UAS - Unmanned Aircraft Systems

Aircraft with no on-board crew or passengers
Nikola Tesla was born in 1856 in Smiljan Lika, Croatia. He was the son of a Serbian Orthodox clergyman. Tesla studied engineering at the Austrian Polytechnic School. He worked as an electrical engineer in Budapest and later emigrated to the United States in 1884 to work at the Edison Machine Works. He died in New York City on January 7, 1943.

The remarkably inventive Nikola Tesla was the first to foresee the coming of militarized unmanned vehicles. It was one of several futuristic predictions that he made while speculating on the potential uses for a remote control system he was developing at the time.

In the 1898 patent "Method of and Apparatus for Controlling Mechanism of Moving Vessels or Vehicles"...
Initiated in the Military, first built during the *FIRST WORLD WAR*. January 1918, the US Army started production of aerial torpedoes. The model that was developed, the *Kettering Bug*, was flown successfully in some tests, but the war ended before it could be further developed.

In 1935 the British produced a number of radio-controlled aircraft to be used as targets for training purposes. It's thought the term 'drone' started to be used at this time.
Reconnaissance UAVs were first deployed on a large scale in the Vietnam War. Drones also began to be used in a range of new roles, such as acting as decoys in combat, launching missiles against fixed targets and dropping leaflets for psychological operations.

Drones now have many functions, ranging from monitoring climate change to carrying out search operations after natural disasters, photography, filming, and delivering goods. But their most well-known and controversial use is by the military for reconnaissance, surveillance and targeted attacks. Since the 9/11 terrorist attacks, the United States in particular has significantly increased its use of drones.
On October 7th, 2001, armed with laser-guided hellfire missiles, a Predator drone launched the first ever combat strike by a remotely piloted aircraft in Kandahar, Afghanistan in an effort to take out Mullah Mohammed Omar, a suspected Taliban leader. While the mission failed, the event marked the dawn of a new era of militarized drones. Since then, unmanned combat aerial vehicles (UCAVs) such as the Predator and General Atomics’ larger and more capable MQ-9 Reaper has completed thousands of missions and yet unintentionally has taken the lives of at least 6,000 civilians, according to a report in the Guardian.
PREDATOR DRONE
Current UAS Applications

- Utility Inspections
  - Gas/Electrical Lines
- Police/Fire/EMS
  - Search & Rescue
  - Searches
- Fire Mitigations
- Real Estate
  - Aerial Profiles
- Wildlife Conservation & Protection
- Hollywood Filming
- Agriculture
  - Crop Inspections
  - Herd Inspections
WHAT IS YOUR EXPERIENCE OPERATING A REMOTE AIRCRAFT
WHAT WOULD BE YOUR MISSIONS OF INTEREST
DIFFERENCES IN DRONES WITH AERIAL & GROUND IMAGING
AERONAUTICAL DECISIONS MAKING SKILL, STRICTLY ADHERING TO STANDARDIZED PROCEDURES.
CFR TITLE 14, PART 107 FAA REGULATIONS - REMOTE PILOT LICENSE
YOU ARE LEGALLY RESPONSIBLE For the safe conduct of each flight.
TAKE TIME TO UNDERSTAND THE RULES - Failure to comply could lead to a CRIMINAL PROSECUTION.
BEFORE each flight check drone for damage.
DRONE is in sight at all times.
YOU are responsible for avoiding collisions.
KEEP YOUR DISTANCE its is illegal to fly your unmanned aircraft over congested areas.
KEEP YOUR DISTANCE don’t fly your unmanned aircraft within 50m of person, vehicle, building or structure or overhead groups of people at any height.
CONSIDER RIGHTS OF PRIVACY Think about what you do with any images you obtain as you may breach privacy laws.
OBTAIN PERMISSION if you intend to used an unmanned aircraft for any kind of commercial activity.
Automated ‘drones’ or remotely piloted vehicles (RPVs). UAV’s can fly for long periods of time at a controlled level of speed and height and have a role in many aspects of aviation.

Drone Flying Failures and What the FAA is doing to Prevent Future Mishaps

Personal privacy is not the only threat small drones pose. Add to that list occasional national security threats and lots of minor lacerations.

the manufacturer of the drone—DJI—modified its popular drones' software to prevent them from flying within 24 kilometers (15 miles) of downtown Washington, D.C. That GPS-programmed no-fly zone adds on to DJI’s existing list of no-go zones, which has been expanded to include 10,000 airports.
1. DISTANCE MISJUDGEMENT
2. LOSS OF ORIENTATION & LACK OF SITUATIONAL AWARENESS
3. LACK OF, AND FALSE COMPASS CALIBRATION
4. BATTERY FAILURE
5. MOTOR FAILURE
6. INCORRECT TIME/FUEL CALCULATIONS
7. PANICKING
8. RAPID VERTICAL DESCENT
9. LACK OF FIRMWARE UPDATE
10. IMPROPER COG (CENTER OF GRAVITY)
While the vast majority of commercial drone operators succeed at running safe, successful UAV missions, mistakes and accidents do still sometimes occur. SenseFly recently posted the following two questions on Facebook and LinkedIn to learn more about these drone fails:

What’s the biggest fail you’ve seen a commercial operator make?
What mistakes do you see happening all the time?

Unlucky landings/ Failure to launch/ Risky business/ Making a meal of it/ Redefining ‘professional’
WHAT IS PART 107? Provides the framework for the use of small unmanned aerial systems in the National Airspace System.

WHAT DOES PART 107 APPLY TO? UAS flown for commercial purposes - no more than .55 lbs but less.

UNMANNED AIRCRAFT AND ALL OF ITS SUPPORT EQUIPMENT.

WHAT DOESN’T PART 107 APPLY TO? Model airplanes, operations outside of USA, Amateur Rockets, Moored Balloons, Unmanned Free Balloons, Kites, Public Aircraft Operations & Air Carrier Operations.
RC FLIGHT RULES - that govern model aircraft operations flown strictly for hobby or recreational use.

PUBLIC COA - CERTIFICATE OF WAIVER OR AUTHORIZATION.

AIRSPACE A, B, C, D, E, F & G

GLOBAL POSITIONING SYSTEM (GPS)

WEATHER
Know your surroundings—Some areas prohibit the operation of UAS near parks, wildfires, public places, within 4 miles of airports without a waiver. There are rules of the air you need to know, always check with local authorities before you fly your drone.

**FLYING SAFELY**

- Avoid flying near other aircrafts
- Fly below 400 feet
- Be aware of FAA airspace requirements faa.gov/go/uastfr
- Fly within visual line of flight
- Always contact airport authorities and control before flying near airport
- Never fly over groups of people

*Do not fly under the influence*
Flying at night (§ 107.29)
Flying directly over a person or people (§ 107.39)
Flying from a moving vehicle or aircraft, not in a sparsely populated area (§ 107.25)
Flying multiple aircraft with only one pilot (§ 107.35)
Flying beyond the pilot's visual line-of-sight (§ 107.31)
Flying above 400 feet (§ 107.51B)
Flying near airports / in controlled airspace (§ 107.41)
Introduction
The two categories of airspace are: regulatory and nonregulatory.

Within these two categories, there are four types: controlled, uncontrolled, special use, and other airspace.

The categories and types of airspace are dictated by the complexity or density of aircraft movements, nature of the operations conducted within the airspace, the level of safety required, and national and public interest. Figure 15-1 presents a profile view of the dimensions of various classes of airspace.
International Civil Aviation Organization (ICAO) Most nations adhere to the classifications.

CLASS A - Conducted under IFR. Aircraft subject to ATC clearance

CLASS B - Conducted Under IFR, SVFR, or VFR.

CLASS C - Conducted under IFR, SVFR, or VFR. Operations under IFR and SVFR are separated from each other. VFR flights are not separated and are given traffic information in respect of other VFR flights.

CLASS D - Conducted Under IFR, SVFR, or VFR. The IFR and SVFR are separate and given traffic information in respect of VFR flights.
CLASS E - Conducted Under IFR, SVFR, or VFR. Flights under VFR are not subject to ATC clearance.

CLASS F - Conducted under IFR or VFR ATC separation will be provided to aircraft under IFR.

CLASS G - Conducted under IFR, VFR ATC has no authority but VFR minimums are to be known by pilots.

Special Airspace: these may limit pilot operations in certain areas.

Consist of Prohibited areas, Restricted areas, Warning areas, MOA's (military operations areas), Alert areas and controlled firing areas.
GLOBAL POSITIONING SYSTEM (GPS)

• A system used for worldwide navigation and surveying, to pin point one’s exact location anywhere on the earth’s surface and obtaining the current time at a certain location.

• Made possible by 24 satellites, which orbit at great speeds and precision. Using low powered radio waves, devices that communicate with the satellites.

• System uses geographical lines of latitude and longitude. Using both sets of lines provides a coordinate for different places around the world.
GLOBAL POSITIONING SYSTEM (GPS)

- **Lines Of Latitude** are horizontal lines that are east to west across the globe.
- The longest and main line of the latitude is the Equator represented as 0 degree - moving north, each line increases by 1 degree up to 90 degree indicated by the letter ‘N’ and below the Equator by ‘S’.
- **Lines of Longitude** are vertical lines from the north pole to south pole. The main line is called the Prime Meridian - location in Greenwich, England it represents 0 degree longitude. Lines to the east are indicated with the letter ‘E’ and same with west ‘W’
REMOTE PILOTS LICENSE ISSUED BY FEDERAL AVIATION ADMINISTRATION
TYPHOON Q500