The Opportunities for Advancing the DoD Arctic Strategy Resulting from Recent Rapid Advances in UAS Technology and Regulations

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What is the Alaska Center for UAS Integration (ACUASI)?

- ACUASI is the University of Alaska's Unmanned Aircraft System (UAS) research program
- ACUASI leads the FAA's Alaska Test Site (a.k.a. the Pan-Pacific UAS Test Range Complex)
- The University of Alaska Fairbanks (UAF) is a core member of the FAA's Center of Excellence for UAS Research (ASSURE)

ACUASI's Military Experience

- Approximately 125 years of combined military service on the ACUASI team
- Over 27,250 combined hours flying and operating military aircraft, approximately 8,000 of that is combat hours
- On the ACUASI team are crewmembers qualified on over 30 different manned and unmanned military aircraft
- ACUASI is a place that military skills are a direct transfer to civilian employment

ACUASI's Role in the Arctic

- We provide a perfect environment for testing and evaluation under Arctic conditions
- We are developing techniques and equipment for use in adverse conditions (cold, poor communications, etc.)
- We, in conjunction with, the scientists and engineers at UAF are developing state of the art payloads for use on UAS (remote sensing, aerosol, etc.)

ACUASI's UAS Fleet

(evolution in action)

Operational Need

The lack of infrastructure and population in the U.S. Arctic means that key missions need to be conducted using remote sensing techniques:

- Persistent surveillance for Arctic domain awareness
- Remote infrastructure monitoring
- Data collection for Arctic science
- Search and Rescue

Figure courtesy of George Backus, Sandia National Laboratories

1917

Solution

Long-endurance UAS have the ability to achieve many of these missions without putting human lives at risk

Operational Challenges

- Cold and dark
- Poor GPS
- Poor satellite coverage (Iridium)
- Icing of airframes and payloads
- Exposed pilots and observers
- Battery life is significantly degraded
- Gravel and icy runways
- Significant manned aircraft activity in surprising areas

SeaHunter Launch on Icy Runway

SeaHunter – Night Landing

Scanning the icing for model comparison

Biggest Challenges for Flying UAS in the U.S.

- Regulations
  - Beyond Visual Line of Sight (BVLOS), night ops, ops over people, time to get COAs
- Cost
  - Hardware, deployment, personnel
- Rapid Technology Development
- Technical experts vs. pilots (e.g. Uber)

UAS Opportunities

- Most of the commercial UAS industry is focused on small and medium UAS due to costs

- Many of the industry's proposed missions require the same capabilities as defense related missions: multiple hour endurance with BVLOS and night capability

Beyond Visual Line of Sight (BVLOS) - 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 coordinating airspace with military, using ADS-B transponders, and requiring daisy-chained observers.

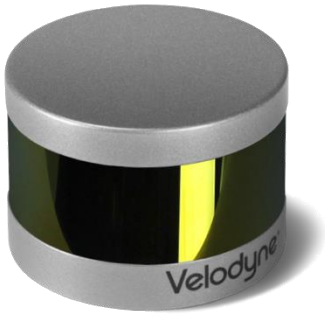
Biggest Opportunities

- UAS industry is rapidly developing low size, weight, and power systems for:
  - Communications, command, and control
  - Sense and avoid
  - Data transmission
  - UAS identification and tracking
- UAS industry is developing highly capable systems far faster and less expensively than DoD

Opportunities

- Many of these civilian missions produce imagery so small, high-resolution cameras, including multispectral and hyperspectral, and other payloads, such as lidar, are developing quickly

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



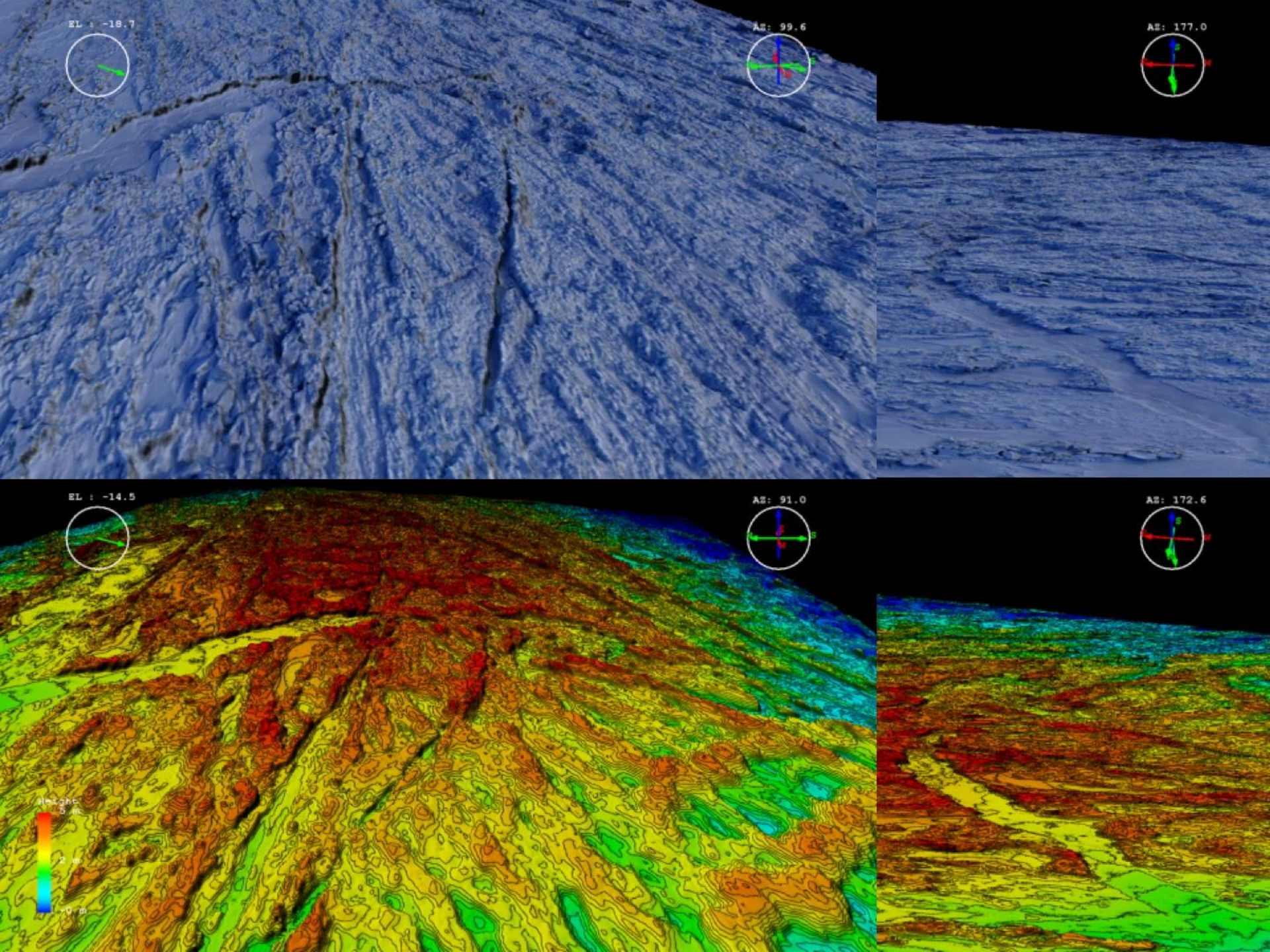
Velodyne Puck Lite Lidar
~ 9 cm

Biggest Civil Opportunities

- Integration Pilot Program
- NASA Systems Integration and Operationalization Demonstration
- Legislative and Executive Branch pushes to accelerate integration (FAA Reauthorization)
- Rapid technology development by commercial entities
- FAA Test Sites and Center of Excellence
- Development of standards

Arctic Opportunities

- Arctic missions require flying UAS BVLOS at night because the missions must occur year round, including the depths of winter and over the Arctic Ocean
- DoD can take advantage of the testing and evaluation of commercial systems and payloads to improve their concepts of operations, technology, and time to deployment of new technologies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Recommendations

- DoD should take advantage of the changing FAA regulations and rapid commercial UAS technological developments to advance their UAS capabilities
- Use ACUASI's work for Transport Canada and others to develop CONOPS for operating in the Arctic

Recommendations (cont.)

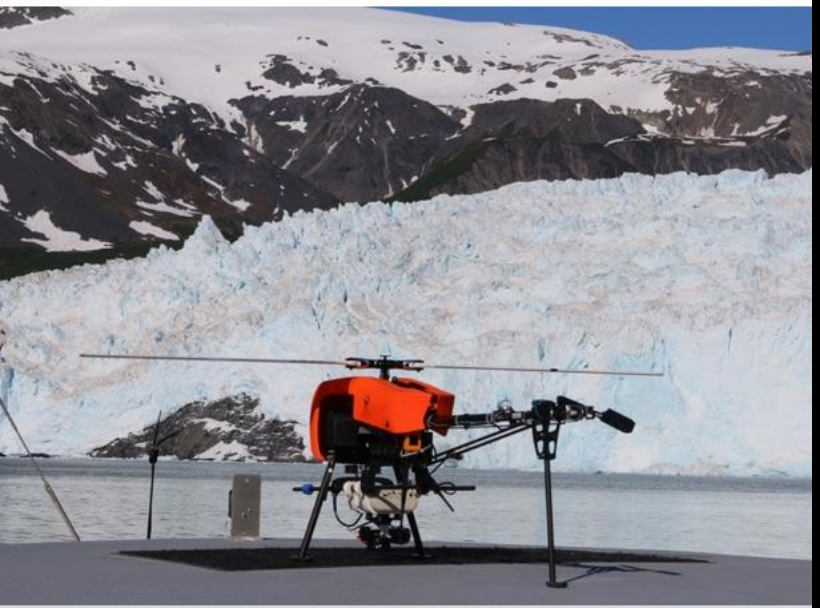
- DoD must routinely fly updated UAS systems in the Arctic, outside of restricted airspace, BVLOS, under real-world conditions, from icy and gravel runways, and under airspace jamming scenarios like Red Flag in Alaska
- DoD must harden the systems and develop CONOPS for securing the U.S. Arctic
  - Leverage civilian activities
  - Test in the Arctic, not in warmer climes

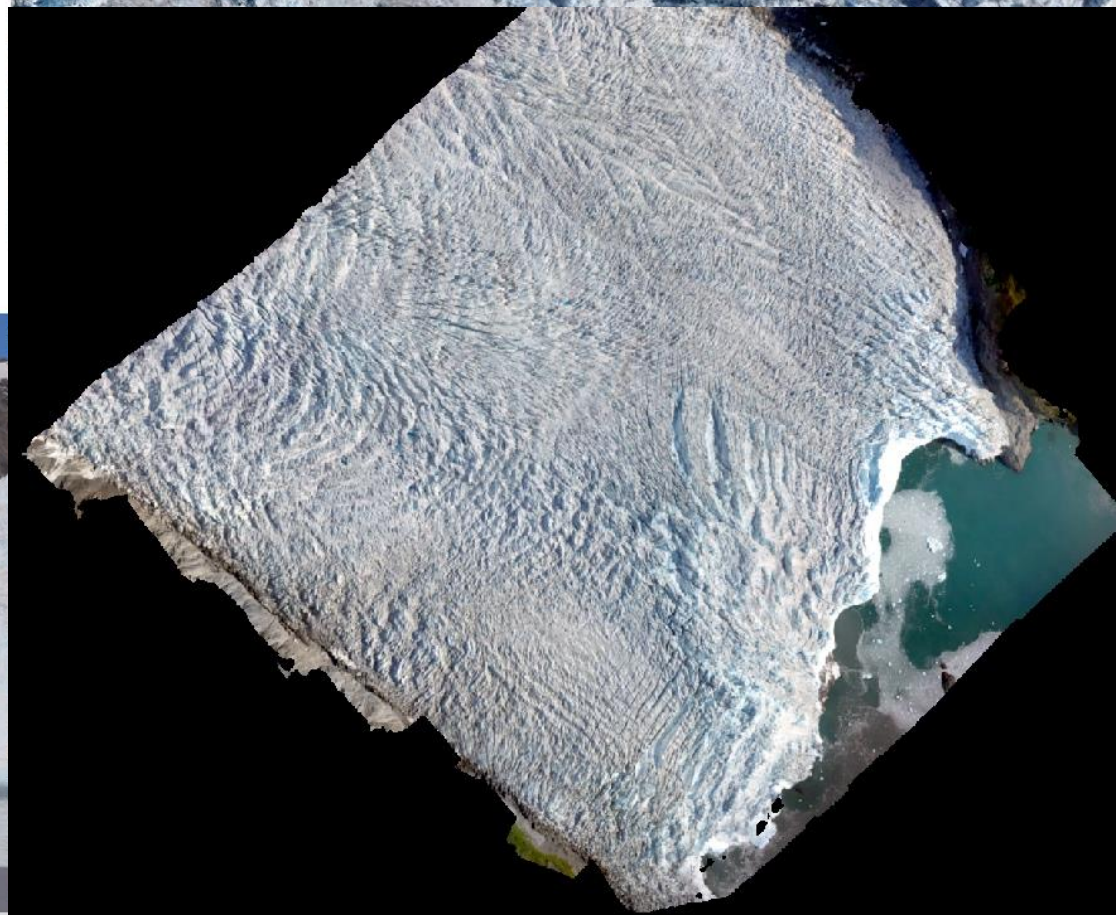
How Do You Successfully Operate in the Arctic?

- Plan, test, and practice
- Many operators would like to take a commercial off the shelf systems and operate them under extreme conditions
  - Don't do it! This will lead to failures
- Talk with arctic practitioners
- Modify your equipment and SOPs
- Plan, test, and practice some more
- Be creative when all of the above fails

Aialik Glacier
Kenai Fjords National Park

- Responder operation
- Launch and recovery from moving 18.5’ by 12’ deck
- Mapped Aialik glacier





Questions?

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