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Standard Classification System for Small Unmanned Aircraft Systems (sUASs) for Land Search and Rescue¹

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1. Scope

1.1 This classification defines small Unmanned Aircraft System (sUAS) land search and rescue resources in terms of their capabilities.

1.1.1 This classification is not intended to classify small UAS utilized in urban search and rescue.

1.1.2 This classification is not intended to classify small UAS utilized in disaster response.

1.2 The classifications in this standard are intended to aid emergency managers ordering resources for search and rescue incidents. These classifications provide a means by which resource managers and sUAS pilots/operators can convey to emergency management the tasks for which their systems are capable of performing.

1.2.1 This classification is designed for incidents at the local and state level and is not intended to encompass federal or military resources.

1.3 This classification does not define standards of performance or training for sUAS systems and operators engaged in search and rescue.

1.3.1 Guides that address the general airworthiness of sUAS systems are under the jurisdiction of ASTM Committee F38 on Unmanned Aircraft Systems and are the direct responsibility of Subcommittee F38.01 on Airworthiness.

1.3.2 Guides that address the general flight operations of sUAS systems are under the jurisdiction of ASTM Committee F38 on Unmanned Aircraft Systems and are the direct responsibility of Subcommittee F38.02 on Flight Operations.

1.3.3 Guides that address the general training, qualifications, and certifications of sUAS personnel are under the jurisdiction of ASTM Committee F38 on Unmanned Aircraft Systems and are the direct responsibility of Subcommittee F38.03 on Personnel Training, Qualification and Certification.

1.3.4 Guides that specifically address sUAS standards for personnel training and operations in the specific attributes for

land search and rescue will fall under the jurisdiction of ASTM Committee F32 on Search and Rescue and will remain compliant with those standards prepared by ASTM Committee F38 on Unmanned Aircraft Systems.

1.4 *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.*

1.5 *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

F3222 Terminology Relating to F32 Land Search and Rescue Standards and Guides

3. Terminology

3.1 *Definitions:*

3.1.1 For definitions of terms used in this classification, refer to Terminology **F3222**.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *CTOL, n*—sUAS capable of conventional takeoff and landing.

3.2.2 *STOL, n*—sUAS requiring short runway requirements for takeoff and landing.

3.2.3 *VTOL, n*—sUAS that can hover, takeoff, and land vertically.

3.2.4 *category, n*—specific task for which a sUAS land search and rescue resource is capable.

3.2.5 *kind, n*—subset of some sUAS land search and rescue resource categories.

¹ This classification is under the jurisdiction of ASTM Committee **F32** on Search and Rescue and is the direct responsibility of Subcommittee **F32.01** on Equipment, Testing, and Maintenance.

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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.

3.2.6 *type, n*—basal characteristic that generally identifies the capabilities for a sUAS in a given category for land search and rescue.

4. Significance and Use

4.1 This standard may be used to classify sUAS resources utilized for land search and rescue.

4.2 Classification of sUAS land search and rescue resources is based upon the complete sUAS including payload, communications systems.

4.2.1 This classification identifies the mechanical features of the sUAS platform and does not account for the pilot's/operator's skill in performing specific tasks.

4.3 UAS land search and rescue resources are classified by Category, Kind, and Type.

4.4 A sUAS land search and rescue resource may be more than one Category.

4.5 A sUAS land search and rescue resource may be more than one Kind.

4.6 A particular Kind of sUAS land search and rescue resource can only be one Type for a given Category or Kind.

5. UAS Resource Category

5.1 *Category* identifies the specific task for which a sUAS search resource is capable of performing, as follows:

5.1.1 *Search*—Providing functions and/or support in an effort to locate an object and/or person(s).

5.1.2 *Rescue*—Providing functions and/or support in an effort to save an object or person(s) from a distressed or life-threatening situation.

5.1.3 *Overhead*—Providing functions and/or support to aid Incident Management or Incident Command. An example would be to provide information for the intent of improving or maintaining situational awareness.

5.1.4 *Communications*—Providing functions and/or support to aid in the transfer of information/data between one or more parties.

6. UAS Search Resource Kind

6.1 *Kind* further defines a sUAS search resource's capabilities in regard to a particular Category.

6.1.1 Not all sUAS search resource Categories are differentiated by Kind.

6.2 *Search*

6.2.1 *Wide Area Search:*

6.2.1.1 *Real-Time Video*—Capable of delivering real-time video data real-time in one or more regions of the electromagnetic spectrum (may include, for example, infrared, visible, or ultra-violet).

6.2.1.2 *Real-Time Stills*—Capable of delivering real-time photographic data real-time in one or more regions of the electromagnetic spectrum (may include, for example, infrared, visible, or ultra-violet).

6.2.1.3 *Delayed Video*—Capable of delivering recorded video data in one or more regions of the electromagnetic spectrum (may include, for example, infrared, visible, or ultra-violet).

6.2.1.4 *Delayed Stills*—Capable of delivering recorded photographic data in one or more regions of the electromagnetic spectrum (may include, for example, infrared, visible, or ultra-violet).

6.2.2 *Radio Frequency Search:*

6.2.2.1 Cellular devices.

6.2.2.2 802.11 (WiFi) network devices Wifi.

6.2.2.3 Family Radio Service devices.

6.2.2.4 Avalanche beacon.

6.2.2.5 ELT/EPIRB/PLB frequency of 121.5 MHz.

6.3 *Attractant/Containment:*

6.3.1 Payload designed to attract missing subject and guide them to a specific point or to indicate that searchers are in the area.

6.4 *Overhead:*

6.4.1 Situational awareness.

6.4.2 Remote sensing utilizing one or more sensors or emitters. For example, LIDAR may be used to identify natural or man-made geographical (topographical) features.

6.4.3 *Aerial Imaging for GIS*—Records photographic data for viewing after aircraft recovery; includes support and software for the creation of geographically rectified orthophoto mosaics.

6.4.4 Team tracking.

6.5 *Rescue*

6.5.1 *Payload Delivery:*

6.5.1.1 *Precision Delivery*—Delivers a payload to specific location.

6.5.1.2 *Fly-by Delivery*—Delivers a payload to a location in a non-specific manner.

6.6 *Communications:*

6.6.1 Radio relay.

6.6.2 Network extender.

6.6.3 Provides one-way visual communication to the subject.

6.6.4 Provides two-way visual communication between the subject and land search and rescue personnel.

6.6.5 Provides one-way audio communication to the subject.

6.6.6 Provides two-way audio communication between the subject and land search and rescue personnel.

6.6.7 Provides some other form of communication between the subject and land search and rescue personnel.

7. sUAS Search Resource Type

7.1 *Type* indicates the characteristics used to define the capabilities of a land search and rescue UAS. The types are as follows:

7.1.1 *VTOL*, less than 30 min of flight time with full payload for category and kind.

7.1.2 *VTOL*, more than 30 min of flight time with full payload for category and kind.

7.1.3 *STOL*, less than 45 min of flight time with full payload for category and kind.

7.1.4 *STOL*, more than 45 min of flight time with full payload for category and kind.

7.1.5 *CTOL*, more than 2 h of flight time with full payload for category and kind.

7.1.6 Tethered, moored, or captive balloon.

8. Keywords

8.1 incident command system; resource typing; search and rescue; sUAS

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