



MAXIMIZING COMMITMENT TO RAIL SAFETY THROUGH THE TSB WATCHLIST

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SUMMARY

In March 2010, the Transportation Safety Board of Canada (TSB) released a safety Watchlist identifying the nine transportation issues posing the greatest risk to Canadians. The purpose of the Watchlist was to serve as a “blueprint for change,” a document that could be used to encourage industry, regulators and other change agents to work together to make the transportation system safer. To achieve maximum commitment from all involved, the TSB implemented a plan to build stakeholder support, foster public debate of the safety issues, and promote increased uptake of the recommendations that underpin each issue.

This paper describes the TSB’s approach, including how the Watchlist was developed, the implementation strategy, as well as an evaluation of efforts thus far. The conclusion describes the overall impact and specific benefits, along with possibilities for future iterations of the Watchlist.

INTRODUCTION

The Transportation Safety Board of Canada (TSB) is an independent government agency. Our mandate is to advance transportation safety in four federally regulated transportation modes: air, marine, rail, and pipeline. We do this in numerous ways, including: conducting independent investigations to determine causes and contributing factors, identifying safety deficiencies, and communicating what we know to the public and to those change agents best positioned to make improvements. This communication can also take many forms: safety letters and advisories, news releases, published reports, and formal Board recommendations.

However, because the TSB is always looking for effective ways to maximize commitment to transportation safety, we are constantly looking for new ways to ensure that identified systemic safety deficiencies are addressed and mitigated. One of those “new ways” concerned how we deal with our recommendations. This involved several changes.

A CHANGE IN TSB RECOMMENDATIONS

First, far fewer recommendations are now being issued. Those we do issue seek to address bigger problems—the ones that pose the highest risk, or the more systemic ones that cannot be easily handled by meetings with stakeholders or through safety communications. Second, we are far more careful as to the wording of our recommendations. They are now written in language that can be easily understood by everyone, not just experts in the field. Without being prescriptive, our recommendations clearly identify the safety issue and our expectation with respect to addressing it. Third, we require that the recommendation can stand alone without any direct reference to the initiating investigation report itself.

When the TSB issues a recommendation, the *Canadian Transportation Accident Investigation and Safety Board Act* (CTAISB Act) compels the regulator to provide a formal response. This response, provided within 90 days, states publicly both what the regulator has done and what it plans to do to address the safety issue. The TSB is not a regulator, nor does it have legislative power. Therefore, we cannot require organizations to address our concerns, nor can they be forced to enact any changes that we recommend.

Previously, it was believed that the TSB had met its obligations merely by reviewing and rating the regulator’s response to each recommendation. But then we started asking ourselves: did that really mean

that we were doing all we could in pursuit of eliminating safety deficiencies and maximizing commitment to safety?

RESPONSES TO RECOMMENDATIONS

Since its inception in 1990, the TSB has issued 544 recommendations for the four modes. To date, 386 of the responses to our recommendations (71 per cent) have been rated as Fully Satisfactory. 128 (24 per cent) have been rated as Satisfactory Intent or Satisfactory in Part, and 23 (4 per cent) have been rated as Unsatisfactory (see Table 1).

	Air	Marine	Rail	Pipeline	Total Recommendations
Number of Recommendations	247	146	131	20	544
Fully Satisfactory	145	113	108	20	386
Satisfactory Intent	20	25	11	0	56
Satisfactory in Part	56	6	10	0	72
Unsatisfactory	20	2	1	0	23
To be determined	6	0	1	0	7

Table 1. Board Assessments of Responses to Recommendations, 1990–2011

Although the number of Fully Satisfactory responses was considered to be good, it was nonetheless noted that there was significant room for improvement. But how to achieve it?

TSB'S WATCHLIST

Back in 2007, the Chair of the TSB challenged a group of managers and investigators to come up with ways to increase the uptake in our recommendations (i.e., to maximize commitment to transportation safety). This led to the development and implementation of a safety Watchlist.

Selecting the issues for the Watchlist involved looking back at years of investigations. Eventually, these were distilled down to a set of nine critical issues—issues which in turn were underpinned by a series of 41 recommendations, specific findings from our many investigations, and various safety communications. For these nine Watchlist issues, regardless of the status of the associated recommendations, the TSB felt that safety action taken to date was inadequate, and that additional concrete steps were required to address the risks.

In March 2010, the TSB released the Watchlist (see Annex A), along with a series of nine “fact sheets” outlining the scope of each issue and providing background and solutions. The rail-related Watchlist issues include:

- Passenger Trains Colliding with Vehicles (see Annex B);
- Operation of Longer, Heavier Trains (see Annex C);
- Safety Management Systems (see Annex D); and
- Data Recorders (see Annex E).

SUSTAINING THE MOMENTUM

The Watchlist is a means, not an end—with the ultimate goal being “enhanced recommendation uptake”. As created, the Watchlist was envisioned as a “blueprint for change”—a way to restate the TSB’s safety messages, to stimulate discussion, and to generate further action on the part of the regulator and industry in order to maximize commitment to safety. And that’s exactly what is happening. Prior to the release of the Watchlist, just 5 of the underlying 41 recommendations had received the TSB’s highest assessment, Fully Satisfactory. Six months later, after further industry and regulator consultation which focused on the Watchlist issues, that number had more than doubled, with 12 of the 41 recommendations assessed as Fully Satisfactory.

With these early successes, the question then became “How do you sustain the momentum?”

The short answer is that we must continue to obtain buy-in and maximum commitment from all change agents. Doing this involves a three-pronged approach:

- Build support for the issues with the stakeholders;
- Foster public debate of the issues; and
- Promote increased uptake of the underlying recommendations.

To accomplish those goals, we came up with the following five tactics:

1. Full-Court Press

The goal is to make Watchlist communication a year-round initiative. The Watchlist does not stop with its initial release. We must incorporate Watchlist messaging into everything. Every investigator, manager, and Board member must ensure that “getting the word out” is a top priority. If, for example, we release a report that deals with a Watchlist-related issue, we ensure that the issue is appropriately highlighted. This includes our Annual Report. In addition, special emphasis must be placed on media relations outreach, including news releases, editorials and articles in industry publications.

2. Increase *Internal Buy-In*

The goal is to engage more TSB employees in Watchlist communication. The Chair and the Chief Operating Officer must continue to conduct meetings with staff across the country—in person or through videoconferencing. The objective is to provide direction to all staff on how they can contribute to Watchlist communication. For example, by soliciting staff suggestions for Watchlist communication, various industry events can be identified for Watchlist discussion and follow-up.

3. Appoint a Watchlist “Champion”

It’s one thing to say you want to accomplish a goal. It’s something else to give that goal a face, and a name. So we appointed someone as the Watchlist Champion. The role of the Watchlist Champion is to:

- Direct the development of the annual plan, budget, and calendar for Watchlist communication, activities, and products;
- Chair inter-branch Watchlist communication planning meetings;
- Conduct face-to-face meetings with staff regarding the Watchlist;
- Share objectives and high-level Watchlist strategy with all staff;
- Provide leadership for event planning; and
- Act as a resource for modal Directors and other subject-matter experts for each Watchlist issue.

4. Stakeholder Outreach

The goal is to ensure that the various industry stakeholders aren’t merely *aware* of the TSB and the Watchlist, but that they *support* it. This can be accomplished through meetings, correspondence, and presentations designed to find common ground on the Watchlist issues. We must actively participate in stakeholder consultation to persuade the regulator and industry to move as quickly as possible to address the safety issues. This can be accomplished by:

- Identifying shared stakeholder interests;
- Soliciting and engaging stakeholder champions on specific Watchlist issues;
- Holding discussions with, and making presentations to stakeholders across the country; and
- Implementing strategies to engage the stakeholders.

5. Do it all again in 2 years

Recognizing that it is a lot tougher to stop and then start again, we must make the Watchlist process an on-going activity based on a defined cycle. Therefore, another iteration of the Watchlist will be prepared in 2012—and then again every second year thereafter.

The timing of each subsequent Watchlist will coincide with an annual event highlighting transportation safety, or with the release of our Annual Report. This will help us focus public and stakeholder attention on new issues, and also ensure that progress is made on the old ones.

MEASURING SUCCESS

The Watchlist strategy for maximizing stakeholder commitment to transportation safety is ambitious. Substantial time and effort is required to evaluate safety issues, to assess safety action, and to engage/convince the stakeholders to take action.

Once the Watchlist has been implemented comes the question of measuring success. The answer can be fairly straightforward: look at the recommendations that have been issued, assess the industry and regulator response, and then count how many of the recommendations are now rated Fully Satisfactory.

Our success since the release of the Watchlist is clearly good news. As of August 2011, 12 of 41 Watchlist-related recommendations had received a rating of Fully Satisfactory. This is a significant increase from March 2010, when the Watchlist was first implemented. At that time, just 5 of 41 recommendations were deemed Fully Satisfactory. Our goal, however, remains 100 per cent, with sufficient safety action taken so that all 41 will eventually receive the same rating.

However, there is a catch. Following the change in approach to our recommendations, the TSB is now striving for more buy-in and more safety action taken during the investigation. Therefore, if we do our job well, we end up having to make fewer recommendations. Moreover, because the recommendations that are issued tend to focus on more systemic issues where positive change can prove to be difficult, achieving a Fully Satisfactory rating for these recommendations can become even harder.

BENEFITS

The Watchlist has resulted in some very clear benefits in the 18 months since its release. Not only have we increased the number of recommendations that have received a rating of Fully Satisfactory, but the shift to being pro-active (i.e., getting the message “out there” to change agents), rather than being reactive (i.e., waiting for another accident to reinforce the message) has led to:

- Improved perception and credibility for the TSB from the public, media, and industry;
- Increased awareness of specific issues by the regulator and by industry; and
- Improved commitment to transportation safety.

CONCLUSION / LOOKING AHEAD

Immediately following the Watchlist's release, the TSB witnessed a flurry of activity and safety action, with a rapid increase in the number of recommendations receiving a rating of Fully Satisfactory. Such a rapid pace of improvement is not expected to remain constant. In fact, it has already begun to slow. The “low-hanging fruit” has been picked, and what remains are the toughest, most systemic issues. Solving these will require a sustained, committed effort from everyone involved, and it's going to take time.

Looking ahead, the TSB expects the safety issues on future iterations of the Watchlist to change. As some safety issues are resolved, new ones will appear. With that in mind, we fully expect that the Watchlist will continue to evolve as positive safety action is made.

ANNEX A—WATCHLIST BROCHURE

Our Mission

The Transportation Safety Board of Canada (TSB) is an independent agency that makes transportation safer by investigating marine, pipeline, rail and air transportation accidents and communicating the results to Canadians.

This Watchlist identifies the safety issues investigated by the TSB that pose the greatest risk to Canadians.

In each case, actions taken to date are inadequate and concrete steps must be taken on the part of industry and the regulator to eliminate these risks.

More details about these transportation safety issues are available on the TSB website at www.bst-tsb.gc.ca.

For more information, contact the TSB Communications Branch by telephone at 819-994-8053 or by e-mail at communications@bst-tsb.gc.ca.



MARINE

PROBLEM

The number of accidents involving loss of life on fishing vessels remains too high.

SOLUTION

Industry needs to adopt and promote safe operating procedures and practices to increase safety knowledge of fishing vessel operators.

Government should work with industry to improve training and awareness and provide a stronger regulatory framework to support these initiatives.

PROBLEM

Emergency preparedness on large passenger ferries operating in Canada needs improvement.

SOLUTION

Large ferry operators must adopt and practice effective emergency preparedness procedures. This includes maintaining detailed passengers lists and practicing evacuations.

RAIL

PROBLEM

The risk of passenger trains colliding with vehicles remains too high in busy rail corridors.

SOLUTION

Transport Canada (TC) and the railways must conduct safety assessments to identify high-risk crossings along busy passenger train routes and make the necessary safety improvements.

PROBLEM

Inappropriate handling and marshalling can compromise the safe operation of longer, heavier trains.

SOLUTION

Railways need to take further steps to ensure the appropriate handling and marshalling of longer, heavier trains. Detailed risk assessments are required whenever operating practices change.

AVIATION

PROBLEM

There is ongoing risk that aircraft may collide with vehicles or other aircraft on the ground at Canadian airports.

SOLUTION

Improved procedures and the adoption of enhanced collision warning systems are required at Canada's airports.

PROBLEM

Fatalities continue to occur when planes collide with land and water while under crew control.

SOLUTION

Wider use of technology is needed to help pilots assess their proximity to terrain.

PROBLEM

Landing accidents and runway overruns continue to occur at Canadian airports.

SOLUTION

In bad weather, pilots need to receive timely information about runway surface conditions.

Airports need to lengthen the safety areas at the end of runways or install other engineered systems and structures to safely stop planes that overrun.





Transportation Safety Board
 of Canada

 Bureau de la sécurité des transports
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MULTI-MODAL

Problem

Implemented property, safety management systems (SMS) allow transportation companies to identify hazards, manage risks, and develop and follow effective safety processes.

However, TC does not always provide effective oversight of transportation companies transitioning to SMS, while some companies are not even required to have one.

Solution

Marine: TC should require domestic commercial shipping operations to adopt SMS.

Rail: Through audits and inspections, TC must proactively monitor SMS practices to ensure they are effectively applied by railways.

Air: The integration of SMS practices into day-to-day operations must be closely monitored by TC to ensure that industry, as a whole, makes a smooth transition to an SMS environment.

Problem

Data critical to understanding how and why transportation accidents happen are frequently lost, damaged or not required to be collected.

Solution

Marine: Operators of large domestic passenger ferries in Canada should be required by TC to install voyage data recorders consistent with international standards and practices.

Rail: Industry needs to expand adoption of recently improved recorder standards to prevent the loss of data following collisions and derailments.

Air: Global efforts are required to build better recorders, to enhance the quality and duration of their recordings, and to ensure they keep recording when the power supply fails.



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WATCHLIST



ANNEX B—PASSENGER TRAINS COLLIDING WITH VEHICLES

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Rail Fact Sheet

March 2010

Passenger Trains Colliding with Vehicles

The Problem

The risk of passenger trains colliding with vehicles remains too high in busy rail corridors.

Background

Every day, cars and trucks regularly cross Canada's 20 000 railway crossings.¹ What happens is usually straightforward, but 380 times in the last 15 years—on average, once every two weeks—something has gone wrong, and 106 Canadians have died when their vehicle was struck by a passenger train. Warning signs, at both public and private crossings, are the first line of defence, helping to reduce the risk by making drivers aware of approaching trains. Approximately one-third² of public crossings also feature flashing lights, a bell, and crossing gates. Yet despite these active warning devices, collisions between vehicles and passenger trains continue to occur.

In 1993, prior to authorizing an increase in train speed from 95 mph to 100 mph along the Québec-Windsor corridor, Transport Canada conducted safety assessments to identify crossings that required upgrading. These assessments are nearly 20 years old. They no longer reflect the present risks, nor do they consider emerging ones. Given that a third track is being considered along portions of the busy corridor between Montréal and Toronto, the need for action is even more pressing.

Solution

Following the investigation of a 2008 collision between a passenger train and an immobilized tractor-trailer, the TSB called for clearer warning signs at steep crossings, noting that the design and placement of these signs has been inconsistent.³ This recommendation was the sixth that the TSB has made since 1999 about the dangers of vehicles crossing railways in busy corridors.⁴

As Canada's population has grown, so has rail traffic in communities along busy rail corridors. Improving the design and placement of signage is just the beginning. New information from safety assessments is needed to reduce the risks of collisions at rail crossings.

- Transport Canada and the railways must conduct safety assessments to identify high-risk crossings along busy passenger train routes and make the necessary safety improvements.

Our Mission

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1 Source: Transport Canada (approximate number of grade crossings under federal jurisdiction)
2 Source: Transport Canada (active warning devices can be found at 5703 of public crossings)
3 TSB Investigation Report R08T0158
4 Five additional recommendations can be found in TSB Investigation Reports R99T0298 and R07D0111



ANNEX C—OPERATION OF LONGER, HEAVIER TRAINS

Transportation Safety Board
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du Canada

Rail Fact Sheet

Operation of Longer, Heavier Trains March 2010

The Problem

Inappropriate handling and marshalling can compromise the safe operation of longer, heavier trains.

Background

Freight trains cross the country every day. The length of each train, as well as the manner in which its cars are marshalled, or put together, affects the forces involved during train handling. Lighter cars, for example, slow down and speed up more quickly than heavier ones, generating disruptive push/pull forces that can derail the train.¹ This effect is more pronounced in longer trains, particularly when empty cars are located at the front. Since 2000, the TSB has investigated at least 12 derailments² where these in-train forces have been a causal or contributing factor, and the problem is growing. Not only are trains involved in main-track derailments heavier than ever, they are longer, too—over 25 per cent from just 15 years ago.³ Some of today's longer, heavier trains stretch over three kilometres in length and contain 150 cars or more. These trains are seeing expanded use across Canada, including into the country's busiest traffic corridors.⁴ The consequences of any derailment, therefore, can become magnified, and it is important that those who identify and monitor the risks be able to mitigate them.

Solution

Following the 2007 derailment of a freight train near Cobourg, Ontario, the TSB once again drew attention to train configuration and braking, expressing concern that effective measures have not been taken to reduce the continued risks of derailment.⁵

The TSB has issued four other safety communications since 2001⁶ all dealing with the safe operation of longer, heavier trains. Despite these efforts, some railways have not taken sufficient steps required to safely manage these in-train forces.

- Railways need to take further steps to ensure the appropriate handling and marshalling of longer, heavier trains. Detailed risk assessments are required whenever operating practices change.

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¹ TSB Investigation Report R01M0061 and TSB Occurrence Summary R01T0026
² TSB Investigation Reports R00Q0023, R01M0061, R01T0006, R02C0050, R02W0060, R05C0082, R7T0110 and R07D0009 and TSB Occurrence Summaries R01T0026, R05T0070, R05D0039 and R05T0051
³ Between 1995 and 1999, average mass of trains involved in main-track derailments was 5130 tonnes, average length was 4097 feet, and average number of cars per train was 66. Between 2005 and 2009, average mass increased to 7163 tonnes, average length increased to 5173 feet, and average number of cars per train was 79.
⁴ Rail Safety Advisory (RSA) 02/06
⁵ Rail Safety Information letter (RSI) 14/07, RSA 08/07, RSA 09/07, Safety Concerns (i) and (ii) R07T0110
⁶ Recommendation R04-01, Safety Concern R02C0050, RSI 08-02, RSA 02-06



ANNEX D—SAFETY MANAGEMENT SYSTEMS

Transportation Safety Board
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du Canada

Multi-Modal Fact Sheet

March 2010

Safety Management Systems

The Problem

Implemented properly, safety management systems (SMS) allow transportation companies to identify hazards, manage risks, and develop and follow effective safety processes. However, Transport Canada (TC) does not always provide effective oversight of transportation companies transitioning to SMS, while some companies are not even required to have one.

Background

Safety is a key component of any healthy industry, and an effective SMS enables operators to identify operational hazards, assess risks, and identify potential mitigation strategies.

In the marine community, the value of SMS has long been recognized. Since July 2002, all vessels over 500 gross tonnage that sail in international waters have had to meet the requirements of the International Safety Management Code and implement an SMS. However, this requirement does not apply to vessels that operate domestically, including the hundreds of passenger and commercial vessels over 500 tonnes.¹

Although SMS has been in place in the rail industry since 2001, recent investigations have shown that the railways are not always taking effective action to identify and mitigate risk through their safety management systems. The TSB has also found that regulatory audits are not always effective and may not consistently produce the expected benefits.

In the aviation industry, some companies still need to do more to develop their SMS in order to better identify hazards. However, as the TSB noted following two recent investigations,² without effective oversight, these hazards may not be properly addressed.

Solution

Marine

The TSB has repeatedly emphasized the advantages of safety management systems in the marine industry, citing numerous deficiencies in various occurrences over the last 12 years.³ Following a 2002 investigation

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¹ Source: Transport Canada
² TSB Investigation Reports A07A0134 and A08W0068
³ TSB Investigation Reports M99L0126, M98C0004, M03W0073, M03L0026, M02W0135 and M02W0061



Safety Management Systems (continued)

of four fatalities, the TSB recommended that TC ensure small passenger vessels have an SMS.⁴ In addition, following a 2006 investigation into the loss of a crew member aboard a sail-training vessel,⁵ the TSB advocated the adoption of effective SMS for both domestic and foreign sail-training vessels. To date, however, this has not yet taken place.

- TC should require domestic commercial shipping operations to adopt SMS.

Rail

In the rail industry, six separate Board investigations have examined the issue of SMS.⁶ The Board has also issued four safety communications⁷ dealing with this issue, as well as a formal recommendation calling for the identification and mitigation of risks to safety as required by a railway's safety management system.⁸ Significant deficiencies, however, remain across a wide range of operations.

- Through audits and inspections, TC must proactively monitor SMS practices to ensure they are effectively applied by railways.

Air

In the aviation industry, recent TSB investigations have shown that the transition from traditional safety programs to SMS needs monitoring to reduce the risk of undetected safety deficiencies.

- The integration of SMS practices into day-to-day operations must be closely monitored by TC to ensure that industry, as a whole, makes a smooth transition to an SMS environment.

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⁴ TSB Investigation Report M02C0030 (*Lady Duck*), Recommendation M04-01

⁵ TSB Investigation Report M06F0024 (*Picton Castle*)

⁶ TSB Investigation Reports R03V0083, R05V0141, R06V0136, R06V0183, R07V0213 and R08M0015

⁷ Rail Safety Advisories (RSA) 02/07, 12/07, 14/07 and 04/08

⁸ TSB Investigation Report R06V0136

ANNEX E—DATA RECORDERS

Transportation Safety Board
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Multi-Modal Fact Sheet

March 2010

Data Recorders

The Problem

Data critical to understanding how and why transportation accidents happen are frequently lost, damaged, or not required to be collected.

Background

Following any accident, investigators have a long list of questions, starting with “what happened,” and “why.” A prime source for information is the onboard recorders—the VDR¹ on a vessel, a locomotive’s LER,² or an aircraft’s FDR/CVR.³ These devices contain valuable information such as engine and equipment settings, navigation details, voice recordings, and computer data that can help pinpoint what happened. Recorders, however, can be lost or damaged in accidents, or not even required by law to be on board.

In the marine industry, although a small number of Canadian passenger vessels have been voluntarily fitted with voyage data recorders, none of the ferries operating domestically—which carry tens of millions of passengers annually—are legally required to carry them.

Lost locomotive data in the rail industry has impeded investigation efforts in six fatal railway accidents in the last 18 years.⁴ And although new crashworthy recorders are slowly being phased in as older locomotives reach the end of their service life, given the 20-30 year lifespan of locomotives, successful replacement of all recorders may be decades away.

Although the aviation industry has enjoyed the benefits of voice and data recordings for approximately 50 years, critical information has been lost by being overwritten or by a loss of power to the recorders.

Without a secure, retrievable information record, the search for hard evidence becomes more difficult. This can translate into longer investigations, which in turn can cause delays that place public safety at risk. With objective data, however, it is easier to pinpoint safety deficiencies which, when corrected, will make the system safer.

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¹ Voyage data recorder
² Locomotive event recorder
³ Flight data recorder/cockpit voice recorder
⁴ TSB Investigation Reports R92T0183, R96C0172, R97V0063, R99H0010, R03V0083 and R06V0136



Data Recorders (continued)

Solution

Marine

The TSB has previously emphasized the benefits of vessels carrying voyage data recorders⁵ and, following the fatal 2006 sinking of a passenger ferry in British Columbia, the TSB recommended that all large passenger vessels⁶ be required to carry VDRs (or a simplified version).⁷ To date, however, this has not happened.

- Operators of large domestic passenger ferries in Canada should be required by Transport Canada to install voyage data recorders consistent with international standards and practices.

Rail

The TSB has also emphasized the survivability of recorded data on trains, and made multiple calls for improved crashworthiness standards to better preserve data.⁸ Older recorders, however, may remain in service for decades.

- Industry needs to expand adoption of recently improved recorder standards to prevent the loss of data following collisions and derailments.

Air

In the air mode, the TSB has made recommendations⁹ that the duration of all cockpit voice recordings be extended to two hours (from the currently mandated 30 minutes). Although there has been some industry movement toward this, a final regulatory change in Canada has yet to be made.

- Global efforts are required to build better recorders, to enhance the quality and duration of their recordings, and to ensure they keep recording when the power supply fails.

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⁵ TSB Investigation Report M98C0082 (*Federal Bergen*)

⁶ Specifically, this refers to passenger vessels over 500 gross tonnage—but also includes all other commercial vessels on an equivalent basis to those trading internationally.

⁷ TSB Investigation Report M06W0032 (*Queen of the North*), Recommendation M08-03

⁸ TSB Investigation Reports R96C0172, R97V0063 and R99H0010, Recommendation R02-04

⁹ Recommendations A99-02 and A99-03 (TSB Investigation Report A98H0003)