Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)

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What is an Unmanned Aircraft System (UAS)?

Alaska Center for Unmanned Aircraft Systems Integration (ACUASI)

- ACUASI is the University of Alaska's unmanned aircraft system (UAS) research program.
- ACUASI is a key partner in the Federal Aviation Administration's Center of Excellence for UAS.
- ACUASI leads the Pan-Pacific UAS Test Range Complex, one of the seven FAA UAS Test Sites.

The Team

- Pilots (small and large UAS)
- Operations/Flight planning
- Engineers
- Research Scientists
- Education/Training
- Administration
- Its working together

Aircraft

Aircraft: Small/Medium UAS – Ptarmigan

- Electric; Hexacopter.
- Modified S800 airframe.
- 1.5kg payload.
- Payloads: EO/LWIR.
- Flight duration 10-15 minutes depending on payload, elevation, winds.

<u>Missions</u>

Oil Spill R&D

Snow/Ice mapping

NASA Air-Traffic Management

Aircraft: Small/Medium UAS – ING Responder

- Electric single rotor helicopter.
- 3DR PixHawk autopilot.
- Payload: 3 kg max.
- Fight duration 40 minutes.
- Payloads: EO/LWIR cameras; VLP16 LiDAR

<u>Missions</u>

Glacier mapping

BVLOS for Pipeline monitoring

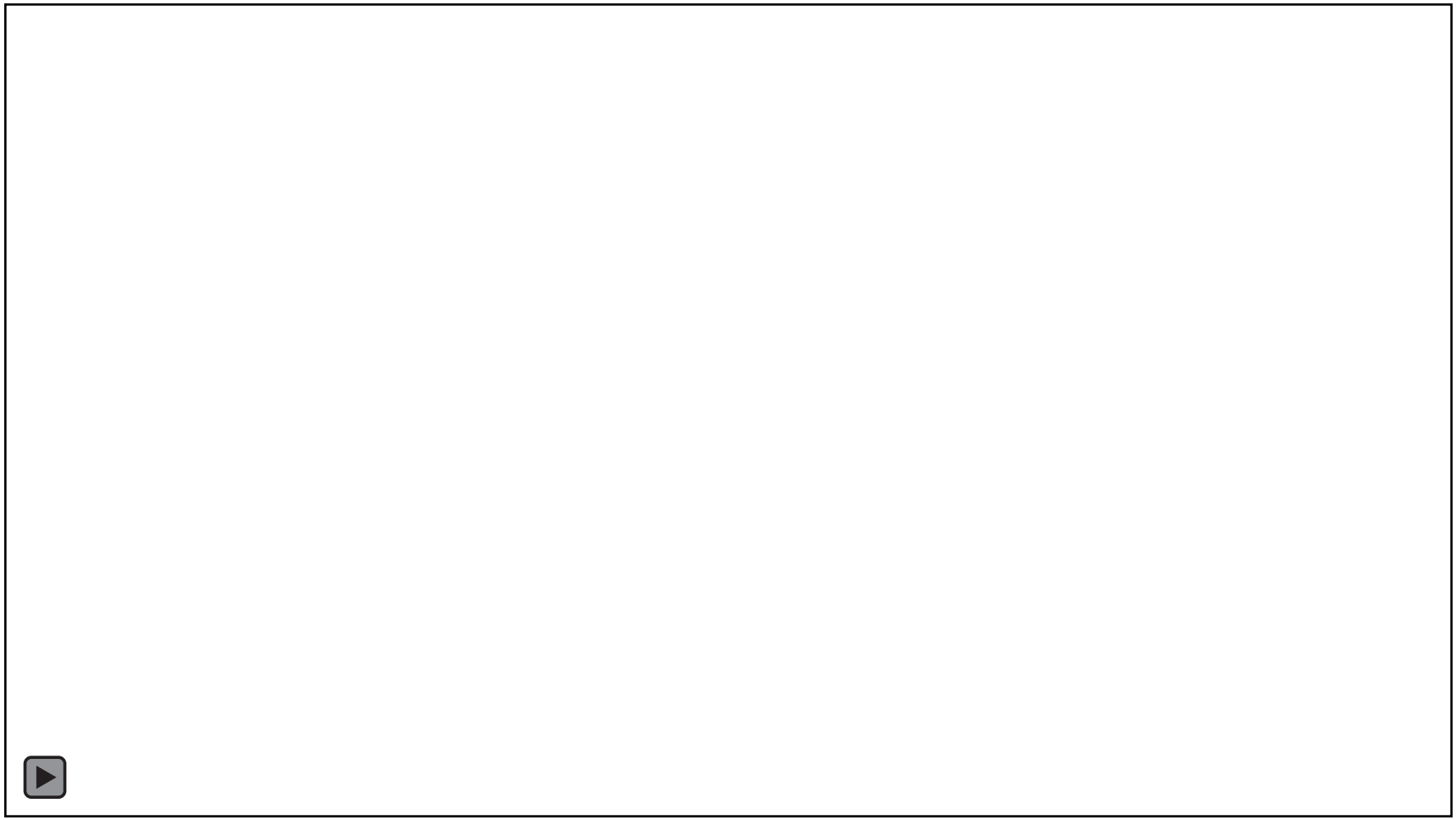
River Ice Breakup

Aircraft: Small/Medium UAS – R&D

Aircraft: Large UAS – Seahunter

- Medium-Large UAS (300 lbs. MTOW).
- 6+ hours endurance.
- Optimized for BVLOS maritime operations.
- Features: ADS-B, AIS, Iridium, MIMO, Yagi antenna, DGPS, Piccolo autopilot, Trillium HD50-LV.

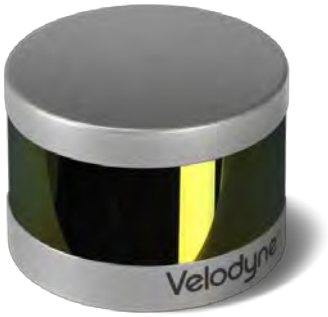
Aircraft: Large UAS – Seahunter



Payloads

Payload: Velodyne VLP16 LiDAR

- High definition 3-D information about the surrounding environment.
- 16 channels, up to 120 m range.
- 5 – 20 Hz.
- ~300,000 points/second.
- 360° HFOV; 30° VFOV.
- Integrated onto Responder.
- One on ground vehicle as well.



~ 9 cm

Uses

High resolution surface mapping

Terrain modeling

Scene mapping

Payload: Visible

Nikon D810.
36.3MP.
7360 x 4912 pixels.
Full Frame, CMOS sensor.

Sony A7R.
36.4 MP, ISO up to 25600.
E-mount Camera; Full Frame Sensor.

Sony NEX7.
RGB/VNIR dual set-up.
24.3 MP; 10fps.

Payload: Long Wave Infrared

FLIR Vue Pro.
7.5 – 13.5 μm, 640 x 512 pixels.
30Hz, 44° FOV.
2.26” x 1.75” dimensions

FLIR A65.
7 - 13 μm, 640 x 512 pixels.
45° x 37° FOV.

Future: FLIR Duo Pro R.
4K RGB camera.
7.5 – 13.5 μm, 640 x 512 pixels.
45° FOV. Visible and LWIR together.

Payload: Adaptable Instruments

- Methane sensors.
- Optical particle counters.
- RGB/VNIR dual GoPro.
- Airborne radar [24.55 GHz].
- Visual distance measurement.

Missions

Mission: Oil and Gas Infrastructure

Eni Infrastructure

Part change out on gas flare stacks has traditionally been performed by ordering parts and shutting the stacks down without knowing whether they required replacement.

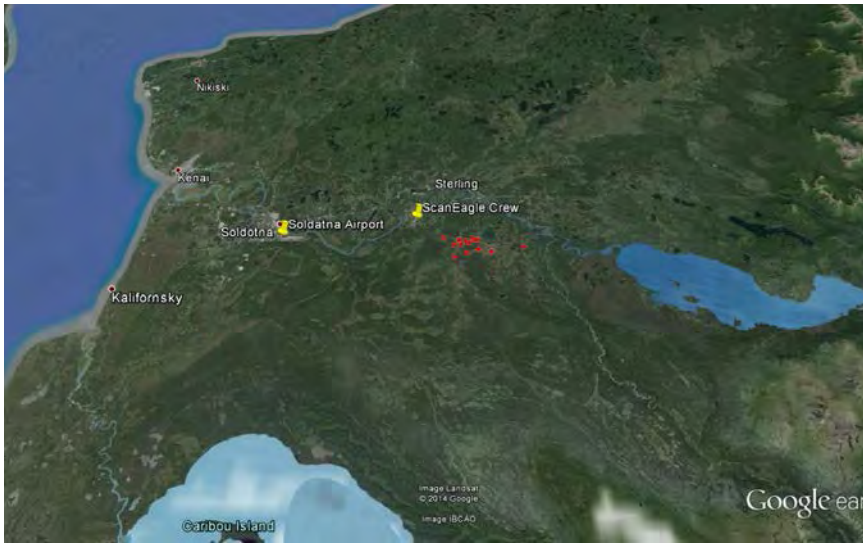
Oliktok Point Production Facility

Through the power of UAS, it is possible to fly close enough and capture video showing whether a part has outlived its useful life.

The result - **$1 to $3 million in savings per stack** by not shutting down unless replacement is necessary.

Mission: Funny River Fire Mapping

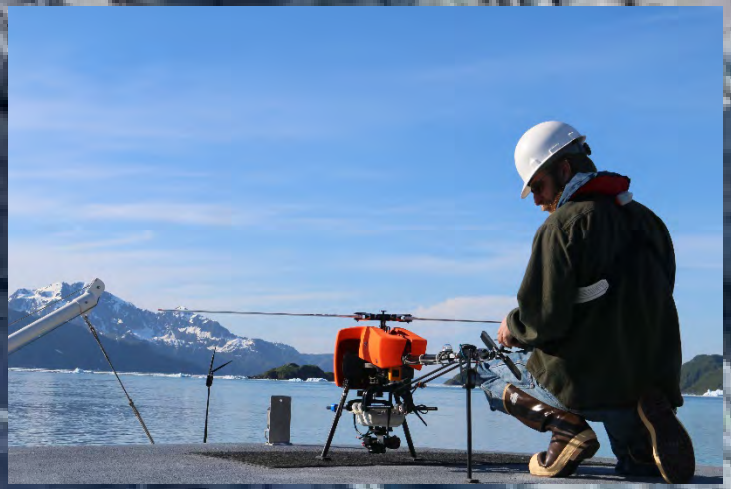
- Support wildfire personnel.
- LWIR data [7 - 13 μm].
- Flew at 'night'.
  - Alaska summer → daylight.

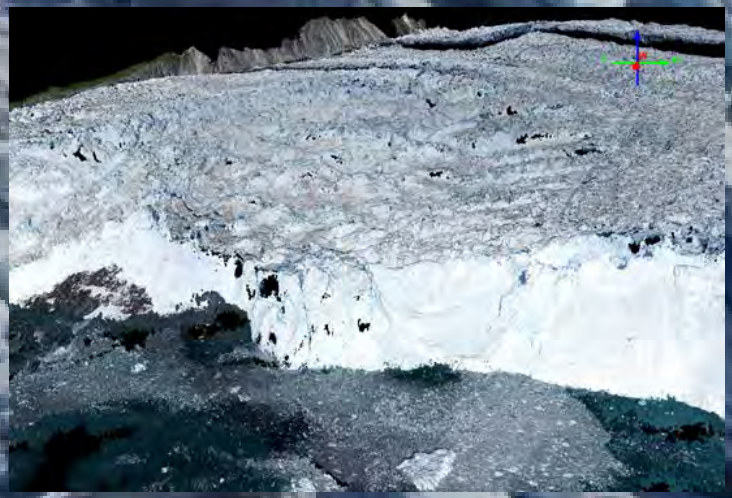


Mission: Oil Spill Research

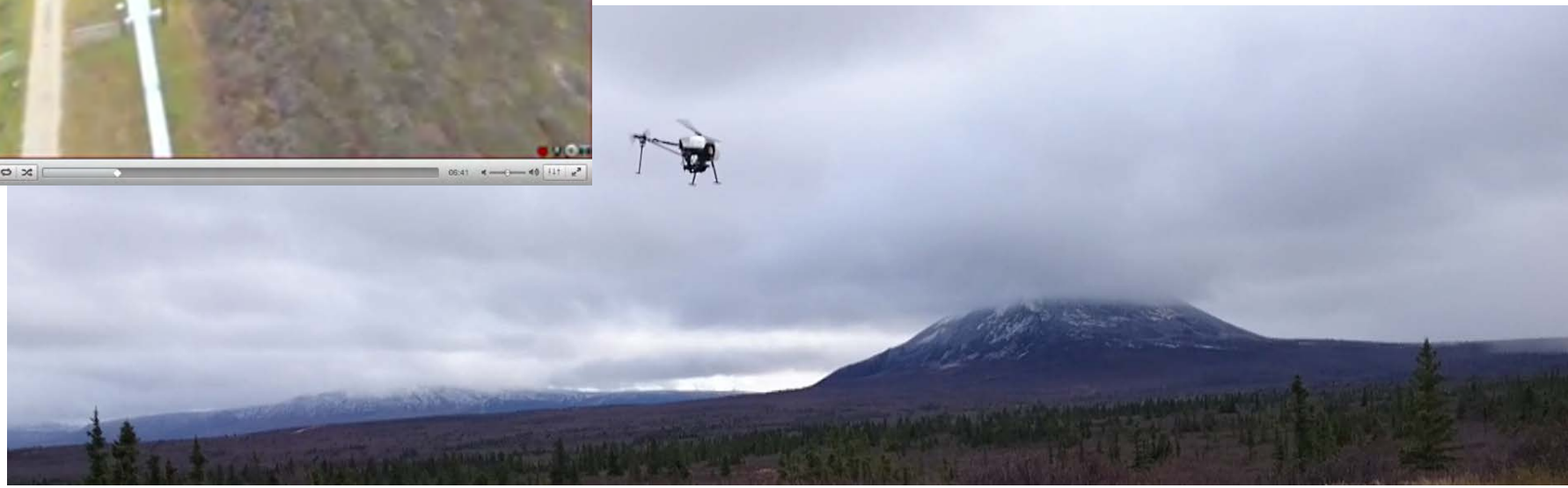
Mission: Mapping Aialik Glacier

- Responder aircraft.
- UAS survey of the front portion of Aialik Glacier.
- Sony NEX-7
  - 6000 x 4000 images
- Mosaic at 15cm per pixel.
- High resolution elevation models at 15cm per pixel.





Mission: Beyond Visual Line of Sight along Trans-Alaska Pipeline



- Monitoring of critical infrastructure, the Trans-Alaska Pipeline, BVLOS of the Pilot in Command in Class G airspace.
- Complex COA process included cooperation from the Alyeska Pipeline Service Company, coordinating airspace with military, using ADS-B transponders, and requiring daisy-chained observers.

Mission: NASA UAS Traffic Management

- Technology Capability Level 1
  - Four UAS in the air at the same time at Poker Flats Research Range and at every test site in the country.
- Technology Capability Level 2
  - Only team to operate aircraft in 2 of 3 missions.
- Technology Capability Level 3
  - Sense and Avoid.
  - Real-time precision for situational awareness.
  - Multiple aircraft tracking.

Federal Aviation Administration Test Range

- Pan Pacific UAS Test Range Complex (PPUTRC).
- One of seven official FAA test sites.
- Spans seven climate zones.
- UAS manufacturers and potential users can test their equipment in the Arctic, the tropics, and in arid environments.

Alaska
[2013]

Oregon
[2013]

Hawaii
[2013]

Mississippi
[2016]

ACUASI: UAS Summary

- UAS ideal for dirty, dull, and dangerous operations.
- UAS provide the ability to make measurements in remote portions of Alaska safely.
- UAS need to be hardened for extreme cold and icing conditions.
- University of Alaska's unmanned aircraft system R&D program.