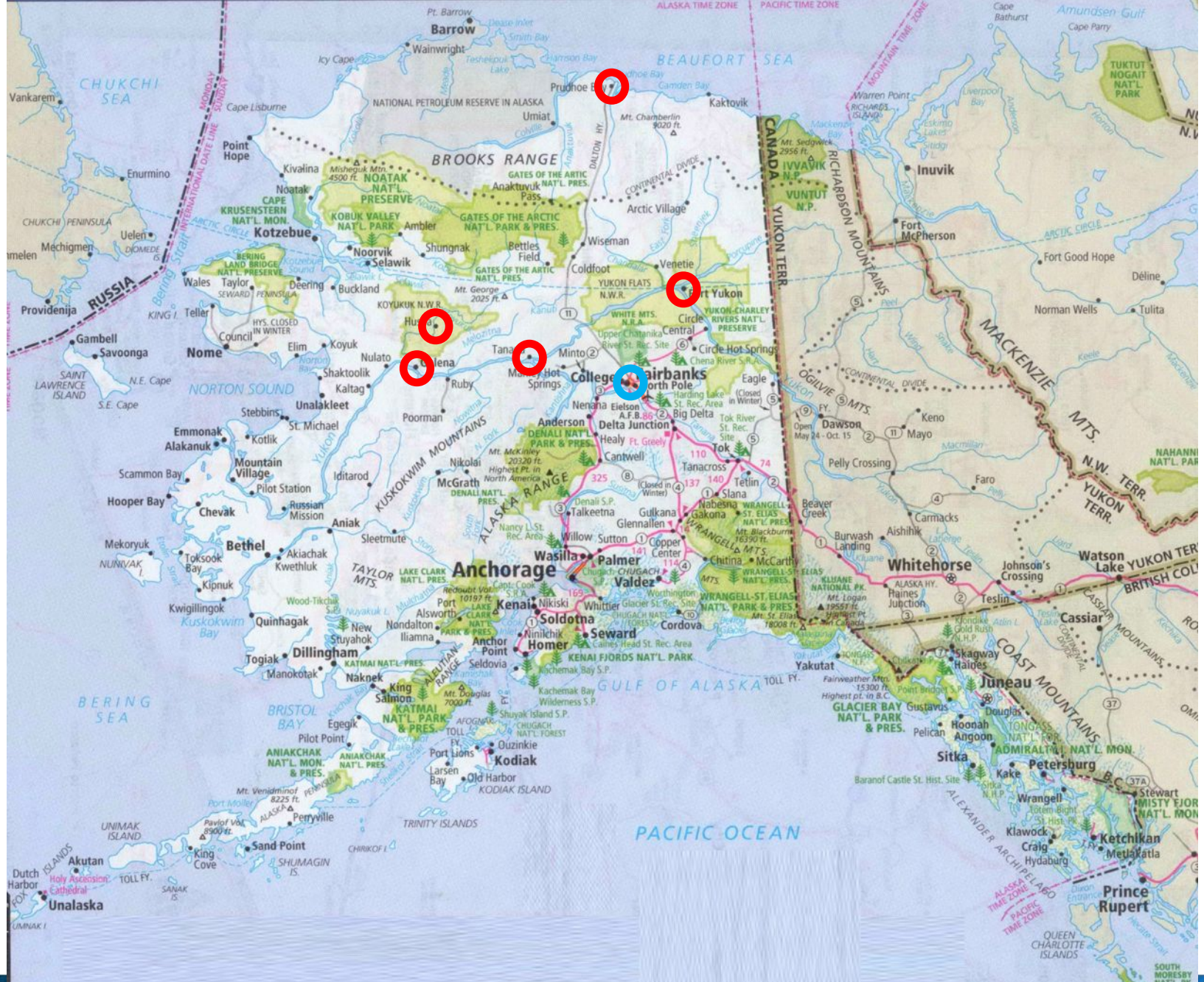
Merlin flew autonomous Cessna Grand Caravan flights in Interior Alaska in June as a part of an Alaska Test Site project

- The Merlin flights had a safety pilot on board and two software engineers

Merlin flew 25 flights between Fairbanks and five remote communities:

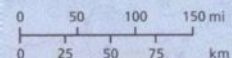
- Deadhorse, Ft. Yukon, Galena, Huslia, Tanana





From OnTheWorldMap.com

Alaska



1917



Merlin at Ft. Yukon

- Class E, non-towered airport
- This airport is a hub and has infrastructure
- Nice gravel runway
- Existing cargo handling facility
- Community engagement was extremely valuable

Fairbanks to Nenana

- SeaHunter conducted its first flight between FAI and ENN on August 2nd
- The flight was a success!
 - The hand-off between Ground Control Stations went well
 - Smooth flight and landing
 - Set up at FAI was the same as for the Sentry flights in May 2022



Breaking Barriers



- Doing something new always has some unknown piece of paper required to operate
- Then UAF got asked to stand down due to an issue with where our GCS was located at ENN
- The UAF team worked the issue with all levels of the FAA and again received approval to fly
- The team flew FAI-ENN on Sept. 7th
- The FAI-ENN-FAI flight occurred on Sept. 8th

Please note the terrain



Photos courtesy of Peter Houlihan and Cathy Cahill

Infrastructure Surveillance

- FAA granted ACUASI a Part 107 waiver for operations along a 20-mile stretch of TAPS for conducting Beyond Visual Line of Sight (BVLOS) pipeline monitoring testing
- We are using this section of pipeline as well as others to test the Detect and Avoid (DAA) technologies and long-distance command and control links required to conduct long-distance, BVLOS operations



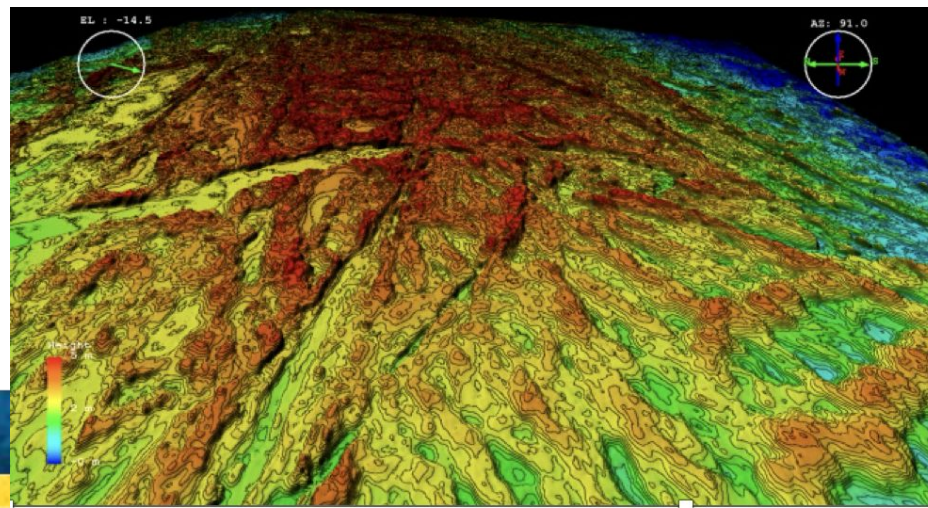
CAUTION
DEEP GULCH
LOW WALLS

Upcoming Maritime Mission

- Goal - deliver an environmental water sample from a natural gas platform 15 miles offshore in Cook Inlet to shore.
- Operation will be Beyond Visual Line of Sight (radar and visual observer at shore to ensure a minimum of 2 minutes response time for any plane breaking the radar plane)

Ice and Snow

- Development of multiples sensors to determine the thickness and condition of ice on rivers and oceans
- STEM outreach based on drones looking at snow and ice in a school's environment



Disaster Response

- ACUASI is part of an FAA project that aims to develop a concept of operations for how different federal, state, and local governments, civil operators, and others can deploy drones cooperatively after disasters, such as earthquakes, volcanoes, ice jams, river flooding and oil spills
- ACUASI and the Alaska Department of Transportation and Public Facilities (DOT&PF) are using drones to identify areas with high avalanche potential and mitigate them



Counter-drone (FAA, DOJ, DHS, ...)

The ACUASI team has entered the realm of counter-drone (C-UAS):

- FAA - ASSURE - Effect of detection and mitigation systems on first responder communications, navigational aids, and other systems critical to the safety of the NAS (the flight campaigns are DHS campaigns)
- DOJ - The use of passive radiofrequency drone detection systems to support local law enforcement agencies
- Army - The development of a mobile prototype system for detection of drones near a column of troops under motion

Civil Operations

- ACUASI received a waiver from the FAA that greatly expanded our ability to help drone manufacturers get their aircraft approved for use in the National Airspace System
- This is the first such waiver ever granted by the FAA



U.S. Department
of Transportation
**Federal Aviation
Administration**

Aviation Safety
Flight Standards Service

800 Independence Ave
Washington, DC 20591

Dr. Catherine F. Cahill, Executive Director
University of Alaska, Unmanned Aircraft Systems
Test Site (Alaska UASTS)
PO Box 757320
Fairbanks, AK 99775
Email: cfcahill@alaska.edu

Dear Dr. Cahill:

This letter is to inform you that the Federal Aviation Administration (FAA) has granted your request for a Waiver (Waiver No. 44803-1) issued under the authority of 49 United States Code (U.S.C.) § 44803(c) for civil operations at an- Unmanned Aircraft System (UAS) test range. This letter transmits the FAA's decision, explains the FAA's basis, and provides the conditions and limitations of the Waiver, including the date it ends.

Emerging Technology Test Ranges

- ACUASI has started setting up three Emerging Technology Test Ranges:
 - Nenana Municipal Airport (ENN)
 - Palmer Municipal Airport (PAQ)
 - Valdez Airport (VDZ)
- Purpose – To assist companies with testing prototype systems and payloads under Alaskan conditions
- Each range will include an on-site range manager, hangar space, and test and evaluation equipment



Nenana Emerging Technology Test Range

- UAF is building a hangar at ENN
- The hangar will have radar and other equipment needed for researchers and companies to test BVLOS operations of large drones under challenging conditions with the Alaska Test Site safety oversight



AWIP Panels on garage door

Education

- UAA, UAF, and UAS are all developing drone courses
 - UAA: Remote Pilot w/operations over people
 - UAF: Certificate in UAS operations and additional degrees in aerospace engineering
 - UAS: Drones in environmental studies
- ACUASI conducts STEM outreach events



What's Next?



- Fly numerous drone missions between Fairbanks and Nenana for DAA testing
- Fly numerous drone mission long-distances to test command and control solutions
- Work with scientists to develop new payloads and data products
- Develop metrics for evaluating the success of ACUASI's efforts to spur economic development in the drone industry
- Continue our work with the State of Alaska DOT&PF
- Conduct STEM outreach across Alaska

The University of Alaska is leading the way to routine UAS operations!

