BROTHERHOOD OF LOCOMOTIVE ENGINEERS AND TRAINMEN

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VIA ELECTRONIC AND OVERNIGHT MAIL

February 4, 2016

Mr. Robert C. Lauby
Associate Administrator for Railroad Safety and Chief Safety Officer
Federal Railroad Administration
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: Locomotive Technology Systems

Dear Mr. Lauby:

The Brotherhood of Locomotive Engineers and Trainmen ("BLET") is writing to you to express our concerns about the use by certain Class 1 Carriers of the Locomotive Engineer Assist/Display & Event Recorder ("LEADER") and the General Electric Trip Optimizer. It is our view that the current deployment of these technologies presents unsatisfactory risks for a host of reasons. A letter from the Transportation Division of the International Association of Sheet Metal, Air, Rail and Transportation Workers ("SMART–TD") was sent to you earlier in January 2016 discussing that Organization's problems with LEADER and Trip Optimizer. We associate ourselves with their comments and have some additional concerns, which are not stated in their letter. First, SMART–TD's discussion concerning distractions to operating crews and that use of these technologies should be regulated by the Federal Railroad Administration ("FRA") is on point and we wholeheartedly concur.

The use of cell phones and interaction with Positive Train Control ("PTC") systems currently are regulated by FRA, and we believe the attention capture that is fostered by the use of the LEADER and Trip Optimizer systems has not been properly scrutinized. If the safety risks of diverting the locomotive engineer's attention away from the track ahead and, instead, toward the automatic control system, were not already clear enough, the situation becomes even more dire when you consider that railroads require — under the threat of discipline — that the engineer track all exceptions to the operation of systems like LEADER during their trip, and then record and report them at the conclusion of the trip. This presses an engineer into performing clerical duties while at the controls of a moving locomotive in the name of fuel efficiency, to the detriment of safety caused by these distractions.

BLET joins SMART–TD in requesting that you issue an emergency order prohibiting the use of these technologies until they are further examined, to ensure that they do not pose risks to the

safe operations of freight railroads. At a minimum FRA should examine to what extent new regulatory requirements are necessary to ensure safe operations, testing and maintenance and actual performance of these systems in the field.

An Example of Proposed Use: Union Pacific Railroad's Product Development Plan Submission Regarding Trip Optimizer and LEADER

As just one example of our concern, the 49 C.F.R. Section 236.913(d)(1) Notice of Product Development for Phase I and Phase II Development of its Communications-Based Train Control ("CBTC") System filed by Union Pacific Railroad ("UPRR") describes Trip Optimizer in the following way:

> Trip Optimizer provides the locomotive engineer with guidance or automated control for fuel efficient operation of the train based on terrain, train dynamics, permanent and temporary speed restrictions and the train's current authority. The Trip Optimizer software suite resides on a separate non-vital hardware platform on V-TMS equipped locomotives, and is designed and implemented in such a manner as to preclude interference with V-TMS's train control functions.

See FRA-2007-27322-0013.

UPRR also makes a distinction regarding which CBTC control components perform safety-critical train control functions and those that perform merely a non-vital business function. UPRR places Trip Optimizer in the category of non-vital business functions, which it defines as follows:

> **Non-vital business functions** are those ***unrelated to train control***, but which provide business benefit, such as location reporting, integration with NYAB's LEADER or integration with GE's Trip Optimizer. These functions may leverage operational data provided by CBTC/V-TMS, such as location, speed, etc., but do not impact the operation of CBTC/V-TMS.

Id. at 25 (emphasis added).

UPRR then explains:

> General Electric's (GE) Trip Optimizer software suite will be integrated into V-TMS equipped locomotives. Trip Optimizer provides the locomotive engineer with guidance for throttle, dynamic brake and air brake settings for fuel efficient operation of the train based on terrain, train dynamics, permanent and temporary speed restrictions, signal indications and the train's current authority limits. Trip Optimizer provides the capability for automated throttle, dynamic brake and air brake control under the guidance of the locomotive engineer. When automated control is selected by the locomotive engineer, Trip Optimizer will manage locomotive throttle, dynamic brake and air brake settings to operate the train in conformance with the recommended operating profile.

Id. at 33 (footnotes omitted).

In its November 13, 2007 letter to UPRR, FRA placed many conditions on the testing of this equipment, but enough has changed in new requirements for PTC and some very unsettling reports from the field that we firmly believe additional action is warranted by FRA. Some of the conditions actually required a FRA field monitor to be present during the tests. *See* FRA-2007-27322-0012.

The above example is not intended to single out UPRR regarding its use of LEADER or Trip Optimizer. Rather, what matters is that use of Trip Optimizer and LEADER is represented to be for "guidance" and "business purposes." Any railroad could make this same statement regarding its use of the technology, as Trip Optimizer and LEADER is vendor software available to any railroads who desire the product on their locomotives.

Use with PTC

Furthermore, we believe that monitoring auto control systems like LEADER is at least as intrusive and distracting as requiring the locomotive engineer to interact with PTC systems. To be clear, BLET desires at the earliest opportunity to take advantage of a PTC system that saves our members' lives in the event of a PTC-preventable accident. The interaction between PTC systems and LEADER or Trip Optimizer remains a critical question.

The fact of the matter is that PTC operational screens could compete with Trip Optimizer for display screen time. There are only two ways to address presentation of the additional information. One would be to incorporate the non-vital business function data with the vital PTC data, but this could result in shrinking information down to a font that is very hard to read, even by persons having perfect eyesight. The other would be to cycle screens displaying the non-vital business function data with those displaying the vital PTC data. However, this would require a locomotive engineer to devote much more attention to the screen, thereby engendering attention lapses from vigilant observance of conditions ahead and out the window to ensure proper whistling at grade crossings, and visualization of track defects, trespassers, unannounced yellow boards, red boards, red/yellow boards, diverging route signals, etc.

If systems such as LEADER and Trip Optimizer were advisory programs only, we might be able to excuse their intrusive effect; however, railroads such as UPRR and BNSF mandate that locomotive engineers obey these non-vital business function data prompts under the threat of discipline. This puts locomotive engineers in a no-win situation, because they do not have any training regarding when and under what circumstances they need to intervene when a prompt is given in error. There are no error management protocols that reliably inform the locomotive engineer when to override the system or when to trust the system when a developing scenario requires immediate action.

UPRR refers to different states of software use between locomotives that are equipped with Trip Optimizer and those not equipped as "mixed mode" use. The customers of Trip Optimizer and

LEADER, the FRA and the end users (i.e., train crews) need to be made aware of the data traces that automation leaves behind, as well as whether the systems make automated moves without leaving a trace. If locomotive engineers are responsible for manual control, the software should be no less responsible for automated control. Once an action has taken place and been monitored, a reaction by a monitoring engineer is already taking place after the fact and can already be categorized as a correction or — even worse — when an automated action is correct, but second-guessed incorrectly by the operator. These problems can arise on any railroad using LEADER and/or Trip Optimizer.

A locomotive's throttle and braking systems are vital to the safe operations of trains. Classifying Trip Optimizer and LEADER as non-vital business systems in order to safeguard them from regulatory oversight ignores too many life-threatening scenarios that require potentially emergent throttle manipulation and braking. These functions may be initiated by a PTC system in the normal course of events. It has not been made clear how a non-vital business fuel-saving system that uses throttle and braking to save fuel will react with a vital PTC system designed to prevent the worst kinds of train accidents by intervening to prevent a potential violation. Nor is it clear whether event recorders can distinguish between PTC actions taken to override a locomotive engineer's command, and PTC actions taken to override a command that was responsive to the demands of a non-vital business system like LEADER and Trip Optimizer.

Human Factors and lessons from Aviation

The aviation industry has gone through a long period of automation from the late 1970's to the present. The logic of this transition to automated operations is that humans are prone to error and properly designed and maintained machines should not be. Machines do not have the fatigue problems or inattention of humans. And in the aviation industry, a manufacturer typically cannot install new equipment without first having the device or system fully tested, vetted and type certified. Oftentimes it is the simplest of components that require this vetting, such as a new style of oil pressure gauge fitting. However, in the railroad industry there is severe lack of oversight with respect to new components or systems installed on cars and locomotives. It is our belief that equipment as complex and distracting as automated communication-based control systems should be properly vetted before they are forced upon operating employees. FRA has correctly chosen to do so regarding vital operational systems. Regrettably, FRA has not yet acted upon non-vital business systems such as LEADER and Trip Optimizer, even though locomotive engineers are required to operate their trains pursuant to the data those systems produce.

Flight operations have become very safe and statistics bear out this fact. That being said, as safety gains have been realized with automation, the rate of human error has not decreased. The rail industry has many lessons to learn from aviation with regard to the great many advances in safety. However, we should also attempt to learn from the new human factors issues that arrive when one moves from being a primary operator to a passive monitor of automation. We believe that oversight of the adoption of technology in the rail industry is not keeping up with the implementation of certain significant technologies. Train crews are being faced with using technology they are unfamiliar with, and are being instructed to place reliance in those systems all

while maintaining their responsibility for the success or failure of the automated operation. The stories of airline pilots attempting to cope with differing and new forms of automation are legion and too numerous to enumerate here. A simple glance at the internet will reveal a myriad of human factors problems and solutions to the adoption of and adaption to automation systems.

Notwithstanding the above decades-long history, concerns regarding how best to maintain skills proficiency in the face of increasingly automated flight deck systems in the aviation industry were underscored earlier this month in a report by the Inspector General ("IG") of the Department of Transportation. The IG found that Federal Aviation Administration "does not have a process to ensure that air carrier pilots are trained to use and monitor automation systems while also maintaining proficiency in manual flight operations." Report No. AV-2016-013 at 2.[1] Thus, the very same issues raised here continue to be of serious concern regarding FAA oversight of commercial aviation.

We must strive to remember that human factors and human error are not only about humans. In addition to being about people, human factors are about the tools people are given to do a job. It is about external pressures, fatigue, task overload, supervision and many other items. It is important for FRA to explore what kind of cues are given to train crews, how they can interpret those cues, what errors are possible at those points, and how recently training to deal with unforeseen events took place.

Experience in the field

We have heard from many of our members that these systems are often positioned directly to the left of the locomotive engineer, such that he is facing the conductor while responding to the system's prompts. In other words, the engineer is physically pointed away from the field of vision he or she is supposed to maintain while operating the locomotive.

Automated communication-based systems such as LEADER or Trip Optimizer were conceived and initially introduced to provide "guidance" for the locomotive engineer and by definition are not considered by UPRR to be a safety-critical system. A guidance system is a tool to be used when guidance is appropriate or necessary. These systems are now being mandated as the primary method of operating. Trip Optimizer and LEADER essentially are becoming a "virtual engineer" — making automated decisions in a manner that transforms the engineer's duties as an operator into that of a spectator or monitor. It strains our expertise to ponder how our members will cope with monitoring multiple systems in potentially conflicting modes (when equipped), and then be required with little or no notice to take over in manual mode when a system either malfunctions or functions as intended, but in scenarios that engineers are not aware of or have not been trained to manage.

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[1] *See, also, The Hazards of Going on Autopilot*, Maria Konnikova, New Yorker Magazine, September 4, 2014.

Based on the experience of our members, suspicion of these systems is common. There have been many examples of locomotive engineers being instructed to perform work-arounds to ensure that the system keeps functioning, or inventing ways to cobble together functionality with other onboard systems such as distributed power locomotives. Automatic train control ("ATC") restrictions, which are encountered numerous times on every trip, require these systems to be suspended; when trains are sorted and sent on diverging routes, these systems must be suspended; when special speed restrictions are issued by the foreman in charge of a Form B work area, these systems must be suspended; and when these systems require train handling that is contrary to an engineer's experienced method of train handling, these systems must be suspended. While moving in a dynamic and changing situation an engineer must then decide whether to suspend these systems and operate the train in the safest manner based on his or her experience. In all of these instances, the specifics of each suspension must be reported upon tie-up. There have been many complaints we have heard directly from engineers working on locomotives equipped with Trip Optimizer and LEADER, such as:

- The locomotive engineer is required to turn train handling over to a software program without any knowledge of when and under what circumstances the engineer may be required to reassume manual control.

- Crewmembers have been thrown out of their seats because of severe slack action; however, they are reluctant to simply disable these non-vital business data systems in these situations for fear of being disciplined for doing so.

- Uncertainty when operating with Trip Optimizer and unexpected signal changes occur in the field.

- Complaints about maintaining proficient operating skills — due to no longer manually operating the controls to compensate for the track profile — which must be tested regularly under 49 C.F.R. Part 240.

- When operating in a "cruise control" like mode there is a risk of being distracted or lulled into a sense of false security, even though the purpose of the technology is to save on fuel and increase profits, and not to enhance safety.

- Discipline is imposed if an engineer fails to take manual control when the technology fails to comply with regulations such as signals or speed restrictions, even though the engineer is expected — if not required — to defer to the technology up to the point when it fails.

The above is not an exhaustive list. There are many other examples and reports from the field. We do not know whether FRA is even attempting to capture reports such as these in debriefings. BLET is concerned this absence of data may give FRA a false sense of security regarding whether and how the agency might regulate the use of systems such as Trip Optimizer and LEADER.

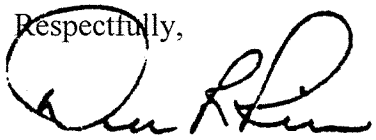
This may also affect how those systems safely integrate ... or fail to safety integrate ... with PTC.

Given all the functions that are ceded to Trip Optimizer and LEADER — such as throttle positions, air brake and dynamic brake operation, and train handling — it is our professional view that FRA cannot accept the current designation of these systems as being simply non-vital business data systems, because their mandated use has crossed the line into vital train operations. It also is insufficient in terms of railroad safety to relegate oversight of the use of this technology to waivers or subsume these safety issues in a part 236, subpart H product safety plan. Nothing less than a complete risk assessment must be performed on how Trip Optimizer and LEADER technologies will manage failure, and if such an assessment has been performed we have not seen its results incorporated into the training of locomotive engineers.

BLET is proud of how this Union and locomotive engineers have fostered and promoted ways to safely integrate new technology, which is reflected in our formal partnering with FRA for the past two decades. Moreover, locomotive engineers have faced new forms of technology since they first climbed on board a locomotive. At every stage in the history of the development of the locomotive cab there has been a story of adapting to and mastering new technology by locomotive engineers. Such mastery can only come about when there is standardization of safety, planning for human error to take place and providing a way to manage failure when it inevitably occurs; that is the end we seek here.

We respectfully request that FRA issue an emergency order to prohibit the mandated use of and reliance upon LEADER, Trip Optimizer and other similar auto control or advisory control locomotive operating systems until railroads can prove that the relevant safety implications of reliance upon these systems have been properly identified and addressed. Communication-based train control systems that interact with throttle positions, train handling, air brakes and dynamic brakes place them in a category where an engineer is left only in reactive mode, and the current reality is unsafe and unsatisfactory.

Respectfully,



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