



MOUNTAINS RECREATION & CONSERVATION AUTHORITY

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Unmanned Aircraft System (UAS) Operations Manual

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A local public agency exercising joint powers of the Santa Monica Mountains Conservancy, the Conejo Recreation & Park District, and the Rancho Simi Recreation & Park District pursuant to Section 6500 et seq. of the Government Code.

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Unmanned Aircraft System (UAS) Operations Manual

1 Introduction

The Mountains Recreation & Conservation Authority (MRCA) is implementing the use of Unmanned Aircraft Systems (UAS) for several of its programs in support of its mission. While this manual may not address all potential UAS activities, it is intended to be the baseline for MRCA UAS policy and it applies to all UAS activities conducted by MRCA personnel or contractors during the course of their job duties.

Wherever possible, this manual draws its terminology and best practices from the FAA, other Federal and State government entities, and other industry leaders. Additionally, the MRCA participates with other Natural Resource Agency Departments in a UAS Working Group to coordinate consistent UAS policy and operations.

1.1 Use of this Manual

This manual provides details of procedures and requirements necessary to safely and efficiently conduct UAS activities. The procedures and requirements outlined in this manual are intended to comply with FAA regulations for the use of small UAS weighing less than 25 Kgs. (55 lbs.).

The procedures described in this manual apply to all MRCA UAS activities. Depending on the nature of the task, the MRCA UAS Coordinator may prescribe additional requirements as needed.

If regulations referenced in this manual change, or safer and more effective operational methods are developed, it is the responsibility of all UAS operations personnel to notify and provide input to the MRCA UAS Coordinator to effect changes to this document. This manual and the policies and procedures provided herein will be reviewed regularly and updated as needed.

UAS operations personnel shall study this manual and have a working knowledge of the policies and procedures contained herein. A copy of this manual and all forms specified herein shall be available at every location where UAS operations are conducted.

1.2 UAS Safety

Safety is the fundamental consideration in all MRCA UAS activities. The MRCA requires a culture of open reporting of all safety hazards. It is imperative that management not initiate disciplinary action or re t a l i a t e against any personnel who, in good faith, disclose hazards, safety incidents, or other concerns.

It is the duty of every crew member involved in UAS activities to contribute to the goal of continued safe operations. This contribution may come in many forms and includes always operating in the safest manner practicable and never taking unnecessary risks. Any safety hazard, whether procedural, operational, or maintenance related should be identified as soon as possible after, if not before, an incident occurs. Any suggestions in the interest of safety should be made to the Pilot in Command or the UAS Coordinator.

Usage and proper documentation of the Go/No-Go Checklist is mandatory for all flights. If a No-Go item cannot be safely mitigated using approved tactics, then UAS flight is not permitted until such time as it can.

An analog radio must be used during flight to monitor any manned aircraft in the surrounding area as per FAA guidelines. Frequencies must be obtained from the incident or nearest control tower if available prior to takeoff.

UAS activities are to be conducted in a manner that provides an accident-free workplace, including no harm or damage to people, biological resources, equipment, or property, and to make every effort to respect the public's privacy. The MRCA encourages monitoring UAS regulations, technology, practices, and laws to ensure best safety practices are continually incorporated into the organization.

Ultimately, each UAS crew member is responsible for their own safety. Each individual is responsible for knowing their own limitations, and should inform their supervisor immediately when a task or conditions are beyond their capability or training, or if they believe a situation is unsafe.

2 Scope and Objectives

The scope of this manual includes all operations conducted by MRCA UAS personnel and is applicable to all locations where UAS activities may be conducted. This manual is also intended to achieve the following objectives:

- Facilitate administration of UAS activities;
- Ensure the safety of MRCA UAS crew members and the public when conducting UAS activities;
- Establish minimum guidelines for qualifications, safety, training, security, and operational procedures when conducting UAS missions;
- Ensure that impacts to biological resources are minimized; and
- Ensure that operations of UAS do not intrude upon the rights of the public.

The following procedures apply to all MRCA personnel, including its agents, engaged in UAS activities during the course of their job duties. These procedures are intended to protect MRCA personnel and the public from hazards associated with UAS activities.

When operating a UAS, MRCA personnel will abide by FAA flight regulations and guidelines and receive the proper authorizations as outlined in this manual. MRCA UAS activities are carried out only by teams of trained employees.

This Operations Manual is a general policy guideline, applicable to UAS usage within all divisions of the MRCA, unless otherwise noted.

3 Definitions, Roles and Responsibilities

This section defines applicable terms, prohibited activities, and outlines the roles and responsibilities of each MRCA employee directly involved in UAS activities.

3.1 Definitions

Global Positioning System (GPS) – A system which determines location on earth based on satellite triangulation.

Near Miss – An incident in which personal injury or damage to equipment, property, or the environment nearly occurred, but was averted.

Small Unmanned Aircraft (UAS or UA) – defined by the FAA in AC 107-2, a UA weighing less than 55lbs at takeoff operated without the possibility of direct human intervention from within or on the aircraft. All UA referenced in this manual are assumed to weigh less than 55lbs at takeoff.

Small Unmanned Aircraft System (sUAS or UAS) – a sUA and its associated elements (including communication links and the components that control the UAS) that are required for the safe and efficient operation of the UAS in the national airspace system. All UAS referenced within this manual are assumed to be UAS. UAS will be used colloquially throughout this manual.

Pilot in Command (PIC) – The lead UAS Pilot designated to a specific UAS mission. In most cases the operator of the UAS aircraft. Ultimately responsible for all aspects of the UAS mission. Also called Remote Pilot in Command.

UAS Pilot – A certification received once someone completes the requirements to allow them to operate UAS for the Department.

UAS Project – A single or multi-outing UAS operation to benefit a targeted project or outcome. A UAS Project is made up of one or more UAS Missions.

UAS Mission – A single-day or near consecutive multi-day UAS operation. One or more UAS Missions make up a UAS Project.

UCO – UAS Coordinator

Visual Line of Sight (VLOS) – Flying a UAS such that the PIC is able to maintain unaided visual contact with the UAS and determine its orientation and attitude without enhancements other than corrective lenses.

Co-Pilot/Visual Observer (CP) – Provides support to the PIC by maintaining visual contact with the UAS and by scanning airspace for traffic and hazards during UAS operations.

AGL – Above Ground Level

COA – Certificate of Waiver or Authorization (issued by the FAA) FAA – Federal Aviation Administration

RTH - Return to Home

UAS – Unmanned Aircraft System

UAV- Unmanned Aerial Vehicle

3.2 Roles and Responsibilities

The UAS personnel roles consist of the UAS Coordinator, Certified MRCA UAS Pilot, Pilot in Command (PIC), Co-Pilot (CP), Camera Operator and support personnel. UAS related duties, to the extent applicable, should be included in the Duty Statement (214) of all UAS personnel. Additional roles may be taken on by individuals/entities as deemed necessary to support the UAS program and it's mission, so long as they have met the comparable civilian certification requirements for the role they will be assuming.

3.2.1 UAS Coordinator (UCO)

The UAS Coordinator is a MRCA employee trained in all aspects of UAS regulation and operation. The UAS Coordinator's responsibilities include, but are not limited to:

- Overseeing the scheduling and planning UAS activities in a safe manner and in accordance with the UAS Operations Manual and MRCA policy;
- Reviewing and authorizing UAS Project Requests prior to any UAS activity;
- Reviewing the UAS Project Request with the assigned crew;
- Serving as the point of contact for any UAS crew member's concerns about the safety of the UAS activities;
- Providing notification to the FAA of any accidents following UAS activities in accordance with MRCA policy and FAA regulation;
- Maintaining the Department's UAS authorization from the FAA;
- Maintaining and reporting flight logs per FAA requirements; and
- Keeping this manual up-to-date with applicable regulatory changes.

3.2.2 UAS Crew

A UAS crew will consist of, at a minimum, a Certified MRCA UAS Pilot in the role of Pilot in Command (PIC) for the mission, and a Co-Pilot (CP). Additional personnel may also be present as support crew members including a camera operator. The responsibilities of each position are detailed below.

3.2.2.1 Pilot in Command (PIC)

The PIC is a Certified MRCA UAS Pilot serving as the PIC for a specific mission. The PIC is the crew leader and is directly responsible for mission safety and objectives. During the flight the PIC's primary duty is to focus on flying the aircraft safely until it is back on the ground. The PIC leads onsite Pre- and Post-flight UAS activities and is responsible for:

- Piloting UAS flights for the mission;
- Overseeing all onsite UAS activities and ensuring that all activities are being carried out in a safe manner;
- Operating the UAS in a safe and effective manner in accordance with the manufacturer's approved flight manual;
- Strictly following and documenting the Go/No-Go Checklist;
- Establishing coordination with personnel that will be onsite;
- Coordinating with Air Operations/Air Attack/Helco on managed incidents;
- Terminating UAS activities at any time due to unsafe or changing conditions encountered prior to or during operations;
- Conducting and documenting briefings (i.e., tailgate safety meetings) addressing hazards specific to the UAS with site operations personnel. This includes an on-site pre-flight assessment of weather conditions, and identification and management of all persons in the area that may be affected by the UAS activities;
- Verifying that copies of the UAS Project Request, UAS Project Authorization, UAS Operations Manual, and all related FAA documents are present and available on-site;
- Performing thorough pre-flight inspections of the aircraft and transmitter, and ensuring that all equipment and settings are in order prior to initiating flight;
- Designating a location or locations where the Co-Pilot (and support personnel) shall be stationed;
- Ensuring the UAS is flown within visual line of sight (VLOS) of at least 1 team member and lower than 400 feet above ground level (AGL) unless instructed otherwise by Air Operations;
- Terminating UAS activities if a manned aircraft enters the immediate area and any possibility of conflict exists;
- Logging the mission and documenting any accidents, near misses, or unanticipated hazards that occurred during flight and any lessons learned;

- Ensuring that a copy of the Flight Log(s) is filed with the UAS Coordinator after each project; and
- Ensuring that all applicable FAA guidelines are followed.

3.2.2.2 Co-Pilot / Visual Observer

The Co-Pilot serves as the role of Visual Observer, as defined by the FAA in Part 107 certification. The Co-Pilot (CP) is responsible for aiding the PIC with a dedicated set of eyes and ears during UAS missions. The primary communication during flight is between the PIC and the CP. The CP is responsible for:

- Keeping their eye on the UAS and continuously scanning the airspace where the UAS is operating for any potential aircraft or collision hazards and maintaining a see- and-avoid awareness of the position of the aircraft and the surrounding airspace through direct visual observation;
- Assisting the PIC in identifying any potential hazards or changing conditions that may affect the mission or the safety of persons or property;
- Communications while the PIC is operating;
- Serving as the principal camera/gimbal operator, using a secondary remote;
- Managing all recorded data from the UAV cameras, documenting and uploading after each flight;
- Managing all data cards used, ensuring that the devices are sufficient to record all information for the flight;
- Communicating to the PIC the active flight status of the UAS and any hazards which may enter the area of operation so that the pilot can take appropriate action;
- Watching and listening for any abnormal sounds or flight characteristics being exhibited by the UAS; and
- Being prepared to carry out emergency plans and procedures in the event of an emergency incident or accident.

3.2.2.3 Support Personnel

Support personnel refers to employees that are part of the UAS crew providing added support to the PIC or CP. The support personnel's duties are similar to the CP's responsibilities. Support personnel are responsible for:

- Following the instructions of the PIC during UAS activities;
- Helping to maintain a "Sterile Cockpit" environment for the PIC and the CP, such that they have minimal distractions, by keeping conversations out of their earshot, and ensuring any spectators do the same;
- Monitoring airspace and site conditions that could adversely affect UAS operations; and

- Being prepared to carry out emergency plans and procedures in the event of an emergency incident or accident.

4 Qualifications and Training

Employees engaged in UAS activities shall possess the necessary certifications, training and experience as defined in this manual and will maintain a professional level of competency and proficiency to safely perform the assigned work.

4.1 UAS Pilot

Prospective MRCA UAS Pilots must possess both the appropriate knowledge and sufficient skills to legally and safely operate MRCA UASs. All UAS Pilot applicants must be approved by the UAS Coordinator.

The requirements include:

- FAA Remote Pilot certificate (Part 107);
- Completion of the UAS Taskbook;
- 200 documented hours of flight time;
- California Driver's License;
- Training in all specific details of the UAS to be operated including normal, abnormal, and emergency procedures;
- 50 hours of logged flight time on specific UAS to be operated; and
- Pass a MRCA practical pilot proficiency test.

The FAA Remote Pilot Certificate is required to satisfy a knowledge component. It can be obtained by taking and passing the Part 107 Remote Pilot Certification Test at an FAA-certified testing center.

The California Driver's License is required to ensure staff has adequate vision for UAS operations. A signed note (medical note) from a licensed medical professional indicating that the staff has sufficient corrected visual acuity to pass the vision screening required for a California Driver's License may be substituted for a California Driver's License.

To satisfy the skills component, staff must log appropriate flight time on equipment similar to what they will be flying for the Department (similar flight configuration, similar sensor package, etc.), and pass a practical pilot proficiency test administered by staff approved by the MRCA UAS Coordinator.

Appropriate flight times and required skills will be determined and documented for each UAS operated by the Department.

Flight time can be accrued at work using MRCA equipment if an approved MRCA UAS Pilot is with the prospective pilot during the flights, and is ready to take over if needed. The MRCA may provide a basic UAS training course to allow for the accrual of this flight time.

Flight time may also be accrued outside of work with non-MRCA equipment so long as the equipment and flight times can be appropriately verified and the UAS Coordinator has approved the equipment.

As a guideline, no more than a third of the required flight time should be accrued with autonomous flights.

After obtaining the FAA Remote Pilot Certification, staff will be considered a Provisional UAS Pilot and can legally fly according to the FAA Regulations. This allows the Provisional UAS Pilot the legal means to fly at work under the supervision of a Certified MRCA UAS Pilot while gaining the required flight hours and task book experience prior to becoming a Certified MRCA UAS Pilot.

Once documentation of all requirements is provided to the UAS Coordinator, a MRCA UAS Pilot Certificate will be issued, authorizing the new UAS Pilot to operate UAS for the Department.

4.2 Co-Pilot

The qualifications required to be a MRCA UAS Co-Pilot (CP) include:

- FAA Remote Pilot certificate (Part 107);
- Open UAS Taskbook; and
- California Driver's License or signed note from a licensed medical professional indicating that the staff has sufficient corrected visual acuity to pass the vision screening required for a California Driver's License.

4.3 Training and Records

The key to continued safe operations is to maintain a professional level of competency. The UAS Coordinator will maintain a file for each UAS Pilot and VO that contains documentation of pertinent documents, training and experience. It is the MRCA UAS Pilot's responsibility to verify their training file contains at a minimum:

- A copy of their FAA Remote Pilot Certificate;
- A copy of their California Driver's License or medical note;
- MRCA flight proficiency testing documentation;
- MRCA UAS Pilot Certificate;
- Accurate and up-to-date flight log, including any incidents; and

- Records of any extended training.

4.3.1 Recurrent Training

MRCA UAS Pilots are required to keep their knowledge and skills up to date to maintain operational eligibility.

The FAA Remote Pilot Certificate is valid for 24 months, and pilots must recertify every 24 months.

All UAS Pilot flight time must be logged with the UAS Coordinator. Minimum flight time of 3 flights per 90 days must be logged to stay current.

The MRCA flight proficiency test must be passed every 24 months.

4.3.2 Degree of Suitability

Employees must demonstrate to the UAS Coordinator's satisfaction a continued high degree of suitability for participation in UAS activities. Demonstration includes, but is not limited to, the following factors:

- Comfort and competency while in flight;
- Contributions to the objectives of the UAS mission;
- Compliance with the standards of the UAS Operations Manual;
- Willingness to work in a team-oriented environment; and
- Acting in a safe manner at all times.

4.3.3 Good Judgment

MRCA UAS Pilots are prohibited from operating an aircraft in a careless or reckless manner that could endanger the life or property of another. UAS Pilots are expected to exercise good judgment and conduct themselves in an ethical, responsible, lawful, and safe manner with respect to other UAS crew members, personnel onsite, and the general public.

4.4 Suspension

Any previously certified Department UAS Pilot who does not meet the ongoing eligibility requirements described above shall be suspended from MRCA UAS activities. UAS Pilots may be reinstated by the UAS Coordinator provided that they demonstrate acceptable compliance with the aforementioned requirements.

5 Operational Procedures

5.1 Requesting a UAS Project

[Section under development]

5.2 Review and Authorization of a UAS Project

[Section under development]

5.3 Pre-UAS Project Procedures

At a minimum, the following procedures will be used in pre-UAS project planning preparation. The UAS Coordinator may require additional site-specific requirements.

5.3.1 UAS Crew Assignment

The UAS Coordinator will assign a UAS Crew for the project. This will include at a minimum a PIC and a CP. Additional crew will be assigned as needed.

5.3.2 UAS Operations at a MRCA Property or Facility

For UAS operations within MRCA land or facility boundary, the UAS Project proponent shall contact, and obtain permission from, the appropriate MRCA Land or Facility Manager prior to submitting the UAS Project Request. Any restrictions or limitations required must be documented and noted on the UAS Project Request form. The UAS Coordinator will confirm this permission with the Land or Facility Manager. No UAS Project shall be conducted at a MRCA Land or Facility without the expressed permission of the UAS Coordinator.

5.3.3 UAS Operations at Non-MRCA Properties

For UAS activities planned on lands not owned/managed by MRCA, appropriate permission is required and must be obtained by the UAS Project proponent and noted on the UAS Project Request form. For State, Federal, or local government lands, check with the appropriate authority to determine if permission or notification is required. If possible, engage with the law enforcement authority responsible for the area of interest.

For private lands, written permission must be obtained from the land owner. If possible, the land owner, or their representative, should be on-site during the project.

5.3.4 UAS Pre-Flight Checklist

Prior to heading out for a UAS Project, the crew will check off the items on the Pre-Flight Checklist. UAS Flight Checklist and Log form to be completed in-office. This includes:

- Check airspace;
- Check for Notices to Airmen (NOTAMs) and Temporary Flight Restrictions;
- Charge batteries and other equipment;
- Check weather forecast; and
- Ensure required documents are in hand for flight.

All items shall be checked off prior to conducting any flight activities.

5.4 On-site UAS Flight Procedures

[Section under development]

5.4.1 Safety Briefing

Prior to UAS operations, the PIC will conduct an on-site briefing for all personnel (UAS crew, biologist, property owner, and any other staff or observers). It will include a review of the UAS Project Request and Authorization, tasks to be undertaken, sterile cockpit procedures, safety procedures, any unusual hazards or environmental conditions, and modifications of standard procedures, if necessary.

5.4.2 UAS Flight Checklist

Prior to every flight, the crew will check off every item on the DFW 1051 UAS Flight Checklist and Log form not already completed in-office. This includes:

- Conduct safety checks, including the precautions listed in section 5.7.1 below;
- Re-Check for Notices to Airmen (NOTAMs) and Temporary Flight Restrictions;
- Ensuring required documents are in hand for flight;
- Recording current weather conditions;
- Checking airspace for aircraft and other hazards immediately prior to flight;
- Equipment prep and inspection;
- Pre-flight power-ups and settings check;
- Ensuring the launch area is clear of people and other hazards; and
- Low altitude flight test.

All items shall be checked off prior to conducting any flight activities.

5.4.3 Flight Procedures

During UAS Flights, all FAA regulations will be followed. Additionally, the following rules will apply:

- A PIC and a VO must be present for all flights;
- The PIC or the VO must maintain visual contact with the UAV at all times;

- A sterile cockpit environment must be maintained at all times;
- If a manned aircraft enters the proximity of the UAS mission, the UAV will be landed until the manned aircraft is outside of the area;
- In the event of any unplanned in-flight situation, contingency plans will be followed immediately; and
- On landing, power-down and checklist procedures will be followed immediately.

5.5 Post-UAS Flight Procedures

Upon finishing a UAS project, the PIC will be responsible for submitting a completed CDFW UAS Flight Checklist and Log summarizing the flight activities with the UAS Coordinator.

The PIC will download and file the data from the project to a shared file location specified by the UAS Coordinator.

5.6 Privacy

The use of the UAS potentially involves privacy considerations. Absent a warrant or exigent circumstances, UAS projects shall adhere to FAA altitude regulations and shall not intentionally record or transmit images of any location where a person would have a reasonable expectation of privacy (e.g., residence, yard, enclosure). Operators and observers shall take reasonable precautions to avoid inadvertently recording or transmitting images of areas where there is a reasonable expectation of privacy. Reasonable precautions can include, for example, deactivating or turning imaging devices away from such areas or persons during UAS operations. Additionally, unintended imaging overlap into private lands should be trimmed from final image products prior to public release or use in reports.

5.7 General UAS Safety Procedures

The procedures described in this section apply to all MRCA UAS activities. Depending on the nature of the task, the UAS Coordinator may prescribe additional requirements as needed. MRCA UAS crew members who fail to follow these safety procedures will be subject to disciplinary action and may have their UAS privileges revoked. Safety rules do not exist as a substitute for common sense, sound judgment, and a continuing concern and vigilance for maximum safety.

The UAS Coordinator will be responsible for the coordination of the regular review of this manual.

5.7.1 Safety Precautions Applicable to All UAS Activities

It is the duty of every crew member involved in UAS activities to contribute to the goal of continued safe operations. This contribution may come in many forms and includes always operating in the safest manner practicable and never taking unnecessary risks. Any safety hazard, whether procedural, operational, or maintenance related should be identified as soon as possible to avoid incidents. It is the responsibility of every crew member to ensure the following, unless otherwise authorized:

- UAS operations are limited to daylight hours (official sunrise to official sunset), although civil twilight (30 minutes before sunrise and 30 minutes after sunset) operations may be approved with appropriate UAS lighting;
- UAS operations shall not be conducted over any persons not directly involved in the UAS project operations;
- All aircraft must use flight controllers that incorporate stabilization and autopilot;
- systems with GPS "Return to Home" (RTH) capabilities;
- Once UAS crew members arrive on-site for a project they should be in an alert status actively scanning the airspace and listening for aircraft and observing any other activities in the area which could affect or be affected by the UAS flight activities;
- UAS crew members should continuously monitor weather conditions, specifically wind velocity and the potential of a dust or sandstorm developing;
- An appropriate level launch area should be selected with sufficient space (preferably away from bystanders) to unpack and assemble the necessary equipment for the UAS project. Try to select an area where the UAS will not kick up a dust cloud on take-off. UAS operations tend to attract local bystanders so be prepared to implement controls for safety;
- A first-aid kit with laceration supplies, and a fire extinguisher are available on-site; and
- A cell phone shall be readily available on-site in the event of an emergency.

5.7.2 Minimum Manning Requirements

At a minimum all UAS operations must include both a Pilot in Command and a Co-Pilot. Under no circumstances will a MRCA UAS Pilot conduct UAS activities for the agency alone, unless in an emergency.

5.7.3 Limits and Termination of UAS Activities

UAS projects shall not be conducted under the following conditions:

- When weather conditions or visibility are deemed unsafe by the UAS Coordinator or PIC;
- When manned aircraft are observed within the immediate vicinity;

- In any situation where local conditions have changed considerably prior to, or during flight; or
- If significant risks to the biological resources, equipment, staff, or observers are identified that can't mitigated for.

The PIC has final authority regarding whether conditions are safe for flying. Should any UAS activity be terminated due to safety or changing conditions, the PIC will inform the UAS Coordinator of the decision.

6 Equipment, Inspections, and Maintenance

Although an airworthiness certification is not required, small UAS aircraft are exposed to high frequency vibrations and should be well-maintained to ensure they are always in a condition for safe flight. It is important to ensure the safety of the UAS crew by regular inspection and maintenance of all UAS aircraft, radio transmitters, and accessories. Maintenance logs should be maintained for each aircraft and at a minimum, the following UAS components should be checked and replaced per manufacturer guidelines or if otherwise necessary:

- Motors;
- Propellers (check for nicks and abrasions);
- Electronic Speed Controllers;
- Electrical connections, (plugs and solder connections);
- Antennae and GPS mounts; and
- Screws which secure the body of the UAS, its arms, motor mounts, landing gear, camera gimbal, etc.

The PIC is responsible for choosing the appropriate equipment.

6.1 Lithium Polymer (LiPo) Battery Management

Batteries used for UAS operations are made from Lithium Polymer (LiPo) and are especially sensitive and potentially dangerous if not maintained and stored properly. As an example, if a LiPo battery is discharged to less than 20 percent of capacity they can potentially catch fire or explode during the next charging. Special battery chargers with cell balancing capabilities must be used and the batteries must be monitored and stored safely. All batteries should be charged, maintained, and stored in accordance with the battery manufacturer's recommendations. Charging of the batteries must be monitored closely at all times. Never leave a charging battery unattended, it could catch fire!

LiPo batteries should also be drained to approximately 60 percent of capacity if stored for more than a few days. Some batteries have auto-discharge capability, but not all. Storing

LiPo batteries charged to 100 percent for long periods will cause the battery to begin to off gas and start bulging. Bulging batteries must be properly discharged and disposed of immediately at an approved disposal site.

6.2 UAS Crew Equipment Requirements

Separate from the UAS Aircraft, Radio Control Transmitter, and tablet, each crew must have the necessary equipment, provided by CDFW, to use for the UAS Project. This includes, but is not limited to, the following:

- Spare propellers, spare batteries, field battery charger;
- Launch pad (when needed);
- Handheld anemometer to measure wind velocity;
- First aid kit; and
- Fire Extinguisher

6.3 Maintenance Logging

All hardware and software updates will be logged into a central location for each UAS setup. This will include:

- Firmware updates to UAS, Controller, and Batteries;
- Tablet application updates (DJI Go, Map Pilot, etc.);
- Tablet OS updates (iOS); and
- Equipment repair or replacement (rotors, batteries, etc.).

6.4 Use of Personal UAS

CDFW staff may not use their personal UAS for Department work.

7 Emergency Procedures

UAS accidents or incidents are defined as an injury or illness occurring during or as a result from a UAS activity. An incident is further defined as any adverse consequence that caused or could have caused injury to personnel and/or damage to equipment, properties, or biological resources. Biological resource incidents are more than just collisions, and include, but are not limited to; displacement of wildlife, nest or den abandonment, aggressive behavior towards the UAS by wildlife, and out-of-ordinary vocalization or alarm calling by wildlife.

Accidents resulting from UAS activities can range from minor injuries and mishaps to life threatening injuries, or even death. All accidents and incidents, regardless of the severity or whether or not the employee is injured, must be reported to the UAS Coordinator.

All accidents requiring medical treatment or resulting in a serious injury or death must be reported immediately after taking necessary actions to preserve life or respond to injuries. In an emergency, dial 911 to reach local authorities and medical aid as soon as possible.

7.1 Incident Reports

If an incident or accident resulting from UAS activities occurs, the PIC must complete and submit a MRCA UAS Incident Report. Incidents from operation of a UAS that result in serious injury or property damage in excess of \$500, must also be reported to the FAA within 10 days. The PIC must coordinate with the UAS Coordinator to file this report.

The PIC will report all near misses involving UAS activities to the UAS Coordinator.

7.2 Reporting and Investigation Responsibilities

A key element of any successful accident prevention program is the timely reporting and investigation of all accidents and incidents. Determining the root cause of an incident and implementing corrective actions will lead to a continual improvement in UAS safety. All crew members involved in the UAS activity; PIC, CP, UAS Coordinator, and any support personnel, must freely discuss and document any incident or near miss to determine what went wrong and develop ways to prevent recurrence.

7.2.1 UAS Coordinator

The UAS Coordinator has the following responsibilities to investigate and report incidents/accidents:

- Review the incident report submitted by the PIC;
- Ensure the submission of the incident to the FAA within 10 days of any operation that results in serious injury or property damage in excess of \$500;
- Immediately investigate each employee-reported incident;
- Notify their respective Division Chief, and Health and Safety;
- Coordinator of any work-related incident; and
- Submit to their respective health and safety official, the timely documentation of elements necessary for job-related injuries or illness requiring medical treatment or first aid provided by a medical professional.

8 UAS Activities Conducted by Non-CDFW Personnel

Any agency or contractor personnel on a MRCA UAS Project must agree to abide by the procedures established in this Manual. Those meeting the standards of this Manual may

be allowed to conduct UAS projects with the MRCA after proper certification and documentation has been approved by the UAS Coordinator.

8.1 Contracting for UAS Services

When MRCA contracts out for services that include UAS technology, specific requirements must be met and documented.

8.1.1 UAS Submittal Package

The contractor shall provide appropriate UAS equipment for the job being contracted. This includes the most suitable aerial vehicle and payload (camera/sensors) equipment for the job, ground station equipment, and data post processing capabilities.

The contractor must be certified by the FAA for UAS operations as applicable to the work being contracted. The contractor is responsible for obtaining the appropriate authorization as may be required by the FAA for any UAS projects under this contract. Proof of the certification/exemption and authorization must be provided to the MRCA prior to any flights.

The contractor shall obtain general liability insurance per MRCA standards specifically covering the UAS operations, and shall name the Mountains Recreation & Conservation Authority as additional insured for any UAS use. Proof of liability insurance must be provided to the MRCA prior to any flights. Contractor must also comply with all safety procedures as set out in the FAA regulations and the Agency's UAS policy.

Appendices

Appendix 1 – UAS In-Flight Contingency Procedures

The UAS In-Flight Contingency Procedures cover several potential unplanned in-flight situations. The procedures listed below provide the basic steps for each situation. These procedures may be modified to the capabilities of a particular UAV as needed.

Loss of Visual Line of Sight: Defined as when neither the PIC nor the VO has a visual on the UA. Procedure: If the UA is visually reacquired promptly, the mission may continue. Otherwise, the mission shall be aborted, and the PIC shall attempt to assess the location of the drone. Prior to piloting the drone in any direction, the PIC will utilize the map and data readouts on the controller and the camera on the drone to determine its position. If still unclear, the PIC will direct the UA to ascend to gain more clearance from ground objects and will then try to assess the location again. If visual line of sight is not then reacquired, a Return-To-Home shall be executed. If the UA is on an autonomous mission, Return-to- Home shall be executed if the UA is not visually reacquired promptly. Once visual line of sight is reacquired, the Return-to-Home may be cancelled and the mission may be continued.

Lost Link: Defined as when the Controller and the UA are no longer connected, and the PIC no longer has control of the UA. Procedure: The UAS will be programmed to issue the Return-to-Home command to the UA in which the UA climbs/ascends to a preset altitude, returns to the Home Point, and lands.

Fly-away: Defined as a Lost Link condition where the Return-to-Home command is not being issued or not being executed by the UA. Procedure: This is an emergency situation and all attempts should be made to regain control of the UA by moving closer to the UA. If this situation occurs while operating in controlled airspace, or if there's a chance of the UA entering controlled airspace, the PIC must notify the ATC as soon as possible.

Evasive maneuvers: Defined as unplanned manual maneuvering of the UAV to avoid wildlife interaction. Procedure: To avoid an aggressive bird, the first option is to ascend rapidly. Birds cannot ascend as fast as a drone. If the drone is already at max altitude, move laterally away from the bird. Once clear of the bird, move laterally until enough distance has been created to safely descend and land the drone. Do not resume operations until the bird has left the area.

Appendix 2 – UAS Incident Procedures

Near Miss incidents

A near miss is an event in which personal injury or damage to equipment, property, or the environment nearly occurred, but was averted. If a near miss incident occurs submit a completed copy of the MRCA UAS Incident Report with a description of the incident to the MRCA UAS Coordinator within 48 hours of the incident. By definition, in a near miss the list of persons injured and environmental, property, and equipment damaged should be entered as “None” or equivalent. The description should include distance details of the near miss and what actions were taken to avoid injury or damages.

UAS Crashes

A crash includes any incident that results in damage to the UAS, persons, property, equipment, or the environment resulting from a collision with people, wildlife, trees, structures, wires, terrain, other obstructions, or mechanical failures.

Following a crash, MRCA staff should immediately take appropriate actions to protect people, and property from further damage and administer appropriate first-aid or seek medical assistance for injured persons. If the UAS contains LiPo batteries, they may be crushed or punctured in a crash. Acting to mitigate fire risk is a critical secondary consideration to treating injured persons.

If a crash occurs, the PIC must submit a completed MRCA UAS Incident Report to the UAS Coordinator within 48 hours of the incident. The incident report must include a clear description of the incident, any injuries to persons, and all damage to equipment, property, or the environment including estimates of costs to repair or replace any property or equipment.

Should damage or injury occur to non-MRCA persons or property, provide contact information for the PIC and the MRCA UAS coordinator to any involved parties and collect contact information from them for inclusion in the incident report and follow-up.

MRCA staff should recover the UA involved in a crash if the recovery can be accomplished without placing staff or other equipment at risk of injury or damage. During recovery a fire extinguisher/fire suppression device should be carried by the recovering staff if at all possible, and the ability to maintain contact with management must be maintained (Immediate Superior/Division/Air Operations) either by working phone or radio. Photo documentation of the crash site should be made for inclusion with the incident report.