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Standard Terminology for Unmanned Aircraft Systems¹

This standard is issued under the fixed designation F3341/F3341M; 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 terminology standard covers definitions of terms and concepts related to unmanned aircraft systems (UAS). It is intended to encourage the consistent use of terminology throughout all ASTM unmanned aircraft system standards and is intended to complement F3060 Standard Terminology for Aircraft. Terms already included in Terminology F3060 are not duplicated here.

1.2 A definition adapted from a particular standard within the ASTM F38 collection of standards is not limited to use within only those standards.

1.3 Additional terms specific to a given standard may be defined solely within that standard and not included here.

1.4 *Units*—The definitions of units will be as defined in NIST SP 330, and will not be duplicated in this document. NIST SP 330 is available on the internet.² The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system are not necessarily exact equivalents; therefore, to ensure conformance with the standard, each system shall be used independently of the other, and values from the two systems shall not be combined.

1.5 *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.*

1.6 *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.*

¹ This terminology 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.

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² Available from National Institute of Standards and Technology (NIST), 100 Bureau Dr., Stop 1070, Gaithersburg, MD 20899-1070, <http://www.nist.gov>.

2. Referenced Documents

2.1 *ASTM Standards*:³

- F2395 Terminology for Unmanned Aircraft Systems (Withdrawn 2014)⁴
- F2908 Specification for Unmanned Aircraft Flight Manual (UFM) for an Unmanned Aircraft System (UAS)
- F2909 Specification for Continued Airworthiness of Lightweight Unmanned Aircraft Systems
- F2910 Specification for Design and Construction of a Small Unmanned Aircraft System (sUAS)
- F2911 Practice for Production Acceptance of Small Unmanned Aircraft System (sUAS) (Withdrawn 2023)⁴
- F3002 Specification for Design of the Command and Control System for Small Unmanned Aircraft Systems (sUAS)
- F3060 Terminology for Aircraft
- F3178 Practice for Operational Risk Assessment of Small Unmanned Aircraft Systems (sUAS)
- F3196 Practice for Seeking Approval for Beyond Visual Line of Sight (BVLOS) Small Unmanned Aircraft System (sUAS) Operations
- F3201 Practice for Ensuring Dependability of Software Used in Unmanned Aircraft Systems (UAS)
- F3266 Guide for Training for Remote Pilot in Command of Unmanned Aircraft Systems (UAS) Endorsement
- F3269 Practice for Methods to Safely Bound Behavior of Aircraft Systems Containing Complex Functions Using Run-Time Assurance
- F3298 Specification for Design, Construction, and Verification of Lightweight Unmanned Aircraft Systems (UAS)
- F3322 Specification for Small Unmanned Aircraft System (sUAS) Parachutes
- F3330 Specification for Training and the Development of Training Manuals for the UAS Operator
- F3364 Practice for Independent Audit Program for Unmanned Aircraft Operators
- F3365 Practice for Compliance Audits to ASTM Standards on Unmanned Aircraft Systems

³ 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.

⁴ The last approved version of this historical standard is referenced on www.astm.org.

- F3366** Specification for General Maintenance Manual (GMM) for a small Unmanned Aircraft System (sUAS)
- F3379** Guide for Training for Public Safety Remote Pilot of Unmanned Aircraft Systems (UAS) Endorsement
- F3389/F3389M** Test Method for Assessing the Safety of Small Unmanned Aircraft Impacts
- F3411** Specification for Remote ID and Tracking
- F3423** Specification for Vertiport Design
- F3442/F3442M** Specification for Detect and Avoid System Performance Requirements
- F3548** Specification for UAS Traffic Management (UTM) UAS Service Supplier (USS) Interoperability
- F3563** Specification for Design and Construction of Large Fixed Wing Unmanned Aircraft Systems

2.2 *Other Documents:*

- 14 CFR 107** Small Unmanned Aircraft Systems⁵
- ICAO UTM Framework** Unmanned Aircraft Systems Traffic Management (UTM) – A Common Framework with Core Principles for Global Harmonization⁶
- NIST SP 330** The International System of Units²

NOTE 1—A source reference will be given for all terms herein. That original source may no longer contain the definition or that definition may have been edited for inclusion herein.

3. Terminology

3.1 *Definitions:*

constrained-space operation, n—an unmanned aircraft systems operation in which UA’s flight environment is limited

⁵ Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, <http://www.gpo.gov>.

⁶ Available from International Civil Aviation Organization (ICAO), 999 Robert-Bourassa Boulevard, Montréal, Québec H3C 5H7, Canada, <https://www.icao.int>.

by walls, ceiling, net, or other physical limitation of the volume; also referred to as an “indoor operation.” This definition is not to be used to denote virtual constraints, such as geofences or geocages.

strategic deconfliction, n—the arrangement, negotiation, coordination, and prioritization of intended operational volumes, routes, or trajectories to minimize the likelihood of airborne conflicts between operations. **(adapted from ICAO UTM Framework)**

tethered aircraft, n—a configuration where the unmanned aircraft remains securely attached (tethered) via a physical link to an anchor (a surface vehicle, the ground, or other object on the ground) at all times while it is flying and is unable to cause the anchor to move.

DISCUSSION—This is different from the recreational practice of “control line model aircraft,” where the aircraft is flown in a circular pattern in close proximity to the remote pilot, who is acting as the anchor.

unmanned aircraft, UA, n—an aircraft operated without the possibility of direct human intervention from within or on the aircraft. **14 CFR 107.3**

visual range, n—distance that unaided (except for normal prescription eyewear) human vision can effectively monitor and provide deconfliction during a UAS operation. **F2395**

3.2 *Abbreviations and Acronyms:*

UA—unmanned aircraft

4. Keywords

4.1 aircraft; remotely piloted aircraft; terminology; sUAS; UAS; unmanned aircraft system

APPENDIXES

(Nonmandatory Information)

X1. AIRWORTHINESS TERMINOLOGY

INTRODUCTION

This terminology appendix contains a listing of terms, abbreviations, acronyms, and symbols related to UAS airworthiness covered by published ASTM Subcommittee F38.01 standards. The intent is to provide baseline definitions that will result in consistent definitions across all of the ASTM UAS standards.

As terms, abbreviations, acronyms, and symbols are incorporated into new standards, and actually used, they may require some slight modification prior to being incorporated into the mandatory section of F3341/F3341M.

abstain

abstain, v—prior to starting a particular test method, the UA manufacturer or designated operator shall choose to enter the test or abstain. Any abstention shall be granted before the test begins. The test form shall be clearly marked as such,

indicating that the manufacturer acknowledges the omission of the performance data while the test method was available at the test time. **F3298**

abstain, v—before starting a particular test method, the unmanned aircraft (UA) manufacturer or designated operator

shall choose to enter the test or decline to perform the test and any abstention shall be granted before the test begins.

F3322

DISCUSSION—The test form shall be clearly marked as such, indicating that the manufacturer acknowledges the omission of the performance data while the test method was available at the test time. **F3322**

acceptable entanglement, n—interaction of the parachute canopy, risers, or lines with the sUA that does not reduce the effectiveness of the parachute recovery system. **F3322**

airframe, n—airframe means the fuselage, booms, nacelles, cowlings, fairings, airfoil surfaces (including rotors but excluding propellers and rotating airfoils of engines), and landing gear of an aircraft and their accessories and controls. **F3298**

airworthiness, n—condition in which the unmanned aircraft systems (UAS) (including the aircraft, airframe, engine, propeller, accessories, appliances, firmware, software, and control station elements) conforms to its design intent, including as defined by the type certificate (TC), if applicable, and is in condition for safe operation. **F3298**

alert, n—a generic term used to describe a control station indication meant to attract the attention of and identify to the flightcrew 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). **F3298**

alert function, A1F, n—the function within the DAA system tasked with notifying the avoid function (whether human or automated system, or both) of the presence of an intruder. **F3442/F3442M**

analysis, n—technique based on analytical evidence obtained without any intervention on the submitted element using mathematical or probabilistic calculation, logical reasoning (including the theory of predicates), modeling or simulation, or combinations thereof, under defined conditions to show theoretical compliance. **F3298**

applicant

applicant, n—the person or organization responsible for seeking the approval to operate, and operating, an unmanned aircraft (UA). The applicant may be one of the following entities: manufacturer, operator, or original equipment manufacturer. **F3389/F3389M**

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. **F3298**

applicant/proponent, n—person or organization responsible for seeking the approval to operate and operating a small unmanned aircraft (sUA). **F3322**

DISCUSSION—The applicant/proponent may be one of the following entities: manufacturer, operator, or original equipment manufacturer (OEM). **F3322**

application programming interface, API—definition of the inputs and outputs for operations intended for use by other software modules. **F3201**

architecture, n—architecture is made up of the definition of the sUA Software components, the data that flows between the components (data flow), and the order of execution of the components (control flow). **F3201**

as flown or as to be flown, n—these terms represent the configuration under test and describe the mass and structural properties of the sUA and its payloads. During test, the as flown or as to be flown configuration structure and impact characteristics shall be representative of the flight configuration being considered for use. **F3389/F3389M**

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. **F3298**

autonomous triggering system, ATS, n—device or components independent from any flight critical system of the sUA that will detect and initiate parachute deployment upon detection of a critical failure of the sUA in flight. **F3322**

avoid function, A2F, n—the function within the DAA system tasked with providing the flight guidance necessary to maneuver away from the potential *hazard* posed by detected intruder(s). Avoidance may be executed automatically by a flight controller or manually by a *pilot*. **F3442/F3442M**

ballistic ejection, n—ejection of the parachute recovery system into free air with the use of springs, pyrotechnic gas generators, or the use of inert gases or compressed air. **F3322**

DISCUSSION—Hazardous materials laws (for air transportation, for proper handling, storage, etc.) may apply when using hazardous materials such as pyrotechnic devices, cold gas generators, or compressed CO₂ for a ballistic parachute. **F3322**

beyond visual line of sight, BVLOS, n—operation when the UA cannot be seen by the individuals responsible for see-and-avoid with unaided (other than corrective lenses or sunglasses, or both) vision, but where the location of the sUA is known through technological means without exceeding the performance capabilities of the C2 link. **F3442/F3442M**

bill of materials, BOM—specific list of all components defined by this specification that make up the parachute recovery system. **F3322**

bit error rate detection, BER—rate at which errors occur in a transmission system; applicable to any system that transmits data over a network of some form in which noise, interference, and phase jitter may cause degradation of the digital signal. **F3002**

C2 range, n—distance between GCS and UA at which positive control of the UA can be maintained. **F3002**

canopy filling/inflammation time—time from canopy (line) stretch to the first full open canopy position. **F3322**