

<u>Measure Name</u>	Unmanned Aircraft Systems (UAS) for detection
<u>Definition</u>	Use of UAS (e.g., drones) to monitor and detect individuals on or near the track area.
<u>Tags</u>	
<i>Incident Type</i>	Both trespass and suicide
<i>Location</i>	Right-of-way only
<i>Intervention Strategy</i>	Engineering: technological and physical deterrents
<i>Measure Group</i>	Detection and lighting

Description

The ability to detect trespassers on the right-of-way can enhance safety; however, it is not economically or operationally feasible to use fixed detection systems to monitor the entire railroad network for trespassers and potential suicides. With advances in Unmanned Aerial System (UAS) technology, railroads and law enforcement agencies have started exploring the use of UAS in detecting and reporting trespassers on the tracks to appropriate officials.

Use of an Unmanned Aerial Vehicle (UAV) is best suited to areas with a good line of sight, due to current Federal Aviation Administration (FAA) requirements that the pilot always maintain visual contact with the UAV during a flight. (Note: UAV refers to the vehicle or drone itself. UAS refers to the entire system, including any controls and communications.) Fulfilling this requirement may be challenging in the rail environment. One railroad, BNSF, has received FAA exemptions to operate drones beyond the visual line of sight [1]. Since UAVs have limited flight time due to battery life, the UAV is most effective when used at locations with known trespass issues or when an individual is at imminent risk for suicide.

The Volpe Center, in partnership with a local police department, conducted a study in that found UAVs can have difficulty detecting certain types of trespassing that frequent but short in duration [2]. In addition, there may be issues with drone software updates. For example, the drone used in the study required regular software updates through its manufacturer. The drone would not fly or would abort a mission mid-flight and return to the landing spot until the update was performed. No other studies on the use UAV for trespass detection have been identified as of 2024.

Other examples of planned drone use for this purpose include Florida's Tri-Rail which plans to use "UAV to spot trespassers and prevent suicides as well as accidents on the railway" [3].

The cost of a UAS, which includes a UAV ground control and communications equipment, can range from several hundred to thousands of dollars depending on application and sensor configuration. The UAS system procured for the Brunswick, ME project cost about \$20,000.

Additional search terms: *cameras, surveillance*

Advantages

- Unlike fixed detection systems, UAS are mobile and can be quickly deployed to a wide variety of locations.
 - Using UAVs can potentially allow law enforcement to respond to trespassers quickly, reducing response time from 40-60 minutes to 15 minutes or less [3].
 - Using UAVs to detect intruders or anomalies is safer and more efficient than officers walking the tracks.
 - UAS have a range of price points, including lower-cost options.
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Drawbacks

- Operators of a UAV for commercial, public safety, or government use must have an FAA Remote Pilot license before flying [4].
 - Per FAA regulation, remote pilots are always required to have visual contact with the UAV while in flight [2]. However, it may be possible to obtain exemption [1].
 - A waiver is required from the FAA to operate a drone after dark [2].
 - FAA rules prohibit operation of UAV in certain airspace [4] and over crowds of people [2].
 - Pilots are discouraged from flying a drone in high winds or rain due to the potential to lose control of the of the drone [2].
 - The battery life of a UAV limits its flying time [2].
 - Isolated trespassing events with short durations are difficult to detect using a UAS [2].
 - There may be limitations to some drone software updates, which can result in malfunction [2].
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Notable Practices

- Ensure that the UAV is registered with the FAA and a registration fee is paid before operating the drone [2].
- Review state and local regulations/guidelines for the use of a UAV. For example, Maine State Laws 25 M.R.S. §4501 requires the appropriate governmental unit approve the acquisition of a UAV by a law enforcement agency [2].
- Consider the approval process when implementing a drone program. In addition to FAA regulations governing the use of drones, many state and local governments also have their own laws and regulations governing the use of drones.
- Consider developing a procedure for how to handle a trespasser detected from the drone.

- Ensure that drone operators receive proper training in regulations as well as privacy issues regarding the operation of drones.
- Consider acquiring a UAV platform that has the capability to use different camera types [2].
- Consider acquiring similar platforms to those used by other law enforcement agencies so that they can share their experiences. These relationships could also potentially lead to equipment sharing in the event of component failures or malfunction [2].
- Ensure that recorded data collected from drones is properly stored and secured.

References

[1] Brajkovic, V. (2019, April 12). [BNSF receives FAA exemption for advance drone operations](#). *Progressive Railroading*.

Description: This news article discusses the exemption BNSF Railway Co. received from the Federal Aviation Administration (FAA) to advance drone operation including "beyond visual line of sight" (BVLOS) flight operations.

[2] Barron, W. and daSilva, M. (2019). [Trespasser Detection on Railroad Property Using Unmanned Aerial Vehicles](#). Technical Report No. DOT/FRA/ORD-20/33. Washington, DC: U.S. Department of Transportation, Federal Railroad Administration.

Abstract: The U.S. Department of Transportation's (DOT) John A. Volpe National Transportation Systems Center (Volpe), under the direction of DOT's Federal Railroad Administration (FRA) Office of Research, Development and Technology (RD&T), conducted a research study that evaluated the effectiveness of using an unmanned aerial vehicle (UAV) to detect trespassers on railroad property. The team cooperated with the Brunswick, Maine Police Department (BPD), which agreed to be trained in operating and maintaining the UAV, and to perform periodic overflights of the railroad property in Brunswick. Over the course of twelve months, BPD conducted 32 flights over railroad property, but was unable to discover trespassing events in progress. The researchers concluded that certain types of trespassing, which occurs frequently but in short duration, were more difficult to detect using a UAV than trespassing that involves loitering on the right-of-way. However, the UAV made it easier for BPD to patrol remote, hard-to-reach sections of track

[3] Pounds, M.H. (2019, March 8). [Tri-Rail has new drones to watch the railways for safety. When will they start flying?](#) *South Florida Sun Sentinel*.

Description: This news article discusses Tri-Rail commuter train's plans to adopt drone technology to detect trespassers and prevent suicides and accidents on their right-of-way.

[4] Federal Aviation Administration. [Operation and Certification of Small Unmanned Aircraft Systems](#).

Description: The FAA is amending its regulations to allow the operation of small unmanned aircraft systems in the National Airspace System. These changes address the operation of unmanned aircraft systems and certification of their remote pilots. This rule will also prohibit model aircraft from endangering the safety of the National Airspace System.

Related Measures

- CCTV and other detection systems
- Collaboration with local government and communities
- Identify funding opportunities
- Incident cost estimation
- Improving the safety of individuals experiencing unsheltered homelessness Removal of obstructions to increase visibility