**Rapid Lesson Sharing**

**Event Type:** Drones (Unmanned Aircraft Systems [UAS])

**Date:** August 1-24, 2018

**Location:** Taylor Creek/Klondike Fire
10 miles west of Grants Pass, Oregon

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**Another Drone Success Story**

“*It was 3 a.m. I had 34 miles of rough road to look at the Division. The ScanEagle flew over. They told me that the fire’s edge was cold. It saved me two hours!*”

**Night Operations**

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**What Can Drones Do For Me?**

Three key missions were conducted on the Taylor Creek/Klondike Fire in Southwestern Oregon: 1) Monitoring the fire activity at night; 2) Aerial ignition; and 3) Scouting the fire’s edge and determining potential control line locations. Drones helped accomplish all three of these missions.

**Mission 1 – Monitoring the Fire Activity at Night**

The Type 1 fixed wing UAS ScanEagle (Call When Needed by Insitu Unmanned Aircraft System) was utilized at night when no other aircraft were working within the Incident’s Temporary Flight Restriction (TFR).

In addition to the darkness of night, the visibility was also poor due to smoke. The ScanEagle was patrolling the fire lines at 8,500 feet above the ground, picking up spot fires and relaying fire intensity back to the control van.

At approximately 0130, the fire started moving toward the control line on Branch IV, Division O, the Illinois River and structures on the other side. The ScanEagle Remote Pilot relayed this information to Night Operations, who moved night.

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**IMT Has Seven Carded Drone Pilots**

The Type 1 Alaska Incident Management Team, assigned to the Taylor Creek/Klondike Fire, has been using UAS/Drones for two years. They have seven carded pilots, several aircraft, and have used Call When Needed aircraft.

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**Questions that this RLS will Answer**

- What can Drones do for firefighters?
- How easy are Drones to use and order?
- What are the drawbacks to Drones?
- What are the positives of using UAS?
- I am on an engine and have a Drone. Can I fly it on the fire?
operations and surge suppression resources to Division O. The fire spotted across the Illinois River and fire personnel suppressed it.

On another instance, night resources could smell smoke across the line but could not find any fire. The ScanEagle was requested. Within a few minutes, the pilot notified the crew of the locations of these spot fires. All of these spots were then contained. In another case, the ScanEagle saved Night Operations several hours of driving on a hazardous road by notifying Operations that all was quiet on those Divisions.

Mission 2 – Aerial Ignition
The Klondike Fire and Taylor Creek Fire were moving toward each other west of Division T. This area is mountainous with steep, rocky terrain that did not provide any accessible Safety Zones.

Operations wanted to decrease the fire’s intensity but did not want to expose a Type 2 Helicopter and pilot, as well as a Plastic Sphere Dispenser (PSD) machine operator, in addition to a Firing Boss and pilot in another aircraft over the area.

The risk and exposure of multiple personnel and two aircraft was high—with moderate benefits.

The solution was using a UAS/Drone with an attached PSD Unit (IGNIS) to fire-out the ridges. They used the Drone for aerial ignition numerous days in various locations—eliminating the risk to fire suppression personnel.

Mission 3 – Scouting
The third important task was to scout the fire’s edge and find potential control locations (control lines). The UAS remote pilots used the Drones in Division P and O “real time” to view the fire behavior/intensity to successfully determine potential fireline locations.

UAS Platform Track Record
Various state wildlife agencies have been utilizing UAS platforms for more than five years on wildlife surveys. The military has been using them for over ten years.
“We watched the fire breach our line from the infrared on the ScanEagle and pushed surge resources.”

“The Drones helped us catch the fire! ScanEagle at night and rotor for the day.”

Operations Section Chief

BACKGROUND

UAS Operations on Federally Managed Incidents

UAS incident response is increasing as federal and state agency UAS programs grow and the utility of UAS is further developed. UAS has proven to be a useful situational awareness and data collection tool.

Goal – The safe integration of UAS technologies into incident management organizations.

How Do we Order UAS?

UAS Personnel and Equipment Ordering (2018):

- Currently UAS personnel are ordered as “THSP” (Technical Specialist) through established ordering procedures. The Interagency Fire UAS Subcommittee maintains a roster of qualified and available UAS personnel and will coordinate through the National Interagency Coordination Center (NICC). Name-requested personnel will be documented in the “Special Needs” section of the resource order.
- Agency-owned UAS should be designated by make, model, and call sign in the “Special Needs” section of the resource order.
- Call When Needed (CWN) UAS are a national resource. Orders will be coordinated through NICC. A federal UAS Manager and Data Specialist will be assigned when the order is filled.

What kind of aircraft are available? – Both Federally operated or Call When Needed (CWN).

Approved UAS Aircraft:

- 3DR Solo Quadcopter (federally owned and operated).
- Firefly6 Pro (federally owned and operated).
- Insitu ScanEagle (CWN).
- Pathways 2 Solutions-Bramor C4Eye (CWN).
- Precision Integrated-Stalker XE (CWN).
- Bridger Aerospace-Silent Falcon (BLM CWN).

[Note: CWN aircraft (on contract) are ordered through NICC (Boise, ID).]

The Silent Falcon. (For more information on this aircraft, see page 10.)
When Can I Use One?

UAS procured/owned by cooperating agencies (state, local, and international) may be used on Unified Command incidents only, under the control of the cooperator agency.

At least for 2018, no cooperator agency-operated UAS have been approved for use on federal fires by the Cooperator Aircraft Letter of Approval.

This is likely to change in future years. It won’t be long before Cooperator UAS will be inspected to a federal standard and Cooperator UAS Aircraft Letters of Approval will be widely issued.

Can Anyone Operate One?

Approved UAS Personnel Only:

- Federal personnel are approved (carded) in accordance with agency policy. In addition to acquiring an FAA Part 107 Remote Pilot certificate, federal employees are required to complete at least a 40-hour Department of Interior (DOI) UAS Operator training course with an additional 40-hour Advance UAS workshop to learn the process of “geo-tagging” data to convert it to usable map products.

- Cooperator personnel may be approved by their own agency and may be utilized on their own incidents or on Unified Command incidents in partnership with federal agencies. Interagency training and equipment standards will soon be developed that will enable cooperator employees and their UAS to someday be approved for use on federal incidents via a Cooperator Aircraft Letter of Approval—as is currently in place for manned aircraft.

What Can the CWN Aircraft Do?

Four UAS Vendors have been awarded a CWN contract to support fire and resource programs. These systems are available through NICC:

- Insitu – ScanEagle
- Precision Integrated – Stalker
- Pathways 2 Solutions – Bramor C4Eye
- Bridger Aerospace – Silent Falcon

These systems have the ability to:

- Provide real-time situational awareness (EO/IR) at a ground terminal (ICP or other location).
- Provide map data: point, line, polygon, and imagery (stills/video).
- Fly several miles beyond visual line of site within a TFR.
- Broadcast location via Mode C (altitude encoding) transponder.
- Fly in winds up to 20 mph.
- Fly at night.
- Remain on station for 2-12 hours.

Video

https://youtu.be/iUlJg7wUng

Spot Fire Detection and Mitigation Using UAS Imagery on the August 2018 Taylor Creek Fire.

Survey

This season there has been significant operational utilization of Incident Assessment and Awareness (IAA) aircraft and technologies in the Pacific Northwest Region’s geographic area. While end-users are assigned, the R-6 State Office Regional Office (SORO) would like to gather information on the use, benefits, and lessons learned to leverage current activity for future planning.

If you have any information that can help us with this effort, please take this informational survey:

https://docs.google.com/forms/d/e/1FAIpQLScVKGeWya5l4N8rN0m7QJ_MKOBXHRxl8bysUwZtyYQFl0DwQ/viewform
**Limitations**

- There are no radios on the aircraft. Communication is maintained by AM and FM radios at the ground station.
- Terrain will limit the crew’s ability to communicate and may require VHF AM or FM repeater support.
- There are a limited number of qualified UAS Managers and Data Specialists. Trainee positions will be requested as mobilizations occur.

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**Are the Aircraft Typed?**

**Type 1 and 2:**

These aircraft are generally operated by contractors and provide strategic situational awareness (SA) and incident mapping.

- They typically operate above all other incident aircraft.
- Communications are maintained with the UAS crew on the assigned Victor (AM) or air-to-ground (FM) frequencies.
- All Type 1 and 2 contract aircraft will be equipped with Mode C transponders.
- Typical aircraft are the ScanEagle, Aerosonde, or MLB Superbat.

**Type 3 and 4:**

These aircraft are generally agency operated and perform tactical SA or mapping missions.

- They are carried and flown on the fireline, flown at relatively low levels (200 feet above ground level).
• Communications are maintained with the UAS crew on the assigned air-to-ground (FM) frequency with the UAS Operator.
• Most do not carry transponders or AFF equipment.
• Typical aircraft are the 3DR Solo, Falcon, and Falcon Hover.

What are the Operational Requirements of Using UAS/Drones?

Operational Requirements (Interagency Fire Unmanned Aircraft Systems Operations Guide)

Remote pilots shall be certified by the FAA in accordance with 14CFR, Part 107 (sUAS rule) prior to attending agency UAS training.

• Remote pilots will be trained and certificated in accordance interagency policy. Interagency fire remote pilot certification cards are required to be in the possession of remote pilots while on an incident.
• UAS aircraft will be certificated in accordance with interagency policy. Interagency certification and FAA registration cards are required to be with the aircraft while on an incident.
• Mode C transponders are required for all fire operations except for the following situations:
  ▪ Otherwise authorized by the aerial supervisor on-scene at the incident. On incidents with no aerial supervision on-scene, the remote pilot must de-conflict with other incident aircraft using the established communications protocols in the Interagency Fire UAS Operations Guide and the Interagency Aerial Supervision Guide.
  ▪ On incidents with no aircraft on-scene the Remote Pilot must coordinate UAS operations with the Incident Commander (or designee) and the appropriate flight following entity for that incident as required by the Interagency Fire UAS Operations Guide.

What Responsibilities Do the Pilots Have?

UAS remote pilots will:

• Obtain approval from the Agency Administrator or designee and the Incident Commander or designee prior to conducting incident assignments/missions.
• Obtain the appropriate level of airspace authorization prior to conducting incident missions.

SAFETY

Safety is the principal consideration in all aspects of UAS operations. A safe UAS operation depends on accurate risk assessment and informed decision-making. Risk levels are established by the severity of possible events and the probability that they will occur.

Assessing risk identifies the hazard, the associated risk, and places the hazard in relationship to the mission. As with all manned aircraft, a decision to conduct a mission requires weighing the risk against the benefit of the mission and deciding whether the risks are acceptable.


Factors to consider during the risk assessment process: Any flight mission has a degree of risk that varies from 0% (no flight activity is conducted) to 100% (aircraft and/or personnel experience a mishap).
“We carry our seven Drone pilots with us. It’s a collateral duty—not full time.”

Incident Commander

“During the day, Drones follow the same rules as other aircraft. But at night we can have more missions and stay up longer.”

UAS Pilot

LESSONS

✓ UAS/Drones have been used successfully for scouting line locations, locating spot fires, monitoring fire intensity/behavior and movement, including with aerial ignition.

✓ The Type 3 and 4 UAS platforms have limited flying time due to battery type/size.

✓ There is minimal risk to personnel on the ground (they do not fly with personnel underneath them).

✓ When there is a mishap no personnel are involved (not on the ground or in the air).

✓ The cost/benefit ratio is huge. There is a minimal cost to repair a damaged aircraft verses a Type 2, Type 3 helicopter and manned pilot.

✓ UAS/Drones are efficient, cost effective and easy to operate.

✓ Though a new tool, the potential for fire managers is huge.

More Information on Unmanned Aviation Systems is Available at:

Interagency Fire UAS Subcommittee Website
Oregon Department of Forestry Policy Document (Use of UAS’s, April 19, 2018)
FAA Part 107, Small Unmanned Aircraft Systems
United States Department of Interior (DOI Operational Procedures Memorandum OPM -11)

The 3DR SOLO and controls used for aerial observation and recon.
The ScanEagle being unpacked; the other wing is unfolded next to the aircraft body; launcher in the background.

Vertical line (rope with bungee cord attached) catches the ScanEagle, then lowers it to the ground.
The Falcon UAS controls and visual helmet used for line location, viewing fire intensity and fire behavior.

### SOLO
Agency Owned and Operated

#### 3DR

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<th>Type</th>
<th>Crew Size</th>
<th>Transportation</th>
<th>Flight Ready</th>
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#### SIZE - WEIGHT - POWER
- Height: 10 in
- Wingspan: 18 in
- Mean Operating Weight: 3.9 lbs
- Payload: 420 grams

#### PERFORMANCE
- Endurance: 20 minutes
- Max Ceiling: 1,200 ft
- Max Speed: 55 mph
- Engine: Electric (Li-Po Battery)

#### SENSOR & DATA OPTIONS
- GoPro
- Image/IR Camera
- GPS Data Logger
**SCANEAGLE**

Call When Needed (CWN)

**Size - Weight - Power**
- Length: 5.3 ft / 1.6 m
- Wingspan: 10.2 ft / 3.1 m
- Operating Empty Weight: 35.3 lb / 16 kg
- Payload Power: Up to 150 W

**Performance**
- Endurance: 24+ hours
- Ceiling: 19,500 ft / 5,944 m
- Max Horizontal Speed: 80 knots / 41.2 m/s
- Cruise Speed: 50-60 knots / 25-30 m/s
- Engine: Heavy fuel (JP-5 or JP 8)
  - or C-10 gasoline engine

**Sensor & Data Options**
- Turret: EO, EO900 (EO camera and EO telescope), MWIR, Dual Imager (EO and MWIR)
- Video Datalink: Analog, digital encrypted
- C2 Datalink: Encrypted, unencrypted

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**SILENT FALCON**

Call When Needed (CWN)

**Size - Weight - Power**
- Length: 6.2 ft
- Wingspan: 14.4 ft
- Mean Operating Weight: 32 lbs
- Payload: Up to 5.5 lbs

**Performance**
- Endurance: 5 hours
- Wing-borne Ceiling: 20,000 ft
- Max Horizontal Speed: 48 knots
- Cruise Speed: 25 knots
- Engine: Electric (Li-Po Battery) / Solar
  - (Integrated Thin Film Photovoltaic)

**Sensor & Data Options**
- Four (4) different ISR EO/IR sensors
- Midwave Infrared (MWIR) camera
- VNIR Hyperspectral Imager
- SWIR Hyperspectral Imager
- FireWatch and CropWatch Payload Spectrometer
- Multispectral Imager
- Three (3) different mapping payloads...

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<td>30 minutes</td>
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**FIREFLY 6 PRO**
Agency Owned and Operated

Birdseye View Aero

**SIZE - WEIGHT - POWER**

- Length: 32.6 ft
- Wingspan: 60 in
- Mean Operating Weight: 8.4 - 9.9 lbs
- Payload: Up to 1.5 lbs

**PERFORMANCE**

- Endurance: 1 hour
- Wing-borne Ceiling: 14,000 ft
- Cruise Speed: 35 knots
- Engine: Electric (Li-Po Battery)

**SENSOR & DATA OPTIONS**

Image/IR Camera

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**STALKER XE**
Call When Needed (CWN)

Lockheed Martin

**SIZE - WEIGHT - POWER**

- Length: 10 ft
- Span: 12 ft
- Operating Empty Weight: 22.5 lbs
- Payload: Up to 5.5 lbs

**PERFORMANCE**

- Endurance: 4-8 hours
- Ceiling: 12,000 ft
- Max Horizontal Speed: 45 knots
- Cruise Speed: 31 knots
- Engine: Hybrid power system (propane/battery)

**SENSOR & DATA OPTIONS**

EO Camera Pod - Color 26x Optical Zoom
IR Camera Pod - 50mm lens 2x Digital Zoom
Dual Imager Pod - Color 10x Optical Zoom

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This RLS was submitted by:
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