5 THINGS TO KNOW
About How Drones are Being Used for Civil Infrastructure Inspections in North America
A recent study concluded that more than 54,000 bridges in the United States are in need of repair. Not long ago, the total United States rail network was determined to consist of approximately 137,000 route miles, while there are approximately 4,071,000 miles of roads in the U.S., all of which are in different conditions that require different levels of maintenance and upkeep. These are just a few of the numbers that demonstrate the enormity of work that private and public agencies have to deal with when it comes to the upkeep and inspection of critical infrastructure throughout the country.

Drones that have been equipped with ultra high definition video cameras can be utilized to inspect all of these pieces of civil infrastructure to look for any signs of trouble. They can easily access areas under bridges or along rail tracks that lessen the risk of falling or exposure to hazards that inspectors otherwise have to deal with. Additionally, the delay costs associated with closing a bridge or road can be completely avoided by using a UAV, which can exponentially drive down the costs of these inspections.

DOTs are Using Drones to Improve Safety and Efficiency

The American Association of State Highway and Transportation Officials (AASHTO) conducted a survey and found that 17 state transportation agencies have studied the use of drones, while 16 state agencies were actively exploring how they could effectively leverage the technology. Their research showcased how these agencies used drones to assist with bridge inspections, accident clearance, surveying and identifying and monitoring risk posed by rockslides and flooding. However, it’s the specific ways that the technology is being applied by these DOTs that is making such a difference.

The North Carolina Department of Transportation (NCDOT) determined that it is possible to use drones in low-light collision scene reconstruction. Their research, conducted in participation with RTI International and the University of North Carolina at Charlotte, found that not only does doing so save thousands of dollars, but using drones instead of traditional ground-based reconstruction techniques also cuts the time each reconstruction takes from almost two hours to less than half an hour.

The Georgia Department of Transportation has 11 offices that are using or want to be using drones, and that adoption has allowed the agency to create a standard around how the
technology should be utilized. Elsewhere, the Kansas Department of Transportation (KDOT) has started testing drones for bridge and tower inspections while DriveOhio and the Ohio UAS Center announced a new strategic plan to support unmanned aircraft systems research and development.

More and more DOTs across the country have begun to realize the kind of difference the technology is making for entire departments, and these differences are enabling adoption and integration of the technology at various levels within these organizations.

The Approach to Drone Adoption is Essential

The National Transportation Safety Board (NTSB) is an independent, federal agency. They are not part of the FAA or DOT, and are charged with investigating transportation accidents, determining the probable cause, and making recommendations to prevent reoccurrence. In addition to aviation accidents and incidents, the NTSB investigates highway, rail, pipeline, hazardous materials, and marine accidents. This scope of work is what makes their efforts to adopt drone technology so important, especially since they’ve been able to detail what kind of a difference the technology has made.

“We’re now able to use the drone to make very accurate and complete wreckage diagrams of aviation accidents that might have parts of an aircraft strewn about in difficult terrain,” said Bill English, Investigator in Charge in the Office of Aviation Safety at NTSB. “Additionally, when we can map the runway in half the time, that means we can give that runway back to the airport authorities, and they can get it fixed, open and airline traffic operating off that runway much more quickly.”

English explained that using a drone isn’t just about saving time or being more efficient though. Drones have allowed NTSB investigators to plot out search patterns to find wreckage that wasn’t spotted by searchers. The technology has allowed investigators to see areas of a freight train accident that they would otherwise avoid due to the danger that could be associated with hazardous material cargo.

The NTSB’s success with the technology is ultimately driven by their approach that sees drones as just another investigative tool to be utilized when necessitated by the mission. English doesn’t consider himself a drone pilot that does accident investigations. Rather, he’s an accident investigator that can fly a drone when necessary.
The Automated Analysis of Drone Data Will Create Incredible Efficiencies

It’s possible to collect a great deal of data for an inspection of a bridge or railway, but how do you process all of that data efficiently from a cost and time perspective? The number of human resources needed to analyze, process and deliver all of that information back to the user can make the entire process as costly as it is complicated.

To make all of this easier, Bihrle Applied Research’s new venture, Ardenna, automates the whole process to provide insightful and actionable data more quickly and accurately than human reviewers. Their work with BNSF Railway, which operates one of the largest freight railroad networks in North America, to automatically process terabytes of imagery collected by drones showcase what it will mean to create incredible efficiencies with this technology for railroad inspections.

“Given the current robust aerospace market, we continue to see a strong demand for our core aeronautical research and development capabilities,” said Jack Ralston, President of Bihrle. “At the same time, we see the increasing use of drones to capture imagery for asset inspections and the growing realization that automation is needed to process this imagery.”

Computer vision and machine learning solutions that are designed to automate detection, classification and reporting of anomalies found during a railway inspection have allowed BNSF Railway to realize incredible efficiencies. Those differences can be quantified both in terms of inspection time as well as the costs associated with preventive maintenance resolving an issue before becomes an expensive problem.
One of America’s Biggest Railroads Has Taken to the Sky

With a history that stretches all the way back to 1862 and the responsibility that goes along with being one of the world’s largest transportation companies, Union Pacific might not be the first company that comes to mind when thinking about organizations that are on the forefront of adopting new tools and technology. It’s quite the opposite though, since Union Pacific first began to utilize drones in 2016, and things have evolved rapidly since then.

The company has used imagery from the drones to change and improve their recovery plans, and also developed their own Perceptive Navigation Technology (PNT), which enables the railroad to fly drones in places without GPS coverage. Examples of areas where that coverage can be troublesome include the space under a large metal bridge, or in the depths of long culverts. Drones have also kept people on the ground, as the alternative sees inspectors hanging from 800-foot-long metal bridges or 600-foot-high radio towers. These solutions have made a major impact on safety for the company as a whole, but these results are set to be pushed even further.

In 2018, Union Pacific became the safest U.S. Class 1 railroad in employee safety for the third consecutive year. In 2016, the railroad achieved the best annual employee safety performance in its 154-year history, but drones could be an important part of accomplishing Union Pacific’s ultimate goal: zero accidents and zero injuries.

Efficiencies Beyond the Bottom Line are Being Created for Pavement Inspections and Highway Mapping

The decision to map 1,000 kilometers of highway with a small drone wasn’t an easy one for Sergio Lugo Serrato of Skylab Industries to come to, but he found it to be his only viable option. Large sections of highway in Mexico needed to be mapped in order to inspect everything from the pavement conditions to vegetation encroachment to the general state of the roads. The team traveled across Mexico to take thousands of images of highway that were then processed into orthomosaic maps via DroneDeploy for delivery to the client.
More recently, the DroneDeploy team highlighted how drones enabled a 60% reduction in field time for a team that was focused on assessing the condition of a roadway in Minnesota. Engineering and Consulting firm Bolton & Menk gathered imagery to evaluate the deterioration of pavement across 26 miles of roadway infrastructure. The data helped the engineering team recommend a construction and maintenance timetable based on a real-time assessment of existing road conditions.

Using drones allowed the team to replace boots on the ground with drone surveys, which dramatically improved Bolton & Menk’s workflow and provided value that went beyond the bottom line. Their client was so happy with the information they asked to use it for projects outside of the roadway analysis. Using drones created a whole new value proposition for everyone involved in the project.