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**National Wildfire
Coordinating Group**



Interagency Fire Unmanned Aircraft Systems Operations Guide

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Interagency Fire Unmanned Aircraft Systems Operations Guide

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The *Interagency Fire Unmanned Aircraft Systems Operations Guide* standardizes the processes and procedures for interagency use of unmanned aircraft systems (UAS), including pilot inspections and approvals. In support of fire management goals and objectives, the aviation community references these standards to utilize UAS in a safe, effective, and efficient manner. This guide further serves as a risk assessment for fire UAS operations and meets federal requirements for aviation safety and operational planning pertaining to recurring aviation missions. Agency level policy and guidance is provided through established federal or state plans and processes.

The National Wildfire Coordinating Group (NWCG) provides national leadership to enable interoperable wildland fire operations among federal, state, tribal, territorial, and local partners. NWCG operations standards are interagency by design; they are developed with the intent of universal adoption by the member agencies. However, the decision to adopt and utilize them is made independently by the individual member agencies and communicated through their respective directives systems.

Table of Contents

Chapter 1 – UAS Policy and Program Administration.....	1
Chapter 2 – UAS Aircraft (Fire)	2
Chapter 3 – Operational Requirements.....	4
Chapter 4 – Operational Considerations	6
Chapter 5 – Airspace Coordination.....	7
Chapter 6- UAS Mission Planning	9
Chapter 7 – Mission Flight Procedures.....	13
Chapter 8 – Safety.....	17
Chapter 9 – UAS Incursions	19
Chapter 10 – Suggested Job Aids	20
Appendix A – UAS Incursion Protocol	22
Appendix B – UAS Re-engagement Process.....	23
Appendix C – Website References	24

Chapter 1 – UAS Policy and Program Administration

1. Policy:

- A. Department of Interior (DOI) agencies operate under 14CFR, Part 107 (FAA Small UAS Rule) DOI Operational Procedures Memoranda (OPM) 11, National Aviation Plans.
- B. Department of Agriculture Forest Service operates under 14CFR, Part 107 (FAA Small UAS Rule), Forest Service Manual (FSM) 5700; Forest Service handbook (FSH) 5709.16; National Aviation Plans, and Regional Aviation Plans.
- C. State agencies shall follow their agency guidance.

2. **Program Administration:** Agencies are responsible for oversight and management of their respective UAS programs. In order to develop a standardized interagency program, the following roles and responsibilities of interagency program management are provided.

National, Regional, and State Agency Program Managers: Are delegated by their respective agencies and are responsible to administer their respective agencies UAS program. Interagency scope of responsibilities should include:

- A. Coordinate with agency program managers, the IFUASS subcommittee, and interagency UAS personnel.
- B. Coordinate with other agency program managers, to update a national resource qualifications roster (ROSS/IQCS).
- C. Participate on interagency working groups, committees, and subcommittees.
- D. Collaborate to develop owned, contracted and cooperator Interagency UAS aircraft and pilot specifications and approval standards.
- E. Provide for quality assurance and oversight of operational and training performance standards.
- F. Distribute UAS program related information on an interagency basis.
- G. Coordinate with agencies that have a desire to develop or enhance a UAS program.
- H. Coordinate operational standards with international cooperators.
- I. Provide input to the revision of the *IUASG* and interagency training management system.
- J. Additional roles and responsibilities may be assigned based on agency specific needs.

Chapter 2 – UAS Aircraft (Fire)

1. **Typing:** UAS are built in a multitude of configurations, which makes classification difficult. For fire management purposes, the following classification applies. Certain aircraft are specialized and will not fit this classification.

Type	Configuration	Endurance	Data Collection Altitude (agl)	Equipped Weight (lbs.)	Typical Sensors
1	Fixed Wing Rotorcraft	6-24 hrs. NA	3,000-5,000' NA	>55 NA	EO/IR/Multi-Spectral, Lidar, *
2	Fixed Wing Rotorcraft	1-6 hrs. 20-60 min.	1,200-3,000' 400-1200'	15-55 15-55	EO/IR/Multi-Spectral, Lidar,
3	Fixed Wing Rotorcraft	20-60 min. 20-60 min.	400-1200' <400'	5-14 5-14	EO/IR Video and Stills
4	Fixed wing Rotorcraft	Up to 30 min. Up to 20 min.	400-1200' <400'	<5 < 5	EO/IR Video and Stills

*Contracted aircraft sensors will be determined by the contract specifications.

2. Operational Characteristics:

A. Type 1 and 2:

- i. These aircraft will be generally operated by contractors and provide strategic situational awareness (SA) and incident mapping.
- ii. They typically operate above all other incident aircraft
- iii. Communications are maintained with the UAS crew on the assigned Victor (AM) or air to ground (FM) frequencies.
- iv. All type 1 and 2 contract aircraft will be equipped with Mode C transponders.
- v. Typical aircraft are the Scan Eagle, Aerosonde, or MLB Superbat.

B. Type 3 and 4:

- i. These aircraft may be generally agency operated and perform tactical SA or mapping missions.
- ii. They are carried and flown on the fireline flown at relatively low levels (200' agl)
- iii. Communications are maintained with the UAS crew on the assigned air to ground (FM) frequency with the UAS Operator.
- iv. Most do not carry transponders or AFF equipment.
- v. Typical aircraft are the 3DR Solo, Falcon, and Falcon Hover.

C. Sensor payloads are variable but typically include daylight (electro-optical), thermal, or mapping cameras. Type 1 and 2 UAS may carry multiple camera types in a gimballed configuration.

3. **Call Signs:** UAS Remote Pilots will follow established incident communications protocols and will make radio calls with the following information:

A. Unmanned Aircraft

B. Configuration (fixed or rotor-wing)

C. Type

D. Agency/Interagency assigned aircraft number.

4. Call Sign Examples

A. “Unmanned R41” (Rotor Wing, Type 4 UAS, Agency/Interagency #1)

B. “Unmanned F12” (Fixed Wing, Type 1 UAS, Agency/Interagency #2)

C. “Unmanned R23” (Rotor Wing, Type 2 UAS, Agency/Interagency#3)

Chapter 3 – Operational Requirements

1. Remote pilots shall be certificated by the FAA in accordance with 14CFR, Part 107 (sUAS rule) prior to attending agency UAS training.
2. Remote pilots will be trained and certificated in accordance interagency policy.
3. Interagency fire remote pilot certification cards are required to be in the possession of remote pilots while on an incident.
4. 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.
5. Mode C transponders are required for all fire operations except for the following situations:
 - A. Otherwise authorized by the aerial supervisor on-scene at the incident.
 - B. 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.
 - C. 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.
6. UAS Remote Pilots will:
 - A. Obtain approval from the agency administrator or designee and the incident commander or designee prior to conducting incident assignments/missions.
 - B. Obtain the appropriate level of airspace authorization prior to conducting incident missions.
 - i. FAA part 107. **Or**
 - ii. Emergency COA (ECO) for flights beyond visual line of sight (BVLOS) in a TFR. **Or**
 - iii. DOI/FAA Memorandum of agreement for night flights or flights below at 1200' AGL. **Or**
 - iv. USDA/FAA Memorandum of agreement for USFS flights.
 - v. Flights utilizing an FAA memorandum of agreement or ECOA have additional provisions, which must be followed by the remote pilot.
 - C. File a Notice to Airman (NOTAM) in accordance with interagency/FAA regulations.
 - i. As soon as practicable on initial attack or incident with no TFR.
 - ii. In accordance with the provisions of a TFR.
 - iii. In accordance with the provisions of a Memorandum of Agreement with the FAA. Typically prior to 24-72 hours of the flight.
 - D. Confirm airspace deconfliction with dispatch or the TFR controlling authority (when applicable) prior to conducting incident missions.
 - E. Coordinate and receive clearance for mission flights with aerial supervisors when they are on scene (ATGS, ASM, HLCO, Lead) prior to conducting incident missions.
 - F. Coordinate mission flights with participating aircraft when aerial supervision is not on scene,
 - G. Make a blind call on the assigned the air to ground frequency when no aircraft are reported to be

on scene.

H. Respond to blind radio calls from incoming aircraft when the UAS is the only aircraft on scene.

I. Give way to all manned aircraft.

7. Have the capability to determine operational altitude requirements.

8. Monitor assigned AM/FM frequencies.

9. Ensure that landowner notifications are attempted prior to flights over private land.

10. Coordinate missions and attend briefings with multiple incident management team (IMT) positions (ASGS, AOBD, etc.) depending on complexity.

Chapter 4 – Operational Considerations

The following information should be considered when planning to utilize UAS to conduct fire missions:

1. What is the data objective for the mission? Photos, video, SA, mapping/GIS, Thermal/IR?
2. How big is the mission area?
3. Endurance – Consider length of mission, distance from launch area, and area of availability.
4. Aircraft performance – Consider operating environment, and payload.
5. Maneuverability – It is essential that the UAS aircraft can be positioned for the particular mission observation requirements. Multi-rotors are excellent for SA on the fireline.
6. Launch Area – Mission requirements may necessitate the need for a fixed wing aircraft and a large launch area.
7. Consider performance capability of the aircraft for the density altitude and terrain at which operations are conducted.

Chapter 5 – Airspace Coordination

Comprehensive airspace policy is referenced in the *Interagency Airspace Coordination Guide*, <https://www.nwcg.gov/sites/default/files/committee/docs/iasc-interagency-airspace-coordination-guide.pdf>.

1. **Fire Traffic Area (FTA) Protocol:** Firefighting aircraft follow a communications protocol known as the Fire Traffic Area (FTA), which is typically a 12-mile radius from the center point of an incident. UAS are typically launched and recovered from inside the FTA. Remote pilots must follow this protocol before the aircraft is launched and recovered.
 - A. See https://www.nwcg.gov/sites/default/files/publications/pms505d_FTA-card-2015.pdf for FTA diagram and additional information. The airspace surrounding an incident is managed by the aerial supervisor who must implement FTA procedures. All wildland incidents, regardless of aircraft on scene, have an FTA. If an incident has an active TFR in place FTA rules apply to the TFR and clearance from the controlling aircraft is required prior to TFR UAS operations. If aerial supervision is not on scene, the first aircraft on scene will establish the FTA protocol.
 - B. The FTA is a communication protocol for firefighting agencies. It does not pertain to other aircraft who have legal access within a TFR (Medevac, Law Enforcement, Media, VFR airport traffic, IFR traffic cleared by the FAA.)
 - C. Key components and procedures of the FTA include:
 - i. **Initial Communication (ICOM) Ring** – A ring 12nm from the center point of the incident. At or prior to 12nm, inbound aircraft contact the ATGS or appropriate aerial resource for permission to proceed to the incident. Briefing information is provided to the inbound aircraft by the aerial supervision resource over the incident (ATGS, ATCO, ASM, and HLCO).
 - ii. **No Communication (NOCOM) Ring** – A ring 7nm from the center point of the incident that should not be crossed by inbound aircraft without first establishing communications with the appropriate aerial supervision resource.
 - iii. **Three (3) C's of initial contact** – Communication requirements and related actions to be undertaken by the pilot of the inbound aircraft:
 - 1) **Communication** – Establish communications with the controlling aerial supervision resource over the incident. (ATGS, ATCO, ASM, HLCO).
 - 2) **Clearance** – Receive clearance from aerial supervision resource to proceeding with UAS operations. Inbound pilot will acknowledge receipt of clearance or (hold) outside the NOCOM ring, or on the ground as UAS, until the clearance is received and understood.
 - 3) **Comply** –UAS aircraft will comply with clearance from aerial supervision resource. If compliance cannot be accomplished, the UAS will remain on the ground until an amended clearance is received and understood.
 - iv. **Departing Aircraft** – UAS departing incident airspace must follow assigned departure route and altitude. Aerial Supervisors must establish/de-conflict routes for departing aircraft through or away from other incident aircraft operations.
2. UAS flights by properly accredited news representatives, prior to entering the area, shall ensure a flight plan is filed with the appropriate FAA or ATC facility specified in the Notice to Airmen and the operation is conducted above the altitude used by the disaster relief aircraft, unless otherwise

authorized by the official in charge of on scene emergency response activities.

Chapter 6- UAS Mission Planning

The following planning elements are recommended in order to effectively conduct UAS missions.

1. UAS Mission Planning – This process applies to incident operations.

A. Pre-Mobilization

- i. Determine mission complexity
 - 1) Location
 - 2) Land status (ownership)
 - 3) Size of area
 - 4) Topography
 - 5) Vegetation type
 - 6) Data objective (final data product) for the area
 - 7) Data collection timeframe (window)
- ii. Acquire GIS data/maps for the area
- iii. Recommended Documentation
 - 1) Crew Qualification Approval Cards
 - 2) Aircraft Approval Cards
 - 3) Airspace Authorizations
 - 4) Maps
 - a) Project location
 - b) TFR
 - c) NOTAM
 - d) Incident perimeter
 - e) Flight hazard map
 - 5) FAA correspondence
 - 6) Financial codes
 - 7) Cooperator agreements
 - 8) Land use permits/authorizations
 - 9) Planning documents (Project Aviation Safety Plan (PASP), Operations plans, etc.)
- iv. Personnel
 - 1) Identify the UAS Crew
 - a) UAS Crew Leader
 - b) Remote Pilot(s)
 - c) Data Specialist(s)

- d) Observer(s)
- e) Public Information Officer (PIO)
- 2) Identify a POC at the requesting unit to coordinate the project with the crew leader.
- 3) Determine data processing schedule and final product delivery deadlines.
- v. Equipment
 - 1) Determine aircraft to be used
 - 2) Determine sensor payloads to be used
 - a) Cameras
 - b) Mounts
 - c) Data storage
 - 3) Determine computer hardware and software requirements
 - a) GIS
 - b) GCS
 - c) Data development
- vi. Operations/Safety Plans
 - 1) Project Aviation Safety Plan
 - a) New or challenging terrain
 - b) High public exposure
 - c) Prescribed fire with multiple aircraft
 - d) High programmatic or operational risk
 - e) Non-recurring mission
 - 2) Recurring Mission
 - a) UAS Mission Notification (agency specific policy)
 - b) Training and proficiency
 - c) Low complexity mapping/photography
 - d) Recurring flights in the same area
 - e) UAS mission on an incident
- vii. Agency Authorization
 - 1) Incident mission
 - a) Agency Administrator
 - b) Incident Commander
- viii. Private landowner authorization/notification
- ix. Airspace Authorization – Determine the appropriate level of authorization.
 - 1) FAA Part 107

- 2) FAA Part 107 with waiver (submit waiver request 90 days in advance)
 - 3) DOI/USDA Memorandum of Agreement (MOA)
 - a) BVLOS in TFR
 - b) SFC-1200' agl
 - c) Night operations
 - 4) COA or ECOA
 - 5) Other applicable FAA authorizations.
- x. NOTAMs: Filed in accordance with Interagency and FAA regulations.

2. Pre-Flight

A. Verify authorizations

- i. Agency
- ii. Incident
- iii. Airspace

B. Verify the pilot and aircraft are authorized and approved

C. Flight & Duty Limitations – Ensure crew is within work/rest policy.

D. Perform UAS preflight inspection.

E. Verify weight, balance, and attachment of payloads.

F. Ensure proper fuel load/batteries fully charged.

G. Obtain a weather briefing

H. Obtain a Mission Briefing. Determine what the data objective is for the mission and obtain the following information.

i. Initial Attack Briefings

- 1) Incident name or number
- 2) Ordering Agency
- 3) Incident location
- 4) Frequencies and tones
- 5) Flight following
- 6) Air-to-Ground
- 7) Air-to-Air (FM and/or AM)
- 8) Contacts: ground and air
- 9) Air resources assigned
- 10) Other resources dispatched (as practical)
- 11) Aerial and ground hazards
- 12) Special information such as land status: wilderness, and urban interface.

- ii. **Extended Attack and Large Fire Briefings** – UAS personnel will attend incident briefings. If this is not possible critical information should be relayed by phone, radio, fax or messenger. A copy of the IAP is essential. UAS personnel may have to seek some of this information:
 - 1) Incident objectives by division
 - 2) Organization Assignment List (ICS 203) or list of key operations people
 - 3) Air Operations Summary (ICS 220) or list of assigned aircraft
 - 4) List of all aircraft by make/model and identification
 - 5) Incident Radio Communications Plan (ICS 205) or list of frequencies
 - 6) Incident Map
 - 7) Fire Behavior Report and local weather
 - 8) Air resource availability/status
 - 9) Incident Medevac Plan and Medevac helicopter assigned.

Chapter 7 – Mission Flight Procedures

The following procedures shall be followed by all UAS flight crews.

1. Before Takeoff:

- A. Confirm authorizations (agency, incident, airspace)
- B. Confirm/test communications (FM/Cell/Sat).
- C. Coordinate with dispatch, helibase, aircraft and ground personnel in the area.
- D. Record launch coordinates (lat/lon, DDMM.mm).
- E. Determine mission altitude (Garmin Fortrex or comparable).
- F. Confirm sensor payload is attached and functioning.
- G. Complete the aircraft checklists.
- H. Obtain takeoff clearance or coordinate flight as required

2. After Takeoff:

- A. Record take off time.
- B. Monitor assigned frequencies
- C. Complete the aircraft checklists.
- D. Establish flight following as required.
- E. Coordinate/communicate with aircraft and ground personnel

3. Aircraft Coordination Procedures

- A. Pilots shall maintain aircraft separation by:
 - i. Using standard aviation ‘see and avoid’ visual flight rules
 - ii. Having access to the appropriate radio frequency for position reporting
 - iii. Adhering to Fire Traffic Area (FTA) procedures.
 - iv. UAS shall give way to manned aircraft.
 - v. Do not fly UAS until you have established positive contact with on-scene aircraft/aerial supervision.

4. Aircraft Coordination Scenarios: Fire Traffic Area (FTA) Protocol: UAS crews shall follow the procedures listed below. There are three typical scenarios; Aerial supervision is on scene, aerial supervision is not on scene, but other aircraft are, or there are no aircraft on scene.

- **Scenario 1:** Aerial Supervision is on scene. Initiate radio contact with aerial supervision. Give your call sign, location, mission, and requested operating altitude.

Example:

“Hunt River Air Attack, Unmanned R41 on air to ground”. “Unmanned R41,Hunt River Air Attack, go ahead”.

Unmanned R41 is at Helispot 10 requesting clearance for a mapping mission in Division

Alpha at 6,500”.

“Unmanned R41, Hunt River Air Attack, Altimeter 3002, clear to lift, maintain 6,500 and below, Air Attack is at 8,500, no other aircraft in your area”.

Remote Pilots are responsible for ensuring separation and de-confliction with manned aircraft on scene. If there is any doubt about de-confliction or separation with manned aircraft they UAS shall stay on the ground until those issues are resolved.

- **Scenario 2:** Aerial supervision is not on scene, but other aircraft are. The remote and manned aircraft pilots are responsible to maintain separation.

Example:

“Helicopter 32B, Unmanned R41 on air to ground”.

“Unmanned R41, Helicopter 32B”.

“32B, Unmanned R41 is at H21, has you in sight and will be lifting for a mapping mission at the heel of the fire once you’re clear”.

“32B Copies, I’ll call when I’m clear”.

“Unmanned R41 copy, standing by”.

Remote Pilots are responsible for ensuring separation and de-confliction with manned aircraft on scene. If there is any doubt about de-confliction or separation with manned aircraft they UAS shall stay on the ground until those issues are resolved.

- **Scenario 3:** No aircraft on scene. The remote pilot must verify that no aircraft are on scene. Call dispatch and the IC to confirm and then make a blind call on air to ground prior to launch.

Example:

“Unmanned R47 in the blind on air to ground any aircraft over the Lane Creek fire, launching UAS at the heel of the fire 6,500 and below.

- **Scenario 4:** UAS is in flight and incoming aircraft calls in the blind. The remote pilot must respond and coordinate with the incoming aircraft.

Example:

“Hunt fire air traffic, Helicopter 42B is inbound from the south”.

“Helicopter 42B, Unmanned R41 in on scene and flying a mapping mission near the point of origin”. “We are at flying at 2,500’ on altimeter 29.92”.

“Helicopter 42B copies, I’m 7 miles out and will maintain 3,000’ until you’re done with the mission.

“R41 copies, we’ll call when on the ground”.

5. Vertical Separation (typical aircraft altitudes)

Mission	Altitude (agl)	Normal Pattern
Media	As assigned	Right or left
ATGS – Fixed Wing	2000 to 2500	Right
ATGS – Helicopter	500 to 2000	Right or left
Airtanker Orbit	1000 to 1500	Left – outside to observe
Airtanker Maneuvering	150 to 1000	Left
Leadplane	150 to 1000	Left
Helicopters	0 to 500 (hard ceiling)	Left or right
Smokejumper Ram Air Chute	3000	Left
Smokejumper Round Chute	1500	Left
Paracargo	150 to 1500	Left
Unmanned Aircraft (T1)	3000 and above	Variable
Unmanned Aircraft (T2)	1200 and below	Variable
Unmanned Aircraft (T3)	1200 and below	Variable
Unmanned Aircraft (T4)	400 and below	Variable

6. Horizontal Separation

- A. UAS crews must ensure there is adequate visibility to conduct operations safely regardless of the airspace classification.
- B. Flight patterns must be adequate, i.e. not hindered by terrain.
- C. Consult Air Tactical Group Supervisor (ATGS)/pilots before finalizing patterns and routes.
- D. Advise pilots on location of other aircraft if visual contact has not been reported.
- E. Geographic references, such as a ridges or a river, can be used to separate aircraft provided aircraft maintain assigned flight patterns.
- F. Virtual Fences and UAS Routes – Effective for maintaining air traffic control with minimal radio traffic.
- G. Remote Pilots may be required to report arrival at a virtual fence and wait for clearance from ATGS before proceeding. Known geographic locations make effective check points and virtual fences.
 - i. Virtual Fences – Roads, power lines, ridges, lakes, etc.

7. After Landing:

- A. Notify aerial supervision, aircraft in the area, or ground personnel.
- B. Close out flight following as required.
- C. Record landing time.

8. Post Mission:

- A. Confirm need for UAS aircraft for next day.
- B. Debrief with available air resources.
- C. Debrief with AOBD and dispatch.

- D. Attend or provide input to incident planning meeting for next day's operations.
 - E. Complete required documentation (invoices, OAS 2U, SAFECOM, etc.).
9. **UAS Emergency Procedures:** Approved UAS have built in failsafe systems. The aircraft will return to home (launch/recovery site) in the event of low battery voltage or loss of link with the ground control station (GCS).
- A. Lost control, communication, or visual contact with UAS: If control of the UAS is lost and a flyaway occurs:
 - i. Notify aerial supervision, aircraft in the area, and ground personnel.
 - ii. Clear the affected airspace and suspend air operations in the area.
 - iii. Notify flight following contact/dispatch as required.
 - iv. Wait for the duration of the fuel/battery load
 - v. Resume air operations
 - vi. Search for the missing UAS
 - B. Follow established mishap reporting procedures:
 - i. Agency guidance/notification process
 - ii. 1-800 MISHAP
 - iii. SAFECOM
 - iv. Local mishap response plan
 - v. Incident within Incident (IWI) plan
 - vi. FAA Part 107 requirements for injury, damage, or lost link (flyaway)

Chapter 8 – Safety

Safety is the principal consideration in all aspects of UAS operation. 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 a relationship to the mission. A decision to conduct a mission requires weighing the risk against the benefit of the mission and deciding whether the risks are acceptable.

Examples of the Risk Management Process are available in the *Incident Response Pocket Guide* (IRPG), the *Interagency Standards for Fire and Fire Aviation Operations* (Red Book), CALFIRE 8300, and the *Interagency Helicopter Operations Guide* (IHOG).

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).
- The UAS crew must identify hazards, analyze the degree of risk associated with each, and place hazards in perspective relative to the mission or task.
- Hazards might not always be limited to the performance of flight, but may include hazards to personnel if the flight is not performed.
- The risk assessment may include the aerial supervisor, Air Operations Branch Director, Duty Officers, agency Fire Management Staff, Incident Commanders, Dispatchers, and Line Officers/Managers.
- Ultimately the pilot in command has the authority to decline a flight mission that he or she considers excessively hazardous.

1. **Mitigating Risks:** In some cases the UAS crew may have to shut down UAS operations. UAS operations must not proceed until risk mitigation measures are implemented.

2. **Risk Mitigation Considerations:**

A. Monitor the overall aviation operation for human factors related issues

- i. Task saturation
- ii. Fatigue, burnout, and stress
- iii. Acceptance of risk as normal
- iv. Lack of situational awareness

B. Utilize the appropriate aircraft for the mission

- i. Fixed wing vs. Multi-rotor
- ii. Density altitude
- iii. Payload types
- iv. Flight duration

C. Communications Planning – When discrete radio frequencies are used during incident operations, ensure appropriate ground personnel monitor contact frequencies such as command and air to ground. Make sure that ground personnel know how to reach the UAS crew.

- D. Obtain Input – Discuss operations safety with other pilots. Mission debriefings are an excellent source of information; UAS crewmembers will utilize After Action Reviews (AAR) to critique mission effectiveness with other incident and airbase when possible.
- E. The Interagency Risk Assessment for UAS operations is located in Appendix B:

Chapter 9 – UAS Incursions

The following information pertains to UAS incursion during incident operations.

1. A UAS incursion is defined as a non-participating UAS operating over or near a wildfire that:
 - A. Intrudes into a Temporary Flight Restriction (TFR), or
 - B. Interferes with fire management efforts and the interference is documented through the appropriate reporting system, such as SAFECOM, SAFENET, or a reporting system used by one of the states.
2. The UAS incursion protocol is located in appendix C
3. The UAS Incursion Re-engagement protocol is located in appendix D
4. Key considerations regarding incursions include:
 - A. UAS are like any other hazard. “If you see something, say something”.
 - B. Fire personnel should report all unauthorized UAS, or drone, activity via the SAFECOM system. www.safecom.gov UAS information (color, size, altitude, flight pattern) should be reported if known. All UAS Incursions should be reported to FAA.
 - C. Unless a Temporary Flight Restriction (TFR) is in place, it may be possible for the drone activity to be “legal”. If anticipating extended air operations, requesting a TFR is recommended.
 - D. If you encounter a person operating a UAS over your incident, a simple request for them to stop should be made. If they fail to comply, law enforcement should be notified. Safety of personnel should be assessed in any operator contact.
 - E. Dispatch centers should report UAS incursions to the nearest Air Traffic Control Center
 - F. Safety of flight should be primary over any fire aircraft locating the operator.
 - G. The FAA has developed additional guidance for Law Enforcement personnel:
https://www.faa.gov/uas/resources/law_enforcement/media/FAA_UAS-PO_LEA_Guidance.pdf.

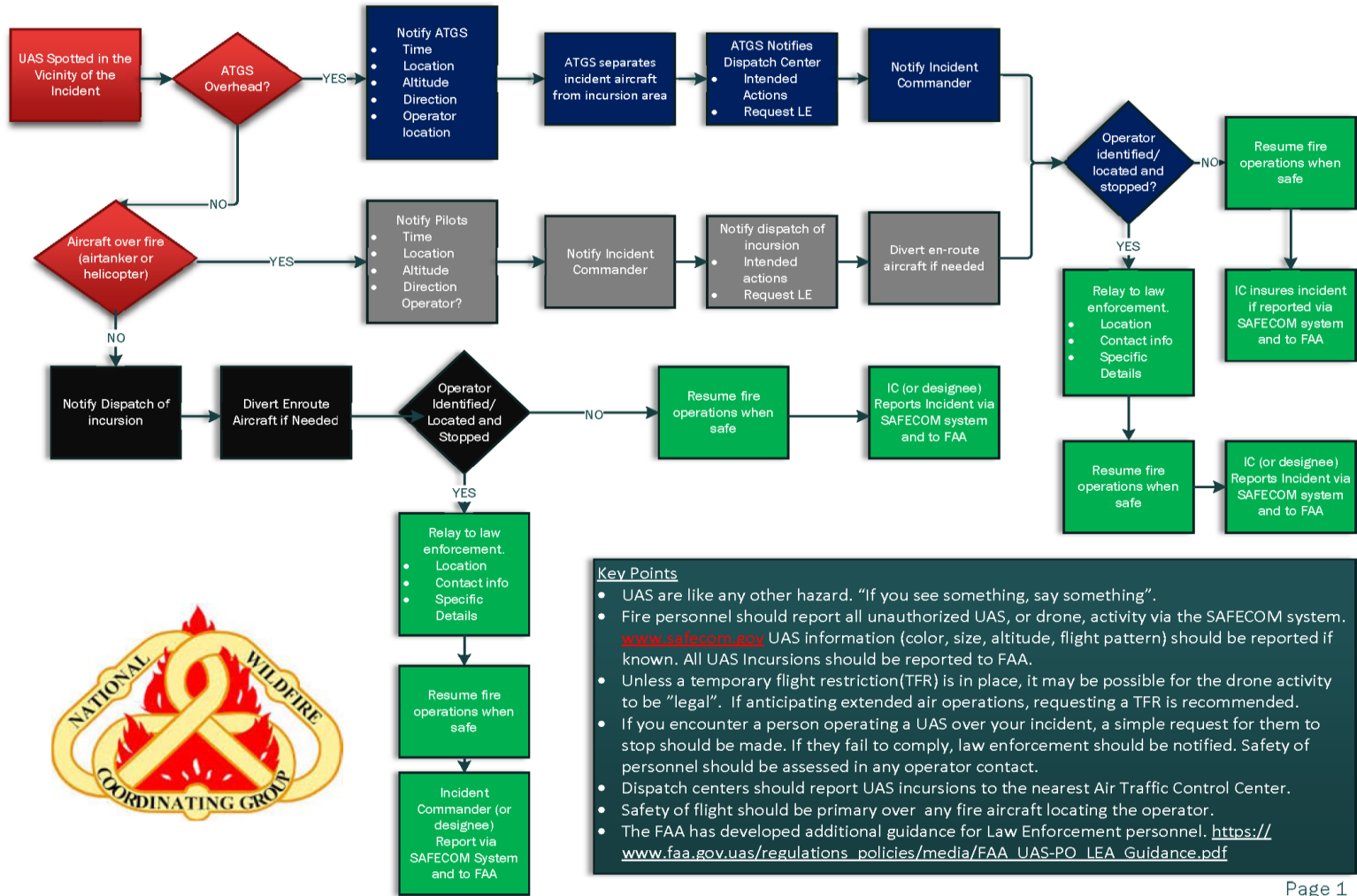
Chapter 10 – Suggested Job Aids

1. UAS Operations Kit: Each Agency UAS crewmember should have and maintain a kit. The following items are recommended.
 - A. Garmin Foretrex 401
 - B. Computer with following software:
 - i. Mission Planner
 - ii. WinSCP
 - iii. Geosetter
 - iv. Adobe Pro
 - v. ArcMap
 - vi. Photoscan
 - vii. Drone 2 Map
 - viii. Google Earth
 - C. Tablet
 - i. GCS app
 - ii. ForeFlight app
 - iii. Astro File Manager
 - D. High capacity portable hard drive
 - E. Portable internet connection (MiFi/smart phone)
 - F. Frequency Guide
 - G. Batteries and cables – Camera, flashlight, etc.
 - H. Flashlight
 - I. Camera
 - J. Overnight Bag
 - K. Maps
 - L. Current FAA sectional chart coverage area
 - M. Agency Maps
 - N. Local Hazard Map (from Dispatch)
 - O. Incident Map (updated daily)
2. Publications
 - A. Aviation Safety Communiqué (SAFECOM): FS-5700-14 and OAS-34
 - B. National Interagency Mobilization Guide, NFES 2092
 - C. Geographic (agency) mobilization guide
 - D. Forest (unit) mobilization guide

- E. Agency aviation management manual handbooks
- F. USDI - USDA aircraft radio communications and frequency guide
- G. Agency aviation plan
- H. *Interagency Aviation Mishap Response Guide and Checklist*, PMS 503.

Appendix A – UAS Incursion Protocol

UAS (aka..Drone) Incursion Protocol for Wildland Firefighters 03/30/2016



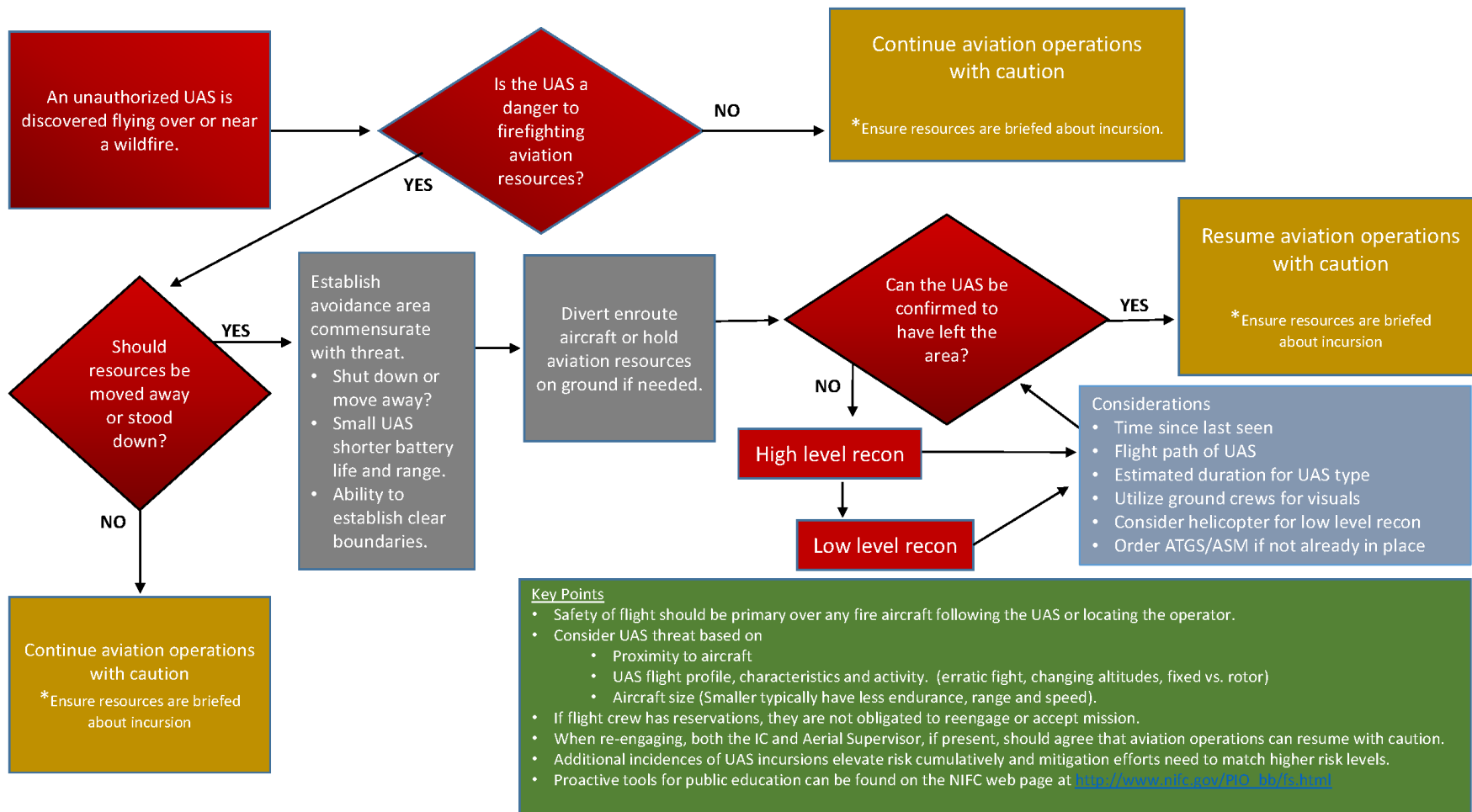
Key Points

- UAS are like any other hazard. “If you see something, say something”.
- Fire personnel should report all unauthorized UAS, or drone, activity via the SAFECOM system. www.safecom.gov UAS information (color, size, altitude, flight pattern) should be reported if known. All UAS Incursions should be reported to FAA.
- Unless a temporary flight restriction (TFR) is in place, it may be possible for the drone activity to be “legal”. If anticipating extended air operations, requesting a TFR is recommended.
- If you encounter a person operating a UAS over your incident, a simple request for them to stop should be made. If they fail to comply, law enforcement should be notified. Safety of personnel should be assessed in any operator contact.
- Dispatch centers should report UAS incursions to the nearest Air Traffic Control Center.
- Safety of flight should be primary over any fire aircraft locating the operator.
- The FAA has developed additional guidance for Law Enforcement personnel. https://www.faa.gov/uas/regulations_policies/media/FAA_UAS-PO_LEA_Guidance.pdf

Appendix B – UAS Re-engagement Process

UAS Incursion Re-engagement Process - DRAFT

August 15, 2016



Appendix C – Website References

UAS Terms and Abbreviations

Found on the Interagency Fire Unmanned Aircraft Systems Subcommittee Resources page:

<https://www.nwcg.gov/committees/interagency-fire-unmanned-aircraft-systems-subcommittee/resources>

UAS Policy

FAA part 107 Summary

https://www.faa.gov/uas/media/Part_107_Summary.pdf

FAA Part 107 Waiver Request

https://www.faa.gov/uas/request_waiver/

DOI UAS Policy Sites

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

DOI Memorandums of Agreement

FAA- Blanket DOI Public Agency COA

https://www.doi.gov/sites/doi.gov/files/uploads/faa_form_7711-1_2016-csa-185_doi_rev_1.pdf

FAA- BVLOS Operations in a TFR MOA

https://www.doi.gov/sites/doi.gov/files/uploads/FAA_DOI_UAS_TFR_MOA_8-13-15.pdf

FAA- Class G Operations (<1200') MOA

https://www.doi.gov/sites/doi.gov/files/uploads/DOI_FAA_MOA_Class_G_09112015.pdf

NASA- sUAS Airworthiness MOA

<https://www.doi.gov/sites/doi.gov/files/uploads/DOI-NASA%20MOU%20for%20Small%20UAS%20Airworthiness%20Evaluations.pdf>

Agency Websites

DOI UAS Information

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

USFS UAS Homepage

<https://www.fs.fed.us/science-technology/fire/unmanned-aircraft-systems>

BLM Aviation Homepage

https://www.nifc.gov/aviation/av_BLMaviation.html

BLM UAS Training Homepage

<https://sites.google.com/a/firenet.gov/unmanned-aircraft-systems/>

USGS UAS Project Office

<https://uas.usgs.gov/>

Interagency SAFECOM System

<https://www.safecom.gov/>

Interagency Aviation Training (IAT)

<https://www.iat.gov/>

Flight Planning

Sky Vector DROTAM page

<https://skyvector.com/>

NOTAM submission & Flight briefing

<https://www.1800wxbrief.com/Website/#/>

COA application

<https://oeaaa.faa.gov/oeaaa/external/uas/portal.jsp>

Foreflight

<https://www.foreflight.com/>

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