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| **Expand/Collapse CategoryVolume 16. Unmanned Aircraft Systems** |
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| [Section 3. Civil Aircraft Operations (TBD)](http://fsims.faa.gov/PICDetail.aspx?docId=8900.1,Vol.16,Ch7,Sec3)  |  |  |  |  |  |
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| [Section 2. Civil Aircraft Operations](http://fsims.faa.gov/PICDetail.aspx?docId=8900.1,Vol.16,Ch10,Sec2)  |  |  |  |  |  |

# UNMANNED AIRCRAFT SYSTEMS

# CHAPTER 1 BACKGROUND, ORGANIZATION, AND DEFINITIONS

## General Information

### **1** **PURPOSE.** This volume provides a means by which prospective air operators, air agencies, or government flight operatives are authorized to conduct business in a manner which complies with all applicable regulations, the Federal Aviation Act of 1958 (FA Act), and Federal Aviation Administration (FAA) directives. The process is designed to preclude the certification and/or approval of applicants who are unwilling or unable to comply with the regulations or conform to safe operating practices unique to Unmanned Aircraft Systems (UAS) operations. This volume also provides policies necessary for reviewing and evaluating the safety and interoperability of proposed UAS flight operations conducted within the U.S. National Airspace System (NAS) for the Flight Standards Service Unmanned Aircraft Systems (UAS) Integration Office (AFS-80) when assessing applications for a Certificate of Waiver or Authorization (COA) or Special Airworthiness Certificate and incorporates FAA Notice N 8900.227, Unmanned Aircraft Systems (UAS) Operational Approval, dated 7/30/13.

### **3 AUDIENCE.** The primary audience for this volume is Flight Standards Service (AFS) aviation safety inspectors (ASI), their managers and supervisors, and other operational and administrative employees. The aviation industry may use this volume as a reference only, and the general public may find it helpful for informational and planning purposes.

### **5 BACKGROUND AND HISTORY.** UASs come in a variety of shapes and sizes and serve diverse purposes. They may have a wingspan as large as a Boeing 737 or smaller than a radio‑controlled model airplane. Regardless of size, the responsibility to fly safely applies equally to manned and unmanned aircraft operations.

#### **UAS Integration.** Because they are inherently different from manned aircraft, introducing UASs into the nation’s airspace is challenging for both the FAA and aviation community. UASs must be integrated into an NAS that is evolving from ground‑based navigation aids to a Global Positioning System (GPS)‑based system in the Next Generation Air Transportation System (NextGen). Safe integration of UASs involves gaining a better understanding of operational issues, such as training requirements, operational specifications, and technology considerations.

#### **Current Use.** To date, the FAA has authorized limited use of UASs for important missions in the public interest, such as firefighting, disaster relief, search and rescue, law enforcement, border patrol, military training, and testing and evaluation. Today, UASs perform border and port surveillance by the Department of Homeland Security (DHS), help with scientific research and environmental monitoring by the National Aeronautics and Space Administration (NASA) and the National Oceanic and Atmospheric Administration (NOAA), support public safety by law enforcement agencies, help state universities conduct research, and support various other missions for public (government) entities.

#### **Restrictions.** Unmanned aircraft (UA) are now flying in the NAS under very controlled conditions. Operations potentially range from ground level to above 50,000 feet, depending on the specific type of aircraft. However, UAS operations are currently not authorized in Class B airspace, which contains the highest density of manned aircraft in the NAS. Routine operation of UASs over congested areas is prohibited.

#### **FAA Authorization.** There are currently two ways to get FAA authorization to operate a UAS. The first is to obtain a Special Airworthiness Certificate for private sector (civil) aircraft, which are typically for research and development (R&D), training, and flight demonstrations. The second is to obtain a COA for public aircraft, and civil operations only for aircraft that have received an airworthiness certificate from the Aircraft Certification Service (AIR).

### **7 POLICY.** Policy identifies UAs as “aircraft” flown by a “pilot,” regardless of where the pilot is located. Aircraft and pilots must demonstrate compliance with applicable sections of Title 14 of the Code of Federal Regulations (14 CFR) to operate in the NAS. However, UAs inherently cannot comply with certain sections of 14 CFR. For instance, the absence of an onboard pilot means that the “see-and-avoid” regulations of 14 CFR part 91, § 91.113 cannot be satisfied. Without an onboard pilot, there is a new and significant reliance on the control and communication (C2) link to allow the pilot to perform basic aircraft functions. The C2 link also introduces new failure modes such as lost link that are not present in manned aircraft. Furthermore, for air traffic control (ATC) operations requiring visual means of maintaining in‑flight separation, the lack of an onboard pilot does not permit ATC to issue all of the standard clearances or instructions available under the current edition of FAA Order JO 7110.65, Air Traffic Control. Consequently, to ensure an Acceptable Level of Safety (ALoS), UAS flight operations require an alternative method of compliance (AMOC) or risk control to address their “see‑and‑avoid” impediments to safety of flight and any problems they may generate for ATC. In the future, permanent and consistent methods of compliance will be needed for UAS operations in the NAS without the need for waivers or exemptions.

### **9 DISCUSSION.** This volume represents the culmination of input from government agencies, industry, and user stakeholders along with best practices and procedures that have been used by the FAA in prior approvals for UAS applications for COAs or Special Airworthiness Certificates. The material presented in this volume represents the processes and procedures necessary for approving applications for UAS flight operations. However, because of the uniqueness of various UAS flight operations, each application must be evaluated on its own technical merits, including Operational Risk Management (ORM) planning. Each application may require unique authorizations or limitations directly related to the specific needs or capabilities of the UAS and/or the proposed specific mission and operating location.

### **11 APPLICABILITY AND APPROVAL PROCESS CRITERIA.** The applicability and process to be used in UAS operational approval are dependent on whether the proposed UAS operation within the territorial airspace of the United States (the airspace above the contiguous United States, Alaska, Hawaii, U.S. territories, and U.S. territorial waters) is defined as public or civil (see 14 CFR part 1, § 1.1 and Public Law (PL) 110-181, The National Defense Authorization Act of 2008). UAS operations outside the territorial airspace of the United States will be classified as either state or civil operations in accordance with international law. A public operation is one that is intrinsically governmental in nature (i.e., Federal, State, and local agencies). Applicants requesting approval of public aircraft operations by UAS will use the COA application process. In contrast, applicants for civil operations approval will use the Special Airworthiness Certificate process and may be issued a COA only for aircraft that have received an airworthiness certificate from AIR. Mandatory terms, such as “must,” as used in this document are used to describe requirements applicable when conducting UAS operations under a COA in the NAS. The fact that an applicant has elected to apply through the COA process to conduct UAS operations in the NAS is evidence that the applicant has agreed to accept these requirements. The FAA has determined that the COA guidance in this section provides an acceptable means, but not the only means, for demonstrating an ALoS for the conduct of UAS operations in the NAS.

### **13 COORDINATION AND APPROVAL.** Regardless of the process for the authorization approval, COA applications for UAS flight operation approvals will be coordinated through the Air Traffic Organization (ATO) component of AFS-80 and Aviation Safety (AVS). Special Airworthiness Certificates will be coordinated through the Aircraft Certification Evaluations and Special Projects Branch (AIR-240) staff as well as the ATO and AFS component of AFS-80 for final approval and disposition.

### **15 APPLICABILITY AND METHODS OF AUTHORIZATION.** Operational policy in this volume applies to both public and civil operations and certain state aircraft operations.

#### **Applicability.** These procedures are applicable for all operations in the contiguous United States, Alaska, Hawaii, U.S. territories, and international airspace in the flight information regions (FIR) delegated to the United States where the FAA is the Air Traffic Service (ATS) provider. These procedures do not apply to the territorial airspace of another sovereign country that lies within FIRs delegated to the United States where the FAA is the ATS provider, except by agreement with that country, or airspace in FIRs delegated to other countries. All UAS operators and pilots must observe all applicable regulations of 14 CFR.

##### In general, the UAS operator or applicant must request specific authorization to conduct UAS operations in the NAS outside of active restricted and warning areas designated for aviation use, or approved prohibited areas. Airspace inside buildings or structures is not considered to be part of the NAS and is not regulated.

##### This volume and the processes prescribed do not apply to hobbyists and amateur model aircraft users when operating unmanned systems for sport and recreation. Those individuals should seek guidance under the current edition of Advisory Circular (AC) 91‑57, Model Aircraft Operating Standards. AC 91-57 is not to be used as a basis of approval for operation of any other aircraft, including by Federal, State, and local governments, commercial entities, or law enforcement.

##### This volume and the processes prescribed also do not apply to UAS operations in FAA‑controlled international airspace by an agency of, or a contractor to, the Federal government when those operations are appropriately designated as State aircraft operations and are operated under “due regard” rules and procedures established by the Federal agency responsible for the operation. The designation of flight operations as State aircraft operations normally are made in coordination within the U.S. Department of State (DOS). This volume and the processes prescribed do, however, apply where the responsible Federal agency either has not established a formal set of rules and procedures for “due regard” operations, or is not operating the UAS under “due regard” rules and procedures in FAA-controlled international airspace. This volume and the processes prescribed also apply to all UAS operations by an agency of, or a contractor to, the Federal government that transit through U.S. territorial airspace en route to or from international airspace. See Volume 16, Chapter 5, Section 1, Figure 16-2, UAS COA Requirement Flowchart. The “due regard” option is not available for State aircraft operations transiting through U.S. territorial airspace en route to or from international airspace.

##### Oceanic UAS operations contained within warning areas are handled in the same manner as those operations conducted in active restricted and approved prohibited areas; that is, neither specific FAA approval nor observers or chase aircraft are required by the FAA.

##### The only public aircraft that can fly under “due regard” are U.S. Government aircraft operating as State aircraft.

#### **Methods.** The methods of approval include the issuance of a COA for public aircraft operations, or for civil aircraft that have received an FAA airworthiness certificate from AIR. In the case of public aircraft operations, the operating entity applying to conduct the UAS operation must comply with its own processes, policies, and standards in the following areas:

* Pilot certification;
* Crew certification;
* Recent pilot experience (or currency);
* Medical certificates; and
* Airworthiness of public UAS.
1. If no established public entity processes, policies, or standards exist, it is highly recommended that the public agency/department apply the specifics outlined in this volume and comply with the regulations of 14 CFR applicable to civil UAS operations.

### **17 ADDITIONAL INFORMATION.** You may find additional information for UAS test sites, COAs, special airworthiness certification, airworthiness, training and etc. at:

### Federal Aviation Administration

### Unmanned Aircraft Systems Integration Office, AFS-80

### 490 L’Enfant Plaza SW, Suite 3200

### Washington, D.C. 20024

### Phone: 202-385-4835

### Fax: 202-385-4651

### Web site: http://www.faa.gov/about/initiatives/uas/.

**16-1-1-19 through 16-1-1-29 RESERVED.**

# UNMANNED AIRCRAFT SYSTEMS

# CHAPTER 1 BACKGROUND, ORGANIZATION, AND DEFINITIONS

## Definitions and Acronyms

### **1** **DEFINITIONS.** The following definitions are used by the Unmanned Aircraft Systems (UAS) Integration Office (AFS-80) and many UAS organizations to describe relevant differences between UAS operations and those of manned aircraft. Other organizations, such as the International Civil Aviation Organization (ICAO) and RTCA, Inc., have also developed acronyms and definitions which may differ from those used by the Federal Aviation Administration (FAA). Aviation safety inspectors (ASI) may wish to refer to the current version of ICAO Circular 328, Unmanned Aircraft Systems (UAS) and RTCA Guidance DO-304, Guidance Material and Considerations for Unmanned Aircraft Systems, until harmonization of terminology is achieved.

#### **Aircraft.** A device used or intended to be used for flight in the air, including unmanned aircraft (UA).

#### **Airworthiness.** A condition in which the UAS (including the aircraft, airframe, engine, propeller, accessories, appliances, and control station (CS)) conforms to its type certificate (TC), if applicable, and is in condition for safe operation.

#### **Airworthiness Certification.** A repeatable process that results in a documented decision that an aircraft system has been judged to be Airworthy. It is intended to verify that the aircraft system can be safely maintained and safely operated by fleet pilots within its described and documented operational envelope.

#### **Airworthiness Statement.** Document required from public UAS applicants during a Certificate of Waiver or Authorization (COA) application process which confirms aircraft airworthiness.

#### **Certificate of Waiver or Authorization (COA).** An FAA grant of approval for a specific operation. COAs may be used as an authorization, issued by the Air Traffic Organization (ATO), to a public operator for a specific UA activity. COAs for civil and commercial operations are only for aircraft that have received an airworthiness certificate from Aircraft Certification Service (AIR). Provisions or limitations may be imposed as part of the approval process to ensure the UA can operate safely with other airspace users.

#### **Chase Aircraft.** A manned aircraft flying in close proximity to a UA that carries a qualified observer and/or UA pilot for the purpose of seeing and avoiding other aircraft and obstacles.

#### **Civil Aircraft.** Aircraft other than public aircraft.

#### **Congested Area.** A congested area is determined on a case-by-case basis. The determination must take into consideration all circumstances, not only the size of an area and the number of homes or structures (e.g., whether the buildings are occupied or people are otherwise present, such as on roads).

#### **Cooperative Aircraft.** Aircraft that have an electronic means of identification (i.e., a transponder or Automatic Dependent Surveillance—Broadcast (ADS-B) transceiver) aboard in operation.

#### **Crewmember (UAS).** In addition to the crewmembers identified in Title 14 of the Code of Federal Regulations (14 CFR) part 1, a UAS flightcrew member includes pilots, sensor/payload operators, and visual observers (VO), but may include other persons as appropriate or required to ensure safe operation of the aircraft.

#### **Crew Resource Management (CRM).** The effective use of all available resources including human, hardware, and information resources.

#### **Daisy-Chaining.** The use of multiple, successive observers to extend the flight of a UA beyond the direct visual line-of-sight of any other pilot in command (PIC) or VO.

#### **Due Regard.** A phase of flight wherein an aircraft commander of a State‑operated aircraft assumes responsibility to separate his or her aircraft from all other aircraft.

#### **Experimental Certificate.** A type of Special Airworthiness Certificate issued for the purposes of research and development (R&D), crew training, exhibition, and market survey as defined in 14 CFR part 21, § 21.191(a), (c), and (f).

1. According to 14 CFR part 91, § 91.319(a)(2), experimental aircraft may not be used for carrying persons or property for compensation or hire.

##### **R&D Aircraft.** Aircraft testing new design concepts, equipment, installations, operating techniques, or uses for aircraft. Any UAS, including an Optionally Piloted Aircraft (OPA), is eligible for an experimental certificate under this purpose. The proponent may conduct operations only as a matter of research or to determine whether an idea warrants further development.

##### **Crew Training.** The process of bringing a person or persons to an established standard of proficiency. Crew training is limited to the number of flightcrews required by the operator to conduct UAS aircraft operations.

##### **Market Survey.** Aircraft may be used for the purposes of conducting market surveys, sales demonstrations, and customer crew training of the manufacturer’s customers, as provided in § 21.195.

#### **External Pilot.** A UAS pilot who flies from outside a control station with direct visual contact with the aircraft.

#### **FAA-Recognized Equivalent.** An FAA recognition that a public agency may exercise its own internal processes regarding airworthiness and pilot, aircrew, and maintenance personnel certification and training; furthermore, the agency has determined that its UAS is capable of safe operation in the National Airspace System (NAS) when conducting public aircraft operations under Title 49 of the United States Code (49 U.S.C.) §§ 40102(a)(41) and 40125.

#### **Flight Termination.** The intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all other contingencies have been exhausted, and further flight of the aircraft cannot be safely achieved, or other potential hazards exist that require immediate discontinuation of flight.

#### **Flyaway.** An interruption or loss of the control link, or when the pilot is unable to effect control of the aircraft and, as a result, the UA is not operating in a predicable or planned manner.

#### **Formation.**

##### **Nonstandard Formation.** A formation operating under any of the following conditions:

* When the flight leader has requested and air traffic control (ATC) has approved other-than-standard formation dimensions;
* When operating within an authorized block altitude or under the requirements of a letter of agreement (LOA);
* When the operations are conducted in airspace specifically designed for a special activity.

##### **Standard Formation.** A formation in which proximity of no more than 1 nautical mile (NM) laterally or longitudinally and within 100 feet vertically from the flight leader is maintained by each wingman or UA. For more information, refer to the FAA Pilot/Controller Glossary (P/CG) addendum to the Aeronautical Information Manual (AIM), Order JO 7110.10, Flight Services, and Order JO 7110.65, Air Traffic Control, at http://www.faa.gov/air\_traffic/publications/atpubs/PCG/index.htm.

#### **Internal Pilot.** A UAS pilot who flies from inside a control station without direct visual contact with the aircraft.

#### **Lost Link.** The loss of command-and-control link contact with the remotely piloted aircraft such that the remote pilot can no longer manage the aircraft’s flight.

#### **Missile.** A nonrecoverable, powered, guided munition that travels through the air or space. Ballistic missiles follow a ballistic trajectory. Cruise missiles generate lift. Guided missiles are launched from a ship or aircraft and serve as a self-contained precision bombs.

#### **Non-Cooperative Aircraft.** Aircraft that do not have an electronic means of identification (e.g., a transponder) aboard or that have inoperative equipment because of malfunction or deliberate action.

#### **Nonstandard Formation.** See Formation, above.

#### **Observer.** A trained person who assists a UAS pilot in the duties associated with collision avoidance and navigational awareness through electronic or visual means. Collision avoidance includes, but is not limited to, avoidance of other traffic, clouds, obstructions, terrain and navigational awareness. A visual observer (VO) is a trained person who assists the UAS pilot by visual means in the duties associated with collision avoidance. A VO includes the OPA pilot when the OPA is being operated as a UAS.

#### **Off-Airport.** Any location used to launch or recover aircraft that is not considered an airport (e.g., an open field).

#### **Optionally Piloted Aircraft (OPA).** An aircraft that is integrated with UAS technology and still retains the capability of being flown by an onboard pilot using conventional control methods (see OPA Safety Pilot, below).

#### **OPA Safety Pilot.** The PIC that is responsible for ensuring the safe operation of an Optionally Piloted Aircraft (OPA), whether under remote control or onboard control, for the purposes of overriding the automated control system in the case of malfunction or any other hazardous situation.

#### **Pilot Duty Period.** The period beginning when a flightcrew member is required to report for duty with the intention of conducting a flight and ending when the aircraft is parked after the last flight. It includes the period of time before a flight or between flights that a pilot is working without an intervening rest period.

#### **Pilot in Command (PIC).** The person who has final authority and responsibility for the operation and safety of flight, has been designated as PIC before or during the flight, and holds the appropriate category, class, and type rating, if applicable, for the conduct of the flight. The responsibility and authority of the PIC as described by § 91.3 apply to the UA PIC. The PIC position may rotate duties as necessary with equally qualified pilots. The individual designated as PIC may change during flight.

1. The PIC can only be the PIC for one aircraft at a time. For an OPA, the PIC must meet UAS guidance requirements for training, pilot licensing, and medical requirements when operating an OPA as a UAS.

#### **Public Aircraft.** An aircraft operated by a governmental entity (including Federal, State, or local governments, and the U.S. Department of Defense (DOD) and its military branches) for certain purposes as described in 49 U.S.C. §§ 40102(a)(41) and 40125. Public aircraft status is determined on an operation by operation basis. Refer to part 1, § 1.1 for a complete definition of a public aircraft.

#### **Public Operator.** An operator that is classified as government and/or otherwise qualifies for public aircraft operation under 49 U.S.C. §§ 40102(a)(41) and 40125. Not all flights by a public aircraft operator qualify as a public aircraft operation under the statute. Public aircraft operation status is not automatic for flights conducted by a government entity or a contractor to a government entity.

#### **Safety Risk Management (SRM).** A formalized, proactive approach to system safety. SRM is a methodology that ensures hazards are identified; risks are analyzed, assessed, and prioritized; and results are documented for decision-makers to transfer, eliminate, accept, or mitigate risk.

#### **Scheduled Maintenance (Routine).** The performance of maintenance tasks at prescribed intervals.

#### **Segregation.** Setting apart from other air traffic operations in the NAS. Segregation is not synonymous with required air traffic separation standards. Therefore, segregation does not prescribe or mandate criteria such as vertical, lateral, or longitudinal distances.

#### **Supplemental Pilot.** Pilots assigned UAS flight duties to augment the PIC. It is common for operators to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions. The supplemental pilot may also assume duties of the PIC if the specified qualifications are met.

#### **Unmanned Aircraft (UA).** A device used or intended to be used for flight in the air that has no onboard pilot. This device excludes missiles, weapons, or exploding warheads, but includes all classes of airplanes, helicopters, airships, and powered-lift aircraft without an onboard pilot. UAs do not include traditional balloons (refer to 14 CFR part 101), rockets, and unpowered gliders.

#### **Unmanned Aircraft System (UAS).** A UA and its associated elements related to safe operations, which may include control stations (ground-, ship-, or air-based), control links, support equipment, payloads, Flight Termination Systems (FTS), and launch/recovery equipment.

#### **Unscheduled Maintenance (Nonroutine).** The performance of maintenance tasks when mechanical irregularities occur.

#### **Visual Line of Sight (VLOS).** Unaided (corrective lenses and/or sunglasses exempted) visual contact between a PIC or a VO and a UA sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.

### **3 ACRONYMS.**

Figure 16-1-2-3A. UAS Acronym List.

|  |  |
| --- | --- |
| AC | Advisory Circular |
| AFPD | Air Force Policy Directive |
| AFS | Flight Standards Service |
| AGC | Office of The Chief Counsel |
| AGL | Above Ground Level |
| AIM | Aeronautical Information Manual |
| ALoS | Acceptable Level of Safety |
| AMOC | Alternative Method of Compliance |
| AR | Army Regulations |
| ASI | Aviation Safety Inspector |
| ATC | Air Traffic Control |
| ATCAA | Air Traffic Control Assigned Airspace |
| ATCSCC | Air Traffic Control System Command Center |
| ATO | Air Traffic Organization |
| ATS | Air Traffic Service |
| AVS | Aviation Safety |
| C2 | Control and Communications Link |
| CFIT | Controlled Flight Into Terrain |
| CFR | Code of Federal Regulations |
| COA | Certificate of Waiver or Authorization |
| CRM | Crew Resource Management |
| CS | Control Station |
| DCP | Divert/Contingency Point |
| DHS | Department of Homeland Security |
| DOD | Department of Defense |
| DSA | Detect, Sense, and Avoid System |
| FAA | Federal Aviation Administration |
| FCC | Federal Communications Commission |
| FHA | Fault Hazard Analysis |
| FIR | Flight Information Region |
| FL | Flight Level |
| FSIMS | Flight Standards Information Management System |
| FTP | Flight Termination Point |
| FTS | Flight Termination System |
| GCS | Ground Control Station |
| GHz | Gigahertz |
| GMF | Government Master File |
| HQ | Headquarters (FAA) |
| IFR | Instrument Flight Rules |
| LLP | Lost Link Point |
| LOA | Letter of Agreement |
| MHz | Megahertz |
| MSL | Mean Sea Level |
| NAS | National Airspace System |
| NASA | National Aeronautics and Space Administration |

Figure 16-1-2-3A. UAS Acronym List (Continued).

|  |  |
| --- | --- |
| NAVAIRINST | Naval Air Systems Command Instruction |
| NM | Nautical Mile |
| NTIA | National Telecommunications and Information Administration |
| OPA | Optionally Piloted Aircraft |
| PIC | Pilot in Command |
| POC | Point of Contact |
| R&D | Research and Development |
| RF | Radio Frequency |
| RM | Risk Management |
| RNAV | Area Navigation |
| RTB | Return to Base |
| RVSM | Reduced Vertical Separation Minimum |
| SM | Statute Mile |
| SRM | Safety Risk Management |
| SRMD | Safety Risk Management Document |
| SSI | Sensitive Security Information |
| STA | Special Temporary Authority |
| TAS | Traffic Advisory Systems |
| TC | Type Certificate |
| TCAS | Traffic Alert and Collision Avoidance System |
| UA | Unmanned Aircraft |
| UAS | Unmanned Aircraft System |
| USC | United States Code |
| USCBP | U.S. Customs and Border Protection |
| USCG | U.S. Coast Guard |
| VFR | Visual Flight Rules |
| VMC | Visual Meteorological Conditions |
| VO | Visual Observer |

* + - 1. **through 16-1-2-29 RESERVED.**

# VOLUME 16 UNMANNED AIRCRAFT SYSTEMS

# CHAPTER 1 BACKGROUND, ORGANIZATION, AND DEFINITIONS

## Related Regulations and Publications

### **1** **GENERAL.** Policy identifies unmanned aircraft (UA) as “aircraft” flown by a “pilot,” regardless of where the pilot is located. Pilots must demonstrate compliance with applicable sections of Title 14 of the Code of Federal Regulations (14 CFR) to operate in the National Airspace System (NAS). However, UAs inherently cannot comply with certain sections of 14 CFR. For instance, the absence of an onboard pilot means that the “see‑and‑avoid” regulation of 14 CFR part 91, § 91.113 cannot be satisfied. Without an onboard pilot, there is a new and significant reliance on the control and communication (C2) link to allow the pilot to perform basic aircraft functions. The C2 link also introduces new failure modes, such as lost link, that are not present in manned aircraft. Furthermore, for air traffic control (ATC) operations requiring visual means of maintaining in-flight separation, the lack of an onboard pilot does not permit ATC to issue all of the standard clearances or instructions available under the current edition of Federal Aviation Administration (FAA) Order JO 7110.65, Air Traffic Control. Consequently, to ensure an Acceptable Level of Safety (ALoS), Unmanned Aircraft Systems (UAS) flight operations require an alternative method of compliance (AMOC) or risk control to address their “see‑and‑avoid” impediments to safety of flight, and any problems they may generate for ATC. In the future, permanent and consistent methods of compliance will be needed for UAS operations in the NAS without the need for waivers or exemptions. Volume 16 is intended to identify AMOCs with the regulations when evaluating proposed UAS operations. For a complete listing of regulations, refer to the following Web site: http://www.faa.gov/regulations\_policies/faa\_regulations/.

### **3 RELATED REGULATIONS AND PUBLICATIONS (current editions).**

#### **Title 14 CFR.**

##### Part 1, Definitions and Abbreviations.

##### Part 21, Certification Procedures for Products and Parts:

* Section 21.25, Issue of Type Certificate: Restricted Category Aircraft.
* Section 21.185, Issue of Airworthiness Certificates for Restricted Category Aircraft.
* Section 21.191, Experimental Certificates.
* Section 21.193, Experimental Certificates: General.
* Section 21.195, Experimental Certificates: Aircraft to Be Used for Market Surveys, Sales Demonstrations, and Customer Crew Training.
* Section 21.197, Special Flight Permits.
* Section 21.199, Issue of Special Flight Permits.

##### Part 23, § 23.1309, Equipment, Systems, and Installations.

##### Part 25, § 25.1309, Equipment, Systems, and Installations.

##### Part 61, Certification: Pilots, Flight Instructors, and Ground Instructors:

* Section 61.23, Medical Certificates: Requirement and Duration.
* Section 61.56, Flight Review.
* Section 61.57, Recent Flight Experience: Pilot in Command.
* Section 61.58, Pilot-in-Command Proficiency Check: Operation of an Aircraft that Requires More Than One Pilot Flight Crewmember or is Turbojet‑Powered.

##### Part 65, § 65.83, Recent Experience Requirements.

##### Part 67, Medical Standards and Certification.

##### Part 91, General Operating and Flight Rules:

* Section 91.3, Responsibility and Authority of the Pilot in Command.
* Section 91.13, Careless or Reckless Operation.
* Section 91.15, Dropping Objects.
* Section 91.17, Alcohol or Drugs.
* Section 91.21, Portable Electronic Devices.
* Section 91.111, Operating Near Other Aircraft.
* Section 91.113, Right-of-Way Rules: Except Water Operations.
* Section 91.115, Right-of-Way Rules: Water Operations.
* Section 91.126, Operating On or In The Vicinity of an Airport in Class G Airspace.
* Section 91.127, Operating On or In The Vicinity of an Airport in Class E Airspace.
* Section 91.129, Operations in Class D Airspace.
* Section 91.130, Operations in Class C Airspace.
* Section 91.135, Operations in Class A Airspace.
* Section 91.155, Basic VFR Weather Minimums.
* Section 91.157, Special VFR Weather Minimums.
* Section 91.180, Operations Within Airspace Designated as Reduced Vertical Separation Minimum Airspace.
* Section 91.203, Civil Aircraft: Certifications Required.
* Section 91.215, ATC Transponder and Altitude Reporting Equipment and Use.
* Section 91.319, Aircraft Having Experimental Certificates: Operating Limitations.

#### **Title 49 of the Code of Federal Regulations (49 CFR):**

* Chapter I, Subchapter C, Hazardous Materials Regulations.
* Chapter VIII, Part 830, Notification and Reporting of Aircraft Accidents or Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records.
* Chapter XII, Part 1520, § 1520.5, Sensitive Security Information.

#### **Advisory Circulars (AC):**

* AC 00-1.1, Public Aircraft Operations.
* AC 91-57, Model Aircraft Operating Standards.
* AC 120-51, Crew Resource Management Training.
* AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers.
* AC 120-92, Safety Management Systems for Aviation Service Providers.

#### **FAA Directives:**

* FAA Order 8000.367, Aviation Safety (AVS) Safety Management System Requirements.
* FAA Order 8000.369, Safety Management System.
* FAA Order 8020.11, Aircraft Accident and Incident Notification, Investigation, and Reporting.
* FAA Order 8040.4 Safety Risk Management Policy.
* FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft.
* FAA Order 8900.1, Flight Standards Information Management System (FSIMS).
* FAA Order JO 1000.37, Air Traffic Organization Safety Management System.
* FAA Order JO 7110.65, Air Traffic Control.
* FAA Order JO 7210.3, Facility Operation and Administration.
* FAA Order JO 7400.8, Special Use Airspace.
* FAA Order JO 7610.4, Special Operations.
* FAA Notice N JO 7210.766, Unmanned Aircraft Operations in the National Airspace System (NAS).

#### **Other Documents:**

##### Title 47 of the Code of Federal Regulations (47 CFR) Part 300, National Telecommunications and Information Administration (NTIA) Manual, Chapter 7.11, Use of Frequencies by Certain Experimental Stations.

##### Title 49 of the United States Code (49 U.S.C.) § 40102(a)(41), Definitions; and § 40125, Qualifications for public aircraft status.

##### FAA Air Traffic Organization (ATO) Safety Management System Manual.

##### Memorandum of Agreement Concerning the Operation of Department of Defense Unmanned Aircraft Systems in the National Airspace System (DOD-FAA MOA).

##### Convention on International Civil Aviation (“Chicago Convention”). December 7, 1944, 61 Stat. 1180, 15 U.N.T.S. 295.

**16-1-3-5 through 16-1-3-29 RESERVED.**

# CHAPTER 16 UNMANNED AIRCRAFT SYSTEMS

# CHAPTER 1 BACKGROUND, ORGANIZATION, AND DEFINITIONS

## Headquarters/Regional ASI Interface, Tasks/Flows, and PTRS

### **1** **HEADQUARTERS/REGIONAL AVIATION SAFETY INSPECTOR (ASI) INTERFACE.** Reserved.

### **3** **TASKS/FLOWS.** Reserved.

### **5 PROGRAM TRACKING AND REPORTING SUBSYSTEM (PTRS).**

#### **Responsibilities.** All inspectors, managers, and supervisors are responsible for maintaining records currency. After completing an initial questionnaire and making the appropriate PTRS entry, all inspectors, including managers and supervisors, will be responsible for keeping their personal record current by entering any changes to the original information (such as additional type rating, training, team participation) in the record as necessary. The inspector should record the Record Identification Number of the PTRS entry so that future record updates can be made. (See Volume 1, Chapter 3, Section 1.)

#### **Recording Information.** Aviation safety inspectors (ASI) record information in the PTRS using activity numbers to identify specific activities and specialties conducted and required to accomplish Flight Standards Service (AFS) work programs involving aircraft. Unmanned aircraft (UA) have been identified by law and by the Federal Register (FR) as aircraft. The PTRS allows ASIs to include Unmanned Aircraft System (UAS) in their reporting and documentation in the PTRS. PTRS guidance is well documented in the most current version of the PTRS Procedures Manual (PPM) and remains the same for UAS with the following additional requirements:

##### All entries will use the standard PTRS codes, but will be followed by “/107” for the regulatory field, denoting UAS.

##### The aircraft registration number field is not a required field and is only used when the UAS has been assigned a registration number.

##### The “Make/Model/Series” field is not a required field and is only used when the UAS has been assigned a make, model, and series (M/M/S).

##### The “Equipment” field will be used for a UAS with no registration number (no Type Certificate Data Sheet (TCDS)) or no M/M/S identifier.

##### The “National Use” field will be a required field.

##### The “National Use” field will be populated as follows:

###### UAS (hyphen) followed by the type of operator (Public (P), Civil (C), or Military (M)), hyphen, and followed by the size (Large (L) or Small (S)). For example:

* UAS-M-L = UAS, Military operator, Large aircraft.
* UAS-P-L = UAS, Public operation, Large aircraft.
* UAS-C-S = UAS, Civil operator, Small aircraft.

###### The “Comment,” “Miscellaneous,” and “Trigger” fields are still available for use.

* + - 1. **through 16-1-4-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 2  Unmanned aircraft systems Certification

## Section 1 Public Aircraft Operations

### **16-2-1-1** **Public Aircraft Operations.** The Unmanned Aircraft Systems (UAS) operator or applicant must provide an airworthiness statement specifying compliance with the proponent’s applicable airworthiness criteria. Airworthiness statements must be provided on agency letterhead and include:

* The date the statement is effective,
* A signature of the responsible certifying authority within the agency,
* A point of contact (POC), and
* Any warnings/limitations.

#### **Airworthiness Statements.** Airworthiness statements are generally written for one UAS. If more than one UAS model is included on a single airworthiness statement, each UAS will be listed, and specific information for each UAS will be included in the statement. Airworthiness statements with an expiration date must remain current for the duration of the Certificate of Waiver or Authorization (COA), including extensions. If a new airworthiness statement is issued during the period the COA is active, a copy of the airworthiness certificate must be provided to the UAS Integration Office (AFS‑80).

#### **Acceptable Policy/Criteria.** Examples of acceptable policy/criteria include, but are not limited to, the current editions of:

* Department of Defense (DOD) Handbook, MIL‑HDBK‑516B, Airworthiness Certification Criteria;
* Air Force Policy Directive (AFPD) 62-6, USAF Airworthiness;
* Army Regulation (AR) 70-62, Airworthiness Qualification of Aircraft Systems; and
* Naval Air Systems Command Instruction (NAVAIRINST) 13034.1 Series, Flight Clearance Policy for Air Vehicles and Aircraft Systems.

### **16-2-1-3 UAS Airworthiness.** All UASs must be in an Airworthy condition to conduct flight operations in the National Airspace System (NAS). An “Airworthy condition for UAS subject to a COA” means that the UAS meets the applicable standards and requirements of its operating agency. The Federal Aviation Administration (FAA) recognizes that some of the requirements can differ from those for manned aircraft, and appropriate changes can be defined. As with airworthiness standards, maintenance technician requirements will be addressed as part of the review process.

* + - 1. **through 16-2-1-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 2  unmanned aircraft systems Certification

## Reserved

* + - 1. **through 16-2-2-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 2  unmanned aircraft systems Certification

##  Civil Aircraft Operations

### 16-2-3-1 **Civil Aircraft Applicants.** Approvals for civil applications using the Special Airworthiness Certificate process receive their airworthiness certification from the Federal Aviation Administration (FAA).

### **16-2-3-3 Airworthiness Determination.** Civil applicants may apply for a Special Airworthiness Certificate from the FAA. The applicant is required to submit the requisite data to support a determination that the aircraft and its systems, including the control station (CS), are designed, built, and maintained in a safe and Airworthy condition.

### **16-2-3-5 Special Airworthiness Certificate Issuance.** Special Airworthiness Certificates are typically issued to proponents wishing to conduct Unmanned Aircraft Systems (UAS) research and development (R&D), crew training, and market surveys under Title 14 of the Code of Federal Regulations (14 CFR) part 21, § 21.191. The FAA also issues special flight permits (SFP) for production flight testing of UAS under § 21.197. Additionally, Special Airworthiness Certificates for Restricted category aircraft may be issued for special purpose operations including agricultural spraying, aerial surveying, pipeline patrolling, and other operations specified by the FAA under § 21.25. Special Airworthiness Certificates are issued in accordance with the current edition of FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft. Refer to Order 8130.34 for indepth information on Special Airworthiness Certificates.

1. Aircraft registration requirements remain unchanged.

### **16-2-3-7 Operations with both a Certificate of waiver OR AUTHORIZATION (COA) and Special Airworthiness Certificate.** In cases where an operator has been issued a Special Airworthiness Certificate and is concurrently eligible to operate a corresponding UAS on a COA as a public aircraft operation, the operator must elect, prior to each flight, which authority is to be used to conduct the flight.

### **16-2-3-9 General Process for Civil UAS Operations.** For civil UAS operations, the Aircraft Certification Service, Production and Airworthiness Division (AIR‑200), at FAA headquarters (HQ) is responsible for the issuance of Special Airworthiness Certificates, according to Order 8130.34. The issuance of a Special Airworthiness Certificate is coordinated with AIR‑200, the UAS Integration Office (AFS‑80), the Air Traffic Organization (ATO) component of AFS‑80, and Aviation Safety (AVS) at the HQ and regional levels. The FAA conducts a thorough review to evaluate the system’s airworthiness and operational specifications. In addition, the FAA reviews and accepts mitigations developed by the applicant to meet acceptable standards of safety.

### **16-2-3-11 UAS Airworthiness.** All UAS must be in an Airworthy condition to conduct flight operations in the National Airspace System (NAS). An “Airworthy condition for UAS subject to a COA” means that the UAS has been issued the appropriate type certificate (TC) from the Aircraft Certification Service (AIR) and/or meets the applicable standards and requirements of its operating agency, and is capable of operating in compliance with the applicable requirements in 14 CFR part 91. The FAA recognizes that some of the requirements can differ from those for manned aircraft, and appropriate changes can be defined. As with airworthiness standards, maintenance technician requirements will be addressed as part of the review process.

**16-2-3-13 through 16-2-3-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 2  unmanned aircraft systems Certification

## Standard Airworthiness (TBD)

* + - 1. **through 16-2-4-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 3  airworthiness

## Continuing Airworthiness Public and Civil Aircraft Operations

### **16-3-1-1 Continuing Airworthiness.**

#### **Public Aircraft.** Operators of Unmanned Aircraft Systems (UAS) used in public aircraft operations should follow their own agency’s procedures and guidelines to maintain continuing airworthiness at a level that ensures they continue to operate the aircraft safely.

#### **Civil Aircraft.** Applicants for civil UAS operational approvals must address continuing airworthiness procedures as part of their application. Civil UASs should be maintained and must conform to the same airworthiness standards defined in the Title 14 of the Code of Federal Regulations (14 CFR) parts under which the UASs are intended to be operated. It is highly recommended that all UAS applicants provide the following information:

##### A Continuing Airworthiness Program.

##### A maintenance training program.

##### Any unique skill sets or maintenance practices relating to their aircraft and/or aircraft operations that may be outside the current scope and practices of manned aviation.

##### A process to report any applicable data relating to the operation and maintenance of the UAS.

* + - 1. **through 16-3-1-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 4  airmen Certification

## Section 1 Pilots

### **16-4-1-1 General Personnel Qualifications.** This chapter addresses the qualifications of all Unmanned Aircraft Systems (UAS) flightcrew members, observers, maintainers, and other personnel, as appropriate. All references to a pilot certificate or Federal Aviation Administration (FAA) written examination refer to an FAA-issued private pilot certificate, a higher certification, or an FAA-recognized equivalent.

### **16-4-1-3 UAS Pilot Qualifications.** The FAA is focused on ensuring that UAS pilots have an appropriate level of understanding of the Title 14 of the Code of Federal Regulations (14 CFR) sections applicable to the airspace where UAS operate. UAS pilots are responsible for controlling their aircraft to the same standards as the pilot of a manned aircraft. Civil UAS pilots may be required to have instruction by an FAA-certificated flight instructor (CFI).

1. UAS pilot time may not be used to meet the aeronautical experience requirements towards the issuance of a pilot certificate under 14 CFR part 61.

#### **UAS General Operational Requirements.** The following operational requirements apply to all UAS pilots:

##### One pilot in command (PIC) must be designated at all times.

##### The PIC of an aircraft is directly responsible for, and is the final authority of, the operation of that aircraft.

##### Each PIC controls only one unmanned aircraft (UA) at a time.

##### Pilots are not allowed to perform concurrent duties both as the pilot and the visual observer (VO). In the case of Optionally Piloted Aircraft (OPA), the airborne pilot may assume the role of PIC at all times, but will only be the observer when the control station (CS) pilot operates the OPA.

##### Unless undergoing initial qualification training, pilots must be qualified on the aircraft being flown.

##### Only one PIC per aircraft is authorized, and the PIC must be in a position to assume control of the aircraft.

#### **PIC.**

##### The designated PIC:

###### Has been designated as PIC before or during the flight.

###### Is responsible for the UAS flight operation as described under 14 CFR part 91, § 91.3, or an FAA-recognized equivalent.

###### Is responsible for determining whether the UAS is in condition for safe flight.

###### Must land as soon as safely practical when any condition occurs that causes operations to be unsafe.

###### May be augmented by supplemental pilots; however, the PIC retains complete and overall responsibility of the flight, regardless of who may be piloting the aircraft.

###### Has the ability to assume the duties of an internal or an external UAS pilot at any point during the flight.

###### May rotate duties as necessary to fulfill operational requirements.

###### Must have a thorough knowledge of the Certificate of Waiver or Authorization (COA) issued to the organization when conducting a public aircraft operation, and must retain a copy to reference during flight.

###### Must be trained and qualified on the specific UAS for the conduct of the flight.

###### May assume the duties of VO or PIC if piloting an OPA when the OPA is being utilized as a UAS and being flown by the CS pilot.

##### Rating requirements for the UAS PIC depend on the type of operation conducted; they fall into two categories:

* Operations that require at least a private pilot certificate or FAA‑recognized equivalent, and
* Operations that do not require at least a private pilot certificate or FAA‑recognized equivalent.

##### The requirement for the PIC to hold a pilot certificate or FAA‑recognized equivalent is based on various factors including:

* The location of the planned operations,
* The mission profile,
* The size of the aircraft, and
* Whether or not the operation is conducted within or beyond Visual Line of Sight (VLOS).

##### The PIC must hold, at a minimum, an FAA private pilot certificate or FAA‑recognized equivalent for all operations listed below:

* All flight at or above 400 feet above ground level (AGL), including Class A, B, C, D, E, and G airspace.
* Instrument flight rules (IFR) (must have instrument rating) operations.
* Night operations.
* At joint‑use or public airfields.
* Requiring a chase aircraft.
* At any time the FAA has determined the need, based on the UAS characteristics, mission profile, or other operational parameters.

##### Operations without a pilot certificate may be allowed when all of the following conditions are met:

###### The PIC has successfully completed, at a minimum, FAA private pilot ground instruction and passed the FAA private pilot written examination or FAA‑recognized equivalents. (Airman Test Reports are valid for the 24 calendar‑month period preceding the month the individual completed the exam, at which time the individual must repeat the instruction and written examination.)

###### Operations are during daylight hours.

###### The operation is conducted in a noncongested location.

###### Operations are approved and conducted solely within VLOS in Class G airspace.

###### VLOS operations are conducted no further than one‑half nautical mile (NM) laterally from the UAS pilot at an altitude at or below 400 feet AGL at all times. See Volume 16, Chapter 1, Section 2, for the definition of VLOS.

###### Operations are conducted no closer than 5 NM from any FAA‑designated airport or heliport other than the airport from which the aircraft is operating.

###### The operation is conducted from a privately owned airfield, military installation, or off‑airport location.

##### The operators/applicants must provide documentation showing the pilots maintain an appropriate level of recent pilot experience in the UAS being operated or in a flight simulation training device (FSTD). At a minimum, the PIC must conduct three takeoffs (launch) and three landings (recovery) in the specific UAS within the previous 90 days, or as prescribed by the operator/applicant’s recurrent training and currency program. This does not apply when the PIC is not required to be involved in the launch and recovery of the UAS operation.

###### For those operations that require a certificated pilot, the PIC, to exercise the privileges of his or her certificate, must have flight reviews and maintain recent pilot experience in manned aircraft per part 61, as appropriate (or FAA‑accepted equivalent).

###### For flights approved for night operations, the PIC must conduct three takeoffs (launch) and three landings (recovery) each, in the specific UAS at night, to a full stop in the previous 90 days.

###### For operations approved for night or IFR, the PIC must maintain recent pilot experience per part 61, § 61.57 or an FAA-accepted equivalent, as applicable.

##### The PIC must maintain, at a minimum, a valid FAA second‑class medical certificate issued under 14 CFR part 67, or the FAA-recognized equivalent. The second‑class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate listed in § 61.23.

##### Section 91.17 or an FAA-recognized equivalent applies to all UA crewmembers.

##### In addition to the training required for a pilot certificate, UAS PICs must have the following additional training (or FAA-recognized equivalent):

* Normal, abnormal, and emergency procedures in all specific details of the UAS being operated;
* Manufacturer-specific training;
* Demonstrated proficiency; and
* Testing in the UAS being operated.

###### Operators/applicants must maintain individual training records of all UAS personnel.

###### All training and testing will be documented in the individual’s training record by the instructor and initialed by the trainee.

#### **Supplemental Pilots.** Supplemental pilots are those pilots assigned UAS flight duty to augment the PIC. It is common for operators to have both an internal and an external UAS pilot. The supplemental pilot can assume either of these positions.

##### **Ratings.** Supplemental pilots must have, at a minimum, successfully completed private pilot ground school and passed the written test or FAA-recognized equivalents. The ground school written test results are valid for 2 years from the date of completion, at which time the individual must repeat the instruction and written examination. If a supplemental pilot assumes the role of PIC, he or she must comply with the PIC rating, currency, medical, and training requirements listed in subparagraph 16‑4‑1‑3B.

##### **Recent Pilot Experience.** The operator/applicant must provide a process that ensures that pilots maintain an appropriate level of recent pilot experience for the position they are assigned in the UAS being operated.

##### **Medical.** Supplemental pilots must maintain, at a minimum, a valid FAA second‑class medical certificate issued under part 67 or the FAA-recognized equivalent. The second‑class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate, according to § 61.23. Section 91.17, or an FAA-recognized equivalent, applies to all UAS crewmembers.

##### **Training.**

###### UAS supplemental pilots must have:

* Training in all specific details of the UAS being operated, including normal, abnormal, and emergency procedures;
* Manufacturer-specific training (or an FAA-recognized equivalent); and
* Demonstrated proficiency and successful testing in the UAS being operated.

###### Operators/applicants must maintain individual training records for all UAS personnel. The instructor must document and the trainee must initial all training.

* + - 1. **through 16-4-1-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 4  airmen Certification

## Flight Instructors (TBD)

* + - 1. **through 16-4-2-29 RESERVED.**

# VOLUNE 16 Unmanned aircraft systems

# chapter 4  airmen Certification

## Mechanics

### **16-4-3-1 General Maintenance Personnel Qualifications.**

#### **Maintenance Ratings.** Ratings will be established as more data is collected and a regulatory guideline is developed.

#### **Recent Maintenance Experience.** It is suggested that operators/applicants follow applicable guidelines of Title 14 of the Code of Federal Regulations (14 CFR) part 65, § 65.83, as appropriate, until final Unmanned Aircraft Systems (UAS) regulatory guidelines are available.

#### **Maintenance Medical Requirements.** At a minimum, the requirements of 14 CFR part 91, § 91.17 or a Federal Aviation Administration (FAA)‑recognized equivalent must be met. No additional medical requirements have been defined at this time.

#### **Maintenance Training.** It is highly recommended that an operator of a UAS submit a training program. This requirement will be further defined as more data is collected and the regulatory process affects these guidelines.

* + - 1. **through 16-4-3-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 4  AIRMEN Certification

## Visual Observers and Other Personnel

### **16-4-4-1 General Qualifications.** All observers must have an understanding of the Title 14 of the Code of Federal Regulations (14 CFR) parts applicable to the airspace where the Unmanned Aircraft Systems (UAS) will operate. Observers are considered crewmembers. Observers must not perform crew duties for more than one UAS at a time. Observers are not allowed to perform concurrent duties both as UAS pilot and observer.

#### **Medical.** All observers must have a valid Federal Aviation Administration (FAA) second-class medical certificate issued under 14 CFR part 67; an FAA-recognized equivalent is an acceptable means of demonstrating compliance with this requirement. The second-class medical certificate expires at the end of the last day of the 12th month after the month of the date of the examination shown on the medical certificate. Title 14 CFR part 91, § 91.17, or an FAA‑recognized equivalent, applies to all UAS crewmembers.

#### **Training.** Observers must complete sufficient training to communicate to the pilot any information required to remain clear of conflicting traffic, terrain, and obstructions; maintain proper cloud clearances; and provide navigational awareness. This training, at a minimum, must include knowledge of:

##### Their responsibility to assist pilots in complying with the requirements of:

* Section 91.111, Operating Near Other Aircraft;
* Section 91.113, Right-of-Way Rules: Except Water Operations;
* Section 91.115, Right-of-Way Rules: Water Operations;
* Section 91.119, Minimum Safe Altitudes: General; and
* Section 91.155, Basic VFR Weather Minimums.

##### Air traffic and radio communications, including the use of approved air traffic control (ATC)/pilot phraseology.

##### Appropriate sections of the Aeronautical Information Manual (AIM).

### **16-4-4-3 Other UAS Personnel Qualifications.** Ancillary personnel, such as Systems Operators (SYSOP) or mission specialists, must be thoroughly familiar with and possess operational experience of the equipment being utilized. If the systems being utilized are for observation and detection of other aircraft for collision avoidance purposes, personnel must be thoroughly trained on collision avoidance procedures and techniques and have direct communication with the UAS pilot, observer, and other applicable personnel.

* + - 1. **through 16-4-4-29 RESERVED.**

# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 5 Operational Requirements and approval

## Section 1 Public and Civil Operations

### **16-5-1-1** **APPLICATIONS.** The Federal Aviation Administration (FAA) accepts applications for a Certificate of Waiver or Authorization (COA) from entities that intend to conduct public, civil, or commercial aircraft operations. An application may be referred to the FAA Operations Law Branch (AGC-220) for determination of the status of an applicant as a government entity under the public aircraft statute. The FAA will only accept COA applications for civil and commercial operations for aircraft that have received an airworthiness certificate from the Aircraft Certification Service (AIR). The duration of COAs complies with the time limitations specified under the current edition of FAA Order JO 7210.3, Facility Operation and Administration. COAs may be issued for a lesser duration if requested or deemed appropriate. COAs are not required for public operations conducted within active restricted or warning area airspace designated for aviation use, or approved prohibited areas with permission from the appropriate authority or using agency of that airspace. (Refer to the current edition of FAA Order JO 7400.8, Special Use Airspace.) Figure 16-5-1-1A, UAS COA Requirement Flowchart, is a visual reference tool designed to assist in determining COA requirements for civil and public Unmanned Aircraft Systems (UAS) operations. Contact the UAS Integration Office (AFS-80) if necessary for additional guidance.

### **16-5-1-3 APPROVING AND REVIEWING AUTHORITY.** AFS‑80 is responsible for determining whether the applicant can conduct the proposed UAS operations safely and responsibly in the National Airspace System (NAS), and that they comply with all COA requirements.

#### **COA Cancellation.** In accordance with Order JO 7210.3, “As a general rule, a waiver or authorization should be canceled when it is no longer required or there is an abuse of its requirements or unforeseen safety factors develop. Failure to comply with the waiver or authorization is cause for cancellation.”

#### **Conditions to Cancel or Suspend COA.** The FAA has the authority to suspend or cancel the COA, or to delay any activities, if there is a violation of the terms in the COA, or if the safety of persons or property on the ground or in the air is determined to be in jeopardy. That may include, but is not limited to:

##### Incidents or accidents occurring during UAS operations in the NAS.

##### Habitual noncompliance with administrative requirements, such as failure to provide the FAA with monthly reports on the number of flights, pilot duty time, or unusual equipment malfunctions (e.g., a malfunction or failure of ground control station (GCS) flight control hardware or software (other than loss of control link); a powerplant failure or malfunction; or a deviation from any provision contained in the COA).

##### Deviations from air traffic control (ATC) instructions, or operational or coordination issues.

##### Events of intermittent or persistent lost link as described in the COA or events determined to pose as a risk to the safety of the NAS.

#### **Event Response.** COA suspensions and cancellations are not automatic. Whenever possible, a documented conversation between the FAA and the operator will happen before the suspension/cancellation is issued. Timely and transparent responses to accidents, deviations, and similar safety-related events are expected.

### **16-5-1-5 GENERAL COA PROCESS.** The Air Traffic Organization (ATO) and Flight Standards (AFS) components of AFS‑80 are jointly responsible for the COA process. Applications can be made two ways:

#### **Online Application.** On the Internet using the UAS COA online system at https://ioeaaa.faa.gov. The UAS COA online system requires a user name and password; it provides a support desk phone number and email address to assist with obtaining an account.

#### **Mail‑in Application.** Using FAA Form 7711-2, Application for Certificate of Waiver or Authorization, available online at http://www.faa.gov/documentLibrary/media/Form/FAA\_Form\_7711-2.pdf. Mail the completed form to: FAA Headquarters, Unmanned Aircraft Systems Integration Office, 490 L’Enfant Plaza SW, Suite 3200, Washington, DC 20024. Mail submittal may encounter significant delay due to current U.S. Postal Service security screening procedures in place.

### **16-5-1-7 OPERATIONAL REVIEW.** Prior to issuance of a COA, air traffic specialist components of AFS‑80 conduct an operational validation that addresses ATC processes. Next, an aviation safety inspector (ASI) evaluates each application to determine if risks to the NAS associated with the operation have been acceptably mitigated. Both the ASI and ATC requirements are merged into the final COA.

### **16-5-1-9 NATIONAL SECURITY CONSIDERATIONS.** When appropriate levels of Department of Defense (DOD) or Department of Homeland Security (DHS) declare a UAS operation to be a matter of national security, the FAA may approve an application for a COA which, under normal circumstances, might not otherwise conform to the guidelines set forth in this volume. In this case, national security may override risk‑mitigation requirements. Such requests to the FAA Administrator will originate from an equivalent level of authority from the operator’s parent organization.

Figure 16-5-1-1A. UAS COA Requirement Flowchart



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# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 5 Operational Requirements and approval

## Reserved

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# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 5 Operational Requirements and approval

## General Operational Requirements

### **16-5-3-1 GENERAL APPLICABILITY AND REQUIREMENTS.** This section applies to Unmanned Aircraft System (UAS) operations conducted in the National Airspace System (NAS) other than in active restricted and warning areas designated for aviation use or approved prohibited areas. The Federal Aviation Administration (FAA) requires aircraft to operate safely among all users of the NAS, including noncooperative aircraft (e.g., aircraft operated without a transponder), and other airborne operations not reliably identifiable by air traffic control (ATC) radar (e.g., balloons, gliders, parachutists). Unless otherwise specifically authorized, UAS operators must use observers, either airborne or ground-based, to comply with Title 14 of the Code of Federal Regulations (14 CFR) part 91 requirements.

### **16-5-3-3 RISK MITIGATION.** While considerable work is ongoing to develop a certifiable detect, sense, and avoid system (DSA) as an alternative method of compliance (AMOC) with the “see‑and‑avoid” aspect of part 91, §§ 91.113 and 91.115, no current solution exists. (At a high level, DSA can be defined as: Detect-is something there? Sense-is it a threat/target? Avoid‑maneuver to miss.) As a result, compliance with the see-and-avoid requirement and navigational awareness (a subset of situational awareness (SA)) are primary concerns in UAS operational approvals leading to imposition of AMOC. Risk mitigation for these two issues is normally based on the use of observers or other methods of maintaining flight separation and collision avoidance or “segregation”; however, they may also include other concepts or systems that an operator/applicant may propose for FAA review. The FAA only approves UAS flight operations that can be conducted at an Acceptable Level of Safety (ALoS). Refer to the current editions of:

* Advisory Circular (AC) 120-92, Safety Management Systems for Aviation Service Providers;
* FAA Order VS 8000.367, Aviation Safety (AVS) Safety Management System Requirements;
* FAA Order 8000.369, Safety Management System; and
* FAA Order 8040.4, Safety Risk Management Policy.
1. Risk mitigations that depend on the establishment of new types and categories of airspace are extremely difficult and time consuming. The NAS is established and configured through a rigorous regulatory process. Risk mitigations that result in the prohibition of the public’s right to transit airspace will require a very long lead time with no guarantee that they will be approved.

#### **See-and-Avoid Strategies.** Operators/applicants proposing see-and-avoid strategies in lieu of visual observers (VO) are required to support proposed mitigations with system safety cases which indicate the operations can be conducted safely. Acceptable system safety cases must include a hazard analysis, risk assessment, and other appropriate documentation that identifies the level of risk.

#### **Risk Mitigation Responsibility.** It is the operator/applicant’s responsibility to demonstrate that the risk of injury to persons or property along the flight path is appropriately mitigated. Aircraft with performance characteristics that impede, delay, or divert other normal air traffic operations may be restricted in their operations.

### 16-5-3-5 **SYSTEM CONSIDERATIONS FOR UASs.**

#### **Traffic Alert and Collision Avoidance Systems (TCAS).** The use of TCAS by UASs has not been validated as an acceptable alternative for see-and-avoid requirements, and is not an approved means of mitigation for UAS see-and-avoid requirements or strategies.

#### **Onboard Cameras/Sensors.** Although onboard cameras and sensors positioned to observe targets on the ground have demonstrated some capability, their use in detecting airborne operations for the purpose of segregation is still quite limited. To date, these types of systems have not been approved as a sole mitigation in the see-and-avoid risk assessment.

#### **Use of Equipment in Lieu of VOs.**

##### Any equipment proposed for use on UAS to accomplish the function of see‑and‑avoid in lieu of VOs must:

###### Be certified as an aircraft system and equipment using standards, requirements, and processes commensurate with installation of equipment in aircraft by a recognized airworthiness authority.

###### Meet the requirements of 14 CFR part 25, § 25.1309, or equivalent process, for any UAS installation, regardless of its size, performance, or maximum takeoff weight (MTOW).

1. For other equipment that is not proposed for use in meeting see‑and‑avoid requirements, 14 CFR part 23, § 23.1309, or an equivalent process, should be used.

##### It is the responsibility of the operator/applicant to show that the contemplated standards, requirements, and processes meet an ALoS.

#### **Radar and Other Sensors.** If the operator/applicant utilizes special types of radar systems or other sensors to mitigate risk, they must provide supporting data which demonstrates the following can be accomplished safely:

##### Both cooperative and noncooperative traffic can be detected and tracked to ensure appropriate separation and collision avoidance.

##### The proposed system can effectively mitigate a potential collision.

##### Operators are suitably trained and equipped to use them effectively.

##### Procedures are in place for the pilot in command (PIC) to effectively use the data.

#### **Lost Link Points (LLP).**

##### LLPs are defined as a point, or sequence of points, where the aircraft will proceed and hold at a specified altitude, for a specified period of time, in the event the command‑and‑control link to the aircraft is lost. The aircraft utilize high levels of automation to hold, or loiter, at the LLP until the control link with the aircraft is restored or the specified time elapses. If the time period elapses, the aircraft may autoland, proceed to another LLP in an attempt to regain the control link, or proceed to a Flight Termination Point (FTP) for flight termination. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is reestablished or fuel exhaustion occurs.

##### For areas where multiple or concurrent UAS operations are authorized in the same operational area, a segregation plan must be in place in the event of a simultaneous lost link scenario. The deconfliction plan may include altitude offsets and horizontal separation by using independent LLPs whenever possible.

#### **Flight Termination System (FTS).** It is highly desirable that all UASs have system redundancies and independent functionality to ensure the overall safety and predictability of the system. UASs that lack these characteristics may be required to have an FTS whose architecture and activation are independent of the UAS system and can be activated automatically or manually by the UAS PIC to safeguard the public.

#### **Spectrum Authorization.**

##### Every UAS operator must have the appropriate National Telecommunications and Information Administration (NTIA) or Federal Communications Commission (FCC) authorization/approval to transmit on the radio frequencies (RF) used for UAS uplink and downlink of control, telemetry, and payload information.

##### Non-Federal public agencies, such as universities and State/local law enforcement, and all civil UAS operators generally require a license from the FCC as authorization to transmit on frequencies other than those in the unlicensed bands (900 megahertz (MHz), 2.4 gigahertz (GHz), and 5.8 GHz). This generally will be in the form of an experimental radio license or a special temporary authority (STA) issued by the FCC. Non-Federal public agencies and civil UAS operators that operate systems using frequencies assigned to the Federal government (e.g., the Department of Defense (DOD)) must demonstrate they have the proper authorization through FCC-issued documentation.

##### DOD agencies will typically demonstrate UAS spectrum authorization through an STA issued by the NTIA or a frequency assignment in the NTIA-administered Government Master File (GMF). Authorizations issued under Title 47 of the Code of Federal Regulations (47 CFR) part 300, in the NTIA Manual, Chapter 7, paragraph 7.11, Use of Frequencies by Certain Experimental Stations, are not appropriate for UAS operations.

##### Federal public agencies other than the DOD, such as the National Aeronautics and Space Administration (NASA), the U.S. Coast Guard (USCG), and the U.S. Customs and Border Protection (USCBP), also need an STA issued by NTIA or a frequency assignment in the NTIA‑administered GMF. This is especially important for systems designed to operate on frequencies assigned to the DOD.

### **16-5-3-7 OPERATIONAL REQUIREMENTS FOR UASs.** Unless operating in an active restricted or warning area designated for aviation use, or approved prohibited areas, UAS operations must adhere to the following requirements.

#### **Observer Requirement.** Visual flight rules (VFR) UAS operations may be authorized utilizing either ground-based or airborne VOs on board a dedicated chase aircraft. A VO must be positioned to assist the PIC to exercise the see-and-avoid responsibilities required by §§ 91.111, 91.113, and 91.115 by scanning the area around the aircraft for potentially conflicting traffic and assisting the PIC with navigational awareness.

##### VOs must:

###### Assist the PIC in not allowing the aircraft to operate beyond the Visual Line of Sight (VLOS) limit.

###### Be able to see the aircraft and the surrounding airspace sufficiently to assist the PIC with:

* Determining the unmanned aircraft’s (UA) proximity to all aviation activities and other hazards (e.g., terrain, weather, and structures);
* Exercising effective control of the UA;
* Complying with §§ 91.111, 91.113, and 91.115; and
* Preventing the UA from creating a collision hazard.

###### Inform the PIC before losing sufficient visual contact with the UA or previously sighted collision hazard. This distance is predicated on the observer’s normal vision.

1. Normal vision may include use of corrective lenses, spectacles, and contact lenses as necessary.

##### Because of field of view (FOV) and distortion issues with aids to vision such as binoculars, field glasses, night‑vision devices, or telephoto lenses, these are allowed only for augmentation of the observer’s visual capability; they cannot be used as the primary means of visual contact. When using other aids to vision, VOs must use caution to ensure the aircraft remains within normal VLOS of the observer. These aids to vision are not to be confused with corrective lenses or contact lenses, which do not alter the FOV or distort vision.

##### The responsibility of ensuring the safety of flight and adequate visual range coverage to avoid any potential collisions remains with the PIC. The PIC for each UAS operation must identify a location from which the observer will perform his/her duties. This location will be selected to afford the best available view of the entire area within which the operation is to be conducted.

##### Daisy-chaining of observers to increase operational distance is not normally approved; however, an operator or applicant may provide a safety case for daisy-chaining in accordance with Volume 16, Chapter 7, by demonstrating an acceptable level of risk to the NAS.

##### Observer(s) must be in place 30 minutes prior to night operations to ensure dark adaptation. See subparagraph 16-5-3-7I.

#### **ATC Communications Requirements.**

##### The UAS pilot must establish and maintain direct two-way radio communication with appropriate ATC facilities anytime:

###### The aircraft is being operated in Class A or D airspace (under § 91.135 or 91.129) or, when required, in Class E and G airspace (under § 91.127 or 91.126). See subparagraph 16-5-3-7Q for operations in Class B or C airspace.

###### The aircraft is being operated under instrument flight rules (IFR).

###### It is stipulated under the requirements of any issued FAA authorizations.

##### It is preferred that communications between the UAS pilot and ATC be established through onboard radio equipment to provide a voice relay; however, for IFR flight this method of transmission is required.

#### **Intercommunications Requirements.** Any VO, sensor operator, or other person charged with providing see-and-avoid assistance must have immediate communication with the UAS pilot. If a chase aircraft is being utilized, immediate communication between the chase aircraft and the UAS pilot is required at all times. If the UAS pilot is in communication with ATC, monitoring of the ATC frequency by all UAS crewmembers (pilots, observers, and chase pilots) is recommended for shared situational and navigational awareness. However, unless it is approved for others to do so, the UAS PIC or the supplemental pilots are the only crewmembers that will communicate with ATC.

#### **Electronic Devices.** The use of electronic devices (including cell phones) other than for UAS flight- and mission-required usage is governed by § 91.21, which ensures these devices do not interfere with the UAS systems. The use of electronic devices (including cell phones) is not authorized for primary communication with ATC unless authorized by a Certificate of Waiver or Authorization (COA), or Special Airworthiness Certificate operating limitations.

#### **Dropping Objects/Expendable Stores or Hazardous Materials (Hazmat).** If the intended UAS operation includes the carriage, dropping, or spraying of aircraft stores outside of active restricted or warning area airspace designated for aviation use, or approved prohibited areas, the operator/applicant must ensure that specific approval is listed in the COA (or Special Airworthiness Certificate operating limitations), all operational risks have been sufficiently mitigated as required by § 91.15, and the hazmat requirements in Title 49 of the Code of Federal Regulations (49 CFR) have been met. The operator/applicant must provide to the FAA acceptable procedures for hung stores and loss of control link while carrying stores. A similar case must be made for hazmats carried aboard the aircraft and, if approved, will be listed in the special provision section of the COA, or Special Airworthiness Certificate operating limitations.

#### **Flight Over Congested Areas.** Routine UAS operations are prohibited over congested areas, except where the level of airworthiness allows. UAS operations may be approved in emergency or national disaster relief situations if the proposed mitigation strategies are found to be acceptable. See Volume 16, Chapter 1, Section 2, for the definition of a congested area.

#### **Aviation Event/Air Show.** An operator is required to provide a safety case in accordance with Volume 16, Chapter 7, that demonstrates an ALoS and must receive a separate aviation event/air show waiver in accordance with this order.

#### **Flight Over Heavily Trafficked Roads or Open-Air Assembly of People.** UAS operations must avoid these areas, except where the level of airworthiness allows. If flight in these areas is required, the operator/applicant is required to support proposed mitigations with system safety cases that indicate the operations can be conducted safely. Acceptable system safety cases must include information in Volume 16, Chapter 7, Section 1. Additionally, it is the operator/applicant’s responsibility to demonstrate that risk of injury to persons or property along the flight path has been mitigated. UASs with performance characteristics that impede, delay, or divert other air traffic operations may be restricted in their operations. Refer to AC 120-92 and Order 8000.369.

#### **Day/Night Operations.**

##### **Day Operations.** UAS operations outside of Class A airspace, active restricted or warning areas designated for aviation use, or approved prohibited areas, will be conducted during daylight hours unless otherwise authorized.

##### **Night Operations.**

###### Night operations may be considered if the operator/applicant provides a safety case and sufficient mitigation to avoid collision hazards at night.

###### UAS night operations are those operations that occur between the end of evening civil twilight and the beginning of morning civil twilight, as published in the American Air Almanac, converted to local time. (This is equal to approximately 30 minutes after sunset until 30 minutes before sunrise, except in Alaska.) External pilots and observers must be in place 30 minutes prior to night operations to ensure dark adaptation.

#### **Flights Below Class A Airspace.** All UAS operations outside of active restricted/warning/Sensitive Security Information (SSI) airspace designated for aviation use, or approved prohibited areas must be conducted in visual meteorological conditions (VMC) if using ground or airborne VOs. In addition, the following weather requirements apply:

##### If on IFR flight, remain clear of clouds. This requirement does not relieve the PIC from following the ATC clearance. According to § 91.3, the PIC retains responsibility for, and is the final authority as to, the operation of that aircraft.

##### If on VFR flight, maintain § 91.155 VFR cloud clearances, except in Class G airspace, where Class E airspace visibility requirements must be applied, but not less than 3 statute miles (sm) in-flight visibility.

###### Special VFR is not permitted.

###### For chase aircraft, no less than 5 sm in-flight visibility.

#### **Automation in UAS Operations.** Although it is possible to have a completely manual (direct pilot intervention) UAS, the majority of UASs utilize high levels of automation to a certain degree. Only those UASs which have the capability of direct pilot intervention will be allowed in the NAS outside of active restricted or warning areas designated for aviation use, or approved prohibited areas. Because the pilot may be technically considered out-of-the-loop in a lost link scenario, this restriction does not apply to UAS operating under lost link.

#### **Operations from Nonconventional Airport Locations.** In most cases, a nonconventional airport location should be situated no closer than 5 nautical miles (NM) from any airport or heliport. The operational areas, including the launch and recovery zones, should be free from obstructions; reasonable efforts should be made to keep operations away from structures.

#### **Crew Resource Management (CRM).** Operators must train all UAS crewmembers in CRM. The current edition of AC 120-51, Crew Resource Management Training, or an FAA‑recognized equivalent applies to UAS operations. Operators must implement the recommended training and procedures included in AC 120-51, or in an FAA-recognized equivalent. The PIC of a UAS must ensure no activities other than those duties required for safe flight operation are performed. No UAS crewmember may engage in any activities unrelated to those required for safe operation of the UAS during critical phases of flight such as launch/takeoff and landing/recovery.

#### **Sterile Cockpit.** Operators must comply with the current edition of AC 120-71, Standard Operating Procedures for Flight Deck Crewmembers, or the FAA-recognized equivalent, for ensuring the PIC implements sterile cockpit procedures. During critical phases of flight, including all ground operations involving taxi (movement of an airplane under its own power on the surface), takeoff, and landing, and all other flight operations in which safety or mission accomplishment might be compromised by distractions, no crewmember may perform any duties not required for the safe operation of the aircraft. No crewmember may engage in, nor may any PIC permit, any activity during a critical phase of flight which could distract any crewmember from the performance of his or her duties or interfere in any way with the proper conduct of those duties.

#### **Operating Under IFR.** While operating on an instrument flight plan, the following must exist, be completed, or be complied with:

##### The PIC must hold a current instrument rating or an FAA-recognized equivalent.

##### The aircraft’s airworthiness signature statement for flight release (not airworthiness document) must include IFR flight and indicate that all equipment required for IFR operations is certified and working (including pitot-static and transponder checks).

##### Applicable navigation database and charts are current and available to the UAS pilot.

##### An IFR flight plan is filed.

##### An ATC clearance has been obtained and all clearances must be followed.

##### Direct two-way radio communication between the UAS pilot and ATC is established and maintained. (A communication relay through the aircraft may be required.)

##### Alternate communication capabilities with ATC for the purpose of lost link and/or lost communication are designated and operational during all phases of flight.

##### The UAS is equipped with a certified operating mode C (mode S preferred) transponder.

##### ATC radar services are obtained throughout the portion of the flight in Class A airspace whenever possible (overwater nonradar operations may be allowed in the COA, or Special Airworthiness Certificate operating limitations).

##### The PIC must have received an ATC clearance to deviate when operating outside of Class A airspace, and all active restricted, prohibited, warning areas, or SSI airspace designated for aviation use.

##### VOs are not required in Class A airspace unless stipulated in the COA, or Special Airworthiness Certificate operating limitations.

1. According to § 91.3, the PIC retains responsibility for, and is the final authority as to, the operation of that aircraft.

#### **Chase Aircraft Operations.** The chase aircraft:

##### Must remain at a safe distance from the UA to ensure collision avoidance if a malfunction occurs.

##### Must remain close enough to the UA to provide visual detection of any conflicting aircraft and advise the PIC of the situation.

##### Must remain within radio control range of the UA to maintain appropriate signal coverage for flight control or activation of the FTS, for all operations when the UA is being flown by a pilot in the chase aircraft.

##### May be required to have communication with appropriate ATC facilities based on the operator’s application or mission profile.

##### Is not required by FAA in active restricted or warning area airspace designated for aviation use, or approved prohibited airspace.

##### Is not required for Optionally Piloted Aircraft (OPA) if a qualified VO is on board.

##### Is not required in Class A airspace unless stipulated in the COA or Special Airworthiness Certificate operating limitations.

##### Operations must be conducted in accordance with the special provisions listed in the approved COA or Special Airworthiness Certificate operating limitations.

##### Must maintain 5 sm in-flight visibility restrictions.

##### Pilot/observer:

###### Will not concurrently perform either observer or UAS pilot duties along with chase pilot duties unless otherwise authorized.

###### Must maintain direct voice communication with the UAS pilot.

##### Pilots operating as a formation flight will immediately notify ATC if they are using a nonstandard formation. Nonstandard formations must be preapproved by ATC. Operators will adhere to the current edition of FAA Order JO 7610.4, Special Operations, as applicable. See Volume 16, Chapter 1, Section 2, for definitions of standard and nonstandard formations.

##### Operations will not be conducted in instrument meteorological conditions (IMC).

##### Operations will be thoroughly planned and briefed.

##### During a lost link situation, the pilot must be notified immediately along with ATC. The chase pilot will report to ATC that the UA is performing lost link procedures as planned or if deviations are occurring.

##### Pilot will ensure safe separation with the UA, and immediately notify ATC and the UA PIC during loss of visual contact with the UA by both the chase pilot and observer, when such contact cannot be promptly reestablished. The UA PIC will either execute lost link procedures to facilitate a rejoin, recover the UA, or terminate the flight as appropriate.

#### **Airspace Considerations by Airspace Designation.**

1. UASs operating in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace must comply with § 91.180.

##### **Class A.** Observers are not normally required in Class A. All UASs must be operating under IFR and on an instrument flight plan. UAS operations approved for Class A must comply with § 91.135.

##### **Class B.** UAS operations are currently not authorized. Class B airspace contains terminal areas with the highest density of manned aircraft in the NAS. On a case-by-case basis, the FAA may consider exceptional circumstances. For public aircraft, a letter of agreement (LOA) between the affected ATC facility and the operator describing UAS segregation procedures is required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class B operations.

##### **Class C (and All Airspace from the Surface Upward to 10,000 Feet Mean Sea Level (MSL) Within 30 NM of an Airport Listed in Part 91 Appendix D, Section 1).** UAS operations approved for Class C must comply with §§ 91.130 and 91.215. Requests for operations without this equipment will be handled on a case‑by‑case basis and may be approved if sufficiently mitigated and a safety case has been established. For public aircraft, an LOA between the affected ATC facility and the operator describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class C operations.

##### **Class D.** Requests for approval will be handled on a case-by-case basis and may be approved if sufficiently mitigated and a safety case has been established. UAS operations approved for Class D must comply with § 91.129. For public aircraft, an LOA between the affected ATC facility and the operator describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class D operations.

##### **Class E.** If there is an operating ATC tower, Class D rules may apply. UAS operations approved for Class E must comply with § 91.127. For public aircraft, an LOA between the affected ATC facility and the operator describing UAS segregation procedures may be required. For civil aircraft, segregation procedures should be incorporated into the operating limitations. UAS operations must not impede, delay, or divert other Class E operations.

##### **Class G.** UAS operations approved for Class G must comply with § 91.126.

#### **ATC Visual Approach Clearances.** The UAS PIC must not accept a visual approach clearance, an instruction to follow another aircraft by visual means, or a clearance to maintain visual separation from another aircraft.

#### **In‑Flight Emergencies.**

##### The PIC will notify ATC of any in-flight emergency or aircraft accident as soon as practical.

##### The PIC will notify ATC of any loss of control link as soon as practical. Loss‑of‑control link scenarios may be handled by ATC as an emergency.

#### **Contingency Planning Limitations.** See Volume 16, Chapter 7.

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# VOLUME 16 Unmanned Aircraft Systems

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## Emergency and National Disaster Operations

### **16-5-4-1 PURPOSE AND NATIONAL SECURITY CONSIDERATIONS.** When appropriate levels of the Department of Defense (DOD) or Department of Homeland Security (DHS) declare a Unmanned Aircraft System (UAS) operation to be a matter of national security, the Federal Aviation Administration (FAA) may approve an application for a Certificate of Waiver or Authorization (COA) which, under normal circumstances, might not otherwise conform to the guidelines set forth in this volume. In this case, national security may override risk mitigation requirements. Such requests to the FAA Administrator will originate from an equivalent level of authority from the applicant’s parent organization.

### **16-5-4-3 NATIONAL DISASTER COA.** Due to the unpredictability of national disasters, a national disaster COA is issued in two parts. In part 1 of the COA, the UAS Integration Office (AFS‑80) completes an evaluation, excluding the location of the disaster. All known information is inserted into a template and signed by the appropriate FAA authority. Once the specific location is identified, this information, along with the specific operation, is inserted into part 2 of the COA in the form of an attachment. Part 2 of the COA must then be signed by appropriate FAA authority, which completes and establishes a valid COA.

### **16-5-4-5 EMERGENCY COA.**

#### **Emergency COA Conditions.** The FAA may consider issuing an emergency UAS COA when all of the following conditions apply:

##### A situation exists that is defined as a condition of distress or urgency.

##### The proposed UAS is operating under a current, approved COA for a different purpose or location.

#### **Non-Emergency COAs.** Requests for UAS COAs that fall outside of these parameters will be processed through the normal online COA application process. Emergency UAS COAs will not be considered for:

* Demonstration flights;
* Flights to test capabilities;
* Training;
* Flights in Class B airspace; or
* Flights over congested areas, unless a suitable mitigation strategy is proposed and found to be acceptable.
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##  Law Enforcement Organizations

### **16-5-5-1 BACKGROUND.** The Federal Aviation Administration’s (FAA) Unmanned Aircraft Systems (UAS) Integration Office (AFS‑80) and the Department of Justice’s (DOJ) National Institute of Justice’s (NIJ) Aviation Technology Program are working collaboratively to meet the emergency nature of unique public safety missions. Building upon their experience, and through close collaboration between subject matter experts (SME) from AFS-80, the NIJ, and other public safety officers, the FAA crafted a “Common Strategy” to help reduce the administrative burden for the public agencies while at the same time ensuring adequate safety. Many of the new requirements in the “Common Strategy” process will help agencies identify the risk of operations within their individual jurisdictions and implement proper mitigating steps to limit them. This initiative will align with the FAA’s progress introducing Safety Management System (SMS) concepts for all operators within the National Airspace System (NAS). While the new “Common Strategy,” which streamlines the Certificate of Waiver or Authorization (COA) process, has been agreed upon in principle, there remains an ongoing implementation process which parties to the agreement are confident can be achieved.

### **16-5-5-3 DEFINED INCIDENT PERIMETER.**

#### **Operational Approval.** The COA process will remain the primary method for operational approval; however, a defined incident perimeter will be established within the agency’s jurisdiction. This will eliminate need for the often time‑consuming emergency COA approval process for a specific law enforcement mission.

#### **Restrictions.** Law enforcement agencies with defined incident perimeters will be permitted to fly UAS with the following restrictions:

* Operations must be conducted within line of sight of the UAS pilot.
* Operations must be limited to below 400 feet above ground level (AGL).
* All flights must be conducted in visual meteorological conditions (VMC).
* All flights must be conducted within the limitations specified in the COA.
* Operations may be permitted in Class C, D, E and G airspace as specified in the COA.
* Agencies may be permitted to operate within 5 nautical miles (NM) of an airport with certain restrictions as specified in the COA.
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## Permit to Operate (TBD)

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# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 6 Data reporting rEquirEments

## All Unmanned Aircraft Systems Operations

### **16-6-1-1 GENERAL DATABASE AND RECORDKEEPING.** The Unmanned Aircraft Systems (UAS) Integration Office (AFS‑80) is responsible for developing the necessary guidance and regulations for Unmanned Aircraft Systems (UAS) certification and operation to ensure their safe integration into the National Airspace System (NAS). However, before this can be accomplished, AFS‑80 must identify the risks and verify the effectiveness of mitigations associated with these operations. The overarching objective is to establish an approach for tracking and analyzing operational and safety data for all UAS activity in order to support standards, certification, and guidance development for the safe and effective integration of UAS into the NAS.

### **16-6-1-3 DATA COLLECTION.** The FAA will collect data from the following stakeholders:

* Certificate of Waiver or Authorization (COA) holders through COA Online (Obstruction Evaluation (OE/AAA) System);
* Experimental certificate holders;
* UAS test sites;
* Small UAS (sUAS) operators;
* Safety centers (Federal Aviation Administration (FAA), National Transportation Safety Board (NTSB), Department of Defense (DOD) and others as appropriate); and
* Centralized collection agencies (e.g., MITRE and AUVSI).

### **16-6-1-5 FAA RESEARCH, DEVELOPMENT, AND PRIVACY.** All information received from UAS operators aids the FAA in establishing a database for the existing UAS types and operations. This data is critical to our development of future certification criteria for both systems and pilots. It expedites the regulatory process for UAS and allows the FAA to have historical data from which to base current and future UAS policy. Accurate recordkeeping is essential in ensuring positive operational and quality airworthiness control. In accordance with Title 49 of the Code of Federal Regulations (49 CFR) part 1520, § 1520.5, reports will not be released outside of government channels without the originator’s permission.

* + - 1. **through 16-6-1-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

# chapter 7  safety risk management

## Section 1 General

### **16-7-1-1 Alternative Method of Compliance (AMOC).** Volume 16 defines certain requirements and procedures to conduct Unmanned Aircraft Systems (UAS) operations, but each application is evaluated on its own technical and operational characteristics, including the proposed operational profiles, mitigations, and systems. When an operator desires to deviate from these requirements and procedures, they must submit an AMOC that includes a safety case (recommended format provided) for approval. For an operator to make an acceptable safety case, they must provide information that outlines all hazards and risks associated with the requested AMOC. In addition, the operator must provide a description of the methods and procedures or equipment for mitigating each hazard and risk. As such, deviations and AMOCs may differ from the information presented in this volume. Therefore, if the operator provides an acceptable safety case with sufficient data that supports the proposal, the Federal Aviation Administration (FAA) will evaluate the AMOC for approval.

### **16-7-1-3 Safety Risk Management (SRM) Process.** Aviation safety inspectors (ASI) and other FAA personnel use SRM principles outlined in the current edition of Advisory Circular (AC) 120‑92, Safety Management Systems for Aviation Service Providers, to maintain or improve the safety of the National Airspace System (NAS) by identifying safety risks, hazards, and mitigations associated with proposed UAS operations.

#### **SRM Reviews.** When deemed appropriate, Safety Risk Management Documents (SRMD) are created through SRM reviews of specific operations or of risks associated with UAS operations in various classes of airspace. SRM reviews may result in the incorporation of additional mitigations or controls into all or some Certificates of Waiver or Authorization (COA) or Special Airworthiness Certificate operating limitations.

#### **Safety Case Information.** The operator should include, at a minimum:

##### A thorough description of the environment in which the aircraft will operate.

##### Criteria for categorizing hazards (e.g., severity and likelihood).

##### A detailed airworthiness description of the affected items associated with the proposed AMOC, which includes, as a minimum:

* Certification status of components and systems, or statement of airworthiness for public aircraft;
* Reliability data;
* Redundant systems;
* Failure modes and effects, including system response to loss of control link;
* An airworthiness determination (for COA operations only);
* Capabilities of the aircraft;
* Flight data (FDAT);
* Accident data;
* Emergency procedures; and
* Pilot/crew roles and responsibilities.

### **16-7-1-5 Sample Safety Case Format.** The following represents the FAA’s approach to documenting the process used for hazard identification and risk mitigation. It is provided as an example for operators and applicants to use when developing and documenting a safety case. In addition to these, a safety case also provides acceptable hazard analysis tools. These include Preliminary Hazard Analysis (PHA), Operational Safety Assessment (OSA), Comparative Safety Assessment (CSA), and Fault Hazard Analysis (FHA).

#### **Signature Page.** Include the following information on the signature page:

##### **Title.** A clear and concise description of the proposed AMOC.

##### **Originator Information.** Originator’s name, organization, contact information, etc.

##### **SRMD Information.** Safety case submission date, revision number, etc.

#### **Executive Summary.** The summary should give a general description of the proposed AMOC, including a list of the hazards with associated risk level (high, medium, low) and their corresponding initial and predicted residual risk. Include a high‑level system description, a summary of how the safety case was developed, and what process/method was used to move through the risk assessment process.

#### **Introduction.** Provide a brief reasoning/rationale for the initiative. The scope of the proposed AMOC, whether it is more complex or far-reaching, will determine the need for increased scope and detail of the analysis to be performed.

#### **Section 1, Current System/System Baseline.** Provide a description of the current system or existing procedures as well as the corresponding (operational) system states. If the proposal entails a procedural change, describe the current procedure and its operational environment. If the current system or procedure is unique and has challenges associated with its unique situation, be sure to delineate these.

#### **Section 2, Proposed Change.** Provide descriptions of the proposed change/procedure, identifying which safety parameters are involved.

#### **Section 3, SRM Planning and Impacted Organizations.** Prior to initiation of the safety analysis, SRM planning is necessary. It is essential to select the appropriate SRM participants, identify the SRM panel, schedule milestones, and assign tasks and responsibilities. With regard to the organizations that the change impacts, describe the method used for collaboration between those organizations during the identification, mitigation, tracking, and monitoring of hazards associated with the change.

#### **Section 4, Assumptions.** If, in the process of developing a procedure to validate an AMOC, any assumptions are made to make the evaluation of the change more manageable, clearly define and document them in this section.

#### **Section 5, Phase 1: System Description.** The description of the system/procedure, its operational environment, the people involved/affected by the change/procedure, and the equipment required to accommodate the proposal must be provided.

#### **Section 6, Phase 2: Identified Hazards.** The SRM Panel identifies hazards as a collaborative effort. The tool(s) and technique(s) used to identify hazards should be specified and discussed. The identified hazards are documented as well as their corresponding causes, the corresponding system states considered, and the consequent potential outcome. It is important to realize that while identification of the worst credible outcome and the system state in which the worst credible outcome occurs is required, system states with less severe outcomes should not be ignored.

#### **Section 7, Phases 3 and 4: Risk Analysis and Risks Assessed.** Describe the process used to analyze the risks associated with the identified hazards. Specify what type of data was used to determine the likelihood of risk occurrence (e.g., quantitative or qualitative) as well as the sources of the data. A risk matrix should provide an illustration of the predicted initial/current risk(s) associated with the identified hazards.

#### **Section 8, Phase 5: Treatment of Risks/Mitigation of Hazards.** If the existing controls and mitigations do not acceptably mitigate the hazards, then additional recommended safety requirements should be identified. An explanation of how the recommended safety requirements are expected to reduce the initial/current risk to an acceptable predicted residual risk level should be included. Low-risk hazards may still warrant recommended safety requirements.

#### **Section 9, Tracking and Monitoring of Hazards.** Once the proposal has been approved and implemented, tracking of hazards and verification of the effectiveness of mitigation controls throughout the life cycle of the system or change are required. Also, the methodology for this tracking and monitoring should be outlined.

#### **Appendices.**

##### **Documents Related to the SRMD.** Include a list of documents (orders, directives, regulations, handbooks, and manuals) that pertain to the proposed change, which have been consulted in the development of the proposed change and the corresponding safety analysis.

##### **Hazard Identification Tools.** Provide information on the different tool(s), method(s), and technique(s) used during the safety analysis. (See Figure 16‑7-1-1A, Acceptable Hazard Analysis Tools and Techniques.)

##### **Hazard Analysis and Risk Matrix.** Depending on the analyses necessary, there might be one or more appendices with analyses. A risk matrix reflecting the initial and predicted residual risks should also be included.

##### **Glossary.** Include any acronyms and definitions for any terms listed in the safety case.

Figure 16-7-1-1A. Acceptable Hazard Analysis Tools and Techniques

1. This chart from the Air Traffic Organization (ATO) Safety Management System (SMS) Manual, available at https://employees.faa.gov/org/linebusiness/ato/safety/sms/guide, displays acceptable hazard analysis tools for developing safety cases.



Figure 16-7-1-1A. Acceptable Hazard Analysis Tools and Techniques (Continued)



### **16-7-1-7** **CONTINGENCY PLANNING.**

#### **Point Identification.** The operator/applicant must submit contingency plans that address emergency recovery or flight termination of the unmanned aircraft (UA) in the event of unrecoverable system failure. These procedures will normally include Lost Link Points (LLP), Divert/Contingency Points (DCP), and Flight Termination Points (FTP) for each operation. LLPs and DCPs must be submitted in latitude/longitude (LAT/LONG) format along with a graphic representation plotted on an aviation sectional chart (or similar format). FTPs or other accepted contingency planning measures must also be submitted in LAT/LONG format along with a graphic representation plotted on an aviation sectional chart, or other graphic representation acceptable to the FAA. The FAA accepts the LLPs, DCPs, FTPs, and other contingency planning measures submitted by the operator/applicant, but does not approve them. When conditions preclude the use of FTPs, operators/applicants must submit other contingency planning options for consideration and acceptance. At least one LLP, DCP, and FTP (or an acceptable alternative contingency planning measure) is required for each operation. Operators/applicants must furnish this data with the initial COA or Special Airworthiness Certificate application. Operators/applicants must provide any subsequent changes or modifications to this data to the UAS Integration Office (AFS‑80) for evaluation no later than 30 days prior to proposed flight operations.

#### **Risk Mitigation Plans.** For all operations, the operators/applicants must develop detailed plans to mitigate the risk of collision with other aircraft and the risk posed to persons and property on the ground in the event the UAS experiences a lost link, needs to divert, or the flight needs to be terminated. Operators/applicants must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, military training routes (MTR), Navigational Aids (NAVAID), and congested areas. In the event of a contingency divert or flight termination, the use of a chase aircraft is preferred when the UAS is operated outside of Restricted or Warning Areas. If time permits, every attempt should be made to utilize a chase aircraft to monitor the aircraft to a DCP or to the FTP. In the event of a contingency divert or flight termination, operations will be conducted in Class A Airspace (CAAS) and Special Area of Operation (SAO) to the maximum extent possible to reduce the risk of collision with nonparticipating air traffic.

##### **Lost Link Procedures.** There are many acceptable approaches to satisfy lost link requirements. The intent of any lost link procedure is to ensure that airborne operations remain predictable. Operators will comply with the UAS lost link procedures as specified in the COA or Special Airworthiness Certificate operating limitations.

1. Lost link is not considered flyaway. (See the definitions of these terms in Volume 16, Chapter 1, Section 2.)

###### Unless otherwise authorized, lost link procedures must comply with the last air traffic control (ATC) clearance (if ATC clearance is required) for a period of time sufficient for ATC to ensure conflict resolution without loss of required separation.

###### AFS‑80 precoordinates lost link procedures with the appropriate ATC facility and includes the procedures in a COA or Special Airworthiness Certificate operating limitations. They include, at a minimum, lost link route of flight, transponder use, lost link orbit points, communications procedures, and preplanned FTP or other contingency planning measures in the event recovery of the UAS is not feasible.

###### If lost link occurs within a Restricted Area, Warning Area, or CAAS, or a lost link procedure takes an aircraft into one of these areas, the aircraft will not exit that airspace, unless otherwise authorized, until link is reestablished. Operators will submit all exceptions as part of the COA application or Special Airworthiness Certificate operating limitations for review.

###### Unless otherwise authorized, lost link procedures will conform to the contingency planning limitations in paragraph 16‑7‑1‑7 and, in general, include the following:

Limiting of UAS operations to operations over water or sparsely populated areas over the ground to transit to another Restricted Area, Warning Area, or to a preplanned lost link orbit point within Visual Line of Sight (VLOS) to reestablish the link. (The UAS lost link procedure will not transit over fixed structures on the water.)

Lost link programmed procedures will avoid unexpected turnaround and/or altitude changes and will provide sufficient time to communicate and coordinate with ATC.

Lost link orbit points will not be contained within any published holding area, airway, jet route, T‑route, or other Area Navigation (RNAV) published route.

###### If the link is not reestablished within a predetermined time as defined by the FAA‑approved authorization (COA or Special Airworthiness Certificate operating limitations) the aircraft may do one of the following:

Autoland; however, the aircraft will not exit the Restricted Area or Warning Area in accordance with subparagraph 16‑7‑1‑7B1)c).

Proceed to another LLP in an attempt to regain control link.

Proceed to an FTP or the location specified in other contingency planning measures for flight termination.

1. LLPs may be used as FTPs. In this case, the aircraft may loiter at the LLP/FTP until link is reestablished or fuel exhaustion occurs. UAS without autoland capability will proceed to a preplanned FTP or other acceptable contingency planning option prior to fuel exhaustion.

##### **DCP Procedures.**

###### A DCP is defined as an alternate landing/recovery site to be used in the event of an abnormal condition that requires a precautionary landing. Each DCP must incorporate the means of communication with ATC throughout the descent and landing (unless otherwise specified in the COA or Special Airworthiness Certificate operating limitations) as well as a plan for ground operations and securing/parking the aircraft on the ground. This includes the availability of control stations (CS) capable of launch/recovery, communication equipment, and an adequate power source to operate all required equipment.

###### For local operations, the DCP specified will normally be the airport/facility used for launch and recovery; however, additional DCPs may be specified as alternates.

###### For transit and/or mission operations that are being conducted in CAAS or Class E airspace above flight level (FL) 600, DCPs will be identified during the flight to be no further than 1 hour of flight time at any given time, taking into consideration altitude, winds, fuel consumption, and other factors. If it is not possible to define DCPs along the entire flight plan route, the operator/applicant must identify qualified FTPs along the entire route and be prepared to execute flight termination at one of the specified FTPs if a return to base (RTB) is not possible.

###### It is preferred that specified DCPs are non-joint‑use military airfields, other government-owned airfields, or private-use airfields. However, any suitable airfield may be submitted for review and consideration.

##### **Flight Termination Procedures.**

###### Flight termination is the intentional and deliberate process of performing controlled flight into terrain (CFIT). Flight termination must be executed in the event that all contingencies have been exhausted and further flight of the aircraft cannot be safely achieved, or other potential hazards exist that require immediate discontinuation of flight. FTPs or alternative contingency planning measures must be located within power-off glide distance of the aircraft during all phases of flight and must be submitted for review and acceptance. Operators/applicants must ensure that sufficient FTPs or other contingency plan measures are defined to accommodate flight termination at any given point along the route of flight. The location of these points is based on the assumption of an unrecoverable system failure and must take into consideration altitude, winds, and other factors.

###### Unless otherwise authorized, FTPs must be located in non-congested areas. Except for on- or near-airport operations, FTPs will be located no closer than 5 nautical miles (NM) from any airport, heliport, airfield, NAVAID, airway, congested area, major roadway, oil rig, powerplant, or any other infrastructure. For offshore locations, appropriate United States Coast Guard (USCG) charts and other publications should be used to avoid maritime obstructions, shipping lanes, and other hazards.

It is preferred that flight termination occurs in Restricted or Warning Areas, government-owned land, or offshore locations that are restricted from routine civil use. However, any suitable location may be submitted for review and consideration.

Operators/applicants are required to survey all designated areas prior to their use as an FTP. All FTPs will be reviewed for suitability on a routine and periodic basis, not to exceed 6 months. The operator/applicant assumes full risk and all liability associated with the selection and use of any designated FTP.

It is desirable that prior permission from the landowner or using agency is received prior to designation of this area as an FTP. Operators/applicants should clearly communicate the purpose and intent of the FTP.

For each FTP, plans must incorporate the means of communication with ATC throughout the descent as well as a plan for retrieval/recovery of the aircraft.

Contingency planning must take into consideration all airspace constructs and minimize risk to other aircraft by avoiding published airways, MTRs, NAVAIDs, and congested areas to the maximum extent possible.

In the event of a contingency divert or flight termination, if time permits, the use of a chase aircraft is preferred when the UA is operated outside of Restricted or Warning Areas.

In the event of a contingency divert or flight termination or other approved contingency measures, operations will be conducted in CAAS and SAO to the maximum extent possible to reduce the risk of collision with nonparticipating air traffic.

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# VOLUME 16 Unmanned aircraft systems

# chapter 7  safety risk management

## Public Aircraft Operations (TBD)

* + - 1. **through 16-7-2-29 RESERVED.**

# VOLUME 16 Unmanned aircraft systems

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## Civil Aircraft Operations (TBD)

* + - 1. **through 16-7-3-29 RESERVED.**

# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 8 Reserved

## Section 1 Reserved

* + - 1. **through 16-8-1-29 RESERVED.**

# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 9 small Unmanned aircraft systems

## Section 1 Reserved

* + - 1. **through 16-9-1-29 RESERVED.**

# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 10 accident and incident investigation and reporting

## Section 1 Public Aircraft Operations

### 16-10-1-1 **ACCIDENT AND INCIDENT NOTIFICATION AND INVESTIGATION.** The current editions of Federal Aviation Administration (FAA) Order 8020.11, Aircraft Accident and Incident Notification, Investigation, and Reporting, and Title 49 of the Code of Federal Regulations (49 CFR) part 830 outline reporting procedures for accidents and incidents involving civil aircraft and certain public aircraft. All accidents and incidents involving fatalities, injuries, property damage, and flyaway by civil aircraft and those public aircraft subject to part 830 require FAA notification within 24 hours. No additional flights by aircraft operating under a Certificate of Waiver or Authorization (COA) are allowed before notification. An immediate investigation is required; and when requested to do so, Unmanned Aircraft System (UAS) operators are expected to provide copies of written aircraft accident/incident reports to the UAS Integration Office (AFS‑80) for review. In accordance with 49 CFR part 1520, § 1520.5, reports will not be released outside of government channels without the originator’s permission.

* + - 1. **through 16-10-1-29 RESERVED.**

# VOLUME 16 Unmanned Aircraft Systems

# CHAPTER 10 accident and incident investigation and reporting

## Civil Aircraft Operations

### **16-10-2-1 INCIDENT/ACCIDENT NOTIFICATION AND REPORTING.** Any incident/accident and any flight operation involving Unmanned Aircraft Systems (UAS) that transgresses the lateral or vertical boundaries of a flight test area, restricted airspace, or other operational boundary, such as a Certificate of Waiver or Authorization (COA), must be reported to the Federal Aviation Administration’s (FAA) UAS Integration Office (AFS‑80) within 24 hours. AFS-80 can be reached by telephone at 202‑385‑4636 and fax at 202‑385‑4559. Accidents must be reported to the National Transportation Safety Board (NTSB) per instructions contained on the NTSB Web site: www.ntsb.gov. When unmanned aircraft (UA) are operated under a Special Airworthiness Certificate, further flight operations must not be conducted until the FAA’s Production Certification Branch (AIR-220) reviews the incident and provides the applicant authorization to resume operations. The current edition of FAA Order 8130.34, Airworthiness Certification of Unmanned Aircraft Systems and Optionally Piloted Aircraft, outlines specific reporting requirements.

**16-10-2-3 through 16-10-2-29 RESERVED.**