UC Mission Binder

Mission: _____

Dates: _____

Flight Crew: _____

Document Summary

This document serves as a template for the assembly of a UAS Mission Binder for UAS operations within the University of California System. It provides a set of standard guidance and supporting templates that the Flight Crew may utilize.

Mission Binder Requirements

- UAS Policy: link
- UC Operation Manuals: link
- UC Standard Guidance
- Mission Documentation (Have available online or printed)
  - UC Drone Approval
  - Documented Procedures
  - Risk Assessment
  - Emergency Action Plans Template Here
- Remote Pilot Certificate
- UAS Registration Certificate
- Airspace Authorization or Waiver Documentation

UC Documentation

UC Policy

The UC UAS Policy can be found here: https://policy.ucop.edu/doc/3500671/Drone

UC UAS Operations Manuals

The UC UAS Operations Manuals can be found at https://ucdrones.github.io

- New User Guide: https://ucdrones.github.io/New_User_Guide/
- Standard Operations Procedures - Advanced Operations: https://ucdrones.github.io/Advanced_SOP/

UC Operating Standards

Standard Guidance

- All UAS activity must establish a buffer or safe-zone between the Unmanned Aircraft and any non-participating persons or sensitive locations.
  - A good rule-of-thumb is to maintain a buffer or safe-zone of roughly $\frac{1}{4}^{th}$ of the flight altitude.
- Visual Observers and supporting ground crew should be utilized when available.
  - Supporting ground crew should assist in ensuring safety to all non-participating persons.
- All members of the flight crew must be conspicuous and wear professional, identifying apparel such as university-branded hats, shirts or lanyards with IDs.
- High visibility reflective vests must be worn when operating near roads or in parking lots.

- When operating in fenced areas, operate exclusively within the fenced areas unless there is sufficient visibility on the other side to ensure safety to non-participants.
- Never fly in areas where UAS activity is prohibited or restricted.
- Always be a good neighbor and ensure that your UAS activity is not disruptive to other authorized activities.

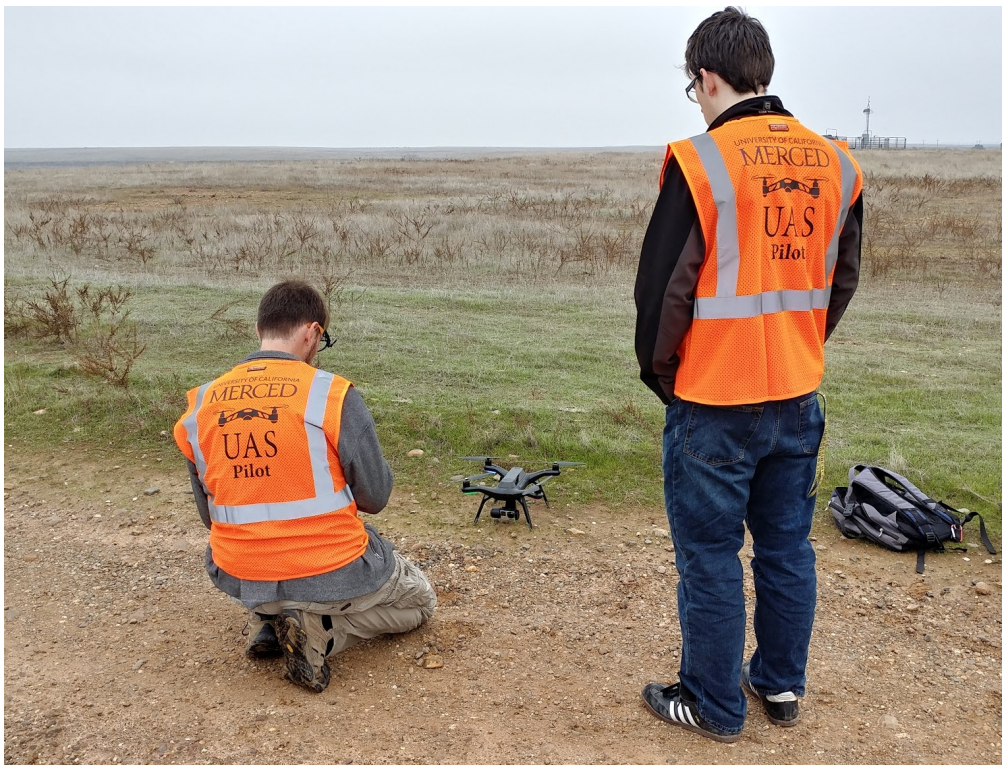

Figure 1: UAS operators with high visiblity vests, UC Merced

Operating on Campus or other busy locations

- Utilize the UC UAS Mission Planning Template (link) to systematically develop your flight plan

- When operating in uncontrolled locations in proximity to non-participating persons, extra care should be exercised. Specific flight paths and altitudes should be pre-planned such that potential gaps in buffer or safe-zones can be identified.
- High visibility vests are recommended, but not required when near nonparticipants or in public areas
- Orange cones may be used to help communicate Unmanned Aircraft flight regions to non-participating persons, but are not fully sufficient.
  - Supplement any portable pedestrian control equipment (cones, caution tape, signs) with ground personnel
- If spectators are expected, a supporting ground crew member should be tasked with preventing spectators from distracting the RPIC with questions or comments.
- When operating near roads, a supporting ground crew member should be tasked with being located near the road to monitor traffic, and if necessary, retrieve a fallen Unmanned Aircraft before it becomes a road hazard.
- Flying above buildings and structures minimizes risk to pedestrians, but it is recommended to contact the facility manager to properly evaluate the potential risks. Some campus buildings are outfitted with research or communication equipment on rooftops.

Privacy Guidelines

In the United States today, the use of UAS for both recreation and commercial use are becoming ever more prominent. UAS may be used for a variety of applications, including photography and videography. The capture and use of photographs and videos from a UAS platform raises new concerns on the rights, privacies, and permissions that involve both the operators of UAS and individuals that are uninvolved in the operation. The University of California recognizes the important value of privacy and strives to achieve an appropriate balance ensuring an appropriate level of privacy, nurturing an environment of openness, honoring its obligation as a public institution to remain transparent while safe guarding information about individuals.

Best Practices

- **Do Not** use a UAS to monitor or record activities where there is a reasonable expectation of privacy.
- **Do Not** use a UAS for unapproved recordings of any campus events or performances, or for any unlawful purposes.
- **Do Not** fly a UAS over private property without prior approval.
- **Do Not** use a UAS to harass people or intentionally disrupt events
- **Do Not** use a UAS for the specific purpose of persistent and continuous collection of identifiable data about individuals without the consent of the data subjects.
- **Do Not** retain identifiable data longer than reasonably necessary to fulfill a purpose.
- **Do Not** knowingly publicly disclose data collected with a UAS without undertaking a reasonable effort to obfuscate or de-identify identifiable data unless the data subjects provide specific consent to the disclosure.
- **Do** make a reasonable effort to provide prior notice to individuals of the general timeframe and area that they may anticipate a UAS intentionally collecting data.
- **Do** establish and make available a Privacy Policy for UAS data if the UAS may intentionally or unintentionally collected identifiable data. The policy should be appropriate to the size and complexity of the data collected.
- **Do** be considerate of other people's concerns over privacy, security and safety.
- **Do** contact the Office of Research Compliance and Integrity if identifiable data is to be used for human-subject research.
- **Do** take steps to ensure the security of any identifiable data.

Fire Safety

Fire Risk Assessment and Planning

- Assess fire risk by reviewing:
  - Calfire Red Flag Warning
  - Air Quality Index (AQI)
  - Vegetation levels and condition
    - Avoid operating above areas that are not viewable to monitor for fires started by a crashed UAS.
- Equipment to bring:
  - Fire Extinguisher (ABC) for regular small fires
  - Fire Extinguisher (D), or bucket of sand for LiPo fires
  - Shovel (optional)
  - Single-Use Fire Blankets (optional)
- Planning for the worst case:
  - Ensure that emergency communication systems are always available during flight operations.
  - Ensure that all flight crew members can describe the flight operation location and how to get to the site to emergency personnel
  - Ensure that all PPE is appropriate for the operation

Battery Fire

- Secure the site.
- Remove any other potential fire fuel or other fire hazards.
- Use a Class ABC fire extinguisher to extinguish and control any secondary fires.
- Use a Class D fire extinguisher or a bucket of sand to extinguish the fire at the battery itself.
- Avoid using water - if no other option, submerge the entire battery in water.
- If you are unable to extinguish the fire:
  - Call emergency services
  - Stop all fire suppression efforts and begin minimizing potential damage by clearing the area and removing other potential fire hazards
- DO NOT COMPROMISE YOUR SAFETY

In-Flight or Post-Flight Fire

- Maintain visual contact with UAS
- Communicate the situation to the Flight Crew
- Verify
  - Check state of UAS (Status/Flight Mode)
  - Check UAS location/altitude
  - Check transmitter/tablet status and control links
- Take Actions
  - Ground Crew – Alert and clear flight area, prepare safety equipment
  - Visual Observer – Be prepared to call emergency services
  - RPIC – Immediately terminate flight

- Issues
  - If UAS sparks a ground fire:
    - Secure site and attempt to extinguish the fire with Ground Crew
  - If unable to extinguish fire:
    - Call emergency services
    - Stop all fire suppression efforts and begin minimizing potential damage by clearing the area and removing other potential fire hazards
  - DO NOT COMPROMISE YOUR SAFETY
- Post-Incident
  - Document incident
  - Contact campus designated local authority or systemwide designated UAS authority

Operations in Cold Weather

Cold Environments

- Before beginning flight operations, double check the weather conditions. Avoid starting flight operations if there is potential for a shift in weather conditions, such as incoming strong winds, rain, and snow.
- Do not fly in temperatures below 0°C (32°F).
- Avoid contact with snow. Moisture can damage the motors. Use a large landing pad for taking off and landing your UAS.
- Expect to see a 10-15% decrease in flight time - plan missions accordingly.

Battery Considerations

- Only use fully charged batteries.
- Pre-warm batteries to 20°C (68°F) or more.
- Check the battery temperature in DJI GO.
- Use an insulated cooler, or keep in a warm car to maintain temperature when not in use.
- After launching, hover for about a minute to allow the battery to warm up.
- Avoid aggressive flight maneuvers and land flights earlier than in normal weather.
- Batteries drain faster in cold temperatures. Always check the UAS battery status during flight.

Operations in Hot Weather

Hot Environments

- Try to avoid flight operations in extreme heat or humidity levels.
- Do not fly in temperatures above 110°C (43°F).
- Keep flights to short bursts, and rest the UAS in the shade between flight operations.
- Monitor the controller and tablet temperature. Avoid direct sunlight.
- If possible, try to operate under shade or a small canopy.
- Expect to see a 10-15% decrease in flight time - plan missions accordingly.

Battery Considerations

- Only use fully charged batteries.
- Never use batteries that are abnormally hot to the touch.
- Check the battery temperature in DJI GO.
- Use an insulated cooler and keep in the shade to keep cool when not in use.
- Avoid aggressive flight maneuvers and land flights earlier than in normal weather.
- Batteries drain faster in hot temperatures. Always check the UAS battery status during flight.
- Never leave a battery in direct sunlight
- After use, store the depleted battery in a well-ventilated area to allow it to cooldown. Do not place in a storage case or bag.

Battery Care Guidance

Lithium Polymer batteries have a limited lifespan and should be replaced as necessary

Battery Maintenance

- Aim to keep battery levels above 40% and below 65% when not in use.
- Avoid charging the batteries to max capacity unless you are going to fly within the next day.
- When done flying, always charge your batteries at least back up to storage level (40%).
- Remove batteries from the aircraft when stored for an extended period.
- Never over-discharge your battery.
- Fully charge and discharge the battery at least once every 3 months to maintain battery health
- Do not place loose batteries on any conductive surfaces, such as metal tables.
- Batteries must be stored in climate controlled storage when not in use. Do not expose to excessive heat or humidity.

Preparing for flight

- When charging batteries, ensure that the charging location is clean, uncluttered and well-ventilated.
- Do not stack chargers when charging batteries, or place batteries on the power adapter during charging.
- Do not leave batteries charging unattended.
- Do not charge batteries near flammable materials or on flammable surfaces.
- Plan to charge batteries no earlier than 3 days prior to flight.

Immediately after flight

- Power off the aircraft completely before removing the battery.
- After removing a used battery, store the battery in a shaded, but well-ventilated location.

- Never store a recently used and warm battery in an enclosed battery bag or UAS case.
- Document any performance issues immediately.

Battery Inspection

- Check battery voltage levels at least once a month when not in use.
- Check for bulging, swelling or cracks in battery casing.
- Check for signs of electrical arcing, such as burn marks or melted plastic around the battery terminals.
- Safely discard any battery that is showing any sign of damage or bulging.

Battery Travel

- Always store batteries in a ventilated location
- Never transport a damaged battery or a battery with less than 5% remaining

- Always store batteries in a specified transportation box/bag before the transit to avoid damage from external forces.
- Do not store a battery with metal components such as paperclips, screws or metal nuts.

Battery Incidents

- Do not use a battery that has been involved in a serious crash or heavy impact.
- If a battery falls into water with the aircraft during flight, take it out immediately, and place it in a safe and open area. Maintain a safe distance from the battery until it is completely dry. Never use the battery again, and dispose of the battery properly. Do not use heat to dry batteries.

- Put out any battery fire using sand, or a dry powder fire extinguisher.

Mission Documentation

UC Drones Project or Flight Request

Place a copy or link to your UC Drones Project or Flight Request here

- Do not forget to include your mission plan and hazard analysis if it is attached as a separate file

Weather Forecast

**Place a copy of link to the weather forecast during your flight operations

Airspace Information

Document any airspace issues including

- Airspace Class
- Nearby airports and heliports
- Small landing strips, glider ports and sea ports
- Areas of potential aviation activities - crop dusting, helicopter tours, VFR checkpoints

Look for and Review any NOTAMS and TFRs within your operating area

Log of Recent UAS performance

Draft a review of the recent UAS performance and any relevant notes that may be useful to communicate during the preflight briefing.

Emergency Contact Information

UC Center of Excellence on UAS Safety

Contact Information

Dr. Brandon Stark
(209) 201-2051
bstark2@ucmerced.edu
UASsafety@ucmerced.edu

Campus Designated Local Authority

Campus

Contact information for Campus Point of Contact

List of Campus Point of Contact can be found here: https://ucdrones.github.io/ch-DLA.html

Nearest Emergency Facility

Enter Contact information for the nearest emergency facility

UAS Operation Site

Address of UAS Operation Site

Write out directions on how to get to the site from the nearest crossroad

Other Documentation

Remote Pilot Certificate

Place a copy of your Remote Pilot Certificate Here

Airspace or Waiver Documentation

Append with any Airspace or Waiver Documentation