UAS Standards, Reg, Law & Exam

FAA Regulations: Part 107

Lesson 1b – Operating Rules

Objectives of FAA Regulations

- To determine the applicant is knowledgeable in the general regulatory requirements of the Title 14 of the Code of Federal Regulations (CFR) Part 107
- To determine that the applicant is knowledgeable of the operating rules of 14 CFR Part 107, the registration rules of 14 CFR Part 47 and Part 48, and other associated operating requirements
- To determine that the applicant is knowledgeable in the requirements associated with remote pilot certification with an small UAS (sUAS) rating
- To determine that the applicant is knowledgeable of the FAA waiver policy and requirements

FAA Regulations: Part 107 – Operating Rules Overview

- Registration requirements for sUAS
- The requirement for the sUAS to be in a condition for safe operation
- Medical condition(s) that would interfere with safe operation of an sUAS
- The responsibility and authority of the RPIC
- Regulatory deviation and reporting requirements for in-flight emergencies
- Hazardous operations
- Operating from a moving aircraft or moving land- or water-borne vehicle
- Alcohol or drugs and the provisions on prohibition of use
- Daylight operation
- Visual line-of-sight (VLOS) aircraft operations
- The requirements when visual observer is used
- The prohibition of operating multiple sUAS

FAA Regulations: Part 107 – Operating Rules Overview

- The prohibition of carrying hazardous material
- Staying safely away from other aircraft and right-of-way rules
- Operations over human beings
- Prior authorization required for operation in certain airspace
- Operating in the vicinity of airports
- Operating in prohibited or restricted areas
- Flight restrictions in the proximity of certain areas designated by notice to airmen (NOTAM)
- Preflight familiarization, inspection, and actions for aircraft operations.
- Operating limitations for sUAS
- The requirements for a Remote Pilot Certificate with an sUAS rating

Registration Requirements for sUAS

- All sUAS greater than 0.55 lbs. must be registered with the FAA prior to flight
- Aircraft markings are required on the outside of the aircraft

Recreational Drones

- Section 336 of the FAA Modernization and Reform Act of 2012 was entirely repealed in 2018 – the FAA does have the right to regulate model aircraft, including recreational drones
- Flown strictly for recreational purposes
- The recreational flyer must take and pass The Recreational UAS Safety Test (TRUST) and carry proof of test passage when flying
- Must obtain authorization prior to flying in B, C, D, or E at the surface associated with an airport airspace and complies with all airspace restrictions and prohibitions
- Have a current FAA registration, and must mark the drones on the outside with the registration number, and carry proof of registration when flying

Recreational Drones

- Follow the safety guidelines of an FAA-recognized Community Based Organization (CBO); for more information on how to become an FAA-recognized CBO, read Advisory Circular 91-57C Flown Strictly for Recreational Purposes
- Keep the drone within the visual line of sight or use a visual observer who is co-located (physically next to) and in direct communication with the operator
- Does not interfere with and gives ways to any manned aircraft
- Operations in Class G airspace
  - The aircraft is flown not more than 400 feet above ground level
  - Complies with all airspace restrictions and prohibitions; including all security flight restrictions; violation of security flight restrictions can be punished with prison time

Recreational Drones

- Cannot interfere with wildfire suppression efforts, law enforcement, or emergency response efforts (49 U.S.C. Section 46320 and 18 U.S.C. 40A)
- Cannot fly in runway exclusion zones without authorization (49 U.S.C. 39B)
- It is a crime to fly knowingly or reckless interfering with, or disrupt the operations of a manned aircraft in a manner that poses a imminent safety hazard to the occupant(s) (49 U.S.C. 39B)
- Recreational flyers need to know airspace and how to identify where and where not to fly
- For more information, read FAA Advisory Circular 91-57B and Recreational Flyers & Community Based Organizations at https://www.faa.gov/uas/recreational_flyers

Do I Need to Register My sUAS?

- Effective December 12, 2017 – all drone owners are required to register their drones with the FAA
- Registration requirements apply to all model and commercial sUAS
- How to Register your Drone https://www.faa.gov/uas/getting_started/register_drone

sUAS Registration

- Use FAA Drone Zone at https://faadronezone-access.faa.gov/#/
- UAS operations require a Foreign Aircraft Permit if it involves a civil aircraft that is:
  - Registered in a foreign country, or
  - Owned, controlled, or operated by someone who is not a U.S. citizen or permanent resident

Who Can Register an sUAS?

- The sUAS must be registered by a person who is at least 13 years of age
- If the owner of the sUAS is less than 13 years of age, then it must be registered by another person who is at least 13 years of age

sUAS Markings

- Before operation, the sUAS must be marked with the registration number
- The registration marking must be:
  - A unique identifier number – this typically the FAA issued registration number or the serial number
  - Legible and durable – markings may be applied by the user of engraving, permanent marker, or self-adhesive label
  - Visible or accessible without tools – the number may be enclosed in a compartment only if you can access the compartment without tools

Medical Condition(s) and Safe Operations of an sUAS

- The safe operation of a sUAS relies on many factors, including the physical and mental capabilities of the RPIC and anyone else involved in the operation
- No person can be involved in the operation of an sUAS if they know, or have reason to know, that they have a physical or mental condition that could interfere with the safe operation of an sUAS; this applies to everyone participating in the operation and is NOT limited to the RPIC

The Remote Pilot in Command (RPIC)

- **The remote pilot in command (RPIC)** is directly responsible for and is the final authority on the operation of the sUAS under Part 107. The RPIC must be designated prior to each flight but can change during flight so long as both RPICs maintain visual line-of-sight (VLOS) and control of the sUAS
- **The RPIC** must:
  - Ensure that the sUAS is maintained in a condition for safe operation
  - Must inspect the sUAS prior to flight to ensure that it is in a condition for safe operation

The Responsibility and Authority of the RPIC

- Assessing the operating environment
- Briefing crew members
- Ensuring all control links are working
- Monitoring battery power
- Monitoring payloads
- Ensuring all documents are easily accessible
- Everything else that affects the safe operation of the sUAS

The Responsibility and Authority of the RPIC

- The RPIC may:
  - Allow a person other than the RPIC to manipulate the flight controls when
    - The person manipulating the controls is directly supervised by a RPIC who has met the recurrent training/testing requirements
    - The RPIC has the ability to immediately take direct control of the sUAS

- When someone other than the RPIC is manipulating the controls, the RPIC must be:
  - Standing close enough to physically take over the control station
  - Using a "buddy box" system with two control stations
  - Using a pre-programmed safe-mode system with "home" or "hover" functions

Checklists for RPIC

- Use them because they make you a better and safer pilot, examples include:
  - Pre-field checklist
  - Pre-flight checklist
  - Post-flight checklist

Visual Observers (VOs)

- The VO assist the RPIC by:
  - Identifying potential hazards to safe operations
  - Alerting the RPIC and rest of the crew of hazards
- Not required by FAA, but if First Person View or similar technology is used, the RPIC must have a VO always keep the sUAS within unaided sight (e.g., no binoculars)
- Someone cannot be a pilot or VO for more than one drone operation at a time
- But the use of VOs can:
  - Improve situational awareness
  - Maintain visual line-of-sight (VLOS)

In-flight Emergencies

- The PRIC is permitted to deviate from any rule of Part 107 to the extent necessary to respond to an emergency
- Upon FAA request, a RPIC who exercised this emergency power is required to send a written report to the FAA explaining the deviation
- Emergency actions should be taken in such as way as to minimize injury to people or damage to property

Hazardous Operations

Prohibited operations include:

- Careless or reckless flight
- Dropping an object from an sUAS
- Operations that interfere with manned aircraft operations
- Operating an sUAS over a human being when the operation does not meet the requirements (see the section of Operation Over Human Beings)
- Loading the sUAS beyond its capability to the point of losing control
- Failure to consider weather conditions near structures, trees, or rolling terrain when operating in a densely populated area
- Flying near emergency responders, firefighters, or police officers during a crisis

Visual Line-of-Sight (VLOS) Aircraft Operations

The RPIC and the personal manipulating the controls maintain a visual line-of-sight (VLOS) at all times during flight:

- VLOS must be maintained without the use of any equipment beyond normal eyeglasses or contact lenses
- Brief periods of loss of VLOS are allowed when required for:
  - The safety of the operation
  - Operational necessity
- Visual observers (VOs) should scan for air traffic by systematically focusing on different segments of the sky for shot intervals

Operating from Moving Vehicles or Aircraft

- Part 107 permits operation of an sUAS from a moving land or water-borne vehicle over a sparsely populated (or unpopulated) area
- However, operation from a moving aircraft is prohibited
- Operations from moving vehicles are subject to the same restrictions that apply to all other Part 107 sUAS Operation
  - VLOS – the RPIC (and the person manipulating the controls, if applicable) operating from a moving vehicle or watercraft is still required to main VLOS for the sUAS
  - Communication – the VO and RPIC must still maintain effective communication
  - No reckless operation

Alcohol and Drugs

No crewmember may participate in any sUAS operation if:

- They have consumed alcohol within the preceding 8-hour
- They have a blood alcohol level of 0.04 percent or greater
- They are using any drug that affects the person's mental or physical capabilities

Daylight and Night Operation

- Small unmanned aircraft operations are generally permitted during daylight hour
- For operations conducted during civil twilight and night, the sUAS must equipped with anti-collision lights that are capable of being visible for at least three (3) statute miles; however, the RPIC may reduce the intensity of the lighting if it would e in the interest of operational safety to do so
- For the continuous United States and Hawaii, the Civil Twilight is the period from 30 minutes before sunrise to 30 minutes after sunset, local time; in Alaska, the definition of Civil Twilight differs and is described in the Federal Air Almanac
- 14 CFR Part 1 defines night as the time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the Federal Air Almanac and converted to local time

Operating Over Human Beings

- Final rules effective date – April 21, 2021
- No person may operate an sUAS over a human being unless:
  - That human being is directly participating in the operation of the sUAS
  - That human being is located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling sUAS
  - The operation meets the requirements of at least one of the operational categories specified in Sub-part D of Part 107:
    - To conduct Category 1 Operations the sUAS must meet the requirement of § 107.100
    - To conduct Category 2 Operations, the sUAS must meet the requirement of § 107.115
    - To conduct Category 3 Operations, the sUAS must meet the requirement of § 107.125
    - To conduct Category 4 Operations, the sUAS must meet the requirement of § 107.140
  - An sUAS may be eligible for one or more of the above categories as long as the remote PIC cannot inadvertently switch between modes or configurations of the categories

Operating Over Human Beings

- No person may operate an sUAS over a human being located inside a moving vehicle unless it meets one of the four aforementioned categories
- To conduct Category 1 though 3 operations, the sUAS must remain within or over a closed- or restricted-access site, all human beings made aware that an sUAS may fly over them, and the sUAS must not maintain sustained flight over the moving vehicle
- To conduct Category 4 operations, the sUAS must have an airworthiness certificate and be operated in accordance with the operating limitations specified in an approved flight manual

Operating Over Human Beings

- Category 1 small unmanned aircraft are permitted to operate over people, provided the small unmanned aircraft
  - Weigh 0.55 pounds or less, including everything that is on board or otherwise attached to the aircraft at the time of takeoff and throughout the duration of each operation
  - Contain no exposed rotating parts that would cause lacerations
- In addition, for Category 1 operations, no remote pilot in command may operate a small unmanned aircraft in sustained flight over open-air assemblies unless the operation is compliant with Remote ID
- Category 2 and Category 3 provide performance-based eligibility and operating requirements when conducting operations over people using unmanned aircraft that weigh more than .55 pounds but do not have an airworthiness certificate under part 21
- In addition, for Category 2 operations, no remote pilot in command may operate a small unmanned aircraft in sustained flight over open-air assemblies unless the operation is compliant with Remote ID

Operating Over Human Beings

- Category 3 small UAS have further operating restrictions. A remote pilot in command may not operate a small unmanned aircraft over open-air assemblies of human beings. Additionally, a remote pilot in command may only operate a small unmanned aircraft over people if:
  - The operation is within or over a closed- or restricted-access site and all people on site are on notice that a small UAS may fly over them; or
  - The small unmanned aircraft does not maintain sustained flight over any person unless that person is participating directly in the operation or located under a covered structure or inside a stationary vehicle that can provide reasonable protection from a falling small unmanned aircraft

Operating Over Human Beings

- Category 4 operations is an addition from the notice of proposed rulemaking (NPRM); this category allows small unmanned aircraft issued an airworthiness certificate under part 21 to operate over people, so long as the operating limitations specified in the approved Flight Manual or as otherwise specified by the Administrator, do not prohibit operations over people; additionally, no remote pilot in command may operate a small unmanned aircraft in sustained flight over open-air assemblies unless the operation is compliant with Remote ID; to preserve the continued airworthiness of the small unmanned aircraft and continue to meet a level of reliability that the FAA finds acceptable for operating over people in accordance with Category 4, additional requirements apply

Operating Over Human Beings

- Note: sustained flight over an open-air assembly includes hovering above the heads of persons gathered in an open-air assembly, flying back and forth over an open-air assembly, or circling above the assembly in such a way that the small unmanned aircraft remains above some part the assembly. ‘Sustained flight’ over an open-air assembly of people in a Category 1, 2, or 4 operation does not include a brief, one-time transiting over a portion of the assembled gathering, where the transit is merely incidental to a point-to-point operation unrelated to the assembly

Operating Over Human Beings

- For all operations conducted under Category 2 and 3 the sUAS must meet a means of compliance (MOC) and be listed on a current Declaration of Compliance (DOC) with the FAA
- The MOC must consist of a test, analysis, and inspection of procedures for the sUAS detailing how the sUAS meets the requirements of § 107.120(a) for Category 2 and § 107.130(a) for Category 3; the description should include conditions, environments, and methods, as applicable; in addition, this information needs to be submitted along with a compliance explanation of how application of the MOC fulfills the requirements of § 107.120(a) and/or § 107.130(a)
- If the FAA determines the sUAS meets the MOC for Category 2 or 3, the operator will then need to submit a DOC to the Administrator for approval; once approved, the DOC must be retained along with all supporting information and made available to the Administrator upon request for a period of at least 2 years
- Fore more information, visit https://www.faa.gov/uas/commercial_operators/operations_over_people

Remote Identification (Remote ID)

- Remote ID is the ability of an sUAS in flight to provide identification and location information via radio frequency (e.g., Wi-Fi or Bluetooth) that can be received by other parties. This information includes:
  - A unique identifier for the sUAS
  - The sUAS' latitude, longitude, geometric altitude, and velocity
  - An indication of the latitude, longitude, and geometric altitude of control station (standard) or takeoff location (broadcast module)
  - A time mark
  - Emergency status (standard remote ID sUAS only)
- This information helps the FAA, law enforcement, and other federal agencies find the control station when an sUAS appears to be flying in an unsafe manner or where it is not allowed to fly; Remote ID also lays the foundation of the safety and security groundwork needed for more complex drone operations

Remote Identification (Remote ID)

- Effective September 16, 2023, no person may operate an unmanned aircraft within the airspace of the United States unless the operation meets the requirements of 14 CFR § 89.110 (standard remote identification) or § 89.115 (alternative remote identification) unless otherwise authorized by the FAA
- Standard remote ID broadcasts identification and location information about the sUAS and its control station; a standard remote ID sUAS is one that is produced within built-in remote ID broadcast capability in accordance with the remote ID rule's requirements
- A remote ID broadcast module is an alternative remote ID device that broadcasts identification and location information about the sUAS and its take off location in accordance with the remote ID rule's requirements; the broadcast module can be added to an sUAS to retrofit it with the remote ID capability; this module is limited to VLOS operations

Remote Identification (Remote ID)

- The Certificate of Aircraft Registration of the unmanned aircraft used in the operation must include the serial number of the remote ID broadcast module, or the serial number of the unmanned aircraft must be provided to the FAA in a notice of identification prior to the operation
- Standard and alternative remote ID must broadcast from takeoff to shut down; in the event of a broadcast failure, the person manipulating the flight controls must land the unmanned aircraft as soon as practicable
- If the unmanned aircraft operation is being conducted for aeronautical research or to show compliance with regulations, the Administrator may authorize such operation without remote ID capability; operations without remote ID may also be conducted in an FAA-recognized identification area (FRIA); FRIAs are often community-based organizations or educational institutions that have received prior FAA permission to allow unmanned aircraft to operate in a specified area wihout remote ID capability

Miscellaneous Operating Rules

Part 107 prohibits against:

- Simultaneous operation of multiple sUAS
- Carrying of hazardous material

Part 107 requirements to "See and Avoid"

- All sUAS operations must be conducted in a fashion that avoids interference with operations and traffic patterns at any airport, heliport, or seaplane base
- The RPIC is responsible to stay clear of an yield the right-of-way to all other aircraft, including other sUAS, and to void other potential hazards that may affect their operation of the aircraft

Prior Authorization Required for Operation in Certain Airspace

Prior authorization by air traffic control (ATC) is required for sUAS operations flights in:

- Class B, Class C, and Class D airspace, and within the lateral boundaries of the surface area of Class E airspace designated for an airport
- ATC authorization is NOT required to operate at or near an airport so long as the flight remains entirely outside controlled airspace

Operating in Prohibited or Restricted Areas

sUAS flights are prohibited in areas designated as “prohibited” or “restricted” unless prior permission is obtained from the controlling agency

This will be covered in more detail in later lectures.

Temporary Flight Restrictions (TFR)

- Temporary Flight Restrictions (TFRs) are issued by way of a Notice to Airmen (NOTAM)
- Temporary so can, and do, change
- The RPIC is responsible to check for any TFRs that may impact the area in which they are flying
- TFRs apply to all aircraft, not just sUAS operators, or manned aircraft pilots
- TFRs are issued for a variety of reasons, including
  - Presidential TFRs and NOTAMs
  - Emergency response TFRs and NOTAMs
  - Standing TFRs that go into and out of effect (e.g., stadiums for sporting events)

Additional information on TFRs is discussed in the Air Space lecture.

Operating Limitations for sUAS

- Maximum ground speed (100 mph)
- Altitude limitations (400 feet above ground level)
- Cloud clearance requirements (at least 500 feet below and at least 2000 feet horizontally from clouds

If flying above a structure (e.g., a building or tower) causes the sUAS to enter controlled airspace the RPIC must follow the appropriate air traffic control (ATC) procedures.

Pre-Flight Familiarization, Inspection, and Actions

Prior to each flight, the RPIC is responsible for

- Inspection of all components of the sUAS
  - ❑ Unmanned aircraft
  - ❑ Control station
  - ❑ Battery control status
  - ❑ Control and telemetry links between unmanned aircraft and control station
- Airspace
- Weather conditions
- Site inspection
  - ❑ Potential hazards
  - ❑ Emergency landing sites
  - ❑ Potential privacy concerns
- Require waivers
- Pre-flight documentation

These will be covered in more detail in later lectures.