Committee on Transportation and Infrastructure
U.S. House of Representatives
Washington DC 20515

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BACKGROUND MEMO

TO:	Members, Subcommittee on Railroads, Pipelines, and Hazardous Materials
FROM:	Staff, Subcommittee on Railroads, Pipelines, and Hazardous Materials
RE:	Roundtable Discussion on "Emerging Railroad Technologies"

PURPOSE

The Subcommittee on Railroads, Pipelines, and Hazardous Materials, will meet on Tuesday, March 21, 2017, at 10:00 a.m., in 2167 Rayburn House Office Building, to hold a roundtable discussion on "Emerging Railroad Technologies". The participants will be a Class I railroad[1]; a major supplier of technology to the industry; the railroad technology research center; and a representative of rail labor.

BACKGROUND

A new wave of technologies in the rail industry holds significant promise for safety, reliability, and efficiency. What sets these new technologies apart is the breadth of sophisticated applications being developed or recently introduced into operation, their use of the internet, and their ability to effectively integrate and use large quantities of data effectively. Just some of the many new technologies are highlighted below.

Freight railroads are able to invest robustly to maintain and improve their networks in large part because of the *Staggers Rail Act*, which partially deregulated the industry in 1980 and restored the industry to financial health. Since *Staggers* was enacted, the freight railroads have invested $600 billion in their systems, contributing to an 83.4 percent reduction in total train accidents and incidents per million train-miles, and a 91.7 percent drop in rail employee on-duty fatalities, injuries, and illnesses.

Nondestructive Testing Techniques

Nondestructive testing refers to analysis techniques used to evaluate the properties of components, materials, or systems without causing damage. In the railroad industry, research is underway to use nondestructive inspection techniques that use fluorescent magnetic particles to

[1] U.S. Class I railroads are line haul freight carriers with operating revenues of $453 million or more in 2016; the operating threshold is adjusted annually for inflation by the Surface Transportation Board (STB). There are currently 7 Class I railroads operating in the United States.

identify defects in rail car castings and coupling systems. In addition, the Transportation Technology Center, Inc. (TTCI) is testing an in-motion "phased array" ultrasound system with high-resolution visibility that can view rail from hundreds of angles in a matter of minutes and provide a level of microscopic detail never before possible. TTCI anticipates the system will allow proactive repairs before a defect occurs. TTCI is also working on ways to use laser-based monitoring to reduce "truck hunting", an instability that causes a rail car to weave down a track, usually with the flange of the wheel striking the rail. Railroads are using infrared technology and acoustic monitoring to detect "hotboxes", friction-caused overheating of wheel journal (axle) boxes.

Unmanned Aircraft Systems

In 2015, BNSF Railway Company (BNSF) was one of three companies[2] selected to work with the Federal Aviation Administration (FAA) on the Pathway research partnership to expand the use of unmanned aircraft systems, or drones, beyond a pilot's line of sight. BNSF is using the drones to inspect track, with the goal of identifying defects and avoiding derailments. Union Pacific Railroad Company (UPRR) has also begun using drones for bridge inspections, tower inspection, accident investigation, and other railroads are exploring their use.

Positive Train Control

Positive Train Control (PTC) technologies automatically stop or slow a train before certain accidents caused by human error occur, including train-to-train collisions, derailments caused by excessive speed, and movement of a train through a track switch left in the wrong position. As a result of a deadly train collision in the Chatsworth district of Los Angeles, California, and a number of train derailments in South Carolina and Texas causing the release of hazardous material, the *Rail Safety Improvement Act of 2008* required the installation of PTC on: (1) lines over which intercity passenger rail or commuter rail are operated; (2) main freight lines over which poison- or toxic-by-inhalation hazardous materials are transported; and (3) other tracks as the Secretary prescribes. The deadline for PTC implementation has been extended to December 31, 2018.

Smart Locomotives

General Electric's (GE) newest Tier 4 Evolution locomotives reduce emissions more than 70 percent compared to the previous Tier 3 model, with no exhaust after-treatment. These locomotives use over 200 sensors monitoring 150,000 data points per minute covering engine, drivetrain, and other system parameters to maximize performance and operating efficiency. GE is also applying its digital solutions to non-GE locomotives. A recent pilot of GE's Asset Performance Management Solution, which provides locomotive health status updates and spots performance issues before failures occur, delivered a 25 percent reduction in road failures for Deutsche Bahn Cargo.

[2] The other companies were CNN and PrecisionHawk.

Grade Crossing Safety

Several companies have developed technologies to allow grade crossing signals and railroad interlockings (an arrangement of signal apparatus that prevents conflicting movements through a switch) to be monitored remotely for malfunctions.

Big Data

The ability to easily store large quantities of data allows TTCI to use computer simulation to model a wide variety of real-life events and to predict circumstances that may lead to a mechanical malfunction, derailment, or train accident. In addition, through the Asset Health Strategic Initiative, the freight railroads and freight car owners are sharing equipment performance information gathered as equipment travels across the 140,000-mile rail network, not just on their own systems, so that problems can be identified sooner, and eventually predicted.

Operations Management

GE Transportation has developed RailConnect 360, a connected suite of digital solutions. One such feature is called Trip Optimizer, which is a locomotive cruise control system that combines train-handling software, train and cargo load information, and route characteristics to drive an optimally fuel-efficient plan. It is estimated this technology could help railroads gain about 10 percent in fuel efficiency. In addition, software called Movement Planner considers multiple factors such as train schedules, traffic-control systems, and train movements to develop an optimized traffic plan for a railroad's entire network. Installed at a major Class I railroad, the system has resulted in a 10 percent increase in velocity, 50 percent reduction in expired crews, and significant improvement in on-time performance on a key subdivision.

Expanding on this operations technology foundation, GE and the Port of Los Angeles partnered to pilot a port information portal to demonstrate the benefits of digitizing shipping data. This digital platform will allow stakeholders to access information about incoming cargo 10-14 days before a ship arrives, allowing for significant advance scheduling to enhance port operations and intermodal shipment connectivity.

PARTICIPANT BIOGRAPHIES

Mr. Seth Bodnar, Chief Digital Officer, GE Transportation

- Prior to his current role, Mr. Bodnar was a general manager for GE Transportation's Cab Electronics business, which focused on delivering onboard computer systems and train control solutions.
- Mr. Bodnar served in Iraq in the United States Army in 2003-2004, commanded a detachment of Green Berets during multiple overseas deployments, and served in Baghdad as special assistant to the commanding general of Multi-National Force-Iraq.

Mr. John Risch, National Legislative Director, Transportation Division, Sheet Metal, Air, Rail, and Transportation Union (SMART)

- Mr. Risch was elected national legislative director in 2014; he has served full-time in the Washington, D.C. office since 2009.
- Mr. Risch is a former North Dakota State Legislative Director for the United Transportation Union, serving in that capacity from 1986 to 2009. He began his career with Burlington Northern Railroad in 1978.

Ms. Lisa Stabler, President, Transportation Technology Center, Inc. (TTCI)[3]

- Ms. Stabler joined TTCI in 2010 as vice president of operations and training, and was named TTCI president in 2011.
- Prior to joining TTCI, Ms. Stabler spent more than a decade with BNSF, and more than two decades with General Motors Corporation's Delphi Corporation.

Mr. Lynden Tennison, Senior Vice President and Chief Information Officer, Union Pacific Railroad Company (UPRR)

- Mr. Tennison has served in his current position since 2005, and has held several other technology-related positions since he joined UPRR in 1992, including president and chief executive officer of Nexterna, a UPRR technology subsidiary.
- Mr. Tennison also spent five years with American Airlines' SABRE division, and has worked for AT&T and Southwestern Bell Telephone.

[3] TTCI, a wholly owned subsidiary of the Association of American Railroads (AAR), manages the Federal Railroad Administration's (FRA's) Transportation Technology Center located near Pueblo, CO under a multi-year contract. The effort is an effective public private partnership, receiving federal research funding and significant financial support from the Class I railroads.