New Jersey Department of Environmental Protection

sUAS Flight Operations Manual

Version 1.0
April 2020

Revision History

Document	Description	Revision Date
FOM V1.0	Initial FOM	2020 04 17

Contents

1.0 PREFACE

Small Unmanned Aircraft Systems (sUAS), aka "drones" offer multiple opportunities to the Department for social media, inspections and environmental monitoring and planning. However, drones are aircraft flying in the National Airspace and subject to the Federal Aviation Regulations as well as State and Local rules and regulations concerning privacy and trespassing. To ensure that drones flown by and for the Department are flown responsibly and safely it was decided that all missions for the Department shall be flown by Certified Remote Pilots flying under the guidelines of the Federal Aviation Regulations 14 CFR Part 107, the Departments sUAS Standard Operating Procedures (SOP) and Flight Operations Manual (FOM).

The Department's SOP lays the basic framework for the use of sUAS in the Department. The Flight Operations Manual (FOM) builds upon the SOP and sets forth the minimum requirements for training, flying and reporting that pilots and flight crew must understand and implement for all Department missions.

All pilots flying missions for the Department are expected to practice sound Aeronautical Decision Making (ADM) and Crew Resource Management (CRM). Safety, above all else, is the primary concern in every operation, regardless of the nature of the mission. However, not all these guidelines will apply to all situations, so the Remote Pilot in Command (RPIC), Visual Observer (VO) and other flight crew will need to exercise best judgement and err to the side of safety. Any deviation or refusal to abide by the requirements and procedures of the UAS Program will be documented and appropriate action will be taken.

2.0 PRIVACY STATEMENT

All flight crew members will ensure the protection of private individuals' civil rights and reasonable expectations of privacy before deploying the UAS. All flight crew members are held accountable for ensuring that operations of a Department UAS intrude to a minimal extent upon private property, persons and businesses. To accomplish this goal, all Department operations, to the extent possible, will observe the following:

- The UAS will record video and still pictures of features that relate to approved mission objectives. Any data captured outside the focus of flight operations is unintentional or only as necessary due to the proximity of the area in question.
- When the UAS is flown, the onboard cameras are turned to be facing away from occupied structures and/or persons as much as practicable to minimize inadvertent video or still images of uninvolved persons or property.
- When asked by a member of the public to delete personal data about him or her that has been gathered, do so, if possible.
- The Department does not conduct random surveillance activities. The use of the UAS is tightly controlled and regulated and not in any way intended to document the random activity of private citizens.

- Hovering over private property shall only be done with property owner permission, be kept to a minimum and only as necessary to accomplish the goal of an individual flight operation.
- Flight over private property shall be conducted only with permission and a minimum of 30 feet away in any direction from any structures or people and wherever practical well above the roofline of any privately-owned structures not involved with the mission objectives.
- All data gathered will be reviewed for any inadvertent intrusion to privacy. If found, reasonable efforts will be made to ensure that such information will be permanently deleted, masked or obscured within the data files prior to the release of photos or video internally within the Department, to other agencies/partners or to the public.
- Department personnel will periodically review the existing UAS procedures as well as new technologies, laws, and regulations on UAS usage and update this FOM as needed. Updates will be passed through the Department Chief Pilot/ Program Manager for review, approval and incorporation into the FOM.
- Ad hoc unplanned operations should never be conducted except for emergency response to manmade/natural disasters; if used, the application of the UAS emergency response work shall be tightly controlled and performed in accordance with existing emergency operations under way.
- Department UAS operate strictly within the Federal, State, and local laws and regulations and in accordance with the Department SOP and FOM. If in doubt, prior to operating the UAS, the RPIC will check with the appropriate jurisdictions and ensure that the proper permissions/permits are applied for and obtained. All operations will be balanced with the need to accomplish the mission while maintaining public safety, privacy and freedom from intrusion.
- In the interest of Public Relations, any UAS flight open to misinterpretation by the public should be avoided.

All flight crew members should make every reasonable effort not to invade the public's privacy in the execution of UAS missions. All federal, state, and local regulations should be adhered to, and to the extent feasible, the public should be notified before UAS operations.

3.0 DEFINITIONS

"Certificate of Waiver or Authorization (COA)" means an authorization issued by the Federal Aviation Administration (FAA) to a public operator[1]for a specific UAS. After a complete application is submitted, the FAA conducts a comprehensive operational and technical review. If necessary, provisions or limitations may be imposed as part of the approval to ensure the UAS can operate safely with other airspace users.

"Currency Flight" means a flight conducted by an RPIC, which demonstrates safe and proficient operation of the UAS, and satisfies the currency requirement.

"Department Certified UAS Operator" means a permanent, seasonal, contract or volunteer employee authorized by the Department to operate an unmanned aircraft as Remote Pilot in Command, has completed an agency-approved training program, and flies in accordance with Part 107.

"Department" means The New Jersey Department of Environmental Protection

"Discrepancy" means any unanticipated event (other than a reportable accident or incident) that involves a departure from an approved flight mission so serious that it may jeopardize future flight missions. Examples include equipment malfunction, interference by observers, unauthorized discussion during a flight mission, or unanticipated line of sight difficulties.

"Designated Training Area" means a pre-determined location used for flight training and functional testing.

"Emergent situation" means a sudden, urgent, or unexpected occurrence or occasion which requires immediate action to protect against an imminent threat to the public health, safety, or welfare or to protect against an imminent threat of significant damage to property.

"Federal Aviation Administration or FAA" means the Federal agency having exclusive jurisdiction over regulating the national airspace system. Activities performed by the FAA include inspection and rating of civilian aircraft and pilots, enforcing rules of air safety, and installing and maintaining air navigation and traffic-control facilities.

"Flight" means the take-off, in-flight, and landing part of the mission.

"Flight crew" Means the RPIC and all persons assisting the RPIC to perform a mission on behalf of the Department. **The flight crew includes, at a minimum, a Department qualified RPIC and a visual observer.**

"Flight Training" means any flight performed for the specific purpose of developing pilot skills and knowledge for future missions, learning and understanding the UAS components and its limitations, and/or learning and understanding pilot limitations for an environment or condition.

"Lead Remote Pilot in Command (LRPIC)" means a remote pilot in command (RPIC) identified to coordinate a mission when multiple RPICs are participating. The LRPIC is responsible for ensuring that the participating parties comply with all applicable requirements in the Flight Operations Manual during the mission.

"Incident" means any event involving use of a UAS that causes other than serious injury to a person and/or damage to property having a fair market value of less than or equal to $500.00.

"Mission briefing" means a verbal assessment and summary of the scope of a drone flight mission including: an overview of the mission and deliverables; roles and responsibilities; location assessment of potential hazards; airspace review and classification; identification of potential aviation conflicts (Temporary Flight Restrictions (TFR's) and Notices to Airmen (NOTAMS)); weather assessment; designation of take-off and landing area; standard callouts (notification on powering up, takeoff, gear up, battery power remaining, coming home, gear down, landing, powering off); and emergency procedures (lost link, return to home settings, emergency landing area).

"Mission" means the entire operation from initiation to completion and includes, planning and coordination, site assessment, pre-flight, flight, and post-flight. The mission can occur on one day and include one flight or multiple flights or can be multiple flights and span multiple days.

"National Airspace System or NAS" means the common network of U.S. airspace; including air navigation facilities, equipment and services, airports, and landing areas; aeronautical charts, information and services; rules, regulations and procedures; technical information; and manpower and material. This includes system components shared jointly with the military.

"Remote Pilot in Command" or RPIC means a person who has the final authority and responsibility for the operation and safety of a flight; has been designated as RPIC before or during the flight; and holds the appropriate certificate, rating, and/or endorsement, for the conduct of the flight.

"Reportable accident" means any incident using a UAS that causes serious injury to a person, loss of consciousness of a person, and/or damage to property (other than the UAS) having a fair market value of more than $500.00 and expected to cost more than $500.00 to repair. The FAA must be notified of a reportable accident within 10 calendar days. 14 CFR 107.9.

"Sterile Cockpit" means that during the flight operation the RPIC and flight crew will not engage in any duties or activities that are not critical for the safe operation of the aircraft, could distract any flight crewmember from the performance of his or her duties or which could interfere in any way with the proper conduct of those duties.

"Unmanned Aircraft System (UAS) aka Drone" means an aircraft and the equipment necessary to operate it, that is operated without the possibility of direct human intervention from within or without the aircraft. For the purposes of this FOM the term drone is used to refer to a small unmanned aircraft system (sUAS) weighing less than 55 pounds and associated equipment that is controlled by an operator on the ground. The system includes everything that is on-board or otherwise attached to the drone as well as all the related support equipment, including the control station, data links, telemetry, communications, and navigation equipment.

"Visual observer" means a flight crew member who is designated by the RPIC to assist the RPIC to observe and avoid other air traffic or objects aloft or on the ground and assist the RPIC as necessary to insure a safe flight.

4.0 General Operating Procedures

4.1 Organization

The Division of Information Technology (DOIT) is responsible for overall coordination and implementation of the Department's drone program including procurement and operations.

The Bureau of Geographic Information Systems (BGIS) within DOIT will coordinate the operations and development of the program through the sUAS Chief Pilot/Program Manager and the sUAS Coordinator. BGIS will fly missions, within its capabilities, in support of Department Programs.

The sUAS Committee will be chaired by the sUAS Chief Pilot/Program Manager and managed by the sUAS Cooordinator. The Committee is open to any Department program interested in using drones to assist their programs. The Committee will explore existing and potential uses and comment on policy and procedures.

Programs choosing to develop program specific flight operations will designate a Program Lead Pilot who will be responsible for overseeing and coordinating program flight operations.

The minimal flight crew will consist of the RPIC and one VO. Additional VOs or flight crew may be added to assist the RPIC as needed.

4.2 Responsibilities

1) The Chief Pilot/Program Manager
    a. Must be a current Certified Remote Pilot
    b. Evaluating and finalizing Department UAS policy
    c. Overseeing all Department flight operations and training
    d. Chairing the Department sUAS committee
    e. Planning and executing flight missions in support of Department programs

2) The UAS Coordinator is not required to be a FAA Part 107 Certified Remote Pilot. However, if the UAS Coordinator is not so certified, duties and responsibilities that require such certification MUST be delegated to or overseen by a Certified Remote Pilot.
    a. Administrative support to the Department sUAS Committee
    b. Technical support for Department Flight Operations
    c. Plan and execute Flight Missions in support of Department Programs (if Certified Remote Pilot)

3) Program Lead Pilot Responsibilities:
    a. Must be a current Certified Remote Pilot
    b. Oversee and assist program pilots to ensure that they follow Department and Program Policy.
    c. Maintain all training, flight and maintenance records for each program pilot, flight crew and aircraft and forward reports as required;
    d. Represent program on the sUAS Committee.

4) Remote Pilot in Command (RPIC):

a. Department pilots shall be current certified remote pilots and have completed Department training to be allowed to fly missions as RPIC. The RPIC is ultimately responsible for all aspects of a mission.
b. A Pilot's primary duty is the safe and effective operation of the UAS in accordance with the manufacturers' approved flight manual, FAA regulations and Department policy and procedures. Pilots must remain knowledgeable of all FAA regulations; UAS manufacturer's flight manual and bulletins and Department policy and procedures and exhibit situational awareness at all times.
c. Prepare a flight plan for each mission and determine if additional flight crew (beyond the required VO) are required.
d. The RPIC will brief the flight crew and participants before every flight and ensure that everyone knows what their responsibility during the flight is.
e. Pilots may be temporarily or permanently removed from flight status at any time by the Chief or Lead Pilot for reasons including performance, proficiency, physical condition, etc. Should this become necessary, the operator will be notified verbally and in writing of the reason, further action to be taken and expected duration of such removal.

5) Visual Observers (VO)
   a. Visual Observers do not need to be certified remote pilots but must have been provided with sufficient training to communicate clearly to the pilot any instructions required to stay clear of conflicting traffic and obstacles.
   b. An observer's primary duty is to assist the RPIC conduct a safe and effective mission. This includes maintaining visual line of sight on the aircraft, scanning for anything that may interfere with flight operations in the air or on the ground, communication with other crew members or members of the public.

6) Flight Crew
   a. Flight Crew do not have to be certified remote pilots.
   b. Flight Crew duties will be assigned by the RPIC before the start of every mission.

4.3 General sUAS Usage Restrictions

- Department drones should only be used by Department Certified sUAS Operators acting in his/her official capacity as a Department employee.
- Department Certified UAS Operators should not use Department issued drones for personal use or for any purpose they are not trained and/or authorized to perform.
- Department Certified UAS Operators should not use personal drones for work-related purposes.

4.4 Non-Department Drone Data Collection

Department staff may obtain drone data (photos, video, mapping, or specialized sensor data) from sources other than authorized Department pilots. This may include but not be limited to; contracting with a company to fly a drone to collect data; drone data obtained from contractors or partners working with the Department on a project; drone data obtained of areas/projects independent of any Department involvement; or volunteers/general public submitting drone data in support of Department efforts. Data used by the Department that was obtained in this manner may or may not have been flown in accordance with Federal, State or local drone requirements and potentially can damage the credibility and reputation of the Department and/or the pilot that obtained the data.

Any Department contract or project involving the collection of drone data by anyone other than current Department Pilots shall be coordinated with the Division of Information Technology prior to the signing of a contract and/or performing the flight. All flights will be conducted in accordance with the flight provisions of the SOP and this FOM.

For Drone Data that is offered to the Department and is not part of a Department initiative or flown by active Department Pilots, the following minimum information shall be submitted, and actions taken before it can be used by the Department;

1) Copy of the pilots current Remote Pilot Certificate (include proof of passing recertification test if certificate was issued more than 24 months before date of flight)
2) Make and model of drone and registration number
3) Copies of all waivers, air space authorizations and special use permits required for the flight and property owner permission for any non-public properties that the pilot flew over while collecting the data
4) Unless permission has been obtained to use the media, photos and videos shall be edited to remove or blur any recognizable images of individuals or views of private property not readily observable at ground level from public property.
5) Flight Plan (if available)

5.0 FLIGHT OPERATIONS

The following planning, operation and reporting requirements apply to all Department flight operations. Additional program specific planning, operation and/or reporting requirements for flight operations will be developed by the program and added as an addendum to this manual.

5.1 Cybersecurity

Department sUAS operations can and will occur in sensitive areas that are not accessible to the general public, including critical infrastructure. Vulnerabilities have been identified with the use of UAS that potentially allow a third party, including foreign governments, to collect personally identifiable information (PII), use patterns and/or the photos/data collected. To reduce the potential threat the following practices shall be observed by Department pilot and contracted pilots:

- Use a Secure Digital (SD) external storage card to collect and remove UAS data. Download the UAS data to a non-networked machine or drive and erase the data after each mission
- Do not stream data directly to the internet. Use an HDMI cable to feed to a secure router.
- When flying ensure that the controller cannot access the internet through a Wi-Fi or cellular device. Remove all memory storage devices from UAS when connected to the internet to limit access.
- Remain vigilant and cognizant of your surroundings to avoid collecting incidental data on critical infrastructure, sensitive operations and special events.
- Use a tablet dedicated only for use with the UAS with minimal PII and no other work-related information.
- When possible turn off all data sharing options in the operating software.

5.2 Logs

- All pilots shall maintain a Flight Log of all flights they perform.
- A separate Flight log shall be maintained for each Department aircraft
- A Maintenance Log shall be maintained for each Department aircraft

5.3 Mission Request Process

1) Requests for BGIS to fly a mission in support of Department interests will be initiated by submitting a DEP IT Project Sheet or request form to the Chief Pilot. Requests should be submitted sufficiently in advance of the proposed mission date(s) to allow time to plan and obtain necessary waivers and/or permits to fly. Program specific missions will be requested through the Lead Program Pilot in accordance with program procedures
2) Upon receipt of the request, the Chief Pilot, or Lead Program Pilot, shall perform an initial review of therequest to determine if the mission is feasible and if the resources to complete the mission are available.
    a. If the mission is deemed feasible, it will be assigned to a RPIC, who will schedule a meeting with the requestor to discuss mission details and determine the deliverables and the timeframe to complete the mission.
    b. If the mission is deemed not feasible, the chief pilot, or Lead Program Pilot will notify the requestor with the reasons and options of what can be done. The requestor can than decide to cancel the mission, meet with the chief pilot or program lead pilot to discuss modifications or consider contracting with a contractor that can fly the mission. **All contracted flights must be approved through DOIT and flown following Department standards.**

5.4 Mission Planning and Reports

The RPIC assigned to a mission will be responsible for the mission planning, flight and reporting. Flight Plans will be documented using the Department's "Unmanned Aircraft Flight Plan and Report" form available in Appendix A and in the Teams "DEP Remote Pilot Users Group". Parts A, B, C and D constitute the planning portion of the form and must be completed prior to flight operations. Parts E, F and G are to be completed after the completion of the flight operations. Any additional supporting information used by the RPIC to plan or implement the flight shall be included with the final report submitted.

5.5 Site Assessment

- Assessments for UAS operation suitability will be conducted prior to operating to ensure operations can be conducted safely.

- Assessments will be made by utilizing aeronautical charts, Department GIS information, or other sources of information such as, digital imagery (e.g. SkyVector, Foreflight, Google Earth, Bing, Google Maps). A site inspection to verify data and see any changes should be performed prior to the flight.

- Site assessment will include at a minimum:

- Identifying operational area boundary
- Airspace class
- Local ordinances concerning UAS operations
- Property ownership (permits/permissions needed prior to flight)
- Potential take-off and landing site identification as well as contingency/emergency locations.
- Site review and assessment:
    - Aircraft operations (e.g. proximity of airports, heliports, seaplane bases or other operating sites).
    - Industrial site hazards.
    - High-intensity radio transmission or electromagnetic interference (e.g. radar sites).
    - General obstacles and heights (e.g. wires, masts, buildings, cell phone towers, wind turbines etc.
    - Other airspace restrictions, if any (e.g. prohibited, restricted and warning areas).
    - Built-up areas, major roadways and recreational activity sites.
- Weather patterns and forecasts
- Minimum separation distances from persons, vehicles and structures.

5.6 Required Documents

The following documents/information must be on site and available to the RPIC during flight operations:

a. FAA Registration,
b. FAA Remote Pilot Certificate,
c. Recurrence test results (if applicable)
d. Drivers License (in lieu of a medical certificate)
e. Unmanned Aircraft Flight Plan and Report,
f. Department SOP
g. Flight Operations Manual
h. User Manuals.
i. Advisory Circular No.107-2
j. Summary of Small Unmanned Aircraft Rule (Part 107) *(in FOM)*
k. Sectional Maps, (hard copy or electronic such as Skyvector)

5.7 Pre-Flight

Prior to day of flight

1) Obtain any FAA waivers, if required, for the flight operation. Waiver request may take 90 days or longer to be approved.
2) Obtain Authorization for flying in controlled airspace, as appropriate through LAANC or Dronezone (as applicable). Authorizations should be applied for and received at least 24 hrs before the planned flight.

3) Obtain all necessary permits and/or permissions from landowners/managers necessary to conduct the mission. Suggested permit processing time should be accounted for when planning the flight time. (Most Federal, State and County lands prohibit Drones and require permission or Permit to fly. Flights in and over State Parks or Wildlife Management Areas REQUIRE a Special Use Permit and may not be performed on verbal permission unless in an emergency situation)
4) Notify the property owner and local law enforcement of proposed flight and include:

a. Location,
b. Dates and times, and
c. Contact Information.

Additional notifications

- For all flights in forest and river areas in Atlantic and Gloucester Counties and along Delaware Bay and for flights along the coast from Raritan Bay down to Cape May and up the Delaware Bay to Salem between May 1 and September 30, Notify John Wimberg, Bureau of Forest Fire Management – Coyle Field, John.Wimberg@dep.nj.gov
- Notify the County Mosquito Commission about flights in marsh/wetlands areas that are subject to spraying and sampling by Mosquito Commission aircraft.

5) File drone NOTAM with Leidos Flight Service no earlier than 72 hours prior to flight (unless planning on a routine recurring flight) and no later than 24 hours prior to flight.

To file a NOTAM, call Leidos Flight Service at 1(877) 487-6867 and be prepared to give the following information:

1. State you are calling for
2. Location – either a radius around a point, with the point identified by Latitude and Longitude in degree, minutes, seconds and the radius in nautical miles or as a polygon with all the corners identified by Latitude and Longitude in degree, minutes, seconds.
3. Operating elevation in AGL (i.e. surface to 400 ft AGL)
4. Date and operating time in Greenwich Mean Time (GMT or Z).
5. Closest Airport, distance and bearing (may or may not be asked for)
6. Your initials and company.

6) Review suggested equipment list and ensure all necessary equipment is available and mission ready. Night before mission, ensure that non-rechargeable batteries are good and that there are spares as needed, that all rechargeable batteries, controllers and electronics are charged and check that all software and databases are current.
7) Review manufacturer warning areas and get codes to remove geofencing (if applicable).
8) Monitor long range weather forecasts, www.weather.gov, for day of the flight.
9) Check NOTAMS and Temporary Flight Restrictions for flight area.

Day of flight before arriving at site

1. Assess the weather forecasts for the day of the flight, use www.weather.gov, www.1800wxbrief,com, and/or www.aviationweather.gov. (METARs and TAFs for airports around the flight area should be checked before **each flight** to monitor changing weather conditions).

    a. *Weather conditions should be within limits and consistent with UAS and RPIC capabilities. The RPIC shall verify the weather conditions in the immediate area of operations. The UAS may not be flown outside the weather minimums identified by the manufacturer.* ***The RPIC shall have final determination of risk due to weather and authority over any mission.***

2. Check NOTAMS and Temporary Flight Restrictions (TFRs should be checked before **each flight**)

Pre- takeoff

1) Complete UAS Risk Assessment Matrix with flight crew. (Reassess if conditions change between flights).
2) Perform crew briefing including;
    a. Mission Overview
    b. Flight objectives and details
    c. Hazards particular to flight and area
    d. Part 107 constraints
    e. Privacy constraints
    f. Weather
    g. NOTAMs and TFRs
    h. Crew responsibilities/fitness (IMSAFE)
    i. Sterile Cockpit
    j. Emergency procedures
3) Set up flight deck and take-off/landing area as appropriate to area conditions. Where possible a minimum 30 foot separation should be maintained.
4) Perform aircraft inspection (prior to every flight)
5) The VO will read the Pre-Takeoff Checklist and verify the RPICs response.

5.8 Takeoff

1) Where possible a designated safety area of at least 30 feet shall be maintained during take-off/landing between UAV and onlookers. Safety cones, UAS operation signs and safety tape may be utilized to maintain separation from the take-off/landing area and onlookers.
2) The RPIC shall make every effort to ensure that flight operations will not pose any undue risk to the persons or property not directly involved with the effort. **The RPIC shall have final determination of risk and authority over any launch of his/her**

aircraft. In all cases, the UAS will not be fly over persons not involved in flight operations, unless during an emergency.

3) Once the aircraft is on the landing pad and the RPIC has the controller, anyone approaching the aircraft must ask permission from the RPIC to approach the aircraft using the phrase **"PERMISSION TO APPROACH THE AIRCRAFT"** and wait for the RPIC to respond with **"PERMISSION GRANTED"**. At this point the RPIC will remove one hand from the controller to prevent accidentally starting the motors while someone is near the aircraft.
4) The VO will read the Takeoff checklist and verify the RPICs response
5) During the takeoff procedure the RPIC shall make the following announcements to alert all persons in the area of what is occurring
    - The RPIC shall visibly check that no one is near the aircraft and announce **"CLEAR"** before starting the motors on the UAV.
    - The RPIC shall announce **"ARMED"** after starting the motors.
    - The RPIC shall announce **"DEPARTING"** before lifting the UAV off the ground
6) During the control check, the RPIC shall announce his intentions so that the flight crew can verify that the UAV is responding correctly, using the phrases;
    - **Translating Forward**
    - **Translating Back**
    - **Translating Right**
    - **Translating Left**
    - **Climbing**
    - **Descending**
    - **Yaw Right**
    - **Yaw Left**

5.9 In Flight

1) **Sterile Cockpit** - During the flight a Sterile Cockpit shall be maintained and the RPIC and flight crewmembers should not engage in any conversation or activity not directly dealing with the safe conduct of the flight or that could distract any flight crewmember from the performance of his/her duties as it relates to safety.
2) **Situational Awareness -** The RPIC is responsible for maintaining situational awareness. (When operating in the vicinity of an airport with or without an operating control tower the RPIC should monitor air traffic on appropriate Unicom/CTAF frequencies).The RPIC should understand the overview of the operation and relative significance of flight factors and its future impact on safety and make decisions accordingly. The RPIC should plan and prioritize tasks ahead of time to avoid work overload and "getting behind" the aircraft
3) **Crew Resource Management (CRM)** - The RPIC will continually evaluate the flight to make use of all available resources prior to and during flight to ensure the successful and safe outcome of the flight.
4) **Cockpit security** - Flight Crew or persons wishing to approach the flight deck during a flight should announce themselves and ask permission of the RPIC by saying **"PERMISSION TO APPROACH THE FLIGHT DECK"** and wait for the RPIC to respond **"PERMISSION GRANTED"**

5.10 Landing

1) At the completion of the mission or at the low battery warning, before starting to return for a landing the RPIC shall announce **"ARRIVING"** to alert people in the vicinity that he is returning with the intent of landing. The VO will read the landing checklist and verify the pilots response.
2) When near the landing zone the RPIC shall announce **"LANDING"** prior to proceeding with touchdown. The RPIC shall ensure that the UAS is established on a stabilized and normal approach, prior to beginning the landing sequence.
3) The RPIC in cooperation with the VO will ensure the identified landing zone is free and clear of objects, personnel and/or debris prior to commencing landing operations.
4) In the event of an abnormal approach or obstructed landing area, the RPIC may initiate a go-around or hover at any time, as soon as a safety concern becomes evident.
5) Upon landing the RPIC will announce **"ON THE DECK"** to advise everyone that the aircraft has landed.
6) The RPIC shall announce **"DISARMED"** after shutting down the motors to alert everyone that the motors have been stopped.
7) VO will complete Landing Checklist.

5.11 Post Flight

1) At the conclusion of the flight operation, the RPIC shall conduct a Maintenance, Operation, Safety and Training (MOST) debriefing with the flight crew. The debrief will cycle through the flight crew on each of the topics until all pass.
2) The RPIC will be responsible for downloading and processing the data collected, inspecting the aircraft, preforming allowable maintenance/cleaning, filling out the flight and maintenance logs and filing the final report of the mission.
3) All collected data shall be reviewed by the RPIC for privacy and security concerns and shall be uploaded and stored in a secure and readily accessible location according to the security requirements assigned. The data should be transferred to the client as soon as practical.
4) If the aircraft or components were damaged or non-functional the RPIC shall report this to the Lead Program pilot and Chief Pilot.
5) Final mission reports are due to the Program Lead Pilot or Chief Pilot (as applicable) within 2 working days of the MOST review with the flight crew. Mission report shall include at a minimum;
    a. Completed Flight Plan and supporting document(s)
    b. Copy of Risk Management Form
    c. Copy of flight log downloaded from tablet
6) Program Lead Pilots will submit copies of

5.12 Operational Limitations

1) RPICs must operate equipment within manufacturer limits. The RPIC may exceed the manufacturer limits in a training scenario, or during an emergency, when the RPIC is within his/her capabilities and safety is maintained.

2) As a rule, any single UAS flight shall initiate landing procedures when the battery reaches 30% capacity and should land with greater than 20% battery capacity remaining. The RPIC may exceed 30% fuel reserve during an in-flight emergency or for battery maintenance.

3) Department pilots and flight crewmembers shall not work when under the influence of alcohol or drugs, or impaired or deficient in ability to make sound decisions during flight operations.

4) Department pilots and flight crew members shall continually assess his/her abilities to perform a mission safely based on a determination of flight proficiency as it relates to the complexity of the mission before and during the mission. In the event the pilot determines the flight is beyond his/her capabilities he/she will terminate the mission.

5) Department pilots shall review and follow all limitations placed on pilots and aircraft as defined in Part 107, the provisions of a COA, other FAA authorizations, Department authorizations or permits required.

5.13 Special Considerations

5.13.1 Multiple RPICS

If multiple RPICs will be conducting flight operations for the same mission, occurring on the same day, a lead remote pilot in command (LRPIC) will be identified to coordinate the effort. The LRPIC will ensure that the mission is conducted in accordance with the flight plan and requirements of the FOM and that the mission is conducted safely.

5.13.2 Indoor Operations

Extra caution will be taken when flying indoors due to the confined spaces and proximity of walls, ceiling obstructions present. Consideration with indoor operations include:

- Loss of GPS – aircraft will not maintain position on its own.
- Amplified intermittent air currents – aircraft will drift sporadically
- Temp and Humidity changes – Aircraft will experience sudden loss or gain in lift
- Pilot experience with speed and hover control.

Due to a potential for loss of positive control of the aircraft, sufficient barriers are required for protecting onlookers during indoor operations. The barriers should be sufficient to protect the onlookers per aircraft velocity, size and weight.

5.13.3 Cold Weather Operations

Cold temperatures will decrease the performance of batteries and electronic devices, and can cause the loss of finger dexterity

Recommendation for cold weather operations include:

- Wearing touch sensitive gloves.
- Setting low battery warning to greater than 30%.
- Monitor UAS battery and tablet battery more frequently.
- Ensure battery is fully charged.
- Warm core battery temperature before use.
- Allow aircraft to hover and warm-up near the ground before flight to manufacturers recommended operating temperature.

5.13.4 Hot Weather Operations

Hot weather and direct sunlight can cause overheating of batteries, which can create a fire hazard, overheat electronics leading to a shutdown and heat stroke in personnel

Recommendations for hot weather operations include:

- Use sunshield on iPad/tablets
- Shade batteries from direct sunlight
- Monitor battery temp during flight
- Stay hydrated and monitor flight crew for signs of heat stroke
- Use sunscreen and\or cover exposed skin

5.13.5 Security Procedures

Department personnel shall maintain positive control of all operational equipment to ensure security. Operational equipment shall be properly stowed and locked in car or locked case in the field while not in use and locked-up while being stored in the office or at the RPICs residence.

The security procedures are in place to:

- Prevent unauthorized access to Department aircraft,
- Prevent the use of Department aircraft to commit unlawful acts and,
- Prevent accidental damage or harmful modification to the aircraft and its systems by third parties or unauthorized personnel.

5.14 In Flight Emergency

Reference **UAS Emergency Checklist** for detailed checklist of emergency procedures.
These procedures are to provide a reference in the event of an in-flight emergency during UAS operations. The RPIC and VO should become familiar with these procedures before flight operations begin. These guidelines provide suggestions only. In an actual flight emergency, the RPIC should determine the best course of action with the highest priority being the safety of other in-flight aircraft and persons on the ground, followed by the safety of vehicles, vessels and structures on the ground. These emergency procedures should be discussed prior to the flight during the pre-flight briefing.

5.14.1 Emergency Landings

1. Scan the operation site to determine which emergency landing zone is the closest/safest for landing.

2. Determine if the emergency landing zone is clear of objects, debris and suitable for landing.

3. Announce to flight crew landing intentions (if applicable).

4. Choose the safest and most efficient flight path to the emergency landing zone.

5.14.2 Fly-Away

A fly-away is when the pilot is unable to affect control of the aircraft and/or where the aircraft is no longer following its preprogrammed procedure and control is unrecoverable. Prior to flight operation the RPIC should obtain contact information for controlling ATC facility (when applicable).

If the fly-away emergency occurs within or into controlled airspace contact the controlling ATC facility. If the emergency occurs in uncontrolled airspace or near controlled airspace, choose the closest ATC facility or contact Air Route Traffic Control Center (ARTCC) for the area. ARTCC numbers are listed below.

In the event of a UAS fly-away, advise ATC/ARTCC of the following:

(1) Aircraft type
(2) Direction of flight
(3) Last know altitude and speed
(4) Maximum remaining flight time

ARTCC:

NEW YORK ZNY 631-468-5959
WASHINGTON ZDC 703-771-3470

5.14.3 Accident -incident

A Department reportable accident/incident includes the following:

- A person sustains any injury as a result of coming into direct contact with any part of the aircraft, including parts that have become detached from the aircraft, or
- The aircraft comes into contact with a building, structure or object, or
- The aircraft sustains damage that adversely affects the aircrafts structure, performance, or flight characteristics, or
- The aircraft is missing or inaccessible, or
- The accident/incident meets the FAA's definition as described in 14 CFR 107.9.

If a Department UAS is involved in an accident/incident, the RPIC must notify the Chief Pilot and Program Lead Pilot and submit a report to them within 24 hours by email.

At the discretion of the Chief Pilot or Lead Program Pilot, the aircraft will be submitted for review and evaluation if the accident meets reportable standards. Once the aircraft is determined airworthy, the aircraft will be returned to service.

If the parties identified in the report are believed to be negligent, disciplinary action will be taken, as warranted.

5.14..4 Aviation Safety Reporting System

The Aviation Safety Reporting System (ASRS) receives, processes and analyzes voluntarily submitted incident reports from pilots, air traffic controllers, dispatchers, cabin crew, maintenance technicians, and others. Reports submitted to ASRS may describe both unsafe occurrences and hazardous situations. Information is gathered from these reports and disseminated to stakeholders. ASRS's particular concern is the quality of human performance in the National Airspace System.

Voluntary reporting an incident to the ASRS at https://asrs.arc.nasa.gov/report/electronic.html, may provide immunity from civil penalty or certificate suspension under Paragraph 9. C. FAA Circular No. 00-46E which states:

c. Enforcement Restrictions. The FAA considers the filing of a report with NASA concerning an incident or occurrence involving a violation of 49 U.S.C. subtitle VII or the 14 CFR to be indicative of a constructive attitude. Such an attitude will tend to prevent future violations. Accordingly, although a finding of violation may be made, neither a civil penalty nor certificate suspension will be imposed if:

1. The violation was inadvertent and not deliberate;
2. The violation did not involve a criminal offense, accident, or action under 49 U.S.C. § 44709, which discloses a lack of qualification or competency, which is wholly excluded from this policy;

3. The person has not been found in any prior FAA enforcement action to have committed a violation of 49 U.S.C. subtitle VII, or any regulation promulgated there for a period of 5 years prior to the date of occurrence; and
4. The person proves that, within 10 days after the violation, or date when the person became aware or should have been aware of the violation, he or she completed and delivered or mailed a written report of the incident or occurrence to NASA.

6.0 TRAINING/PROFICENCY

6.1 Training Mission Statement

Department pilots are required to hold a current Remote Pilot Certification in order to fly for the Department. However, obtaining a Remote Pilot Certification does not require the pilot to demonstrate that he/she can effectively and safely operate a sUAS, therefore before flying missions for the Department it will be required that each new pilot complete a minimum of 4 hours flight time and 10 hours crew time with a Department Instructor and pass a practical flight test.

The purpose of the Department training is to ensure that Department pilots and visual observers have the necessary flight skills, coordination and understanding of FAA and Department policy and procedures for sUAS operations while maintaining **safety as the highest priority.** Department pilots must exercise good decision making and judgement, in the air and on the ground, and represent the Department and the State in a positive manner

6.2 Pilot Training

Pilot training is divided into three separate phases

Phase 1 – FAA Certification
Phase 2 – Flight planning, record keeping and basic flight training
Phase 3 – Skill building and scenario based training

a. Phase 1 - FAA Certification: The first component of training is to learn the pertinent FAA UAS regulations, successfully pass the knowledge test and apply for the Remote Pilot Certification. Potential pilots should contact the chief pilot to discuss available resources. In this phase pilots will develop a working understanding of

i. FAA Part Regulations
ii. National Airspace System and Sectional Charts
iii. Operations near aviation facilities
iv. Aviation Weather
v. Loading and Performance
vi. Human Factors, Crew Resource Management
vii. Emergencies and contingencies
viii. UAS Maintenance

b. Phase 2 - Practical Training – This practical training phase is designed to supplement the trainee's academic knowledge with skills and hands on flight experience such that the trainee can safely fly without supervision. These skills shall include;

i. Pre-mission Planning
ii. Flight planning
iii. Site Survey and Risk Assessment
v. PreFlight equipment checks
vi. Mission briefings
vii. Take off/Landing and basic flight maneuvers
viii. Camera controls
ix. Battery handling
x. Operations and maintenance
xi. Recordkeeping
xii. Data Management
xiii. Waivers and Authorizations

c. Phase 3- The objective of this phase is to enable newly certified remote pilots to build confidence and refine their flying skills before attempting to fly missions on their own. This phase will be broken down into two parts. Skill Building Phase 3a – The newly certified UAS Remote Pilot will practice more complex maneuvers and be tasked with planning and implementing a mission.

i. Practice quadcopter flying in a controlled environment
ii. Perform a preflight and configuration checks
iii. Prepare and present a Mission brief
iv. Perform depth-perception exercises
v. Use the drone camera to capture photos and video
vi. Plan and fly autonomous flights.

d. Mission Specific Phase 3b - This training is mission specific to Program objectives. The skill and proficiency required to fly over a marshland at high altitude is distinctly different than the skills required to fly in a wooded area or inspect a structure. Working with the individual programs, scenarios of expected missions will be developed for pilots to practice and hone their skills and get use to what to expect before having to fly actual missions. Some scenarios may include:

I. Construction monitoring
II. Structural Inspections
III. 2D/3D Mapping
IV. Emergency Response Assessment
V. Volume Calculations
VI. Wildlife monitoring
VII. Search and inspection
VII. Specialized sensors

6.3 Visual Observer Training

All VOs must complete sufficient training prior to flight to communicate to the RPIC any information required to: remain clear of conflicting traffic, terrain and obstructions, maintain proper cloud clearances, and provide navigational awareness.

All training to be provided to the VO by RPIC, must include, at a minimum, knowledge of the following:

1) VO's responsibility to assist RPICs in complying with the requirements of:
   - Section 91.111, Operating Near Other Aircraft,
   - Section 91.113, Right-of-Way Rules: Except Water Operations,
   - Section 91.115, Right-of-Way Rules: Water Operations,
   - Section 91.119, Minimum Safe Altitudes: General, and
   - Section 91.155, Basic VFR Weather Minimums,

2) Air traffic and radio communications, including the use of approved air traffic control/pilot phraseology, and

3) Appropriate sections of the Aeronautical Information Manual (AIM).

Duties and Responsibilities:

- Provide the RPIC with information to maneuver the UAS clear of any hazards and any potential collision with ground obstructions or air traffic.

- Assist the RPIC in complying with applicable FAA VFR flight conditions such as visibility, cloud clearance requirements and keeping UAS within VLOS.

- Able to determine the UAS relative altitude, flight path, and proximity to all aviation activities and hazards (e.g. terrain, weather, wildlife, structures) sufficiently to prevent the aircraft from creating a hazardous situation.

- Perform observation duties for one (1) UAS at a time.

- Maintain constant communication with the UAS pilot and communicate timely information to the UAS pilot to avoid other aircraft or structures.

- Must be able to:
  - Perform visual scanning techniques.
  - Facilitate inter-crew communications succinctly and clearly.
  - Assess hazardous weather conditions.
  - Take action in the event a risk of collision develops.
- Must demonstrate an understanding of:
  - The vertical and horizontal boundaries of the operation.
  - The class of airspace restrictions and determine adjacent classes of airspace.
  - Right of way rules as specified in FAA regulations.
  - UAS system limitations.
- VO is not permitted to fulfill the duties of any other flight crew member while performing duties as VO

6.4 Advanced Training

Advanced training includes training beyond the Department training requirements, including but not limited to, additional aircraft, and advanced software and/or hardware. Advanced training may be given by Department instructors or provided by a vendor. Where applicable advanced training will be noted in the pilots logbook and signed off by the instructor.

6.5 Pilot/flight crew meetings

Regular pilot/flight crew meetings will be scheduled to discuss and share operational experiences with the goal of improving safety and expanding skills. To maintain a high level of competency, the meetings will also include training to cover selected items which contribute to the UAS Program's ongoing mission of safety, such as flight maneuvers, FAA regulations, pilot decision making, crew resource management, accident-incident mishap review, emergency procedures, reporting, and standard operating procedures changes/updates.

6.6 Currency

Department pilots may not operate a sUAS for a mission in a category, class, and type, unless he/she has conducted a currency flight, including a minimum of 20 minutes of flight time with three takeoffs/landings within the preceding 60 days. The RPIC must conduct the flight in a manner so as not to pose an undue hazard to persons and property. Flight times and takeoffs/landings performed during a mission will count toward meeting currency requirements. Flight times and takeoffs/landings performed with non-Department equipment will count toward meeting currency requirements provided it is on similar equipment. Times will be verified by the pilot's logbook. All flights with Department equipment must be done with a visual observer.

If a Department pilot does not fly 6 months or more in a category, class, and type, he/she must conduct a currency flight with the chief pilot or program lead pilot including a minimum of 18 minutes of flight time with three takeoffs/landings before being allowed to fly a mission.

Maintenance Procedures

7.0 MAINTENANCE

7.1 Permitted Maintenance and Repairs

RPICs are permitted to conduct maintenance and/or repairs, including but not limited to, prop replacements, firmware and/or software updates, sensor and/or gimbal adjustments, battery maintenance and required manufacturer maintenance.

The following maintenance and repair rules apply:

- All maintenance or repairs which void the manufacturer warranty are prohibited.

- All required manufacturer aircraft maintenance shall be completed by a **TRAINED** and authorized RPIC assigned to the aircraft.

- In the event the aircraft requires repairs beyond permitted maintenance, the RPIC will notify the program lead program pilot for further action. The lead program pilot will also notify the chief pilot.

7.2 Battery Maintenance

- All battery maintenance required by the manufacturer shall be performed by the RPIC assigned to the aircraft.
- The night before or at the beginning of a day with a planned mission or training exercise, charge the required number of batteries
- At the end of the flight day, check the charge levels of the batteries. If the charge level of any battery is over approximately 50% charged, utilize the aircraft to discharge to that approximate level. If the batteries are discharged to below 20% charge them to that level.
- Do not store the battery or aircraft in a hot garage, car or direct sunlight. If stored in a hot garage or car the battery can be damaged or even catch fire.
- Lock the batteries and aircraft in a cabinet when not in in use or being prepped for flight. Batteries should be stored in a fireproof bag or container.
- Store the LiPo batteries at room temperature and in a dry area for best results.
- You must always charge the LiPo battery in a safe, well-ventilated area away from flammable materials.
- Always inspect the battery, charger and power supply before charging.
- If at any time the LiPo battery begins to balloon or swell, discontinue charging or discharging immediately. Quickly and safely disconnect the battery, then place it in a safe, open area away from flammable materials to observe it for at least 15 minutes. Continuing to charge or discharge a battery that has begun to balloon or swell can result in a fire. A battery that has ballooned or swollen even a small amount must be removed from service completely.
- When charging, transporting or temporarily storing the LiPo battery the temperature range should be from approximately 40–120° F (5–49° C), check manufacturers recommendations for the specific battery used.

7.3 UAS Maintenance Log

RPICs must log and track all repairs in the UAS Maintenance Log including, changes and/or alterations to software, firmware and/or hardware components including but not limited to aircraft and its components, batteries, ground control station, payloads, tablets or other UAS components that affect the safety of flight.

The maintenance log shall include date, total flight hours, work that was completed and a signature of the person who completed or inspected the work (if performed by the manufacturer a repair number will be included in the log and a copy of the invoice or scope of work will be sent to the program lead pilot and chief pilot).

All batteries will be labeled and subsequently logged in the UAS Maintenance Log each time discharge or maintenance is performed as part of the manufacturer battery maintenance schedule.

All geofencing unlocks shall be logged in the UAS Maintenance log and include date of entry, maintenance activity (geofencing unlock), and date of geofencing unlock expiration.

7.4 Maintenance Function Testing

Any UAS that has undergone maintenance, repairs, or alterations that may potentially affect the safety of UAS operations, such as replacement of a flight critical component, including but not limited to, software/firmware/hardware updates and/or changes, must undergo a functional test flight prior to conducting further operations. Functional test flights may only be conducted by a RPIC, with a VO, and must remain at least 300 feet from people not involved in the operation. The functional test flight must be conducted in such a manner so as not to pose an undue hazard to persons and property.

In the event a VO is not available, the RPIC may proceed with a functional test without a VO, at his/her discretion, and within his/her capabilities. In the event the RPIC must perform a functional test flight due to a practical constraint, he/she must remain at least 300 feet from people not involved in the operation, and conduct the flight in a manner so as not to pose an undue hazard to persons and property.

APPENDIX A

COMMON FORMS

(available in DEP SUAS Committee TEAMS)

Suggested Equipment List

1. Safety glasses (required), a safety vest and/or Department clothing/uniform (required). A hard hat is suggested but not required unless appropriate for the site or operations where the flight crew may be in close proximity to the drone in flight, such as hand launching or recovering the drone or setting up the LZ closer than 30' from the flight deck because of site constraints.
2. Personal Protective Gear appropriate for conditions/site.
3. First aid kit/sunscreen
4. Landing Pad
5. Signs and cones for marking flight deck and LZ
6. Anemometer
7. Smart phones/chargers – for 911 and other emergency/flyaway contacts, weather and TFR checks before flights
8. Scanner with spare batteries to monitor air traffic if within 5 miles of an airfield or planning on flying in controlled airspace or above 500 feet AGL.
9. Handheld radios for crew communications – 2 minimum with spare batteries
10. Bottled water
11. Power source/adapters for phone/battery charging, control station/ aircraft batteries, etc.
12. Warning signs/safety cones
13. Binoculars - cannot be used to maintain VLOS but can be used to look for potential safety issues like people or vehicles at the perimeter of the flight operations area.
14. Tarp or folding tables depending on site conditions to keep electronics off the ground and dry or area for assembly.
15. Can of condensed air – for wet/dirty connectors and blowing out debris
16. Aircraft specific support and safety equipment and tools

sUAS MISSION RISK ASSESSMENT MATRIX

Date: _____ **Mission ID:** _____ **Mission Type:** _____

Step 1. Risk Assessment

Review questions and input the score for Risk and Gain according to currently available information. Score items according to instinct and the examples given. Absence of data automatically sets the score to maximum point value and circle the value.

Planning: Thoroughness of pre-mission planning. Factors which increase risk: Immediate Launch, Normal Pre-Plan, in-mission change.

Adequate — Minimal — None

1 2 3 4 5

Event: Refers to mission complexity and guidance. Factors which may increase risk: incomplete details or non-standard mission.

Clear Guidance — Complex/Innovation Required

1 2 3 4 5

Asset: Selection of appropriate resources. Factors that affect risk: time with qualification, familiarity w/OP area, fatigue, flight time (total time & time w/UAS), knowledge of asset capabilities

A. Pilots

Excellent — Adequate — Marginal

1 2 3 4 5

B. Crew

Excellent — Adequate — Marginal

1 2 3 4 5

C. UAS Performance and Resources airframe/engines/batteries/ controllers/sensors/peripherals

Fully Mission Capable — Partially Mission Capable

1 2 3 4 5

Communications: Ability to maintain comms throughout mission with multiple observers.

Adequate — Marginal — None

1 2 3 4 5

Environment: External condition surrounding mission: Weather, Cloud ceiling, terrain, power lines/structures, airfields

Benign — Marginal — Hazardous

2 4 6 8 10

Add the values for each Risk Assessment and plot the final Risk Assessment on graph below if above 20 then STEP 2

Step 2. Risk Management Reduction

Risk Management is the decision to control or reduce hazards. *Control Options* below assist in risk control or reduction. Review the options and reassess the risks as appropriate, enter final value in the box.

Spread Out – Disperse the risk by launching additional assets.

Transfer – If practical, locate a better suited asset to conduct the mission i.e. different aircraft, surface asset, or crew.

Avoid – Circumvent hazard: Wait for risk to subside i.e. wait weather passes, wait for additional resources

Accept – In all cases the benefit must justify the assumption of low risk. The decision to accept risk must be made with the stipulation that risk is reevaluated as the mission progress. (No adjustment to Risk Assessment)

Reduce – Reduce or limit risk exposure: bring in fresh or more experienced crew.

Step 3 Apply Risk Values

Risk vs. Gain

Low Gain – Situation with intangible benefits or a low probability for providing concrete results

Medium Gain – Situation that provides immediate, tangible benefits. Examples include producing outreach materials, environmental monitoring, enforcement activities.

High **G**ain– Situation that provides immediate, tangible benefits that if ignored could result in severe environmental damage or loss of life. Given the mission description above, what is the "Gain" for this mission?

Risk VS **Gain**

It is recommended that any mission which results in a Risk Assessment value above 20, requires re-evaluation and/or Command guidance.

Use the Risk vs. Gain Chart (next page) for recommendations on how to proceed

It is recommended that any mission which results in a Risk Assessment value above 20, requires re-evaluation and/or Command approval.

8 — 12 — 20 21 — 32 — 40

Low — Medium — High

UAS MISSION RISK ASSESSMENT MATRIX

It is recommended that any mission, which results in a Risk Assessment value above 20, requires re-evaluation or Command guidance to proceed.

Risk	*High Gain*	*Medium Gain*	*Low Gain*
Low Risk	Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.	Accept the Mission. Continue to monitor Risk Factors, if conditions or mission changes.	Accept the Mission. Re-evaluate Risk vs. Gain, should Risk Factors change.
Medium Risk	If available contact division or program coordinator for guidance. Continue to monitor RISK, employ options to minimize RISK	If available contact division or program coordinator for guidance. Continue to monitor RISK, employ options to minimize RISK	Do not accept the Mission.
High Risk	Only accept HIGH RISK missions when loss of life or injury is imminent.		

NOTE: This Risk Assessment Matrix is intended as a tool to focus attention on items which cause risk when flying UAS missions. Although one could selectively evaluate Risk Factors with a mind toward achieving an acceptable Risk Factor score, doing that would subvert the intent of this tool. This is intended to help everyone on the aircrew shift their thinking towards the hazards of the aviation environment. All members of the flight crew should participate in the Risk Assessment scoring. This Risk Assessment process should continue throughout the mission as conditions evolve.

Instructions

1. Complete Step 1, Risk Assessment. Review each of the Risk Factors and assign a numerical score as indicated. Circle the score given.
Note: The relative scale provided is a guide to determine how much risk is associated with each factor. If you know or have information not specifically addressed in the example you may want to reference the scale at the bottom of the page. Example: If you feel that the wrong Asset is being sent or used on the mission, you may want to score that factor as high risk. Use your best judgment as YOU see the information developing. Add the values of the boxes together. Use this score to determine the Risk, by applying it to the Risk Scale at the bottom of the page. Note: The Environmental Risk Factor has a weighted value.
2. Complete Step 2, Risk Management. If Risk Assessment is determined to be excessive, review the control options and determine if the risks can be reduced or controlled. Enter the final Risk factor in the box provided. Total the values of the boxes and again compare to the Risk Scale at the bottom of the page then enter factor (L,M,H) in box (Risk vs Gain).
3. Complete Step 3, Determine Potential Gain. Determine the gain by reviewing the definitions, apply as appropriate.
4. Utilize the matrix above to receive a recommendation on whether or how to proceed with the mission.
5. Communicate the findings with your crew. Continue to re-evaluate Risk Assessmnent vs. Risk Management throughout all phases of the mission. This process should be an endless loop and continue until the safe completion of the mission.

Source: Adapted from USCG Auxiliary Standard AV-04-4

INSTRUCTIONS FOR FILLING OUT THE NJDEP UNMANNED AIRCRAFT FLIGHT PLAN AND REPORT FORM

The NJDEP "UNMANNED AIRCRAFT FLIGHT PLAN AND REPORT" form was designed to provide a standardized format for Department remote pilots to plan for, execute and report on UAS operations that can be shared among the different programs to learn from and improve flight operations.
Parts A, B, C and D constitute the planning portion of the FORM and must be completed prior to the planned flight. The flight plan should be used in conjunction with the Ready Room Briefing checklist to brief flight crew and other participants prior to the flight(s)

Part A - Flight Information

- **Mission ID –** unique number to identify program missions.
- **Type of Mission** – Training, photo, video mapping remote sensing etc.
- **Mission Requested By** – identify entity requesting the flight
- **Operation Area** – Identify flight area by Mun, Co, State and local/project name (if applicable)
- **Mission Date(s) –** flight date(s)
- **Latitude –** Latitude in DD MM SS format
- **Longitude –** Longitude in DD MM SS format
- **Class Airspace –** Identify the class(es) of airspace flight will be performed in
- **Time of Operation –** time frame within which flight was conducted in Local time
- **Max Altitude –** maximum altitude planned in AGL
- **NOTAM # -** filed NOTAM number for the flight(s)
- **Closest Airports –** Identify all airports with controlled airspace within 10 NM of the flight area or closest airport with controlled airspace if none within 10NM. Use airport identifier along with bearing and distance from flight area, i.e. KMJX 5 NM S
- **Aircraft/Sensors –** Aircraft type deployed, and sensors mounted on aircraft

Flight Crew – Identify the individuals assigned to the flight crew (including RPIC) including crew position cell phone number (in case of last-minute flight cancellation or other emergency) and affiliation.

Contacts

- **ARTCC** – Air Route Traffic Control Centers – New Jersey is covered by the New York ZNY or Washington ZDC centers. In the event of a fly away the appropriate center should be notified immediately
- **Airports** – identify all airports, and phone number, within 5 NM of the flight area
- **Local Law Enforcement** – Identify local law enforcement covering the flight area
- **Local Emergency** – Identify local emergency services covering the flight area

MAPS

- **Sectional** – copy of area of sectional map showing flight area and vicinity. NJ is covered by either the New York or Washington Sectional Map
- **FAA Facilities Map**. – Copy of facilities map including flight area. Primarily used to check LAANC requirements/availability, but can also be used to verify airspace and restrictions
- **SkyVector** -copy of SkyVector map showing the flight area. checked on day of flight to verify that NOTAM is in place and see any TFRs in area

- **Area of Interest –** Aerial of flight area with flight limits marked

Part B: Mission

- **Description** -Overall description of the Mission - Who, What, When, Why, Where
- **Flight Descriptions and Product Details** – Describe details of each flight and the expected product to be delivered

Part C: Mission Hazards and Emergency Procedures

- Based on the examination of maps, aerials, site inspections and any other gathered data, identify and discuss potential hazards or issues that may impact the safe conduct of the flight operation and privacy concerns. Include mitigations and emergency procedures for all potential problems.

Part D: Waivers & Procedures

- List all permissions/restrictions required to legally fly in the project area (such as air space waivers, LAANC authorizations, Part 107 waivers, Special Use Permits Property owner permission) and attached permissions to flight plan and have on site while performing flight operations.

Part E: Weather

- The primary sources for weather that should be consulted are weather.gov, 1800wxbrief.com and aviationweather.gov. Other sources can be used to compliment these sources.
- Weather will need to be monitored well in advance of the flight date for planning purposes but for Part E weather it should be checked on the day of the flight looking to see the expected hourly forecast for the flight area prior to and during the flight. Hourly forecast for the day is available at weather.com (NOAA) and TAFs are available for several airports in NJ.
- METARs for airports surrounding the flight location should be checked (and recorded) BEFORE EACH FLIGHT to check conditions and see if the forecast is playing out. METARS only cover about a 5 mile radius around the airport so if the flight area is not within that radius it is solely on the RPIC discretion that weather conditions are within limits for the flight

Part F: M O S T

- Post flight crew debriefing looking at positive and/or negative issues during the flight dealing with Maintenance, Operation, Safety and Training.

Part G: Mission Summary

- Mission Summary by RPIC analyzing the flight, whether the mission was a success with all the goals accomplished or circumstances that hindered the completion of the missions. Should include any issues that affected the flight positively or negatively that can be shared with other Department pilots to avoid or copy.

New Jersey Department of Environmental Protection

UNMANNED AIRCRAFT FLIGHT PLAN AND REPORT

Part A: Flight Information

Mission ID		Type of Mission	Mission Requested By:
Operation Area: (Municipality, County, State - local/project name)			Mission Date(s)
Latitude DD MM SS	Longitude DDD MM SS	Class Airspace:	Time of operation (local time)
Max Altitude: (AGL)	Closest Airports (with Controlled Airspace distance/bearing)		Aircraft Model: Sensor: Weight:
NOTAM #			

Flight Crew

	Name:	Crew Position:	Cell Phone:	DEP Program or affiliation
1				
2				
3				
4				
5				
6				

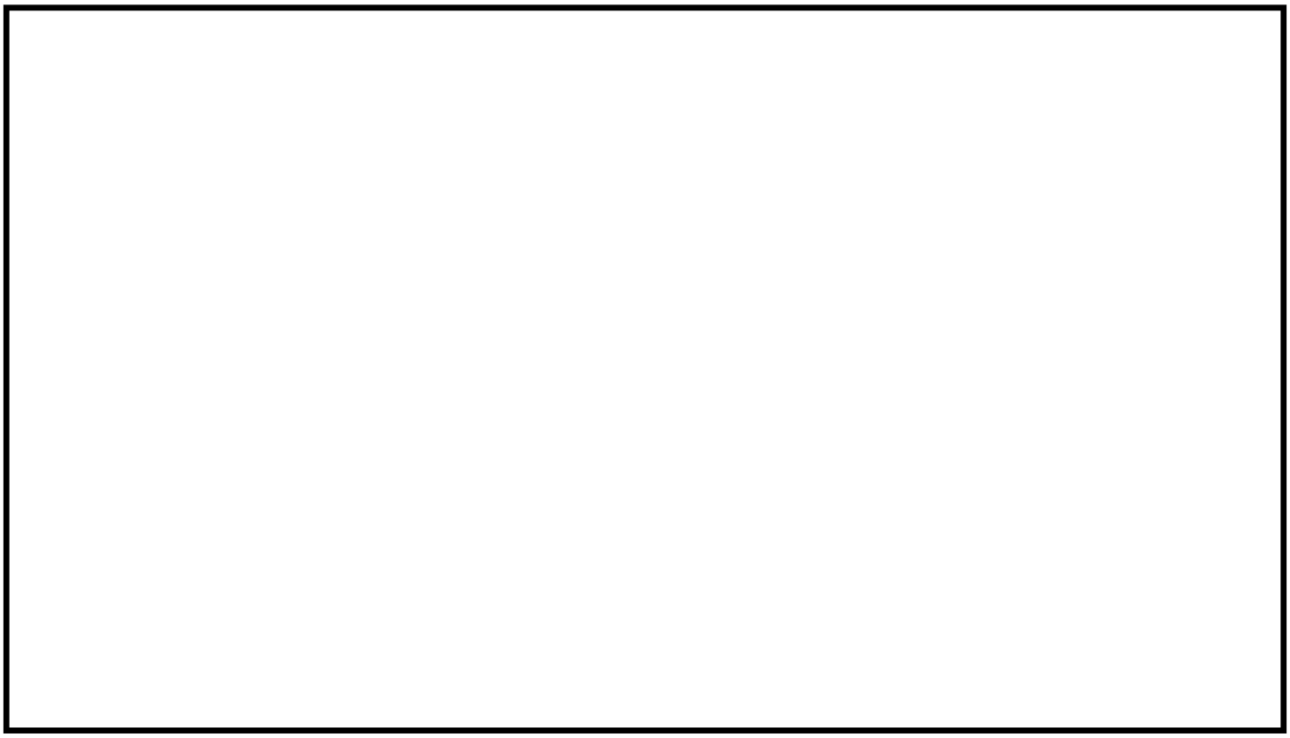
Contacts

ARTCC **New York ZNY 631-468-5959** **Washington ZDC 703-771-3470**

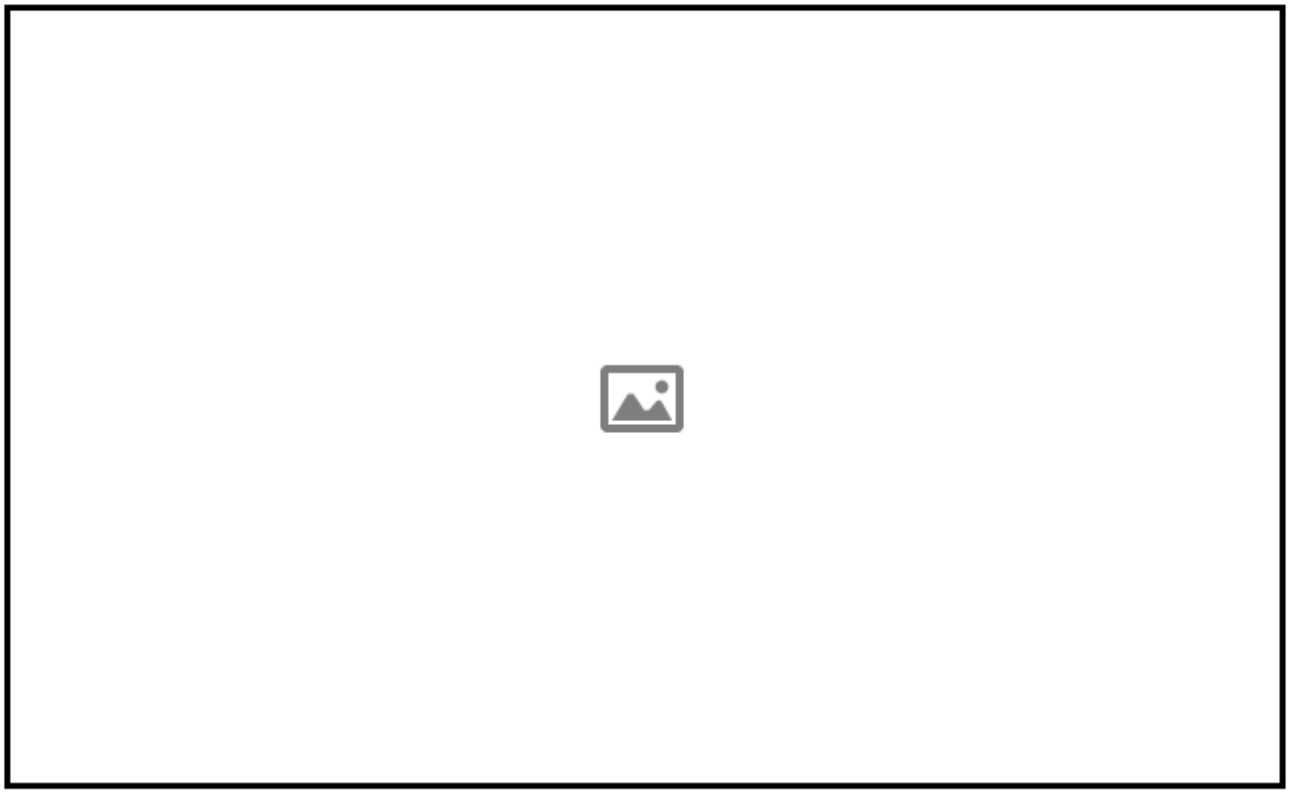
Airports (within 5 miles Airport/Phone)

Local Law Enforcement		
Local Emergency		

MAPS



Sectional



FAA Facilities Map Website Link

2

SkyVector Website Link

3

Area of Interest

Part B: Mission

Description

Flight Descriptions and Product Details

Part C: Mission Hazards and Emergency Procedures

Examples: Air traffic, ground traffic, powerlines, obstructions, electromagnetic interference, etc.

Part D: Waivers & Permissions

Examples: Part 107 waivers, Air Space Authorizations, Special Use Permits, property owner permission, photo release, ect. attach copies

Part E: Weather

Part F: Maintenance - Operation - Safety - Training (MOST)

6

Part G: Mission Summary

Prepared By: **Date:**

Signature: _____

7

FIELD NOTES

Mission #: _____ Date: _____
Location: _____
Lat/Long (dms): _____
Aircraft: _____ Sunrise/Sunset: _____

Flight #: _____ Batt#: _____ Time: _____ TFR: _____
Flight Crew: RPIC: _____ Inspection ____
VO: _____
CREW: _____
_____
METAR: _____
_____
_____
Quick MOST Notes: _____
_____
_____
_____

Flight #: _____ Batt#: _____ Time: _____ TFR: _____
Flight Crew: RPIC: _____ Inspection ____
VO: _____
CREW: _____
_____
METAR: _____
_____
_____
Quick MOST Notes: _____
_____
_____
_____

Flight #: ___________ Batt#:___________ Time: ______________ TFR: __________

Flight Crew: RPIC: ____ Inspection ____

VO: ____

CREW: ____

____

METAR: ____

____

____

Quick MOST Notes: ____

____

____

____

Flight #: ___________ Batt#:___________ Time: ______________ TFR: __________

Flight Crew: RPIC: ____ Inspection ____

VO: ____

CREW: ____

____

METAR: ____

____

____

Quick MOST Notes: ____

____

____

____

Flight #: ___________ Batt#:___________ Time: ______________ TFR: __________

Flight Crew: RPIC: ____ Inspection ____

VO: ____

CREW: ____

____

METAR: ____

____

____

Quick MOST Notes: ____

____

____

____

UAS Emergency Checklist

The following table gives some suggested actions for pilot and crew to take in emergency situations that may develop during a flight. Each emergency is unique and requires that the pilot and crew evaluate the situation and react accordingly. Safety is the primary concern in all situations and to maintain safety in an emergency situation the pilot and crew may deviate from any requirements of the Part 107 rules or Department policy to the extent necessary.

Issue	Pilot Action	Crew Action	Post Incident Action
Aircraft Unresponsive	-Alert crew to problem -Check that the RC power is on and antenna extended -Assess what controls are responding and attempt to regain control and land at original or emergency landing site -If unable to regain control and automatic RTH has not started initiate RTH -If fly away note bearing altitude, speed and flight time remaining and report to ARTCC	-Maintain VLOS on aircraft (if moving note bearing, altitude and speed) -Clear Landing Area -Keep pilot updated with necessary information -Follow Pilot commands	-Assess Factors leading to the issue -Note incident in logs and report -Follow procedures for reporting incident
Loss of Data link	-Alert crew to problem -Check that data cord is plugged in at both ends -If data link still unresponsive land the aircraft	-Maintain VLOS -Clear Landing Area -Keep pilot updated with necessary information -Follow Pilot commands	-Assess Factors leading to the issue -Note incident in logs and report -Follow procedures for reporting incident
Loss of GPS	-Alert crew to problem -Compensate for lack of GPS and land	-Maintain VLOS -Clear Landing Area -Keep pilot updated with necessary information -Follow Pilot commands	-Assess Factors leading to the issue -Note incident in logs and report -Follow procedures for reporting incident
Loss of VLOS	-Alert Crew to problem and check if crew still has VLOS -If crew does not have VLOS initiate VLOS recovery procedures -If VLOS cannot be reacquired initiate RTH	-Alert pilot that VLOS has been lost -Attempt to reacquire VLOS -Keep pilot updated with necessary information -Follow Pilot commands -Clear landing area	-Assess Factors leading to the issue -Note incident in logs and report -Follow procedures for reporting incident
Loss of Situational Awareness	-Alert crew to problem -Stop operations and assess conditions -If SA cannot be established initiate emergency landing	-Alert pilot to problem -Maintain VLOS -Clear Landing Area -Keep pilot updated with necessary information -Follow Pilot commands	-Assess conditions that led to loss of SA -Note incident in logs and report -Follow procedures for reporting incident

Issue¤	Pilot·Action¤	Crew·Action¤	Post·Incident·Action¤	¤
Air·traffic·in·flight·area¤	-Alert·crew·to·problem¶ -Initiate·"see·and·avoid"¶ -If·aircraft·above·drone·flight·level·descend·and·land·if·necessary¶ -If·aircraft·below·drone·flight·level·climb·and·move·perpendicularly·away·from·aircraft·flight·path·descend·when·safely·clear·(Part·107·400'·agl·flight·limit·may·be·exceeded·in·an·emergency)¶ -Perform·emergency·landing·if·necessary¤	-Alert·Pilot·and·advise·actions·to·"see·and·avoid"¶ -Clear·landing·area¤	-Assess·Factors·leading·to·the·issue·¶ -Note·incident·in·logs·and·report¶ -Follow·procedures·for·reporting·incident¤	¤
Public·entering·flight·area¤	-Alert·crew·to·problem¶ -adjust·flight·to·stay·clear·¶ -Access·situation·and·land·if·necessary¤	-Alert·pilot·to·problem¶ -if·possible,·intercept·and·divert·¤	-Note·incident·in·logs·and·report¶ -Follow·procedures·for·reporting·incident¤	¤
Injury·to·flight·crew·or·non-participant¤	-Alert·crew·to·problem¶ -Render·First·Aid·¶ -Call·local·emergency·for·serious·injury¤	-Alert·pilot·to·problem¶ -Render·First·Aid·¶ -Call·local·emergency·for·serious·injury¤	-Assess·Factors·leading·to·the·issue·¶ -Note·incident·in·logs·and·report¶ -Follow·procedures·for·reporting·incident¤	¤
Battery·swelling·¤	-Alert·crew·to·problem¶ -Remove·the·battery·to·open·area·away·from·flammable·material¶ -Dispose·of·battery·as·appropriate¤	-Alert·pilot·to·problem¶ -Remove·the·battery·to·open·area·away·from·flammable·material¶ -Dispose·of·battery·as·appropriate¤	-Note·incident·in·logs·and·report¶ -Follow·procedures·for·reporting·incident¤	¤
Battery·overheating¤	-Alert·crew·to·problem¶ -Initiate·emergency·landing·in·open·area·and·shut·down¶ -Watch·for·fire¤	-Clear·landing·area¶ -Get·fire·extinguisher·if·available¤	-Isolate·aircraft·and·or·battery·until·danger·of·fire·passes¶ -Assess·Factors·leading·to·the·issue·¶ -Note·incident·in·logs·and·report¶ -Follow·procedures·for·reporting·incident¤	¤

¶

NJ Department of Environmental Protection's
Photo Release Form

I,_____
(Signature)

hereby give permission to the **NJ Department of Environmental Protection** to use any still and/or moving image being video footage, photographs and/or frames and/or audio footage depicting me, that have been taken:

On behalf of (event/program):_____

_____

On (date): _____

At (place): _____

For any of the following uses:

- Publications, website inclusion, presentation slides, displays/exhibits, advertisements or any other use for the purpose of sharing information, instruction, training, or publicity purposes.

The above consent will apply throughout New Jersey and be for an indefinite period.

Name (Print): _____ Date: _____

Home Address: _____

_____ Zip Code: _____

Primary Phone #: (_____) _____

Email Address: _____

For DEP Records:

DEP Communications/Press Office: (609) 984-1795 Form 2/2017

Photo ID #: _____ Name of Folder: _____

NJ Department of Environmental Protection's

Parental Consent Form

For Use of Images that Include Minors (Youth under 18 years of age)

I/we,_____

the parent(s)/guardian(s) of:

(Child's full name): _____

(Child's full name): _____

(Child's full name): _____

hereby give permission to the **NJ Department of Environmental Protection** to use any still and/or moving image being video footage, photographs and/or frames and/or audio footage depicting my/our children named above, that have been taken by:

(Name of photographer) _____

On behalf of (event/program): _____

On (date): _____

At (place): _____

For any of the following uses:

- Publications, website inclusion, presentation slides, displays/exhibits, advertisements or any other use for the purpose of sharing information, instruction, training, or publicity purposes.

The above consents will apply throughout New Jersey and be for an indefinite period.

Signature: _____ Date: _____

Signature: _____ Date: _____

Home Address: _____

_____ Zip Code: _____

Primary Phone #: (_____) _____

Email Address: _____

DEP Communications/Press Office: (609) 984-1795 **Form 2/2017**

Photo ID #: _____ Name of Folder: _____

DECIDE Model

D etect the fact that a change has occurred.
E stimate the need to counter or react to the change.
C hoose a desirable outcome for the success of the flight.
I dentify actions which could successfully control the change.
D o the necessary action to adapt to the change.
E valuate the effect of the action.

I'M SAFE Checklist

I llness — Do I have any symptoms?
M edication — Have I been taking prescriptions or over-the-counter drugs?
S tress — Am I under psychological pressure from the job? Worried about financial matters, health problems, or family discord?
A lcohol — Have I been drinking within 8 hours? Within 24 hours?
F atigue — Am I tired and not adequately rested?
E ating — Am I adequately nourished?

COMMUNICATIONS FACILITIES

CALL SIGNS

Facility	Call Sign
Airport Advisory Area (FSS)	Radio
Aeronautical Advisory Service	Unicom
Air Route Traffic Control Center	Center
Approach/Departure Control	Approach/Departure
Automatic Terminal / Information Service	ATIS
Clearance Delivery	Clearance Deliver
Common Traffic / Advisory Frequency	Traffic (C)
Flight Service Station	Radio
Ground Control	Ground
Hazardous Inflight Weather Advisory Service	HIWAS (H)
Multicom	Traffic (C)
Tower	Tower

PHONETIC ALPHABET

Character	Telephony	Morse Code
A	Alfa	•–
B	Bravo	–•••
C	Charlie	–•–•
D	Delta	–••
E	Echo	•
F	Foxtrot	••–•
G	Golf	––•
H	Hotel	••••
I	India	••
J	Juliet	•–––
K	Kilo	–•–
L	Lima	•–••
M	Mike	––
N	November	–•
O	Oscar	–––
P	Papa	•––•
Q	Quebec	––•–
R	Romeo	•–•
S	Sierra	•••
T	Tango	–
U	Uniform	••–
V	Victor	•••–
W	Whiskey	•––
X	Xray	–••–
Y	Yankee	–•––
Z	Zulu	––••
1	One	•————
2	Two	••–––
3	Three	•••––
4	Four	••••–
5	Five	•••••
6	Six	–••••
7	Seven	––•••
8	Eight	–––••
9	Niner	––––•
0	Zero	–––––

DATE	AIRCRAFT	IDENT	LOCATION (CITY, STATE) COORDINATES (LAT/LONG) DD/MM/SS	TYPE OF FLIGHT (Training, Proficiency, data collection)	NOTES	D/N	TO/L	TOTAL FLIGHT TIME (hrs)
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								

Time Conversion		SQWK				
.1 = 6	.6 = 36		Page Totals			
.2 = 12	.7 = 42		Amount Forward			
.3 = 18	.8 = 48					
.4 = 24	.9 = 54		Total			
.5 = 30						

Maintenance Log (Drone make and model)		S/N ############## CERT # ############		
Date	**Flight No.**	**Issue**	**Action**	**Initial**

APPENDIX B

Summary Of Small Unmanned Aircraft Rule (Part 107)

Fact Sheet – Small Unmanned Aircraft (Part 107)

FAA News

Federal Aviation Administration, Washington, DC 20591

June 21, 2016

SUMMARY OF SMALL UNMANNED AIRCRAFT RULE (PART 107)

Operational Limitations	• Unmanned aircraft must weigh less than 55 lbs. (25 kg). • Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the remote pilot in command and the person manipulating the flight controls of the small UAS. Alternatively, the unmanned aircraft must remain within VLOS of the visual observer. • At all times the small unmanned aircraft must remain close enough to the remote pilot in command and the person manipulating the flight controls of the small UAS for those people to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses. • Small unmanned aircraft may not operate over any persons not directly participating in the operation, not under a covered structure, and not inside a covered stationary vehicle. • Daylight-only operations, or civil twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time) with appropriate anti-collision lighting. • Must yield right of way to other aircraft. • May use visual observer (VO) but not required. • First-person view camera cannot satisfy "see-and-avoid" requirement but can be used as long as requirement is satisfied in other ways. • Maximum groundspeed of 100 mph (87 knots). • Maximum altitude of 400 feet above ground level (AGL) or, if higher than 400 feet AGL, remain within 400 feet of a structure. • Minimum weather visibility of 3 miles from control station. • Operations in Class B, C, D and E airspace are allowed with the required ATC permission. • Operations in Class G airspace are allowed without ATC permission. • No person may act as a remote pilot in command or VO for more than one unmanned aircraft operation at one time. • No operations from a moving aircraft. • No operations from a moving vehicle unless the operation is over a sparsely populated area. • No careless or reckless operations. • No carriage of hazardous materials.

	• Requires preflight inspection by the remote pilot in command. • A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS. • Foreign-registered small unmanned aircraft are allowed to operate under part 107 if they satisfy the requirements of part 375. • External load operations are allowed if the object being carried by the unmanned aircraft is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft. • Transportation of property for compensation or hire allowed provided that- o The aircraft, including its attached systems, payload and cargo weigh less than 55 pounds total; o The flight is conducted within visual line of sight and not from a moving vehicle or aircraft; and o The flight occurs wholly within the bounds of a State and does not involve transport between (1) Hawaii and another place in Hawaii through airspace outside Hawaii; (2) the District of Columbia and another place in the District of Columbia; or (3) a territory or possession of the United States and another place in the same territory or possession. • Most of the restrictions discussed above are waivable if the applicant demonstrates that his or her operation can safely be conducted under the terms of a certificate of waiver.
Remote Pilot in Command Certification and Responsibilities	• Establishes a remote pilot in command position. • A person operating a small UAS must either hold a remote pilot airman certificate with a small UAS rating or be under the direct supervision of a person who does hold a remote pilot certificate (remote pilot in command). • To qualify for a remote pilot certificate, a person must: o Demonstrate aeronautical knowledge by either: ▪ Passing an initial aeronautical knowledge test at an FAA-approved knowledge testing center; or ▪ Hold a part 61 pilot certificate other than student pilot, complete a flight review within the previous 24 months, and complete a small UAS online training course provided by the FAA. o Be vetted by the Transportation Security Administration. o Be at least 16 years old. • Part 61 pilot certificate holders may obtain a temporary remote pilot certificate immediately upon submission of their application for a permanent certificate. Other applicants will obtain a temporary remote pilot certificate upon successful completion of TSA security vetting. The FAA anticipates that it will be able to issue a temporary remote pilot certificate within 10 business days after receiving a completed remote pilot certificate application. • Until international standards are developed, foreign-

	certificated UAS pilots will be required to obtain an FAA-issued remote pilot certificate with a small UAS rating. A remote pilot in command must: • Make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the rule. • Report to the FAA within 10 days of any operation that results in at least serious injury, loss of consciousness, or property damage of at least $500. • Conduct a preflight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is in a condition for safe operation. • Ensure that the small unmanned aircraft complies with the existing registration requirements specified in § 91.203(a)(2). A remote pilot in command may deviate from the requirements of this rule in response to an in-flight emergency.
Aircraft Requirements	• FAA airworthiness certification is not required. However, the remote pilot in command must conduct a preflight check of the small UAS to ensure that it is in a condition for safe operation.
Model Aircraft	• Part 107 does not apply to model aircraft that satisfy all of the criteria specified in section 336 of Public Law 112-95. • The rule codifies the FAA's enforcement authority in part 101 by prohibiting model aircraft operators from endangering the safety of the NAS.

Fact Sheet – Small Unmanned Aircraft Regulations (Part 107)

June 21, 2016
Contact: Les Dorr or Alison Duquette
Phone: 202-267-3883

The new rules for non-hobbyist small unmanned aircraft (UAS) operations – Part 107 of the Federal Aviation Regulations (PDF) – cover a broad spectrum of commercial uses for drones weighing less than 55 pounds. Here are the highlights of the new rule.

Operating Requirements
The small UAS operator manipulating the controls of a drone should always avoid manned aircraft and never operate in a careless or reckless manner. You must keep your drone within sight. Alternatively, if you use First Person View or similar technology, you must have a visual observer always keep your aircraft within unaided sight (for example, no binoculars). However, even if you use a visual observer, you must still keep your unmanned aircraft close enough to be able to see it if something unexpected happens. Neither you nor a visual observer can be responsible for more than one unmanned aircraft operation at a time.

You can fly during daylight or in twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time) with appropriate anti-collision lighting. Minimum weather visibility is three miles from your control station. The maximum allowable altitude is 400 feet above the ground, and higher if your drone remains within 400 feet of a structure. The maximum speed is 100 mph (87 knots).

You can't fly a small UAS over anyone who is not directly participating in the operation, not under a covered structure, or not inside a covered stationary vehicle. No operations from a moving vehicle are allowed unless you are flying over a sparsely populated area.

Operations in Class G airspace are allowed without air traffic control permission. Operations in Class B, C, D and E airspace need ATC approval. See Chapter 14 in the Pilot's Handbook (PDF).

You can carry an external load if it is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft. You also may transport property for compensation or hire within state boundaries provided the drone – including its attached systems, payload and cargo – weighs less than 55 pounds total and you obey the other flight rules. (Some exceptions apply to Hawaii and the District of Columbia. These are spelled out in Part 107.)

You can request a waiver of most operational restrictions if you can show that your proposed operation can be conducted safely under a waiver. The FAA will make an online portal available to apply for such waivers.

Pilot Certification
To operate the controls of a small UAS under Part 107, you need a remote pilot airman certificate with a small UAS rating, or be under the direct supervision of a person who holds such a certificate

You must be at least 16 years old to qualify for a remote pilot certificate, and you can obtain it in one of two ways:

- You may pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center.

- If you already have a Part 61 pilot certificate, other than a student pilot certificate, you must have completed a flight review in the previous 24 months and you must take a small UAS online training course provided by the FAA.

  If you have a non-student pilot Part 61 certificate, you will immediately receive a temporary remote pilot certificate when you apply for a permanent certificate. Other applicants will obtain a temporary remote pilot certificate upon successful completion of a security background check. We anticipate we will be able to issue temporary certificates within 10 business days after receiving a completed application.

UAS Certification

You are responsible for ensuring a drone is safe before flying, but the FAA does not require small UAS to comply with current agency airworthiness standards or obtain aircraft certification.Instead, the remote pilot will simply have to perform a preflight visual and operational check of the small UAS to ensure that safety-pertinent systems are functioning properly. This includes checking the communications link between the control station and the UAS. The UAS must also be registered.

Respecting Privacy

Although the new rule does not specifically deal with privacy issues in the use of drones, and the FAA does not regulate how UAS gather data on people or property, the FAA is acting to address privacy considerations in this area. The FAA strongly encourages all UAS pilots to check local and state laws before gathering information through remote sensing technology or photography.

As part of a privacy education campaign, the agency will provide all drone users with recommended privacy guidelines as part of the UAS registration process and through the FAA's B4UFly mobile app. The FAA also will educate all commercial drone pilots on privacy during their pilot certification process; and will issue new guidance to local and state governments on drone privacy issues. The FAA's effort builds on the privacy "best practices" (PDF) the National Telecommunications and Information Administration published last month as the result of a year-long outreach initiative with privacy advocates and industry.

Other Requirements

If you are acting as pilot in command, you have to comply with several other provisions of the rule:

- You must make your drone available to the FAA for inspection or testing on request, and you must provide any associated records required to be kept under the rule.
- You must report to the FAA within 10 days any operation that results in serious injury, loss of consciousness, or property damage (to property other than the UAS) of at least $500.

APPENDIX C

Program Specific Forms and Procedures

Division Of Information Technology – BGIS

Phantom 4 Pro Checklists

BGIS Phantom 4 Pro Checklists
04/2020

READY ROOM BRIEFINGS
Mission Planning
Flight Crew Assignments
Map-Based Site Evaluationheader
Airspace (Class, Restrictions, TFRs, NOTAMs, Airports)
Permissions/Permits
Authorizations (including LAANC and DJI)
Waivers
Weather (Ceiling, Visibility, Winds, Precip, Daylight)
Mission plan
Cache Mission Area Maps
Assemble mission required equipment
Crew Brief
Date/Time/Location
Crew
Mission details and objectives
Hazards
Part 107 Constraints
Privacy issues
Weather
NOTAMs and TFRs
Crew Responsibilities and Fitness
Sterile Cockpit
Emergency Procedures
Debrief Location/Time
Questions
POSTFLIGHT
Quick Cycles Around Crew Until All Pass
Date/Time/Location
All Crew Names
Maintenance
Operations
Safety
Training

FLIGHT DECK PREP & SECURE CHECKLIST
Flight Station Prep Checklist
Signs, Cones
Personal Protective Equipment
Flight Area Inspection
iPads WiFi/cellular Off
Aircraft Prep Checklist
Aircraft Inspection
Propellers
Camera/Gimbal/ND Filter Inspection
Micro SD Card Installed w/ Suffient Free Space
Aircraft Battery
Remote Controller w/iPAD/Glare Shield
iPAD
Handheld Radios Tuned & Checked Intra & Inter
POSTFLIGHT
Shutdown Checklist
Aircraft Battery
iPad(s)
Remote Controller(s)
PIC Hot Wash for MOST Immediate Corrections
Recover Aircraft Checklist
Propellers
iPad Cable(s)
iPad/Glare Shield
Remote Controller(s)
Aircraft
Battery Status Each

BGIS Phantom 4 Pro Checklists
04/2020

	PRE-TAKEOFF & TAKEOFF CHECKLIST
	PRE-TAKEOFF
	Crew/Mission Brief *YES/NO*
	Radio Controller(s) *ON*
	iPAD(s) *ON*
	DJI Go App(s) *OPEN*
	Aircraft Battery *ON*
	DJI Go Connection(s) *YES/NO*
	DJI Geo Safe *ON/OFF*
	Maximum Altitude Set *DATA SET*
	Maximum Flight Distance Set *DATA SET*
	Return-To-Home Altitude Set *DATA SET*
	RC Signal Lost *DATA SET*
	Aircraft State *DATA*
	Compass *CALIBRATE YES/NO*
	Flight Mode *DATA*
	Aircraft Battery *DATA*
	Aircraft Battery Temp *DATA*
	RC Battery *DATA*
	TAKEOFF
	Format SD Card (if required)
	Turn iPad Audio Up Full *FULL*
	Confirm Satellite Lock (minimum of 8) *DATA*
	Clear Aircraft Ground Area CLEAR
	Start Engines ARMED
	Verify Home Point Set *YES/NO*
	Fuel Percentage
	Low Fuel Dot
	Announce Takeoff DEPARTING
	Climb Above LZ Minimum Safe Altitude (Min 10M)
	Control Check
	Landing Gear GEAR UP
	Orientation Lights
	Head Home Icon

	ARRIVAL & LANDING CHECKLIST
	ARRIVAL
	Coordinate Multiple AC Landing
	Announce Landing 70M Out ARRIVING
	LANDING
	Landing Checklist
	Hold Above LZ Minimum Safe Altitude
	Landing Gear Down at 10M GEAR DOWN
	Visually Clear Landing Area
	2M Final Approach Fix
	Land Aircraft ON THE DECK
	Shutdown Engines DISARMED
	Fuel Percentage
	Aircraft Battery *DATA*
	Remote Controller(s) DATA
	iPad(s) DATA
	Battery Replacement *YES/NO*

VERBAL CONFORMATION - RPIC/VO
RPIC ANNOUNCEMENTS

BGIS DJI Phantom 4 Pro

Setup, Pre Flight inspection and post flight packing

1) Setup

    a. Remove motor caps, gimble guard and gimble stabilizer – store in backpack
    b. Inspect props for nicks or damage - if ok attach to appropriate motor
    c. Inspect battery – check that the battery is charged, for cracks in the housing, that the ventilation slots are clear and that the battery is not bulging – if ok insert battery into P4P
    d. Inspect cables and remote controller for damage, check that controller is charged extend antenna and attach IPad.

2) Pre-Flight inspection – (**RPIC responsible to insure prior to EVERY flight**)

    a. Inspect battery – check that the battery is charged, for cracks in the housing, that the ventilation slots are clear, and that the battery is not bulging – if ok insert battery into P4P
    b. Inspect props for nicks or damage and check if – replace if damaged
    c. Inspect top of body casing for cracks or warping of the arms
    d. Inspect the left side – check that the SD card is inserted, that the IR sensors are clear, check for cracks and warpage in the body and arms and check for damage on the landing skid
    e. Inspect the back side – check that the vision sensors are clear, check that the Battery is properly inserted and check for cracks and warpage in the body and arms
    f. Inspect the right side – check that the IR sensors are clear, check for cracks and warpage in the body and arms and check for damage on the landing skid
    g. Inspect the front – check that the vision sensors are clear, check for cracks and warpage in the body and arms
    h. Inspect the gimble to ensure it is free to move in all directions
    i. Inspect the camera to ensure that the lens is clean, and the proper filter is attached
    j. Inspect the underside – check for cracks and warpage of the arms, check for damage to the landing skids, check that the vision and pressure sensors are clear

    If the inspection reveals anything that may compromise the flight do not fly until the issues have been corrected.

3) Post flight

    a. Inspect, remove and stow props, check prop connectors for damage or if they are loose
    b. Inspect motors for damage
    c. Replace gimble guard and then the stabilizer, stow P4P in backpack
    d. Check batteries for damage or bulging
    e. Remove IPad and cable from remote controller, check cable and remote controller for damage, stow in backpack
    f. **Any issues with the equipment should be included in the MOST review under Maintenance and addressed before the next flight.**

BGIS Mavic 2 Enterprise Dual Checklists
04/2020

	READY ROOM BRIEFINGS
	Mission Planning
	Flight Crew Assignments
	Map-Based Site Evaluationheader
	Airspace (Class, Restrictions, TFRs, NOTAMs, Airports)
	Permissions/Permits
	Authorizations (including LAANC and DJI)
	Waivers
	Weather (Ceiling, Visibility, Winds, Precip, Daylight)
	Mission plan
	Cache Mission Area Maps
	Assemble mission required equipment
	Crew Brief
	Date/Time/Location
	Crew
	Mission details and objectives
	Hazards
	Part 107 Constraints
	Privacy issues
	Weather
	NOTAMs and TFRs
	Crew Responsibilities and Fitness
	Sterile Cockpit
	Emergency Procedures
	Debrief Location/Time
	Questions
	POSTFLIGHT
	Quick Cycles Around Crew Until All Pass
	Date/Time/Location
	All Crew Names
	Maintenance
	Operations
	Safety
	Training

	FLIGHT DECK PREP & SECURE CHECKLIST
	Flight Station Prep Checklist
	Signs, Cones
	Personal Protective Equipment
	Flight Area Inspection
	iPads WiFi/cellular Off
	Aircraft Prep Checklist
	Aircraft Inspection
	Propellers
	Camera/Gimbal/ND Filter Inspection
	Micro SD Card Installed w/ Suffient Free Space
	Aircraft Battery
	Remote Controller w/iPAD/Glare Shield
	iPAD
	Handheld Radios Tuned & Checked Intra & Inter
	POSTFLIGHT
	Shutdown Checklist
	Aircraft Battery
	iPad(s)
	Remote Controller(s)
	PIC Hot Wash for MOST Immediate Corrections
	Recover Aircraft Checklist
	Propellers
	iPad Cable(s)
	iPad/Glare Shield
	Remote Controller(s)
	Aircraft
	Battery Status Each

BGIS Mavic 2 Enterprise Dual Checklists
04/2020

	PRE-TAKEOFF & TAKEOFF CHECKLIST
	PRE-TAKEOFF
	Crew/Mission Brief *YES/NO*
	Radio Controller(s) *ON*
	iPAD(s) *ON*
	DJI Pilot App(s) *OPEN*
	Aircraft Battery *ON*
	DJI Go Connection(s) *YES/NO*
	DJI Geo Safe *ON/OFF*
	Maximum Altitude Set *DATA SET*
	Maximum Flight Distance Set *DATA SET*
	Return-To-Home Altitude Set *DATA SET*
	RC Signal Lost *DATA SET*
	Aircraft State *DATA*
	Compass *CALIBRATE YES/NO*
	Flight Mode *DATA*
	Aircraft Battery *DATA*
	Aircraft Battery Temp *DATA*
	RC Battery *DATA*
	TAKEOFF
	Format SD Card (if required)
	Turn iPad Audio Up Full *FULL*
	Confirm Satellite Lock (minimum of 8) *DATA*
	Clear Aircraft Ground Area CLEAR
	Start Engines ARMED
	Verify Home Point Set *YES/NO*
	Fuel Percentage
	Low Fuel Dot
	Announce Takeoff DEPARTING
	Climb Above LZ Minimum Safe Altitude (Min 10M)
	Control Check
	Landing Gear GEAR UP
	Orientation Lights
	Head Home Icon

	ARRIVAL & LANDING CHECKLIST
	ARRIVAL
	Coordinate Multiple AC Landing
	Announce Landing 70M Out ARRIVING
	LANDING
	Landing Checklist
	Hold Above LZ Minimum Safe Altitude
	Landing Gear Down at 10M GEAR DOWN
	Visually Clear Landing Area
	2M Final Approach Fix
	Land Aircraft ON THE DECK
	Shutdown Engines DISARMED
	Fuel Percentage
	Aircraft Battery *DATA*
	Remote Controller(s) DATA
	iPad(s) DATA
	Battery Replacement *YES/NO*

VERBAL CONFORMATION - RPIC/VO

RPIC ANNOUNCEMENTS

BGIS DJI Mavic Enterprise Dual

Setup, Pre Flight inspection and post flight packing

1) Setup

    a. Unfold arms (Front Arms forward, back Arms down and back), remove gimble guard
    b. Inspect props for nicks or damage - if ok attach to appropriate motor
    c. Inspect battery – check that the battery is charged, for cracks in the housing, and that the battery is not bulging – if ok insert battery into Mavic ED
    d. Inspect cables and remote controller for damage, check that controller is charged, attach joysticks extend antenna and attach IPad.

2) Pre-Flight inspection – (**RPIC responsible to insure prior to EVERY flight**)

    a. Inspect battery – check that the battery is charged, for cracks in the housing and that the battery is not bulging – if ok insert battery into Mavic ED
    b. Inspect props for nicks or damage and check if – replace if damaged
    c. Inspect top of body casing for cracks or warping of the arms, that the sensor is clear and that registration number is clearly marked
    d. Inspect the left side – check that the SD card is inserted, that the sensor is clear, check for cracks and warpage in the body and arms.
    e. Inspect the back side – check that the sensor is clear and check for cracks and warpage in the body and arms
    f. Inspect the right side – check that the IR sensors are clear, check for cracks and warpage in the body and arms.
    g. Inspect the front – check that the sensors are clear, check for cracks and warpage in the body and arms
    h. Inspect the gimble to ensure it is free to move in all directions
    i. Inspect the cameras to ensure that the lens is clean.
    j. Inspect the underside – check for cracks and warpage of the arms, and that the vision and pressure sensors are clear

    If the inspection reveals anything that may compromise the flight do not fly until the issues have been corrected.

3) Post flight

    a. Inspect, remove and stow props
    b. Inspect motors for damage
    c. Replace gimble guard, fold up the arms (back arms down and forward, front arms back) stow P4P in case.
    d. Remove IPad and cable from remote controller, check cable and remote controller for damage, remove joysticks and stow controller in case
    e. **Any issues with the equipment should be included in the MOST review under Maintenance and addressed before the next flight.**

Appendix C

Weather

Beaufort Wind Scale

One of the first scales to estimate wind speeds and the effects was created by Britain's Admiral Sir Francis Beaufort (1774-1857). He developed the scale in 1805 to help sailors estimate the winds via visual observations. The scale starts with 0 and goes to a force of 12. The Beaufort scale is still used today to estimate wind strengths.

Force	Speed (mph)	Speed (knots)	Description	Specifications for use at sea Specifications for use on land
0	0-1	0-1	Calm	Sea like a mirror. Calm; smoke rises vertically.
1	1-3	1-3	Light Air	Ripples with the appearance of scales are formed, but without foam crests. Direction of wind shown by smoke drift, but not by wind vanes.
2	4-7	4-6	Light Breeze	Small wavelets, still short, but more pronounced. Crests have a glassy appearance and do not break. Wind felt on face; leaves rustle; ordinary vanes moved by wind.
3	8-12	7-10	Gentle Breeze	Large wavelets. Crests begin to break. Foam of glassy appearance. Perhaps scattered white horses. Leaves and small twigs in constant motion; wind extends light flag.
4	13-18	11-16	Moderate Breeze	Small waves, becoming larger; fairly frequent white horses. Raises dust and loose paper; small branches are moved.
5	19-24	17-21	Fresh Breeze	Moderate waves, taking a more pronounced long form; many white horses are formed. Small trees in leaf begin to sway; crested wavelets form on inland waters.
6	25-31	22-27	Strong Breeze	Large waves begin to form; the white foam crests are more extensive everywhere. Large branches in motion; whistling heard in telegraph wires; umbrellas used with difficulty.
7	32-38	28-33	Near Gale	Sea heaps up and white foam from breaking waves begins to be blown in streaks along the direction of the wind. Whole trees in motion; inconvenience felt when walking against the wind.
8	39-46	34-40	Gale	Moderately high waves of greater length; edges of crests begin to break into spindrift. The foam is blown in well-marked streaks along the direction of the wind. Breaks twigs off trees; generally impedes progress.
9	47-54	41-47	Severe Gale	High waves. Dense streaks of foam along the direction of the wind. Crests of waves begin to topple, tumble and roll over. Spray may affect visibility Slight structural damage occurs (chimney-pots and slates removed)
10	55-63	48-55	Storm	Very high waves with long overhanging crests. The resulting foam, in great patches, is blown in dense white streaks along the direction of the wind. On the whole the surface of the sea takes on a white appearance. The tumbling of the sea becomes heavy and shock-like. Visibility affected. Seldom experienced inland; trees uprooted; considerable structural damage occurs.
11	64-72	56-63	Violent Storm	Exceptionally high waves (small and medium-size ships might be for a time lost to view behind the waves). The sea is completely covered with long white patches of foam lying along the direction of the wind. Everywhere the edges of the wave crests are blown into froth. Visibility affected. Very rarely experienced; accompanied by wide-spread damage.
12	72-83	64-71	Hurricane	The air is filled with foam and spray. Sea completely white with driving spray; visibility very seriously affected. see Saffir-Simpson Hurricane Scale

Beaufort Scale (wind)	Average Miles per Hour	Knots	Wave heights Average to Maximum	Conditions at Sea	Conditions on Land
0 calm	0 - 1	0 - 1	0	Water has mirrior-like surface	Calm, smoke rises vertically
1 light air	1.2 - 3.0	1 - 3	0.1 (.25 ft)	Ripples with apperance of scales	Smoe drift indicates wind direction, flag and vanes do not move
2 light breeze	3.7 - 7.5	4 - 6	.2-.3 m (.5- 1 ft)	Small wavelets, crests of glassy apperance, not breaking	Wind felt on face, leaves rustle; vanes and flags begin to move
3 gentle breeze	8.0 - 12.5	7 - 10	0.6-1m (2-3 ft)	Large wavelets, crests begin to break, scattered white caps	Leaves and small twigs in constant motion, light flags waving
4 moderate	13.0 - 18.6	11 - 16	1-1.5 m (3.5-5 ft)	Small waves becoming longer, numerous whitecaps	Dust, leaves, loose paper raised up, small branches move, flags extended
5 fresh breeze	19.3 -25.0	17 - 21	2-2..5m,)6-8 ft)	Moderate waes, taking longer form, many whitecaps, some spray	Small trees begin to sway, light materials blowing about
6 strong breeze	25.5 - 31.0	22 - 27	3-4 m (9.5-13 ft)	Larger waves forming, whitecaps everywhere, more spray	Large branches on trees in motion, whistling heard in wires
7 moderate gale	32 -38	28 - 33	4-5.5 m (13-19 ft)	Sea heaps up, white foam from breaking waves begins to be blown in streaks in wind direction	Whole trees in motions, resistance felt in wind.
8 fresh gale	39 - 46	34 - 40	5.5-7.5 m (19-25 ft)	Moderately high waves of greater lengths, edges of crest break into sindrift, foam streas well defined	Tigs and small branches broken off of trees
9 strong gale	47 - 55	34 - 47	7-10 m (23-32ft)	High waves, sea begins to role, dense foam streaks, spray may reduce visibility	Slight structural damage, large branches broken, shingles lost from roofs
10 whole gale	56 - 64	48-55	9-12.5 m (29-41 ft)	Very hig waves with overhanging crests, sea white from foam streaks, intense rolling, reduced visibility	Widespread damage, trees uprooted, rarely experienced on land
11 storm	65 - 74	56 - 63	11.5- 6 m (37-53 ft)	Exceptionally high waves, sea covered with whte foam patches, heavy spray, very poor visibility	Violent and widespread destruction in many forms, building destroyed
12 hurricane	75+	64+	12-30m (40-100 ft)	Maximum size wind waves, sea covered with foam patches, heavy spray, visibility near gone	Catastrophic destruction, massive damage to nearly all structures

VFR Weather Minimums

Altitude	Type of Airspace	Flight Visibility	Cloud Clearance
10,000 MSL	E	5 statute miles	111 ✈1,000 below, ✈1,000 above, ✈1 sm horizontal
Below 10,000 MSL	C	3 statute miles	152 ✈ 500 below ✈1,000 above ✈2,000 horizontal
	D		
	E		
	B	3 statute miles	Clear of clouds
1,200 AGL or higher	G (night)	3 statute miles	152 ✈ 500 below ✈1,000 above ✈2,000 horizontal
	G (day)	1 statute mile	152 ✈ 500 below ✈1,000 above ✈2,000 horizontal
Below 1,200 AGL	G (night)	3 statute miles	152 ✈ 500 below ✈1,000 above ✈2,000 horizontal
	G (day)	1 statute mile	Clear of clouds

The basic VFR weather minimums (14 CFR 91.155) are specific to types of airspace and altitudes. Understanding the rationale behind the different requirements might help you remember them more easily.

VFR flight is based on the principle of "see and avoid." The presumption made in establishing the basic VFR weather minimums is that aircraft flying at lower altitudes (i.e., below 10,000 MSL) and/or in airspace with radar approach control and/or an operating control tower (i.e., Class B, C, and D airspace) will be moving more slowly, or that they will be under positive control. Consequently, these aircraft do not need as much flight visibility or as much distance from clouds to see and avoid other traffic.

Aircraft operating at higher altitudes (i.e., Class E airspace above 10,000 MSL) are likely to be not only faster, but also operating on instrument flight plans. The rationale for greater visibility and more distance from clouds when flying above 10,000 MSL is to give VFR pilots more time to see and avoid faster aircraft that are popping in and out of clouds.