



U.S. Department of Transportation
Federal Transit Administration



Use Cases for Unmanned Aircraft Systems (UAS) in Public Transportation Systems

Background

Technological advancements in commercial unmanned aircraft systems (UAS) over the past decade have created a groundswell in potential applications in both the public and private sectors. Recent applications using UAS (drones) have shown an increase in the safety and efficiency for tasks that would otherwise be time-consuming, difficult, and dangerous. Within the U.S. Department of Transportation, the potential applications of UAS have extended to all modes of transportation, including the exploration of UAS in public transportation settings; however, the perceived complexity of the technical and regulatory framework of using UAS effectively can be a barrier to transit agencies new to the technology.

Objectives

This report aims to provide detailed considerations from a regulatory, operational, and business case perspective for using UAS in public transportation systems. The report provides guidance and support to public transit agencies in determining whether to apply UAS technology to current operations through the development of example use cases.

Findings and Conclusions

Considerations for developing a successful UAS evaluation platform include ensuring sufficient representation of the overall market, addressing data and knowledge gaps, collecting data for further benefit cost analysis, and identifying ways to measure potential private sector outsourcing.

To better understand the needs of transit agencies, interviews with stakeholders at the local, state, and federal levels were conducted, which yielded a broad list of potential use cases for UAS in public transportation systems. Two use cases were further examined in greater detail—rail and track inspections and disaster response & recovery. UAS applications were analyzed through three specific disciplines—air traffic management, human factors, and economic, cost-effectiveness analysis.

From an air traffic management perspective, it is crucially important to understand regulations (FAA Part 107) guiding the legal use of small UAS (< 55 lbs). Most use cases can easily remain within FAA regulations; in the case of track inspections and disaster response & recovery, no additional waivers are needed for basic operations.

Human factors considerations can help to determine whether use is feasible from an operator's perspective and that the operation does not have any unintended consequences, including the design, planning, and implementation of UAS operations. Human factors should be considered before, during, and after UAS operations. Training should encompass Part 107 and the specific needs of the transit agency, and roles and responsibilities, communication procedures, and contingency plans (e.g., with a lost link) should be considered.

A detailed cost accounting for the use of UAS in track inspections was conducted to analyze the potential cost-effectiveness of the application compared with traditional routine inspections. The analysis found that applying UAS to track inspection operations was relatively inexpensive and that efficiency gains of around 5% would see a breakeven return on investment using UAS. A brief discussion of the business case viability for disaster response & recovery is also included.

The report includes a discussion of future considerations for demonstrations and evaluations of UAS applications in public transportation settings, including ensuring sufficient representation of the overall market, addressing data and knowledge gaps, collecting data for further benefit cost analysis, and identification of ways to measure potential private sector outsourcing.

Benefits

The application of commercial UAS operations to industry continues to grow while drastically improving both safety and efficiency. Best-suited for difficult or time-consuming tasks, UAS have been applied to numerous federal agencies and state department of transportation operations. This report seeks to extend the application of UAS technology to public transportation systems, with a focus on two use cases permitted under current regulation—infrastructure inspection and disaster response & recovery.

Project Information

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This research project was conducted by the John A. Volpe National Transportation Systems Center. For more information, contact FTA Project Manager Terrell Williams at (202) 366-0232 or Terrell.Williams@dot.gov. All research reports can be found at <https://www.transit.dot.gov/about/research-innovation>.