



Unmanned and Unbound: The Future of Commercial UAS

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The recent expansion of the drone industry has prompted large research projects and investment initiatives in UAV and related technologies

UAS Industry Overview: Today

- Currently, over **1 million drones** have been registered with the FAA
- Drone sales in 2017 crossed the **\$1 billion mark**
- There are over 1,000 companies in the drone market
- Industry is currently worth over **\$2 billion**
- Emerging trend of **drone specialization requests for specific industry uses**
- **Investment in drone software** is growing rapidly as new drone technology applications are being realized



UAS Industry Overview: Future

- Drone sales are projected to reach **\$12 billion by 2021**
- Global investment in drone **research and development is expected to reach \$4 billion**
- Projections for the **next seven years predict continued drone industry growth**
- **Urban Air Mobility and eVTOL technology** development is expected to drive innovation within the UAS community
- **Package delivery services, air taxis, and medical supply deliveries** are just a few possible future use cases for unmanned vehicles

Public and private entities are currently utilizing UAVs to conduct everyday affairs in a more safe and efficient way

Current Drone Applications

Use case	Description
Border Surveillance	The United States Border Patrol utilizes drones to enable the provision of intelligence, surveillance, tracking and acquisition capabilities in areas with little accessibility
Precision Agriculture	Farmers utilize drones to monitor crops and increase yields, by employing drones to survey their lands and identify irrigation, pest, and soil related issues
Aerial Imaging	Photographers, the entertainment industry, and news outlets use drones to easily capture photos and footage from high altitudes, providing an alternative to helicopter imaging
Forest Fire Prevention/Identification	With drones' capabilities of using infrared technology and visual imaging, forest fire monitors can track and identify fire origins in a quicker, more efficient manner
Building/Structure Monitoring	Construction companies use drones to monitor construction progress and conduct structural inspections in a safe and cost effective way
Disaster Assessment	Disaster relief organizations use drones to assess highway, building, bridge, and power line damages and identify distressed persons
Wilderness/Wildlife Monitoring	Utilizing drone camera and infrared imaging technology to monitor wilderness conditions, track migratory patterns, and examine effects of climate change on wildlife
Capturing Geological Topography	Companies/organizations use drones equipped with photogrammetric software processing to render accurate 3D models of lands, buildings, etc.

Type

Survey



Drone use continues to become a normal practice, prompting more innovative and complex drone applications

Current Drone Applications

Use case	Description
Medical Supplies Delivery	Companies like Matternet and Zipline are pioneering drone-conducted medical supplies deliver services in Africa and Europe
Drone Light Show	Drone light shows program drone fleets to create in-air images while emitting colored lights
Entertainment Assistance	Using drones to enhance concerts, plays, and other forms of live entertainment
Combating Zika Mosquitoes	Drones are used to deploy sterile mosquitoes, preventing some mosquito reproduction, reducing the Zika-carrying mosquito population
Artwork Assistance	Drones equipped with painting tools help artists complete large projects, such as murals, mosaics, and more
Real-Estate Imaging	Real estate firms/agents are using drone imaging technologies to capture photos useful in marketing and promotions
Land Mine Identification	Drones can be used for the mapping, detection, and detonating of land mines, potentially saving thousands of lives
Anti-Poaching Efforts	Drone are used to monitor animals threatened by poaching efforts and detect potential poachers within wilderness areas

Type

- Move
- Entertain
- Operate
- Survey



Continuing advancements in drone technology will allow for greater integration of UAVs and related technologies into every day life

Future Drone Applications

Use case	Description	Type
Package Delivery	Large companies like Amazon plan on using drone fleets to transport packages	Move
Food Services	Dominos and other companies that provide food delivery services would like to use drone to deliver meal orders	
Last-Mile Delivery	Drone use for transporting packages from a transportation hub to their final destination	
Mail Delivery	Using drones to deliver priority mail in a more efficient manner	Emit
Providing Internet/Cell Service	Use drone to provide internet and cell service in areas where those services do not exist	
Highway/Traffic Monitorization	Employ drone traffic monitors and use their collected data to inform traffic reports and GPS applications	Survey
Urban Air Mobility	Drones will likely play a large role in the development of urban transit involving airborne deliveries of both packages and people	Move
Air Taxi/Air Metro	Combining the drone framework with distributed electric propulsion systems could result in widespread adoption of air transit systems	



Today, regulations surrounding UAS vehicles and operations are promulgated and enforced by the Federal Aviation Administration

UAS operations regulation

- **Federal Aviation Regulations**
 - **Part 107**
 - Operating rules for UAS operations
 - **Part 101**
 - Operating rules for hobbyist/recreational UAS
 - **Exemptions from Part 107**
 - Waivable sections from Part 107
 - **Public COAs**
 - Over 70 COAs have been issued to public entities
- **Public Law 112-95**
 - **Section 333**
 - Special Rules for Certain Unmanned Aircraft Systems
 - **Section 336**
 - Special Rules for Model Aircraft



UAS certification and registration regulation

- **Part 21**
 - Outlines certification procedures for parts and products
 - **Subpart H** outlines airworthiness certification of aircraft
- **Federal Drone Registration**
 - Recreational and commercial registration
 - All drone owners are required to register if the UAS weighs greater than .55 lbs (**H.R.2810**)
- **No specific airworthiness standards have been created for UAVs**
- Regulation regarding the certification of larger VTOLs and eVTOLs has yet to emerge, but will likely include evolutions of Part 21, Part 23, and Part 135

Today, sUAS operations are governed primarily by Part 107 and a series of supporting waivers and COAs

Current commercial small UAS (sUAS) operations are governed under Part 107¹...

- **Vehicles:** Aircraft <55 lbs
- **Operators:** require Part 107 certification for commercial applications
 - Must be 16 years old and pass an in-person knowledge exam and TSA screening
- **Operations:**
 - Aircraft must remain within visual line of sight
 - Fly at or below 400 feet
 - No flights over people
 - Flights only permitted during daylight or civil twilight
 - Must yield right of way to manned aircraft
 - Fly at or below 100 mph
 - Fly only in Class G airspace²
 - Cannot operate from a moving aircraft
 - Cannot operate from a moving ground vehicle, unless in sparsely populated areas
- Last-mile delivery **operations may soon be governed by an exemption to Part 135** through the IPP³

... However, expanded operations are permitted on a case-by-case basis with waivers and COAs

- **Part 107 waivers** are available to organizations for expanded operations (e.g., Enhanced Visual Line of Sight (EVLOS), nighttime operations, etc.)
 - In order to get a waiver, organizations must develop a credible safety case that is reviewed and accepted by the FAA
 - To date, there have been over 1,815 waivers granted to organizations around the U.S. for expanded operations⁴
- Public **Certificates or Waivers of Authorization (COAs)** are another avenue for expanded operations available to public sector entities
 - To date, over 70 COAs have been issued to public entities around the U.S.⁴
 - Public agencies are allowed to operate either under blanket COAs or under Part 107 depending on their operations and preference

¹ Section 336 is an alternative means of compliance for recreational users operating as hobbyist / aircraft modelers. Operating under this regime significantly lessens the regulatory requirements (e.g., no Part 107 license required), but cannot be used by commercial entities or commercial operations. However, proposed legislation to amend section 336 is currently in the senate as part of the FAA re-authorization bill, which may change the regulatory authority of the FAA over these groups

² The Low Altitude Authorization and Notification Capability (LAANC) program is starting to facilitate operations in controlled airspace (Airspace B, C, D, and E)

³ Integration Pilot Program; ⁴ As of May 22, 2018

Public COAs offer government agencies an alternative and flexible path to conduct UAS operations

Public Certificates of Authorization provide special UAS operational privileges to public operators

COA vs. Part 107 exemption:

- Public COAs provide much greater operational flexibility for public entities when compared to Part 107, allowing operators to operate regularly in parts of controlled airspace, over people, at night, and beyond visual line of sight
- The lead time and complexity involved with obtaining a waiver is substantially longer than operating under Part 107, as the organization needs to demonstrate a detailed CONOP, a thorough set of standard operating procedures, information regarding specific UAS to be used and a process for self-certification of pilots

Current Public COA Holders Include

Federal Agencies	Agencies are utilizing UAS to conduct research, augment law enforcement operations, provide emergency relief in natural disasters, and monitor United States lands
Universities	Universities engaged in the drone community have COAs that enable research, development, and testing of drones and related technologies
Military Branches	Branches of the U.S. military use COAs to allow for drone operations testing and combat drone research and development
State and Local	COAs are gaining popularity with state and local governments as they explore this technology for fire/EMS, law enforcement, public health, public works and other infrastructure needs

Section 333 was a precursor to the small UAS rule, but with Part 107's implementation, 333 became less relevant for UAV rules exemption requests

At a glance: Section 333

- Section 333 of the FAA Modernization and Reform Act of 2012 (FMRA) grants the Secretary of Transportation the authority to determine whether an airworthiness certificate is required for a UAS to operate safely in the National Airspace System
- This section is no longer used to acquire UAS rules exemption unless the vehicle in question weighs over 55 pounds

Why Section 333 is still relevant

- Before Part 107, entities looking to fly small unmanned aircraft for commercial operations could **get approval from a Section 333 exemption**
- A **Certificate of Authorization would be issued under a Section 333 exemption**, allowing for limited commercial UAV operations
- Now with the small UAS rule in place (Part 107), operators no longer apply for Section 333 exemptions
- However, **some commercial entities still operate under a Section 333 exemption**, which the FAA still recognizes as legitimate
- Section 333 also holds the UAS rules exemption power when the **UAVs in question weigh more than 55 pounds or the intended operation is not waivable under Part 107**

The future of drones will depend on the speed at which regulations surrounding UAVs change and the time at which the necessary technological advancements for further UAV integration occur

- **New applications for drones.** As drone technology advances, new applications for drones will continue emerging. Companies on the forefront of UAV innovations are already announcing the ways in which they plan to use new drone technologies. Amazon, Zipline, Dominos, and Uber are just a few of the many companies invested in drone innovation. As the drone industry expands and becomes more accessible, different industries will have opportunities to incorporate drone tech into their daily operations. The utilization of drones in new and exciting ways will continue to result in safer, more efficient task completion.
- **Research and development focusing on drone technology.** Research regarding drone technology will increase over the next few years. Projects such as electric propulsion development and autonomous flight systems testing are just a few exciting drone developments on the horizon.
- **Developing hybrid and fully electric drone operations.** Government agencies and private firms are investing in the development of hybrid VTOL and eVTOL technology. Improvements in battery technology, VTOL safety, and VTOL autonomous flight incorporation will be key in advancing UAV operations.
- **Changing regulations to incorporate advanced drone technologies into airspace.** Current regulations regarding drones are highly restrictive and slow in responding to innovation. Regulations that address advancements in UAV technology (eVTOLs, distributed electric propulsion, unmanned traffic systems) have yet to be developed.
- **Urban Air Mobility.** Urban Air Mobility is a transit system in which people and cargo are transported via air taxi/air metro in a safe and efficient manner. Urban Air Mobility address current transportation concerns with regards to heavy urban congestion and transportation-related environmental degradation. The system would incorporate UAV technology that can deliver packages, supplies, and people in a safe and efficient manner.

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About Ascension Global: Ascension Global works closely with a range of public and private sector clients in the aviation and aerospace fields to tackle their toughest challenges. Our team works on cutting edge innovative technologies such as Commercial Space, Unmanned Aircraft Systems (UAS), and Flying Vehicles (eVTOLs), with specific focuses on regulation, policy, strategy, PPPs, and investment. Ascension Global works to bring the public and private sectors together to achieve innovation and progress that would otherwise not be possible. To learn more about Ascension Global, please visit our website at www.ascensionglobal.com

