

Testimony of Todd Graetz
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Aviation Operations, Safety and Security Subcommittee
“Keeping Pace with Innovation – Update on the Safe Integration of UAS into the Airspace.”
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Introduction

Thank you Chairman Blunt, Ranking Member Cantwell and Members of the Subcommittee for the opportunity to submit testimony and appear before the Subcommittee on the subject of “Keeping Pace with Innovation – Update on the Safe Integration of UAS into the Airspace.” It is my privilege to testify before the Subcommittee today and discuss with you BNSF’s experience with the use of Unmanned Aircraft Systems (UAS). I hope to give you some insight into the practical implications of this technology in the railroad operating environment, and BNSF’s experience as a participant in the Federal Aviation Administration’s (FAA) Pathfinder program.

BNSF recognizes the essential role technology plays in driving the dramatic improvements we have achieved towards safer rail operations, particularly over the last decade. For the past several years, our experimentation with UAS—or drones—has provided an additional overlay of inspections and an additional tool for our comprehensive risk based safety program. BNSF’s drone program and participation in the Pathfinder program has provided valuable learning about airspace deconfliction procedures and techniques.

Drones are part of a suite of inspection and detection technologies for track, rail and equipment. Our other technologies provide a real-time and ongoing view of our assets “under load” in operations, and offer BNSF the ability to continually monitor track and equipment health. They provide for high resolution inspection and associated data analytics that is far superior to visual inspections, and detect safety standard deviations in real time so that we can respond before something happens and preventatively maintain assets. Drones are utilized for certain inspections and are providing additional visibility into our assets and operations. Together, these technologies are improving safety and reducing risk exposure for our employees.

As one of three companies selected by the FAA to participate in the Pathfinder program, BNSF’s experience with the FAA’s administration of the program was excellent. BNSF appreciates its partnership with the FAA. The agency implemented a robust risk-based, data-supported oversight system which has enabled the FAA to best target its priorities and resources, and permitted BNSF the necessary flexibility to safely make the first long-range “beyond visual line-of-sight” (BVLOS) UAS operations a reality. The Pathfinder program allowed us the flexibility to begin this program and determine the best application of promising new technology quickly.

Safe integration of drones into our operating environment is extremely important, given the nature of our network as critical infrastructure and the need to ensure against the risk of operational disruption or infrastructure damage. With the FAA's guidance, we conducted testing, developed a safety platform, established best practices, and initiated BVLOS drone flights along our railroad right-of-way. BNSF's work with the FAA demonstrated our ability to control the land and airspace utilized by our UAS flights across managed flight corridors over BNSF's property. As the FAA continues its effort to build the foundation for broader commercial use of UAS and BVLOS flights in the U.S., BNSF believes that it has contributed to the agency's better understanding of BVLOS drone operations. Going forward, BNSF will continue to use UAS in its operations, as one of several tools to continue fundamental improvements in our network safety and efficiency.

Review of the Use of UAS in Railroad Operations

Since 2014, BNSF has been using UAS flights for supplemental visual track and bridge inspections in a variety of conditions. From the start, our interest in this effort was aimed at focusing on community and employee safety. Increasingly high resolution cameras and agile drone systems offered us the prospect of enhancing visual inspections while reducing the risk presented by track occupancy for our workers and providing additional support to diminish the risk of derailment on our network.

In May 2015, the FAA announced creation of its Pathfinder program and partnered with three U.S. companies to perform research aimed at helping the agency determine how to safely expand UAS operations in the United States. As part of this program, BNSF was tasked with exploring the challenges of using BVLOS drones in remote areas to inspect rail infrastructure. We have since expanded the use of both short-range and long-range aircraft as well as computer vision and data analytics to provide supplemental information to our engineering staff with bridge and structure inspections, track integrity analysis and yard measurement capability.

Through Pathfinder, the FAA and BNSF had the inherent understanding that we were both focused on risk elimination while the federal government pursued the safe integration of UAS into the National Airspace System (NAS). With BVLOS flights as the FAA's stated direction for BNSF to pursue, our leadership made a commitment to this planned three-year partnership and using existing rail infrastructure to support air traffic control (ATC) capabilities. This process required us to work collaboratively on design standards, analytics development, and adequate exemptions to position our team to deliver an effective "proof of concept" that would allow the FAA to continue moving towards expanded use of commercial drones in U.S. airspace.

In October 2015, BNSF began initial BVLOS drone flights on our Clovis Subdivision in New Mexico. Since that initial test, over the past three years, BNSF has conducted more than 4,500 hours of UAS flights. We have developed a drone operations prototype that can expand across our network to supplement inspecting infrastructure, monitor system security and survey service interruptions. For example, we conduct concrete tie and key train route

evaluations, assess track integrity, establish switch position confirmation, organize flash flood patrols, and initiate significant applications for resource protection. By using drones that are equipped with the proper multispectral imaging and computer functions, BNSF has been able to produce asset condition reports of all varieties that contain location, detailed imagery and even identify potential items of concern.

Our work under Pathfinder also encouraged BNSF to establish a process for conducting supplemental structure inspections with continuing, focused rotations using “line of sight” operations. This allows us to provide additional inspections for some of our challenging bridges on a recurring basis. Some of these bridges rise 200-300 feet above the ground and the reduced human exposure while gaining more repetitive views and angles on these massive structures will help to further the safety of our workforce while giving us an enhanced view of the structural integrity of vital aspects of our network.

Our drone experience showed that the application of HD camera technology has great promise as a tool to help better evaluate the condition of track and structures. BNSF continues to determine the best host for the use of the camera technology, whether on a drone or the front of locomotives or other locations. We already use a variety of other technologies to fuse information gathered from specialized railcars, right-of-way sensors, and now drones, through data analytics to achieve ongoing predictive maintenance of railroad assets. Together, these technologies enable BNSF to reduce exposures to risk for the thousands of employees who inspect lines, locomotives and cars, permit more efficient use of maintenance resources and make the railroad safer.

Review of Pathfinder BVLOS UAS Operations on BNSF

While BNSF’s Pathfinder partnership with FAA ended in 2018, it has produced a number of significant successes that FAA, the transportation industry, and potential commercial users can build upon. More than 680 of the 4,500 drone flight hours conducted during BNSF’s participation in the Pathfinder program have been BVLOS and have led to more than 2.8TB of flight and safety data collection for us and the FAA to review. This information will help the FAA safely integrate commercial UAS flights into the NAS.

BNSF also worked with FAA to produce airspace risk assessments to better understand the behavior, frequency and density of air traffic in the surrounding areas. This knowledge allowed us to use multiple safety mitigations to protect manned aircraft from our drone operations and to consider options for improved technology in those areas with higher air traffic levels.

A major accomplishment of the Pathfinder experience was the approach we developed with the FAA to establish a layered platform for safely flying BVLOS drones that combined our right-of-way, technology, procedures and analytics. We overlaid the use of dedicated spectrum, ATC sensors and air traffic displays with existing FAA flight procedures (standard communication plans and navigational charts), and used our analytical capabilities to create a baseline risk assessment of UAS flights along the BNSF right-of-way. All three

components of this platform contribute to enhanced safety of these operations and improved the overall effectiveness of the system. This should be helpful to the agency as it addresses the ongoing challenges of wider BVLOS drone use, such as ATC infrastructure constraints and limitations on detect-and-avoid capabilities.

Conclusion

We have found after several years of the use of drone technology that their best application is for the evaluation of bridge structures and during service outages and incidents. Going forward, BNSF will continue to leverage the safety and operational benefits of drones on our network. We are grateful for the opportunity to have worked closely with the FAA through the Pathfinder program. One of the most significant benefits for BNSF was the insight we gained into the process of partnership with a safety regulatory agency to demonstrate new technologies, and transition quickly and safely into ongoing operations. This is a prototype for other railroad technologies that BNSF uses on our network. We seek to fully and efficiently utilize them in our operations by demonstrating them through flexible application of existing Federal Railroad Administration (FRA) regulatory requirements, and then implement them across the network after showing that they meet expectations for safety outcomes. BNSF believes that the kind of partnership that it achieved with the FAA can be achieved with the FRA to obtain "pathfinder" railroad safety and regulatory results.