ACUASI/PPUTRC Research

SCOAR

14-15 April 2015

Alaska Center for Unmanned Aircraft Systems Integration

(907) 455-2015/2016

Pan Pacific UAS Test Range Complex (PPUTRC)

Roadmap

- About the Test Site
- Activities since last year
  - Test Site & others—a few missions
  - Politics in our states
- Research Plan for 2015
  - Agency supported
  - Industry supported
  - New UAS
- Challenges and opportunities

Pan Pacific UAS Test Range Complex (PPUTRC)

- University of Alaska is lead
- Principal members include States of Alaska, Oregon, Hawaii and Iceland
- Participating team members
  - Various universities, businesses, associations, agencies, military
- Member of ASSURE COE team

PPUTRC Ranges Outside Alaska

- Three Oregon ranges
  - Tillamook/Near Space LLC—Small uncontrolled public airport, high altitude balloon ops, some UAS
  - Pendleton—small public controlled airport, operational
  - Warm Springs Reservation—managed by confederated tribes corporation, COAs approved, near operational
- Hawaii offers high altitude corridors
  - First COA for the Big Island near submission, for research on traffic management with NASA
  - Exploring opportunities with interested participants
- Iceland—formally added as range

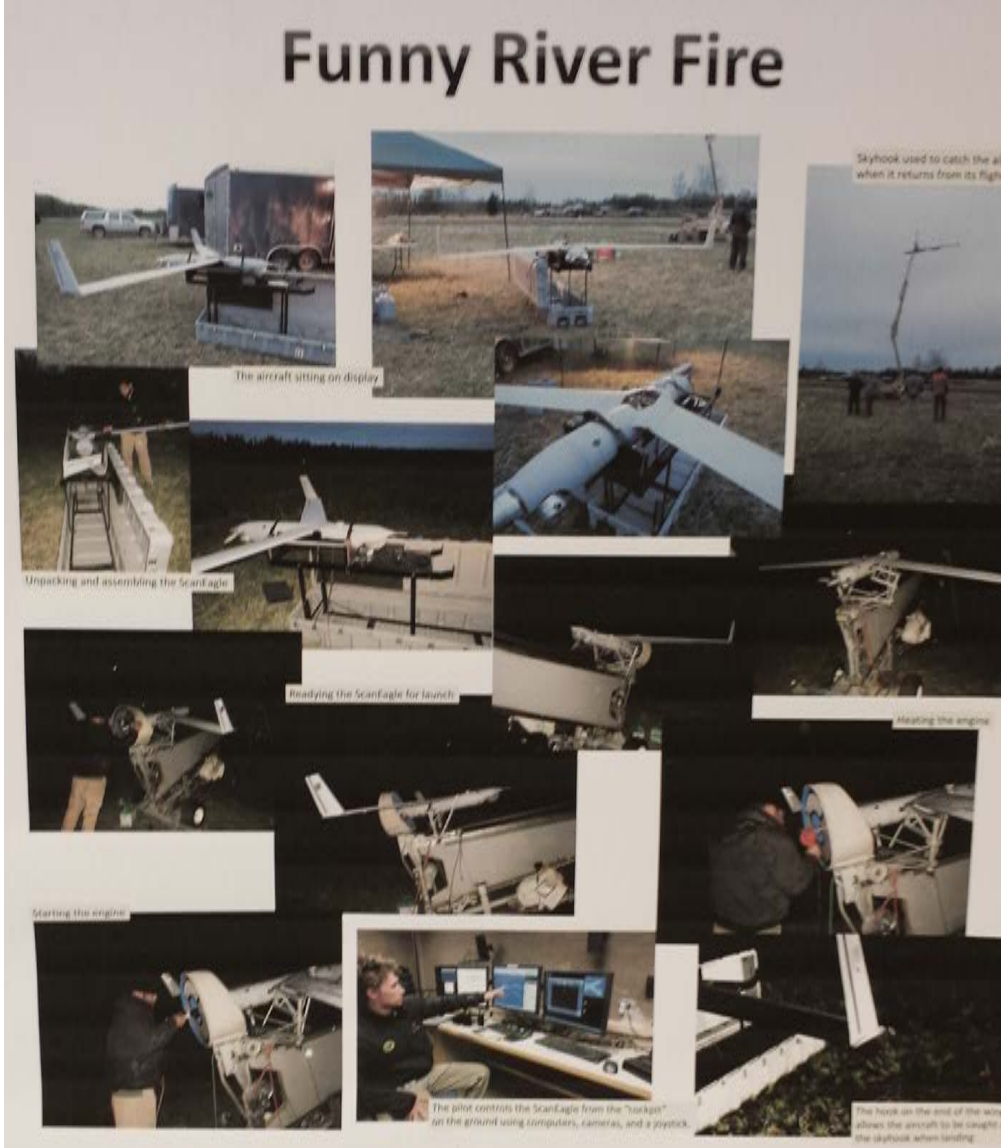
PPUTRC in Alaska

- ACUASI leads Alaska ranges
  - Kodiak Range--managed by Alaska Aerospace—not yet operational
  - Other Alaska ranges are deployment locations-no permanent presence
  - Future UAS Tech Park/airport in planning
  - Other “Alaska” locations: Kansas, Tennessee
    - Not full partners—subordinate to Alaska

Activities since last time

- Outreach is making a difference
  - Alaska Air Carriers Association 2014—rotten tomatoes; 2015—invited us to join (and they have to change bylaws)
  - AOPA—2014—highly skeptical; 2015—joint project to improve NOTAMS
  - General aviation & pilots groups: applying to be UAS pilots
  - Oregon—looks like adverse law will get repealed, Test ranges funded
  - Hawaii—good legislative support, looks like funding coming
  - Alaska legislature—still strong support, funding surviving

UAS Operations



The University of Alaska's Unmanned Aircraft Systems program provides support to fire personnel with their ScanEagle, which is equipped with long-wave infrared imagers and cameras that locate heat sources near the fire's perimeter.

National and International Support

Emergency Mgmt - Funny River Wildfire May/June 2014

Friday 23 May: ACUASI received request

Sat/Sun 24/25 May: We packed

Mon 26 May: Resource Order received, team departed. Emergency COA requested

Tues/Wed 27-28 May: Set up, moved, set up, crew rest. Got eCOA, also permission to fly over KNWR

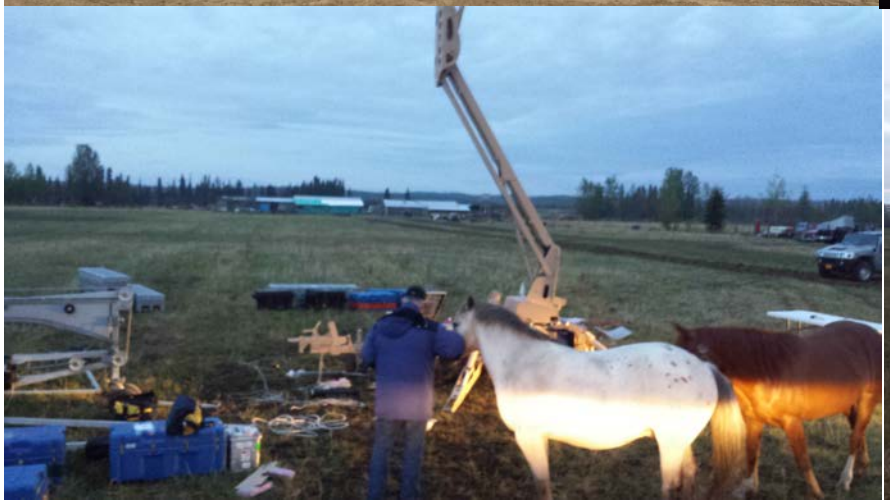
Wed night 28 May: first flight

Thur 29 May + 5: flew, downloaded images, uploaded to Interagency Dispatch Center system

Each day: crews downloaded maps, clicked to get IR photos of hot spots

Results: Strong positive response from firefighters, learned lessons, may have shortened fire fighting timeline by 2-3 weeks (per firefighters)

Funny River Wildfire
May/June 2014 Images



Funny River Wildfire Hotspot Data 1 & 2 June

First Responder Demos 7-11-2014

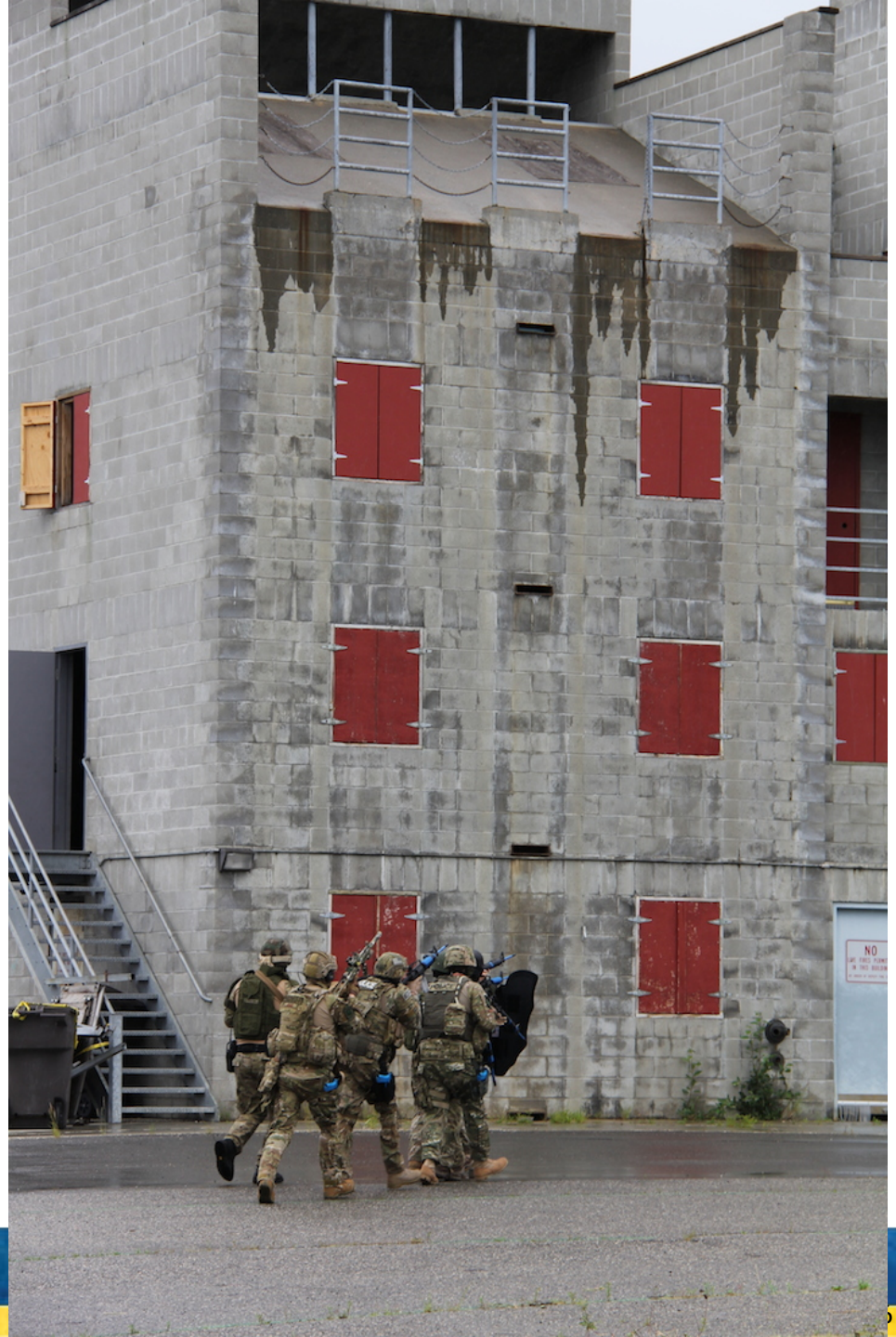
- Four scenarios supported, AK Troopers, Fairbanks Fire & Police
- Troopers: Forensics data capture of MVA, 2 vehicles, 2 lane highway
  - UAS: 7 min flight, 2 hours post processing, 3D color "fly-thru" result
  - Conventional: 80 min data collection, "3+ hrs processing," printed paper product
- Fairbanks Police: Armed suspect in multistory building
  - UAS with IR used to locate entrances, windows, obstacles, then watch suspect as possible
  - Oversight of scene informed Tactical Team & IC Commander, enabled close timing & takedown


Airspace Safety Observer
Bad Guy


Scout

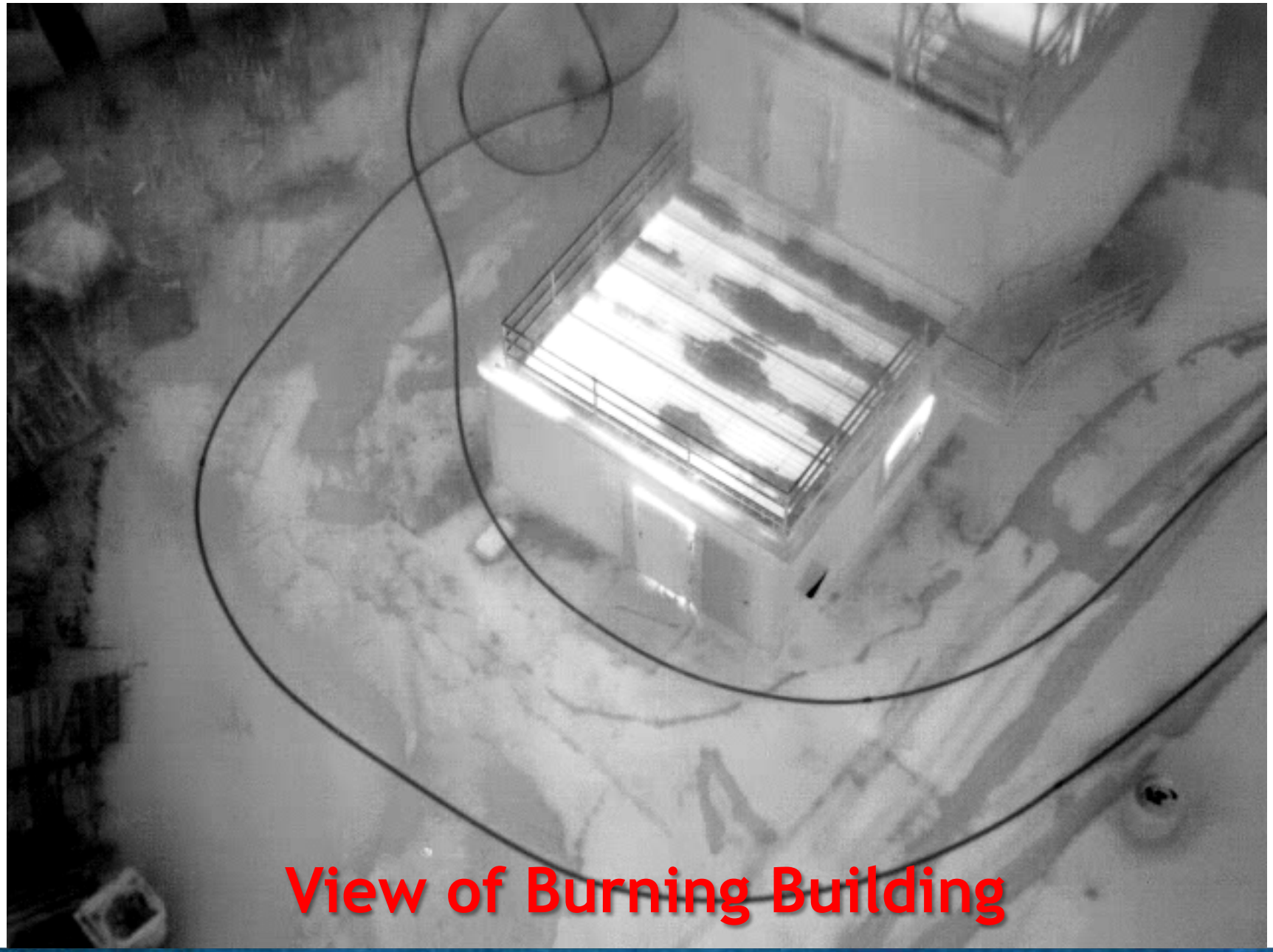
Team Insertion

- Scout operator reports Bad Guy has moved inside & is not looking out window
- Tactical team moves in while BG is out of view
- Team cannot see BG unless he leans over window sill or outside barrier



First Responder Demos, 7-11-2014

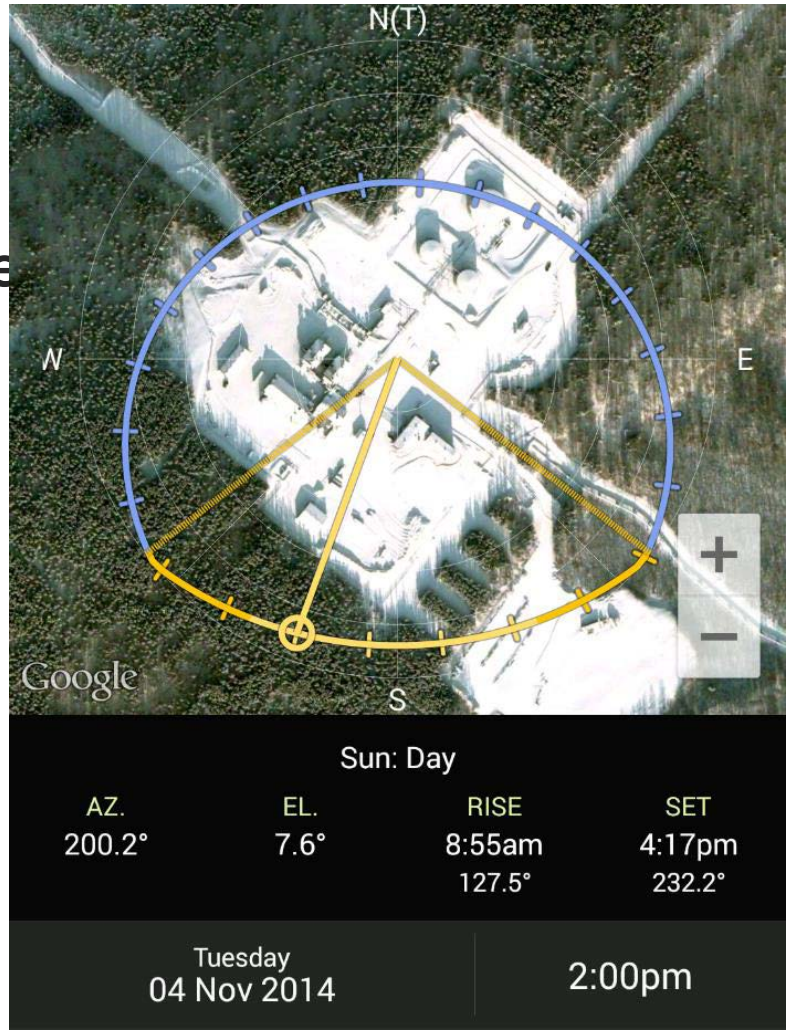
- Fairbanks Fire Department
  - Burning (training) building, UAS with IR showed location of fire, enabled precise attack by firefighters
  - As breach occurred, (opened doors/windows), effect on fire observed
  - Second scenario, fire pronounced out, UAS located hot spot for follow-up
  - Minimal effect in training building, but significant for large industrial or multistory buildings
- All first responders impressed, considering own program
- FAA observers convinced very small UAS for first responders NOT of significant concern to safety of airspace



View of Burning Building

Alyeska Pipeline Inspection

- Proof of inspection concept
  - Phase 1
- Ptarmigan Hexacopter
- Multiple flights to determine be approach
  - Angle relative to sun angle (November flights)
  - Distance from pipeline
- Ability to remote to Anchorage
- Comparison to satellite data
- Reliability, stability of UAS
- Future: grow into BLOS, new payloads like IR



EOD/EPA particle collection

- EPA air quality project assessing UAS for air sampling over an explosive ordnance disposal action
  - In restricted airspace (inherently risky operation)
  - No COA, so no reporting mechanism available yet
  - Further testing ahead, so opportunity for questions available
- Direct comparison with ground-based sampler
- Results: Ground-based sampler didn't work in Alaska winter conditions; UAS mounted sampler worked perfectly
  - Sample comparisons not possible, but UAS effective, safer, more operationally available
  - Effective interaction with range management

Large Animal Research

- Expanding on first operational day, multiple flights with multiple rotorcraft
- Assessing impact on animals, improved counts, proper distances
- Assessing adequacy of NOTAMs, details for tower personnel to convey to pilots, reaction of pilots (none, so far) (FAA Consideration 9 (C9))

Formal Processes

- Pilot/Observer Training (FAA C41)
  - First formal pilot training conducted in March on Ptarmigan
  - Prior ground school test passed
  - Now assessing outcome & update as needed
- Aircraft acceptance testing
  - Ptarmigans 2-5 completed acceptance test last week
  - Assessing lessons to date; continuing to compare flight operations to assess adequacy of acceptance test (FAA C38)
- FISDO Part 135-like support to manual development
- Continuous improvement process throughout—redesigning AWS & FPG into unified process/ document

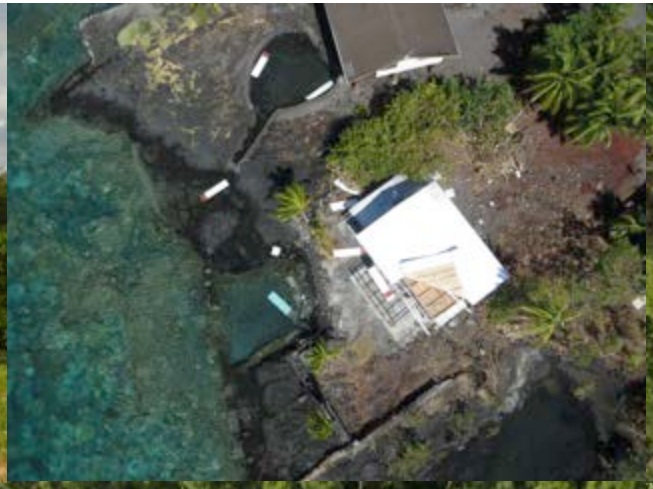
Progress in Hawaii

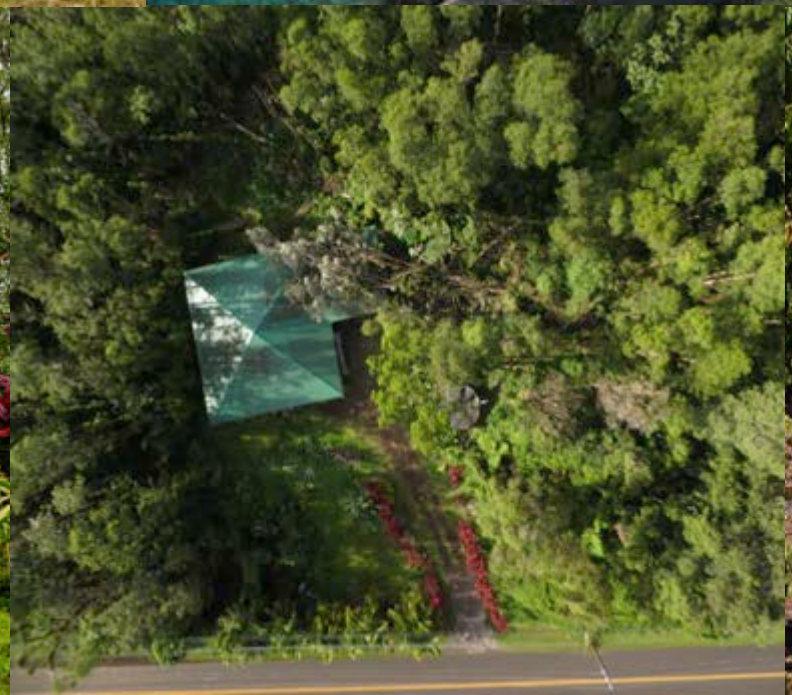
- "Adopted" University of Hawaii Hilo team
  - Already part of team, moving into lead for Hawaii
- Operationally focused team
  - Young, focused, mission-oriented, smart & determined to do it right
  - Operating on a shoestring, but with leadership support
  - Secured first COAs on own, directly supporting civil defense
- Leadership support—meet Arthur

University of Hawaii Hilo
Mapping the Lava Flow

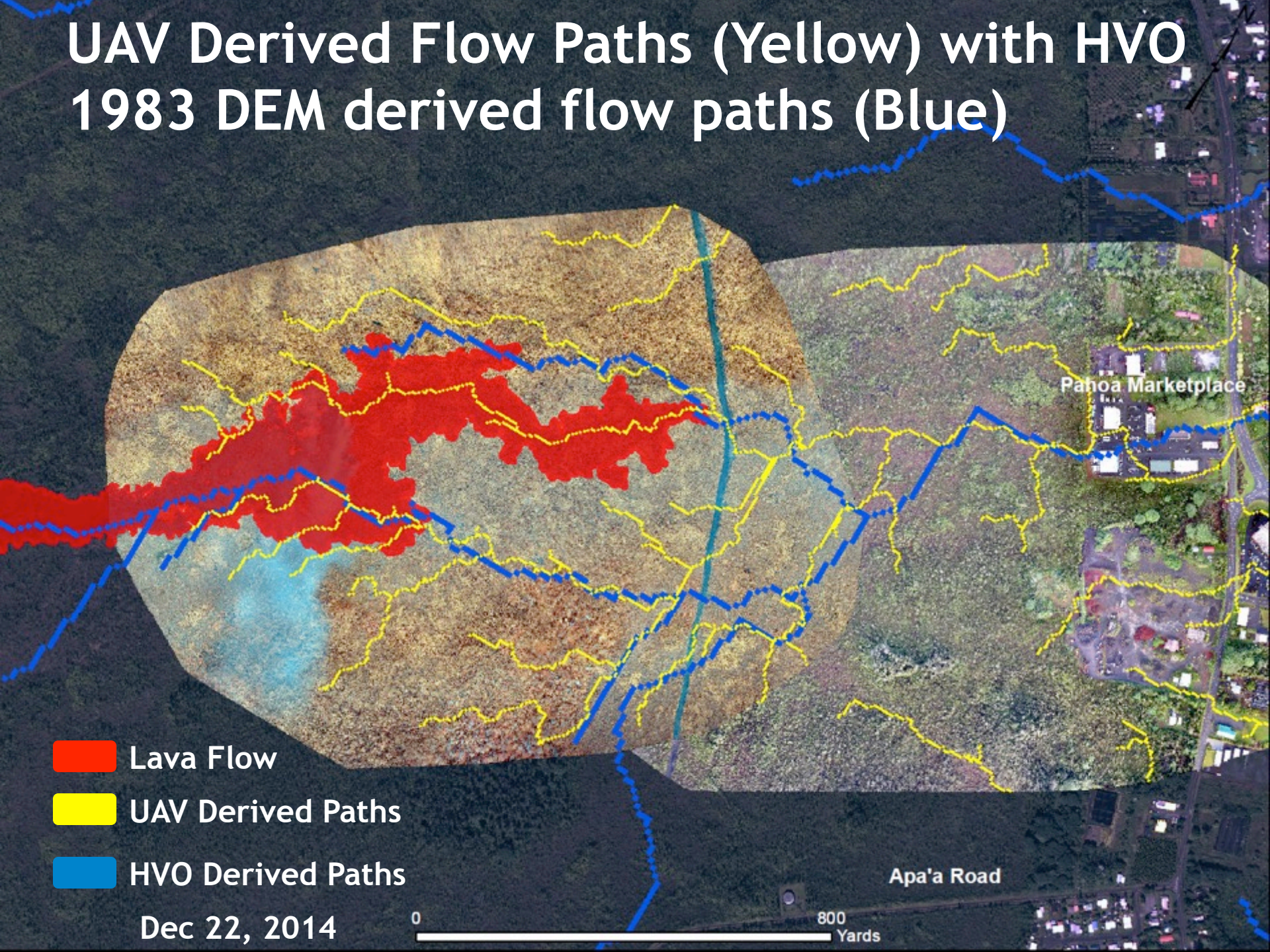
- UH Hilo hosted our team, presented their program, took us to see the lava flow (2 days old)
    - Excerpts from their presentation next
    - Offers the real potential to help grow the state's program
        - Direct operational support
        - Central Big Island contacts for operations, esp. emergency response
        - Already gaining national recognition for lava work—Discovery show clip
- UH Hilo response to Typhoon Halyan & Lava Flow on next charts
    - Typhoon response was damage assessment
    - Lava flow mapping, predictive flow paths, damage assessment
- Thanks to Nick Turner, Dr. Ryan Perroy for slides

Post-Iselle Damage Assessment


UAV Derived Flow Paths (Yellow) with HVO 1983 DEM derived flow paths (Blue)



Research Plan for 2015

- Agencies
  - NASA UTM – hopefully with all six involved
  - NSF—UNOLS ship-based ops for station-keeping and science
  - DoD—DSCA
  - NOAA—joint missions with significant data potential
  - DOE—missions exploring ICAO/FAA interaction
- Major (but shy) corporations
  - High altitude operations
  - sUAS and much larger
  - Innovative approach to pipeline/power line inspections
  - New/modified UAS testing (experimental?)
- International
  - UK, Denmark, Spain, Norway

Topically…

- Managing traffic
  - sUAS: UTM, Lockheed flight services software
  - Working group with AOPA, AACA, airports
- Enabling BLOS operations
  - Pipeline/power line
  - Testing ADS-B, other WAAS—establishing path to UAS certification
  - Defining “adequate” safety case
- Disaster response—working with state and DHS
  - Infrastructure inspection
  - Critical supplies delivery
  - SAR

Near Term (or just done)

- Barrow Sea Ice measurements
  - Just returned yesterday, so no data reduction yet
  - Initial measurement, to baseline melt activity this year
- Homer Sea Grasses
  - Departs Thursday to fly 50 feet above water
  - Mapping shallow grasses near shoreline
  - Challenges
- Herder Burner
  - Use of new sensors (currently stuck in customs)
  - Measuring oil spill atmospherics at boundary layer
  - Constructed tank at Poker Flat, using oil surrogates

More topics…

- Improving UAS information to manned aviation
  - NOTAM process
- Operating at airports
  - Generally for larger UAS, evaluating taxi, launch & recovery, & near-airport flight operations
  - From rural uncontrolled to international airports
- Developing FAA-quality manuals & procedures
  - AK administrator offered assistance
  - Advice, reviews hugely helpful
- Developing /testing pilot & observer training
- Assessing system acceptance testing approach

Responder

- 12 kg payload max capacity
- 30-40 min flight time
- Highly reliable, wind gusts to 65 km, temperatures to -35 C (- 31 F)
- Rapid deployment (from pickup truck or …)

- Planned as partial replacement for Aeryon Scout

SeaHunter

- 250-300 lb MTOW
- Up to 2000kw payload power
- Wing & fuselage hardpoints
- Runway launch/recovery
- Heated pitot tube, enhanced engine, others for ACUASI version

- Planned for long distance off-shore operations—150-200 miles
- 250 knots speed, 250 miles range
- 16,000 ft AGL
- Gas powered, SATCOM Comms
- Anticipate placing on Gulf (of Mexico) coast to support BLOS flights
- Currently assessing launch locations

Ptarmigan Hexacopter

- Designed by Northern Embedded Systems
- Flight tested in Iceland in 2014
- Multiple COAs in Alaska
- Replacing Aeryon Scout along with Responder single rotor
- Highly stable, capable of up to 5 lb payload
- Open interface enables easy payload integration
- Low cost--<$15,000

Challenges & Opportunities

- COAs
- Dealing with changing environment—Sec 333, NPRM, low altitude/no COA
- Restrictions
- Beta testing NPRM—huge opportunity during comment period
- Platform-agnostic COAs—critical to give test sites something no one else has
- Communicating with regional FAA

Challenges: COAs

- Average time to approval:
  - 2013—20.3 days; 2014—53.85 with 2 forced approvals
  - But getting assistance in mission-critical approvals
  - Range from low of 31 days to high of 91 days, not counting emergency COAs
- Currently get hung up in facility review, especially if a new facility
- New person assigned to only do test site COAs
  - We expect this will help—but FAA coordination for all things new is lengthy, difficult, and secretive

Summing It Up…

- Activity level is increasing—but stymied by untimely COA approvals
  - Research opportunities abound, but approval of novel COAs a challenge
  - ‘and funding—but money is out there, if we can offer something
- Developing joint proposal to beta test NPRM (but not limit to that)
  - And strongly support platform agnostic COAs
    - Big interest from industry, agencies (NASA)
- Meanwhile recasting fleet, very active operational year ahead

Unmanned Aircraft Systems and the Arctic

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