

# Assessing the Condition of Railroad Bridges Using Unmanned Aerial Vehicles (UAVs)

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## Background

Currently, 40% of the United States' freight tonnage is carried by railroads. Infrastructure systems are aging, demands have increased and capacities are being stretched. Maintaining adequate track capacity to address expanding passenger and freight needs is one of the largest challenges in creating a competitive rail network. Since resources are limited, railroad companies are interested in using new technologies that can collect information about their infrastructure to cost-effectively and safely make decisions about maintenance and replacement prioritization.

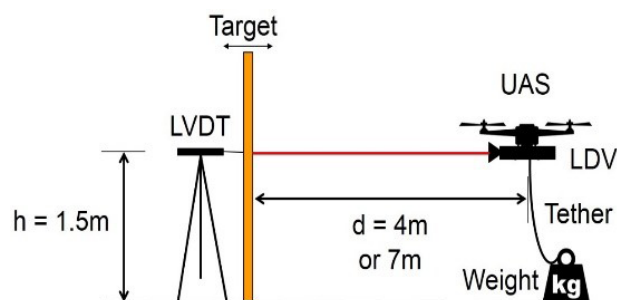
Bridge inspections are required annually as part of the bridge management program and follow the American Railway Engineering and Maintenance-of-Way Association (AREMA) recommended practices. There are significant challenges that affect railroad bridge inspections today: (1) Railroad bridge inspectors need to evaluate all the bridge structural elements. This is a major challenge in tall and long steel bridges where elements are difficult to access. At times, inspections need to be scheduled in between regular traffic to allow visual access of inspectors to bridge elements, reducing traffic capacity; (2) Visual observations without measurements can't quantify defects, they are in general subjective and depend on the inspector carrying them; and (3) Current inspections cannot quantify the dynamic response of bridges to railroad crossing events, even though the railroad community is interested in measuring the performance of railroad bridges under live loads. To measure displacements under traffic, a reference point needs to be installed at the field, which is costly and sometimes not possible. There is a present market need for a system that overcomes these challenges and allows for objective and effective assessment and monitoring of structures.

## Technology Breakthrough

Researchers at the University of New Mexico have developed a system for assessing and monitoring the condition of railroad bridges. With the use of Unmanned Aerial Vehicles (UAVs) and one laser mounted on the UAV, this system will allow for collection of structural health data from remote and inaccessible locations. This innovative approach is being developed to intelligently integrate both the bridge performance (displacement) and bridge condition (inspection) remotely, specifically in environmentally affected areas when the bridges cannot be easily accessed, i.e., when high water level exists. Furthermore, such assessments can be used to provide warnings to emergency management services, to inform transportation decisions as necessary, and to identify potential weak links in a critical rail infrastructure network. Ultimately, this is a tool that collects data of interest to the railroad owner to manage their inventory of bridges.

## Key Advantages

- Assesses structural condition of railroad bridges and other structures under dynamic loads
- Potential framework for consequence-based management of critical infrastructure systems
- Real-time processing and transmission of data
- Measurement of critical responses from a large population of bridges, enabling the prioritization of maintenance, repair, and replacement decisions at the network level using objective data
- Safe collection of structural condition data in remote, inaccessible locations
- Applications for structural health monitoring (SHM), performance monitoring of infrastructures, critical infrastructure assessment, and railroad bridge monitoring



## Intellectual Property

U.S. Utility Application 15/477,775

## Contact

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