



"Drones for Good"

The Game-Changing Promise

for

Wildland Fire

Presented to the OSTP
Subcommittee on Disaster Reduction

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<https://www.doi.gov/aviation/uas>

DOI UAS Program - *Metrics That Matter*

- **2nd only** to DOD in size, scope, reputation.
- **Unique** FAA-granted authorities.
- **\$50M** saved on one fire mission.
- **1/7th** the time, **1/10th** the cost RoT.
- **Leader** in domestic sUAS testing.
- **First** to identify commercial drone manufacturer cybersecurity issue, first to address.
- **Leads** the Interagency Committee on Aviation Policy (ICAP) UAS Subcommittee.
- **Selected** to Federal UAS Executive Committee (ExCom).
- **>40** favorable news articles.
- **>14,000** successful flights.
- **Zero** complaints from public.
- **Zero** accidents.
- **Zero** additional OAS funding/pers.
- **Two** national level UAS-related awards.
- **>400** fleet UAS, available call-when-needed contract for fire, SAR, natural resources.
- **21¹** separate Federal, State, Local agencies/governments have reached out to OAS for sUAS program development support.

¹NOAA, NASA, DHS, CBP, ID F&G, CO DPS, AK DoF, USFS, LAFD, Chicago, OR DoF, WA DNR, USACE, NSF, USDA, GSA, USDOT, ID DoL, USCG, CalFire, DC

Fire & sUAS



✓ Precision Fire Boundary Mapping

✓ Fire Behavior Detection ✓ Hotspot Detection

✓ Danger & Escape Route Detection

✓ **Tactical**
✓ **Divisional**
✓ **Strategic**

❑ Ground-to-Ground Voice, Video, & Data Relay

❑ Atmospheric Monitoring

❑ *"In-Your-Hand & On-Demand"* Products

❑ Outcome Effectiveness Measurement

❑ Traffic Management

❑ Airborne Targeting Support

❑ Personnel & Equipment Location

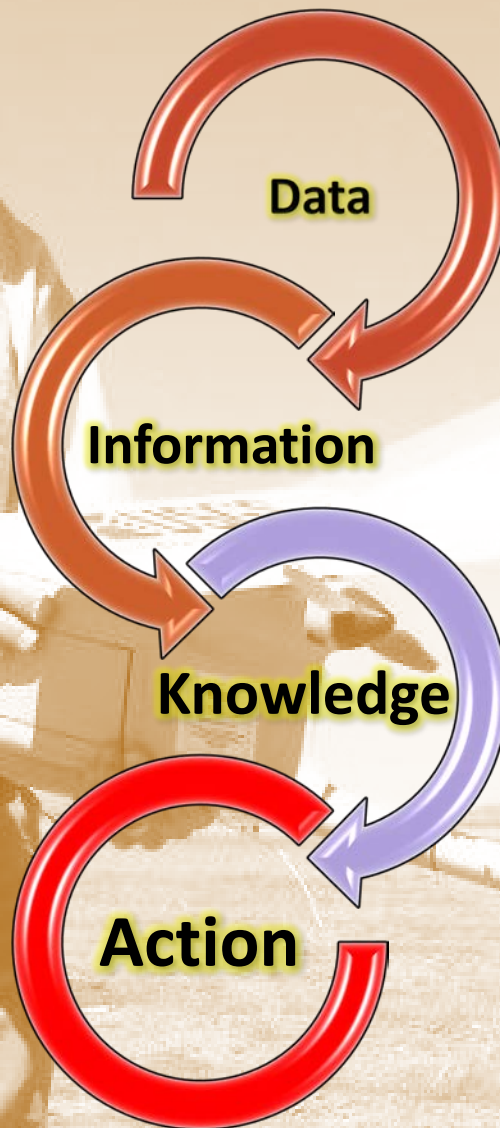
2017 = 707 flights, 71 fires

Keys to Effective Use of the "UAS IT Node"

**Weak Links:
People & Processes**

Trends and
connections in
collected data

Supports actionable
decisions with
measurable impact



Means to collect, distribute,
access, and analyze the >24X
amount of data collected ¹

What do the
trends/connections mean
relative to previous trends,
current expectations,
established standards

¹ <http://www.defenseindustrydaily.com/uav-data-volume-solutions-06348/>



**The Game –
Changing
Potential of
Optionally
Piloted
Aircraft (OPA).**

**2017:
~10M acres
\$3B suppression**

Day VFR

“X” helicopters in
direct attack and
resupply support ~8
hours = 100%
Manned aircraft only

X

Night

2X

Day IFR

3X

**Winds
Temp
Rh**



Wildfire Task/Mission	Traditional Firefighting Methods	Current UAS Capabilities	Future UAS Vision
Fire Boundary Mapping	<ol style="list-style-type: none"> 1. IR equipped airplanes (only 2) produce rough perimeter. 2. Shape file derived from a low level helicopter flight with a handheld GPS. 	Use small UAS to fly perimeter and then export the flight log to build the shape file.	Automatic mapping using long endurance UAS that can automatically detect and map the progress of the incident.
Tactical Situational Awareness (module level)	Done through on the ground lookouts or through verbal relay from Air Tactical Group Supervisor (ATGS) to the ground firefighters	Small UAS can be embedded with the crews eliminating the need for lengthy verbal relay and actually provides better situational awareness (SA) to firefighters.	Long endurance UAS will transmit data to lightweight rovers embedded with the crews. These aircraft can be tasked in real time to look at whatever target on the ground the firefighter wants. There will always be a need for embedded small UAS.
Division Level Situational Awareness	Done through relay with ATGS or from gaining a high point for observation.	Medium endurance UAS can be launched and deliver data to the Division Supervisor.	Division Supervisor will have access to rover units and be able to direct task a sensor to be able to look at whatever target on the ground they desire.
Strategic Level Situational Awareness	Done through situation reports delivered to a multi agency coordination group that then decides the allocation of scarce resources.	Current UAS can provide intel during times when decision makers did not used to have that ability. Night and low vis events are a good example of this.	Use of high altitude long endurance UAS with powerful sensors will allow managers to look at and assess multiple incidents cross a geographic area. This will help them to make better decisions based on the actual conditions they are seeing on the fires.

Wildfire Task/Mission	Traditional Firefighting Methods	Current UAS Capabilities	Future UAS Vision
Initial Attack (IA)	Crews may or may not have access to aerial suppression / retardant delivery assets when the fire is first discovered.	Embedded UAS provide aerial intelligence for crews that may not have access to a helicopter or if an ATGS is not on scene. So far the number is low relative to the total number of fire resources.	IA resources will have small UAS available like any other part of their equipment. Existing crew will be trained in UAS use and the need for helicopter recons for the IC's will be met through UAS. UAS or Optionally-Piloted Aircraft (OPA) capable of delivering cargo/water will become a new tool for IA.
Extended Attack (EA)	Crews and equipment build fire line around the perimeter or use natural barriers to stop the fire.	UAS provide SA not previously available to managers. Growing, but integration is still relatively small.	UAS/OPA will deliver water/cargo 24/7 and will free fire crews to be more efficient and thus increase production. Fire managers will know at all times the location and rate of spread of the fire.
Communications Relay	Done through vulnerable analog mountain top repeaters.	UAS are available that can supplement the repeaters system, but are not currently used.	UAS will provide voice, data, video relay through a variety of platforms. Meshed network radios will turn each person into a data relay node. Allowing for much better connectivity for firefighters. "In-Your-Hand & On-Demand" location data and situational awareness will be available to every firefighter.
Emergency Extraction	Done with a small number of exclusive use aircraft or with state cooperators. Limited availability at night.	DOI is issuing RFI's for UAS or Optionally-Piloted Aircraft (OPA) that can carry large payloads. Future foundation of UAS for extraction	UAS/OPA will be capable of extracting an injured firefighter 24/7 and delivering them to the nearest care.

Wildfire Task/Mission	Traditional Firefighting Methods	Current UAS Capabilities	Future UAS Vision
<p>Equipment Repositioning</p>	<p>Equipment is moved by helicopter or truck to the needed location. Crews then carry things like pumps/hoses to emplace them where needed. Limited to daylight and good visibility.</p>	<p>DOI is issuing Requests for Information (RFI's) for various sized cargo unmanned aircraft. Testing is planned for 2019.</p>	<p>Cargo will be delivered via UAS and things like hose-lays will be nearly automated so the necessary equipment is laid out for the firefighters, reducing their workloads. Can be accomplished 24/7 and in reduced visibility.</p>
<p>Aerial Ignition</p>	<p>Done with low level manned helicopter flights. Hazardous: 2 helicopters, 5 lives lost in this mission in 13 years.</p>	<p>DOI has 2 payloads for aerial ignition using UAS. Testing will be completed by this fall and will be available to DOI bureaus.</p>	<p>Medium endurance aircraft will be able to carry both EO/IR cameras but also an aerial ignition device that allows for mission flexibility.</p>
<p>Aerial Supervision</p>	<p>ATGS relays to firefighter on the ground what they are seeing via radio. Very little to no data-linking currently occurring – labor intensive, voice comms reliant.</p>	<p>UAS can provide “eye in the sky” direct to firefighters, freeing up the ATGS to manage the tactical aerial assets.</p>	<p>Fire managers will be able to directly task resources using data derived from UAS. Eventually there will be fully autonomous firefighting capability from detection to tactical delivery of water/retardant and gear.</p>

A firefighter in a yellow jacket and helmet is working on a hillside with a large fire in the background. The fire is bright orange and yellow, and the firefighter is positioned on the left side of the frame, facing the fire. The background is a hazy, smoke-filled sky.

Needs

1. Funding to complete transition of DOD-derived Optionally-Piloted Aircraft (OPA) technology to wildland fire Initial, Extended Attack, Resupply, and Emergency Extraction missions (\$10M).
2. FAA certification criteria for heavier UAS (>55 lbs) for suppressant, retardant, supplies, emergency extraction missions.
3. Executive attention to encourage continued development and adoption of UAS and OPA technology across the interagency community.



Thank you,
Questions?

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UAS Homepage: <https://www.doi.gov/aviation/uas>

DOI Bureau National Aviation Managers:

https://www.doi.gov/aviation/eab/nam_members

DOI Aviation Executives:

https://www.doi.gov/aviation/eab/committee_members