Unmanned Aircraft Systems (UAS) Use on the Funny River Fire

May-June 2014

Introduction

In June 2014 a Boeing Insitu ScanEagle Unmanned Aircraft System operated by the University of Alaska Fairbanks' Alaska Center for Unmanned Aircraft Systems Integration (ACUASI) and Precision, an Oregon-based aviation contractor, was used to provide heat detection services on the Funny River Fire in Soldotna, Alaska. This was the second time a University ScanEagle has been used to support an Alaska fire. In 2009 a ScanEagle was flown on the Crazy Mountain Complex in an attempt to locate the fire edge in dense smoke. Reports are that the 2009 mission was flown with limited success.

On May 22 the Alaska Type 2 IMT managing the Funny River Fire first became aware that a UAS might be available to provide heat detection services when they were contacted by the State Emergency Operations Center (SEOCC). The IMT placed a resource order, and eventually four missions were flown between May 29 and June 2.

Figure 1: ScanEagle Prelaunch Systems Check. ***Photo courtesy Ty Miller***

Ordering

Based on information provided by the SEOCC, the IMT placed a Resource Order for UAS services from the Alaska National Guard on 5/23. The source of the service turned out to be incorrect – the UAS services were being offered through the University of Alaska ACUASI program, not the National Guard. As a result, the initial order was not processed. The IMT followed up on the stalled order and was contacted by ACUASI with accurate information. However, concerns about airspace coordination, DOI requirements, costs, and payment mechanisms delayed the processing of an amended resource order **(Attachment** 1) until 5/28. The order was processed as a Supply Order specifying services (IR data/products) to be received by the incident.

Memorandum of Understanding

During the ordering process a May 2012 Memorandum of Understanding between the Alaska Fire Service, The Alaska Division of Forestry, and The University of Alaska (**Attachment 2**) relative to operating UAS during wildland fire incidents was uncovered. The MOU outlines general responsibilities and procedures but does not address specific airspace or technical issues, or any obligation for expenditure of funds.

ACUASI provided the IMT with a letter clarifying the following:

- ACUASI would maintain operational control of the UAS throughout the incident, and would coordinate with the FAA and the incident Air Operations Branch.
- ACUASI would provide IR data to the incident.
- ACUASI would file for reimbursement of costs/expenses with the understanding that expenses may not be recognized by the funding agency and may not be reimbursed.

DOI Operational Procedures

During the ordering process the IMT was made aware of DOI operational procedures regarding the use of UAS (DOI OPM No. 13-11 [extended through 7/1/14] **Attachment 3 & Attachment 4**). It was determined that the UAS would be operated as a cooperator aircraft under the operational control of ACUASI. The DOI UAS Coordinator was contacted, and all requirements of DOI OPM No. 13-11 were met. Prior to issuing DOI approval for the UAS flights, the DOI UAS Coordinator requested authorization from the Kenai National Wildlife Refuge Manager for flights over the Refuge. Early on, there seemed to be confusion about who controlled the airspace over DOI land … DOI or FAA. It might be helpful if a clear statement regarding authority to regulate access to the National Airspace System (NAS) was included in UAS agreements and briefed on by UAS users.

FAA COA

In order to support the incident, ACUASI requested an addendum to their FAA Certificate of Authorization (**Attachment 5**). The COA addendum authorized flight in Class E/G airspace below 2,500 feet MSL within the incident TFR.

Logistics

The ACUASI UAS crew began preparations in Fairbanks on 5/25, travelled on 5/26, and arrived at the incident on the morning of 5/27. They were self-contained and required minimal logistical support from the incident. The crew consisted of:

- 2 Pilots
- 1 Data Manager
- 3 Ground Crew
- 1 Mission Director

The incident provided some meals and assisted with locating a suitable launch site. The land-use agreement for the launch site was between ACUASI and the landowner, and was not maintained by the incident. A local boom truck was used to increase the height of the tracking dish. ACUASI negotiated and contacted with the boom-truck owner and the incident was not involved. Ideally mobilization could take place in the following timeframes

- Fairbanks preparation and loading (6-8 Hours)
- Fairbanks to Soldotna drive time (12 hours) [will be less for most Interior Alaska fires]
- Incident set-up (6-8 hours)

Mobilization time on this incident was affected by several factors, including delays in processing of the resource order, and the holiday weekend, which added to the difficulty in obtaining required authorizations, especially considering that there was no identified standard process in place and known to all the parties. In the future the mobilization process can be made more efficient by:

- Establishing agreements that are more specific regarding:
    - Costs
    - End-product expectations.
- Establishing a well-defined ordering process that clearly identifies the responsibilities of each of the parties for making contacts and obtaining approvals.
- Clarification of UAS Group logistical needs:
    - Crew size (if incident support is required)
    - Launch site specifications

Airspace

While ACUASI negotiated the COA with FAA, the IMT worked with Federal and State fire aviation officials to ensure policy compliance and adequate controls were in place to ensure airspace de-confliction. A decision was made early on to limit UAS flights to night –time hours when all incident aircraft were on the ground and general aviation traffic was at a minimum. All flights took place between the hours of 2200 and 0800, and were completely within the TFR. Prior to launch, pilots contacted the incident AOBD and confirmed that incident aircraft were on the ground for the day. The AOBD was notified when the UAS had been retrieved in the morning. In addition, ACUASI contacted Kenai Interagency Dispatch Center and Kenai Flight Service Station before and after each mission, per the terms of the COA. There were no airspace issues during any of the UAS flights. Although not mandated by DOI or the COA, conducting UAS operations within the TFR at night or in low visibility conditions, reduces concerns by aviation managers and minimizes de-confliction issues.

The original plan was to launch from Soldotna Airport. There was initial concern that the Class D airspace associated with a temporary FAA tower in place at the airport would be outside of the COA authorizations. However, ScanEagle flights occurred after the tower closed for the day, and ceased before the tower opened the next day. During those hours when the tower was not in operation, the Class D airspace reverted to Class E and G and would have been within the COA authorization except that the airport fell outside of the incident TFR. An alternate site (a farmer's field) was located within the TFR and, in addition to be authorized under the COA, proved to be a more suitable location due to a better line-of-sight to the area of flight operations. If operations from airports are considered in the future, COA applications should include a corridor from the airport to the incident TFR. It might also be useful to include FAA Terminal personnel in planning for UAS use on incidents so they can become familiar with UAS operations requirements and flexibilities.

Flight Operations

UAS missions were flown on four separate nights on the Funny River Fire. On some nights the aircraft was flown and recovered more than once. The initial launch was delayed for several hours due to last minute adjustments to the aircraft and flight control system.

The tracking dish was moved to an alternate mount on top of the command trailer in an attempt to improve reception. Tracking issues were resolved by mounting the dish on a boom-truck the second night. Although the IMT was initially told that rain could limit operations, the UAS was launched in the rain on the first night. The rain and gusty winds may have contributed to tracking issues that night.

- Time aloft: 19.5 hours
- Altitude: 1,800 – 2,200 MSL
- Max distance flown from Operations Center: 15 Miles
- Terrain limitations: Operations were conducted from a slight depression, limiting ability for long-range system operation to 8 miles until high-lift boom was located.

Figure 2: Preparing for Launch. *Photo courtesy Ty Miller*

UAS Group/Incident Coordination

Aviation/airspace coordination on the Funny River fire was excellent. The incident AOBD, known by the UAS Group as the "Air Boss," maintained communications with the group and ensured airspace coordination was maintained and any aviation issues were addressed. Had flight operations occurred during the incident operational period, this coordination would have been more difficult, and it is possible a dedicated "UAS Aviation Coordinator" attached to the incident would have been required.

Coordination between the Planning Section and the UAS Group improved throughout the incident, but additional work is needed in this area. The incident operational period was between 0700 and 2300 while the UAS Group operated between 2200 and 0800. This limited the amount of direct interaction between incident personnel and the UAS Group. It became evident early on that neither organization had a clear understanding of the other's capabilities, requirements, and needs. Initially, the UAS Group was under the impression that live-feed video would be a valuable product for the incident, when in reality the IMT was unprepared to process and use that level of detail in real time. The Funny River Fire provided an excellent training ground in those regards, but in retrospect, both organizations would have benefited if the incident had embedded a "UAS Mission Coordinator" into the UAS Group. Traditionally three "types" of IR have been used on fires: MODIS IR, NIROPS IR, and Hand-held "Palm" IR.

MODIS Heat Detection

MODIS heat detection is satellite-based and available nationally from the MODIS website and from various web feeds without incident ordering (**Figure 3**). Only point heat sources are identified, and timing is based on the time of satellite pass-over (typically four times daily) Precision is less than that of NIROPS IR and is generally not useful for hot-spot location by ground forces, but the data can be useful for perimeter estimation when smoke or cloud cover limit other methods of data collection. It also has value in location of remote fires in areas not regularly flown in detection routes.

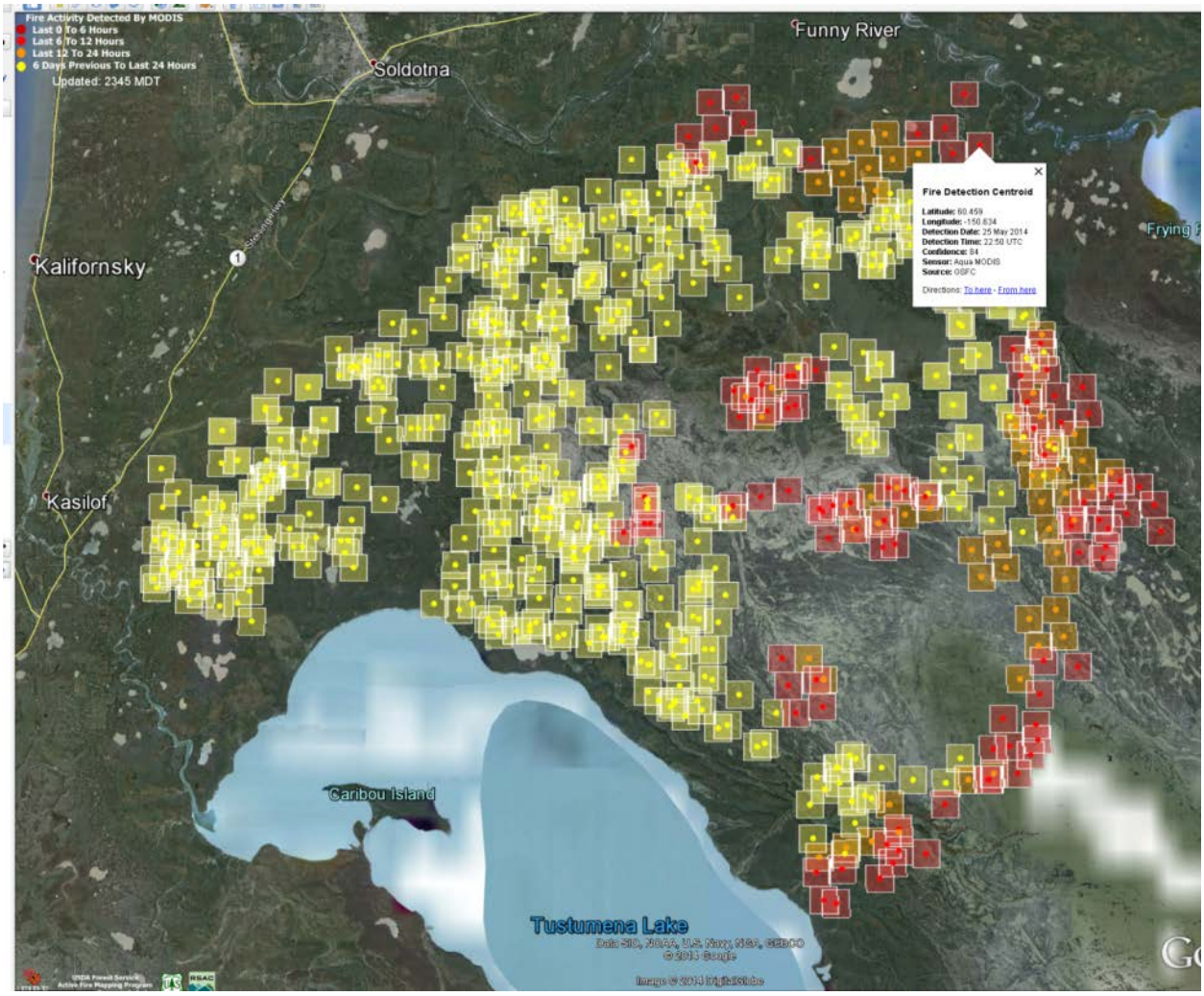

Figure 3: Funny River MODIS Data displayed in GoogleEarth

NIROPS IR

NIROPS IR flights are ordered by an incident and scheduled/coordinated by a Regional IR Coordinator. Flights take place at night and may cover numerous incidents which are prioritized by the coordinator. There is no guarantee when or if a particular incident will be flown on a given night. Clouds and heavy smoke may obscure the imagery and limit its usefulness. Data from NIROPS IR missions is interpreted by an Infrared Interpreter (IRIN). IRIN is a 310-1 red-carded position. The IRIN takes the raw data and interprets heat sources, areas of scattered and intense heat, and perimeter changes. IRINs are usually assigned regionally and not attached to or co-located with a particular incident. They typically produce five products for an incident and post them to the NIFC.FTP site:

- Shapefile (polygon) – Scattered Heat
- Shapefile (polygon) – Intense Heat
- Shapefile (Point) – Heat Sources
- Shapefile (polygon) – Estimated Perimeter
- Pdf File – 11x17 map overlaying the 4 layers above on a USGS topo basemap (**Figure 4**).

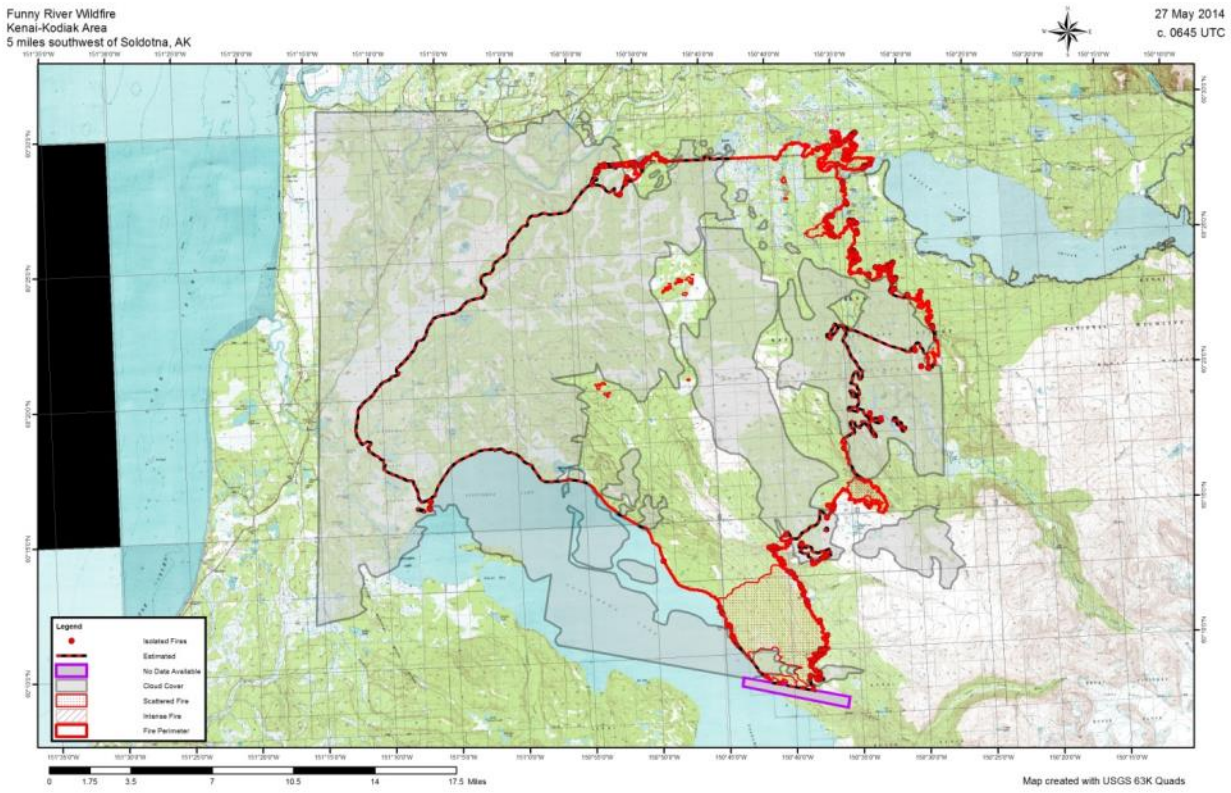

Figure 4: Funny River NIROPS IR Product

These products are received by the incident GISS in the early morning for distribution and inclusion in incident map products.

Handheld (Palm) IR

Handheld (Palm) IR can be used from a helicopter or on the ground. Cameras may be ordered by the incident with/or without operators. Operators are not 310-1 Red Carded, but training and experience is required to accurately detect heat. Missions are typically flown in the early morning or late evening under VFR rules. The operator identifies heat sources with the IR Camera and logs location with a handheld GPS. Sometimes streamers attached to weights are dropped to provide visual clues to ground firefighters seeking the heat source. Handheld IR data is not used to estimate perimeter change, though sometimes perimeter data is collected independently by visually locating the fire edge and recording a GPS tracklog. Upon completing a mission, data from the IR operator's GPS is downloaded by the incident GISS, who then typically produces a map displaying the heat sources and an associated coordinate table used to precisely locate points (**Figure 5**). Waypoints collected by the IR Operator may also be loaded directly into firefighters' GPSs.

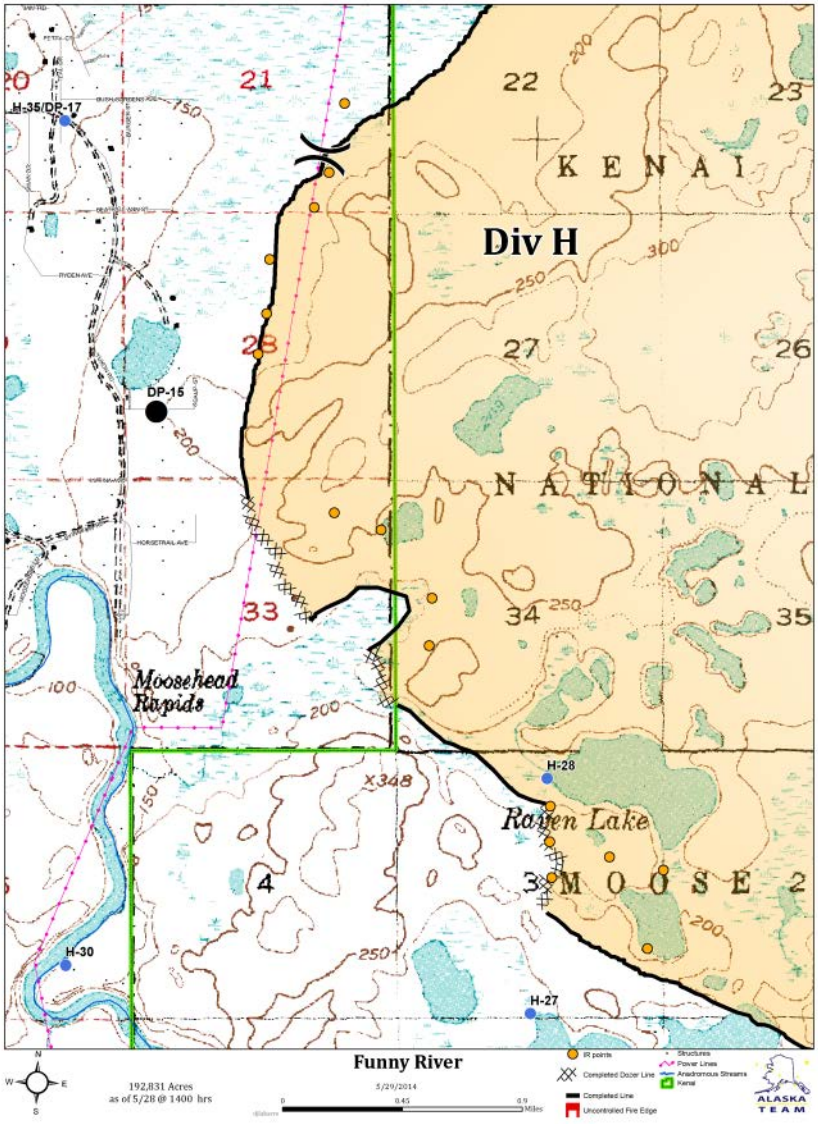

Figure 5: Funny River Palm IR GPS data plotted on Incident map

UAS IR

IR missions flown by the ACUASI ScanEagle on the Funny River Fire were flown at night and provided the incident with kmz (Google Earth) files containing heat source points linked to an IR image that could be viewed when clicked on in Google Earth (**Figure 6**). IR Perimeter estimation was never attempted.

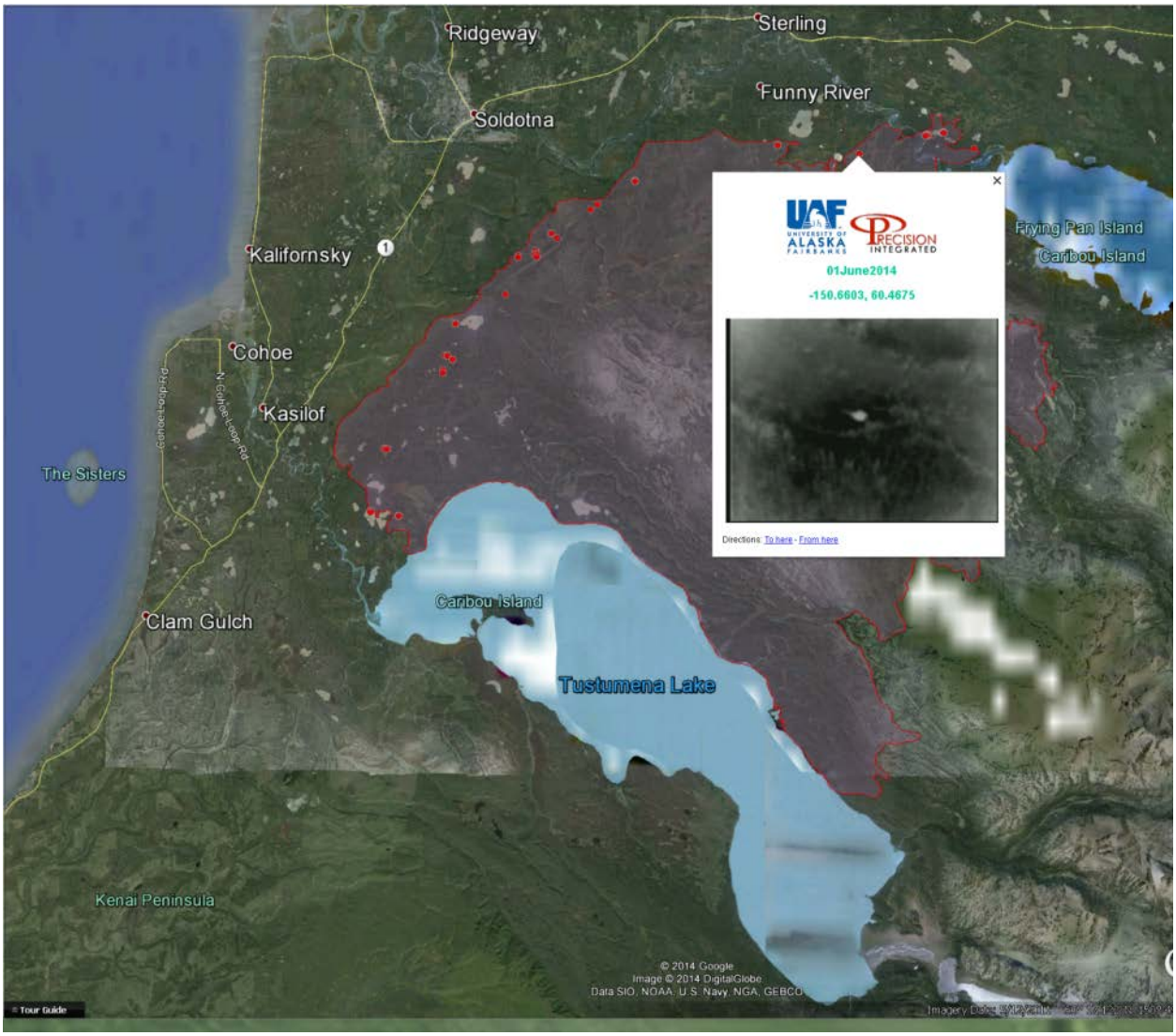

Figure 6: Funny River UAS IR Data displayed in GoogleEarth

Incident GISS were provided with kmz files via email and were easily able to export to shapefiles for inclusion in incident map products. Kml files were also posted to the incident map distribution website where incident personnel could download them directly onto their own devices. Data transfer between the UAS technical specialist and the incident GISS went well. For the most part data transfer was timely enough to allow for distribution and inclusion if incident map products produced immediately prior to the operational period.

However, UAS IR products produced on the Funny River Fire did not prove useful to firefighters. This was due to both coordination and technical issues, most of which can be resolved in the future.

- IR Image quality was too poor to be useful.
- IR heat detection included too many false positives to be useful. In addition, some heat sources identified by Helicopter Palm IR and located by ground forces were not identified by the UAS IR flying the same area the night before. The reasons for this are unclear.
- Linked images were only visible on PCs and could not be viewed on iOS or Android mobile devices, severely limiting their usefulness.
- Heat points and images were not clearly time stamped (only Date was included).
- IR Perimeter estimation was never attempted.
- Current fire perimeters were not displayed on the pilot's monitor, making it difficult to judge whether heat was close to the fire edge or not. Most missions will prioritize heat within 100-200 meters of the fire edge.
- Incident priority was misinterpreted on at least one mission, leading to data collection along an inconsequential portion of line.
- A wetting rain immediately prior to the initiation of UAS operations limited the number of heat sources available for interpretation.

Potential solutions for these issues on future missions include:

- Use of a more advanced IR payload in the UAS.
- Pre-incident development and testing of UAS IR end-products.
- Pre-incident training of UAS pilots and technical specialists regarding incident IR processes.
    - Product specifications
    - Product delivery methods and timelines
    - Target prioritization
- Embedding a Mission Coordinator into the UAS Group with the understanding that operational control of the UAS remains with the UAS vendor and not the incident. The Mission Coordinator should have the following skillset:
    - Familiarity with incident Situation Unit and GIS workflows, timelines, products, and data patterns.
    - Familiarity with incident operational use of IR products.
    - Familiarity with handheld IR techniques and perimeter estimation based on NIROPS IR or MODIS heat detection.

Future Use

Despite the problems encountered obtaining a useable product on the Funny River Fire, the IMT recognizes the potential value of UAS use on future incidents. In order for future efforts to be successful, the following should occur:

Develop an "end use product" agreement with a scope of work and estimated cost for IR products provided.

- Test and experimental flights would not be included in the agreement
- Use of more advanced IR payloads on future flights
- Provide incident and IR interpretation training for the UAS Group
- Embed a UAS Coordinator (and potentially a UAS Airspace Coordinator) with the UAS Group on future incidents.
- Development of more specific agreements between UAS providers and ordering agencies.
    - Clearly define scope of work, end product expectations, and costs to the incident for the timely delivery of products.
    - Any publicty related to the use of the UAS on the incident will be handled by the Incident Public Information Officer
    - In order to be viable, the cost to the incident relative to the product received must compare favorably to NIROPS and Handheld IR options.
    - The "End Use Product" model used on the Funny River Fire has multiple benefits including:
        - Allows Vendor to maintain operational control of the UAS operations and simplifying the ordering process and compliance with FAA, DOI, and State aviation regulations and procedures.
        - Holds the UAS operators accountable for providing the incident with useable products (it is not the flight that is important to the incident, it is the data).
- Development of a more efficient ordering process to ensure timely deployment of UAS services. This process might look like this:
    - Incident recognizes need for UAS support
    - Incident contacts a vendor to ascertain availability. If available:
    - Incident obtains approval from DOI, State Aviation officials, Jurisdictional Agency to use a UAS. (develop a standardized form)
    - Incident places Resource Order for UAS- identifies the need and the proposed working area – ideally within the current TFR.

- Incident places order for UAS Mission Coordinator "THSP" Name Request for pre-identified individual.
- Dispatch Office contacts "vendor" and fills order.
- Vendor uses Resource Order to request COA from FAA.
- Vendor mobilizes.
- Vendor will be responsible for launch and retrieval sites
- Provide Incident Briefing for Vendor/Coordinator upon arrival. Include AOBD, ATGS, SITL, and GISS. Establish timelines and data transfer methods and contacts.
- Vendor set-up and deploy.
- Provide daily target priorities and feedback from previous mission to vendor through Coordinator
- Vendor transmits data to incident GIS personnel by assigned times for direct distribution and inclusion in incident products

Contacts

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US Fish and Wildlife Service
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Marty Rogers
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Alaska Center for Unmanned Aircraft Systems Integration
907-322-9913

RESOURCE ORDER	Initial Date/Time	2. Incident / Project Name	3. Incident / Project Order Number	Financial Codes
SUPPLY	05/19/14 1605	FUNNY RIVER	AK-KKS-403140	403140 [P] H4Q1 PNH4Q1-1502

4. Office Reference Number	9. Jurisdiction / Agency Kenai - Kodiak Area Forestry

5. Descriptive Location	6. TWN	RNG	SEC	Base MDM	8. Incident Base / Phone Number	10. Ordering Office
AK-KKS-403140	4N	10W	14	Seward, AK	AK-KIDC (Dispatch) 907-260-4232 STATE LOGISTICS CENTER 451-2680 FUNNY RIVER GROUND SUPPORT (907) 799-5493 AK-LCSC (Dispatch) STATE LOGISTICS CENTER - 907-451-2680 GALENA WAREHOUSE 907-656-1222	State of Alaska Logistics Center
	LAT. 60 26 22 N					
	LONG. 150 57 42 W					

11. Aircraft Information

Bearing	Distance	VOR	Contact Name	Frequency Type	Assigned Frequency	Reload Base	Other Aircraft / Hazards
203	3	OLT	Soldotna Tower	Air to Ground	118.2	ENA	
120	13	ENA	Forestry	Air to Ground	132.45	PAQ	
353	46	HOM		Air to Ground	166.675	MCG	
				Air to Air	132.575 - Primary	BIG	
				Air to Air	133.850	TSG	
			Funny River Helibase	Air to Ground	169.150 - Primary	FBK	
						GAL	

12. Request Number	Ordered Date/Time	From	To	Qty	Resource Requested	Needed Date/Time	Deliver To	From Unit	To Unit	Assigned Date/Time	Resource Assigned Unit ID	Resource Assigned	M/D Ind	Estimated Time Of Departure	Estimated Time Of Arrival	Released Date	Released To
S-200045	05/28/14 1626 AST	AK-LCSC (Dispatch) STATE LOGISTICS CENTER - 907-451-2680	AK-LCSC	1	Reconnaissance of Funny River fire	05/28/14 2300 AST	AK-KKS-403140	AK-LCSC	AK-LCSC	05/28/14 1627 AST	AK-LCSC	University of Alaska (AK-LCSC)					

Travel Mode | Financial Code 403140 | Special Needs Request detailed map products/information on current fire line, areas of interest and hot spots. This information shall be provided to the Funny River fire Planning unit. Contact Peter Butterl @ 907 350-4702 | Reporting Instructions

13. User Documentation

Req. No.	Documentation	Entered By
S-200045	Request S-200045 was Filled/Closed by Peggy Kern@AK-LCSC ROSS.	Peggy Kern (AK-LCSC) 05/28/2014 1627 AST

Attachment 1: UAS Resource Order

Attachment 2: UAS MOU

MEMORANDUM OF UNDERSTANDING

Between

The U.S DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Alaska Fire Service

And

STATE OF ALASKA
Division of Natural Resources
Division of Forestry

And

The University of Alaska's
Geophysical Institute

Relative to:
Operating Unmanned Aerial Systems (UAS) during a wildland fire incident

I. Background: An opportunity exists to use the Unmanned Aircraft System (UAS), combined with other technologies, to fly over wildland fires for the intent of enhancing wildland fire fighting capabilities. Entering into this Memorandum of Understanding (MOU) allows the partners and their represented institutions an opportunity to explore new methods of monitoring wildland fires.

As per the Federal Register, February 13, 2007, (Volume 72, Number 29): "Simply stated, an unmanned aircraft is a device that is used, or is intended to be used, for flight in the air with no onboard pilot."

II. Purpose: This MOU defines, in general terms, the basis upon which the Parties agree to cooperate relative to the use of the Unmanned Aerial Systems (UAS) platforms in evaluating their operational capabilities within wildland fire Restricted Airspace.

III. Objective: To provide a master document under which the Bureau of Land Management, Alaska Fire Service (BLM-AFS), State of Alaska, Department of Natural Resources, Division of Forestry (DOF), and the University of Alaska's Geophysical Institute (GI), will implement services, tests and the evaluations of UAS platforms on wildland fires.

IV. Authorities:

A. BLM-AFS enters into this MOU under the following authorities: The Protection Act of 1922 (42 Stat. 857; 16 U.S.C., 594); Reciprocal Fire Protection Act of 1955 (69 Stat. 66; 42 U.S.C. 1856, 1856a); Federal Land Policy and Management Act of 1976 (43 U.S.C. 1702); and The Granger-Thye Act of 1950, as amended (16 U.S.C. 572c).

B. The GI enters this MOU under the following authority: Reciprocal Fire Protection Act of 1955 (69 Stat. 66; 42 U.S.C. 1856, 1856a).

C. The DOF enters this MOU under the following authority: Reciprocal Fire Protection Act of 1955 (69 Stat. 66; 42 U.S.C. 1856, 1856a).

V. Responsibilities and Procedures: The responsibilities outlines in this MOU are for the mutual exchange of information and services. Exchanging data, information, and coordinating airspace will benefit the Parties by providing them valuable experience in using the UAS platform. Because of their common interests, all parties agree to the following:

A. The BLM-AFS and DOF agree to:

1. Provide to the GI logistical and operational support during a wildland fire incident.
2. Provide a safe environment for the flight crew and UAS operational staff during wildland fire operations.
3. Provide a group of Subject Matter Experts (SME) from the various components of the wildland fire organization to assist the GI in succeeding in their mission.
4. Assist in the coordination of airspace, which includes Temporary Flight Restrictions (TFR) and air traffic during UAS operations.

B. The GI agrees to:

1. Provide to BLM-AFS and DOF imagery, video or any information collected by the UAS during its operation over a wildland fire.
2. Adhere to the rules and regulations during a wildland fire and operate under the direction of the Incident Commander in charge over a wildland fire.
3. Coordinate all Public Affairs activities with BLM-AFS and DOF and any Public Affairs officials related to the wildland fire.
4. Assist in the coordination of airspace, which includes Temporary Flight Restrictions (TFR) and air traffic during UAS operations.

VI. Administration:

A. This MOU is not intended to be sufficiently specific to constitute an obligation for expenditure of funds.

B. The parties to this MOU will review it every five years to determine its adequacy and its effectiveness. This agreement will last five years from the date of the last signature.
C. Conflicts between the Parties concerning procedures under this MOU that cannot be resolved at the operational level will be referred to successively higher levels for resolution.
D. Any participant may terminate this MOU by providing 90 days written notice to the other. Unless terminated by written notice, this memorandum will remain in force.
E. This MOU will become effective upon signature by all of its participants.
F. Modifications within the scope of this MOU shall be made by mutual consent of the parties, by the issuance of a written modification.

APPROVED:

Kent Slaughter
Manager, BLM-Alaska Fire Service

5/23/2012
Date

Tom Kurth
Chief, Fire and Aviation Operations
State of Alaska, Division of Forestry

5/23/2012
Date

for Gregory Walker
Manager, Poker Flat Research Range
University of Alaska, Geophysical Institute

5.18.12
Date

Attachment 3: DOI OPM 13-11

United States Department of the Interior
Office of Aviation Services
300 E. Mallard Dr., Ste 200
Boise, Idaho 83706-3991

DOI OPERATIONAL PROCEDURES (OPM) MEMORANDUM NO. 13-11

Subject:	DOI Use of Unmanned Aircraft Systems (UAS)
Effective Date:	January 1, 2013
Supersedes:	OPM 11-11 issued on December 19, 2011
Expiration:	December 31, 2013

1. **PURPOSE.** The purpose of this OPM is to provide guidance on the operations and management of Unmanned Aircraft Systems (UAS).

2. **AUTHORITY.** This policy is established by the Director, Department of the Interior, Office of Aviation Services(OAS) in accordance with the provisions of Departmental Manual 112 DM 12, 350 DM 1; and Secretarial Order 3250 dated September 30, 2003.

3. **BACKGROUND.** Current FAA policy is provided in Interim Operational Approval Guidance 08-01, Unmanned Aircraft Systems Operations in the U.S. National Airspace System (NAS).

   A. FAA retains the authority to approve UAS operations within the NAS in Class A, B, C, D, E and G airspace.

   B. When operating in Class A, B, C, D, E and G airspace, DOI UAS's must be operated with a FAA Certificate of Waiver or Authorization (COA).

   C. COAs are not required in Restricted, Prohibited, or Warning airspace. However, UAS operations in these specific airspaces will be regulated and approved by the Controlling Authority (a.k.a. "Range Control").

4. **POLICY.** UAS by definition are considered aircraft. While their size, method of control, and airspace utilization procedures are different than manned aircraft, the overall responsibility for management within the Department of Interior (DOI) rests with the Office of Aviation Services (OAS). Ownership of all aircraft, including UAS, is a function and responsibility of OAS. Additionally, OAS will coordinate with other federal agencies on use and cooperate with the FAA on existing and proposed rule making. Department of Interior bureaus shall employ the following procedures when using any UAS, either DOI-owned or DOI contract vendor-owned and operated.

5. **PROCEDURES AND GUIDELINES.**

   A. UAS Project and COA Application:

      1. The OAS Alaska Regional Director, Harry Kieling is the DOI UAS Coordinator for FAA COA applications, harry_kieling@nbc.gov, 907-271-5626, 907-271-6569 (Fax).

      2. The alternate UAS Coordinator is Alaska Region Aviation Safety Compliance Specialist, Rod Russell, rod_russell@nbc.gov, 907-271- 5004, 907-271-4788 (Fax).

      3. Only a U.S. (Federal/State/Local) government agency or university may apply for a COA.

4. The COA includes, but is not limited to the operational plan, risk management, airworthiness, airspace, pilot qualifications, frequencies and communication plan, and should be developed and submitted using the COA online system (https://oeaaa.faa.gov/oeaaaA/Welcome.jsp). This web site is password protected.

5. Initial feasibility discussions will be conducted between bureau unit, local bureau and National Aviation Manager and, if necessary, DOI UAS Coordinator.

6. The local unit will prepare and submit a formal request to initiate a UAS COA. This proposal shall include the general purpose, objectives and justification for utilizing UAS.

7. The request shall be routed through the bureau state/regional office to the bureau National Aviation Manager for review and approval/disapproval.

8. If approved, the proposal will be forwarded to OAS and a request will be made for an on line COA account for the project.

9. Following the establishment of the on line COA account, the bureau proponent will complete the detailed COA application. When the proponent feels the application is ready for review and submittal, it should be forwarded through bureau channels to the Bureau National Aviation Manager for approval and then to the OAS COA coordinator for **committal** to the FAA.

10. Collaboration and agreement will occur prior to official commitment of the application. Status of the COA can be followed on the On Line web site. The COA, once issued, shall serve as the UAS Operations Plan.

B. Restricted/ /Prohibited and Warning Area Utilization:

1. Operations conducted entirely within Restricted/Prohibited and Warning areas do not require a COA, however, an MOU for UAS use will be established between the using bureau/OAS and the controlling agency and the request process outlined above is still necessary, requiring Bureau National Office approval.

C. Minimum Operational Requirements: The following requirements must be met prior to any operational use of UAS:

1. Obtain approval from bureau National Aviation Office.

2. Obtain (1) a valid and current COA issued by the FAA or (2) MOU with the controlling agency for operations wholly within Restricted/Prohibited and Warning areas.

3. Exercise operating limitations in accordance with the COA/MOU Range provisions/COA and this OPM.

4. Meet DOI UAS Pilot/Mission Operator/Observer Training and Certification Requirements. DOI operators of UAS vehicles must first receive bureau authorization and concurrence and then must receive training in the specific vehicle to be operated. The using bureau and OAS will identify appropriate training. Personnel must possess training certificates from OAS or OAS-approved sources prior to receiving OAS certification.

5. Possess a DOI UAS Operator Letter of Authorization. The LOA must specify the UAS vehicle(s) that are authorized to operate.

6. VFR cloud clearances and visibilities for Class E airspace will be used regardless of airspace the UAS is operating in, except when operating in Class Airspace where 14 CFR Part 91.155 will apply.

7. Operations outside of restricted areas, warning areas, prohibited areas, and/or Class A airspace may only be conducted during daylight hours, unless authorized in the Special Provisions Section of the COA.

6. UAS Pilot Qualifications and Certification

A. General UAS Pilot Responsibilities: The pilot in command, (PIC) of a UAS is directly responsible for, and is the final authority as to the operation of that aircraft.

1. One PIC must be designated for all flights.

2. Pilots are responsible to perform a thorough preflight inspection of the UAS.

3. Pilots, mission operators and observers will not have concurrent responsibilities during the mission. They may not perform more than one crew duty at a time (i.e. pilot/mission operator/observer).

4. Per 350 DM 1.8, Reporting Requirements, an OAS 2 or OAS 23 will be required for each flight.

B. UAS Pilot Certification Factors: Rating requirements for the UAS PIC depend on the type of operation conducted and fall into two categories. The requirement for the PIC to hold a pilot certificate is based on various factors including:

1. Location of the planned operations.

2. Mission profile.

3. Size of the UA.

4. Whether or not the operation is conducted within or beyond visual line of sight. Each application will be carefully reviewed to assess the feasibility of allowing that type of operation.

C. Operations that require a FAA pilot certificate and Letter of Authorization:

1. All operations approved for use in Class A, B, C, D, and E airspace.

2. All operations conducted under IFR (FAA instrument rating required).

3. All operations approved for nighttime operations. Night operations are authorized in Restricted/Warning/Prohibited areas without a FAA pilot certificate unless prohibited by the Controlling Authority. Also the night operations without a FAA pilot certificate are permitted if specifically allowed in the Special Provisions Section of the COA.

4. All operations conducted at joint use or public airfields.

5. All operations conducted beyond line of sight.

6. Operations above 400 feet AGL or with visual line of sight conducted greater than one NM from the UAS observer. A FAA pilot certificate may not be required for altitudes to 1000 ft in Restricted/Warning/Prohibited areas if not prohibited by the Controlling Authority. Also, the higher altitude is authorized without a FAA pilot certificate if specifically allowed in the Special Provisions Section of the COA.

7. At any time the FAA (as specified in the COA) has determined the need based on the UAS' characteristics, mission profile, or other operational parameters.

8. For those operations that require a certificated pilot, the PIC, in order to exercise the privileges of his certificate, shall have flight reviews and maintain currency in manned aircraft per 14 CFR 61.56 *Flight Review* and 61.57, *Recent Flight Experience: Pilot in Command*.

9. For operations approved for night or IFR, the PIC shall maintain currency per 14 CFR 61.57, *Recent Flight Experience: Pilot in Command* as applicable.

D. Operations requiring only a Letter of Authorization: The PIC *may not* be required to hold an FAA pilot certificate for the following operations:

1. Approved and conducted solely within visual line of sight.

2. In Class G or Restricted/Prohibited or Warning airspace.

3. Conducted in a sparsely populated location.

4. With visual line of sight conducted no further than 1 NM laterally from the UAS observer and at an altitude of no more than 400 feet above ground level (AGL) at all times. Altitudes to 1000 ft are authorized in Restricted/Warning/Prohibited areas unless prohibited by the Controlling Authority. Also, the higher altitude is authorized if specifically allowed in the Special Provisions Section of the COA.

5. Conducted during daylight hours only. Night operations are authorized in Restricted/Warning/Prohibited areas unless prohibited by the Controlling Authority. Also the night operations are authorized if specifically allowed in the Special Provisions Section of the COA.

6. Conducted no closer than 5 NM from any airport or heliport.

7. If the pilot in command (PIC) is not required to hold a FAA pilot certificate for such operations and stated in the approved COA he/she must have in lieu of a pilot certificate one of the following:

   a. Successfully completed an FAA private pilot ground instruction, and have passed the written examination, or

   b. Completed a tailored aviation course approved by DOI-OAS covering applicable sections of the FAR/AIM or other aviation publications that will enable the pilot to safely operate a specific UAS in the class of airspace desired. This training will include but not be limited to weather (as applicable to a UAS pilot), emergency procedures, aircraft mishap reporting, SAFECOM Program, lost link, Air Traffic Control (ATC communications) and NOTAM procedures, classes of airspace, system operating limitation all other applicable DMs and OPMs pertaining to aviation.

E. UAS Specific Training and Certification for all UAS Pilots and Operators:

1. All UAS pilots/mission operators will complete the manufacturer's UAS specific training or equivalent, be tested on their knowledge, and be certified to operate the UAS upon graduation. These courses will be monitored by OAS Tech Services/Alaska Regional Director.

2. DOI-OAS or approved bureau inspectors will provide a Letter of Authorization (LOA) under the direction of the DOI-OAS Chief of Technical Services/Alaska Regional Director. The LOA will specify the UAS vehicle(s) that are authorized to operate.

F. Flight Currency:

1. PIC must demonstrate three takeoffs (launch) and landings (recovery) in the specific UAS in the previous 90 days. If currency is lost prior to a mission, operator must regain currency by flying three emergency scenarios in the UAS simulator or fly under the observation of a current UAS pilot.

G. Medical Qualification: The PIC shall maintain, and have in their possession, at a minimum, a valid FAA Class 2 medical certificate issued under 14 CFR Part 67. For operations that are covered in paragraph 5G above, alternate medical certification that is as rigorous as the Class II, may be considered and approved on a case by case basis by the Bureau National Aviation Manager and OAS. After approval this alternate certification must be listed on the COA.

H. General UAS Observer Responsibilities:

1. Observer duties include but are not limited to the following:

   a. Have a clear view of the area of operation.

   b. Be in communications with the PIC either within speaking distance or with a portable radio/cell phone.

   c. Keep the pilot advised of any possible hazards such as power lines, birds, other aircraft, rocks, and hazardous weather conditions.

   d. The observer can also act as the launch person for a hand launched aircraft.

2. Observer Training. Observers must have completed sufficient training to communicate to the pilot any instructions required to remain clear of conflicting traffic. This training, at a minimum, shall include knowledge of the rules and responsibilities described in 14 CFR 91.111, *Operating Near Other Aircraft*; 14 CFR 91.113, *Right-of-Way Rules: Except Water Operations*; and 14 CFR 91.155, *Basic VFR Weather Minimums*; knowledge of air traffic and radio communications, including the use of approved ATC/pilot phraseology; and knowledge of appropriate sections of the *Aeronautical Information Manual*. This training will be reviewed and approved by the Chief of Tech Services/Alaska Regional Director.

3. Observer Medical Qualification: The provisions of Paragraph 5J above will apply to observers.

I. Maintenance:

1. Maintenance inspectors will require the same qualifications (DCI/OAS 6700.202) as current OAS inspectors plus knowledge of UAS procedures. Until OAS can develop specific UAS maintenance inspection procedures, Mil Handbook 516, or similar document will be used. Initially Rod Russell, Alaska Regional Office, OAS, should be contacted to evaluate any specific UAS airworthiness questions.

2. A conditional Inspection must be performed during preflight and must be logged in the aircraft flight log for the first flight of each day as part of a continuing airworthiness compliance program. This entry should read "I have inspected this aircraft in accordance with (site the publication and reference) and have found it to be in condition for safe operation" and be signed and dated.

3. Log and maintain progressive flight hours of the aircraft in the aircraft logbook to validate inspection intervals, component times, and time life items (i.e. batteries.

4. Record malfunctions (loss of link), damage (parts that require repair to be airworthy again), and serial numbered parts that require replacement (wings, tail booms, etc). Record serial number of the part coming off and serial number of the part going on.

5. Every twenty four months, a biennial airworthiness inspection and carding by qualified maintenance personnel will be performed. At this time a new OAS-36 *Aircraft Data Card* will be attached to each aircraft within the system kit.

6. A maintenance inspector training and evaluation program will be developed for each system specific and in compliance with the POH

7. OAS inspectors will coordinate with the FAA to ensure airworthiness criterion has been approved if required. OAS inspectors will then issue an OAS 36A/36B for UAS aircraft

J. **Radio Frequencies:** Radio frequencies to be used will be coordinated with the bureau's Radio Office and the FAA and be included in the COA application.

K. **Cooperator Aircraft:** This could include work with universities, other governmental agencies such as the Department of Defense, or multiple agency collaborative projects. Bureau involvement in these projects does not necessarily mean that the bureau has operational control; therefore it is important for field units to communicate with the bureau National Aviation Manager on all UAS projects to determine the extent of bureau responsibilities. UAS projects must have a COA (except those covered in paragraph 3c) and shall be obtained by the agency having operational control. Even if the COA is not requested by DOI (i.e. another government agency), it must be coordinated with Bureau aviation personnel and OAS COA administrator.

1. Involvement in a UAS project but no operational control. DOI personnel collect data but do not own, operate, or participate directly in the UAS process. This will be handled similar to an end product contract, field units need only to advise the bureau aviation manager and DOI COA Administrator. However, because of the nature of the responsibilities associated with the COA application and approval process the individual/organization with Operational Control must file the COA

2. DOI has operational control but does not own or operate the UAS. Bureaus would follow the procedures to include the formulation of a Project Aviation Safety Plan (PASP) identifying all agencies involved in the project, outlining their responsibilities and level of involvement. Each project will be evaluated on its own merits of involvement, complexity, and standards of safety. Therefore, responsibilities will be determined on a case by case basis as determined by the bureau National Aviation Manager and DOI-OAS

7. **EXCEPTIONS, LIMITATIONS.** Per 350 DM 1.8., Deviations from this OPM must be approved by the Director, Office of Aviation Services.

/s/ Mark Bathrick
Director, Office of Aviation Services

Attachment 4: DOI CY14 OPM Extension

United States Department of the Interior
Office of Aviation Services
300 E. Mallard Dr., Ste 200
Boise, Idaho 83706-3991

JAN 07 2014

113A-2

Memorandum

To: DOI Executive Aviation Committee (EAC)

From: Mark L. Bathrick, Director, Office of Aviation Services

Subject: Extension of CY13 Operational Procedures Memoranda (OPM)

In September 2013, the Department released a new Departmental Manual (DM) chapter, 112 DM 12, which describes the structure and functions of the Office of Aviation Services (OAS). Because of this, all DM's are currently in the process of being reviewed and edited, then will be placed in to routing for the approval process. To ensure that Department aviation managers and field personnel continue to have clear aviation policy and operational procedures guidance, an extension of the existing CY13 OPM's is necessary. Since the previous aviation DM's remain in effect, the current CY13 OPM's which were written to supplement these DM's are hereby extended until July 1, 2014. Please note, there are two CY14 that have been signed and are in effect.

As the designated aviation executives for each of your bureaus, please disseminate this important information to all your bureau aviation operations personnel. To assist you in this effort, OAS will also be posting a copy of this extension authorization on our website: http://oas.doi.gov/.

OAS in partnership with the Executive Aviation Subcommittee (EAS) will be reviewing and updating the DM's. When the new DM's are approved, OAS will provide appropriate notification. At that time, new CY14 OPM's will be issued with an effective date coinciding with the issuance of the new DM's.

Please contact Erin Horsburgh at 208-433-5033 or by email at erin_horsburgh@ios.doi.gov if you have further questions.

cc: Kim Thorsen, DAS, Public Safety, Resource Protection, and Emergency Services
Executive Aviation Subcommittee

Attachment 5: Funny River COA

WARNING: This correspondence may contain Sensitive Security Information and attachments that are controlled under 49 CFR 15 and 1520. No part of this correspondence may be disclosed to persons without a "need to know", as defined in CFR parts 15 and 1520, except with the written permission of the Administrator of the Transportation Security Administration or the Secretary of Transportation. Unauthorized release may result in civil penalty or other action. For U.S. government agencies, public disclosure is governed by 5 U.S.C 552 and 49 CFR parts 15 and 1520.

ADDENDUM TO CERTIFICATE OF AUTHORIZATION (COA) 2013-WSA-84.

ISSUED TO: University of Alaska

DESCRIPTION: The University of Alaska has requested an Emergency COA Addendum to assist Fire Fighting operations using a Scan Eagle (Insight) Unmanned Aircraft System (UAS). The UAS will launch and recover within the confines of the most current TFR supporting the Funny River firefighting efforts. The University of Alaska has declared that there is an emergency mission necessity to operate outside the Area of Responsibility (AOR) authorized in the primary COA for the purpose of assisting law enforcement and this mission meets the requirement of distress or urgency.

DATES OF USE: This addendum is valid May 27, 2014 June 2, 2014.

PROCEDURES:

These procedures supplement all provisions contained in the primary COA.

1. The University of Alaska is authorized to operate in the vicinity of Soldotna, AK. in Class E/G airspace at or below 2,500 Mean Sea Level within the TFR supporting the Funny River firefighting efforts (see attachment 1).
2. Flights over populated or congested areas is not authorized unless in direct support of the Funny River firefighting efforts if allowed in the airworthiness release.
3. Lost link procedures shall not be over populated or congested areas.
4. Flights must be coordinated and approved with the Kenai Interagency Dispatch Center, telephone 907-260-4231.
5. The University of Alaska will contact Kenai Flight Service Station before and after each mission at 907-283-3466. Ensure pilot has most current TFR information.
6. Comm procedures with ground observers & ATC: radio primary frequencies are as follows:
    a. Soldotna tower, 118.2;
    b. Forestry air to ground, 132.45; 166.675;
    c. Forestry air-to-air, 132.575; air-to-air 133.850;
    d. Crew number, 907-451-3084;
7. A distant (D) NOTAM must be issued when unmanned aircraft operations are being conducted. This requirement may be accomplished:

a. Through the proponent's local base operations or NOTAM issuing authority, or

b. By contacting Kenai Flight Service Station at 907-283-3466 as soon as practical prior to the operation. The issuing agency will require the:

(1) Name and address of the pilot filing the NOTAM request

(2) Location, altitude, or operating area

(3) Time and nature of the activity.

8. Lost Link (LL) Procedures

a. All Lost Link procedures must remain in the TFR.

b. In the event of a lost link, the PIC will immediately notify the Kenai Interagency Dispatch Center, telephone 907-260-4231. The PIC must provide the location, maximum altitude, programmed lost link maneuvers, state pilot intentions, and comply with the provisions in attachment 2.

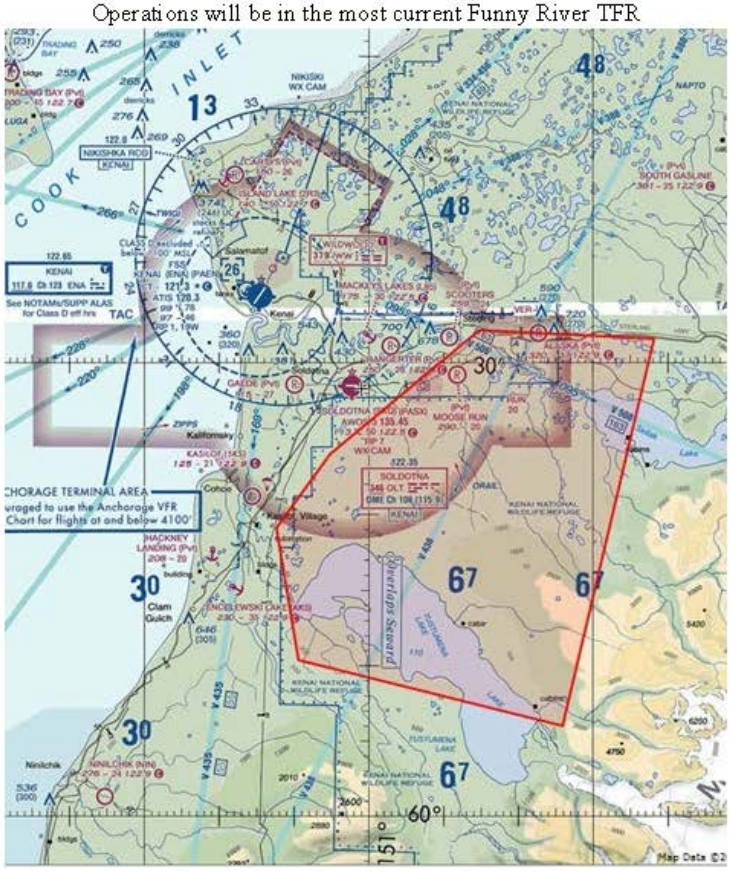
Approved by UAS Integration Office ASI and Anchorage ARTCC.

FOR Jacqueline R. Jackson
May 27, 2014

Attachment 1

General Operating Area

Operations will be in the most current Funny River TFR



Surface to 2,500 MSL. (TFR goes up to 7,000MSL)

Attachment 2

Insitu Insight A-20 Lost Link/Mission Procedures

The Insight A-20 UAS has a series of mission parameters which are physically loaded into the aircraft's flight control computer's memory prior to flight. These parameters define the locations of emergency runways, lost link flight plans, and timing and safety limits used by the UAS in the event of lost link or lost-navigation event occurs. Although configurable in flight, these parameters are typically designated for a given launch and recovery site and are configured for the anticipated flight environment and mission(s)..

The Insight A-20 follows an autonomous lost-uplink procedure if communications from the ground fail. This procedure ends in a belly-landing at a specified location if communications are not re-established by the pre designated time limits.

	Insight A-20 Lost-Link Procedure
1	The lost-uplink procedure begins after 60 seconds has passed without the aircraft receiving any messages from the ground. The aircraft then flies between 45 and 50 kts airspeed, holds its current altitude, and starts a periodic reset of its communications channels.
2	The aircraft continues tracking its current flight-plan for 30 seconds.
3	The aircraft climbs for 30 seconds towards the highest of three altitudes: its current altitude, safe altitude, or the altitude calculated for line-of-sight communications with the ground-station.
4	The aircraft continues tracking its current-flight plan for 60 seconds.
5	The aircraft flies directly to the nearest waypoint that is closer to home from its current location in the abort flight-plan. Additionally this flight plan will have a "tail" that has at least two (2) waypoints that will follow along with the flight providing a direction for the aircraft to follow back to the racetrack if there are any concerns about how it should proceed in order to keep the aircraft within sight of the ground observers.
6	After reaching the home holding pattern, the aircraft waits for 15 minutes to allow the ground crew time to re-establish communications and/or secure the landing area. This means that the aircraft will remain in the racetrack pattern for an hour prior to making an automated landing if communication is not re-established.
7	If communications have still not been re-established the aircraft selects an appropriate approach and touchdown point for a belly-landing. The approach will be determined based on the aircraft's calculated winds so there is a head wind for the final approach.