

Miami-Dade Police Department Special Patrol Bureau / Aviation Unit

Micro Air Vehicle (MAV) Standard Operating Procedures

I. **POLICY:**

The use of the Micro Air Vehicle (MAV) unmanned aircraft system (UAS) by the Miami Dade Police Department (MDPD) Aviation Unit (AU) is expected to enhance, not replace manned aircraft operations. While MAV operations afford specific mission capabilities that make use of a UAS advisable in some tactical operations, they currently lack the flexibility available to manned aircraft. Depending on the tactical situation UAS operations may be integrated with manned aircraft operations to provide the most successful response.

II. **MISSION:**

The mission of the MAV program is to provide tactical aerial support and assistance to the MDPD Special Response Team (SRT) in high threat situations where the operating environment is hazardous to manned flight. These can include, but are not limited to, subjects armed with high powered weapons or hazardous materials scenes.

III. **DEFINITIONS:**

1. Micro Air Vehicle (MAV): Refers to the Honeywell Micro Air Vehicle (or T-Hawk) System including the Air Vehicle (AV), Ground Control Station (GCS), and associated peripherals.
2. Air Vehicle (AV): Refers to the vertical take-off and landing aircraft portion of the MAV.
3. Ground Control Station (GCS): Consists of the Operator Control Unit (OCU), Ground Data Terminal (GDT) and associated cables and antennas. This GCS provides the interface between the Pilot in Command (PIC) and the AV.
4. Ground Data Terminal (GDT): Contains all the necessary equipment for the communication links between the AV and the OCU for both data and video. Also contains a Global Positioning System (GPS) to enable the operator to determine the system's location.

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5. Operator Control Unit (OCU): Consist of a laptop computer (currently a Panasonic Toughbook) with touch screen capability utilized to control the system and provide data and video transmitted by the AV.
6. Avionics Pod: Contains the AV's Global Positioning System (GPS) and the battery to power AV operations.
7. Payload Pod: Consists of 2 portions. The upper portion contains the radio and antenna for command and control communications. The lower portion contains the camera and antenna for video signal downlink.
8. Pilot In Command (PIC): The PIC is the person directly responsible for the operation of the MAV as described by Federal Aviation Regulations (FARS) 91.3.
9. Observer: The observer is responsible for the visual observation of the MAV while in flight.
10. Safety Officer: The safety officer is responsible for providing support during MAV operations.
11. Liaison: The liaison officer will liaison with the SRT personnel on behalf of the MAV team.

IV. ORGANIZATION:

A: EQUIPMENT

The MAV and all related equipment (Appendix A) will be stored and available for missions as needed. The MAV and it related support equipment will be stored at an Aviation Unit facility whenever possible.

B: TEAM COMPLIMENT

The MAV will be operated by a team consisting of a minimum of four (4) AU members. Each member of the team will be assigned a specific role during MAV operations. Roles may be rotated when more than one flight will be completed during an operation. Each member should be clearly designated with an assignment prior to any flights taking place.

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C: QUALIFICATIONS

MAV operators/team members must be certified in the operation of the MAV by successfully completing a manufacturer approved training course or by completing training conducted by MDPD MAV Instructor Pilots (IP). They must meet the standards required by the FAA (possess a valid second class -or higher- medical certificate, must pass the required knowledge test for a private pilot certificate and must keep their aeronautical knowledge up to date). Additionally, they must meet the proficiency events standards as stated in section **XIV. TRAINING/PROFICIENCY**, in order to act as a team member. Furthermore, they must be listed by the Miami-Dade County insurance carrier.

D: DUTIES

- (1). Pilot in Command (PIC): The PIC will function as team leader and the operator of the MAV. The PIC will be ultimately responsible for the operation and solely responsible for input of commands/piloting of the MAV during flight. The PIC will be responsible for GCS assembly (Appendix A), GCS Flight Preparation (Appendix B), GCS Post Flight Procedures (Appendix C), and GCS Disassembly/ Storage (Appendix D). Additionally, the PIC will appoint the observer and safety officer at his discretion.
2. Observer: The observer will maintain a visual observation of the AV while it is in flight and alert the PIC of any conditions (obstructions, terrain, structures, air traffic, weather, etc.) which affect the safety of flight. Additionally, the observer will be responsible for all aviation related communications required by FARs. To accomplish this effectively, the observer will be in close proximity to the PIC to ensure instant relaying of information. The observer will also assist the safety officer in completing his functions.
3. Safety Officer: The safety officer will complete all ground operations regarding the AV to include assembly (Appendix E), mixing fuel (Appendix L), fueling (Appendix M), defueling (Appendix N), tuning (Appendix H), and launch preparations (Appendix J). During flight, the safety officer will ensure that the operations area remains secured and both PIC and observer are not interrupted.

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4. Liaison Officer: The liaison officer will be an AU supervisor or designee whose function is to provide a conduit for information and request from the SRT to the MAV team. As the liaison officer may not be physically located with the other MAV team members, communications will be paramount. The PIC will have discretion as to which team member will monitor police communications with the liaison officer during MAV operations as any request for the MAV to perform a specific function will be communicated to the PIC via the liaison officer.

V CALL-OUT PROCEDURES:

1) Upon notification of a request for the MAV an AU Supervisor or designee will gather the facts and decide if a response is warranted. The AU Supervisor will then contact the MAV team for response.

2) Team members (preferably the AU Supervisor or designee and/or PIC) will be contacted and advised to report to the call out location and/or an Aviation Unit Facility to pick up the MAV and its related support equipment. The MAV Team members that respond to the scene will determine the response necessary from AU personnel in order to support the request. The AU supervisor or designee along with the MAV team members will determine if safe operation of the MAV can be accomplished as requested. The decision will be contingent upon several factors to include the ability of the MAV team to operate within a secure perimeter, physical features of the area, obstructions to flight, terrain, and the weather.

3) If it is determined that the MAV can be safely operated at the location, the AU supervisor or designee will contact the remaining MAV team members for response.

4) One (1) or more team members (preferably the Safety Officer and/or Observer) may be directed to respond to an AU facility to retrieve the MAV and its related operating equipment and transport it to the location.

Upon completion of each mission, the MAV will be returned to an AU facility for storage.

5) AU pilot are authorized to evaluate and accept or decline any mission request, or portion thereof, made by personnel not assigned to the AU. The basis for declining a mission shall be verbally communicated to requesting personnel and an AU supervisor immediately notified.

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Additionally, the AU pilot declining the mission will be required to document the circumstances upon request by an AU supervisor.

VI SAFETY OF OPERATION:

- 1) Safety of the MAV operations (including persons and property) is the responsibility of the entire team. MAV team members should bring to the attention of other members any condition which they feel is a safety concern.
- 2) Except as required by the mission, all MAV team members will ensure that no persons are in the vicinity of the AV during operations to avoid flying over non-hostile persons or vehicles.
- 3) Under no circumstances shall the AV be utilized directly over large gatherings of people, as a chase vehicle in a vehicle pursuit or operated from a moving vehicle.
- 4) Except for the purpose of training or with AU supervisory approval, only AU personnel who meet the requirements set forth in Section **IV. ORGANIZATION**, B. QUALIFICATIONS will be permitted to act as a team member.
- 5) MAV team members will comply with the MAV Operator Manual, warning, limitations, placards, and/or checklists at all times unless an emergency dictates otherwise.
- 6) MAV PICs are authorized to evaluate and accept or decline any mission or portion thereof which the safety of operations.
- 7) All MAV operations will be conducted in Day/Visual Meteorological Conditions only.
- 8) MAV night operations are **not** authorized.
- 9) All MAV team members will be familiar with the COA and Attachments which relate to operation of the MAV and comply with same.

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VII NORMAL OPERATIONS:

A. OPERATIONS AREA

The operation area selected by the MAV team shall be located within a secure perimeter, whenever possible. The area should be evaluated for adequate space and clearances in order to safely assemble, launch, and recover the MAV. Attention should be given to overhead obstacles and obstructions that may pose a risk to the MAV during operation. The site selected and utilized by the MAV team should be restricted and access granted to personnel for operational purposes only.

B. MAV ASSEMBLY

C. The MAV will be assembled on site by the MAV team as described in Section IV. **ORGANIZATION**, C. DUTIES.

D. FUELING PROCEDURES

- 1) Fueling/Defueling procedures as recommended by the manufacturer will be utilized (Appendix M & N).
- 2) 100 Low Lead (LL) high-octane aviation fuel (AVGAS) will be the only utilized for AV operations.
- 3) Fuel/Oil will be mixed at a ratio of 50 to 1 with AMSOIL synthetic oil in an approved fuel container prior to its use in the MAV. (Appendix L).
- 4) When fuel is mixed as listed above and stored, the date the fuel was being mixed shall be recorded and placed in a conspicuous location on the fuel container. This can be accomplished by tagging the container with the date which the fuel was mixed.
- 5) Pre-mixed fuel to be utilized for future MAV operations may be stored for a maximum period of six (6) months and shall be stored and transported in containers specially designed for that purpose.
- 6) Regardless of the intention (flight or tuning), the AV shall be fully fueled as per the AV Fueling Procedures (Appendix M) prior to operation.

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7) All fueling operations will be completed by the Safety Officer and the Observer assisting to ensure that the fueling procedures are properly complied with.

E. PRE-FLIGHT PROCEDURES

A pre-flight check of the MAV (including tuning if necessary will be completed in accordance with the manufacturer's recommendation and applicable FARs utilizing the AV Exterior Checklist (Appendix F) and GCS Preparation For Flight (Appendix B).

F. COMMUNICATIONS

- 1) All radio communications required by the FAA will be complied with.
- 2) Communications with MAV team members during operations will be limited to operationally necessary communications in order to minimize disruptions to MAV team members.
- 3) If applicable, prior to any MAV operation, the PIC will ensure that the Senior Bomb Technician on scene is aware that the AV will be launched. Flight operations will not be conducted if Electronic Countermeasures (ECM) equipment is energized.

G. FLIGHT OPERATIONS

- 1) The AV shall be operated in accordance within manufacturer specifications and applicable FAA limitations and restrictions.
- 2) Care shall be taken in the operation of the AV to avoid overflying persons and property that could result in injury or damage whenever possible.
- 3) A copy of the current valid COA shall be present whenever MAV operations are conducted.
- 4) The lost link response shall be set to rally point and the maximum altitude set in accordance with the altitude limit of the COA.
- 5) For all operations, the observer shall utilize a distance from the MAV that will adequately permit them to maintain a visual observation on the MAV and maintain Officer safety.

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6) All MAV team members will comply with all limitations, restrictions and requirements as enumerated in the COA.

H. POST-FLIGHT PROCEDURES

A post-flight check of the MAV will be completed on accordance with the manufacturer's recommendation and applicable FARs utilizing the Post-Flight Checklist (Appendix C, and I). The MAV shall then be prepared for redeployment (Appendix J) or for disassembly and storage (Appendix D, and K).

I. DOCUMENTATION

The PIC shall be responsible for completion of the Vehicle Time Tracking Form (Appendix O) following each flight. Each flight will be listed on the Vehicle Time Tracking Form along with the Pilot in Command, the flight time and engine time for purposes of maintenance, proficiency and reporting/documentation to the FAA

VIII EMERGENCY PROCEDURES:

Emergency Procedures stated in the manufacturer's operations manual shall be complied for all MAV operations.

A. LOSS OF AV FLIGHT CONTROL (Lost link):

The MAV lost link procedures shall be set for 15 seconds to the rally point response which shall automatically cause the AV climb to its ceiling altitude and return to and land at the launch site. If positive control of the MAV cannot be maintained and the MAV is leaving the operation area or the MAV poses a risk to life and/or property the PIC will issue an Engine Kill command

B. LOSS OF AV VISUAL CONTACT

If visual contact with the AV lost, the PIC shall command the aircraft into a hover mode and the Observer shall try to re-establish visual contact. If visual contact cannot be re-established within a reasonable amount of time to determine by the PIC, then lost link procedures shall be executed.

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C. LOSS OF GPS SIGNAL

Should the MAV lose GPS signal during autonomous operations, the PIC must immediately command the AV into manual mode and land as soon as practical. If positive control of the MAV cannot be maintained and the MAV is leaving the operation area or the MAV poses a risk to life and/or property the PIC will issue an Engine Kill command.

D. LOSS OF AV POWER (Engine Failure)/AV CRASH:

In case of an engine failure, the AV will not be able to maintain flight. AU Team Members will immediately attempt to locate the AV, assess the scene for injuries, and render first aid as necessary.

IX. STORAGE/TRANSPORTATION:

A. STORAGE

The MAV and support equipment will be securely stored at an AU facility in the designated gear bags for timely portability and deployment.

B. TRANSPORTATION

1) The MAV and support equipment will be ground transported in a dedicated vehicle(s) unless circumstances dictate otherwise. The MAV may be transported via AU aircraft or other method with AU supervisory approval.

2) Prior to transporting the MAV for deployment, the Team Member responsible for transport will ensure that all necessary gear is loaded by comparing the gear with the MAV Equipment Checklist (Appendix A).

X. MISSION READINESS:

In order to ensure mission readiness for MAV operations, the following procedures will be adhered to:

A. FUEL

AU Supervisors shall ensure that a minimum of 1 gallon of pre-mixed fuel is readily available at all times for MAV operations.

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B. BATTERIES

MAV batteries will be cycled through a charger on a monthly basis (as recommended by the manufacturer) to ensure immediate operability upon deployment. The cycling of batteries will be documented in the MAV Battery Log (Appendix R). Batteries will be labeled and replaced as necessary.

XI. INCIDENTS/ACCIDENTS:

A. PRIORITY

During an incident/accident, efforts will be focused on:

- (1) Minimizing risk to life
- (2) Care for the injured
- (3) Protect property

B. NOTIFICATIONS

The following notifications will be made as soon as practical:

- (1) Contact emergency personnel (Fire Rescue) if necessary.
- (2) Notify FAA and /or National Transportation Safety Board as necessary.
- (3) Notify MDPD Safety Officer (if appropriate).

A. INVESTIGATION

The following investigative procedures shall be utilized:

- (1) Initial investigation conducted by AU supervisory personnel utilizing an Accident/Incident Investigation Form (Appendix Q).
- (2) Follow-up investigation will be conducted by the appropriate agency or department.

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XII DAMAGE:

Any damage to the MAV or its support equipment shall be immediately reported to an AU supervisor. Any damage to the MAV or its equipment that is determined to render the system un-airworthy shall be labeled (ex.-utilizing a red tag) so as to be visually observable. An AU supervisor will be contacted and advised.

XIII MAINTENANCE:

A. CERTIFICATION

AU Aircraft Technicians must successfully complete a manufacturer's maintenance training course; possess a valid FAA Airframe and Power-plant License in order to perform maintenance on the MAV (unless working under the direct supervision of a certified AU Aircraft Technician).

B. SERVICING

All maintenance, servicing, and repairs of the MAV to (include scheduled maintenance) shall only be accomplished by certified AU technicians. AU Aircraft Technicians will ensure that a spare tool kit and parts are available for deployment to allow MAV operators to remedy minor issues in the field (e.g. tightening loose screws, replacing antennas, changing pod straps, etc.). Employees, technicians and authorized subcontractors of the manufacturer, that they permit to service the MAV, shall also be allowed to maintain service and repair the MDPD AU MAV's as necessary while acting as agents for the manufacturer.

XIV TRAINING/PROFICIENCY:

A. INITIAL TRAINING:

Initial MAV training will be accomplished by manufacturer personnel or AU Instructor Pilots (IP) who have completed a training course established for this purpose.

B. RECURRENT TRAINING

Operations permitting, MAV training will be conducted on a regular basis by all certified personnel. The training will consist at a minimum of 1 takeoff and landing event in order to meet the proficiency and currency requirements, weather permitting. MAV certified personnel not able to

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attend a training session will attempt to make up the session at the earliest possible opportunity. The intent is to have AU pilots maintain currency and be prepared for missions.

C. PROFICIENCY

All AU pilots will maintain currency in the MAV in order to be readily available for assignment as a MAV team member. Currency for MAV operations will consist of three (3) take-off and landing events within the last 90 days prior to act as PIC. If an AU pilot is not current, they must notify their immediate supervisor and will not be eligible to operate the MAV as PIC (except for training purposes) until they regain currency.

D. TRAINING SITE(S)

MAV training will only take place at a site designated and approved by the FAA for such purpose.

E. TRAINING NOTIFICATIONS

In compliance with FAA COA's which has been issued to the MDPD, notifications will be made to the appropriate FAA facilities prior to MAV operations. Additionally, notifications deemed appropriate for airspace safety purposes will also be made (e.g. Homestead Air Reserve Base Air Traffic Control Tower for operations at the training site, Airports in the area and other users of the airspace).