



## Small Unmanned Aircraft System (sUAS)

Resource Ordering Guide for Incident Commanders

September 2020



## **Introduction**

Small Unmanned Aircraft Systems (sUAS) Teams are now a resource that the several Michigan Mutual Aid Box Alarm System (MABAS) Member Departments are making available for inter-state mutual aid. The sUAS Teams provide a whole new tool for situational awareness to the Incident Commander.

Uses:

- Situational Awareness
- Thermal Imaging
- Search and Rescue
- Monitoring and Sampling
- Global Positioning

As a Member Department, the Incident Commander can request a sUAS Team under the Michigan Mutual Aid Box Alarm System Agreement. Understanding the uses and imitation is important for the Incident Commander when ordering a resource. This document will provide some background, uses and a decision tool when ordering to support an emergency response.

## **Background**

The Federal Aviation Administration (FAA) regulates the airspace that sUAS fly in. Public responders typically gain permission to fly in this controlled air space in one of two ways:

- a. Under a Certificate of Authorization (COA) – A COA is a program that a public entity creates its own training and flying parameters that the FAA approves<sup>1</sup>.
- b. 14 CFR 107 – Part 107 pilot is a person who has demonstrated basic airmanship by passing an FAA knowledge test on sUAS rules and principals. A Part 107 pilot flies under their own license in a commercial aspect.

Federal Emergency Management Agency (FEMA) – FEMA categorizes sUAS into two types; Type 1 and Type 2.

- a. **Type 1** - sUAS team would have the highest, most robust sUAS capability, including, but not limited to: Long term search and rescue, detailed disaster surveys, long flying missions (typically 4 or more fly hours), special multispectral surveys to include at least thermal imaging and/or HazMat surveys. Additionally, this team may have in the field video editing capability and nighttime fly waivers.
- b. **Type 2** – sUAS team would be used for shorter flying durations (less than 4 hours), less detailed surveys and/or limited to visual imaging capability.

Both type teams have a minimum of 3x team members: 1x pilot (PIC), 1x visual observer (VO) and 1x technical specialist (TS).

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<sup>1</sup> See [https://www.faa.gov/about/office\\_org/headquarters\\_offices/ato/service\\_units/systemops/aaim/organizations/uas/coa/](https://www.faa.gov/about/office_org/headquarters_offices/ato/service_units/systemops/aaim/organizations/uas/coa/) for more info on COAs.

The FAA also has several standing waivers to sUAS Part 107 as listed below:

FAA Special Permissions	Part 107 Waiver
Fly a sUAS from a moving aircraft or a vehicle in populated areas	§ 107.25 – Operation from a Moving Vehicle or Aircraft
Fly a sUAS at night	§ 107.29 – Daylight Operations
Fly a sUAS beyond your ability to clearly determine its orientation with unaided vision	§ 107.31 – Visual Line of Sight Aircraft Operation
User a visual observer without following all visual observer requirements	§ 107.33 – Visual Observer
Fly multiple sUAS with only 1 remote pilot	§ 107.35 – Operation of Multiple sUAS
Fly a sUAS without having to give way to other aircraft	§ 107.37(a) – Yielding Right of Way
Fly a sUAS over a person/people	§ 107.39 – Operation Over People
Fly a sUAS:  Over 100 miles per hour groundspeed Over 400 feet above ground level (AGL) With less than 3 statute miles of visibility Within 500 feet vertically or 2000 feet horizontally from clouds.	§ 107.51 – Operating limitations for Small Unmanned Aircraft

Many teams may hold such waivers as such as the ability to fly near a airport/airspace, over people, or at nighttime, for example. The waiver(s) that a team or pilot holds may allow for a successful mission.

**Concept of Operation**

The Incident Commander must be aware there may be no fly conditions due to weather or mission profile. When the need for the sUAS team resource is needed the Incident Commander will make a request through their Division Dispatch Center with defining mission parameters. The Division Dispatch Center, using the sUAS Resource Checklist, can make a request through the normal MABAS resource request procedure for mutual aid. A trained pilot will then evaluate the mission and determine which team(s) best meet the mission profile. On more complex incidents sending two teams of similar capability should be considered redundant support and equipment.

Data created and/or generated will remain property of the IC and shall not be released without written permission of the IC.



Resource Typing Definition for  
Response Situational Assessment

## UNMANNED AIRCRAFT SYSTEM TEAM

<b>DESCRIPTION</b>	A small Unmanned Aircraft System (sUAS) Team is an aircraft operations team without a human pilot onboard, also known as a drone. The pilot on the ground has an FAA sUAS or Certificate of Authorization (COA) to fly to collect data for improved situational awareness through remote sensing. The sUAS Team operates under the Air Operations Branch, as established by the Incident Commander (IC).
<b>RESOURCE CATEGORY</b>	Incident Management
<b>RESOURCE KIND</b>	Team
<b>OVERALL FUNCTION</b>	<p>The sUAS Team:</p> <ol style="list-style-type: none"> <li>1. Provides situational awareness by transmitting real-time or near real-time imagery, data, or verbal assessment, using multiple technologies, such as photogrammetry, live video, thermal imaging, and lidar, to enhance the Common Operating Picture (COP), planning functions, and Incident Action Plan (IAP) development.</li> <li>2. Uses various platforms based on mission need, in accordance with FAA Code of Federal Regulations (CFR) Part 107, including:             <ol style="list-style-type: none"> <li>a. Fixed wing aircraft under 55 Pounds</li> <li>b. Rotary wing aircraft under 55 pounds</li> <li>c. Lighter-than-air UAS</li> </ol> </li> </ol>

## COMPOSITION AND ORDERING SPECIFICATIONS

1. Discuss logistics for deploying this team, such as security, communications, lodging, transportation, power, recharging, fuel, and meals, prior to deployment
2. This team typically is self-sustainable for 72 hours, and is deployable for up to 14 days
3. Pilot in Command (PIC) determines duty cycle of aircraft based on assignment, environment, terrain, battery life, and other factors affecting performance
4. Incident Commander (IC) should consider the following needs when ordering:
  - a. Collection: A measurable description of each information or image collection task, including image resolution; distribution instructions
  - b. Processing: Ability to link platform to satellite; platform-required ground reception and range limitations, if any; data collection media used; delivery points of data on media; media compatibility with end users; turnaround time for analysis
  - c. Distribution: Parameters for when, where, and how to disseminate images, information, and data
  - d. Storage: Image, data, and information storage locations and servers; time frames for storage and maintenance
  - e. Resolution, detail and IR or normal images/movies.
  - f. Weather conditions.
  - g. Duration of the mission.
5. Incident Commander (IC) orders data analysis capabilities separately
6. Incident Commander (IC) provides management and oversight of this team by:
  - a. Providing Air Operations Branch staff, including the Air Tactical Group Supervisor and the Air Support Group Supervisor
7. Incident Commander (IC) should consider mission needs in selecting a Type 1 or Type 2 Team:
  - a. **Type 1** - sUAS team would have the highest, most robust UASs capability, including, but not limited to: Long term search and rescue, detailed disaster surveys, long flying missions (typically 4 or more fly hours), special multispectral surveys to include at least thermal imaging and/or HazMat surveys. Additionally, this team may have in the field video editing capability and nighttime fly waivers.
  - b. **Type 2** – sUAS team would be used for shorter flying durations (less than 4 hours), less detailed surveys and/or limited to visual imaging capability.



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8. Ensuring Air Operations Branch staff understand sUAS operations, FAA regulations, and requirements of other local, state and Federal agencies having jurisdiction
9. Incident Commander (IC) and provider should discuss availability of equipment and supplies needed to establish an adequate Ground Control Station, such as a portable system for data management, wireless or networking equipment, batteries, and a specialized communications cache
10. Based on mission requirements, Incident Commander (IC) and provider should discuss data collection payload options such as:
  - a. Aerial photography
  - b. Full motion video
  - c. Specialized sensors, such as photogrammetry, sonar, radar, infrared, lidar, and hyperspectral
  - d. Infrared thermography (IRT)
11. Discuss mission planning factors, including:
  - a. Time-on-scene and flight duration requirements
  - b. Topography, climate, land and maritime factors, and population density
  - c. Launch and retrieve capabilities; takeoff and line of sight capabilities; first-person view (FPV), beyond line of sight view, video piloting; use of multiple controllers; follow-me capability (electronic or tether)
  - d. Operational time (day/night); takeoff and landing terrain; and operational area terrain
  - e. Weather factors (maximum wind speeds, temperature, humidity, and inclement conditions)
  - f. Airports and restricted airspace nearby
12. Incident Commander (IC) and provider should discuss the need for FAA waivers and authorizations, such as permission to fly beyond the visual line of sight, fly at night, fly directly over a person or people, fly multiple aircraft with only one pilot, fly above 400 feet, fly near airports, and fly in other restricted or special-use airspace.
13. This team adheres to FAA restrictions on crew duty according to Title 14 Code of Federal Regulations (CFR) Part 117: Flight and Duty Limitations and Rest Requirements

Each type of resource builds on the qualifications of the type below it. For example, Type 1 qualifications include the qualifications in Type 2, plus an increase in capability. Type 1 is the highest qualification level.

COMPONENT	TYPE 1	TYPE 2	NOTES
<b>MINIMUM PERSONNEL PER TEAM</b>	3	3	Not Specified

Resource Typing Definition for Response  
Situational Assessment

COMPONENT	TYPE 1	TYPE 2	NOTES
<p><b>SUPPORT PERSONNEL PER TEAM</b></p>	<p>Same as Type 2</p>	<p>2 – National Incident Management System (NIMS) Type 1 Pilot-in-Command (PIC)–UAS 1 – NIMS Type 1 Technical Specialist–UAS</p>	<ol style="list-style-type: none"> <li>1. Incident Commander (IC) provides Air Operations Branch staff for management and oversight of this team.</li> <li>2. Incident Commander (IC) ensures Air Operations Branch staff understand UAS operations and meet requirements of FAA, FCC, Department of Transportation (DOT), and other local, state and Federal agencies having jurisdiction.</li> <li>3. One PIC–UAS serves as a safety flight observer for the UAS Team during flight operations and is not in direct control of an operational UAS platform. He/she provides field oversight and situational awareness and ensures the safety of the PIC–UAS operating the UAS.</li> <li>4. Teams can add additional UAS aircraft and a corresponding number of additional PIC–UAS personnel within a manageable span of control.</li> <li>5. Each additional UAS aircraft should have an additional PIC–UAS, unless personnel are trained and qualified to operate more than one UAS, which requires an FAA waiver.</li> <li>6. For Type 1 teams using UAS aircraft over 55 pounds, Incident Commander (IC) should add pilots and personnel based on manufacturer recommendations for safe operation and handling.</li> </ol>
<p><b>AIRCRAFT SYSTEMS PER TEAM</b></p>	<p>Same as Type 2</p>	<p>Combination of fixed wing, lighter-than-air, and rotary wing UAS aircraft, under 55 pounds</p>	<ol style="list-style-type: none"> <li>1. Incident Commander (IC) determines image resolution required using the National Imagery Interpretability Rating Scale (NIIRS).</li> <li>2. UAS platforms needed, such as fixed wing, rotary wing, or lighter-than-air, may vary based on mission assignment.</li> <li>3. For Type 2 and Type 3 teams, each UAS should have a combined weight of less than 55 pounds, aircraft and payload included.</li> <li>4. For Type 1 teams using UAS aircraft over 55 pounds, Incident Commander (IC) should add pilots and personnel based on manufacturer recommendations for safe operation and handling.</li> </ol>

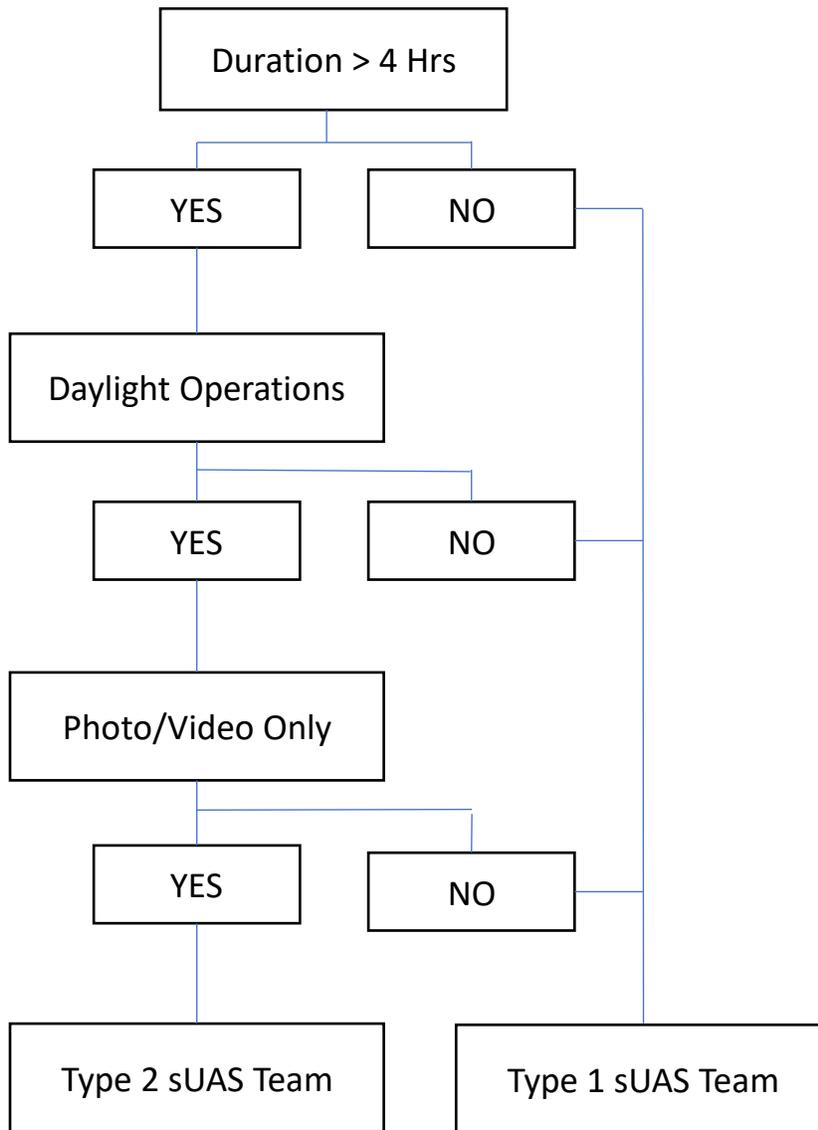


## Resource Typing Definition for Response Situational Assessment

COMPONENT	TYPE 1	TYPE 2	NOTES
<b>INFORMATION COLLECTION EQUIPMENT PER TEAM</b>	Same as Type 2, PLUS: Specialized information collection equipment, such as: <ol style="list-style-type: none"><li>1. Specialized sensors, such as photogrammetry, sonar, radar, infrared, lidar, and hyperspectral</li><li>2. Infrared thermography (IRT)</li></ol>	<ol style="list-style-type: none"><li>1. Photography</li><li>2. Full motion video</li></ol>	Incident Commander (IC) provides image resolution requirements based on mission needs.
<b>COMMUNICATIONS EQUIPMENT PER TEAM MEMBER</b>	Same as Type 2	<ol style="list-style-type: none"><li>1. Two-way portable radio</li><li>2. Cell phone</li></ol>	Consider alternate forms of communications, such as satellite phones, based on the mission assignment and team needs.



## Small Unmanned Aircraft System (sUAS) Resource Decision Flow Chart



## **NOTES**

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Nationally typed resources represent the minimum criteria for the associated component and capability

## **REFERENCES**

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1. FEMA, NIMS 509: Air Operations Branch Director
2. FEMA, NIMS 509: Air Tactical Group Supervisor
3. FEMA, NIMS 509: Air Support Group Supervisor
4. FEMA, NIMS 509: Remote Pilot-in-Command, pending publication
5. FEMA, NIMS 509: Technical Specialist–Unmanned Aircraft System, pending publication
6. Federal Aviation Administration (FAA) Joint Order (JO) 7200.23: Air Traffic Organization Policy, October 2016
7. Title 14 Code of Federal Regulations (CFR) Part 107: Small Unmanned Aircraft Systems, latest edition adopted