NWCG Standards for Fire Unmanned Aircraft Systems Operations

PMS 515

February 2019
The NWCG Standards for Fire Unmanned Aircraft Systems Operations 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. These standards further serve as a risk assessment for fire UAS operations and meet 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.
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Chapter 1 – UAS Policy and Program Administration

Policy

1. Department of Interior (DOI) agencies operate under 14CFR, Part 107 (FAA Small UAS Rule); DOI Operational Procedures Memoranda (OPM) 11; and national aviation plans.

2. 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.

3. State agencies shall follow their agency guidance.

4. The procedures in this publication pertain to fire/incident (unplanned/emergency) operations only. Unmanned Aircraft Systems (UAS) operations on a fire after it has been declared out are considered a planned project and will adhere to departmental and agency specific UAS planning processes for UAS projects.

5. UAS aerial ignition operations shall be conducted in accordance with provisions contained in this publication and in the National Interagency Aviation Committee (NIAC) Memo 19-02, Interim Approval of UAS Aerial Ignition Payload, [https://www.nwcg.gov/publications/515](https://www.nwcg.gov/publications/515).

Program Administration

Agencies are responsible for oversight and management of their respective UAS programs. National, regional, and state agency program managers are delegated by their respective agencies. In order to develop a standardized interagency program, the following roles and responsibilities of interagency program management are provided.

1. Coordinate with agency program managers, the Interagency Fire UAS Subcommittee (IFUAS), and interagency UAS personnel.

2. Coordinate with other agency program managers to update a national resource qualifications roster (IQCS).

3. Participate on interagency working groups, committees, and subcommittees.

4. Collaborate to develop owned, contracted, and cooperator interagency UAS aircraft, pilot specifications and approval standards.

5. Provide quality assurance and oversight of operational and training performance standards.

6. Distribute UAS program information on an interagency basis.

7. Coordinate with agencies that have a desire to develop or enhance a UAS program.

8. Coordinate operational standards with international cooperators.

9. Provide input to the revision of the *NWCG Standards for Fire Unmanned Aircraft Systems Operations*, PMS 515, and interagency training management system.

10. Additional roles and responsibilities may be assigned based on agency specific needs.
Chapter 2 – UAS Typing and Call Signs

UAS are built in a multitude of configurations, which makes classification difficult. For incident management purposes, the classification applies in Table 1.

Table 1–UAS Types and Stats

<table>
<thead>
<tr>
<th>Type</th>
<th>Configuration</th>
<th>Endurance</th>
<th>Data Collection Altitude (agl)</th>
<th>Max Range (miles)</th>
<th>Typical Sensors*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fixed-Wing Rotorcraft</td>
<td>6-14 hrs. NA</td>
<td>3,500-8,000 NA</td>
<td>50 NA</td>
<td>EO/ Mid Wave IR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>High Quality IR</td>
</tr>
<tr>
<td>2</td>
<td>Fixed-Wing Rotorcraft</td>
<td>1-6 hrs. NA</td>
<td>3,500-6,000 NA</td>
<td>25 NA</td>
<td>EO/Long Wave IR</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate Quality IR</td>
</tr>
<tr>
<td>3</td>
<td>Fixed-Wing Rotorcraft</td>
<td>20-60 min.</td>
<td>2,500 and Below 2,000 and Below</td>
<td>5 5</td>
<td>EO/IR Video and Stills Moderate Quality IR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20-60 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Fixed-wing Rotorcraft</td>
<td>Up to 30 min.</td>
<td>1,200 and Below 1,200 and Below</td>
<td>&lt;2 &lt;2</td>
<td>EO/IR Video and Stills Moderate Quality IR</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Up to 20 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

Note: Certain aircraft are specialized and will not fit this classification.

Additional current information can be accessed on the Interagency Fire UAS Operations website at https://sites.google.com/a/firenet.gov/interagency-fire-uas/systems.

Operational Characteristics

1. Type 1 and 2
   a. These aircraft will generally be operated by contractors and provide strategic situational awareness (SA) and incident mapping.
   b. They typically operate above all other incident aircraft.
   c. Communications are maintained with the UAS crew on the assigned Victor (AM) or air-to-ground (FM) frequencies.
   d. All Type 1 and 2 contract aircraft will be equipped with Mode C transponders.
   e. Typical aircraft are the Scan Eagle, Aerosonde, or Penguin C.

2. Type 3 and 4
   a. These aircraft are generally agency operated and perform tactical SA or mapping missions on/near the fireline or incident.
   b. Most do not carry transponders.
   c. Communications are maintained with the UAS crew only on assigned FM frequencies.
   d. None are equipped with Automated Flight Following (AFF) equipment.
   e. Typical aircraft are the 3DR Solo (RW) and FireFly6 (FW).

Call Signs

Unmanned Aircraft Systems, Pilots (UASP) will follow established incident communications protocols and will make radio calls with the following information:
Unmanned Aircraft

- Configuration (fixed or helicopter)
- Type
- Agency/Interagency assigned aircraft number.

Call Sign Examples

- Unmanned R41: Rotor-Wing, Type 4 UAS, Agency/Interagency #1
- Unmanned F12: Fixed-Wing, Type 1 UAS, Agency/Interagency #2
- Unmanned R23: Rotor-Wing, Type 2 UAS, Agency/Interagency#3
Chapter 3 – Operational Requirements

Aircraft and pilots will be given a certificate in accordance with FAA and 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 when:

- Otherwise authorized by the aerial supervisor on scene at the incident.
- On incidents with no aerial supervision on scene. The UASP must de-conflict with other incident aircraft using the established communications protocols contained in this publication.
- On incidents with no aircraft on scene. The UASP must coordinate UAS operations with the Incident Commander (IC), or designee, and the appropriate flight following entity for that incident as required by this publication.

1. The UASP will:
   a. Obtain approval from the IC or designee prior to conducting incident missions.
   b. Obtain one of the following airspace authorizations prior to conducting incident missions:
      i. FAA part 107.
      ii. Special Government Interest (SGI) Waiver for flights Beyond Visual Line of Sight (BVLOS) in a Temporary Flight Restriction (TFR).
      iii. DOI/FAA Memorandum of Agreement for night flights or flights below 1,200’AGL.
      iv. DOI/FAA Certificate of Authorization (COA) for Extended Visual Line of Sight (EVLOS) flights.
      v. USDA/FAA Memorandum of Agreement for United States Forest Service (USFS) flights.

      *Note: Flights utilizing an FAA memorandum of agreement or SGI have additional provisions, which must be followed by the UASP.*

   c. Conduct aerial ignition operations in accordance with approved aerial firing plans.
   d. File a Notice to Airmen (NOTAM) as soon as practical and in accordance with interagency and FAA regulations (typically 24 - 72 hours pre-flight for planned missions or as soon as practical during initial attack).

      *Note: A NOTAM is issued by the FAA when a TFR is established.*
   e. Confirm airspace de-confliction with dispatch or the TFR-controlling authority, when applicable, prior to conducting incident missions.
   f. Prior to conducting incident missions, obtain clearance for mission flights from aerial supervisors such as Air Tactical Group Supervisor (ATGS), Aerial Supervision Module (ASM), Helicopter Coordinator (HLCO), or Lead Plane.
   g. Coordinate mission flights with participating aircraft when aerial supervision is not on scene.
   h. Make a blind call on the assigned Victor (AM) or air-to-ground frequency (FM) when no aircraft are reported to be on scene.
i. Respond to blind radio calls from incoming aircraft when the UAS is the only aircraft on scene.

j. Give way to all manned aircraft.

k. Have the capability to determine operational altitudes based on an altimeter setting.

l. Monitor AM/FM frequencies.

m. Ensure that landowner notifications are attempted prior to flights over private land.
Chapter 4 – Mission Planning and Mobilization

Planning Considerations

1. What is the data objective for the mission: e.g. photos, video, SA, mapping, thermal, or IR?
2. What size is the mission area?
3. Endurance: Consider length of mission, distance from launch area, and area of availability.
4. Aircraft performance: Consider operating environment, payload, density altitude, and terrain in which operations are conducted.
5. Maneuverability: It is essential that the UAS can be positioned to meet mission observation requirements. Multi-rotors are excellent for SA on the fireline.
6. UAS Launch and Recovery Zone (LRZ): Mission requirements may necessitate the need for a designated launch and recover zone (T1/T2 operations).
7. Terrain: Can the UAS maintain link with the Ground Control Station (GCS)?
8. Communications: Consider the capability to effectively monitor and transmit on AM and FM frequencies. Do not fly a mission if you can’t communicate with air and ground resources.
9. Data sharing: How will data be delivered to decision makers? Internet connectivity is key.
10. Operational tempo/complexity of the incident before requesting clearance to fly. The UAS mission may not be a priority.

Mobilization

1. Obtain a resource order prior to mobilization.
2. Ensure vendor crews are ordered as required/requested.
3. Initiate contact with ordering unit (IC, Operations Section Chief [OSC], Air Operations Branch Director [AOBD], etc.).
4. Determine the data objective (final data product) for the incident.
5. Identify the UAS Module (vendor or agency activation):
   a. Unmanned Aircraft System, Module Leader (UASL).
   b. Unmanned Aircraft System, Pilot (UASP).
   c. Unmanned Aircraft System, Data Specialist (UASD).
   d. Unmanned Aircraft System, Manager (UASM).
   e. Vendor crew as required
6. Coordinate mobilization of personnel. Schedule planning calls as needed.
7. Obtain the Incident Action Plan (IAP).
8. Obtain/confirm airspace authorization (SGI, TFR, etc.).
9. Acquire GIS data/maps for the area.
10. Identify possible LRZ locations for vendor aircraft.
a. Location.
b. Land status (ownership).
c. Size of area.
d. Topography.
e. Vegetation type.
f. Expected weather.
g. Data collection timeframe (window).

2. Start a paper trail or build an assignment folder with:
   a. Crew Qualification Cards.
   b. Aircraft Data Cards.
   c. Airspace Authorizations.
   d. Maps.
      i. Project location.
      ii. TFR/NOTAM.
      iii. Incident perimeter.
      iv. Flight hazards.
      v. Financial codes.
      vi. Cooperator agreements/letters (aircraft, pilots, etc.).
      vii. Land use permits/authorizations.
   e. Vendor documents.
      i. Contract.
      ii. Invoice forms (AMD 23, etc.).

   a. Determine aircraft to be used.
   b. Determine sensor payloads to be used.
   c. Cameras/mounts.
   d. Data storage.

4. Determine computer hardware and software requirements.
   a. Laptop and GIS: Make sure the computer has appropriate permissions to add/update software.
   b. GCS: Ensure base maps are built for the mission area.
   c. Data processing (GIS, mapping, DEM, orthomosaic, etc.).

5. Verify authorizations.
   a. Agency.
b. Incident.
c. Airspace.

6. Ensure crew is within work/rest policy for flight and duty limitations.

**Incident Arrival**

1. Follow established incident check in procedures.
2. Verify chain of command.
3. Confirm hours of operation, mission location(s), data objective(s), final product, and data delivery.
4. Discuss meeting/briefing attendance with assigned supervisor.
5. Perform site survey and consider:
   a. Access and egress.
   b. Proximity to fire activity.
   c. Communications (AM and FM).
   d. Takeoff and landing area.
   e. GCS link to aircraft (terrain/vegetation).
   f. GCS video/data link to remote display at Incident Command Post (ICP) or designated location.
   g. Cell/Wi-Fi coverage.
6. Establish an LRZ when applicable (vendor aircraft/Type 1 or 2 UAS).
   a. Coordinate with incident personnel to identify potential LRZs.
   b. Plot potential LRZ locations.
   c. Perform a viewshed analysis to confirm GCS link can be maintained.
   d. **Ensure LRZ location is documented, communicated to incident Geographic Information System Specialist (GISS) and depicted on appropriate incident maps.**
7. Build GCS maps and download applicable base map data.
8. Perform UAS/sensor preflight inspection.
10. Ensure proper fuel load/batteries fully charged.
11. Obtain a weather briefing.
Chapter 5 – Airspace Coordination

Airspace policy is referenced in the *NWCG Standards for Airspace Coordination, PMS 520* [https://www.nwcg.gov/publications/520](https://www.nwcg.gov/publications/520).

Fire Traffic Area (FTA) Protocol

Firefighting aircraft follow a communications protocol known as the FTA, which is a 12-mile radius from the center point of an incident. UAS are typically launched and recovered from inside the FTA. UASPs must follow this protocol before the aircraft is launched.

1. For FTA diagram and additional information see: [https://www.nwcg.gov/sites/default/files/publications/pms505d_FTA-card-2015.pdf](https://www.nwcg.gov/sites/default/files/publications/pms505d_FTA-card-2015.pdf). The airspace surrounding an incident is managed by the aerial supervisor who must implement FTA procedures. All wildland fire 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.

2. 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, or IFR traffic cleared by the FAA).

3. Key components and procedures of the FTA include:
   a. **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).
   b. **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.
   c. **Three Cs of initial contact:** Communication requirements and related actions to be undertaken by the pilot of the inbound aircraft:
      i. **Communication:** Establish communications with the controlling aerial supervision resource over the incident (ATGS, ATCO, ASM, HLCO).
      ii. **Clearance:** Receive clearance from aerial supervision prior to proceeding with UAS operations. The inbound pilot will acknowledge receipt of clearance or hold outside the NOCOM ring or on the ground, until the clearance is received and understood.
      iii. **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.

4. 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.

5. UAS flights by accredited news representatives within a TFR shall adhere to current FAA policy.
Chapter 6 – Mission Flight Procedures

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

**Before Takeoff:**

1. Confirm authorizations (agency, incident, airspace).
2. Confirm/test communications (AM/FM/cell/sat).
3. Coordinate with dispatch, helibase, aircraft, and ground personnel in the area.
4. Record launch coordinates (lat/lon, DD MM.mmm).
6. Determine mission altitude (feet, MSL).
7. Confirm sensor payload is attached and functioning.
8. Complete the aircraft checklists.
9. Obtain takeoff clearance from aerial supervisor or coordinate flight as required.

**After Takeoff:**

1. Record takeoff time.
3. Complete the aircraft checklists.
4. Establish flight following as required.
5. Coordinate/communicate with aircraft and ground personnel.

**After Landing:**

1. Notify aerial supervision, aircraft in the area, or ground personnel.
2. Closeout flight following as required.
3. Record landing time.
4. Verify data quality and transfer to appropriate storage device.

**Post Mission:**

1. Confirm need for UAS for next operational period.
2. Debrief with available air resources and appropriate incident management or dispatch personnel.
3. Attend or provide input to incident planning meeting for next day’s operations.
4. Complete required documentation (invoices, OAS 2U, SAFECOM, etc.).
5. Process and deliver desired data products.
UAS Emergency Procedures

Approved UAS have built in failsafe systems. The aircraft will return to home (LR2) in the event of low battery voltage or loss of link with the GCS.

In the event of loss of control, communication, or visual contact with UAS:

1. Notify aerial supervision, aircraft in the area, and ground personnel.
2. Clear the affected airspace and suspend air operations in the area.
3. Notify flight following contact and/or dispatch as required.
4. Wait for the duration of the fuel/battery load.
5. Resume air operations.
6. Search for the missing UAS.
7. Follow established mishap reporting procedures:
   a. Agency guidance and notification process.
   b. 1-800-MISHAP.
   c. SAFECOM.
   d. Local mishap response plan
   e. Incident within Incident (IWI) plan.
   f. FAA Part 107 requirements for injury, damage, lost link, or flyaway.
Chapter 7 – Aircraft Coordination and Separation

UASP and UASM are responsible for ensuring separation and de-confliction with manned aircraft on scene.

**Do not fly UAS** until you have established positive contact with on-scene aircraft/aerial supervision.

1. Pilots shall maintain aircraft separation by:
   a. Adhering to FTA protocols.
   b. Using standard aviation see-and-avoid visual flight rules.
   c. Having access to the appropriate radio frequency for position reporting.
   d. **Giving way to manned aircraft.**

**Aircraft Coordination Scenarios**

There are four typical scenarios:

1. Aerial supervision is on scene.
2. Aerial supervision is not on scene but other aircraft are.
3. There are no aircraft on scene.
4. Aircraft arrive on scene and UAS is in flight.

**Aircraft Coordination Examples:**

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

“*Hunt River Air Attack, Unmanned R41 on air-to-ground.*”

“*Unmanned R41, Hunt River Air Attack, go ahead.*”

“*Unmanned R41 is at H10 requesting clearance for a mapping mission in DivisionAlpha at 6,500 feet.*”

“*Unmanned R41, Hunt River Air Attack. Altimeter 3,002, clear to lift. maintain 6,500 and below. Air Attack is at 8,500. No other aircraft in your area.*”

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

“*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 clear.*”

“*Unmanned R41 copies. Standing by.*”
**Scenario 3:** No aircraft on scene. The UASP 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.

“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 UASP must respond and coordinate with the incoming aircraft.

“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 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.”

Table 2–Vertical Separation (typical aircraft altitudes)

<table>
<thead>
<tr>
<th>Mission</th>
<th>Altitude (agl)</th>
<th>Normal Pattern</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media</td>
<td>As assigned</td>
<td>Right or left</td>
</tr>
<tr>
<td>ATGS – Fixed-Wing</td>
<td>2,000 to 2,500</td>
<td>Right</td>
</tr>
<tr>
<td>ATGS – Helicopter</td>
<td>500 to 2,000</td>
<td>Right or left</td>
</tr>
<tr>
<td>Airtanker Orbit</td>
<td>1,000 to 1,500</td>
<td>Left – outside to observe</td>
</tr>
<tr>
<td>Airtanker Maneuvering</td>
<td>150 to 1,000</td>
<td>Left</td>
</tr>
<tr>
<td>Lead Plane</td>
<td>150 to 1,000</td>
<td>Left</td>
</tr>
<tr>
<td>Helicopter</td>
<td>0 to 500 (hard ceiling)</td>
<td>Left or right</td>
</tr>
<tr>
<td>Smokejumper Ram Air Chute</td>
<td>3,000</td>
<td>Left</td>
</tr>
<tr>
<td>Smokejumper Round Chute</td>
<td>1,500</td>
<td>Left</td>
</tr>
<tr>
<td>Paracargo</td>
<td>150 to 1,500</td>
<td>Left</td>
</tr>
<tr>
<td>Unmanned Aircraft (T1)</td>
<td>3,500 and above</td>
<td>Variable</td>
</tr>
<tr>
<td>Unmanned Aircraft (T2)</td>
<td>3,500 and above</td>
<td>Variable</td>
</tr>
<tr>
<td>Unmanned Aircraft (T3)</td>
<td>2,500 and below</td>
<td>Variable</td>
</tr>
<tr>
<td>Unmanned Aircraft (T4)</td>
<td>1,200 and below</td>
<td>Variable</td>
</tr>
</tbody>
</table>

**Horizontal Separation**

1. UAS crews must ensure there is adequate visibility to conduct operations safely regardless of the airspace classification.

2. Patterns must be adequate and not hindered by terrain.

3. Consult aerial supervision or on-scene aircraft before finalizing patterns and routes. UAS may be required to report arrival at a check point or virtual fence and wait for clearance from ATGS before proceeding.

**Known geographic locations make effective check points and virtual fences.**
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, and associated risk, and it 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.


Factors to consider during the risk assessment process:

1. 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).
2. 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.
3. Hazards might not always be limited to the performance of flight, but may include hazards to personnel if the flight is not performed.
4. The risk assessment may include the aerial supervisor, AOBD, duty officers, agency fire management staff, Incident Commanders, dispatchers, and line officers/managers.
5. Ultimately the pilot-in-command has the authority to decline a flight mission that they considers excessively hazardous.

Risk Mitigation Considerations

UAS operations must not proceed until risk mitigation measures are implemented.

1. Monitor the overall aviation operation for issues related to human factors.
2. Operational tempo or complexity.
3. Task saturation.
4. Fatigue, burnout, and stress.
5. Acceptance of risk as normal.
6. Lack of SA.
7. Complacency.
9. Rushing or a sense of urgency.
10. Utilize the appropriate aircraft for the mission.
11. Fixed-wing vs. multi-rotor.
12. Density altitude.
13. Payload types.

15. LRZ.

**Communications**

Ensure communication can be maintained on assigned frequencies.

**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.
Chapter 9 – UAS Incursions

The following information pertains to UAS incursion during incident operations.

A UAS incursion is defined as a non-participating UAS operating over or near an incident that intrudes into a TFR or interferes with fire management efforts. The incursion is documented through the appropriate reporting system such as SAFECOM, SAFENET, or a reporting system used by one of the states. The UAS incursion protocol is located in Appendix A.

Considerations

1. UAS are like any other hazard, “If you see something, say something.”
2. Incident personnel should report all unauthorized UAS activity via the SAFECOM system, https://www.safecom.gov/ UAS information (color, size, altitude, flight pattern) should be reported if known. All UAS Incursions should be reported to FAA through established reporting systems.
3. Dispatch centers should report UAS incursions to the nearest Air Traffic Control Center.
4. Safety of flight should be primary over any incident aircraft locating the operator.
5. Additional FAA guidance for law enforcement personnel can be found at: https://www.faa.gov/uas/resources/policy_library/media/FAA_UAS-PO_LEA_Guidance.pdf.
Chapter 10 – Job Aids

UAS Operations Kit
UAS crewmembers should have and maintain a kit. The following items are recommended:

1. BadElf GPS Pro+
2. Computer with agency approved software, including:
   a. Mission Planner,
   b. WinSCP,
   c. Geosetter,
   d. Adobe Pro,
   e. ArcMap with Full Motion Video (FMV) and Spatial Analyst extensions,
   f. Photoscan, and
   g. Google Earth.
3. Tablet.
   a. GCS app.
   b. ForeFlight app.
   c. AirMap.
   d. Astro File Manager.
4. High capacity portable hard drive.
5. Portable internet connection (WiFi/smart phone).
6. Frequency guide.
7. Batteries and cables.
8. Flashlight.
10. Overnight Bag.
11. Maps.
   a. Current FAA sectional chart coverage area.
   b. Agency maps.
   c. Local hazard map (from dispatch).
   d. Incident map (updated daily).

Publications
3. Geographic (agency) mobilization guide.
4. Local mobilization guide.
5. Agency aviation management manuals/handbooks.
6. USDI–USDA aircraft radio communications and frequency guide.
7. Agency aviation plan.
8. *Interagency Aviation Mishap Response Guide and Checklist, PMS 503,*
Appendix A – UAS Incursion Protocol

NWCG Unmanned Aircraft System Incursion Protocol for Wildland Firefighters

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.safeicomm.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/regs_policies/media/FAA_UAS-PO_LEA_Guidance.pdf

Refer to NWCG Memo 16-006 Unmanned Aircraft Incursion Protocol for Wildland Firefighters
Appendix B – Website References

NWCG References

UAS Terms and Abbreviations:
https://www.nwcg.gov/committees/interagency-fire-unmanned-aircraft-systems-subcommittee/resources
Interagency Fire UAS Subcommittee: https://sites.google.com/a/firenet.gov/interagency-fire-uas/
NWCG Position Catalog, Air Operations: https://www.nwcg.gov/positions/ao

UAS Policy

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
Blanket Area sUAS Class G COA Extended Visual Line of Sight Operations (EVLOS)

FAA- BVLOS Operations in a TFR MOA

FAA–Class G Operations (<1200’) MOA

NASA–sUAS Airworthiness MOA

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/#!/!
Foreflight https://www.foreflight.com/
AirMap https://www.airmap.com/
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