Maintenance Program

for

Small Unmanned Aircraft System

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Version: 1.0

Introduction

This manual provides guidance for the conduct for the small unmanned aircraft system (sUAS or drone) flight operations.

The City of Gaithersburg, Maryland is dedicated to highly professional flight operations. Safety is always the first priority, and the sUAS team will be persistent in continuously demonstrating an effective program.

The sUAS program builds upon federal regulations, providing more detail and guidance when necessary to ensure the highest levels of safety. Gaithersburg recognizes compliant sUAS operations includes obeying all local, state and federal laws and regulations.

All sUAS personnel are to be familiar with this manual and are to comply with its provisions. Changes to this manual will be promptly disseminated to all sUAS personnel.

Shall vs. should vs. may vs. will — each of these implies specific requirements:

- Use of the word *shall* implies that a procedure or statement is mandatory and must be followed to comply with this standard. Since *shall* statements are requirements, they include sufficient detail needed to define compliance.
- *Should* implies recommended. *Should* statements are provided as guidance towards the overall goal of improving safety and could include only subjective statements.
- *May* implies optional at the discretion of the manufacturer, or operator. *May* statements are provided to clarify acceptability of a specific item or practice, and offer options for satisfying requirements.
- *Will* implies compliance with future, not yet realized activities or events.

Record of Manual Changes

Changes are promulgated as required by the sUAS Manager and are issued to each document holder.

Each amended page shall record the appropriate amendment number and date.

It is the responsibility of the document's holder to insert all amendments issued to him/her in a timely manner.

Record of Changes

Number	Date	Date Entered	Entered By
1.0	08/15/2018	Original Issue	Original Issue

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1. General Information

1.1 Purpose

This document applies to all sUAS flight operations conducted by the City of Gaithersburg, Maryland (hereafter known as the "City"), including designated locations in accordance with Federal Aviation Administration (FAA) requirements. This document describes the management of sUAS aircrew training. The policies and procedures in this document are issued by the authority of the City Manager (hereafter known as "Executive").

Unless otherwise stated, all sUAS operations described herein are based upon compliance with applicable FAA Regulations, at 14 CFR Part 107. Any new authorizations or waivers shall require an update to this document and training for affected personnel before conducting those operations.

1.2 Authority

The Executive retains ultimate authority for the conduct and operation of the sUAS program, receiving strategic guidance and fiscal support from the City. This document applies to all City personnel involved in the sUAS program and those who request their services. The Executive has delegated authority to the sUAS Manager (hereafter known as "Manager") for daily program management unless otherwise noted herein.

1.3 Administration

This manual addresses sUAS flight operations as the procedures existed when this document was drafted. Personnel, equipment, environment, and other factors change over time. A systematic approach to monitoring change is critical to ensuring this manual remains relevant. The entire document will be reviewed annually by the Manager to ensure it is current. Changes to this document must be approved by the Manager. The program is administered under these documents:

- sUAS Flight Operations Manual
- sUAS Aircrew Training Program
- sUAS Maintenance Program
- sUAS Field Guide

1.4 State and Local Laws

The City shall adhere to all applicable state and local laws and City policies pertaining to the use and operation of sUAS.

1.5 Regulatory Compliance

City personnel shall comply with Title 14 CFR Part 107, to include any special provision, exemptions, or authorizations that are issued to the City. FAA guidance in the form of Advisory Circulars, Orders, Notices, and Bulletins will be reviewed to assist the City in remaining compliant.

1.6 Distribution of Information

The City will disseminate operational information to aircrew personnel through the use of City communications, quarterly safety/staff meetings, and memoranda. This includes items such as FAA updates, safety concerns, equipment management, and information that benefits the team.

2. Maintenance

The airworthiness of sUAS must be assured and is dependent upon scheduled maintenance, thorough inspections and timely correction of discrepancies. Maintenance for sUAS includes scheduled and unscheduled overhaul, repair, inspection, modification, replacement, and system software upgrades of the sUAS and its components necessary for flight.

2.1 Preflight

During preflight inspection, the remote-pilot-in-command (RPIC) may discover that a component is in need of servicing, repair, modification, overhaul, or replacement outside of the scheduled maintenance period as a result of normal flight operations or resulting from a mishap. In addition, the sUAS manufacturer or component manufacturer may require an unscheduled system software update. In the event such a condition is found, the RPIC should not conduct flight operations until the discrepancy is corrected.

2.2 Scheduled Maintenance

The sUAS manufacturer may provide documentation for scheduled maintenance of the entire sUAS and associated system equipment. There may be components of the sUAS that are identified by the manufacturer to undergo scheduled periodic maintenance or replacement based on time-in-service limits (such as flight hours, cycles, or calendar-days). All manufacturer-scheduled maintenance instructions shall be followed in the interest of achieving the longest and safest service life of the sUAS.

If there are no scheduled maintenance instructions provided by the sUAS manufacturer or component manufacturer, the Maintenance Supervisor (MS) should establish a scheduled maintenance protocol. This includes:

- Documenting any repair, modification, overhaul, or replacement of a system component resulting from normal flight operations
- Recording the time-in-service for that component at the time of the maintenance procedure

In the absence of a manufacturer provided schedule, Enclosure (1) provides recommended guidance.

2.3 Discrepancies

During preflight and postflight inspections, discrepancies are recorded in the sUAS Maintenance Record, see Enclosure (2). Prior to the next flight, the RPIC reviews the Maintenance Discrepancies for the current sUAS status.

3. Maintenance Administration

3.1 Policy

The following are the policies of the maintenance program:

- All inspections, replacements, repairs, overhauls, and alterations to the sUAS airframe, components, and systems must be made according to the standards set forth by the manufacturer's recommendations and/or pertinent regulations.
- All inspections and scheduled removal and overhaul or replacement of life-limited parts will be at intervals not exceeding those recommended by the manufacturer or approved by the FAA should guidance exist.
- The sUAS shall comply with all mandatory service bulletins or service bulletins attached to an Airworthiness Directive.
- No person shall perform any preventative maintenance or ground handling without first being trained and authorized in accordance with this manual. Preventative maintenance shall be performed in accordance with the methods and procedures recommended by the specific component manufacturer.
- Should a component, such as a propeller, require replacement, the RPIC, camera operator (CO), or visual observer (VO) may perform the replacement in the field. When there is any damage beyond the in-field repair capability, the sUAS is grounded until repairs are incorporated.

3.2 Maintenance Records

Maintenance records shall be kept of all maintenance activities performed on sUAS, to include the engines, propellers, components, software, and systems, in accordance with appropriate maintenance processes, policies, and procedures. Maintenance records shall be completed each time a sUAS airframe, engine, propeller, system, or component is repaired following a reported discrepancy. These records shall reflect the history and current disposition of such airframe, engine, propeller, system, and component

A permanent record is maintained for each sUAS until such time as that sUAS is transferred, sold, or retired from service. These records shall be preserved in aircraft logs and on back-up spreadsheets to provide the following data to the MS, so that aircraft and equipment performance reliability can be determined:

- Current aircraft status
- Maintenance history
- Aircraft and equipment performance reliability

Immediately upon finding a defect in a sUAS or upon completing any maintenance on a sUAS, the person discovering the defect or performing the maintenance shall enter all of the details of the event in the applicable technical records.

3.3 Technical Dispatch

Before each flight, the RPIC shall consult the Maintenance Records to determine airworthiness. The sUAS will only be flown when no discrepancies exist. The RPIC has full authority to determine whether the flight may or may not take place; these decisions are made at his or her sole discretion.

3.4 Conditional Inspections

Conduct an inspection for any of the following occurrences:

- Loss of control of the air vehicle
- Contact with any object while in flight
- Abnormally hard landing

4. Maintenance Training

The foundation for continued safe operations is maintaining a professional level of competency in all aspects relating to the safe operation of sUAS. The first step in maintaining that foundation is establishing the minimum qualifications to perform maintenance. The second step involves providing continuous training in policies, procedures, and methods for improving safety.

RPICs and crewmembers receive training on basic maintenance to include information on relevant sUAS components. Recurrent training may include the following topics:

- Salvage decisions, including assessment of damage and composite material compromise
- Ground controller management
- Theory and maintenance of electric motors
- Composite materials and repairs
- Software and electronics
- Radio transmission and theory of radio control
- Radio frequency interference and shielding
- Autopilot maintenance, including software uploads
- Navigation systems
- Electric battery operation and maintenance of batteries
- Radio Control (RC) systems operations
- Calibration procedures after assembly and interaction with autopilot software
- Data management and distribution

Enclousre 1 – Maintenance Schedule

sUAS Maintenance Schedule
Before and After every flight
Check condition of props
Check motor shafts have no free play
Check motors move freely when spun by hand
Check condition of battery, battery connectors and data pins
Check camera/payload mounts are secure
Check antennas are securely fastened
Confirm no unusual noise or vibration from running motors
Every 10 flights
Visual inspection of shell for cracking/damage
Check tightness of retaining screws
Check batteries health and life
Every 40 flights
Inspect interior of casing: wiring, plugs, and joints
Every 100 hours
Remove and replace camera rubber vibration mounts
Remove and replace motors
Remove and replace propellers

Enclosure 2 – Maintenance Record

sUAS Maintenance Record

FAA Registration Number	Item (e.g., prop, battery, firmware)	Time			Last Inspection Date	Inspected By
		Previous	New	Total	mm/dd/yyyy	Last Name

Maintenance Discrepancy	Description	Who	Date