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Operating Practices Working Group

Use of Unmanned Aircraft Systems (UAS) in Rail Transit Environments

Abstract: This recommended practice (RP) provides guidance for development of unmanned aircraft system (UAS) plans and procedures for rail transit agencies (RTAs). The RP provides RTAs with guidance on what must be considered in terms of operating UASs in and around rail transit operating environments in order to minimize the potential for unsafe occurrences involving transit operations that may result in damage to equipment or injury or loss of life to passengers, employees, or the general public.

Keywords: unmanned aircraft systems, unmanned aerial vehicles, drones, inspections, emergency response,

Summary: This recommended practice establishes a framework for a management program or formal requirements that RTAs should enact in order to operate UASs for various purposes under a formal, organized approach. The recommended practice offers guidance on use of UASs in the transit environment, design considerations, communications protocols, operations, maintenance, administrative requirements, and training.

Scope and purpose: This RP recognizes that RTAs have many potential uses for UAS, but that their use must be appropriately managed. Inspections and emergency response are among the reasons RTAs may use UAS equipment; their use by the RTA or outside contractors on behalf of the RTA must be carefully managed so as to not interfere with or pose a safety risk to rail transit operations. Their use must be carefully managed and structured in much the same way access to the right of way or to RTA critical infrastructure is controlled and much the same way data within the RTA is controlled and managed. This document will apply to both existing and new RTAs considering the use of UAS equipment.

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Introduction

This introduction is not part of APTA RT-OP-RP-025-20 *Use of Unmanned Aircraft (UAS) in Rail Transit Environments.*

The recommended practice encourages rail transit agencies (RTAs) to develop formal unmanned aircraft system (UAS) plans and procedures. The program, plans and/or procedures are intended to ensure that any individual or party using a UAS on behalf of an RTA satisfies a minimum set of requirements as a safety measure for UAS operations and as a control measure for work conducted above or adjacent to RTA right of way and critical infrastructure.

Note on alternate practices

An RTA may modify the recommended practice to meet its specific needs. APTA recognizes that some RTAs may have unique operating environments that make strict compliance with every provision of this recommended practice impractical. As a result, certain RTAs may need to implement the recommended practice herein in ways that are more or less restrictive than what this document prescribes. An RTA may develop alternates to the APTA recommended practices as long as they are based on a safe operating history and are described and documented in the RTA's Public Transportation Agency Safety Plan (PTASP) or another document that is referenced in the PTASP.

Documentation of alternate practices shall:

- Identify the specific APTA rail transit safety recommended practice requirements that cannot be met;
- State why each of these requirements cannot be met;
- Describe the alternate methods used; and
- Describe and substantiate how the alternate methods do not compromise safety and provide a level of safety equivalent to the practices in the APTA safety standard (operating histories or hazard analysis findings may be used to substantiate this claim).

It must be noted that rail transit is not directly comparable to railroads (e.g. Amtrak, commuter, freight rail, etc). Rail transit systems differ greatly in the types of service, vehicles and technology employed, with some systems operating fully automated trains on exclusive rights-of-way and others operating on streets mixed with traffic. Rail transit demands a unique approach to solving its problems, and the APTA Rail Transit Standards Program was enacted to accomplish this complex task.

Use of Unmanned Aircraft Systems (UAS) in Rail Transit Environments

1. Use of unmanned aircraft systems (UAS) in the rail transit operating environment

Rail transit agencies (RTA) have begun to use unmanned aircraft systems (UAS) to support a number of existing required functions of the organization. These may include but are not limited to: operating environment inspections, incident response, and system mapping. UAS provide RTAs with timely access to difficult areas and the ability to inspect these locations and obtain high quality video. The future capabilities of UAS are likely to exceed what can be imagined today. However, the use of UAS in a rail transit environment poses a range of unique risks that must be identified and mitigated by the RTA.

RTAs using UAS technology should develop, implement, and adhere to a written UAS program, which may consist of policy, rules, procedures, and/or other processes. The UAS program requirement is intended to control and reduce the risks associated with UAS operations (e.g., airborne collisions, cyber security, entering restricted airspace, etc.) and improve safety (e.g., emergency response, remote hazard inspection). Failure to establish a UAS program would ignore the risks associated with UAS operations and could lead to improper and inconsistent use of UAS technology by different parties in or on behalf of the RTA.

The RTA operating environment is unique, and some issues for consideration include, but are not limited to:

- Operation in urban areas with people and ground congestion
- General operation of the equipment in and around rail transit environments
- Operation at lower altitudes near right of way infrastructure and equipment such as catenary structures
- High voltage of the traction power systems (e.g., stray current, electromagnetic fields, etc)
- Operation in twilight, degraded visibility, or in areas with limited line of sight
- Interference with train or on-track equipment movement
- Interactions at stations
- Coordination with RTA work activities
- Coordination with the track allocation and availability protocols
- Coordination with parties performing construction or other work adjacent to the RTA right of way

1.1 Use cases

RTAs may implement UAS for a variety of purposes to support critical RTA functions in operations, maintenance, safety, security, emergency management, or other areas. The RTA should identify, review, and update the UAS program to reflect the authorized users and approved applications. The RTA may have multiple use cases for UAS and may have different groups coordinating for use of the UAS (e.g. emergency responders and inspectors have a need for UAS as part of regular duties). Use cases may include, but are not limited to:

- Inspections
- Infrastructure monitoring
- Incident response
- Emergency management
- After action reports from drills/exercises
- Special event management

- Accident reconstruction
- Post disaster information gathering and recovery
- Inventory management (e.g. car counts, equipment in field, staging of components)
- Development/support of training materials
- New system mapping
- Surveys and site mapping
- Traffic studies and traffic counts
- Mapping purposes related to transit asset management and knowledge of underground utilities or other infrastructure

1.2 Executive support for a UAS program

An RTA should ensure that protections are built into the UAS program; this is intended to identify the risks and make certain they are being mitigated to an acceptable level, as defined by the RTA. Executive management should adopt a policy statement that explains that any UAS use at or near the RTA must comply with the requirements of the RTA UAS program. Any other potential uses will not be considered unless they are reviewed and approved, as stated in the UAS program. Accountability is ultimately the responsibility of RTA leadership.

1.3 RTA stakeholder involvement

The RTA should identify any roles and responsibilities of RTA stakeholders, such as the safety department, in leading or supporting activities such as hazard analysis, safety certification, configuration management, or other departmental duties that interface with the UAS program.

1.4 Administration of the UAS program

The UAS program should identify departments and/or personnel responsible for its administration and management. An RTA may create an RTA-wide UAS program that is applicable to all users in the RTA and includes procedures and requirements, or it may create a more general policy or standard with which individual departments must create departmental UAS programs that comply with the RTA's general policy or standard.

The RTA should develop a safety certification and/or testing/commissioning process specific to the introduction of the initial UAS program and continued modifications to the program. Safety certification in this case means a formal process for ensuring that new equipment, training, and procedures are tested and accepted in accordance with the UAS program requirements. The Federal Aviation Administration is developing a technical safety certification process for the design of UAS hardware, which is separate from the operational safety certification called for in this recommended practice.

2. Product design considerations

The design and functionality of UAS is wide ranging, and the RTA should identify how it intends to use the UAS, including the mission requirements and what data the RTA intends to gather with UAS. The RTA may consider UAS design requirements or standards, including, but not limited to:

- Flight UAS types
- Flight performance
- Flight cameras (infrared, collision avoidance)
- Anti-collision lighting
- Flight battery capabilities
- Environmental conditions

- Controllers
- Payload weights (e.g., < 55 pounds total)
- Flight management and ground control software (e.g. GPS)
- 2-D mapping
- 3-D modeling
- Image stitching
- Data formats - Lidar, AutoCAD, and Revit, volumetric
- Spare parts
- System redundancies

3. Communication

Formal methods for communication of UAS operations include coordination with regulatory agencies, law enforcement, emergency first responders, and/or employees. Formal methods for communication should also take into consideration community outreach and public notification protocols. The UAS program should include RTA requirements for these types of communication.

Communications requirements related to the operation of UAS in relation to any train or on track equipment movement must also be included in the UAS management plan.

The RTA communication policy and procedures should take into consideration the following:

- Public outreach/notification
- Markings on equipment to demonstrate it belongs to RTA.
- UAS operations readily identifiable by the public
- FAA, air traffic control, Transportation Security Administration, and airport operations
    - Federal rules
    - State/county/municipal level requirements beyond federal requirements
    - Coordination with Department of Homeland Security and relationship of DHS requirements with other regulatory agencies and emergency response agencies
- Coordination with local law enforcement agencies (especially in emergencies, e.g. mitigating risks associated with operation of multiple UAS in the same location)
- Integration with the track allocation process and/or use during both revenue and non-revenue operating periods
- Communication with the rail operations control center, when applicable

4. Administrative and program requirements

The UAS program may include guidance/requirements related specifically to the use of UAS. This may include, but not be limited to:

- Procurement of professional UAS services
- Procurement of UAS equipment
- FAA equipment requirements
- FAA reporting requirements
- State and local requirements
- Personal privacy
- License/permits

- Costs/fees
- FAA restricted space
- Buildings of critical concern
- City operations
- Interagency coordination
- Data rules and storage
- Flights during search and rescue operations
- Training of UAS pilots and support personnel
- Operations and hazard familiarization for rail operations personnel on UAS usage
- Maintenance, repair, and calibration of UAS equipment
- Incident and collision reporting, inspection for damage, and investigation
- Insurance requirements

5. Operation and maintenance

All operations and maintenance requirements activities should be accounted for in a UAS program. The operations and maintenance portion of the UAS program may include, but not be limited to, the following:

- Flight manuals
- Flight planning
- Line of sight requirements
- Flight approvals
- Preflight checklists
- Flight logging
- Flights in the ROW
- Night operations
- Weather
- Spotters for pilot(s)
- Cameras and connectivity problems
- Unusual operations failure/recovery procedures
- Equipment maintenance
- Waiver for any restrictions

6. Training of personnel

The RTA should establish a training program whose administrative requirements meet those established in APTA Standard for Training of Rail Operating Employees (APTA RT-OP-S-013-03, Rev. 2). UAS pilots and crew should comply with the following requirements:

- All pilots must meet current FAA requirements for UAS operations
- All pilots should demonstrate their ability to perform the tasks required for the safe use of UAS in a rail transit environment, including exercising the emergency recovery capabilities
- Minimum use frequency to maintain certification
- Supervision of newly certified pilots by experienced pilots
- Minimums related to maintenance, repair, and calibration of equipment

Related APTA standards

- APTA RT-OP-S-013-03 Rev 2 Standard for Training of Rail Operating Employees
- APTA RT-OP-S-016-11 Rev 1 Standard for Roadway Worker Protection Program Requirements

References

- 2017 FAA National Pilot Program
- FAA 14 CFR Part 107 Small Unmanned Aircraft Systems
- FAA Fact Sheet – Small Unmanned Aircraft Regulations (Part 107)
- ISO/TC20/SC16 Unmanned Aircraft Systems
- Chapter 13 of the FAA's Helicopter Flying Handbook
- Chapter 17 of the FAA's Pilot Handbook of Aeronautical Knowledge
- FAA Pilot Safety Brochure "Spatial Disorientation Visual Illusions"

Definitions

AutoCAD AutoCAD is a computer-aided design (CAD) program used for 2-D and 3-D design and drafting. AutoCAD is developed and marketed by Autodesk Inc. and was one of the first CAD programs that could be executed on personal computers.[1]

image stitching: Image stitching is the combination of images with overlapping sections to create a single panoramic or high-resolution image.[2]

lidar A device that is similar in operation to radar but emits pulsed laser light instead of microwaves.[3]

on-track equipment A rail mounted vehicle or equipment that is not used in revenue service but is used to inspect, maintain, and repair the rail system.

rail transit agency: The organization that operates rail transit service and related activities. It is also known as the transit system, transit agency, operating agency, operating authority, transit authority or other similar term.

Revit Revit is a building-specific design and documentation solution, supporting all phases and disciplines involved in a building project.[4]

track allocation: The management, scheduling, and authorization of access by employees and contractors to perform work on, near, or adjacent to the right of way or any RTA facilities.

train: Any motorcar, locomotive or other self-propelled on-rail vehicle, with or without other cars coupled. A regular train is a train authorized by a schedule. An extra train is any train that is not in the schedule.

[1] https://www.techopedia.com/definition/6080/autocad
[2] https://whatis.techtarget.com/definition/image-stitching
[3] https://www.merriam-webster.com/dictionary/lidar
[4] https://www.autodesk.com/solutions/revit-vs-autocad

Abbreviations

APTA American Public Transportation Association
FAA Federal Aviation Administration
NATSA North American Transit Services Association
RTA rail transit agency
SOP standard operating procedure
TSA transportation security administration
UAS Unmanned aircraft system

Summary of changes

This is a new document, hence there are no changes.

Document history

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