Attachment F

Mutual Aid Box Alarm Systems
Unmanned Aircraft Systems Program (UAS)
UAS Operational Application Guidelines – Search and Rescue

PURPOSE

This document shall provide guidelines on operating a UAS at a search and rescue incident. These guidelines shall coincide with the MABAS-IL UAS Flight Operations and Deployment Policy and Operational Application Guidelines – General document, and shall not supersede the AHJ. The document will be broken down into various tasks. A specific operation may use one or many of these tasks.

SCOPE

The document will offer non-compulsory guidance to facilitate the safe and successful completion of a number of objectives in the safe and effective deployment of UAS assets. Many of these tasks may need to be completed over a series of flights, dependent on the nature of the incident and number of units responding.

OPERATIONAL TASKS

For search and rescue, the general objective of the UAS is to collect data over a wide area to search for clues of the victim's whereabouts. Generally, there are two ways UAS can be utilized for search and rescue: to deliver first aid devices or to perform search operations, each of which require appropriate risk assessment. The following sections discuss non-compulsory practices for each type of search method.

Hasty search

The hasty search is an ad-hoc search preformed in a pre-defined area that is used to look for the victim or clues of their whereabouts. This search a free-flight search where the pilot looks for clues and documents what is found. This type of search is flown 2 to 3 times over the specified area for proper effectiveness.

1. Fly the aircraft at an altitude that balances reasonable ground coverage with resolution.
2. Record data when not taking images during the mission (takeoff and landing excluded). This video may be reviewed in real time or between flights by ground personnel to find clues as to the whereabouts of the victim that may have been missed by the pilot.
3. When the UAS is at a point of interest, collect still images.
    - Position the gimbal at a 60-degree angle from the ground and center the camera on the target.
    - The UAS may fly a point of interest pattern around the target while collecting still images.
    - If the location has many high contrast shadows, intentionally over exposing the image may help viewing into the shadowed areas.

Grid search (systematic sweep of a defined area)

A grid search is the most common search pattern used with UAS. Most UAS platforms have software that allows them to perform this type of pattern or supports a third-party solution to do. This type of search pattern has a high probability of detection with a UAS but collects a substantial amount of data. This type of search may have limited results in heavily wooded or urban areas. Below are guidelines for performing grid searches.

1. Use flight automation software to automate the flight path and data collection tasks, if possible.
2. Fly the aircraft as low as is safely practicable, at least 20'AGL above Minimum Obstacle Clearance Altitude (MOCA).
3. Images should have minimum 20% image overlap. Less overlap may prevent the images from being used in derivative data products (such as an orthostatic map, or other GIS information).

4. The camera should be positioned in a nadir position (90-degrees straight down) or, if the search area is urban, consists of dense foliage, has elevation changes, the camera may be positioned at 75-degrees to account for incidental object occlusion of the subject.
5. Generally, a wide-angle lens providing between 80 to 100 degrees of field of view is preferred.

Parallel route search (moving targets with a known course)

Parallel route search is a proven practice for aerial search operations designed to search for a moving target when the last known location and target are known. The parallel route search is flown by first following the last known course of the target and expanding the flight path in parallel lines outward from there. Pilots should exercise caution to ensure that the length of the route search does not extend beyond the pilot's visual line of sight. The following guidelines should be used by pilots intending to fly parallel route searches

1. Before takeoff, plot the last known location and course of the target.
2. If the targets course extends beyond the pilot's visual line of sight, divide the course into segments to be completed on multiple flights, or by different flight crews simultaneously. Additionally, Special Government Interest Addendum (SGI) may be available for flights beyond line of sight in exigent circumstances.
3. Fly the aircraft at an altitude that balances area coverage with ground sampling resolution.
4. Position the camera at a slightly oblique angle (approximately 75-degrees or 15-degrees above nadir).
5. Fly each succeeding parallel course with 30% visual overlap with the last course.

Expanding square search (when a last seen point is identified)

The expanding square search is a proven practice for aerial search operations designed to be used when a last scene or last known point of a victim is identified, but their current movements or whereabouts are unknown. The expanding square search should be conducted in phases by shifting the expanding square course in 45-degrees of azimuth if a detection is not obtained during each succeeding square course. The following guideline should be used by pilots flying an expanding square search.

1. Before takeoff plot the last known point of the target.
2. Fly the aircraft at an altitude that balances area coverage with ground sampling resolution.
3. Position the camera at a slightly oblique angle (approximately 75-degrees or 15-degrees above nadir) similar to the parallel route search pattern.
4. Fly the aircraft in an expanding square course, with the "top" of the camera feed facing the heading of the aircraft.
5. If the pattern is completed without detection of the victim, shift the course by 45-degrees of azimuth counter clockwise and begin the search from the start point again.