Unmanned Aircraft Systems (Drones)

Terms – Use – Rules
Plan

1. Terms
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The term **drone** refers to an unmanned vehicle

- **Aerial drone & Underwater drone**

- **Aerial drones** receive commands remotely – they can carry out a range of tasks from taking aerial photos/videos to military operations.

- **Unmanned Aerial Vehicles (UAV)** – globally known term

- **Unmanned Aircraft Systems (UAS)** – FAA term

- **Small Unmanned Aircraft Systems (sUAS)** – FAA term for small drones
Different types of drones are used for various purposes:

1. **Fixed-wing** drones: longer endurance and high flight speed benefiting from their aerodynamics and design – they are best for mapping large areas.

2. **Single-rotor helicopter** drones: powerful and durable – They are suited to carry large payloads and fly more efficiently. Usually they use gas engines.

3. **Multi-rotor** drones: widely used – excellent control & maneuverability – vertical take off – best for aerial photography and aerial inspection. Low flight time if powered by batteries. They can be Tricopter, Quadcopter, Hexacopter, Octocopter.

4. **Fixed-wing hybrid VTOL** drones: fixed wing drones modified to take off and land vertically. They are designed for mapping, power line inspection, surveillance, agriculture, and rescue operations.
How are drones flown?

- Flying drones **manually**: drone pilots have full control of the aircrafts and are responsible of every drone movement – Pilots must be skilled. Continuous training is recommended.

- Flying drones **autonomously**: drones execute predefined plans and perform specific maneuvers to complete tasks with minimal to no human intervention. This requires advanced flight control systems, sensors and software algorithms.
How are drones powered?

**Batteries**: lightweight but expensive, short lifespan and can be hazardous (lithium-ion or lithium polymer)

**Gasoline**: Long flight time, higher flight speed but potentially dangerous and drones can be noisy

**Hydrogen fuel**: long flight time, environmentally friendly, works at low temperatures but produce a lot of heat and still not efficient

**Solar**: long flight time while the sun is available, low operating cost
Main parts of a drone

- Drone Motors
- Propellers
- Flight Controller
- GPS Module & antenna
- Inertial Measurement Unit: it tracks drone orientation (i.e. Yaw, Pitch, Roll)
- Electronic Speed Controller
- Power Port Module
- Obstacle Avoidance Sensors
- Gimbal
- Camera
- Battery
- Remote controller
Payload types

**Optical cameras**: they produce photos & videos

**Thermal cameras**: they produce photos & videos

**Multispectral cameras**: they produce multi-band images

**Lidar sensors**: they produce 3D point cloud data

**Sniffer sensors**: sense leaks of gases

![Point cloud](image1)

![Thermal photo](image2)

![Sniffer drone](image3)

![Orthoimage](image4)
Mouth of the Brazos river

Spatial resolution 0.8 cm
Examples

Bird Survey

Prescribed Burn at UH Coastal Center

3D Oil Tanks
sUAS are subject to the Federal Aviation Administration (FAA) oversight and enforcement. FAA timeline for drone integration

Regulations vary depending on purpose:
- Commercial use: Remote pilot with a Part 107 License
- Recreational use: **requirements**
  - Fly only for recreational purposes
  - Follow the safety guidelines of an FAA-recognized Community Based Organization (CBO)
  - Maintain visual line of sight or use a visual observer
  - Give way to and do not interfere with other aircraft
  - Fly at or below FAA-authorized altitudes in controlled airspace (Class B, C, D, and surface Class E designated for an airport) only with prior FAA authorization by using LAANC or DroneZone
  - Fly at or below 400 feet in Class G (uncontrolled) airspace
  - Take The Recreational UAS Safety Test (TRUST) and carry your certificate when flying
  - Have a current FAA registration
  - Do not endanger the safety of the national airspace system
Airspace Classification
National Airspace System (NAS)

FL 600 (Flight Level 60,000)

Class A: IFR Flight Only
- 18,000 msl
- G Airspace = Uncontrolled
- E Airspace = Uncontrollable
- 15 Miles
- 10,000 msl (VFR Flight)

Class B
- Mode C Transponder
- Two way radio
- Clearance
- 1200 agl
- Solid Blue
- UAS ≤ 87 kph

Class C
- Mode C Transponder
- Two way radio
- 10 Miles
- 4,000 msl
- Solid Magenta

Class D
- Two way radio
- 5 Miles
- 2,500 msl
- Dotted Blue

Class E
- Clouds
- 3 miles visibility
- 2000 ft away
- 500 ft below
- 14,500 msl
- 1200 agl
- Class G could be extended to
- 1400' near airport
- 700 agl
- UAS 400' agl

Class G
- UAS ≤ 87 kph
- Solid Blue
- 5 Miles
- 1200 agl
How can you become a remote pilot?

- Create an account on IACRA to obtain your FAA Tracking Number (FTN) at: https://iacra.faa.gov/IACRA
- Create an account on PSI to schedule your test at: https://faa.psiexams.com/faa/login
- Find a testing center in your area on PSI and apply for a Remote Pilot Knowledge Test
- Fees: $175.
- Bring your photo ID with signature and address on it.
• Knowledge Test takes up to **2 hours**.

• **60 questions** (style: three multiple choice answer).

• 1/3 of questions are easy to answer, 1/3 can be challenging, 1/3 designed to test your reading comprehension.

• Passing score: **70%**.

• FAA recommends 15-20 hours to prepare for the test.

• You have to wait 14 days to retake the test if you fail.
Integrated Airman Certification and Rating Application (IACRA)

IACRA is the web-based certification/rating application that guides the user through the FAA’s airman application process. IACRA helps ensure applicants meet regulatory and policy requirements through the use of extensive data validation. It also uses electronic signatures to protect the information’s integrity, eliminates paper forms, and prints temporary certificates.

New to IACRA? Please read the New User Guide.

Trouble Viewing Documents? Please make sure your browser allows popups in IACRA.

Reminder: Password Reset and Recovery

If you need to reset your password you can use the IACRA password recovery page: Forgot Username or Password?

What's new in IACRA

IACRA Version 10.7

This release contains the following changes:

- Updated the fields for place of birth so they won’t be affected when using browser autofill to autofill addresses on the user profile and Foreign Verification application.
- Updated the help text for the applicant name on the user profile to indicate the importance of matching the knowledge test name if a knowledge test is required.
- The Notice of Disapproval will display the full description for selected ACS codes instead of only the codes.
- The Notice of Disapproval supports overfloving to additional pages when needed.
Notice: Upcoming Maintenance

Testing will be temporarily unavailable during the weekend of February 24th-25th, 2024, while PSI performs system maintenance and upgrades. The estimated time for the outage is from 2:00 PM EST on Saturday, February 24th through 2:00 PM EST on Sunday, February 25th. Scheduling has been blocked accordingly. We apologize for any inconvenience and thank you for your patience during this process.

For news and announcements related to Airman Testing, please check the FAA’s Community Advisory publications at https://www.faa.gov/training_testing/testing

FAA Airman Knowledge Testing is now available for online scheduling.

View Test Authorization Requirements

If you are a new user, and want to start scheduling your exam, click below to create an account (In order to create an account, you will need your FAA Tracking Number and an authenticator app for MFA).
Why covering a range of topics?

- To insure safe airspace and air travel
- It prepares you to become a good remote pilot
- It provides you with a better understanding of aviation by providing a glimpse into the FAA history in providing safe air travel
Key rules & numbers

• **0.55 lbs**: minimum weight of small Unmanned Aircraft Systems (sUAS) for aircraft registration with FAA. No need for registration if aircraft weight less than 0.55 lbs and used recreationally.

• **55 lbs**: maximum weight of sUAS is under 55 lbs.

• Check for details on registration at: [https://faadronezone.faa.gov/](https://faadronezone.faa.gov/)

• You must be at least **13 year** age to register a drone

• You can take the test to become a certified remote pilot at **16 year** of age or older

• The test is valid for **2 years**

• **400 ft Above Ground Level** (AGL): maximum altitude you can fly a drone
Welcome to the FAA DroneZone

FAA DroneZone is the official FAA website for managing drone services.

Account Log In

- Email
  - Enter Email Address
  - Email is required.
- Password
  - Enter Password
  - Password is required.

Helpful Links

- Register your drone
- Download the BUFLY Mobile App
- Take T.R.U.S.T.
- UAS on Español
- Check out Hot Topics in U.A.S.
- Get an airspace authorization through LAANC

You must use the paper (N-number) registration process if:

- Your unmanned aircraft is 55 pounds or greater
- You hold title to an aircraft in trust
- You want to qualify a small unmanned aircraft for operation outside the United States
- The small unmanned aircraft owner uses a voting trust to meet U.S. Citizenship requirements
• 400 ft above/around buildings/structures
• 500 ft below clouds
• 2000 ft horizontal from clouds
• 2000 ft horizontal from guy wires
• 100 MPH (86 knots): maximum speed
• 3 Statute Miles (SM) visibility: minimum visibility distance
• Must maintain visual line of sight of the drone unaided by any device other than corrective lenses (medical glasses or contacts).
• At least 8 Hours without alcohol & 0.04 is the maximum blood alcohol level.
• Penalty if you refuse to give a blood alcohol test is: Suspension or Revocation of your certificate
• You cannot fly sUAS for 1 year after a narcotic conviction.

• $500: minimum damage (other than the value of your drone) to report an accident to FAA.

• You must report accidents to FAA within 10 days of an accident.

• You MUST file FAA report if someone seriously injured and needed a hospitalization for 48 hours or more.
Questions?