

**DEPARTMENT OF TRANSPORTATION**

**Federal Railroad Administration**

**[Safety Advisory 2013-06]**

**Pipeline and Hazardous Materials Safety Administration**

**[Docket No. PHMSA – 2013 – 0196; Notice No. 13 – 13]**

**Lac-Mégantic Railroad Accident Discussion and DOT Safety Recommendations**

**AGENCY:** Federal Railroad Administration (FRA) and Pipeline and Hazardous Materials Safety Administration (PHMSA), Department of Transportation (DOT).

**ACTION:** Notice of Safety Advisory and Announcement of Emergency Meeting of the Railroad Safety Advisory Committee.

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**SUMMARY:** A recent catastrophic railroad accident occurred in Canada when an unattended freight train containing hazardous materials rolled down a descending grade and subsequently derailed. It is currently estimated that this accident resulted in 42 fatalities, and 5 persons are still reported to be missing. In response, FRA issued Emergency Order No. 28 regarding the securement of trains, and FRA and PHMSA (collectively, DOT) are also issuing this safety advisory. This safety advisory discusses the circumstances surrounding the accident and makes certain safety-related recommendations to railroads operating in the United States. This safety advisory also provides notice of FRA's intent to schedule an emergency meeting of the Railroad Safety Advisory Committee to discuss this accident and potential regulatory actions to prevent similar future accidents from occurring.

**FOR FURTHER INFORMATION CONTACT:** Thomas J. Herrmann, Acting Director, Office of Safety Assurance and Compliance, Office of Railroad Safety, FRA, 1200 New Jersey Avenue, SE., Washington, DC 20590, telephone (202) 493-6404; Joseph St. Peter, Trial Attorney, Office of Chief Counsel, FRA, 1200 New Jersey Avenue, SE., Washington, DC 20590, telephone (202) 493-6047; or Charles Betts, Director, Standards and Rulemaking Division, Office of Hazardous Materials Safety, PHMSA, 1200 New Jersey Avenue, SE., Washington, DC 20590, telephone (202) 366-8553.

**SUPPLEMENTARY INFORMATION:**

**Incident Summary**

On July 6, 2013, a catastrophic accident involving a freight train containing loaded tank cars of petroleum crude oil occurred in the town of Lac-Mégantic, Quebec, on the Montreal, Maine & Atlantic Railway (MMA). While the accident is still being investigated by Canadian authorities and no final determinations have been made, the following is known based on preliminary information released by the Transportation Safety Board of Canada.<sup>1</sup>

According to Rail Safety Advisory Letters issued by the Transportation Safety Board of Canada on July 19, 2013, the incident is summarized as follows. At approximately 10:45 pm (EDT) on July 5, 2013, an MMA train was proceeding eastward from Montreal, Quebec, to St. John, New Brunswick. The train was approximately 4,700 feet long, weighed over 10,000 tons and consisted of five locomotives, a loaded box car, and 72 loaded tank cars containing petroleum crude oil (Class 3, UN 1267). At approximately 11:00 pm the train

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<sup>1</sup> This accident occurred in Canada and DOT is neither responsible for determining, nor has jurisdiction to investigate, the cause of this accident. Further, Canadian authorities have not yet determined the cause of this accident. As such, nothing in this safety advisory is intended to attribute a definitive cause to this accident or place responsibility for the incident on the acts or omissions of any specific person or entity.

stopped near mile post 7.40 near Nantes, Quebec. At that location the single operator secured the train and departed, leaving the train unattended on mainline track with a descending grade of approximately 1.2 percent.

At approximately 11:50 pm, a local resident reported a fire on the lead locomotive (MMA 5017) of the train and the local fire department was called and responded with another MMA employee. At approximately midnight, in accordance with established operating procedures, the lead locomotive was shut down and the fire extinguished. After the fire was extinguished, the fire department and the MMA employee left the site.

At approximately 1:00 am the next day, it appears that the train began rolling and picking up speed down the descending grade toward the town of Lac-Mégantic, Quebec. Near the center of town, the train derailed. The locomotives separated from the train and came to a stop approximately ½ mile from the derailment site. The box car and 63 of the loaded tank cars derailed. A number of derailed tank cars released product resulting in multiple explosions and subsequent fires. At this time, it is estimated that there were 42 fatalities and 5 persons are still missing. There was also extensive damage to the town, and approximately 2000 people were evacuated from the surrounding area.

### **Transport Canada Emergency Directive**

In response to this accident, Transport Canada (the Canadian government department responsible for regulating transportation safety in Canada) issued an emergency railroad directive pursuant to Section 33 of the Canadian Railway Safety Act.<sup>2</sup> The directive ordered railroad companies in Canada to ensure that:

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<sup>2</sup> Available online at: <http://www.tc.gc.ca/eng/mediaroom/backgrounders-safety-locomotives-7292.html>. Additionally, in response to this accident, the Transportation Safety Board of Canada issued Rail Safety Advisory Letter - 09/13 regarding the securement of equipment and trains left unattended; available online at:

- Within five days of the issuance of the directive, all unattended controlling locomotives on a main track and sidings are protected from unauthorized entry into the cab;
- The directional controls, commonly known as reversers, are removed from any unattended locomotives, preventing them from moving forward or backward, on a main track or sidings;
- Their company's special instructions on hand brakes are applied to any locomotive attached to one or more cars that are left unattended for more than one hour on a main track or sidings;
- In addition to complying with their company's special instructions on hand brakes referred to in the item immediately above, the automatic brake is set in full service position and the independent brake is fully applied for any locomotive attached to one or more cars that are left unattended for one hour or less on a main track or sidings
- No locomotive attached to one or more loaded tank cars transporting dangerous goods is left unattended on a main track; and
- No locomotive attached to one or more loaded tank cars transporting dangerous goods is operated on a main track or siding with fewer than two persons qualified under their company's requirements for operating employees.

Transport Canada explained in the emergency directive that the cause of the accident in Lac-Mégantic remains unknown at this time. However, the emergency directive stated that, “. . . in light of the catastrophic results of the Lac-Mégantic accident and in the interest of ensuring the continued safety and security of railway transportation, there is an immediate

need to clarify the regime respecting unattended locomotives on main track and sidings and the transportation of dangerous goods in tank cars using a one person crew to address any threat to the safety and security of railway operations.” As such, Transport Canada exercised its statutory emergency directive authority to order railroad companies in Canada to comply with the above-listed requirements. In addition, Transport Canada also issued an accompanying order pursuant to paragraph 19(a)(1) of the Canadian Railway Safety Act directing railroad companies in Canada to formulate or revise certain railroad operating rules, respecting the safety and security of unattended locomotives, uncontrolled movements, and crew size requirements. The order provides that rules should be based on an assessment of safety and security risks, and shall at a minimum:

- Ensure that the cab(s) of unattended controlling locomotives are secure against unauthorized entry;
- Ensure that the reversers of unattended locomotives are removed and secured;
- Prevent uncontrolled movements of railway equipment by addressing, at a minimum:
  - The application of handbrakes based on factors including but not limited to:
    - Tonnage, gradient, location and fatigue of the operator;
    - The application of independent and automatic brakes; and
    - The application of temporary or permanent derails as a secondary line of [defense] at high risk locations such as sidings used for storage or main track used for crew change-off, or in high risk conditions including consideration of the type of goods being transported and environmental conditions, in order to prevent movement due to tampering or accidental release of brakes from defective components;

- Ensure the security of stationary railway equipment transporting "dangerous goods" as this expression is defined in section 2 of the Transportation of Dangerous Goods Act; and
- Provide for minimum operating crew requirements considering technology, length of train, speeds, classification of dangerous goods being transported, and other risk factors.

### **Emergency RSAC Meeting**

The Railroad Safety Advisory Committee (RSAC) is a group composed of railroad industry, labor, and governmental representatives. FRA established the RSAC in 1996 to develop recommendations on new regulatory standards and other rail safety program issues through a collaborative process with all segments of the rail community. FRA consults with the RSAC regularly regarding the development of its regulatory program, and also to advise the RSAC of emerging issues and statutory requirements, and to discuss other identified needs. The RSAC may consider a variety of approaches to address safety issues, including the use of industry standards, which can complement and be incorporated into FRA regulations.

In light of the Lac-Mégantic railroad accident, FRA is scheduling an emergency meeting of the RSAC to discuss the accident. FRA will publish a Federal Register notice to announce the date, time, and location of this meeting. At this emergency meeting FRA intends to address the safety requirements that were issued in Emergency Order No. 28, and the recommendations made in this safety advisory. FRA also plans to discuss the safety implications and potential costs and benefits of the requirements in Transport Canada's

emergency directives discussed above, and safety-related initiatives going forward, including possible new RSAC tasks to implement such safety-related initiatives.

FRA requests that both freight and passenger railroads be prepared to discuss the Transport Canada directive requiring that two-person crews operate trains carrying hazardous materials on main track. FRA believes initiatives to require a minimum of two crewmembers for over-the-road trains (including both passenger and freight trains) could enhance safety. At the emergency RSAC meeting FRA expects to discuss the formulation of a task statement regarding appropriate train crew size for an RSAC working group to consider. FRA also requests that RSAC representatives be specifically prepared to discuss two other requirements contained in Emergency Order No. 28. First, FRA intends to discuss the appropriate types and quantities of hazardous materials that should preclude trains transporting such materials from being left unattended on main track and sidings. Emergency Order No. 28 currently specifies certain types and quantities of hazardous materials that trigger requirements regarding train attendance and securement procedures, but FRA would like to explore the issue further in conjunction with PHMSA. FRA also intends to discuss the various criteria and evaluation processes railroads have used, or intend to use, to formulate plans they may choose to adopt that identify locations where it is safe and suitable to leave trains unattended and secured on main track or sidings outside of yards or terminals.

### **DOT's Review of the Lac Mégantic Accident's Safety Implications**

Canadian authorities investigating this accident have not yet identified the accident's cause. However, the known facts at this point raise apparent safety-related implications in several areas in which DOT regulates in the United States. In developing this safety advisory and in preparing to participate in the emergency RSAC meeting, DOT has considered

particular existing Federal railroad and hazardous materials safety regulations, existing industry practices, and relevant accident and inspection data. As mentioned above, FRA has already issued Emergency Order No. 28 to address securement-related safety issues. Another area of concern is resultant dangers that occur when trains transporting hazardous materials are involved in accidents, in addition to broader concerns involving the securement of unattended rolling equipment. Transport Canada's emergency directive and accompanying order also raised potential human factor issues regarding crew size for trains transporting hazardous materials.

### Transportation of Hazardous Materials

DOT is making two recommendations in this safety advisory that relate to the requirements in PHMSA's Hazardous Materials Regulations (49 CFR Parts 171-180; HMR). In addition to the two recommendations, the discussion below addresses the safety implications regarding the transportation of petroleum crude oil, and hazardous materials generally, by rail. As illustrated at Lac-Mégantic, it is often the hazardous materials being transported in a train that have the potential to cause the most harm.

Nonetheless, the transportation of hazardous materials by rail is extremely safe, and the vast majority of hazardous materials shipped by rail each year arrive at their destinations safely and without incident. In calendar year 2011, for example, out of the approximately 2.2 million shipments of hazardous materials transported by rail, there were only 20 accidents in which a hazardous material was released. In these accidents, a total of 66 hazardous materials cars released some amount of product. DOT has developed and enforces a comprehensive regulatory framework for the safe rail transportation of hazardous materials. This comprehensive regulatory program serves to mitigate the safety risk associated with the rail



transportation of hazardous materials. However, as this accident, and accidents such as the 2005 Graniteville, South Carolina incident in which a single breached railroad tank car containing chlorine resulted in nine fatalities indicate, both DOT and the rail industry must remain vigilant and continually seek to improve safety.

The train involved in the Lac-Mégantic accident was a unit train of tank cars containing petroleum crude oil. Industry statistics demonstrate that, in terms of rail originations, crude oil shipments are the fastest growing of all hazardous materials shipped by rail. According to the Association of American Railroads' (AAR) Annual Report of Hazardous Materials Transported by Rail for 2012, the number of crude oil originations has increased by 443% since 2005. Further, since 2005, rail shipments of ethanol have increased by a similar percentage. DOT anticipates that for the foreseeable future rail shipment originations of crude oil will remain high.<sup>3</sup> Both ethanol and crude oil are classified as Class 3 flammable or combustible liquids by the HMR.

The causes of rail accidents involving trains carrying hazardous materials are often related to railroad operational or mechanical failures. For example, as based on FRA's accident reporting data for the period from 2008 through 2012, railroad accident causes were

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<sup>3</sup> The U.S. Energy Information Administration anticipates that crude oil rail export capacity from the Bakken region, located mostly in North Dakota, will increase over the next two years. See <http://www.eia.gov/todayinenergy/detail.cfm?id=10431>. Much of the near term growth in rail originations is currently a function of how quickly tank car manufacturers can produce new cars to meet the demand for tank cars, primarily for Bakken crude oil. The rise in rail originations in crude oil is subject to changes in the number of tank cars available, price of crude oil, and overall production of crude oil in that region, and is also dependent on whether, or how quickly, additional pipeline export capacity from that region comes online. However, for the foreseeable future, all indications are for continued growth of rail originations of crude in that region as new tank car fleets come online to meet demand. Bakken crude oil is primarily shipped via rail to refineries located near the U.S. Gulf Coast or also to pipeline connections, most notably to connections located in Oklahoma. Crude oil is also shipped via rail to refineries on the East Coast and, to a lesser extent, refineries in other regions of the U.S. See Association of American Railroads *Moving Crude Oil by Rail* (May 2013), [https://www.aar.org/keyissues/Documents/Back ground-Papers/Crude-oil-by-rail.pdf](https://www.aar.org/keyissues/Documents/Back_ground-Papers/Crude-oil-by-rail.pdf).

allocated as follows: human factors (35.7 percent); track and structures (34.5 percent); equipment (12.7 percent); signal and train control (2.4 percent); and miscellaneous (14.7 percent). DOT has taken a variety of actions to address these accident causes, including the promulgation of FRA's human factors regulation on operational tests and inspections involving handling equipment, switches, and fixed derails, passenger hours of service rules, regulations requiring the installation of positive train control systems on certain lines, regulations governing the use of distracting electronic devices by railroad operating employees, regulations governing conductor certification, the issuance of a notice of proposed rulemaking on the training of certain railroad employees, the issuance of a notice of proposed rulemaking regarding railroad track inspection practices, and the issuance of a notice of proposed rulemaking to require system safety programs on certain passenger railroads.

As applicable to the rail transportation of hazardous materials, and particularly tank car crashworthiness in instances when accidents do occur, PHMSA has issued numerous regulations designed to improve the accident survivability of rail tank cars carrying hazardous materials. Most recently, in 2009, PHMSA issued a final rule requiring newly constructed tank cars designed to carry materials toxic-by-inhalation (TIH materials or materials poisonous-by-inhalation (PIH materials)) to have increased side and head-impact puncture resistance by requiring a combination of thicker outer jackets and/or inner shells and the use of full head shields where not already mandated by regulation.<sup>4</sup> The rule also establishes enhanced standards and features to protect the valves, top fittings and nozzles of newly constructed TIH materials tank cars and imposes a 50 mile-per-hour ("mph") speed limit for all trains transporting loaded tank cars containing TIH materials.

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<sup>4</sup> 74 Fed. Reg. 1770 (Jan. 13, 2009).

Further, PHMSA is currently formulating an advanced notice of proposed rulemaking addressing, among other items, safety improvements to DOT Specification 111 tank cars, which are commonly used to transport crude oil and ethanol. DOT has also scheduled a public meeting on August 27-28 to discuss improving the safety of the transportation of hazardous materials by rail. As the above discussion indicates, DOT has already taken steps to provide for the safety of transportation of hazardous materials by rail, and will continue to evaluate the need for additional safety measures as details of the Lac-Mégantic accident become known.

DOT's HMR-related recommendations below are in regard to the proper classification of crude oil and the HMR's requirements regarding railroad and hazardous materials offeror and carrier safety and security plans. First, the HMR require that an offeror<sup>5</sup> of a hazardous material properly classify and describe the hazardous material. See 49 CFR § 173.22. To attest compliance with the HMR, an offeror of a hazardous material must also certify that the hazardous material being offered into transportation is offered in compliance with the HMR. In the case of petroleum crude oil, relevant properties to properly classify the material include: flash point, corrosivity, specific gravity at loading and reference temperatures, and the presence and concentration of specific compounds such as sulfur (as found in sour crude oil). The classification requirements in the HMR ultimately determine the appropriate and authorized selection of the packaging, the fill densities and outage, accompanying hazard communications (markings, labels and placards), transportation safety and operational controls, and safety and security planning; and, if necessary, they enable the most effective and informed emergency response.

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<sup>5</sup> See 49 CFR 171.8 for the definition of "person who offers" or "offeror."

Crude oil transported by rail often derives from different sources and is then blended, so it is critical that offerors properly classify a hazardous material and select the proper HMR-authorized packaging for transportation of that hazardous material. Section 173.150(f) of the HMR allows flammable liquids such as petroleum crude oil with a flash point at or above 38 °C (100 °F) that do not meet the definition of any other hazard class to be reclassified as a combustible liquid, and excepts such combustible liquids from certain HMR requirements, to include the requirement that the material be transported in a DOT-specification bulk packaging.<sup>6</sup> As such, AAR 211 class cars are permitted, in certain instances, to be used to transport crude oil that has been classified as a Packing Group III material with a relatively high flash point. This distinction has safety implications if the crude oil being transported has been improperly classified and actually has a lower flash point and is a Packing Group I or II flammable liquid material. As such, DOT recommends that offerors evaluate their processes for testing, classifying, and packaging the crude oil that they offer into transportation via railroad tank car as required by Part 173 of the HMR. The frequency and type of testing should be based on an offeror's knowledge of the hazardous material, with specific consideration given to the volume of hazardous material shipped, the variety of sources that the hazardous material is generated from, and the processes that generate the hazardous material.

With regard to DOT's next HMR-related recommendation, the HMR also include requirements that specifically address safety and security plans for the transportation of certain hazardous materials. Specifically, Subpart I part 172 requires security plans to include

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<sup>6</sup> Section 172.102, Special Provision B1, states, "If the material has a flash point at or above 38 °C (100 °F) and below 93 °C (200 °F), then the bulk packaging requirements of § 173.241 of this subchapter are applicable."

an assessment of transportation security risks for shipments of hazardous materials (e.g., a large bulk quantity of Class 3 material such as crude oil meeting the criteria for Packing Group I or II). See 49 CFR 172.800-802. This assessment at a minimum must include elements addressing personnel security, unauthorized access, and en route security. The plan must also include security duties for each position or department that is responsible for implementing the plan as well as the training of hazardous materials employees. DOT is recommending that offerors and carriers of hazardous materials review their plans adopted in accordance with subpart I of part 172 of the HMR that govern the safety and security of the transportation of railroad tank cars containing hazardous materials. DOT recommends that after such review offerors and carriers of hazardous materials evaluate whether their existing plans adequately address known or potential safety and security risks and, as necessary, amend the plans as to ensure the continued safe and secure transportation of railroad tank cars containing hazardous materials.

#### Securement of Unattended Equipment

Next, with regard to the securement of unattended equipment, FRA accident data indicates that approximately 8.5% of human factor-caused accidents from calendar year 2011 until April 2013 were the result of improper securement. Existing Federal regulations, at 49 CFR part 232, require that railroads adopt procedures to ensure that unattended equipment is secured. FRA conducts inspections on a regular basis to monitor compliance with these applicable railroad securement procedures that railroads adopt in accordance with FRA's securement regulation. A review of FRA's inspection data indicates that since 2010, FRA inspectors have conducted 163,510 observations for compliance with railroad procedures adopted to comply with FRA's securement requirements for both passenger and freight trains

at § 232.103 and at 49 CFR part 238. FRA inspectors have discovered 5,236 instances where these railroad securement procedures were not complied with, and recommended violations in 1,625 of those instances. FRA's Emergency Order No. 28 was based, in part, on the above information, and requires railroads in the United States to adopt certain additional securement procedures to prevent accidents like the one that occurred at Lac-Mégantic when trains make uncontrolled movements.

In addition to those requirements conveyed in the emergency order, this safety advisory makes additional train securement-related recommendations. Existing Federal regulations, at 49 CFR part 217, require that railroads conduct operational tests to ensure their employees' compliance with railroad operating rules, and particularly those rules which are most likely to cause the most accidents or incidents. See 49 CFR 217.9(c)(1). As the above statistics indicate, a failure to comply with railroads' securement procedures account for approximately 8.5% of human factor caused accidents. When these accidents are viewed in light of the Lac-Mégantic accident, it is clear that compliance with Federal regulation and accompanying railroad procedures governing the securement of unattended equipment is safety-critical. Thus, DOT is recommending that railroads evaluate their current operational testing practices for securement-related rules compliance, and determine whether their current testing practices are sufficient, both in quality and quantity of the operational tests performed.

In making this recommendation, FRA also notes that past audits of railroads' operational testing records indicate, that in certain instances, there are significant discrepancies between the number of operating rules compliance failures that railroads record when compared with the ratio of operating rule failures that FRA inspectors observe during compliance inspections. DOT encourages railroads to use the recommendations in this safety

advisory to ensure that their operational testing practices, particularly as related to securement and all human factor-related operating rules, are evaluated for effectiveness. Operational testing should regularly take place under all operation conditions in which railroad employees perform duties. DOT encourages railroads to utilize all tools at their disposal, to include checking locomotive downloads to monitor compliance with railroad rules requiring certain actions be taken (e.g., air brake release) to verify that a sufficient number of handbrakes have been set to prevent a train's movement. FRA plans to place particular emphasis on its inspection efforts related to monitoring railroad compliance with securement procedures.

Two additional recommendations below also relate to preventing the unauthorized movement of trains. The first of these recommendations relates to removing the reverse lever (reverser), when the lever is capable of being removed from the control stand by a train crewmember, from the controlling locomotive of any train left unattended on a main track outside of yard limits. Emergency Order No. 28 addresses requirements regarding the status of the reverser for trains transporting certain hazardous materials that are left unattended on mainline track or mainline sidings outside of a yard or terminal. The recommendation in this safety advisory is meant to address any train or locomotive consist left unattended on main track outside of yard or terminal, regardless of commodity being transported. Railroads are currently required by 49 CFR 232.103(n)(4) to adopt procedures to govern the status of the reverse lever (reverser) on unattended locomotives. Typically, the rules adopted by railroads to comply with § 232.103(n)(4) require that the reverser of an unattended locomotive be removed from the control stand but do not require that the lever otherwise be removed from a train or secured. In an effort to ensure that any persons, primarily railroad trespassers, are unable to easily initiate unauthorized movements of any unattended trains outside of yard

limits, DOT is recommending that railroads amend their procedures adopted to comply with § 232.103(n)(4) to require that when the reverser is removed from the controlling locomotive of an unattended train that the lever is actually removed from the cab or otherwise secured in a place where a trespasser cannot readily access the lever. As the Lac-Mégantic accident illustrates, the uncontrolled movement of a train can have catastrophic consequences. DOT will also evaluate whether future regulatory activities should require railroad procedures be amended to enhance requirements governing access to an unattended train's reverser lever. DOT looks forward to discussing this issue and receiving information from the industry regarding this issue at the emergency RSAC meeting.

The Transport Canada emergency directive also contained a provision regarding the status of a train's automatic and independent brakes when a train is left unattended on a main track or siding for one hour or less. Existing § 232.103(n)(4) of FRA's regulations requires that railroads adopt and comply with procedures governing the status of the independent and automatic brake valves (in addition to the status of the reverser lever as discussed directly above) when locomotives are left unattended. Traditionally, such rules adopted to comply with § 232.104(n)(4) in the United States already require that a train's independent and automatic brakes be applied when a train is left unattended for any period of time. Thus, DOT has chosen not to address that item in this safety advisory, but plans to discuss this topic along with all of the items addressed by the Transport Canada emergency directive and order at the emergency RSAC meeting.

Next, DOT is also recommending that railroads evaluate risks at locations where trains are regularly left unattended on main track outside of yard limits, such as at crew change points. DOT recommends that after identifying locations where increased risks exist (for



example, due to grade conditions or trespasser accessibility to unattended trains at particular locations) railroads adopt procedures to mitigate such risks that could result in unauthorized or uncontrolled train movements. DOT understands that many railroads that transport hazardous materials by rail may have already implemented certain portions of such an evaluation in complying with 49 CFR 172.800-172.820 of the HMR, which as discussed above govern planning requirements for the transportation of hazardous materials. DOT also recognizes that railroads may undertake such evaluations if they choose to submit a plan to DOT regarding where trains containing certain hazardous materials may be left unattended, as described in Emergency Order No. 28. However, DOT recommends that such analysis/evaluation of how to mitigate risks be undertaken specifically for locations on main track where all trains are regularly left unattended outside of yard limits, as whether or not a train contains hazardous materials, an uncontrolled or unauthorized movement of such train can have catastrophic consequences, especially on main track where passenger trains might also travel.

### Human Factors

Finally, Transport Canada's emergency directive and order implicate other human factors issues such as crew size, personnel available to secure trains, operator fatigue, and the possible use of derails as a secondary line of defense against runaway trains at certain, higher risk, locations. DOT is making two recommendations below regarding these issues. First, DOT is making a recommendation regarding railroad crew staffing practices. Transport Canada's directive contained a specific requirement that railroads in Canada operate trains carrying loaded hazardous materials tank cars over main track and sidings with at least two

crew members. DOT believes that railroad safety is enhanced through the use of multiple crew members and recommends below that railroads review their crew staffing practices for over-the-road train movements of trains transporting 20 or more tank car loads of Class 3 flammable or combustible liquids, as well as certain of the amount and type of hazardous materials specified in AAR's Circular No. OT-55-M, October 1, 2012 (Circular),<sup>7</sup> and, as necessary, amend those practices to ensure safety. DOT intends to explore with the RSAC the appropriate level of crew staffing for over-the-road train operations. As mentioned above, at the emergency RSAC meeting FRA expects to ask the RSAC to consider the creation of a task statement regarding appropriate crew size for both freight and passenger operations for an RSAC working group to consider.

DOT is also recommending below that railroads evaluate all of the other human factors raised by Transport Canada with regard to train operations in the United States, particularly as related to train operations on main track, and amend those procedures as necessary. FRA plans to address this recommendation, and, as discussed above, also plans to address any other items at the emergency RSAC meeting that are raised in Transport Canada's emergency directive and order that are not otherwise addressed in Emergency Order No. 28 or this safety advisory.

**Recommended Railroad Actions:** In light of the above discussion, and in an effort to maintain safety of the Nation's rail system, DOT recommends that railroads:

1. Review with their employees the circumstances of the Lac-Mégantic accident described in this Safety Advisory.

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<sup>7</sup>Available online at: [http://boe.aar.com/CPC-1242\\_OT-55-M.pdf](http://boe.aar.com/CPC-1242_OT-55-M.pdf).

2. DOT believes that railroad safety is enhanced through the use of multiple crew members. Accordingly, railroads should review their crew staffing practices for over-the-road trains that transport:

- (a) Five or more tank car loads of any one or any combination of materials poisonous by inhalation as defined in 49 CFR 171.8, and including anhydrous ammonia (UN 1005) and ammonia solutions (UN 3318); or
- (b) 20 rail car loads or intermodal portable tank loads of any one or any combination of materials listed in (a) above, or, any Division 2.1 flammable gas, Class 3 flammable liquid or combustible liquid, Class 1.1 or 1.2 explosive, or hazardous substance listed in 49 CFR 173.31(f)(2).<sup>8</sup>

After such review, DOT recommends that railroads amend existing practices as necessary to ensure the safe movement of trains containing the above-listed hazardous materials on main track and sidings. DOT intends to explore with the RSAC the appropriate level of crew staffing for over-the-road train operations.

3. Amend their procedures adopted to comply with 49 CFR 232.103(n)(4) by requiring that the reverser lever of the controlling locomotive of a train or locomotive consist be either removed from the cab of the controlling locomotive or otherwise secured (when such reversers are capable of being removed by a train crewmember) to prevent unauthorized movement of any train or locomotive consist left unattended on mainline track or mainline siding outside of a yard or terminal.

4. Review both their operational testing programs (as adopted in accordance with 49 CFR 217.9) and relevant accident data related to the securement of unattended equipment to determine whether it is appropriate to increase the frequency of, or to otherwise enhance,

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<sup>8</sup> See 49 CFR 173.115 for the definition of Division 2.1 flammable gas, 173.120 for definition of Class 3 flammable liquid; and 173.50 for the definition of the various classes of explosives.

operational tests performed to determine the extent of railroad employee compliance with operating rules governing the proper securement of unattended equipment. DOT also recommends that railroads ensure that their operational tests are conducted under all operational conditions, and that the results of such operational tests are accurately reflected in the records required to be kept by 49 CFR 217.9(d).

5. Conduct system-wide evaluations to identify particular hazards (e.g., grade, train commodity, trespasser accessibility) which increase securement and other safety risks at crew change locations and other locations where any trains or rolling equipment are regularly left unattended. After identifying hazards at these locations, railroads should adopt procedures to mitigate risks that could result in unauthorized or uncontrolled train movements.

6. Review the other requirements in Transport Canada's emergency directive and order, to include human factor requirements such as operator fatigue, the use of derails as a secondary line of defense at high risk locations, and available personnel to secure a train, and, as necessary, amend the procedures governing these issues to ensure the safety of train operations, particularly as they relate to train operations conducted on main track.

**Recommended Hazardous Materials Actions:** In light of the above discussion, and in an effort to maintain safety of the Nation's rail system, DOT recommends that:

1. Offerors evaluate their processes to ensure that hazardous materials are properly classed and described in accordance with the HMR.

2. Offerors and carriers of hazardous materials review their safety and security plans adopted in accordance with subpart I of part 172 of the HMR. Offerors and carriers evaluate

whether the existing plans adequately address personnel security, unauthorized access, and en-route security and, as necessary, amend the plans as to ensure the continued safe and secure transportation of railroad tank cars containing hazardous materials.

DOT encourages railroad and hazardous material industry members to take actions that are consistent with the preceding recommendations, and to take other complementary actions to help ensure the safety of the Nation's railroads. DOT may modify this safety advisory, issue additional safety advisories, or take other appropriate actions necessary to ensure the highest level of safety on the Nation's railroads, including pursuing other corrective measures under its rail and hazardous materials safety authority.

Issued in Washington, DC, on August 2, 2013.

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