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Infrastructure and Systems Security Working Group

Use of Unmanned Aircraft Systems in Support of Transit Security and Emergency Management

Abstract: This guideline provides information and recommendations to help transit agencies explore and implement the use of unmanned aircraft systems to support transit security and safety.

Keywords: security, safety, unmanned aerial vehicle (UAV), unmanned aircraft system (UAS), UASs

Summary: This guideline provides information and recommendations to provide transit agencies information on UAS applications in transit. This document describes UAS applications in the transit environment, UAS limitations and restrictions, technological advancements, and considerations for developing a UAS program and details.

Foreword

The American Public Transportation Association is a standards development organization in North America. The process of developing standards is managed by the APTA Standards Program's Standards Development Oversight Council (SDOC). These activities are carried out through several standards policy and planning committees that have been established to address specific transportation modes, safety and security requirements, interoperability, and other topics.

APTA used a consensus-based process to develop this document and its continued maintenance, which is detailed in the manual for the APTA Standards Program. This document was drafted in accordance with the approval criteria and editorial policy as described. Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

This document was prepared by the Infrastructure and Systems Security Working Group as directed by the Security and Emergency Management Standards Policy and Planning Committee.

This document represents a common viewpoint of those parties concerned with its provisions, namely transit operating/planning agencies, manufacturers, consultants, engineers and general interest groups. The application of any recommended practices or guidelines contained herein is voluntary. APTA standards are mandatory to the extent incorporated by an applicable statute or regulation. In some cases, federal and/or state regulations govern portions of a transit agency's operations. In cases where there is a conflict or contradiction between an applicable law or regulation and this document, consult with a legal adviser to determine which document takes precedence.

This is a new document.

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Introduction

This introduction is not part of APTA SS-ISS-GL-009-25, "Use of Unmanned Aircraft Systems in Support of Transit Security and Emergency Management."

APTA recommends the use of this document by:

- individuals or organizations that operate public transit systems;
- individuals or organizations that contract with others for the operation of public transit systems; and
- individuals or organizations that influence how public transit systems are operated (including but not limited to consultants, designers and contractors).

Scope and purpose

The primary goal of this document is to provide considerations and applications to help transit agencies explore using UAS in transit security and emergency management environments.

Use of Unmanned Aircraft Systems in Support of Transit Security and Emergency Management

1. Introduction: unmanned aircraft systems

In the 21st century, technological advancements and cost reductions have broadened applications for unmanned aircraft systems (UAS) beyond military purposes, for which UAS were first developed. Current non-military applications include aerial photography, ecological monitoring, surveillance and entertainment. Transit agencies can apply many of these UAS applications to support transit activities, especially safety and security functions.

In 2024, a wide range of off-the-shelf commercial UAS are available for purchase, with native capabilities that address photography, infrared and thermal imaging, and underground operations. Most UAS require a ground controller to operate, though automation and artificial intelligence are rapidly advancing automated capabilities. UAS ground controller hardware can include computers, mobile telephones, and dedicated controller hardware provided by the UAS manufacturer. In some cases, manufacturers may produce specialized UAS under specific contracts to meet customer or mission needs.

The term “unmanned aircraft vehicle (UAV)” refers to the physical aircraft that flies. The term “unmanned aircraft system (UAS)” refers to the full package required to fly and control the system, which includes the UAV, the ground control system, camera, GPS, software, etc.

1.1 Purpose of transit UAS programs

Transit agencies can use UAS to support a wide range of transit activities, ranging from facility and track inspections to promotional photography. The benefits of UAS include quick access to inaccessible areas, bird’s-eye views of transit assets, and specialized data like thermal and infrared imaging.

As every transit system has a unique set of operating circumstances, there is no one-size-fits-all approach to a transit UAS program. Transit agencies should examine their requirements and environment (e.g., service footprint, weather patterns, tree coverage) and determine the areas where a UAS program would prove most useful.

1.2 Benefits of transit UAS programs

The primary benefit of a UAS program is that UAVs can quickly reach vantage points impossible or challenging for humans and provide high-level imagery of transit lines, maintenance yards, tunnels, and other assets and areas. Transit agencies can also deploy UAS relatively inexpensively and consistently, especially compared with traditional aviation equipment, though higher-end capabilities typically increase costs.

2. UAS limitations, restrictions and requirements

UAS have a wide range of limitations and restrictions from both policy and technical standpoints. Transit agencies should be aware of all federal, state and local restrictions to maintain compliant programs. The following sections describe national requirements, but transit agencies may also have to comply with state,

local and tribal restrictions. Transit agencies should collaborate with local governmental agencies when creating a UAS program to ensure compliance with legal or policy requirements.

2.1 Airspace restrictions

The Federal Aviation Administration has an extensive set of policy regulations regarding UAS. Before creating a UAS program, transit agencies should consult the FAA's UAS website, specifically the sections relating to public safety and government use of UAS.

An abridged list of the FAA's airspace restrictions follows. Consult the FAA's website for the full list of airspace restrictions and additional information and resources, such as the FAA's UAS Data Delivery System.

2.1.1 Stadiums and sporting events

Flying UAVs in and around stadiums is prohibited starting one hour before and ending one hour after the scheduled time of any of the following events:

- Major League Baseball games
- National Football League games
- NCAA Division I Football games
- NASCAR Sprint Cup, Indy Car and Champ Series races

2.1.2 Airports

For flights near airports in controlled airspace, drone operators must receive an airspace authorization prior to operation. Airspace authorizations come with altitude limitations and may include other operational provisions. Controlled airspace and other flying restrictions can be found on the FAA's B4UFLY app. Separately, the FAA requires all airports certified under Part 139 to have an approved UAS Response Plan that addresses the interruption of airport operations and/or the safe operations of manned air traffic. Transit agencies with airport operations or overlap should consult relevant airport authorities to ensure UAS policy and plan alignment.

2.1.3 Security sensitive airspace

UAVs are prohibited from flying over designated national security sensitive facilities. Example security sensitive airspace includes the following:

- military bases and national security sites such as those designated by the U.S. Department of Defense, National Nuclear Security Administration, U.S. Department of Energy, etc.
- national landmarks (e.g., Statue of Liberty, Hoover Dam, Mount Rushmore)
- certain critical infrastructure, such as nuclear power plants

The FAA maintains a regularly updated and publicly accessible map of security sensitive airspace. Transit agencies should consult the FAA's map when creating UAS missions and flight plans.

2.1.4 Restricted or special use airspace

Other regional or local jurisdictions may impose restrictions over airspace. This can include Temporary Flight Restrictions (TFRs) to address the following:

- temporary hazardous conditions, such as wildfires, hurricanes or chemical spills
- a security-related event, such as a meeting of the United Nations General Assembly
- other special situations, like VIP movement
- National Special Security Events or Special Event Assessment Rating–rated events (e.g., Super Bowl, FIFA World Cup, World Series)

The FAA maintains a map of restricted use airspace. Transit agencies should consult the FAA's map and data when creating UAS mission and flight plans.

2.1.5 Washington, D.C., or U.S. Capitol region airspace

The FAA maintains a Special Flight Rules Area (SFRA) within a 30-mile radius of Ronald Reagan Washington National Airport, restricting all flights in the greater D.C. area. Within the 15-mile "inner ring" of the SFRA, operating a UAS without an FAA waiver is prohibited. Within the 15-mile "outer ring," UAS operation is permitted under normal FAA regulations.

2.2 Pilot licensing

The FAA requires individuals to maintain qualifications to operate UAS. Transit agencies have two options to qualify pilots.

The first option is for transit agencies to designate individual staff to earn FAA UAS pilot certificates under CFR 14 Part 107 and fly under the rules for small unmanned aircraft systems (sUAS).

The second option is for transit agencies to receive an FAA certificate of authorization (COA) to function as a "public aircraft operator." Public aircraft operator authorization allows transit agencies to self-certify UAS pilots and UAS for flights to perform governmental functions. The FAA's COA process can take up to 60 days and begins with the transit agency's counsel submitting a Public Declaration Letter to the FAA.

2.3 Mechanical and technical limitations

While UAS technology is advancing rapidly, even the most cutting-edge systems experience mechanical and technical limitations. Generally, UAS technological limitations may include signal interference from tall buildings or geographical features, GPS dead zones, battery life, and limited operational range.

Individually, every UAS will have specific mechanical and technical limitations. Transit agencies should document their UAS requirements and assess available UAS capabilities before procuring UAS. Transit agencies should incorporate known technical limitations of procured UAS into mission and flight plans.

2.4 Below-ground limitations

While UAS can operate in subterranean environments, transit agencies should be aware of the challenges of operating UAS below ground. Below ground challenges may include the following:

- Areas of subterranean transit systems may be GPS-denied, which can cause UAS to behave unpredictably or not at all.
- Subterranean light conditions often vary throughout the environment, and operators may need to quickly transition from brightly lit platforms into dark tunnels.

- UAS light accessories may confuse or misinform transit personnel who often rely on light signals for critical communication purposes.
- Subterranean transit environments are often confined areas with numerous obstacles, including members of the public, support columns, water elements, dust and low-hanging wires, all of which will interfere with obstacle avoidance technology, if equipped, and make UAS operations especially difficult.

2.5 Other restrictions

Transit agencies should consult with stakeholders and experts to ensure that UAS equipment, policies and procedures comply with all regulations and laws and incorporate UAS and transit industry best practices. Transit agencies should explore incorporating the following procedures and/or restrictions as part of their UAS program:

- Without FAA waivers (beyond visual line of sight, at night, etc.), operators should not fly beyond visual line of sight, higher than 400 feet above ground level or during hours of darkness.
- Operators should not fly UAVs dangerously, recklessly or near any crewed aircraft.
- Operators should not fly UAVs directly over people or moving vehicles.
- Operators should build flight paths that consider restricted airspace, signal-disrupting buildings, commonly used pedestrian paths, recovery zones and other hazards.
- Operators should not use UAS in any way that would violate the constitutional rights of any citizen.
- UAS programs should include provisions regarding recording and transmission of images where individuals have a reasonable expectation of privacy or near military restricted airspace.
- Operators should not use UAS in situations where usage increases a risk of injury to others in the operational area.
- UAS should be prohibited from spraying or dropping anything from the aircraft.
- UAS should not be weaponized.

2.6 Counter-UAS restrictions

The FAA organizes counter-UAS (C-UAS) systems into two broad categories: UAS detection systems and UAS mitigation systems. While C-UAS operations are of growing interest to transit and other government agencies, the FAA maintains regulations and policies that may restrict transit agency C-UAS operations. Improper installation or use of C-UAS equipment may disrupt commercial activity and air traffic operations and expose a transit agency to legal consequences. Transit agencies should consult the FAA before deploying any C-UAS technology.

2.6.1 UAS detection systems

Transit agencies may pursue UAS detection systems to detect when a UAS enters transit agency airspace and track UAS movements. UAS detection systems range from commercial-off-the-shelf systems to made-to-order systems and typically include radar and radio frequency, electro-optical, and/or acoustic sensors. Detection systems do not have the ability to determine UAS operator intent or threat level. Active sensors that emit energy into the airspace require varying levels of FAA approvals.

Agencies with vulnerable security footprints or histories of security incursions may investigate incorporating UAS detection systems into their UAS programs. Transit agencies should seek FAA technical assistance prior to installing or deploying UAS detection systems.

If a transit agency detects unauthorized UAS on transit agency property, agency personnel should immediately report the violation to the FAA and local law enforcement.

2.6.2 UAS mitigation systems

UAS mitigation systems include countermeasures to disrupt, disable, destroy, take control of or provide alternate flight instructions to a UAS. Transit agencies may not deploy UAS mitigation systems. Only federal departments that have explicit statutory authority to use UAS mitigation technology (e.g., U.S. Department of Defense, U.S. Department of Energy, U.S. Department of Homeland Security, U.S. Department of Justice) may deploy UAS mitigation systems. If a transit agency foresees a requirement to deploy UAS mitigation technology, it should consult authorized federal agency partners.

3. UAS applications in transit

Transit agencies span unique, difficult-to-reach environments (e.g., surface-level, elevated and subterranean locations over large areas) and employ various transportation modes, vehicles and equipment (e.g., light rail, ferries, monorails, buses). UAS can offer valuable, real-time information and intelligence to transit and law enforcement agencies in areas and environments that may otherwise be inaccessible or unavailable.

Prior to deploying UAS, transit agencies should review and address all UAS-related federal, state and local laws applicable to an agency's jurisdiction(s). UAS and airspace regulations and requirements may vary from one part of a transit system to another, and airports, stadiums, security sensitive sites and other critical infrastructure may impact agencies' ability to deploy UAS.

UAS operators should also be cognizant of how their UAS will perform in the transit environment in which they will be operating. For instance, denied GPS, limited or nonexistent signals (both between the UAS and controller or between the UAS and server for live-streaming video), and errant electrical interference are common issues operators face in subterranean environments.

3.1 Surveillance

Transit agencies may use UAS to surveil areas that are not covered by stationary cameras or that are inaccessible or dangerous for transit personnel and first responders. These areas may include above- and below-ground train stations, rail yards, and bus depots. Relevant surveillance applications include routine aerial inspections of critical infrastructure; support to proactive law enforcement operations in areas prone to criminal activity; and support to emergency responders during various transit incidents, which may include derailments, track fires, suspicious packages, criminal trespass, etc.

Camera technology (e.g., thermal cameras) can help facilitate surveillance in low- or no-light operations. However, UAS may also require obstacle avoidance or lidar technology to more safely navigate low- or no-light environments.

3.2 Countersurveillance

Transit agencies should be aware that criminals and other adversaries may use their own UAS to monitor transit, law enforcement and emergency response operations. Transit agency personnel should be able to detect and determine whether others' use of UAS is unauthorized according to federal, state or local laws and respond accordingly.

3.2.1 Example countersurveillance incident and response

In 2024 in New York, law enforcement identified two individuals trespassing in a rail yard. While one individual was vandalizing train cars with graffiti, the other individual used a UAS to both record the criminal activity and surveil for a security response. Even though the operator of the UAV possessed a Part 107 certificate, the flight was not authorized and was in violation of several New York City and federal regulations, including the following:

- **NYC Administrative Code 10-126(c):** Takeoff/landing of a UAS is prohibited within the city, outside of designated places of takeoff/landing.
- **Title 38 of the Rules of the City of New York § 24-03:** An application for a permit to take off or land an unmanned aircraft within New York City must be filed, and insurance must be maintained.
- **FAA Part 107:** Flight was conducted in LaGuardia Airport's Class B airspace, specifically a LAANC zero-grid without permission or notification, and no visual observers or anti-collision lights were utilized.

Both individuals were apprehended, with officers conferring with the FAA's operations duty inspector, the Flight Standards District Office, the local FAA frontline manager and federal special agents. Notably, the redundancy of applicable federal and local laws improved officers' legal ability to intercede in this unauthorized UAS flight.

3.3 Emergency management and response

Transit agencies can deploy UAS to support a variety of emergency response situations by providing agencies and responding personnel with valuable surveillance, information and intelligence that would otherwise be difficult or impossible to obtain. Emergency response scenarios that may benefit from UAS deployments include derailments, noncriminal incidents involving individuals struck by trains, train collisions and fires. UAS operators can assist in surveying for damage, identifying causes, directing response and monitoring emergency evacuations from trains and/or stations. Live video streams to leadership can support informed decision-making, and operators can save UAS video footage for later dissemination and reference during investigations, after-action reporting and training. Agencies should coordinate with relevant emergency response agencies before deploying UAS in support of emergency responders to avoid inadvertently disrupting response operations.

3.4 Law enforcement use

Transit agencies can deploy UAS to support numerous law enforcement activities. Transit agencies across the country have successfully deployed UAS, in conjunction with officers in the field, during proactive and preventative operations, ongoing incidents, and post-incident response. UAS operations easily expand observable areas beyond that of patrol officers on the ground. Additionally, UAS-captured footage can strengthen criminal cases. Thus, transit agencies should treat and maintain UAS footage with the same care as other videos deployed for law enforcement purposes (e.g., body-worn cameras, fixed cameras).

In proactive law enforcement operations, transit agencies can use UAS in areas prone to dangerous and illegal activities. Transit uses may include the following:

- **Detecting individuals riding outside of moving trains (i.e., train or subway surfing) in between stations.** Observation and apprehension of train surfers in the past has been notoriously difficult, as they will surf only for a short duration and typically dismount and reenter the train prior to it pulling into the station.

TRANSIT USE CASE

Aerial UAS footage has proved useful in countering train surfing in New York City, where most train surfers are juveniles. Captured UAS footage is presented to parents/guardians when they take custody of the juvenile from the precinct to clearly show the juvenile's train surfing and demonstrate the extreme danger their child placed themselves in. Showing parents/guardians video footage of their juveniles' illegal and dangerous behavior increases parental buy-in to dissuade that juvenile from train surfing in the future. Additionally, as train surfing is a criminal offense, footage of the crime is shared with District Attorney's Offices for potential prosecution.

- **Detecting criminal behavior in low- or no-light environments (e.g., train yards).** Low- and no-light areas prone to criminal mischief (e.g., graffiti) often have limited sight lines that prevent functional use of fixed cameras. In the past, these areas have been limited to foot patrol, often using a flashlight for illumination. However, use of UAS equipped with a thermal camera and/or spotlight attachment provides improved views that may easily highlight unauthorized persons for targeted direction of apprehension teams in the field. Additionally, UAS may be outfitted with loudspeakers to more effectively give commands to perpetrators on the ground.

- **Covering areas with large footprints.** Transit agencies can deploy UAS within stations or above adjacent commuter lots that may experience significant but temporary crime patterns. Similar to operations within train yards, UAS operations can monitor a large area and direct resources appropriately in the event of an incident. Additionally, agencies can use UAS to monitor vehicular and pedestrian traffic during periods of increased ridership due to special events (e.g., concerts, sporting events).

In responsive and ongoing operations, transit law enforcement can assist searches for perpetrators and evidence in Drone as First Responder operations. UAS can be particularly beneficial in transit environments, which contain active trains, rails, track beds and tunnels. The use of both visual sight, lighting accessories and thermal imaging can assist officers in quickly pinpointing subjects or evidence, without needing to send personnel into dangerous areas.

Finally, during post-incident response, law enforcement can use UAS with photogrammetry features to preserve 3-D or 2-D imagery of a crime or incident scene. UAS-provided imagery may provide investigators with detailed information quickly and with minimal resources. In some cases, the UAS may be able to conduct scans and capture media with little to no operator input. The use of UAS can aid, and perhaps accelerate, recovery activities.

3.5 Inspections and other uses

Transit agencies can use UAS to conduct routine inspections of infrastructure throughout the system and identify areas in need of repair. Specialized cameras can detect irregular heat signifiers, which could indicate electrical and/or mechanical failures and may not be noticed by regular visual inspection. With some types of inspections, UAS can offer faster inspections at a lower cost. Transit agencies should consider including guidelines for contractors who wish to use UAS to conduct inspections. Guidelines should address nondisclosure agreements, flight plans, proper video footage preservation, FAA registration/license requirements, and other internal and external requirements.

UAS operations can often capture footage on internal memory or stream live video, which both allow for long-term preservation of video and photography. Transit agencies can use captured footage to draw attention to trends or priority initiatives, improve transit promotional material, support training, and increase public awareness and stakeholder outreach. Transit agencies may also be able to use UAS, in combination with

geographic information system (GIS) capabilities, to support surveys, site mapping, traffic studies, and new system and site planning. Transit agencies can also use UAS to support inventory management by deploying UAS to conduct car counts, observe equipment in the field, and direct the staging of transit equipment.

See APTA RT-OP-RP-025-20, "Use of Unmanned Aircraft Systems (UAS) in Rail Transit Environments," for more information about other UAS applications in the rail environment.

4. Evolving UAS technology

UAS hardware and software are rapidly evolving. Transit agencies may want to consider advanced UAS technology, if program requirements align.

4.1 Cameras

While most UAS offer traditional cameras to capture photographs and video, a major benefit of UAS is their ability to mount specialized cameras that provide imaging outside the normal range of human vision. Many models have advanced camera technology, or agencies can add off-the-shelf camera modification packages.

Specialized cameras and software can detect infrared radiation, allowing for enhanced visibility in various conditions. The cameras detect heat signatures and are useful for spotting people, animals or equipment in low-light situations. This can be of particular use in detecting intrusions into secured areas and scans for weapons or other prohibited objects.

Photogrammetry-capable UAS can create 3-D models of objects and environments and provide responders highly detailed maps of incidents and crime scenes from various vantage points.

FIGURE 1
Thermal Imaging

An imitation pistol dropped by a person on a dark roadbed is illuminated by a UAV's visual light accessory and shown via thermal imaging.

4.2 Artificial intelligence

Recent innovations in AI technology have potential crossover into UAS programs. Of particular interest to transit agencies are developments in real-time processing technology, which use AI's ability to parse large volumes of data to provide instant feedback for decision-making in critical situations.

AI programs should never be the sole authority in decision-making. Human operators should validate and confirm outputs from AI programs to ensure accuracy.

4.3 Speakers

Agencies can explore fitting UAS with speakers, allowing for remote contact with involved parties. For instance, this can be of use in securing restricted areas, alerting trespassers that they are in secured spaces. They can also be used to broadcast guidance during emergencies or perform other passenger service functions.

Agencies should ensure that the use of speaker technology does not violate any constitutional or legal rights or transit policies and does not violate UAS flight regulations.

4.4 Technology for underground and GPS-denied environments

Using UAS underground is challenging due to limited GPS signals and varying environmental conditions. However, there are a wide range of UAS designed specifically for underground operations in tunnels, mines, quarries and other subterranean environments. Transit agencies with significant underground footprints may explore UAVs with the following technology and capabilities:

- **Inertial measurement units:** These sensors track the UAV's orientation and movement without relying on GPS, helping to maintain stability and navigation underground.
- **Visual odometry:** Using onboard cameras to analyze the UAS's surroundings and track movement based on visual landmarks, which helps in positioning and navigation.
- **Lidar:** This technology creates detailed 3-D maps of underground environments by measuring distances using laser pulses, aiding in navigation and obstacle avoidance.
- **Ultrasonic sensors:** These can be used for short-range obstacle detection and to measure distances, helping UAVs navigate through confined spaces.
- **Magnetic field mapping:** Utilizing magnetic sensors to navigate based on variations in the earth's magnetic field, which can be helpful in underground environments.
- **Radio frequency communication:** Establishing reliable communication links for data transmission and control.
- **Autonomous navigation algorithms:** Advanced software that allows UAVs to plan and execute flight paths based on sensor data, enabling them to navigate complex underground environments autonomously.

5. Elements of a UAS program

If a transit agency is interested in deploying UAS to support transit operations, it should develop a comprehensive UAS program that covers UAS planning, procurement, maintenance, storage and training. Agencies should also update their Public Transportation Agency Safety Plan, Security Plan, and other relevant emergency or incident action plans to reflect the UAS program.

5.1 Planning and establishing a UAS program

Before procuring or deploying UAS, transit agencies should develop a program that addresses the full programmatic life cycle, including initial and ongoing costs. Features associated with building a UAS program include identifying stakeholders, identifying designated personnel, procuring a software program for video management and livestreaming, developing an internal system for frequency management and deconfliction, developing policies and procedures, and evaluating and updating the program.

5.1.1 Identifying stakeholders

Transit agencies should assign a UAS project manager or coordinator to supervise and manage the UAS program. Program staff should identify key stakeholders to assist with program planning, execution and assessment. Internal stakeholders should include transit agency staff from all relevant departments, which

may include safety, security, legal, policy, maintenance, operations, and information and transportation technology.

Transit agencies should also collaborate with external federal, state and local public safety and transportation partners to integrate plans and restrictions, as well as to incorporate others' expertise, resources and training, to help develop the transit agency's program. Relevant external stakeholders may include municipal, local, state and federal agencies (e.g., FAA, TSA), law enforcement, public safety and emergency management agencies, other transportation authorities (e.g., airport or seaport authorities), and transportation partners.

5.1.2 Identifying designated personnel

During the initial phases of developing a UAS program, transit agencies should identify personnel designated to operate UAS. To assist with identifying designated personnel, transit agencies should consider formal and informal staff responsibilities and position descriptions, safety and security circumstances, employee interest or disinterest, liabilities, authorities, and other considerations. Transit agencies should identify a suitable number of staff and redundancy to facilitate UAS deployment whenever required.

5.1.3 Developing policies and procedures

Before deploying a UAS program, transit agencies should develop policies and procedures that address all aspects of the program. Related policies and procedures may include the following:

- Program purpose, scope and policy.
- Administrative and program management requirements, to include deployment authorization, program roles and responsibilities, identification of positions that may pilot UAVs, relevant authorities, references, and risk management.
- UAS technology, data and functionality integration into transit systems.
- Video retention and management.
- Frequency management and deconfliction.
- Training requirements (see Section 5.5 for additional details) and maintaining flight proficiency.
- Safety requirements and procedures, to include conducting airworthiness assessments before and after deployment.
- Maintenance requirements and responsibilities.
- Restrictions and/or limitations on use.
- UAS operator instructions and procedures.
- UAS reporting and documentation.
- Programmatic monitoring and assessment procedures, to include key performance indicators and activities to evaluate and report data, trends and observations to improve the program.

5.1.4 Evaluating and updating the program

Transit agencies should require reporting on UAS deployments and incidents to facilitate program evaluation and updates. Transit agencies should collect and assess relevant programmatic data, information and observations via after-action reviews to identify trends and changes to sustain and improve the program. Transit agencies should also regularly seek feedback, regulatory updates and best practices from employees, relevant local partners and industry peers.

5.2 Purchasing UAS

As with all other elements of UAS programs, there is no one-size-fits-all approach to purchasing or procuring UAS or UAS services for transit agency use. After examining potential use cases and requirements for UAS, transit agencies should research and purchase UAS that meet their requirements.

Transit agencies should pursue off-the-shelf UAS models as a starting point. Off-the-shelf models convey many benefits over specialized models, especially for new programs and pilots. Benefits of off-the-shelf models typically include reduce cost, simpler maintenance, ready availability of parts, and existing knowledge bases and communities of interest. Transit agencies should refer to approved vendor lists such as the Defense Innovation Unit's "Blue UAS Cleared List" to identify approved UAS vendors.

Some off-the-shelf models may allow customizations or modifications to units and operating software to meet agency needs. UAS modifications for transit agencies may include installing propeller guards to enhance safety for nearby individuals and to overcome obstacles and wind overpressure from moving components such as trains or other vehicles.

Agencies should consult with finance, policy and/or legal staff to investigate federal, state and local grant funding that may be available for UAS applications. Agencies may monitor H.R.3593, the Drone Infrastructure Inspection Grant Act, which was introduced in May 2023 and seeks to establish a U.S. Department of Transportation grant program to fund UAS use within critical infrastructure sectors.

Agencies should also consult with agency information technology staff, as agencies should treat UAS procurement the same as other IT hardware. Working with information technology and information security staff should minimize cybersecurity risks, such as data spillage, that may be associated with operating UAS.

Once purchased, transit agencies should register UAS with the FAA before deploying.

5.3 Maintaining UAS

Transit agencies should always maintain UAS in a state of good repair and with batteries charged as recommended to ensure airworthiness, calibration and rapid deployment. Transit agencies should maintain UAS in accordance with manufacturer specifications. Based on the program's size, transit agencies may need to create a dedicated UAS maintenance role within the agency.

5.4 Storing UAS

Transit agencies should store UAS according to manufacturer specifications. Transit agencies should store UAS in an area and manner where they are easily accessible to authorized staff at all hours in case of an urgent need. Transit agencies should also maintain safe storage areas for fuel sources (e.g., batteries, gas) or other hazardous materials used on or by the UAS and agency personnel.

5.5 Training individuals to use UAS

Transit agencies should ensure that all pilots receive training to operate UAS according to FAA regulations. See Section 2.2 for further information on UAS operations training requirements.

Transit agencies should also train relevant personnel on transit agency procedures, responsibilities and authorities for deterring, detecting, investigating and responding to unauthorized UAS activities. Training may also include material to raise awareness of UAS capabilities and threats.

Related APTA standards

APTA RT-OP-RP-025-20, "Use of Unmanned Aircraft Systems (UAS) in Rail Transit Environments"

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Abbreviations and acronyms

AI	artificial intelligence
C-UAS	counter-UAS
COA	certificate of authorization
GPS	Global Positioning System
FAA	Federal Aviation Administration
FIFA	Federation Internationale de Football Association
GIS	Geographic Information System
IT	information technology
LAANC	Low Altitude Authorization and Notification Capability
lidar	light detection and ranging
SFRA	Special Flight Rules Area
sUAS	small unmanned aircraft systems
TFR	Temporary Flight Restriction
TSA	Transportation Security Administration

UAS unmanned aircraft system or unmanned aircraft systems
UAV unmanned aerial vehicle
VIP very important person
VLOS visual line of sight

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