TESTIMONY OF

EDWARD R. HAMBERGER

PRESIDENT & CHIEF EXECUTIVE OFFICER

ASSOCIATION OF AMERICAN RAILROADS

BEFORE THE

UNITED STATES SENATE
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

HEARING ON RAIL SAFETY

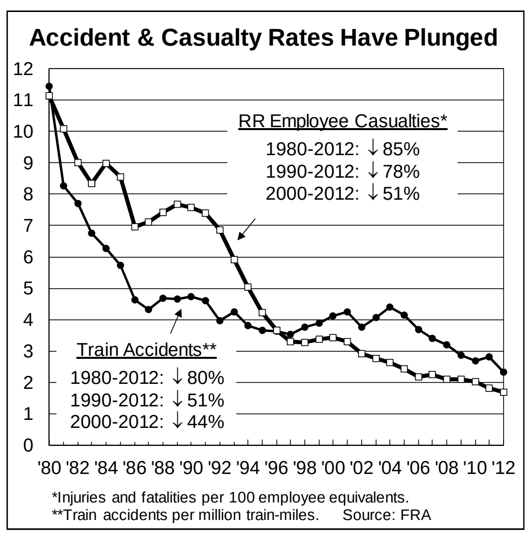
JUNE 19, 2013

Association of American Railroads
425 Third Street, S.W.
Washington, DC 20024
202-639-2100

On behalf of the members of the Association of American Railroads, thank you for the opportunity to discuss rail safety. AAR freight railroad members, which include the seven large U.S. Class I railroads as well as approximately 170 short line and regional railroads, account for the vast majority of freight railroad mileage, employees, and traffic in Canada, Mexico, and the United States. Amtrak and several commuter railroads are also members of the AAR. In my testimony below, I will discuss several important topics associated with rail safety, ways that railroads are working to advance safety in those areas, and steps that we believe policymakers should take to promote rail safety.

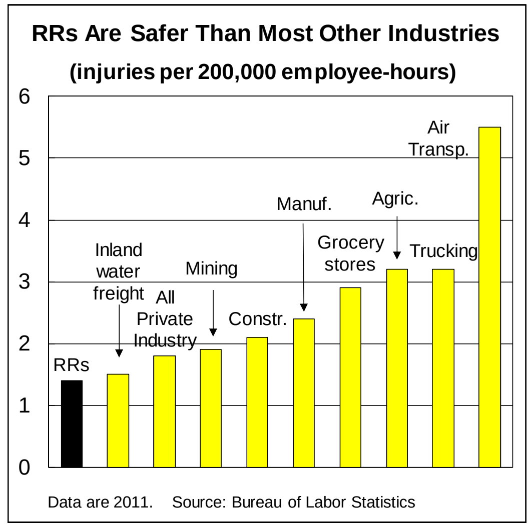
Overview of Rail Safety

It's important to note at the outset that for our nation's freight and passenger railroads, pursuing safe operations is an absolute imperative. It makes business sense and it's the right thing to do. Through massive private investments in safety-enhancing infrastructure, equipment, and technology; cooperative efforts with rail labor, suppliers, customers, communities, and the Federal Railroad Administration (FRA); extensive employee training; and cutting-edge research and development, railroads are at the forefront of advancing safety.



The rail industry's strong and pervasive commitment to safety is reflected in its excellent safety record. In fact, 2012 was the safest year ever for America's railroads, breaking the previous record set in 2011. From 1980 to 2012, the train accident rate fell 80 percent, the rail employee injury rate fell 85 percent, and the grade crossing collision rate fell 82 percent. Since 2000, the declines have been 44 percent, 51 percent, and 45 percent, respectively, indicating that rail safety continues to improve. 2012 saw record lows in each of these categories.

According to data from the Bureau of Labor Statistics, railroads today have lower employee injury rates than other transportation modes (including trucks, inland water transportation, and airlines) and most other major industries, including agriculture, mining, manufacturing, and construction. Available data also indicate that U.S. railroads have employee injury rates well below those of most major foreign railroads.

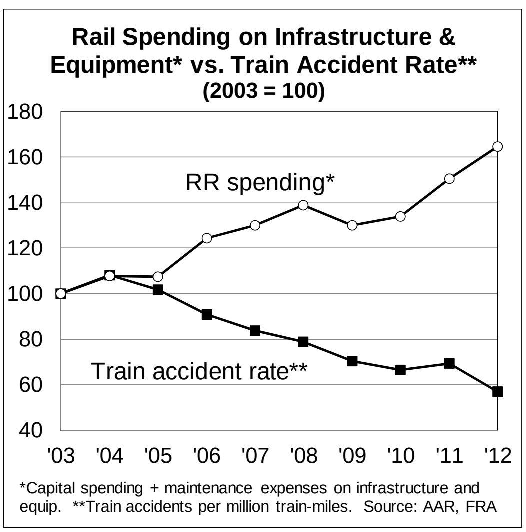


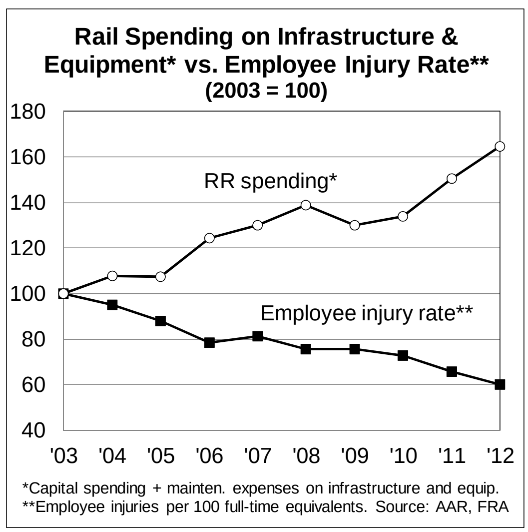
Virtually every aspect of rail operations is subject to strict safety oversight by the FRA. Among many other areas, railroads are subject to FRA regulation regarding track and equipment inspections; employee certification; allowable operating speeds; and the capabilities and performance of signaling systems. Hundreds of FRA personnel perform regular inspections of rail facilities and operations throughout the country. In many states, FRA safety inspectors are supplemented by state safety inspectors. Railroads are also subject to safety oversight by additional federal agencies, including the Occupational Safety and Health Administration, the Pipeline and Hazardous Materials Safety Administration, and the Department of Homeland Security.

A Healthy Balance Sheet is Important to Safety

A commitment to safety demonstrated day in and day out in the workplace is critical to promoting safety. Railroads have this commitment. That said, a financially viable railroad is in a much better position to invest in safety enhancements and risk reduction strategies than a financially challenged railroad.

In recent years, railroads have been reinvesting more private capital than ever before in their infrastructure and equipment, including a record $25.5 billion in 2012. From 2008 to 2012, Class I railroads purchased 2,669 new state-of-the-art locomotives and rebuilt another 845 locomotives to improve their capabilities. Over the same time period, railroads installed nearly 77 million new crossties, installed 2.9 million tons of new rail, and placed nearly 61 million cubic yards of ballast. In addition, as described later in this testimony, railroads in recent years have devoted substantial resources to developing and implementing innovative new technologies. These investments have made railroads much safer. In fact, as the charts below show, there is a clear correlation between rail reinvestments and rail safety improvements.





Positive Train Control

The term "positive train control" (PTC) describes technologies designed to automatically stop or slow a train before certain accidents caused by human error occur. The Rail Safety Improvement Act of 2008 (RSIA) requires passenger railroads and U.S. Class I freight railroads to install PTC by the end of 2015 on main lines used to transport passengers or toxic-by-inhalation (TIH) materials.[1] Specifically, PTC as mandated by Congress must be designed to prevent train-to-train collisions; derailments caused by excessive speed; unauthorized incursions by trains onto sections of track where maintenance activities are taking place; and the movement of a train through a track switch left in the wrong position.[2]

Unprecedented Technological Challenge

Positive train control is an unprecedented technological challenge. A properly functioning, fully interoperable PTC system must be able to determine the precise location, direction, and speed of trains; warn train operators of potential problems; and take immediate action if the operator does not respond to the warning provided by the PTC system. For example, if a train operator fails to begin stopping a train before a stop signal or slowing down for a speed-restricted area, the PTC system would apply the brakes automatically before the train passed the stop signal or entered the speed-restricted area.

Such a system requires highly complex technologies able to analyze and incorporate the huge number of variables that affect train operations. A simple example: the length of time it takes to stop a train depends on train speed, terrain, the weight and length of the train, the number and distribution of locomotives and loaded and empty freight cars on the train, and other factors. A PTC system must be able to take all of these factors into account automatically, reliably, and accurately to safely stop the train.

PTC development and implementation includes a daunting array of tasks that railroads must perform, including:

---

[1] TIH materials are gases or liquids, such as chlorine and anhydrous ammonia that are especially hazardous if released into the atmosphere.

[2] A switch is equipment that controls the path of trains where two sets of track diverge.

- A complete physical survey and highly precise geo-mapping of the 60,000 miles of railroad right-of-way on which PTC technology will be installed, including geo-mapping of nearly 474,000 field assets (mileposts, curves, grade crossings, switches, signals, and much more) along that right of way.
- Installing PTC technology on approximately 22,000 locomotives.
- Installing approximately 36,000 "wayside interface units" (WIU) that provide the mechanism for transmitting information to locomotives and the train dispatching office from signal and switch locations along the right of way.
- Installing PTC technology on nearly 4,800 switches in non-signaled territory and completing more than 12,300 signal replacement projects at locations where the existing signal equipment cannot accommodate PTC technology.

PTC locomotive cab display unit

- Developing, producing, and deploying a new radio system and new radios specifically designed for the massive data transmission requirements of PTC at 4,200 base stations, 33,700 trackside locations, and on approximately 22,000 locomotives.
- Developing back office systems and upgrading dispatching software to incorporate the data and precision required for PTC systems.
- Installing more than 20,000 new antenna structures nationwide to transmit PTC signals.

Freight railroads have enlisted massive resources to meet the PTC mandate. They've retained more than 2,200 additional signal system personnel to implement PTC, and to date have collectively spent approximately $3 billion of their own funds on PTC development and deployment. Class I freight railroads expect to spend an additional $5 billion before development and installation is complete. Currently, the estimated total cost to freight railroads for PTC development and deployment is around $8 billion, with hundreds of millions of additional dollars needed each year after that to maintain the system.

Despite railroads' best efforts, due to PTC's complexity and the enormity of the implementation task — and the fact that much of the technology PTC requires simply did not exist when the PTC mandate was passed and has been required to be developed from scratch — much work remains to be done. Most of the effort to date has been directed toward development, deployment, and initial testing of technology that can meet the requirements of the legislation and which can be scaled to the huge requirements of a national system.

The task is made particularly complex by the need to ensure that PTC systems are fully interoperable[3] across all of the nation's major railroads, and that the many potential failure points and failure modes in PTC systems are identified, isolated, and corrected — all without negatively affecting the safe movement of freight and passengers by rail throughout the country. In addition, the FRA must review each railroad's PTC safety plan and certify the railroads' PTC systems after the development and testing of the components are complete. Only then can a fully operable PTC installation be completed.

The FCC and PTC Antennas

Railroads also face non-technological barriers to timely PTC implementation. One such challenge that railroads are struggling to overcome right now involves regulatory barriers to the construction of antenna structures.

As part of PTC implementation, railroads must install tens of thousands of new antenna structures nationwide to transmit PTC signals. Approximately 97 percent of these structures will be relatively small poles, between 6 and 60 feet high, installed on railroad rights-of-way alongside railroad tracks. The remainder, approximately three percent, will be larger base stations similar to traditional telecommunication towers. Depending on the location, these larger structures may or may not be located on a railroad's right-of-way.

The Federal Communications Commission (FCC) maintains that all PTC antenna structures, regardless of their size or location on the right-of-way, are subject to the National Environmental Protection Act (NEPA) and the National Historic Preservation Act (NHPA). The

[3] Interoperability means that the PTC system on any railroad's locomotives can seamlessly interface with the systems of any other railroad.

FCC's current interpretation of its rules implementing these acts would subject every PTC antenna structure to a separate environmental evaluation process at the FCC. Depending on the outcome of this evaluation, a more comprehensive environmental assessment (EA) might be required.

Example of a PTC antenna

According to the FCC, as part of each environmental evaluation, railroads must provide certain information on each antenna structure (height, location, etc.) to historic preservation officers within state governments and Native American tribes (depending on where the antenna structure will be installed) so that the state or tribe can determine if the installation will negatively impact areas of historic, cultural or religious significance. Notice of the construction must even be provided to tribes that do not currently reside along the railroad right-of-way but who have previously expressed interest in the county in which the antenna structure will be installed.

On May 15 of this year, representatives of the railroads met with FCC staff to discuss the PTC antenna issue. The railroad representatives explained why the FCC's current approval process is unworkable for a deployment on the scale of PTC in the timeframe mandated by the RSIA and FRA's rules. Meanwhile, the FCC staff stated that railroads should not construct any antenna structures for PTC that have not gone through the complete environmental evaluation process, including tribal notice, while they consider ways to streamline the state and tribal approval processes. The railroad industry, the FRA, and the FCC are consulting to try to find a workable solution that will protect the interests of Native American tribes and allow the timely deployment of PTC. While the AAR is hopeful that a solution can be found, today construction of antenna structures is on hold. If our efforts with the FCC and the FRA cannot reach a workable solution to avoid antenna-by-antenna review, the timeline for ultimate deployment of PTC will be delayed.

Pending FRA Regulations

There are important PTC regulatory issues that are unresolved. For example, the current rules inadvertently subject yard movements over PTC-equipped main line track to PTC requirements. There are a number of technical and operational reasons making PTC impractical for yard movements. It was never anticipated that yard movements would be subject to PTC and doing so would adversely affect the efficiency of rail transportation. Another issue concerns en route failures of locomotives equipped with PTC. The current regulations impose operational restrictions so severe that, again, the fluidity of the rail network would be drastically impaired, despite the existence of the underlying safety systems and additional safety precautions that could be put in place. Finally, the regulations purport to exempt lines where there are very small amounts of TIH traffic and no passenger traffic, but the de minimis regulations are constructed so that they fail to achieve this objective. It is important to resolve these issues and AAR appreciates that FRA is considering them in a current rulemaking proceeding.

Extending the Statutory Deadline

In addition to the challenges presented by both the FCC and FRA issues, another critical variable to the successful implementation of a nationwide PTC network is the question of the proper operation of the system. Does the system work? To effectively answer this question, railroads will need adequate time to ensure that PTC works as intended and that the systems are communicating accurately. The industry believes it can achieve the objectives of the mandate with an implementation schedule that allows the technology to be developed as well as tested and proven so the safety and operational efficiency of the nation's rail system are not put at risk.

Freight railroads will continue to aggressively pursue the implementation, activation and testing of PTC systems. However, due to both technological and non-technological uncertainties associated with the development and installation of PTC, it is a challenge to identify an exact date of completion of all necessary components to ensure the successful implementation of an interoperable system. Critical aspects include, but are not limited to, the testing and activation of PTC systems.

Consequently, the current PTC implementation deadline mandated by the Rail Safety Improvement Act of 2008 should be extended by at least three years from December 31, 2015, to December 31, 2018. Given the unprecedented nature of PTC and the uncertainties — both known and unknown — flexibility beyond December of 2018 should also be addressed, with the authority for that flexibility residing with the Secretary of the Department of Transportation. Additionally, in order to ensure that railroads can operate safely and efficiently with the PTC system, the imposition of PTC-related operational requirements and associated penalties should be deferred until all PTC systems are fully integrated and testing has been completed.

Railroads have been working extremely hard to meet the 2015 deadline. While the deadline for completion is important, ensuring that the testing and development of PTC proceeds appropriately is paramount. The intent and the goal is to ensure a new system that enhances safety.

A December 2010 report by the Government Accountability Office supports this view. The GAO noted that "implementing an immature system to meet the deadline could pose serious safety risks," and that "[i]dentifying and mitigating risks sooner, rather than later, would better ensure a reliable PTC system can be fully implemented to provide the intended safety benefits of this technology without resulting in unintended consequences."[4]

In an August 2012 report, the FRA confirmed that, "Given the current state of development and availability of the required hardware and software, along with deployment considerations, most railroads will likely not be able to complete full RSIA-required implementation of PTC by December 31, 2015."[5] The FRA report notes that PTC implementation on the scale required by the RSIA has never been attempted anywhere in the world.

For a more thorough analysis and understanding of freight rail industry efforts, implementation progress, and existing challenges, the Association of American Railroads' 2013 report, *PTC Implementation: The Railroad Industry Cannot Install PTC on the Entire Nationwide Network by the 2015 Deadline,* is included as "Attachment A."

Highway-Rail Grade Crossings and Trespassers

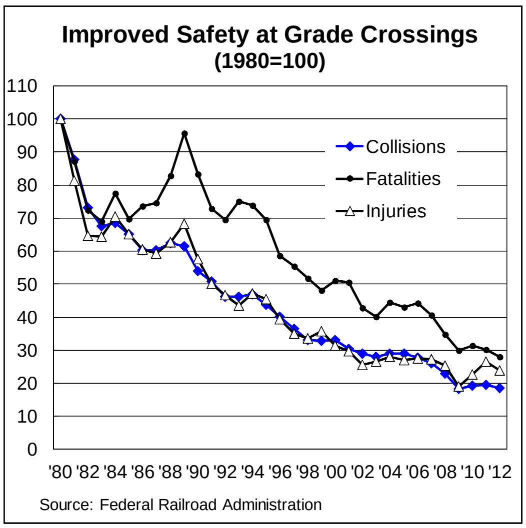
Collisions at grade crossings, along with incidents involving trespassers on railroad rights-of-way, are critical safety problems. These two categories typically account for more than 95 percent of rail-related fatalities. Although these incidents usually arise from factors that are largely outside of railroad control, and even though highway-rail crossing warning devices are properly considered motor vehicle warning devices there for the benefit of motorists, not trains, railroads are committed to efforts aimed at further reducing the frequency of crossing and trespasser incidents.

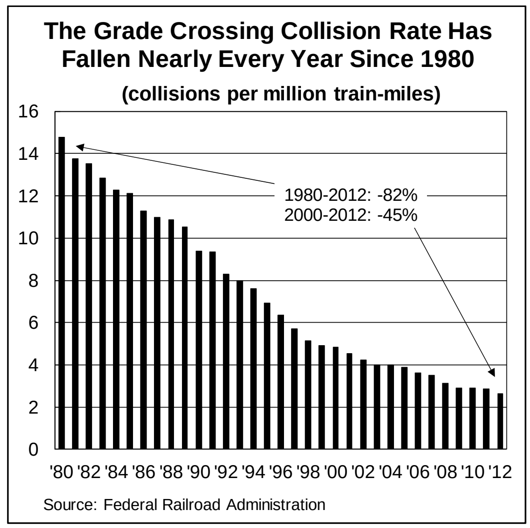
---

[4] Government Accountability Office, "Rail Safety: Federal Railroad Administration Should Report on Risks to the Successful Implementation of Mandated Safety Technology," Report No. GAO-11-133, December 2010. The quotes are from pages 22 and 46, respectively.

[5] Federal Railroad Administration, "Positive Train Control: Implementation Status, Issues, and Impacts," August 2012, p. 1.

Much success has already been achieved. From 1980 through 2012, the number of grade crossing collisions fell 82 percent; injuries associated with collisions fell 76 percent; and fatalities fell 72 percent. Since 2000, the declines have been 44 percent, 24 percent, and 45 percent, respectively, indicating that grade crossing safety continues to improve. The grade crossing collision rate has fallen nearly every year since 1980; from 1980 through 2012, it fell 82 percent. And because total exposure (train-miles multiplied by motor vehicle-miles) has risen sharply over time, the reduction in crossing incidents and casualties per unit of exposure has been even higher.





America's freight railroads spend hundreds of millions of dollars each year to maintain and improve grade crossings. They also:

- Cooperate with state agencies to install and upgrade warning devices and signals, and bear the cost of maintaining them in perpetuity.
- Help pay to close unneeded crossings.
- Support Operation Lifesaver, a nationwide non-profit organization that educates the public about the need for proper behavior at grade crossings and on railroad property.
- Work with law enforcement and others to keep grade crossings safe.
- Solicit assistance from the public. In June 2012, the FRA issued a final rule requiring railroads to install signs at grade crossings with telephone numbers the public can use to alert railroads to unsafe conditions.

Under the federal "Section 130" program, $220 million in federal funds are divided among the states each year for installing new active warning devices, upgrading existing devices, and improving grade crossing surfaces. Several years ago, FRA noted that the Section 130 program "has helped prevent over 10,500 fatalities and 51,000 nonfatal injuries." Those figures are surely much higher now.

Without a budgetary set-aside like the Section 130 program, grade crossing needs would fare poorly in competition with more traditional highway needs such as highway construction and maintenance. Indeed, one of the primary reasons the Section 130 program was created in the first place was that highway safety — and especially grade crossing safety — traditionally received low funding priority. The surface transportation bill signed into law on July 6, 2012 will continue dedicated funding for this important program for two more years and will mean more injuries averted and more lives saved.

The vast majority of grade crossing collisions are the result of motorists' actions. Consequently, grade crossing accidents can best be reduced through a mix of *education*, *engineering*, and *enforcement*.

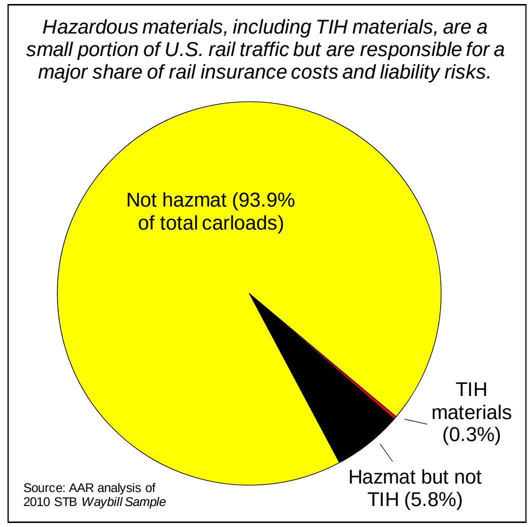
An organization that deserves special commendation for its efforts to educate the public about the dangers of grade crossings and trespassing on railroad rights-of-way is Operation Lifesaver. Operation Lifesaver — a non-profit whose mantra is "look, listen, and live" — started in Idaho in 1972 and now has chapters in the 48 contiguous states, Alaska, and the District of Columbia. Operation Lifesaver's presenters, many of whom are current or retired rail industry employees, have provided free safety presentations to millions of Americans, including school children, driver's education students, business leaders, truck drivers, and bus drivers. I urge you to generously fund this important educational organization. Railroads also believe that grade crossing safety should be part of commercial driver’s license educational curricula.

Education alone is not enough to reduce the number of tragic grade crossing accidents. Engineering and enforcement actions are also critical. Railroads support research regarding the effectiveness of innovative types of warning devices, such as four quadrant gates. Because maximum safety can be realized if crossings are eliminated, the closing of crossings (and, where appropriate, grade separation) is the ultimate engineering improvement. In that regard, we recommend that Congress consider measures that would help incentivize grade crossing closures. Finally, there should be tough penalties for grade crossing traffic violations.

Grade crossing safety is only part of the public safety challenge. Trespassing is another area of concern. It is an unfortunate reality that too many people inappropriately use railroad property for short cuts, recreation, or other purposes, sometimes with tragic results. Railroads are engaged in ongoing efforts with Operation Lifesaver and others to educate the public that, for their own safety, they should stay off rail property.

The Transportation of Hazardous Materials by Rail

Although many types of chemicals pose little or no threat to anyone or anything, some chemicals are classified as hazardous. Depending on the year, U.S. railroads transport around 1.8 million carloads of hazardous materials. “Toxic inhalation hazard” (TIH) materials — gases or liquids, such as chlorine and anhydrous ammonia, that are especially hazardous if released into the atmosphere — are a subset of hazardous materials. In 2010 (the most recent year for which data have been tabulated), U.S. railroads carried some 77,000 TIH carloads. Hazardous materials accounted for 6 percent of rail carloads in 2010; TIH materials accounted for 0.3 percent.



The rail hazmat safety record is excellent. In 2010, 99.998 percent of rail hazmat shipments reached their destination without a release caused by a train accident. Rail hazmat accident rates are down 91 percent since 1980 and 38 percent since 2000.

In fact, railroads are the safest mode for transporting hazmat. Railroads and trucks have roughly equal hazmat ton-mileage, but railroads have only about 5 percent of the hazmat incidents that trucks have. In other words, trucks are about 20 times more likely to have a hazmat incident than a train. Since 1982, railroads have incurred 15 fatalities due to hazmat transport; trucks have incurred 113.

Railroads and tank car builders are taking concrete steps to make chemical and hazmat transportation safer and more reliable. For example, they are enhancing tank car safety. Nearly half of all chemicals, and nearly all TIH materials, are transported in tank cars. Tank cars built today are vastly improved over earlier generations of tank cars, with higher grade steel, better thermal protection, improved valves and fittings, often thicker tanks, and many other improvements.

The industry committee responsible for establishing tank car design standards has adopted a proposal that will enhance the robustness of tank cars that carry TIH materials. That standard was the basis of a recent FRA rulemaking on TIH tank cars. Another proposed industry standard addresses ways to make petroleum and ethanol cars safer.

The railroad industry is also a key partner in the "Advanced Tank Car Collaborative Research Program" (ATCCRP), a cooperative effort involving the railroads, shippers (represented by the American Chemistry Council, the Fertilizer Institute, and the Chlorine Institute), tank car builders and owners (represented by the Railway Supply Institute), and several U.S. and Canadian government agencies. The program is sponsoring cutting-edge research aimed at further improving TIH tank car safety.

In addition, railroads work cooperatively with various federal agencies — including the Pipeline and Hazardous Materials Safety Administration (PHMSA), the FRA, the Transportation Security Administration (TSA), and the Federal Emergency Management Agency (FEMA) — to help ensure safe and secure rail transport. For example:

- FEMA, FRA, PHMSA, TSA, and the railroads have jointly developed the *Rail Corridor Risk Management System* (RCRMS), a sophisticated statistical routing model designed to ensure that TIH materials are transported on routes that pose the least overall safety and security risk. The model uses a minimum of 27 risk factors to assess the safety and security of rail routes, including hazmat volume, trip length, population density along the route, and emergency response capability. When transporting TIH materials, railroads must use the routes deemed safest and most secure by the routing model.
- Railroads follow stringent TSA *"chain of custody" requirements* for rail cars carrying TIH materials. Transfer of TIH cars from a shipper to a railroad, from one railroad to another, and from a railroad to a receiver must be carefully documented. Rail cars carrying TIH materials cannot be left unattended while in certain high-threat urban areas.

- TSA regulations require railroads to *track TIH shipments*. Within five minutes following a TSA request, railroads must be able to identify the location of a particular tank car carrying TIH. Within a half hour, railroads must be able to report the location of all TIH tank cars currently on the rail network.
- PHMSA requires railroads to develop and implement *security plans* that include an

assessment of security risks for hazmat shipments; background vetting and training of employees who work in hazmat transport; measures to restrict unauthorized access to hazmat cars; and coordination with shippers and receivers to minimize the duration of storage in transit.

- Railroads equip train dispatchers and crews with *information about hazmat on individual trains* and detailed emergency response information. In addition, railroads maintain contact lists for local emergency response agencies.
- Railroads provide *hazmat awareness training* to all employees who are involved in hazmat transportation. Employees responsible for emergency hazmat response efforts receive far more in-depth training.
- Rail industry personnel are in constant communication with the TSA, other agencies within DHS, the Department of Defense, DOT, the FBI, and state and local law enforcement agencies to *share intelligence and security information*.
- More than 25 years ago, the AAR established what is now the Security and Emergency Response Training Center (SERTC), a world-class facility that is part of TTCI in Pueblo, Colorado. The SERTC has provided in-depth hazmat emergency response training to more than 40,000 emergency responders and railroad and chemical industry employees.

The rail transport of crude oil, which is considered a hazardous material, has been the subject of much discussion lately. Over the past couple of years, technological advances, along with relatively high crude oil prices, have led to sharply higher U.S. crude oil production. Historically, most crude oil has moved from production areas to refineries by pipeline. However, much of the recent increases in crude oil output has moved by rail. In 2008, U.S. freight railroads originated just 9,500 carloads of crude oil. In 2012, they originated nearly 234,000 carloads. Based on the approximately 97,000 rail carloads of crude oil in the first quarter of this year, more than 400,000 carloads are possible in 2013. Today, railroads transport approximately 10 percent of U.S. crude oil production, up from a miniscule percentage just a few years ago.

Railroads have an excellent crude oil safety record. Based on data from PHMSA, the "spill rate" for railroads from 2002-2012 was just 2.2 gallons per million crude oil ton-miles generated. The fact is, both pipelines and railroads are safe, reliable ways to transport crude oil. Each enhances our energy security and benefits consumers.

Safety-Enhancing Technologies

At a very basic level, railroading today seems similar to railroading 150 years ago: it still consists of steel wheels traveling on steel rails. This apparent similarity, however, masks a widespread application of modern technology and a huge variety of ongoing initiatives to research, test, and apply advanced technologies to promote a safer and more efficient railroad environment.

Many of these advancements were developed or refined at the finest rail research facility in the world: the Transportation Technology Center, Inc. (TTCI) in Pueblo, Colorado. TTCI is a wholly owned subsidiary of the Association of American Railroads. Its 48 miles of test tracks, highly-sophisticated testing equipment, metallurgy labs, simulators, and other diagnostic tools are used to test track structure, evaluate freight car and locomotive performance, assess component reliability, and much more. The facility is owned by the FRA but has been operated (under a competitively-bid contract with the FRA) by TTCI since 1984. TTCI is responsible for all the facility's operating costs and some capital costs. We extend a standing invitation to all members of this committee and others in Congress to visit TTCI and see firsthand the tremendous research and emergency response training that is being done there.

Among many other things, TTCI has been actively involved in the rail industry's research and technology development efforts to improve the performance of track and freight car component designs and materials. The most significant of these are improved suspension truck designs, improved maintenance of the wheel-rail interface, wheel inspection and cleanliness standards, and improved wheel and rail metallurgy.

In addition, TTCI continues to work with track suppliers and railroads to test and evaluate wear- and fatigue-resistant rail steels, innovative special track work and bridge designs, improved tie/fastener systems, and maintenance practices at its Facility for Accelerated Service

Testing (FAST). As a result of these efforts, derailments caused by broken rails have decreased significantly over the past ten years.

A few of the many other examples of new safety-enhancing rail technologies developed in recent years or now being developed include:

- *Wayside detectors* identify defects on passing rail cars, including overheated bearings and damaged wheels, dragging hoses, deteriorating bearings, cracked wheels, and excessively high and wide loads.
- Trackside *acoustic detector systems* use "acoustic signatures" to evaluate the sound of internal bearings to identify those nearing failure. These systems supplement or replace systems that *measure the heat bearings generate* to identify those in the process of failing.
- Rail *defect detector cars* detect internal flaws in rails which are caused by fatigue and impurities introduced during manufacturing. A prototype of an advanced system dubbed the "phased-array" rail inspection system is being developed and tested at TTCI to detect hard-to-find internal rail defects.
- Advanced *track geometry cars* use sophisticated electronic and optical instruments to inspect track alignment, gauge, curvature, and other track conditions. A new system called the "vehicle track interaction system" is also used to locate difficult-to-find track geometry defects. This information helps railroads determine when track needs maintenance.
- *Ground-penetrating radar* is being used to help identify problems below the ground (such as excessive water penetration and deteriorated ballast) that hinder track stability.
- Because a relatively small percentage of freight cars causes an inordinately high percentage of track damage and have a higher than usual propensity to derail, TTCI is working on ways to use *optical geometry detectors* to identify poorly performing freight trucks.[6]
- New automated detector systems are being tested and evaluated at TTCI to inspect the under carriage, safety appliances and truck components using *machine-vision-based car inspection systems*.
- Railroads are expanding their use of advanced communications systems. For example, the *Integrated Railway Remote Information Service (InteRRIS)*, an advanced Internet database with wide potential applicability, was developed at TTCI. An early project using InteRRIS collects data from wheel impact load detector systems (which identify wheel defects by measuring the force generated by wheels on tracks) and detectors that monitor the undercarriage of rail cars (which identify structural defects or missing components such as key fasteners). InteRRIS processes the information to produce vehicle condition reports.

[6] In terms of rail cars, "truck" refers to the complete four-wheel assembly that supports the car body.

Many of these technological advances have been incorporated in the rail industry's Equipment Health Monitoring Initiative, a predictive and proactive maintenance system designed to detect and report potential safety problems and poorly performing equipment *before* they result in accidents or damage. In addition to reliably detecting cars that exhibit high levels of stress and reduce derailments, one of the purposes of EHMS is to work with freight car owners to develop efficient methods to proactively maintain the freight car fleet and keep out-of-service time to a minimum.

Rail industry safety will also be enhanced by the Asset Health Strategic Initiative (AHSI), a multi-year rail industry program initiated in December 2011 that will apply information technology solutions and processes to improve the safety and performance of freight cars and locomotives across North America.

In a nutshell, AHSI aims to improve safety and reduce costs across the rail industry by addressing mechanical service interruptions, inspection quality, and yard and shop efficiency. It is based on the recognition that improving asset health means more than just focusing on railcar and locomotive repair. Rather, it encompasses the entire rolling stock health cycle, incorporating prevention, detection, planning, movement, and repair.

For example, the Comprehensive Equipment Performance Monitoring (CEPM) program, which is just one part of the AHSI initiative, is a web-based application that captures data for railcar equipment components, including repair histories, the mileage the freight cars incorporating the components have traveled, and the current and past health status of the equipment. CEPM will make it much easier to track the health of individual railcar components and will provide crucial information on the health of entire classes of components, making early identification of potential safety problems much more likely.

As noted above, in recent years railroads have been reinvesting more than ever before back into their networks. These investments have had a pronounced positive impact on asset health and, as a result, improved safety. However, a strategic focus at the network level — like that provided by AHSI — will provide more significant returns and greater efficiencies than furthering incremental or local efforts. AHSI builds on existing industry capabilities and defect detector systems, including many of those described above, to provide a more comprehensive assessment of rail car and locomotive health. It's just one of many efforts by railroads to harness the power of advanced technologies for the benefit of their customers, their employees, and the communities they serve.

Safety and Passenger Rail

In the United States, freight railroads provide the foundation for most passenger rail. Around 70 percent of the miles traveled by Amtrak trains are on tracks owned by freight railroads, and dozens of commuter railroads operate, or plan to operate, at least partially on freight-owned corridors. In addition, most of the high speed and intercity passenger rail projects under development nationwide plan to use freight-owned facilities.

Freight railroads agree that passenger railroading can play a key role in alleviating highway and airport congestion, decreasing dependence on foreign oil, reducing pollution, and enhancing mobility. But safety has to come first when it comes to passenger trains sharing track or rights-of-way with freight trains. Among other things, this means that in some cases — depending on train speeds and frequency, track standards, and other factors — separate tracks for passenger and freight trains might be needed. AAR believes that safety would be enhanced if these separate tracks were sufficiently far apart to minimize the likelihood that a derailment on one track could foul an adjacent track and lead to a collision involving a freight and passenger train.

Railroads and Fatigue

Railroads want properly rested crews — it's not in a railroad's best interest to have employees who are too tired to perform their duties properly. That's why railroads have long been working to find innovative, effective solutions to fatigue-related problems. Combating fatigue in the rail industry is a shared responsibility: employers need to provide an environment that allows employees to rest during off-duty hours, and employees must set aside time when off duty to obtain the rest they need.

Because factors that can result in fatigue are multiple, complex, and frequently inter-twined, there is no single solution, and efforts to combat fatigue should be based on sound scientific research, not on anecdotes or isolated events. That's why railroads and their employees are pursuing a variety of scientifically-based fatigue countermeasures. Not every countermeasure is appropriate for every railroad, or even for different parts of the same railroad, because circumstances unique to each railroad influence the effectiveness and practicality of specific countermeasures. That said, individual railroads have been using the following countermeasures (among others) to help combat fatigue:

- Increasing the minimum number of *hours off duty* and providing *more predictable calling assignments* and rest opportunities between shifts.
- Focusing, when possible, on *returning crews home* rather than lodging them away from home and making away-from-home lodging more rest-inducing.
- Allowing employees to *request an extra rest period* when they report off duty if they feel excessively fatigued.
- Devising systems (including web sites, e-mails, pagers, and automated telephone systems) to *improve communication* between crew callers and employees.
- Allowing employees who have been off work more than 72 hours (*e.g.*, on vacation) to begin their first shift in the morning rather than at night.

- Encouraging confidential *sleep disorder screening and treatment*.
- Offering *fatigue education programs* for employees and their families. Education is critical, since the effectiveness of fatigue initiatives depends on the actions of employees while off duty. Employees must make appropriate choices regarding how they spend their off-duty time, and education is important in encouraging sound decision making.

Conclusion

Railroads are proud of their safety record, which results from their recognition of their responsibilities regarding safety and the enormous resources they devote to its advancement. At the same time, railroads want rail safety to continue to improve. The rail industry is always willing to work cooperatively with you, other policymakers, the FRA, its employees, and others to find practical, effective ways to make this happen.