

The background of the cover is a photograph of a tall, lattice-structured tower on a grassy hill under a blue sky with light clouds. A drone is flying in the sky to the right of the tower. The tower has several white satellite dishes or antennas attached to it. The drone is a quadcopter with a camera mounted underneath.

Unmanned Aerial Systems Operations Around Vertical Communications Infrastructure

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Photo courtesy of Sentra UAS

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Introduction

This document represents the National Association of Tower Erectors' (NATE) efforts to create guidelines for operating small Unmanned Aerial Systems (UAS) around vertical communications infrastructure. UAS hold significant promise with their ability to enhance worker safety, reduce fatigue and increase productivity, while facilitating such important work as tower inspections and pre-climb hazard assessments. However, like any new technology, operational considerations must be addressed to escort UAS into the current value stream seamlessly and safely. In doing so, the benefits will be recognized by all constituents at multiple locations along the current operational path.

Objective and Scope

The intended focus of this document is on UAS operations around wireless infrastructure, cellular towers, broadcast towers and utility structures. This document intends to improve UAS operation by suggesting additional items to consider above and beyond the established Federal Aviation Administration (FAA), federal, state and local requirements.

Primary consideration has been placed upon the safety of tower technicians, ground personnel and the general public with respect to flight operations of UAS in the National Airspace System (NAS) as they relate to vertical communications infrastructure. The operational suggestions in this document are in support of all FAA regulations, which take precedence over any suggested operational procedures outlined below.

Federal Aviation Administration Certification

The commercial use of UAS in the NAS is now permitted. The FAA has been working with manufacturers and industry to allow for the safe implementation of UAS to perform commercial activities. The FAA recognizes that flight operations of UAS can provide a safety benefit by augmenting current tower climbing operations, yet pose potential safety risk to manned aircraft if operated irresponsibly; the agency has regulated the airspace accordingly.

Effective August 29, 2016, the FAA amended the Federal Aviation Regulations (FARs) to allow the operation of UAS in the NAS. These changes address the operation of UAS and certification of their remote pilots. This rule will also prohibit model aircraft from endangering the safety of the NAS. Access to the complete, downloadable description of Part 107 of the FARs is available on the FAA website (www.faa.gov) or can be obtained from the U.S. National Archives.

Title 14 CFR Part 107 regulation is an extensive document describing the knowledge and training requirements for operators, operational limitations, flight certification requirements, aircraft requirements and flight prohibitions of UAS operating under Part 107. This new regulatory framework allows small UAS operations for many different non-recreational purposes, including cellular and broadcast infrastructure inspections, without requiring airworthiness certification, exemption or a Certificate of Authorization (COA).

Because it would be impractical to address every page of every document pertaining to the operation of UAS, NATE has elected to publish general guidelines and provide directions to access training and certification collateral provided by the FAA. As an outline to UAS operations, NATE has also included the FAA's Summary of the Major Provisions of Part 107, recognizing that all FARs--including parts outside of Part 107-- must be consulted to comply with all regulatory requirements.

This document is being provided as a resource to assist NATE members in preparing to operate UAS safely and legally. NATE, its Board of Directors and the UAS Committee emphasize the importance of additional training specific to UAS operation in the vertical communications infrastructure environment. For example, there should be a thorough understanding of potential radio frequency (RF) interference. RF produced by assets on the tower is capable of compromising communication between a UAS and its corresponding ground controller. Operators should be aware of these potential issues and understand how to mitigate potential safety risk.

Summary of the Major Provisions of Part 107

*Source: [FAA News: Summary of Small Unmanned Aircraft Rule - June 21, 2016](#)

Operational Limitations

- Unmanned aircraft must weigh less than 55 lbs. (25 kg).
- Visual line-of-sight (VLOS) only; the unmanned aircraft must remain within VLOS of the remote pilot in command and the person manipulating the flight controls of the small UAS. Alternatively, the unmanned aircraft must remain within VLOS of the visual observer.
- At all times, the small unmanned aircraft must remain close enough to the remote pilot in command and the person manipulating the flight controls of the small UAS for those people to be capable of seeing the aircraft with vision unaided by any device other than corrective lenses.
- Small unmanned aircraft may not operate over any persons not directly participating in the operation, who are not under a covered structure or inside a covered stationary vehicle.
- Daylight-only operations, or civil twilight (30 minutes before official sunrise to 30 minutes after official sunset, local time) with appropriate anti-collision lighting.
- Must yield right of way to other aircraft.
- May use visual observer (VO) but not required.
- First-person view camera cannot satisfy “see-and-avoid” requirement but can be used as long as requirement is satisfied in other ways.
- Maximum groundspeed of 100 mph (87 knots).
- Maximum altitude of 400 feet above ground level (AGL) or, if higher than 400 feet AGL (that is, inspecting a structure which stands higher than 400 feet AGL), remain within 400 feet of a structure.
- Minimum weather visibility of 3 miles from control station.
- Operations in Class B, C, D and E airspace are allowed with the required Air Traffic Control (ATC) permission.
- Operations in Class G airspace are allowed without ATC permission.
- No person may act as a remote pilot in command or VO for more than one unmanned aircraft operation at one time.
- No operations from a moving aircraft.
- No operations from a moving vehicle unless the operation is over a sparsely populated area.
- No careless or reckless operations.
- No carriage of hazardous materials.
- Requires preflight inspection by the remote pilot in command.
- A person may not operate a small unmanned aircraft if he or she knows or has reason to know of any physical or mental condition that would interfere with the safe operation of a small UAS.

- Foreign-registered small unmanned aircraft are allowed to operate under Part 107 if they satisfy the requirements of Part 375.
- External load operations are allowed if the object being carried by the unmanned aircraft is securely attached and does not adversely affect the flight characteristics or controllability of the aircraft.
- Transportation of property for compensation or hire is allowed, provided that the aircraft, including its attached systems, payload and cargo weigh less than 55 pounds total; the flight is conducted within visual line-of-sight and not from a moving vehicle or aircraft; and the flight occurs wholly within the bounds of a State and does not involve transport between: (1) Hawaii and another place in Hawaii through air-space outside Hawaii; (2) the District of Columbia and another place in the District of Columbia; or (3) a territory or possession of the United States and another place in the same territory or possession.
- Most of the restrictions discussed above are waivable if the applicant demonstrates that his or her operation can safely be conducted under the terms of a certificate of waiver.

Remote Pilot in Command Certification and Responsibilities

- Establishes a remote pilot in command position.
- A person operating a small UAS must either hold a remote pilot airman certificate with a small UAS rating or be under the direct supervision of a person who does hold a remote pilot certificate (remote pilot in command).
- To qualify for a remote pilot certificate, a person must demonstrate aeronautical knowledge by either: passing an initial aeronautical knowledge test at an FAA-approved knowledge testing center; or holding a Part 61 pilot certificate (other than student pilot), completing a flight review within the previous 24 months, and completing a small UAS online training course provided by the FAA (<https://www.faa.gov/>).
- A pilot must also be vetted by the Transportation Security Administration (TSA) and be at least 16 years old.
- Part 61 pilot certificate holders may obtain a temporary remote pilot certificate immediately upon submission of their application for a permanent certificate. Other applicants will obtain a temporary remote pilot certificate upon successful completion of TSA security vetting. The FAA anticipates that it will be able to issue a temporary remote pilot certificate within 10 business days after receiving a completed remote pilot certificate application.
- Until international standards are developed, foreign-certificated UAS pilots will be required to obtain an FAA-issued remote pilot certificate with a small UAS rating.
- A remote pilot in command must: make available to the FAA, upon request, the small UAS for inspection or testing, and any associated documents/records required to be kept under the rule; report to the FAA within 10 days of any operation that results in serious injury, loss of consciousness or property damage of at least \$500; conduct a preflight inspection, to include specific aircraft and control station systems checks, to ensure the small UAS is in a condition for safe operation; and ensure that the small unmanned aircraft complies with the existing registration requirements specified in § 91.203(a)(2).
- A remote pilot in command may deviate from the requirements of this rule in response to an in-flight emergency.

Aircraft Requirements

- Less than 55 lbs.
- Must be registered
- FAA airworthiness certification is not required. However, the remote pilot in command must conduct a preflight check of the small UAS to ensure that it is in a condition for safe operation.

Pilot Requirements

- Must be at least 16 years old
- Must pass an initial aeronautical knowledge test at an FAA-approved knowledge testing center
- Must be vetted by TSA.

Operating Rules (Subject to Waiver)

- Class G airspace
- Must keep the aircraft in sight (visual line-of-sight)
- Must fly under 400 feet AGL
- Must fly during the day
- Must fly at or below 100 mph
- Must yield right of way to manned aircraft
- Must NOT fly over people
- Must NOT fly from a moving vehicle

Remote Pilot Knowledge Test Prep

Suggested Study Materials

- [Airmen Certification Standards](#) (PDF)
- [Knowledge Test Instructions](#) (PDF)
- [Knowledge Test Study Guide](#) (PDF)
- [Knowledge Test Sample Questions](#) (PDF)
- [Part 107 Advisory Circular](#) (PDF)
- [Pilot's Handbook of Aeronautical Knowledge](#)

Flying Near Vertical Communications Infrastructure

Current FAA regulations for **manned** aircraft (FAR 91.119) require minimum safe distances from obstructions. The minimum manned-flight safe separation distances are greater than 500 feet in uncongested areas or greater than 2,000 feet horizontally and 1,000 feet above the highest obstacle in congested areas, i.e., areas of higher population density. The reduced presence in this zone by **manned** aircraft essentially allows an operating space for UAS operations to de-conflict with most **manned** and unmanned flights.

The FAA recognized the opportunity for UAS to fly in this lower airspace, and created a buffer between airspace reserved for manned flight operations and unmanned operations. Therefore, it is a requirement of all UAS flights to operate at a maximum altitude of 400 feet AGL or, if higher than 400 feet AGL, remain within 400 feet of a structure.

Commercial Operations

The FAA requires UAS operators, flying UAS for compensation or hire, or for internal purposes, to acquire appropriate authorization within the National Airspace System. Compliance requires fulfilling all Part 107 requirements. NATE wholly supports the efforts of the FAA and encourages all UAS operators intent on operating commercially around structures to become FAA-approved through the current CFR 14 Part 107 requirements before conducting any commercial operations in/around vertical structures.

There are different and separate rules for those pilots performing UAS operations under FAA Section 333 of the FAA Modernization and Reform Act of 2012. Exemptions under Section 333 that the FAA has already granted will remain in effect until they expire, and will not be renewed. Moving forward, the FAA foresees most commercial operations by small UAS, previously conducted under Section 333 exemptions, to be conducted under Part 107. This document does not cover Section 333 rules and regulations.

Operational Waivers

The FAA recognizes there may be operational needs for UAS outside of the current regulatory environment. In an effort to provide a pathway to legal operation and better regulations, the FAA provides an application process to earn a waiver that allows operators to fly under certain circumstances or conditions. When a flight operation is expected to be outside of Part 107, operators should consult the regulations for waiver application procedures. (To apply for a waiver, go to: https://www.faa.gov/uas/request_waiver/).

Flight Operations

FAA Requirements – To date, the FAA has not published practical test standards for small UAS operations. Platform reliability, advancements in technology and simplicity of operation continue to improve user capabilities and overall safety. NATE believes operators should be provided some guided training around towers to ensure safety and reduce the possibility of an incident between the UAS and the communication structure being inspected.

Training

- **Judgment** – The need for the operator to demonstrate common sense is an important characteristic to ensure safe flight operations. This characteristic should be considered before the operation of UAS is attempted or employees are selected to operate UAS for the company.
- **Initial Operation Experience & Flight Supervision** – Flight training using a defined syllabus of aircraft operations, standard operating procedures, emergency procedures, UAS systems, National Airspace System and pertinent Federal Aviation Regulations should be part of the initial operating experience and knowledge for each UAS operator operating UAS around structures. Fifteen hours of combined ground training and operational training by a qualified instructor are recommended for each operator before operating independently.
- **Standard Inspection Flight** – It is imperative to clearly identify the route of flight, expected time necessary to complete the mission, intended observations to be made and how the data are to be collected. Standardizing the route provides the most consistent data collection and provides the highest quality data/photos for the end user.
- **Expected Outcomes** - Clearly identify objectives about what information/data is being used and who is the intended recipient of what is being collected. Effort should be made to help operators improve the context of the images or inspection data before they begin the flight.
- **Aircraft Manual and Operators Handbook** - Operators should be familiar with the contents of the aircraft manual and operator handbook to familiarize themselves with systems, standard procedures and emergency procedures.
- **Pre-flight inspections** - Follow guidelines of the aircraft manual and operator handbook concerning all protocols for pre-flight inspections. These may vary among aircraft manufacturers.

- **Standard Operations** - Standard operations vary across different drone manufacturers and types. It is important to understand the standard operations of the particular aircraft being operated. Some examples of standard operations include the following.
 - Pre-flight Checks
 - Notice to Airmen (NOTAM) must be filed with FAA 24 hours in advance of each flight
 - Normal Take-off
 - Normal Landing
 - Altitude and Distance Management
 - Free Flight & Waypoint Route Planning
 - Cold Weather Operations
 - Fuel/Power Reserves – Understanding aircraft systems and indications
 - Performance – Each UAS has its own performance capabilities and wind limitations. It's important to understand each aircraft's performance limitations and corresponding weather conditions prior to each flight.
- **Emergency Procedures** - Emergency procedures vary from aircraft to aircraft, but generally include the following. It is important to thoroughly understand the emergency procedures as specified by the manufacturer.
 - Manned Aircraft Avoidance
 - Forced Landing
 - Lost Communications Landing Procedures
 - RF Interference and Awareness
- **Hardware**
 - GPS Connection Indications and Meanings
 - Altitude Indication for Operator
 - Battery Life indication for Operator
 - Maintenance (Required and Documented) – See Operations Manual
- **Hours of Operation**
 - Daylight Hours
 - Night Operations – Not currently permitted by the FAA.
- **Weather Requirements**
 - Visibility – 3 statute miles
 - Minimum distance from clouds being no less than 500 feet below a cloud and no less than 2,000 feet horizontally from the cloud.
 - Wind – See aircraft Manual for limitations
 - Temperature – See aircraft Manual for limitations
- **Noise Abatement**
 - Operators should consider their location, local buildings and time of day. Normal business hours should be considered when operating in residential locations.
- **Non-participating Observers**
 - General Public and Observers have a high propensity to unintentionally interfere with flight operations. Non-participants should be discouraged from being around flight operations.

- **Operational Considerations**

- **Guyed Towers** - Guy wires add an additional level of complexity for flight operations. Standard procedures should be to transverse to another part of a structure by operating outside the wires. Passing between wires should not be performed.
- **Self-Support Structures**
- **Monopole Structures**
- **Rooftop Antennas**
- **Elevated Water Towers**
- **Radio Frequency (RF) Awareness**
- **Relationship to the Operator** – Unobstructed view between the operator and the UAS is critically important. It is also important the UAS is not directly above the operator, observers, critical infrastructure or any other person.
- **Landowners Notification** – Notification to all property owners within 500’ of operation is required prior to operation.
- **Manned Aircraft** – UAS must be operated in a manner that does not interfere with and gives way to any manned aircraft.

Additional Thoughts about Airspace

Emphasis: The most important issue affecting the use of UAS in the NAS is ensuring proper separation between UAS and manned aircraft. The dangers of operating a UAS without proper knowledge of how the airspace system works could produce a catastrophic outcome if a small UAS collides with manned aircraft. The importance of operating safely cannot be overemphasized. Operators must understand that they are flying a real aircraft in the NAS, and should conduct all their actions accordingly. Pilots, specifically, must take their duties with the utmost seriousness, and remember that they are personally responsible for the safety of the flight.

Airspace Ownership: There are a number of competing entities believing they own/manage the airspace around a tower. In fact, the FAA has jurisdiction over all airspace in the United States (that is, the NAS). However, the tower companies, landowners, carriers and tenants all have interests in and concern with the authorization of flying small UAS around a tower. It is important to understand who should be consulted before flying around a tower.

Privacy

NATE recognizes the value UAS brings to the tower industry and the corresponding societal benefits. With those benefits comes the responsibility to operate with respect to personal privacy. The National Telecommunications and Information Administration (NTIA), within the U.S. Department of Commerce, collaborated with media and commercial organizations (including NATE) in developing a best practices document that focused principally on privacy matters. Parties interested in utilizing UAS should review the document here at [NTIA Best Practices](#). Adding this consideration to each and every flight will help reduce potential issues between operators and unintended consequences with non-participants in imagery collected around a tower. Please respect the personal privacy of others.

Disclaimer

This document represents the National Association of Tower Erectors’ (NATE) efforts to create guidelines for operating small Unmanned Aerial Systems (UAS) around vertical communications infrastructure. The information contained in this resource is to be applied as appropriate to the specific needs and activities of your UAS operations activities. NATE expressly notifies you that you are responsible for knowing and following all applicable regulations and laws regarding UAS operations. It is your sole responsibility to comply with all applicable FAA regulations and requirements and the use of this resource and the concepts discussed herein is at your sole discretion.