



Designation: F3266 – 23

Standard Guide for Training for Remote Pilot in Command of Unmanned Aircraft Systems (UAS) Endorsement¹

This standard is issued under the fixed designation F3266; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This guide is intended for two distinct readers: educators who wish to develop curricula and training courses and individual pilots wishing to raise their knowledge level for particular flight operations. The guide describes the knowledge, skills, and abilities required to safely operate unmanned aircraft for commercial purposes. A Civil Aviation Authority (CAA) may, at their discretion, use this guide to aid the development of existing or future regulations. This guide addresses powered fixed-wing, vertical-take-off and lift and rotorcraft UAS and not other potential unmanned aircraft categories (for example, glider, lighter-than-air, etc.). This guide has been purposefully designed within the broader context of the ASTM F38 library. Although the original source materials for the content presented here were intended to function as standalone documents, the committee has consciously removed any redundant information in favor of adopting a referential “single-source-of-truth” approach. Consequently, when applying this standard, it is essential to consider and integrate all relevant ASTM F38 standards to ensure its comprehensive and accurate implementation.

1.2 When intending to utilize the information provided in this guide as a means of compliance for operational and/or design approval, it is crucial to consult with the respective oversight authority (for example, CAA) regarding its acceptable use and application. To find out which oversight authorities have accepted this standard (in whole or in part) as an acceptable means of compliance to their regulatory requirements (hereinafter “the Rules”), please refer to the ASTM F38 webpage (www.ASTM.org/COMMITTEE/F38.htm).

1.3 An unmanned aircraft system (UAS) is composed of the unmanned aircraft and all required on-board subsystems, payloads, control station, other required off-board subsystems, any required launch and recovery equipment, all required crew members, and command and control (C2) links between UA and the control station.

¹ This guide is under the jurisdiction of ASTM Committee F38 on Unmanned Aircraft Systems and is the direct responsibility of Subcommittee F38.03 on Personnel Training, Qualification and Certification.

Current edition approved July 1, 2023. Published July 2023. Originally approved in 2018. Last previous edition approved in 2018 as F3266 – 18. DOI: 10.1520/F3266-23.

1.4 This guide provides fundamental general knowledge, task performance and knowledge, and activities and functions for remote pilots of lightweight UAS (but not necessarily limited to UAs under 55 lb Gross Take Off Weight) or for certain CAA operational approvals using risk-based categories. Flight operations outside the scope of this guide require additional knowledge, experience, and training.

1.5 This guide can be used to evaluate a training course outline and syllabus to determine when its content includes the topics necessary for training individuals to be proficient and competent remote pilot personnel. Likewise, this guide may be used to evaluate an existing training program to see when it meets the requirements in this guide.

1.6 A person meeting the requirements of this guide does not necessarily possess adequate knowledge, experience, and training to make specific mission-critical decisions safely. This guide merely describes recommended topics and does not provide specific mission training.

1.7 It is not the intent of this guide to require that a training course track the sequence or exact scope of the topics presented. However, the knowledge and skill objectives that are part of the training course should be included in any training course outline and syllabus to be used to train remote pilots. Furthermore, it is not the intent of this guide to limit the addition of knowledge and skill objectives required by local conditions or any governmental body.

1.8 The knowledge, skills, and abilities described in the following sections are not intended to be a rigid training sequence and should be adjusted by the appropriate CAA for specific scope and context.

1.9 This guide does not stand alone and must be used with other CAA/ASTM standards to identify the knowledge, skills, and abilities needed for remote pilots to operate safely and effectively.

1.10 Where proficiency in a skill or ability need be demonstrated, unless stated otherwise they shall be demonstrated for initial qualification, and as frequently as required by CAA.

1.11 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are

mathematical conversions to SI units that are provided for information only and are not considered standard.

1.12 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.13 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

F2908 Specification for Unmanned Aircraft Flight Manual (UFM) for an Unmanned Aircraft System (UAS)

F3005 Specification for Batteries for Use in Small Unmanned Aircraft Systems (sUAS)

F3060 Terminology for Aircraft

F3178 Practice for Operational Risk Assessment of Small Unmanned Aircraft Systems (sUAS)

F3298 Specification for Design, Construction, and Verification of Lightweight Unmanned Aircraft Systems (UAS)

F3341 Terminology for Unmanned Aircraft Systems

2.2 U.S. Federal Standards:³

14 CFR Part 107 Small Unmanned Aircraft Systems

2.3 EASA Standard:⁴

NPA 2017-05 (A) Unmanned Aircraft System Operations in the Open and Specific Category (Draft)

2.4 Australian Government Civil Aviation Safety Authority (CASA):⁵

AC 101-01 Remotely Piloted Aircraft Systems – Licensing and Operations

2.5 South African Civil Aviation Authority (SACAA):⁶

AIC 007/2015 Remote Pilot License: Training, Examination and Application for RPL Requirements

3. Terminology

3.1 *Unique and Common Terminology*—Terminology used in multiple standards is defined in Terminology **F3341** and Terminology **F3060**. Terminology that is unique to this specification is defined in this section.

3.2 Definitions:

3.2.1 *alert, n*—a generic term used to describe a control station indication meant to attract the attention of and identify to the flight crew a non-normal operational or airplane system condition. Alerts are classified at levels or categories corresponding to Warnings, Cautions, and Advisories. Alert indications also include non-normal range markings (for example, exceedances' on instruments and gauges.)"

3.2.2 *applicant/proponent, n*—the person or organization responsible for seeking the approval to operate and operating a UA. The applicant/proponent may be one of the following entities: manufacturer, operator, or original equipment manufacturer.

3.2.2.1 *manufacturer, n*—the person or organization who causes production of a product or article. A manufacturer may also be an operator.

3.2.2.2 *operator, n*—the person or organization that applies for CAA approval to operate a UAS or who seeks operational approval for types of flight operations prohibited by a CAA for that UAS.

3.2.2.3 *original equipment manufacturer, n*—the person or organization who first produced that product or article. An OEM may also be an operator.

3.2.3 *Authority Having Jurisdiction (AHJ), n*—an organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, in installation, or a procedure.

3.2.4 *automatic flight control system, n*—a system which includes all equipment to control automatically the flight of an aircraft to a path or altitude described by references, internal or external, to the aircraft.

3.2.5 *Control and Non-Payload Communications (CNPC), n*—radio frequency (RF) link(s) between the control station (CS) and the unmanned aircraft (UA), also known as the Command and Control Link(s).

3.2.6 *control station, n*—apparatus for hosting the remote pilot and her/his device to operate the UAS.

3.2.7 *controlled flight, n*—a condition whereby the remote pilot or onboard systems or both, have the ability to perform functions to the extent necessary to continue safe flight and landing, but not necessarily full functional performance.

3.2.8 *envelope protection, n*—the human-machine interface extension of an automatic flight control system that prevents the remote pilot from making control commands that would force the aircraft to exceed its structural or aerodynamic, or both, operating limits.

3.2.9 *lightweight UAS, n*—unmanned small aircraft that are approved for operation under the authority of a CAA (for example, UAS approved to operate by the FAA under 14 CFR Part 107, UAS approved to operate by EASA as Open and Specific Category UA, and UAS approved to operate by CASA as Small, Medium, or Large RPA, or combinations thereof).

3.2.10 *lost link, n*—occurrence in which the control station has lost the ability to maintain a positive C2 link with the sUA

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, Washington, DC 20401-0001, <http://www.access.gpo.gov>.

⁴ Available from European Aviation Safety Agency (EASA), EASA Headquarters Konrad-Adenauer-Ufer 3, D-50668 Cologne, Germany, <https://www.easa.europa.eu>.

⁵ Available from the Australian Government Civil Aviation Safety Authority (CASA), GPO Box 2005, Canberra ACT 2601, Australia, <https://www.casa.gov.au>.

⁶ Available from the South African Civil Aviation Authority (SACAA), Ikhyala Lokundiza, Building 16, Treur Close, Waterfall Park, Bekker Street, Midrand, South Africa, <https://www.caa.co.za>.