



Designation: F2584 – 06

Standard Practice for Maintenance and Development of Maintenance Manuals for Light Unmanned Aircraft System (UAS)¹

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1. Scope

1.1 This practice provides guidelines for the qualifications to accomplish the various levels of maintenance on certificated light unmanned aircraft system (UAS). In addition, it provides the content and structure of maintenance manuals for aircraft, ground control station, and data links that are operated as a light unmanned aircraft system (UAS).

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

F2241 Specification for Continued Airworthiness System for Powered Parachute Aircraft

F2295 Practice for Continued Operational Safety Monitoring of a Light Sport Aircraft

F2395 Terminology for Unmanned Aircraft Systems

F2411 Specification for Design and Performance of an Airborne Sense-and-Avoid System

F2415 Practice for Continued Airworthiness System for Light Sport Gyroplane Aircraft

2.2 CFR Standards:³

14 CFR Part 21.190 Issue of a Special Airworthiness Certificate for a Light-Sport Category Aircraft

14 CFR Part 43 Maintenance, Preventive Maintenance, Rebuilding, and Alteration

14 CFR Part 65 Certification: Airmen Other Than Flight Crewmembers

3. Terminology

3.1 Definitions:

3.1.1 *A&P*—airframe and powerplant mechanic as defined by 14 CFR Part 65 in the U.S. or equivalent certification in other countries.

3.1.2 *annual condition inspection*—detailed inspection accomplished once a year on a light UAS in accordance with instructions provided in the manufacturer's maintenance manual supplied with the aircraft. The purpose of the inspection is to look for any wear, corrosion, or damage that would cause an aircraft to not be in a condition for safe operation.

3.1.3 *heavy maintenance*—any maintenance, inspection, repair, or alteration a manufacturer has designated that requires specialized training, equipment, or facilities.

3.1.4 *light UAS repairman inspection*—U.S. FAA certificated repairman (light UAS), with an inspection rating as defined by 14 CFR Part 65, authorized to perform the annual condition inspection on light UAS aircraft, ground station, and the ground data terminal, or an equivalent rating issued by other civil aviation authorities.

3.1.4.1 *Discussion*—Experimental light UAS do not require the individuals performing maintenance to hold any FAA airman certificate in the U.S.

3.1.5 *light UAS repairman maintenance*—U.S. FAA certificated repairman (light UAS), with a maintenance rating as defined by 14 CFR Part 65, authorized to perform line maintenance on aircraft, ground control station, and ground data terminal, certificated as light UAS. Authorized to perform the annual condition/100-h inspection on a light UAS aircraft, ground control station, and ground data terminal, or an equivalent rating issued by other civil aviation authorities.

3.1.6 *light unmanned aircraft system*—light unmanned aircraft system designed in accordance with ASTM standards under the jurisdiction of Committee F38. The UAS includes the aircraft, the ground control station, and the ground data terminal. Examples include Specification **F2411**, Terminology **F2395**, and 14 CFR: Code of Federal Regulations Title 14 Aeronautics and Space, also known as the "FARs" or Federal Aviation Regulations.

3.1.7 *line maintenance*—any repair, maintenance, scheduled checks, servicing, inspections, or alterations not considered

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² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401.

heavy maintenance that is approved by the manufacturer and is specified in the manufacturer's maintenance manual.

3.1.8 *major repair, alteration, or maintenance*—any repair, alteration, or maintenance for which instructions to complete the task are excluded from the manufacturer's maintenance manual(s) supplied to the consumer are considered major.

3.1.9 *manufacturer*—any entity engaged in the production of a light UAS or component used on a light UAS.

3.1.10 *manufacturer's maintenance manual(s)*—manual provided by a light UAS manufacturer or supplier that specifies all maintenance, repairs, and alterations authorized by the manufacturer.

3.1.11 *minor repair, alteration, or maintenance*—any repair, alteration, or maintenance for which instructions are provided for in the manufacturer's maintenance manual(s) supplied to the consumer of the product are considered minor.

3.1.12 *overhaul*—maintenance, inspection, repair, or alterations that are only to be accomplished by the original manufacturer or a facility approved by the original manufacturer of the product.

3.1.13 *overhaul facility*—facility specifically authorized by the aircraft or component manufacturer to overhaul the product originally produced by that manufacturer.

3.1.14 *100-h inspection*—same as an *annual condition inspection*, except the interval of inspection is 100 h of operation instead of twelve calendar months and there must be at least one 100-h inspection each year. This inspection is utilized at 100-h intervals of flight when the light UAS is being used for commercial operations.

3.1.15 *repair facility*—facility specifically authorized by the aircraft or component manufacturer to repair the product originally produced by that manufacturer.

4. Significance and Use

4.1 The purpose of this practice is to provide guidance to owners, mechanics, airports, regulatory officials, and aircraft and component manufacturers who may accomplish maintenance, repairs, and alterations on a light unmanned aircraft system (UAS). In addition, this practice covers the format and content of maintenance manuals and instructions for the maintenance, repair, and alteration of light UAS. The light UAS can be operated as a commercial aircraft or as a sport aircraft. This practice states the requirements for the maintenance of light commercial UAS. These same requirements may be used for the sport light UAS with the provisions shown. The maintenance requirements are divided between the aircraft and the ground equipment. The aircraft contains the air data terminal and the ground station controls the nearby ground data terminal. Therefore, the data link is not listed as a separate component, but has elements in the aircraft and near the ground station that is called the ground data terminal.

5. Manufacturer's Maintenance Manual

NOTE 1—This practice provides the information needed to comply with the requirement of what the maintenance manual will contain.

NOTE 2—Manufacturers of light UAS for sale in the U.S. are required to provide a maintenance manual for each aircraft in accordance with 14

CFR Part 21.190. These manuals do not require any type of approval from the FAA or other government entity; however, the regulations do require the manual to be developed in accordance with industry consensus standards.

5.1 Format:

5.1.1 *Aircraft*—The maintenance manual for the aircraft shall have the following sections:

5.1.1.1 *General*—Listings of general specifications, capacities, and instructions on ground handling, servicing, and lubrication, such as:

- (1) Equipment list,
- (2) Sources to purchase parts,
- (3) List of disposable replacement parts, for example, air filters, fuel filters, oil filters, and tires,
- (4) Engine specifications,
- (5) Weight and balance information,
- (6) Tire inflation pressures,
- (7) Approved fluids and capacities,
- (8) Recommended fastener torque values,
- (9) General safety information, and
- (10) Instructions for reporting possible safety of flight concerns found during inspection/maintenance.

5.1.1.2 *Inspections*—Instructions on and checklists for the completion of periodic and annual condition/100-h inspections as appropriate.

5.1.1.3 *Structures*—A description of and instructions for the maintenance, repair, and alteration of the aircraft primary structures such as:

- (1) Wing (fixed, rotary, or inflatable),
- (2) Empennage (tail section),
- (3) Landing gear, and
- (4) Structural control surfaces, for example, elevator (if applicable).

5.1.1.4 *Engine*—A description of and instruction for the maintenance, repair, and overhaul of the aircraft's engine, if the aircraft is powered.

NOTE 3—A light UAS manufacturer may defer to the engine manufacturer for the required maintenance, repair, and overhaul instructions.

5.1.1.5 *Fuel System*—A description of the system, schematic diagram, and instructions for the maintenance and repair of the aircraft fuel system, if a powered aircraft.

5.1.1.6 *Propeller*—A description of and instructions for the maintenance and repair of the propeller, if a powered aircraft.

NOTE 4—A light UAS manufacturer may defer to the propeller manufacturer for the required maintenance, repair, and overhaul instructions.

5.1.1.7 *Utility Systems*—A description of the systems and instructions for the maintenance and repair of utility systems such as heating, vent, and air-conditioning, if installed.

5.1.1.8 *Instruments and Avionics*—A description of and instructions for the maintenance, repair, replacement, and installation of existing and additional instruments and avionics, as applicable.

NOTE 5—A light UAS manufacturer may defer to the avionics/instrument manufacturer for the required maintenance, repair, and overhaul instructions.

5.1.1.9 *Electrical System*—A description of the system, schematic diagram, and instructions for the maintenance, repair, and alteration, as appropriate.

5.1.1.10 *Structural Repair*—A description of the structural repairs that are authorized without further consultation with the manufacturer.

5.1.1.11 *Painting and Coatings*—A description for the repair, replacement, or alteration, or a combination thereof, of paint or coatings used on the aircraft.

5.1.1.12 *Revisions*—A section, such as a change history table, for the listing of any revisions to the maintenance manual by the manufacturer.

5.1.1.13 *Feedback Form*—A form for the aircraft owner or maintainer to provide notification to the manufacturer about issues and anomalies identified during the operation or maintenance of the aircraft, or in the content of the manual.

5.1.2 *Ground Station*—The maintenance manual for the Ground Control Station shall have the following sections:

5.1.2.1 *General*—Listings of general specifications, capacities, and instructions for the Ground Station:

- (1) Equipment list,
- (2) Sources to purchase parts,
- (3) List of disposable replacement parts, for example, air filters, desiccant, and so forth,
- (4) List of non-disposable items, for example, data storage medium, and so forth,
- (5) Equipment specifications,
- (6) General safety information, and
- (7) Instructions for reporting possible items that affect safety of flight of the aircraft; concerns found during flight operations/inspection/maintenance.

5.1.2.2 *Inspections*—Instructions on and checklists for the completion of annual/periodic condition inspection, as appropriate for the Ground Control Station.

5.1.2.3 *Utility Systems*—A description of the systems and instructions for the maintenance and repair of utility systems such as heating, vent, and air-conditioning, if installed.

5.1.2.4 *Electrical and Computing System*—A description of the system, schematic diagram, and instructions for the maintenance, repair, and alteration, as appropriate. The use of “built-in-tests” will allow this system to be maintained only “on condition”.

5.1.2.5 *Painting and Coatings*—A description for the repair, replacement, or alteration, or a combination thereof, of paint or coatings used on the ground control station.

5.1.2.6 *Revisions*—A section, such as a change history table, for the listing of any revisions to the maintenance manual by the ground control station manufacturer.

5.1.2.7 *Feedback Form*—A form for the ground control station owner or maintainer to provide notification to the manufacturer about issues and anomalies identified during the operation or maintenance of the ground control station, or in the content of the manual.

5.1.3 *Ground Data Terminal*—The maintenance manual for the Ground Data Terminal shall have the following sections:

5.1.3.1 *General*—Listings of general specifications for the Data Link.

- (1) Equipment list,

- (2) Sources to purchase parts,

(3) List of disposable replacement parts, for example, air filters, desiccant, and so forth, if applicable,

- (4) Lubrication schedule, if applicable,

- (5) General safety information, and

(6) Instructions for reporting possible safety of flight concerns found during inspection/maintenance.

5.1.3.2 *Inspections*—Instructions on and checklists for the completion of annual/periodic condition inspections, as appropriate for the Ground Data Terminal.

5.1.3.3 *Utility Systems*—A description of the Ground Data Terminal systems and instructions for the maintenance and repair of utility systems such as heating, vent, and air-conditioning, if installed. If desiccant is required, the inspection and replacement schedule will be stated.

5.1.3.4 *Antenna Structural Repair*—A description of the Ground Data Terminal antenna structural repairs that are authorized without further consultation with the manufacturer.

5.1.3.5 *Electrical and Computing System*—A description of the Ground Data Terminal system, schematic diagram, and instructions for the maintenance, repair, and alteration, as appropriate. The use of “built-in-tests” will allow this system to be maintained only “on condition”.

5.1.3.6 *Painting and Coatings*—A description for the repair, replacement, or alteration, or a combination thereof, of paint or coatings used on the Ground Data Terminal antennas.

5.1.3.7 *Revisions*—A section, such as a change history table, for the listing of any revisions to the maintenance manual by the Ground Data Terminal manufacturer.

5.1.3.8 *Feedback Form*—A form for the Ground Data Terminal owner or maintainer to provide notification to the manufacturer about issues and anomalies identified during the operation or maintenance of the data link or in the content of the manual.

5.2 *Inspection, Repair and Alterations*—Each of the inspections, repairs, and alterations outlined in the maintenance manual shall specifically list:

- (1) Recommended special tools to accomplish the task,
- (2) The parts needed to perform the task,
- (3) Type of maintenance, for example, line, heavy, or overhaul,
- (4) The level of certification needed to accomplish the task, for example, Owner, A&P, Repairman (Light UAS) inspection, repair station,
- (5) Detailed instructions and diagrams as needed to perform the task, and
- (6) Method to test/inspect to verify the task was accomplished properly.

5.2.1 *Repairs and Alterations*—Manufacturers may refer to other repair and alteration manuals, such as FAA’s AC, for the detailed instructions to accomplish tasks outlined in the maintenance manual.

5.3 *Level of Certification*—When listing the level of certification needed to perform a task, the manufacturer shall use one of the following descriptors.

5.3.1 *Owner*—Items that can be expected to be completed by a responsible owner who holds a pilot certificate, but who has not received any specific authorization.