SECTION 20
Small Unmanned Aircraft Systems

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SECTION 20
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PERFORMANCE OBJECTIVES:

- This section is intended for use by qualified staff who are planning, conducting or supporting operations of small Unmanned Aircraft Systems (sUAS)
- This section describes preparation for and conduct of sUAS operations.
- This section of the manual is maintained by the UAV Workgroup.

20.1 Scope and Applicability

This SOP applies to operations using small unmanned aircraft systems (sUAS) for documentation or support of DHEC Environmental Affairs activity. Operations may be conducted to observe and document conditions on permitted facilities or at other locations, collect data for mapping, observe areas where physical access or safety of personnel is a concern or support response to emergencies.

All sUAS operations in support of DHEC Environmental Affairs activities shall be conducted in accordance with federal regulations promulgated by the Federal Aviation Administration (FAA), Federal Communications Commission (FCC), applicable federal, state and local law, and this Standard Operating Procedure. Some deviation from this Standard Operating Procedure may be necessary during an emergency or in other extraordinary circumstances. Deviations must be documented in the flight records.

Flight operations conducted by non-DHEC personnel or contractors using non-DHEC sUAS equipment should be performed consistent with this Standard Operating Procedure as applicable and applicable federal, state, and local law.

20.2 Definitions

20.2.1 Acronyms

A. **ACC** – DHEC Agency Coordination Center

B. **ATC** – Air Traffic Control

C. **DCC/DCT** – [Env. Affairs] Disaster Coordination Center/Disaster Coordination Team

D. **DJI** – Dà-Jiāng Innovations – UAS manufacturer

E. **DMS** – Degrees, Minutes, Seconds

F. **COA** – Certificate of Authorization

G. **FSDO** – (FAA) Flight Standards District Office

H. **FPV**.– First Person View

I. **GIS D2M** – Geographic Information System Drone2Map

J. **LAANC** – Low Altitude Authorization and Notification Capability

K. **NOTAM** – Notice to Airmen

L. **P4** – DJI Phantom 4 UAV

M. SEOC – State Emergency Operations Center (Air Operations is sUAV contact)

N. SC EMD – SC Emergency Management Division

O. SOSC – FAA Systems Operation Support Center [(202) 267-8276]

P. TFR – Temporary Flight Restriction

20.2.2 **General**

A. **small Unmanned Aircraft System (sUAS)** - unmanned aircraft having a complete takeoff weight of less than 55 pounds and the associated remote control and communication components.

B. **Airspace Authorization** - ATC authorization to fly in controlled airspace (this is not the same as a waiver). Flights are typically conducted near airports and are at or below the ceiling heights published in the Facility Maps. Authorizations are obtained through the LAANC program or the Drone Zone Portal.

C. **Waiver** – FAA-issued certificate of waiver authorizing a deviation from specific elements of the regulations (see 14 CFR § 107.205)

D. **Project Manager**- contact and on scene program/project representative who has knowledge of the site and flight objective. The project manager will assist with preparation, execution and initial on-site review of collected information to ensure objectives have been met.

E. **Remote Pilot in Command (PIC)** - person holding a current remote pilot certificate with UAS rating, present and responsible for all aspects of field organization, preflight checks and operation of the sUAS. If not the immediate operator of the sUAS, the PIC must exercise direct supervision over the operator and have the ability to immediately take direct control of the sUAS.

F. **Operator** - person manipulating the flight controls of the aircraft. Must have a remote pilot certificate or be under the direct and immediate supervision of the PIC.

G. **Visual Observer** - personnel in effective communication with the PIC and operator who assists in maintaining visual awareness of aircraft position and attitude and the operation airspace.

H. **Camera Operator** - person tasked with operating the sUAS camera, freeing PIC and operator to focus on aircraft operation.

I. **Regulation(s)** - refers to FAA regulations found in 14 CFR Part 107 - SMALL UNMANNED AIRCRAFT SYSTEMS, applicable to the aircraft registration, airman certification, and operation of civil small unmanned aircraft systems.

20.3 Health and Safety

20.3.1 It is the PIC's responsibility to ensure the safety of all flight operations with respect to the National Air Space, project personnel and people in the area of the flight operations.

20.3.2 A signal from the transmitter should always be present when the drone is powered on. The transmitter should be powered on first and shut off last.

20.3.3 Personal Protective Equipment

A. Personnel working with or near an operating aircraft must wear eye protection.

B. If hand launch or retrieval of the aircraft is anticipated, personnel handling the operating aircraft must wear gloves substantial enough to prevent lacerations due to blade contact with powered rotors (heavy canvas, leather, or equivalent).

C. The PIC should evaluate the need for use of high visibility garments (safety vest, Class 2 minimum) based on site conditions (nearby heavy machinery, traffic, etc.) and time of year (e.g. hunting season).

20.3.4 The position of aircraft may shift significantly during takeoff. Avoid standing downwind of the takeoff area.

20.3.5 The sUAS must remain within unaided Visual Line of Site (VLOS) of (i) the PIC and operator, or (ii) the visual observer (if used) at all times to allow fulfillment of the "see and avoid" requirement.

20.3.6 Unless a waiver has been obtained, only daylight or civil twilight operations (30 minutes before official sunrise to 30 minutes after official sunset, local time with appropriate anti-collision lighting) are permitted.

20.3.7 In absence of an in-flight emergency, all requirements of the Regulation or certificate of waiver must be met.

20.3.8 The aircraft must be operated to avoid plumes or visible aerosols, in particular when supporting emergency response operations, both to maintain VLOS and minimize the potential for a need to decontaminate the unit. Current UAVs are not rated intrinsically safe.

20.3.9 Battery type and management shall conform to recommendations of the aircraft manufacturer. Most unmanned aircraft batteries are based on Lithium Polymer (LiPo) chemistry. If misused or mismanaged, there is a fire safety risk associated with LiPo battery management. To minimize this risk, the procedures below must be followed if they are not inconsistent with battery manufacturer recommendations:

A. Remain in visual proximity of batteries when charging or discharging battery. No unattended/overnight charging.

B. Store batteries at voltage levels recommended by the manufacturer (50 % of full charge using 'Storage' setting on DJI charging hub.)

C. Whenever possible, batteries should be charged/discharged for use or storage in the charger's cell balance mode.

D. If battery pack swells or if the PIC or operator notices significant decreases in flight time or excessive battery pack temperatures after a flight, the battery should be replaced. The battery pack should be discharged completely in a controlled manner prior to recycling.

E. NEVER PUNCTURE SWOLLEN BATTERY PACKS!

20.4 Personnel Qualifications / Responsibilities

The PIC alone may serve as the operator if the project objectives can be safely met. Whenever possible, the PIC should be accompanied by the Project Manager. Additional personnel, such as a separate operator under the direct supervision of the PIC and/or a visual observer, or other support staff may be employed to improve safety, operational awareness and improve the potential to meet project objectives.

20.4.1 Remote pilot in command (PIC) - Must be designated before start of flight operations and remain present on site and responsible for all aspects of the flight operations. The PIC responsibility may be transferred to another certificate holder during operations, but the transfer of responsibility requires communication to, and confirmation of the transfer by all staff involved in the flight operations. The transfer of responsibility must be recorded in the flight documentation.

The PIC must:

A. Hold a current remote pilot airman certificate with a UAS rating.

B. Be able to immediately take direct control of the aircraft.

C. Ensure operational consistency with federal regulations, certificates of waiver, and this SOP.

D. Ensure adherence to flight related requirements and limitations related to the project objectives.

E. Coordinate, direct and ensure clear communication between all flight support personnel (PIC, operator, observers, camera operator) during flight operations.

F. Document project and flight and deliver raw images to project Manager

20.4.2 Operator - The Operator must comply with all applicable requirements of the Regulation. The Operator must:

A. Maintain effective communication with the visual observer (if used) and camera operator;

B. Maintain effective communication with the PIC (if someone other than the PIC is the operator); and

C. Have demonstrated capability to safely and effectively operate the aircraft.

20.4.3 Visual Observer - The visual observer, if used, must comply with all applicable requirements of the Regulation, including requirements to communicate and coordinate with the PIC and Operator to scan the airspace for potential collision hazards, maintain awareness of the aircraft position and attitude through direct visual observation as directed by the PIC, and engage non participating observers to allow undistracted operations.

20.5 Equipment and Supplies

20.5.1 Aircraft

All sUAVs owned by DHEC or operated in support of Agency projects will have a valid FAA registration, be properly marked with the registration number and be in condition for safe operation.

A. All aircraft must be individually registered by DHEC when received. Federal law requires that all aircraft (which includes sUAVs and radio/remote controlled aircraft) flown outdoors must be registered with the FAA and marked with a registration number.

B. Any person operating a DHEC sUAS must have the FAA registration certificate in his/her possession when operating the unmanned aircraft. The certificate can be maintained either on paper or electronically.

C. Federal law requires sUAS operators to show the certificate of registration to any federal, state, or local law enforcement officer if asked. You can show it electronically or show the printed certificate.

20.5.2 Communications

A. Clear and effective communications must be maintained between all flight support personnel during flight operations.

B. If radios are used for flight support communication, they must be demonstrated to have no interference with flight system control or data transfer.

20.5.3 Data Storage Media

Extra data storage media (micro SD card for P4) should be carried in case of loss, malfunction or need for extra storage capacity.

20.5.4 Laptop or viewing device

It is recommended that a method of reviewing captured video, photographs, or other data be available to support review of the information prior to leaving the site. The device should include all necessary cables and adaptors necessary to access the aircraft data storage media.

20.5.5 Handheld Anemometer - Optional for use in monitoring local wind conditions

20.6 General Procedures for sUAS Operations

20.6.1 Project Requests and Approvals

A. Projects/Investigations - Flight operations performed as part of any project that is outside a program's routine activity and flight operations performed as part of any compliance/enforcement-related investigation or inspection will be specifically approved by the Bureau Chief or his/her designee and conducted as described in this SOP.

(1) Projects can be requested through use of the UAS Request Form to describe objective, area, project contact and the sUAS support requested. The form is accessible on the Office of Environmental Affairs SharePoint site under Applied Science >Projects >Drones.

Flight Request Form

(2) Approval status will be indicated in the request list available to the PICs.

(3) A PIC may request additional clarification of the project scope, requirements and site access/permissions from the Project Manager prior to management approval and scheduling.

B. Emergency Operations – Flight operations conducted in support of response or recovery will be at the request, and with the approval, of the On-Scene Coordinator (OSC). The PIC is responsible for safe and appropriate operation of the aircraft and communication with the OSC or designee.

C. Program Routine operations – If a program area implements routine flight operations to support program activity, flights will be requested and approved as described in the activity Standard Operating Procedures. If no separate Standard Operating Procedures have been adopted for routine sUAS operation, requests for approval shall be submitted as provided in Paragraph A.

20.6.2 Accidents

A. First, seek medical care if the situation warrants it (call 911 if needed); but all accidents, or near misses must be reported as soon as it is possible and ALWAYS within 24 hours to the supervisor of the employee involved and the program Assistant Bureau Chief. Events should be reported for both employees (Form 3419) and non-employees (Form 0140); host employees should initiate the report if non-employees are involved. Accidents or near misses, will be reviewed by the safety coordinator (Agency HR) and any lessons learned and/or corrective actions identified will be implemented.

B. The PIC is required to report an accident to the FAA within 10 days if it:

(1) results in a serious[1] injury to any person or any loss of consciousness, or

(2) if the accident causes damage to any property (other than the sUAS) in excess of $500 to repair or replace the property (whichever is lower).

C. An online portal is available through www.faa.gov/uas for the remote pilot to report accidents in accordance with reporting requirements in the Part 107 Regulations. Accident reports may also be made by contacting your nearest FAA Flight Standards District Office (FSDO).

D. Any FAA-reportable damage or significant damage to a sUAS component must be documented at the time of occurrence. If FAA reportable, the occurrence must be documented with the DHEC Office of General Counsel (OGC) and Agency/program safety officer within 24 hours.

20.6.3 Operational Area

A. Planning

Prior to flight operations, the expected airspace and potential airspace restrictions must be identified. Planning may include use of:

(1) Current Aeronautical Charts

Current SC Aeronautical Charts for the Atlanta and Charlotte sections will typically also be available on the UAV Workgroup SharePoint site and are posted at: https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/

(2) Review of applicable Notice to Airmen (NOTAM) available at:

https://pilotweb.nas.faa.gov/PilotWeb/

(3) Property ownership records

(4) Mobile device applications

FAA's B4UFLY application or an equivalent (ex. DJI Fly-Safe), may be used to determine if operations are planned in or near controlled (Class B, C, D, or E) or special use airspace. If the B4UFLY app's status indicator is yellow ("Use Caution – Check Restrictions"), a user is in uncontrolled (Class G) airspace. Airspace indications provided by mobile applications should be confirmed against the most current aeronautical chart and NOTAMs.

[1] Level 3 or higher on the Abbreviated Injury Scale (AIS) of the Association for the Advancement of Automotive Medicine - reversible but usually involves overnight hospitalization

(5) Weather forecast: Hourly weather forecasts are available from NOAA for up to 6 days at: http://forecast.weather.gov

B. Regulated Airspace

This section addresses necessary permissions from the FAA before conducting an sUAS flight in regulated airspace. Questions regarding site access/permissions from underlying property owners/representatives are addressed in Section 20.6.3(D).

(1) Uncontrolled Airspace (*i.e.*, airspace federally designated as Class G airspace)

No specific FAA authorization is needed to conduct sUAS flights in uncontrolled airspace in compliance with the Regulation.

(2) Controlled Airspace (*i.e.*, airspace federally designated as Class A, B, C, D, or E)

(a) The PIC can request authorization to operate in controlled airspace through an online web portal available at www.faa.gov/uas/request_waiver [14 CFR § 107.41]

(b) Information you will need includes:

1) Responsible party and contact information

2) Remote pilot Name, Address, Phone certificate information

3) sUAS description and Registration number

4) Flight plan (Date, time, location (DMS), altitude, nearest airport)

(c) All airspace permission requests must be made through the FAA online portal.

(d) Restrictions imposed by the sUAS [ex. DJI Fly-Safe] may require the sUAS controller to have internet access to allow operations close to controlled airspace.

(3) DJI Geo System Unlock (DJI 4): If the DJI Geo System or similar geofencing application restricts or will potentially impact operations in an area for which approval has been secured, cellular access through the controller may be required to unlock the area following the process described in 20.6.3(B)(3)(a) through (c):

NOTE: Following process is for the DJI Go4 application

(a) Locked area indication:

1) Power on controller, then aircraft. A signal from the transmitter should always be present when the drone is powered on

2) Open the DJI Go App on the tablet/smart device. If in a locked area, the main flight screen on tablet/smart device will have a message in upper right corner outlined in red that states "**Cannot take off.**"

3) When the controller sticks are moved to the bottom inside corners (as to start motors), a message will display on the screen that states "**Note. (1) authorized area detected in GEO System. Flight in these areas is restricted. When approaching a No-fly Zone during your flight under Smart RTH or an Intelligent Flight Mode, your flight will be restricted. Unlock this area?**" Choose "Yes" from the bottom left side of the message box.

4) Depending on the DJI classification of the area within which you are attempting to fly (zones are indicated by color coding: red- Restricted Zone, yellow- Authorization Zone, green- Warning Zone), you may have

to obtain a code from DJI to unlock the GEO System. A verified account and having to unlock a zone is required only when attempting to fly in an Authorization Zone (yellow).

(b) Unlock Authorization Zone in the field

The field unlock procedure may differ from the steps listed below. Follow the on-screen prompts.

1) The input box on tablet/smart controller device will display "**Requesting DJI account user ID and password."** Type these aircraft specific items into the blanks displayed (maintained in EAPilots spreadsheet).

2) The input box on tablet/smart controller device will display **"Requesting a phone number."** This phone number must be for an accessible device that is capable of receiving/displaying a text message [NOT iPad mini]. Enter the ten-digit phone number of your text receivable device without dashes, spaces, etc.

3) A text message from DJI will state "**Verification Token: xxxxxx**" (number of digits may vary).

4) Within five minutes you must enter the code in the box displayed on the tablet/smart controller device and connect to the aircraft.

5) A box will display that states "**Please confirm: I have the authorization (if required) to fly in this location. I bear full responsibility for my flight here.**" Check both boxes and click on "**Confirm.**"

6) A box will display that states "**Unlock Success**". Click on "**OK**".

7) Once a zone is unlocked, it will remain unlocked for three days.

(c) Unlock Authorization Zones in areas without an Internet connection

A flight area may be unlocked in advance during final preparation and planning using the Flight Planner.

By unlocking prior to a flight, you acknowledge you are choosing not to receive updated information from GEO and may miss relevant information about your intended flight area. Each PIC is responsible for checking official sources and determining what flight restrictions might apply to the flight area at the time of flight.

For more information and advance unlocking procedures go to: www.dji.com/flysafe/custom-unlock

C. Waivers

Waivers of specific requirements of the Part 107 FAA Regulation may be requested from the FAA and may be approved if performance-based standards can be met and operations can be conducted safely. The FAA encourages applicants to submit waiver requests well in advance of when they need a waiver – 90 days is strongly encouraged. Applicants will be notified via email about the response to their waiver request. Waivers will be considered for:

(1) Moving aircraft or vehicle in populated areas [14 CFR § 107.25]

(2) Daylight operation [14 CFR § 107.29]

(3) Visual Line Of Sight (VLOS) [14 CFR § 107.31]

(4) Visual Observer without all VO Requirements [14 CFR § 107.33]

(5) Fly multiple UAS with only one remote pilot [14 CFR § 107.35]

(6) Operation over people [14 CFR § 107.39]

(7) Altitude [14 CFR § 107.51(b)]

(8) Minimum visibility [14 CFR § 107.51(c)]

D. Access

Except as otherwise authorized by your Bureau Chief or his/her designee, permission will be requested and obtained for flights over, or entry onto, private property or private facilities for purposes of sUAS operations. Grant or denial of permission must be documented by the Project Manager and confirmed by the PIC prior to operations. When consent is not granted, the Project Manager must contact his supervisor, who will consult with Bureau management and the Office of General Counsel as needed for further guidance.

To the extent the Department intends to capture photographic, video, or other recordings through a sUAS aircraft, Department staff should ensure compliance with applicable procedures governing collection of such information contained in Section 1.2.4 of the EA Standard Operating Procedures (EA SOP) or any other more specific Bureau guidance. For specific guidance on entry by Department staff onto private property or facilities (as opposed to sUAS overflight), see:

(1) Section 1.2 of the EA SOP (Civil Enforcement Investigations and Studies);

(2) the Department guidance document entitled Securing Access to Private Property for Investigation or Inspection[DRAFT]; and

(3) Sections 2.2.3-4 of BEHSPROC-800[DRAFT]: Complaint Investigation Procedures

Staff should also ensure compliance with any other applicable Department policies and procedures, in addition to all applicable federal and state law.

20.6.4 Flight Preparations

A. Review of Project Scope and Mission

(1) The PIC must confer with the Project Manager to clarify the project scope and objectives, any special considerations, concerns, or site details of particular interest, and what, if any, previously captured images need to be repeated to document change at the site.

(2) The PIC should review any previous flight records for the site.

B. Environment

(1) Weather - The PIC is responsible for determining if weather conditions exceed the capability of the aircraft or adversely impact the ability to safely operate, observe or communicate during flight operations.

(2) Launch/Landing Area - The launch/landing area(s) should be level and clear of loose material to allow safe initiation of the aircraft sensors and minimize the potential for damage to the aircraft or personnel. Use of a portable surface may be appropriate.

(3) Obstructions- prior to operation, all flight support personnel must, to the extent possible, be aware of any visible or potential obstructions in or near the planned flight area.

(4) Project Staff – the PIC is responsible for ensuring all flight support personnel know their responsibilities.

C. Equipment

If possible, operational checks of equipment – including software and firmware updates -should be made prior to travel to the site. Equipment to be checked will include:

(1) Aircraft – Equipment operational checks and aircraft firmware updates

(2) Control units– Equipment operational checks and application updates

(3) Batteries

(4) Spare parts

(5) Geospatial Control Targets

(a) Visible targets may be identified, designated or placed to facilitate post processing of the images or provide known spatial reference.

1) Targets should be placed to clearly mark surveyed or accurately located points otherwise difficult or impossible to locate in images to aid processing and verification of images and products.

2) Targets should be placed in large areas that do not have identifiable features (fields, cleared sites, marshes, etc.) to facilitate merging and rectification of images during processing.

(b) Local USGS control points can be identified using the interactive map available at:

https://geodesy.noaa.gov/datasheets/

(6) Communications - Radio communications may be necessary to facilitate communications among flight support personnel and project personnel. Radio use must be in compliance with FCC rules and demonstrated to not cause interference with flight control or telemetry.

(a) Family Radio Service (FRS) - 462 MHz, no license, line of sight, 1/2 watt max ½ to1 mile range

(b) General Mobile Radio Services - (GMRS) 462 and 467 MHz, license required, line of sight, 5 watt max, 5 mile range

(c) Multi Use Radio Service (MURS) - 151 and 154 MHz, no license, line of sight, 2 watt max, 10 mile range

(d) Public Safety (Palmetto 800) - 800 MHz, statewide coverage

(e) Air Traffic Control (ATC) - If in or near controlled airspace, the PIC may need to monitor or communicate with ATC or make advisory calls on a Common Traffic Advisory Frequency (CTAF). Follow this procedure:

1) Select the correct frequency.

2) Ensure no one else is talking.

3) Formulate your message prior to pressing the push to talk button.

4) Speak slowly and distinctly.

5) Utilize the following message format:

a) State the identification of the station or aircraft you are calling.
b) Identify yourself.

c) Report your location relative to the airport, altitude, and state your aircraft type. Also state your intentions (entering the airspace or traffic pattern or staying clear).
d) State your request or transmit your information.
e) Repeat the station identification (not used when speaking to another aircraft).

Example Phraseology – GREENWOOD UNICOM, UAS 5 MILES SOUTHEAST OF THE FIELD COMMENCING FLIGHT ACTIVITIES AT 400 FEET GREENWOOD.

20.7 Operations during Declared Emergency

Operations conducted during declared emergencies must be coordinated with the local incident command. Operations must not interfere with lifesaving and critical emergency response operations. sUAVs MUST yield airspace to all other aircraft

20.7.1 Preparations

A. Refresh list of available PICs, operators and support available (no assigned responsibilities or commitments) and contact information.

B. Confirm available equipment operational status and location.

C. Refresh information available on internet independent device

(1) Charts (ATL and CLT)

(2) EA Pilots (with current pilot cert number)

(3) Certification / qualification documentation for any contract PICs

(4) pdfs of current UAV certifications

(5) Contact information (Flight, DHEC teams, FAA, EOC Air Ops

(6) SOP(s)

(7) Active or archived map access (Google, Bing, or equivalent)

D. Check existing NOTAM/TFRs

20.7.2 Coordination

A. Flight requests through:

(1) DCT

(2) Program (Dams, solid waste, etc.)

(3) Routine request process

B. Confirm information

(1) Sufficient to identify location, objective, contact/program support

(2) Check Airspace

(3) Accessibility

(4) Overflight permissions

(5) TFR area(s)

C. Start FAA Emergency Operations Request Form

If UAS operators need to fly in controlled airspace or an area with a disaster TFR to support the response and recovery, operators **must** use the Emergency Operations Request Form available on the FAA Waivers and Authorizations Supporting Emergency UAS Operations (Special Governmental Interest) web page https://www.faa.gov/uas/advanced_operations/emergency_situations/]
In preparation, fill out organizational and event information that will be common to all event requests and save a draft request form.

D. Identify and contact PIC and support

E. Initiate FAA request

Complete Emergency Operations Request form for the mission and email the completed form to the FAA System Operations Support Center (SOSC) at 9-ATOR-HQ-SOSC@faa.gov to secure authorization to access the airspace. Coordination with the SOSC may include a requirement that the UAS operator obtain support from the appropriate incident commander. Be prepared to provide:

(1) Contact information for requestor

(2) Contact and information about the pilot, operator, and observer(s)

(3) UAS type,

(4) the pilot's Part 107 certificate number,

(5) nature of the event (fire, law enforcement, local/national disaster, missing person),

(6) details about the proposed flight (date, time, location, altitude, direction and distance to the nearest airport, and latitude/longitude),

(7) GIS details for area of operation

(a) Generally circular (DMS point and radius),

(b) Polygon (DMS of most northerly point and proceeding clockwise) or

(c) DMS of waypoints and width for a path.

20.8 Data and Records Management

20.8.1 sUAS Log

Each sUAS will have a log (bound book or secure electronic) where all use, maintenance and repair will be documented. The log will include, at a minimum:

A. Date and Time of the sUAS operation

B. Operator and Pilot in Command

C. Flight time

D. Parts replaced or repaired or maintenance performed

E. Software updates to aircraft, controller or applications supporting flight operations.

F. If operations deviate from Regulations, applicable waiver, or SOP due to an emergency, the PIC must document the event in the flight records.

20.8.2 Project documents

A. Plans - If sUAS flight is a component of an approved project Quality Assurance Project Plan, the flight personnel must be familiar with the objective, limitations and requirements associated with the QAPP.

B. Access - project manager must confirm necessary permissions have been obtained prior to overflight.

C. Flight documents - paper or electronic copies must be available on request

(1) Remote pilot airman certificate with a UAS rating

(2) Aircraft registration

(3) Waivers

D. Preflight Inspection Checklist (see Table 1). A "printer friendly" version of the checklist is maintained on the UAV Share Point site under Documents > UAV SOPs

1) A preflight visual/functional inspection of the sUAS and assessment of the operating environment must be conducted. The form found in Table 1 below shall be used to document this inspection.

2) All cells in the second column of the form must be filled in utilizing either a "S" (satisfactory), "U" (unsatisfactory), or "N/A" (not applicable).

3) The third column of the form (labeled "Comments") should be used to provide detailed information, or to clarify a site specific condition or concern, of the line item in question (examples of entries include recording airspace classification, weather condition specifics, specific risks/hazards encountered, specific risk mitigation steps, etc.).

4) The completed Preflight Checklist document, along with a copy of the section of the aeronautical chart in which the mission is being flown, shall be scanned and saved on the drone image server in the mission project file along with the photos and/or videos created during the flight. The documentation is to remain with the photo/video files when transferred to the site project manager. It is then the project manager's responsibility to manage the files in accordance with their program's file retention policies. Once the documentation is provided to the project manager, the pilot may shred/recycle the Preflight Checklist.

5) If multiple flights are conducted back to back at one site on one day, only one preflight checklist needs to be completed. However, the UAV should receive a visual inspection before each flight; these inspections can be noted in the 'Comments' column of the form.

E. Image digital files

Collected data will be provided to the program or project manager requesting the flight to be maintained consistent with the applicable record retention policy.

(1) All images/video files collected must be retained as part of the project record regardless of the quality, redundancy or applicability of the content.

(2) The properties (metadata) embedded in the file (including camera, image GPS and file metadata) must not be compromised. ANY necessary image processing must only be performed on copies, not the original file(s).

(3) All imagery files must be placed in a project specific directory on the Drone Imagery server [\\DHCUAVVPF01\Drone_Imagery] until transferred to the program

or project manager. After files are transferred, they will be removed from the Drone Imagery Server.

(4) GIS processing must be requested through submission of a Footprints ticket [Subject: GIS-D2M processing].

F. Digital flight logs - Logs collected by the DJIGo apps (on controller tablet – accessible through iTunes) or equivalent should be preserved along with raw image files.

(1) Flight Record - .txt files that contain detailed equipment telemetry collected during flights. Files require conversion to .csv by an online or standalone converter to be useful.

(2) videoCache – lower resolution[720p] video feed to controller tablet can provide a backup video record. Lower resolution still images may be available on the controller tablet and can provide a backup record.

(3) PICs may download lower resolution iPad images to the UAV SharePoint or location specified by project manager

(a) Create identifiable directory in Documents>Flights (typically, Sitenamemmddyy)

(b) connect iPad

(c) on PC, open device to view files

(d) navigate to Apple iPad/Internal Storage /DICM

(e) Select and drop image and video files into Flight sub directory created in (a)

G. Pilot logs

[Under development]

Table 1

PREFLIGHT INSPECTION CHECKLIST

Project/Site Name		**Site Address (physical)**
Site Coordinates (deg, min, sec and decimal degrees)		
PIC Name (print)		**UA #**
PIC Signature		**PIC Cert. #**
Date of Operation	**Site Arrival Time**	**Site Departure Time**
Operator		
On Site Project Manager		
Additional Crew Members		

Relevant FAA requirements: FAA Advisory Circular No. 107-2,Chapter 5.9,states that the FAA's Part 107 regulations require the remote PIC to "complete a preflight familiarization, inspection, and other actions, such as crewmember briefings, prior to beginning flight operations." Also, "Section 107.15 [of the FAA regulations] requires the remote PIC to perform checks of the UA prior to each flight to determine if the sUAS is in a condition for safe operation."

Based on FAA's Part 107 regulations and the Department's SOP, a preflight visual/functional inspection of the sUAS and assessment of the operating environment must be conducted that includes (but is not limited to) the following items:

	ITEM	**S**at. **U**nsat. **N/A**	COMMENTS
1	**Assessment of the operating environment**		
1a	Local weather conditions (cloud cover, winds, etc.) Weather info.: www.1800wxbrief.com , www.aviationweather.gov		
1b	Local airspace and any flight restrictions Flight restrictions: http://tfr.faa.gov		
1c	Property owner permission		
1d	The location of persons and property on the surface		
1e	Other ground hazards (may require flight path walk through, to note obstructions that may interfere with the UAS)		
2	**Persons directly participating in UA operation informed of:**		
2a	Operating conditions		
2b	Emergency procedures		
2c	Contingency procedures		
2d	Roles and responsibilities of each person		
2e	Potential hazards		
3	**Documentation available for inspection (incl. remote pilot certificate, aircraft registration, Certificate of Waiver, etc.)**		
4	**Registration markings, properly displayed and legible**		

ITEM		**S**at. **U**nsat. **N/A**	COMMENTS
5	**Visual condition inspection of the UAS components**		
5a	Airframe structure (including undercarriage), all flight control surfaces, and linkages		
5b	Propulsion system, including powerplant(s), propeller(s), rotor(s), ducted fan(s), etc.		
5c	Check that any equipment, including camera, is securely attached		
6	**UAS Communications and Electrical**		
6a	Check system navigation and communication data links, UAS has acquired GPS location from at least four satellites		
6b	Control station functioning properly, antennas in good condition, iPad mini connected and app working, camera micro SD card installed		
6c	Check flight termination system (Return to Home settings appropriate for operational area)		
6d	Calibrate UAS compass prior to any flight		
6e	Check battery levels for the aircraft and CS		
7	**Check ground support equipment (communication radios, binoculars, etc.)**		
8	**Start the UAS propellers to inspect for any imbalance or irregular operation**		
9	**At a controlled low altitude, fly within range of any interference and recheck all controls and stability**		

20.9 References

	Airport	Facility Map?	LAANC TCC
AND	Anderson	Y	ZTL
AGS	Augusta	Y	ZTL
FLO	Florence	Y	XJX
	Donaldson Center	Y	
GSP	Greenville-Spartanburg	Y	ZTL
	Greenville Downtown	Y	
	Joint Base McEntire	Y	
CAE	Columbia	Y	XJX
CHA	Charleston	Y	XJX
CLT	Charlotte	Y	ZTL
	Hilton Head Airport	Y	
MYR	Myrtle Beach	Y	XJX
	MCAS Beaufort	Y	
	Grand Strand	Y	
SPA	Spartanburg Downtown Memorial	Y	ZTL

20.10 Revision History

DATE	CHANGE	SECTION
4/4/2017	Submitted for internal review	All
9/12/17	Added Emergency Operations	20.7
9/12/17	Added Acronyms	20.2.2
9/12/17	Added Airport Reference Table	20.9
10/6/2017	Multiple formatting corrections	
10/6/2017	Incorporation of OGC comments	Multiple
10/6/2017	Added iPad image download	20.8.2
3/6/2018	Added Drone imagery server	20.8.2 E(3)
5/14/2018	Added safety vest evaluation.	20.3.3
	Revision 1.1	
8/27/18	Added Checklist Instructions	20.8.2
8/27/18	Updated Checklist	Table 1
10/21/19	Added and reordered elements	20.2.1, 20.2.2
10/21/19	Updated links	20.6.1, 20.7.2
10/23/19	Minor edits for clarity	Throughout
10/28/19	Expanded and reordered list of potential waivers	20.6.3(C)
10/28/19	Added statement on applicable records retention	20.8.2(E)
10/3019	Added space for chapter approval signatures	Table of Contents