Transportation Safety Board of Canada

2015-16 Annual Report to Parliament

Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

Canada

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ANNUAL REPORT TO PARLIAMENT 2015-16

Place du Centre
200 Promenade du Portage, 4th floor
Gatineau, Quebec K1A 1K8

20 July 2016

The Honourable Maryam Monsef, P.C., M.P.
President of the Queen's Privy Council for Canada and
Minister of Democratic Institutions
House of Commons
Ottawa, Ontario K1A 0A6

Dear Minister,

In accordance with subsection 13(3) of the Canadian Transportation Accident Investigation and Safety Board Act, the Board is pleased to submit, through you, its Annual Report to Parliament for the period 01 April 2015 to 31 March 2016.

Yours sincerely,

Original signed by

Kathleen Fox
Chair




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Message from the Chair

When the Transportation Safety Board of Canada (TSB) investigators deploy to the site of an accident, our first responsability is to find out what happened. But that's only the beginning—because it is just as important to understand why it happened. And that means taking a closer look, identifying not only the initial causes, but also the contributing factors and the many systemic organizational factors behind them.

Because there's never just one cause to an accident, our investigations must always dig deeper. It's an approach that has served us well for over 25 years, ensuring that our reports are based on hard facts, sound science, and the most rigorous analysis.

Over the years, we've also found that many accidents can have similar causes. That's why we regularly study our own database, searching for trends. And when we find them, once again we look closer—seeking to expose the causes and contributing factors behind those trends.

Why, for instance, were we seeing an alarming number of post-impact fires in small aircraft crashes a few years ago? Why did Canada's fishing industry average nearly one fatality a month for almost a decade—a disproportionate number of those in small vessels? The answers uncovered in our Safety Issues Investigations turned out to be complex and multi-faceted, just as they will be for our current study on Canada's air taxi sector, where accident and fatality figures are decreasing but are still much higher than other sectors of the commercial aviation industry.

As usual, this year's Annual Report to Parliament features a detailed rundown of our accomplishments in every mode: marine, pipeline, rail, and aviation. Some highlights include an ongoing study on the use of on-board voice and video recorders in locomotives, as well as the release of investigation reports into the fatal collision between an OC Transpo bus and a VIA Rail train in Ottawa, and the Perimeter Flight 993 accident in Sanikiluaq, Nunavut. In both of those cases, we issued important safety recommendations aimed at reducing the associated risks—recommendations we will follow up on for the benefit of all Canadians.

Our Annual Report also features a wealth of information about how we go about our work: from statistics on the number of accidents that are reported to us in each mode, to how many investigations we carry out, to how long they take. You'll find details about our Strategic Plan, our updated SECURITAS standard operating procedures and database, our web and media metrics, our Outreach program, and—even the award-winning employees who do their best to advance safety every single day.

That's a lot for one document to cover, just like it's a lot of work for a small organization. But at the TSB, we believe it's worth it, because transportation safety affects us all, and that means a closer look is always necessary.

Kathleen Fox

What we do

Mission

The Transportation Safety Board of Canada (TSB)'s mission is to conduct independent safety investigations and communicate risks in the transportation system.

Mandate

The *Canadian Transportation Accident Investigation and Safety Board Act* provides the legal framework that governs TSB activities. Our mandate is to advance transportation safety in the marine, pipeline, rail, and aviation modes of transportation by

- conducting independent investigations, including public inquiries when necessary, into selected transportation occurrences in order to make findings as to their causes and contributing factors;
- identifying safety deficiencies, as evidenced by transportation occurrences;
- making recommendations designed to eliminate or reduce any such safety deficiencies; and
- reporting publicly on our investigations and their findings.

As part of its ongoing investigations, the TSB also reviews developments in transportation safety and identifies safety risks that it believes government and the transportation industry should address to reduce injury and loss.

In making its findings as to the causes and contributing factors of a transportation occurrence, it is not the Board's role to assign fault or determine civil or criminal liability. However, the Board does not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings. No finding of the Board should be construed as assigning fault or determining civil or criminal liability. Findings of the Board are not binding on the parties to any legal, disciplinary, or other proceedings.

Independence

When an accident occurs, it's the TSB's role to find out what happened and why. Delivering these results for Canadians also means earning their trust and confidence in the work we do, which is why our organization must be objective, independent, and free from any conflict of interest. By reporting to Parliament through the Leader of the Government in the House of Commons, the TSB remains separate from all other government departments and agencies. Our independence helps ensure we can arrive at impartial conclusions and make recommendations to those best placed to take action.

Who we are

The TSB consists of about 220 employees located across the country. The Board, which is composed of up to five Members, including the Chair, approves all reports, makes findings as to causes and contributing factors, and issues recommendations to address safety deficiencies. The Senior management team, responsible for strategic planning and leadership as well as day-to-day operations, is headed by the Chief Operating Officer. Our headquarters is located in Gatineau, Quebec. We have a laboratory in Ottawa and regional offices in Vancouver, Edmonton, Calgary, Winnipeg, Toronto, Montréal, Quebec City, and Halifax.

TSB employees come with a wide range of background careers, and include pilots; engineers; cabin safety and operational control specialists; locomotive, track, and chief engineers; rail traffic controllers; human factors and education specialists; pipeline experts; computer technicians; naval architects; ocean navigators; marine engineers; accountants; and former members of the Canadian Forces, to name just a few. Whether they are expertly piecing together a sequence of events using flight recorder and radar data, analyzing broken rail and joint bars to determine the cause of track infrastructure failure, recreating vessel voyage tracks using electronic technologies, or establishing investigation cooperation arrangements with other state administrations, these men and women have spent over a quarter of a century making the TSB a world leader in transportation safety.

The Board

Joseph Hincke	Hélène Gosselin	Kathy Fox	Faye Ackermans	John Clarkson
Board member	Board member	Chair	Board member	Board member

Marc-André Poisson	Kirby Jang	Mark Clitsome	Jean L. Laporte	Leo Donati	Patrizia Huot	Jacqueline Roy	Chantal Lemyre
Director, Marine Investigations	Director, Rail/ Pipeline Investigations	Director, Air Investigations	Chief Operating Officer	Director, Operational Services	General Counsel	Director, Communications	Director General, Corporate Services

Our values

As federal public service employees, we are guided by enduring public service values—respect for democracy, respect for people, integrity, stewardship, and excellence. We at the TSB also place a particular emphasis on our own core values, which are of the utmost importance to our success in achieving our mandate.

Excellence

We maintain a highly skilled and knowledgeable team of professionals through leadership, innovation, and commitment to continuous improvement in the delivery of our products and services.

Openness

We actively promote the exchange of information to advance transportation safety.

Integrity

We are guided by honesty, impartiality, propriety, and accountability for our actions and decisions.

Respect

We are committed to treating all individuals and organizations with consideration, courtesy, discretion, and fairness.

Safety

We maintain and promote a positive and proactive safety culture.

Leading the change

In 2015-16, the TSB celebrated 25 years of passion for safety and a commitment to doing the right thing—a passion shared by the 200-plus TSB employees from coast to coast to coast. The department also developed a new Strategic Plan to define its priorities for the next five years, which revolves around four strategic objectives: serving, improving, modernizing, and updating. In essence, as we continue to investigate occurrences and advance transportation safety, we will make concerted efforts to adjust the organization and the way it conducts its business to ensure that we can continue to be relevant and effective in fulfilling our mandate in the future.

We completed a thorough review of the 2014 Public Service Employee Survey results, and held follow-up meetings with employees to develop a comprehensive action plan. We implemented action items related to improving our workplace during the year and will continue doing so into the new year. These included launching a comprehensive review of our key business processes for improved efficiency and a review of our Occurrence Classification Policy. We also made significant progress in such key areas as information management, increasing awareness of the TSB and its work, and maintaining a knowledgeable and professional workforce.

We initiated work with Transport Canada and key stakeholders to remove the barriers to the use of on-board recorders within the framework of company safety management systems. We also continued to highlight the eight issues identified on our 2014 Watchlist, and a new safety issues investigation continued to examine more closely the risks that persist in air taxi operations across Canada. In addition, we conducted a survey to obtain feedback from our stakeholders and used this information to help us better focus our products and efforts.

Moreover, as we do every year, we continued to carry out rigorous independent investigations, while simultaneously looking for ways to improve efficiency. We also shared more of our data with Canadians as part of the Open Government Initiative. Additionally, we continued to meet with regulators and industry stakeholders to ensure that our findings and recommendations were not just heard, but were acted upon.

Transportation Safety Board awards

TSB employees frequently go above and beyond the call of duty – and when they do, we ensure their efforts are recognized. In 2015, four individuals and two teams were recognized for making valuable contributions to the public service.

From left to right: Joel Morley, Brad Vardy, Kathy Fox and David Ross.

Outstanding achievement award

The Outstanding achievement award was given to Brad Vardy, Joel Morley, and David Ross for their work on the Independent Peer Review of the Australian Transport Safety Bureau (ATSB)'s Investigation Methodologies and Processes. In 2013, the ATSB asked the TSB for a review after its report on an aircraft accident received public and political criticism. The TSB team made 14 recommendations; all were accepted. Also, the TSB's senior management team reviewed the ATSB best practices, and retained many items to improve the TSB's own investigation process.

Excellence in leadership award

Susan Greene and Line Laflèche both received the Excellence in leadership award: Susan for her work on developing and implementing investigators' training modules, and Line for her leadership on numerous information management (IM) and information technology (IT) projects.

Over the past year, Susan has led the development and implementation of the new skills training. From the outset, she engaged investigators and managers to clearly define the business needs of each group. Susan also led working groups through the various steps of development, validation, piloting, and delivery of the new training across the country.

Facing a challenging year as she assumed responsibility for IM at a time when both the IM and the IT senior positions were vacant, Line worked to quickly learn the priorities and new responsibilities. Under her leadership, good progress was made on the development of guidance on record keeping and changes to improve electronic records. Line ensured the implementation of a rigorous IT project management methodology and the successful completion of various IT projects.

Impact award

The Impact award was given to François Dumont for his tireless efforts during major investigations such as the grounding of the tanker *Halit Bey* and the collapse of a cargo crane on the bulk carrier *Seapace*. For example, François proposed a novel approach to communicate the safety issues relating to the cargo crane. Based on the safety information letter he wrote in collaboration with the Engineering Lab, the TSB used social media to alert international stakeholders of the safety issues. In turn, the stakeholders took safety action that led to safety improvements on potentially over 400 ships that used the same type of cargo crane. François' oral and written communications are of the highest quality in both official languages, showing a constant effort to ensure that the TSB's safety messages are easily understood and are taken seriously.

Client service award

Michel Mongrain—who took on the new role of compensation liaison and support between the TSB and Public Works and Government Services Canada (PWGSC) Shared Human Rresources Services during the changeover period—received the Client service award. During the transition, several long-standing issues came to the surface; Michel conducted in-depth research to resolve the issues as quickly as possible. No matter how much work Michel has on his plate, his sense of humour shines through in his dealings with clients and colleagues.

Excellence in investigation award

The Excellence in investigation award was presented to the team that worked on the Perimeter Aviation Metroliner accident in Sanikiluaq, Nunavut. Under the leadership of Gayle Conners, the investigation team was composed of Allen Barrett, Eckhard Dittbrenner, John Hannah, Kyle Jackson, Louis Landriault, Missy Rudin-Brown, Pierre Gavillet, Peter Kramar, Robert Potvin, Ted Parisee, and Tony Gasbarro. The team conducted a detailed and thorough analysis that identified important safety issues which led to two Board recommendations. They collected, organized, and analyzed more than 1,100 documents during the investigation.

The transportation safety landscape

While Canada is generally considered to have a safe transportation system, accidents continue to occur and unmitigated risks in the transportation system persist. In 2015, 1,696 accidents and 1,811 incidents were reported in accordance with the TSB's regulations for mandatory reporting of occurrences.[1] The number of accidents in 2015 decreased by 5% from the 1,793 accidents reported in 2014, but was unchanged from the 2010–2014 annual average of 1,695 accidents. The number of reported incidents decreased to 1,811 in 2015 from 1,838 in 2014, and increased from the 2010–2014 average of 1,516. In 2015, the TSB also received 470 voluntary reports.[2] Fatalities totalled 112 in 2015, up 24% from the 2014 total of 90, but down 28% from the 2010–2014 average of 156.

Reported occurrences

All reported occurrences were assessed under the Board's Occurrence Classification Policy to identify those with the greatest potential for advancing transportation safety. It is in these cases that a formal investigation is launched. However, whether we investigate or not, all information is entered into the TSB's database to keep records, analyze trends, and validate safety issues.

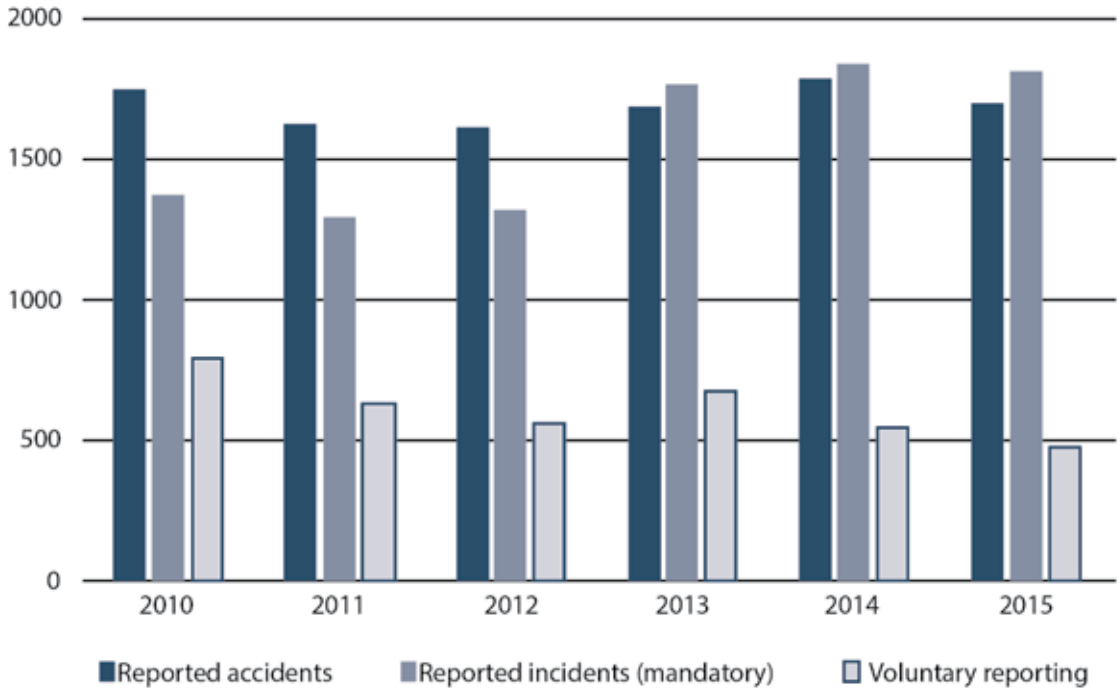
In fiscal year 2015-16, investigations were undertaken for 46 of the occurrences reported to the TSB and two safety studies were initiated. In that period, 48 investigations were completed, compared with 51 in the previous year.[3] The number of investigations in progress at the end of the fiscal year, did not differ from 70 at the start. The average time to complete an investigation was 502 days in fiscal year 2015-16, compared to the previous five-year average of 505 days.

1 While the TSB's operations are for the 2015-16 fiscal year, occurrence statistics are for the 2015 calendar year, unless otherwise indicated. Please note that, in a live database, the occurrence data are constantly being updated. As a result, the statistics can change slightly over time. Comparisons are generally for the last 5 or 10 years. For definitions of terms such as *accident*, *incident*, and *occurrence*, see Appendix B.

2 "Voluntary reports" refers to all occurrences reported to the TSB that are not required to be reported under the *Transportation Safety Board Regulations*.

3 Investigations are considered complete after the final report has been issued. See Appendix A for a list of reports released by the TSB in 2015-16 by sector.

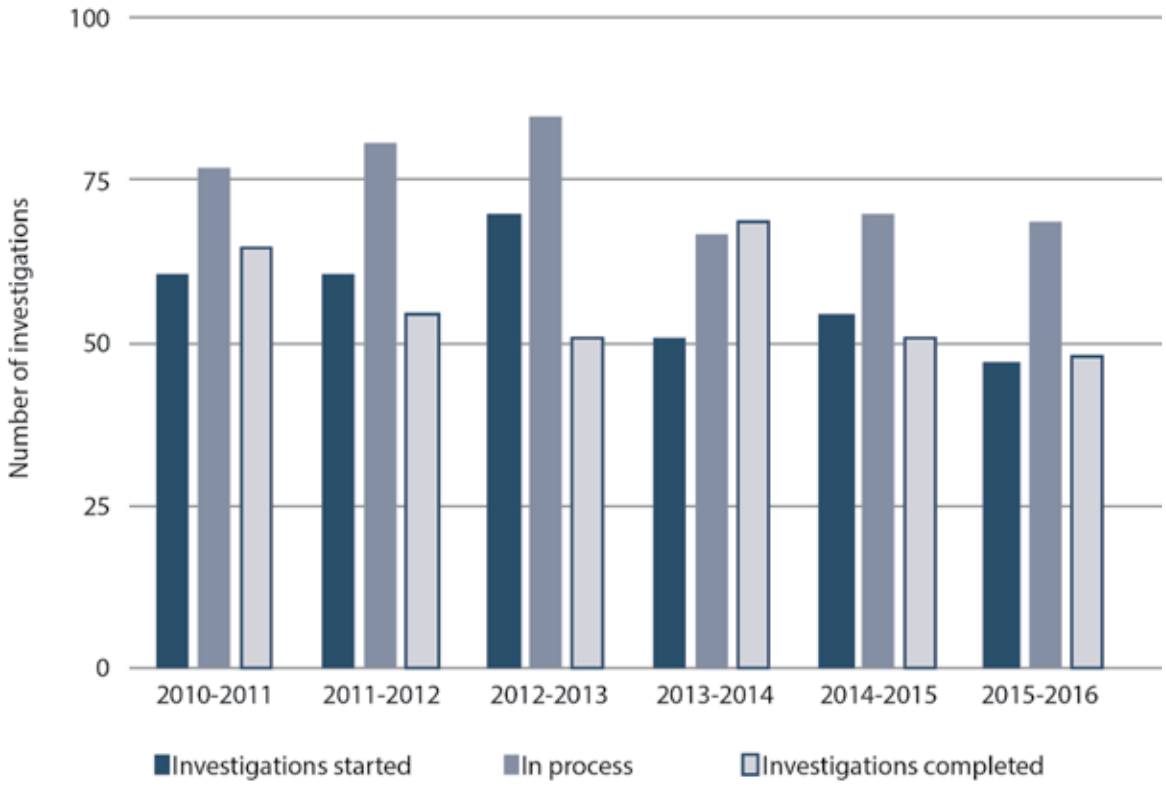
Figure 1: Reported occurrences



Investigations

The TSB has been successful in identifying safety issues and contributing to a reduction in the risks in the transportation system. Each Class 2 and Class 3 investigation led to a comprehensive report identifying causes and contributing factors, indicating the safety action taken, when applicable, and, when necessary, making recommendations aimed at reducing risks. Through the Occurrence Classification Policy and investigation methodology, our systematic approach ensured that TSB resources were invested to ensure the greatest safety payoff.

Figure 2: Investigations



Safety communications

In 2015-16, in addition to investigation reports, the TSB issued a total of 65 safety communications,[4] including seven recommendations, 22 safety advisories, 33 safety information letters, and three safety concerns.

Table 1: Safety communications

Sector	Recommendations	Safety advisories	Safety information letters	Safety concerns
Marine	0	1	11	1
Pipeline	0	0	1	0
Rail	5	20	20	2
Aviation	2	1	1	0
TOTAL	7	22	33	3

Information is one key TSB deliverable. Our investigations uncover the causes and contributing factors that led to an accident. As the TSB identifies safety issues, it doesn't wait until the end of an investigation to alert industry and government. Safety information is provided to stakeholders throughout the investigation, allowing them to take immediate action—a common practice for industry and government. For example, based on the TSB's initial observations relating to excessive truck hunting during its investigation into a main-track derailment near Gananoque, Ontario, a Rail Safety Advisory letter was issued. "Truck hunting" is a term used to describe the side-to-side movement of wheel sets within a freight car truck. Under certain conditions, the truck hunting can become excessive which can cause wheel lift or wheel climb, either of which can cause a derailment. Both Canadian National (CN) and Canadian Pacific (CP) responded by reintroducing 45-mile-per-hour speed restrictions for all empty centrebeam bulkhead flat cars. In these situations, the TSB reports such corrective actions taken by industry or government. When an investigation identifies a serious or systemic safety issue that is not being adequately addressed, the Board will issue a recommendation, which warrants the highest levels of regulatory attention.

Under the *Canadian Transportation Accident Investigation and Safety Board Act*, a federal minister who is notified of a TSB recommendation must, within 90 days, advise the Board in writing of any action taken or proposed to be taken, or of the reasons for not taking action. The Board considers each response, assessing the extent to which the safety deficiency was addressed, and provides its rating of the response and its reasoning soon after. The TSB continues to publish its yearly reassessments of industry and government responses to its recommendations.

4 See Appendix B for the definition of each of the TSB's safety communications.

Board assessments of responses to recommendations

Since 1990, the Board has reviewed the responses to a total of 566 recommendations. Many of these recommendations have led to positive change. As of 31 March 2016, Board recommendations that achieved **Fully Satisfactory** status increased to 78% from 76% the year before, indicating that change agents have taken action that will substantially reduce the safety deficiency. Another 4% were assessed as **Satisfactory Intent**, indicating that change agents have taken action or plan to take action that, when fully implemented, will substantially reduce the safety deficiency.

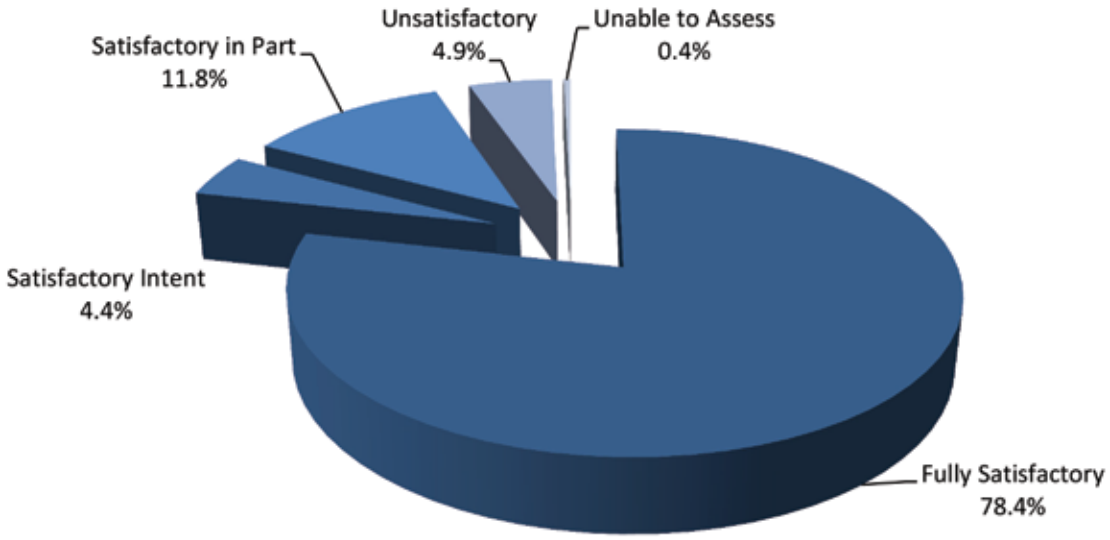
In 12% of cases, a rating of **Satisfactory in Part** was issued, which means change agents have taken or plan to take action that will only partially address the deficiency. The remaining 5% of responses received a rating of **Unsatisfactory**, as change agents have not, and do not plan to, take action that will address the deficiency. The Board has been unable to assess the response to two recommendations due to a lack of new information from Transport Canada (TC).

Our goal is a safer transportation system for everyone. To help get there, we want 80% of our recommendations assessed as **Fully Satisfactory** by March 2017. So far, there has been progress in every mode, but not nearly enough in aviation, where too many safety issues remain outstanding.

Table 2: Board assessments of responses to recommendations, 1990–2016

	Marine	Pipeline	Rail	Air	Recommendations	%
Number of recommendations	147	20	144	255	566	100.0
Fully Satisfactory	128	20	126	170	444	78.4
Satisfactory Intent	5	0	8	12	25	4.4
Satisfactory in Part	10	0	10	47	67	11.8
Unsatisfactory	4	0	0	24	28	4.9
Unable to Assess	0	0	0	2	2	0.4
Not Yet Assessed	0	0	0	0	0	0

Figure 3: Ratings of assessed responses, 1990–2016



Communicating transportation safety

Communicating by the numbers

Mentions in the media

Among over **6,000** broadcast news clips and articles on transportation safety last year, **2,248** directly mentioned the TSB.

Media enquiries

Our media hotline received **1,417** enquiries this year, up slightly from the previous year.

Social media

More popular all the time: an ever-increasing number of views on YouTube and Flickr.

YouTube:

we reached over **.5M** lifetime views this year—more than double last year's lifetime total.

Flickr:

lifetime photo views reached almost **5.5M**— doubling from the previous year's lifetime views.

Total Twitter followers increased to **15K** this year, a 30% increase from 12K last year.

Web metrics

The go-to source for information about all our work—and we've got the numbers to prove it! For 2015–16:

Total page views:	Total users:	Total sessions:
561,132 almost 30% more than last year	138,825 a 46% jump from 95,258 last year	204,427 an over 40% increase from last year

Communications products

Telling the public what they want to know: Where we're going. How long we'll be. What we found. What it means. Why. How long it took...

62	83	10
news releases	deployment notices	media advisories

Statistics

The TSB Macro-Analysis team responded to **267 requests** for transportation occurrence database information. This is a 37% decrease from last year, suggesting that the public and the media are finding what they need from the annual and monthly statistical reports, and data flat files, on our website.

Outreach

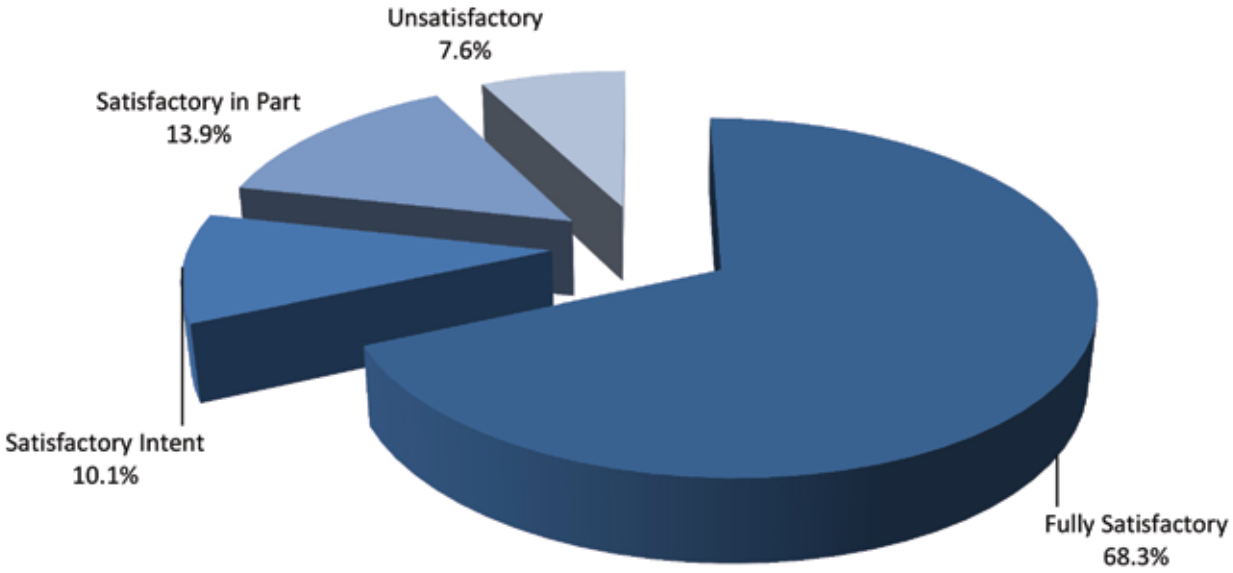
There were **135 events** this year, an 18% decrease from 2014–15 (but still 34% more than 2013–14). This year, the TSB implemented a more targeted approach, prioritizing outreach to stakeholders who are in a position to help resolve persistent safety deficiencies, outstanding recommendations, and Watchlist issues.

Watchlist 2014

In 2014, the TSB released its latest Watchlist, which comprises the eight issues posing the greatest risk to Canada's transportation system. These issues, which concern the marine, rail, and aviation transportation industries and affect Canadians from coast to coast to coast, are supported by hundreds of accident investigations, thousands of hours of research, and dozens of TSB recommendations.

Originally conceived and first published in 2010, the TSB Watchlist was a means of focusing attention on issues critical to safety in Canada's transportation system. It was hoped that such attention would encourage change agents to take a closer look at the issues and move towards improving safety. While some action has indeed been taken and some issues have fallen from the lists (train handling and marshalling—Watchlist 2010; aircraft collisions with land and water—Watchlist 2012), many issues persist. This past year saw little progress on a few persistent issues in each mode—issues that risk becoming fixtures on the Watchlist. The TSB is convinced that no issue is insurmountable and that solutions can be found. The Watchlist is as relevant now as it ever was, and it will continue to shine a light on unsafe conditions in Canada's transportation system.

Figure 4: Ratings of assessed responses to Watchlist recommendations, 1990–2016



The following is a summary of some of the issues that persist on the Watchlist, and indicates where more needs to be done.

Marine

Loss of life on fishing vessels

The fishing community does not yet have a strong safety culture although there are encouraging initiatives across Canada with the continued promotion of local governance. As regional fishing communities develop their own governance capacity, a fishing safety culture is emerging through the identification, adoption, and promotion of safe operating procedures and best practices within each community and fishery. Nonetheless, over the last several years, the TSB has reported that the lack of personal flotation device usage, lack of emergency preparedness, and lack of risk assessments have all contributed to recent fishing fatalities.

The number of fishing fatalities remains relatively unchanged from year to year. Eight of the Marine Branch's 22 active Watchlist recommendations are directly targeted at fishing vessel safety. However, growing awareness has translated into regulatory action to reduce some of the risks associated with the lack of thermal protection as demonstrated in the proposed amendments to the *Small Fishing Vessel Inspection Regulations* that were published in the *Canada Gazette,* Part I on 6 February 2016. However, new regulations alone are not enough. Federal and provincial authorities, along with leaders in the fishing community, need to coordinate action to improve the safety culture in fishing operations, recognizing the interaction of safety deficiencies.

Rail

Railway crossing safety

There has been a continued improvement in crossing safety this year, stemming from the implementation of the new *Grade Crossings Regulations* (GCR), which came into effect on 27 November 2014. When all grade crossings meet the safety requirements of the GCR, the Board foresees a substantial reduction in risk. However, there must also be ongoing consultation with provincial authorities and further public driver education on the dangers at railway crossings.

Transportation of flammable liquids by rail

Despite the recent slowing trend in the transportation of flammable liquids, such as crude oil, by rail across North America, the associated risks must be effectively mitigated. These include better route planning and analysis, ongoing risk assessments, and the long-standing issue of the vulnerability of Class 111 tank cars—a flaw that the TSB pointed out years before the devastating tragedy in Lac-Mégantic, Quebec.

Following railway signal indications

When signal indications displayed in the field are not responded to appropriately, a train collision or derailment can occur. The Centralized Traffic Control (CTC) system does not provide any indication that a train is operating beyond a restricted location, nor does it

provide automatic enforcement to slow or stop a train before it passes a stop signal or other point of restriction. Although research has been initiated to study this deficiency, there are no short-term plans to address the risks. Additional physical safety defences must be implemented to ensure that railway signal indications governing operating speed or operating limits are consistently recognized and followed.

On-board video and voice recorders

With no requirement for on-board video and voice recorders on locomotives, key information to advance railway safety may not always be available to accident investigators. Objective data is invaluable to help understand the sequence of events leading up to an accident and to identify potential operational issues and human factors. On-board recordings can help confirm the nature of crew communications and the dynamics of crew actions and interactions. Several recent TSB investigations would have benefited from a recording of crew communications and interactions immediately prior to the accident. Some railways have started to equip their locomotive fleets with on-board recorders, but there are no definitive commitments to install these recorders on a widespread basis. The railway industry must ensure that communications and interactions in locomotive cabs are recorded.

Aviation

Approach-and-landing accidents

Approach-and-landing accidents continue to occur at Canadian airports. That's why we're calling on TC and aviation operators to take action to reduce unstable approaches. The TSB has also urged the regulator to move ahead with regulatory changes to guide airports to develop tailored solutions to lengthen runway end safety areas (RESAs) or implement other engineered systems to stop planes that overrun. Action on these issues continues to be delayed.

Risk of collisions on runways

The risk of aircraft colliding with other aircraft or vehicles on the ground, called runway incursion, is still present. Although their frequency is relatively rare in relation to the number of take-offs and landings taking place every year, the consequence of a runway incursion could be catastrophic. Companies and authorities involved in runway incursion occurrences have reacted positively to TSB findings to that effect by communicating or modifying procedures; however, the number of these occurrences remains at approximately one per day. TC could take a more proactive role to encourage industry to improve procedures and adopt enhanced collision-warning systems.

Multi-modal

Safety management and oversight

Some transportation companies are not effectively managing their safety risks, and TC oversight and intervention have not always proven effective at changing companies' unsafe operating practices. In the **aviation mode**, TC's requirement for safety management systems (SMS) applies only to large carriers. This means that although air taxis, commuter airlines, helicopter operators, and flight training schools are responsible for over 90% of all commercial aviation accidents and fatalities, they are still not mandated to operate under a system that could manage their risks effectively. In the **marine mode**, the TSB continues to push for the introduction of formal safety management processes on smaller commercial vessels; TC must oversee those processes. In the **rail mode**, TC has initiated a plan to help railways become aware of and progressively implement the requirements of the new SMS regulations that came into effect on 01 April 2015.

Moving forward, the implementation of three elements is key in all modes: a clear regulatory framework requiring companies to implement some form of safety management process; SMS that are effective in identifying hazards and mitigating risks; and balanced regulatory oversight and audits by TC.

Outreach program

In 2015-16, the TSB conducted 135 outreach events across the country. These included speeches, meetings, articles in newspapers and magazines, tours, and presentations to a variety of stakeholders—such as government regulators, foreign investigative bodies, operators, industry associations, first responders, and training institutions.

In addition, within each branch, specific outreach action plans targeted key stakeholders and "priority" items and issues. In the Marine mode, for instance, emphasis was placed on fishing vessel safety. As such, TSB representatives met with provincial labour ministries and with occupational health and safety (OHS) organizations, pushing for change to OHS regulations on fishing and for more education for the fishing community about outstanding TSB recommendations.

Another Marine Branch initiative saw the TSB and the Canadian Marine Pilots Association team up to launch a poster campaign aimed at increasing teamwork aboard ships navigating in pilotage waters around the world. The posters have been endorsed by both the Marine Accident Investigators' International Forum and the International Marine Pilots Association.

In the Rail Branch, the priorities were the ongoing implementation of safety management systems, the transportation of flammable liquids, and the promotion of a strong safety culture. To push these issues, we met with the Railway Association of Canada and its members, the International Railway Safety Council, and various short-line railways across the country.

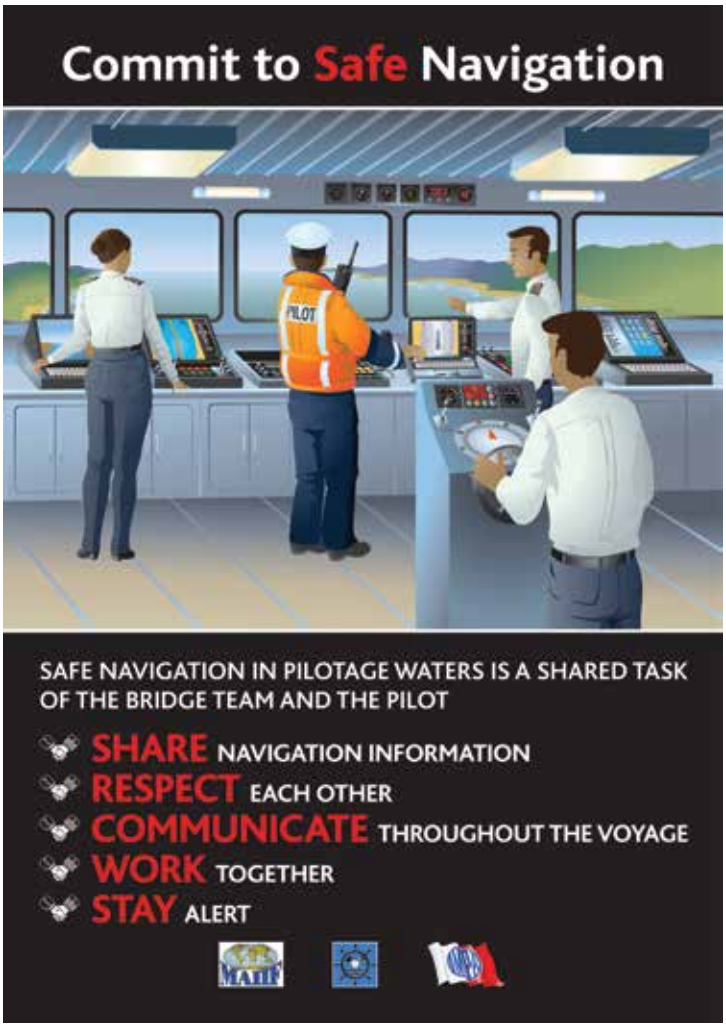
In the Air Branch, the priorities were our Watchlist issues: approach-and-landing accidents and the risk of collisions on runways. We spoke to Calgary, Regina and Montréal airport authorities to discuss methods by which the risks associated with these issues could be mitigated. We also discussed with airline pilots' associations the topic of video and voice recorders for safety management purposes.

In June 2015, we showcased the TSB's mandate as well as some of its technological capabilities by taking part in Doors Open Ottawa, a public event that saw several hundred people visit our Engineering Laboratory near the Ottawa airport.

Perhaps the year's most significant outreach, though, was the multi-modal stakeholder consultation that was carried out over several weeks in spring/summer 2015. This project, which built upon previous research completed in 2011, sought to update information about key stakeholders' opinions and attitudes toward the TSB, its goals, priorities, strategies, products, and services.

The results showed that most stakeholders share a very positive view of the TSB's competence, professionalism, and efforts to advance transportation safety in Canada. Many of those contacted also praised the high quality of our investigations and recommendations, along with our ability to keep up to date with changes in the industry and new technologies. However, some stakeholders also noted that, while they appreciate the complexity and thoroughness of our investigations, they would like our reports to be released more quickly. Responses also suggested that stakeholders were not always familiar with the range of communications products beyond our investigation reports and recommendations.

Going forward, the TSB plans to build on the results of this survey, strengthening our relationship with key stakeholders, while at the same time advocating for specific safety issues. That's because, in a country with such a vast and complicated transportation network, change will always be a constant—and that means there will always be more people to reach and new issues to raise.



SECURITAS

Confidential reporting

The Canadian public and transportation industry employees can report unsafe transportation acts and conditions through SECURITAS, the TSB's confidential reporting system. While employees are urged to use existing internal company-specific safety reporting systems, not all transportation companies have systems in place, and even when companies do, some employees may not feel comfortable using them. SECURITAS offers an additional way for people to share safety concerns in the marine, pipeline, railway, and aviation industries without fear of reprisal.

How the TSB handles reports

When the TSB receives a confidential report, a designated modal trusted agent will analyze the information, communicate with the reporter, and determine the appropriate action to be taken. The TSB may forward information to the appropriate regulatory authority for follow-up. The TSB may also contact specific transportation organizations, companies, or agencies directly if they are the ones that are best placed to address the problem. The TSB may also choose to launch its own investigation or issue a formal safety communication. However, the TSB will not take any action that might reveal the reporter's identity. The identity of the person making a report to SECURITAS always remains confidential.

In 2015-16, the TSB reviewed and updated its standard operating procedures for the SECURITAS program to ensure greater alignment across the modes of transportation. The TSB implemented a new database to track and follow up on all confidential reports. Also, the TSB continued to promote SECURITAS to various stakeholders' groups.

Activities

A total of 172 SECURITAS reports were received in 2015-16. All were carefully assessed: 17 pertained to topics outside the scope of the TSB SECURITAS mandate. In those cases, the reporters were contacted and informed and, where appropriate, suggestions were made for them to contact the appropriate organizations.

For 155 of the issues reported, the information provided by the reporter was communicated either to TC, to the operator mentioned in the report, or to the appropriate organization for follow-up. In 11 of the reported issues, SECURITAS trusted agents conducted their own detailed assessment and resolved the issue. When the information pertained to an ongoing TSB investigation, it was communicated to the appropriate investigator-in-charge.

Table 3: SECURITAS confidential reports

Sector	Marine	Pipeline	Rail	Aviation	Total
Number of reports received in 2015-16	**19**	**0**	**106**	**47**	**172**
Outside TSB mandate	0	0	14	3	17
Cases closed	17	0	77	41	135
Cases remaining open as of 31 March 2016	2	0	15	3	20

Results

Marine sector

In 2015-16, 19 marine-related reports were received through the SECURITAS program. Six of the reports dealt with regulatory matters and were resolved in collaboration with regional TC offices. Five of the reports contained confidential information related to reportable occurrences or were part of an ongoing investigation. None of the reports resulted in safety communications. Seventeen of the 19 safety issues validated were closed at the end of the year. Some of the cases related to regulatory matters, one to a close-quarters situation between two vessels, and the following examples.

Safe manning level of a new vessel (cable ferry)

A report concerning the safe manning level of a new vessel (cable ferry) was made to SECURITAS. This report was referred to TC, which was already aware of the issue. A minimum safe manning for the vessel was established by TC, depending on the number of passengers carried, and the company was required to have the crew demonstrate their ability to respond to an emergency (fire and boat drill) with passengers on board.

Tug operating without an inspection certificate or experienced crew

A report was made concerning a tug that was being operated without an inspection certificate or experienced crew. The reporter was advised by the TSB that the tug was less than 15 gross tons and, as such, was not subject to inspection or certification by TC.

Pipeline sector

There were no pipeline issues raised through the SECURITAS program in 2015-16.

Rail sector

In 2015-16, the SECURITAS program received 106 rail-related reports. A total of 21 safety communication products were issued as a direct result of these reports. The TSB trusted agent communicated directly with TC for 45 of those reports and directly with the operator on five others. Another eight reports were resolved directly with the reporter. Some of the common issues reported included safety at railway yards, fatigue in the workplace, railway crossings, track conditions, and passenger facilities. Following are some examples of the cases that were resolved.

Fatigue in the industry

SECURITAS received various reports indicating that fatigue was becoming an increasing problem in terms of maintaining fitness for duty. Many reports indicated that the railway companies were unable to accurately predict when employees would be required to work. After verifying the particulars with the reporters, the TSB issued a rail safety information letter to TC. The TSB was informed that starting in 2016–2017, TC will begin conducting audits to verify industry compliance with the *Railway Safety Management System Regulations, 2015* which include a requirement for railways to address fatigue.

Total time on duty

SECURITAS also received various reports indicating that time spent deadheading (authorized transportation of operating employees from one location to another for the purpose of crewing a train) was not being included in the total hours of service. After verifying the details with the reporters, the TSB issued a rail safety information letter to TC. TC responded by issuing a "notice and order" requiring total time on duty to include time spent deadheading.

Remote operation and supervision of railway bridge

SECURITAS received a report questioning the remote operation of a railway bridge in terms of workload and the effect on marine traffic passing under the bridge. After verifying the details with the reporters, the TSB issued a rail safety information letter to TC. The TSB was informed that remote bridge operations fall under the purview of TC's Navigation Protection Program, and that in planning this change, CN hired a third-party risk evaluation expert to conduct a comprehensive risk assessment, which was presented to key stakeholders in July 2014. Furthermore, TC's Pacific Regional Office performed inspections at both the Fraser Bridge and the Lulu Island Bridge and reviewed CN's risk assessment. Mitigation measures outlined in the risk assessment addressed all concerns relative to rail safety initially noted during TC's inspections.

Aviation sector

In 2015-16, 47 aviation-related reports were received through the SECURITAS program. Thirty-seven of the 47 submissions received referred to topics for which a current Canadian Aviation Regulation (CAR) is in place and for which regulatory requirements exist. There were no reports that resulted in safety communications. In total, 44 cases were closed during 2015-16. The reports covered a variety of issues, including laser pointers, turbulence, flight deck procedures, de-icing, unsafe landing procedures, low-flying helicopters, and cabin safety issues. Examples of cases the TSB trusted agent resolved follow.

Regulatory violation

Following an accident, a reporter had specific details about a suspected CARs violation by an operator. Since a TSB Class 3 investigation was already underway for this accident, the information was transmitted to the investigator-in-charge (IIC), who contacted the reporter to get more in-depth details. The information was also relayed to TC, which launched a Process Validation Inspection on the operator.

Lack of de-icing

A reporter informed SECURITAS about a dangerous situation where they witnessed a CARs 703 operator taking off from a small airport with a thick layer of snow on the fuselage and the tail. The information was relayed to TC in confidence. TC Enforcement advised that they would perform tighter oversight on the operator in the future.

Safety hazard at airport

A reporter informed SECURITAS that, following the demolition of a building at an airport, adjacent to an airport ramp where aircraft circulate, debris and asbestos material were left free and unattended for a long period of time. This had created a hazard to operators of the airport and aircraft. SECURITAS notified TC, which contacted the airport operator. The operator stated that the debris had been removed.

Marine sector

Making safety a priority from coast to coast

Marine sector

Annual statistics

In 2015, 245 marine accidents were reported to the TSB, down from the 2014 total of 301, and down from the 2010–2014 average of 300. Over the past 10 years, 83% of marine accidents were shipping accidents, while the remainder were accidents aboard ship.

There were 210 shipping accidents in 2015, down 16% from the 2014 total of 249, and down 15% from the 2010–2014 average of 246.

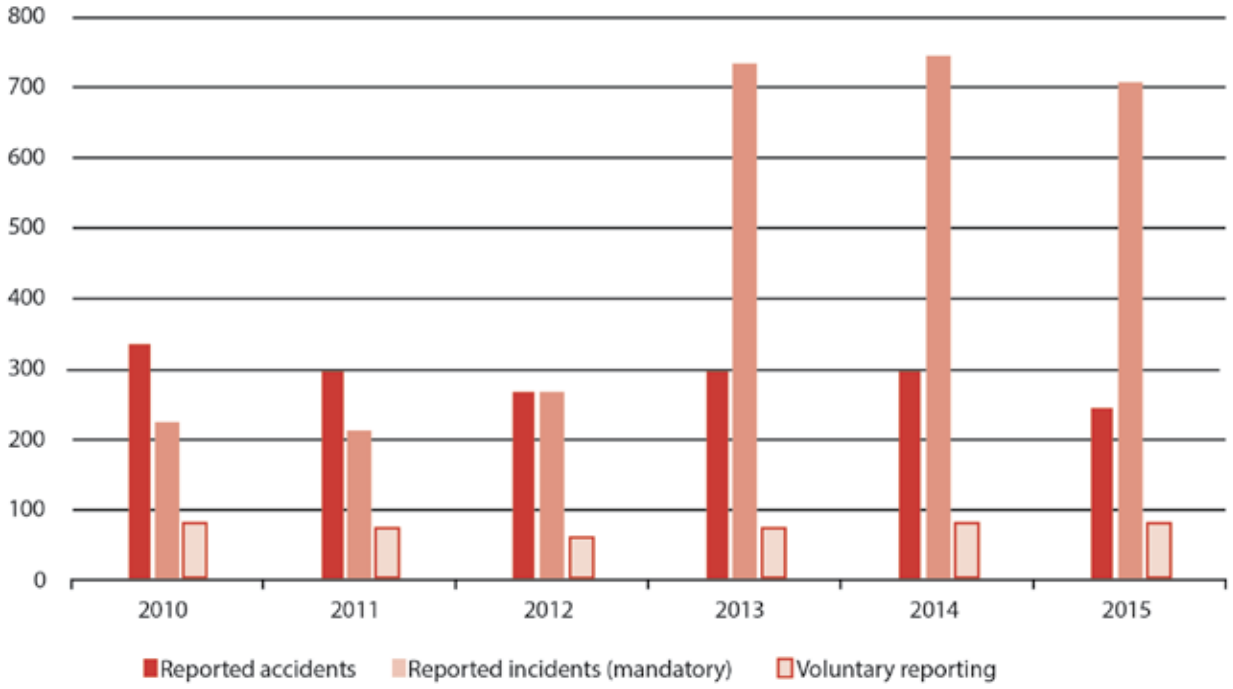
In 2015, there were 35 accidents aboard ship, down from 52 in 2014 and down from the 2010–2014 average of 54. The largest numbers of accidents aboard ship occurred on fishing vessels (60%) and ferry/passenger vessels (23%).

Marine fatalities totalled 19 in 2015, up from a total of 12 in 2014, and up from the annual average of 16 in 2010–2014. A whale-watching vessel accident accounted for 6 of the 13 shipping accident fatalities in 2015, and fishing vessels accounted for another 6 of the 13 shipping accident fatalities. In addition, accidents aboard fishing vessels led to 5 of the 6 accident-aboard-ship fatalities. In total, there were 11 fishing vessel fatalities in 2015, unchanged from the annual average of 11 in 2010–2014.

In 2015, there were 707 marine incidents reported in accordance with the TSB mandatory reporting requirements, down from 747 in 2014, but up from the annual average of 438 in 2010–2014.

The increase in the number of incidents since 2013 is related to clarification of the threshold used to classify engine/rudder/propeller incidents in order to obtain a better understanding of related safety issues, and to new TSB regulations, effective 01 July 2014, which clarified the reporting requirements for a total failure of any machinery or technical system (and incorporated engine/rudder/propeller incidents into that category).

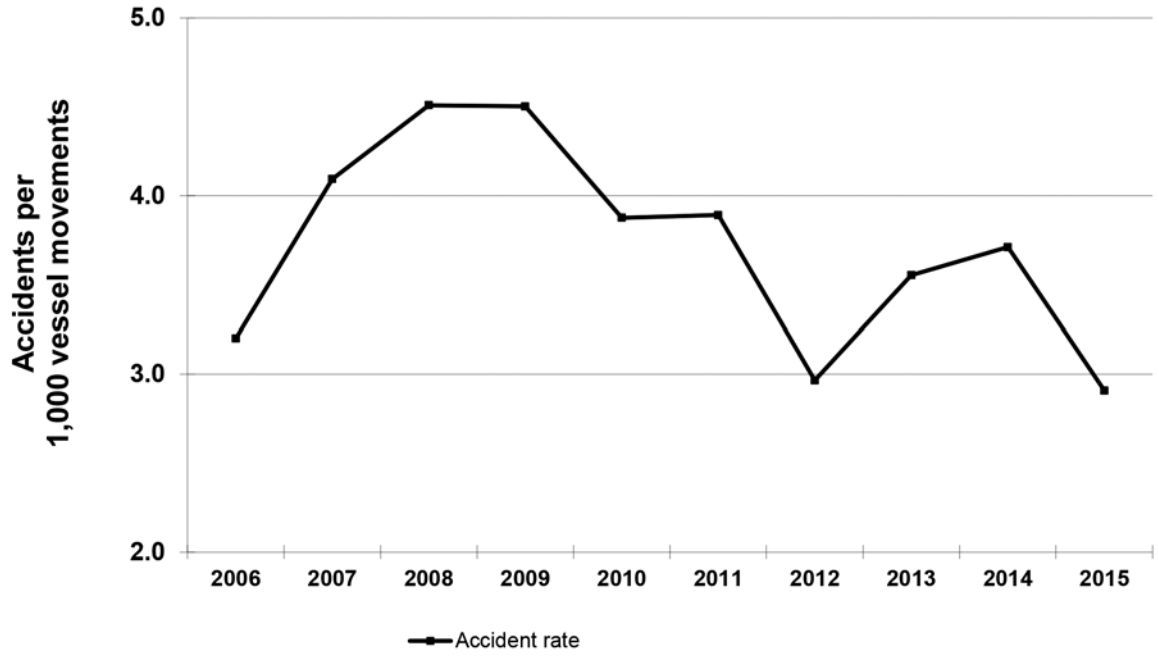
Figure 5: Marine occurrences



Accident rate

One indicator of marine transportation safety in Canada is shipping accident rates for Canadian-flag commercial vessels (Figure 6). According to information provided by TC, marine activity for Canadian commercial non-fishing vessels over 15 gross tons (GT) (excluding passenger vessels and cruise ships) increased by 2% from the 2010–2014 average. The 2015 accident rate was 2.9 accidents per 1,000 movements, down from the five-year average of 3.6. Marine activity for foreign commercial non-fishing vessels was unchanged from the 2010–2014 average, and the accident rate decreased to 1.1 accidents per 1,000 movements from the five-year average of 1.6.

Figure 6: Canadian-flag commercial shipping accident rate



Vessel movements for 2012-2015 are estimated (Source: Transport Canada)

Investigations

In 2015-16, 10 marine investigations were started, and 15 were completed. On average, investigations were completed within 406 days, a continued improvement from past years and below the target of 450 days.

Table 4: Marine investigations at a glance

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Investigations started	6	9	12	12	12	10
Investigations completed	8	7	10	13	12	15
Average number of days to complete investigations	530	504	522	458	435	406
Recommendations	0	2	0	0	0	0
Safety advisories	5	8	5	6	6	1
Safety information letters	6	6	6	7	12	11

Marine highlights

Some of the 15 marine investigations concluded in 2015-16 are related to Watchlist issues. In the case of the sinking of the *Syringa*, the Board is concerned that without adequate oversight by the Department of Transport, shortcomings in the safety management and operations of tugs less than 15 GT may not be addressed. In the case of the passenger vessel, *La Relève II*, the Board identified issues related to emergency preparedness and regulatory oversight. The investigation found that enforcement of the amended *Fire and Boat Drills Regulations* is not leading to adequate compliance with regulations as they pertain to passenger safety.

Tugboat sinking – *Syringa* (M15P0037)

In its investigation into the sinking of the tug *Syringa* off Sechelt in British Columbia on 18 March 2015, TSB found that the tug was not maintained sufficiently to prevent water seeping from the deck into the hull during the voyage. The lack of a functioning high-level bilge alarm further exacerbated the issue by depriving the crew of an early warning of the downflooding. The investigation also identified a number of issues related to emergency preparedness.

With respect to SMS, there was no requirement for the *Syringa* to have one. The TSB has identified safety management and oversight as a Watchlist issue. The TSB is calling on TC to implement regulations requiring all operators in the marine industry to have formal safety management processes and is emphasizing that TC must oversee these companies' safety management processes.

Additionally, the onus was on the authorized representative (AR) to ensure compliance with the regulations; there is minimal regulatory oversight to identify shortcomings in the event that ARs are not fulfilling their responsibilities. The Board expressed concern that, without adequate oversight by TC, shortcomings in the safety management and operation of tugs less than 15 GT may not be addressed. The Board will continue to monitor this situation with a view to assessing the need for further safety action on this issue.

Passenger safety on Canadian vessels – *La Relève II* (M14C0156)

In its investigation into the fire and abandonment of the passenger vessel *La Relève II*, the Board found that the engine caught fire when a cooling system failed, causing the engine to overheat. The investigation also found that the vessel lacked written emergency procedures, formally assigned emergency duties, and training in these duties. Again, in this investigation, it was determined that the company did not have an SMS, nor was the vessel required to have one by regulation.

A 2004 TSB recommendation that TC take steps to ensure that small passenger vessel enterprises have an SMS is still outstanding, and is assessed as **Unsatisfactory**.

The investigation also identified the requirement for TC-inspector guidance in assessing the severity of a deficiency. Without this guidance, there is a risk that vessels will be certified and operated with major deficiencies. Subsequent to the occurrence, TC issued a notice reminding inspectors to review the approved plans for vessels and to verify any notations to ensure a thorough inspection.

Recommendations and progress

No marine safety recommendations were issued in 2015-16. The Board reassessed responses to 20 active recommendations. Following the Board reassessments, the ratings were as follows: six **Fully Satisfactory**, four **Satisfactory Intent**, six **Satisfactory in Part**, and four **Unsatisfactory**. The Unsatisfactory reassessments were due, for the most part, to TC not having finalized the *Fishing Vessel Safety Regulations*.

While the results of these reassessments represent an improvement in the marine sector, key recommendations that could enhance safety across the marine industry remain outstanding, specifically the recommendations that the Board has made about fishing vessel safety and safety management systems.

Another six older recommendations also remain outstanding and will be reassessed once updated information is received from stakeholders, including provincial legislative bodies, Canadian port and pilotage authorities, and TC.

Pipeline sector

Contributing to a strong safety record on federally regulated pipelines for over a quarter century

Pipeline sector

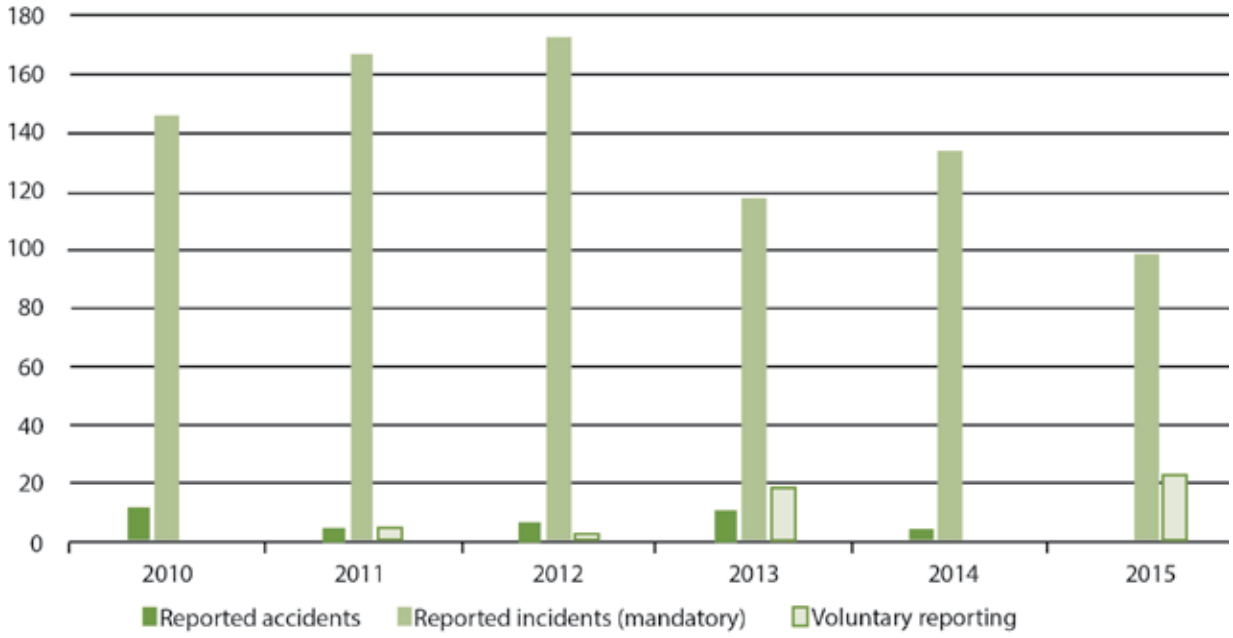
Annual statistics

No pipeline accidents were reported to the TSB in 2015, down from a total of 5 in 2014, and down from the annual average of 8 in the previous five-year period (2010–2014).

There have been no fatal accidents on a federally regulated pipeline system directly resulting from the operation of a pipeline since the inception of the TSB.

In 2015, 99 pipeline incidents were reported to the TSB, down from 134 in 2014, and down from the annual average of 147 in 2010–2014.

Figure 7: Pipeline occurrences

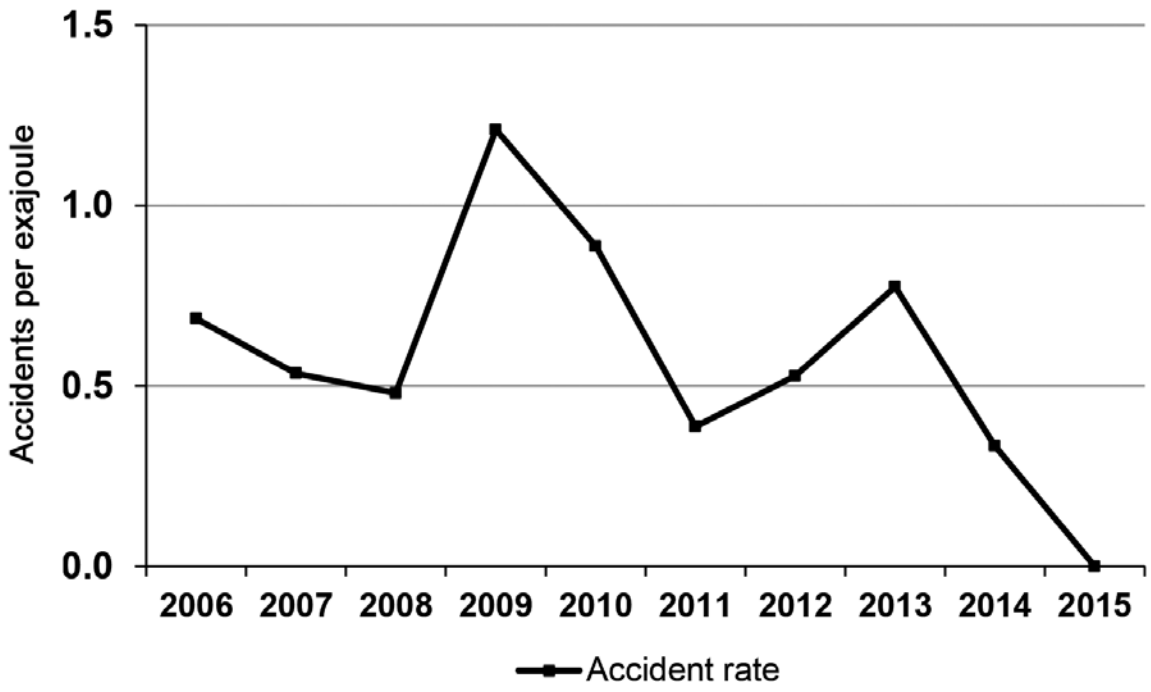


Accident rate

One indicator of pipeline transportation safety in Canada is the pipeline accident rate (Figure 8). According to data provided by the National Energy Board, pipeline activity increased by 1% from 2014. The 2015 rate was 0 pipeline accidents per exajoule,[5] down from 0.3 in 2014, and down from the annual average of 0.6 in 2009–2013.

5 One exajoule = 10^{18} joules. A joule is a unit of work or energy equal to the work done by a force of 1 newton acting through a distance of 1 metre.

Figure 8: Pipeline accident rate



Exajoules are estimated (Source: National Energy Board)

Investigations

In 2015-16, no pipeline investigations were started, and two investigations were completed. The duration of the completed investigations was 650 days, above the average of the previous five years (453 days).

Table 5: Pipeline investigations at a glance

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Investigations started	1	0	3	2	0	0
Investigations completed	3	1	0	2	1	2
Average number of days to complete investigations	432	404	n/a	402	665	650
Recommendations	0	0	0	0	0	0
Safety advisories	2	1	0	1	0	0
Safety information letters	0	0	2	0	0	1

Pipeline highlights

Two pipeline investigation reports were made public in 2015-16. The first involved an explosion of a natural gas pipeline near Otterburne, Manitoba, which burned for 12 hours and caused the temporary evacuation of five nearby homes until the fire was extinguished. The second involved the rupture of a natural gas pipeline near Fort McMurray, Alberta, in which an estimated 16.5 million cubic metres of natural gas was released into the atmosphere. Neither accident produced injuries.

Pre-existing defect in gas pipeline (P14H0011)

The TSB investigation into the January 2014 natural gas pipeline rupture of TransCanada's Line 4001, near Otterburne, Manitoba, determined that the 30-inch pipeline failed due to a fracture that occurred at a pre-existing crack. The crack had formed at the time of the pipeline's construction, 50 years prior to the accident, and was likely due to an inadequate welding procedure and poor welding quality. There was no requirement for inspections of every weld by radiography at the time of the pipeline's original construction. The fracture was caused by incremental stresses to the pipeline, which were likely due to a combination of factors. These included weakened soil support in the area, due to maintenance activities over the years; record-low temperatures that winter; recent work at and around the valve site that may have driven frost deeper into the ground; and thermal contraction that may have happened when the pipeline cooled due to the absence of gas flow for 20 days prior to the occurrence.

Following the accident, the National Energy Board required TransCanada Pipeline Inc. to perform several engineering assessments along the accident line. TransCanada performed numerous excavations, inspections, and repairs along the line before returning it to service. Following the pipeline's return to service, TransCanada performed in-line inspections to rule out other threats to the pipeline's integrity.

Thermal expansion on elbow joint in gas pipeline (P13H0107)

In this case, the TSB investigation into the October 2013 pipeline rupture near Fort McMurray, Alberta, revealed that a fracture had started at an elbow joint and spread through the wall thickness, resulting in the pipeline rupture. Thermal expansion had developed in the pipeline, causing increased stress at the elbow joint. This increased stress had occurred over a 50-day period when the pipeline was being operated at an increased discharge temperature to meet downstream customer demand.

The investigation also determined that the elbow's internal pressure rating had been overstated based on information from the manufacturing design drawings, instead of from a direct measurement. Additionally, the stress analysis had used a lower maximum operating temperature that did not fully address the potential operating envelope. These issues were not identified by TransCanada's quality assurance process.

Following the occurrence, the National Energy Board initiated an investigation to verify compliance with its regulations, and subsequently issued two Inspection Officer Orders to TransCanada Pipeline Inc. For its part, TransCanada performed a number of safety actions, including excavating, examining, and reinforcing 16 elbows. TransCanada has also begun developing an assessment tool that will be used to assess its pipelines for the threat of thermal expansion. Further, TransCanada has enhanced its third-party inspection requirements and auditing protocols to ensure that pipeline elbows and other fittings comply with the required standards and specifications.

Recommendations and progress

No pipeline safety recommendations were issued in 2015-16. With all of the TSB's pipeline recommendations rated as **Fully Satisfactory**, no responses to recommendations were reassessed.

Rail sector

Influencing changes that improve the safety of the Canadian railway system

Rail sector

Annual statistics

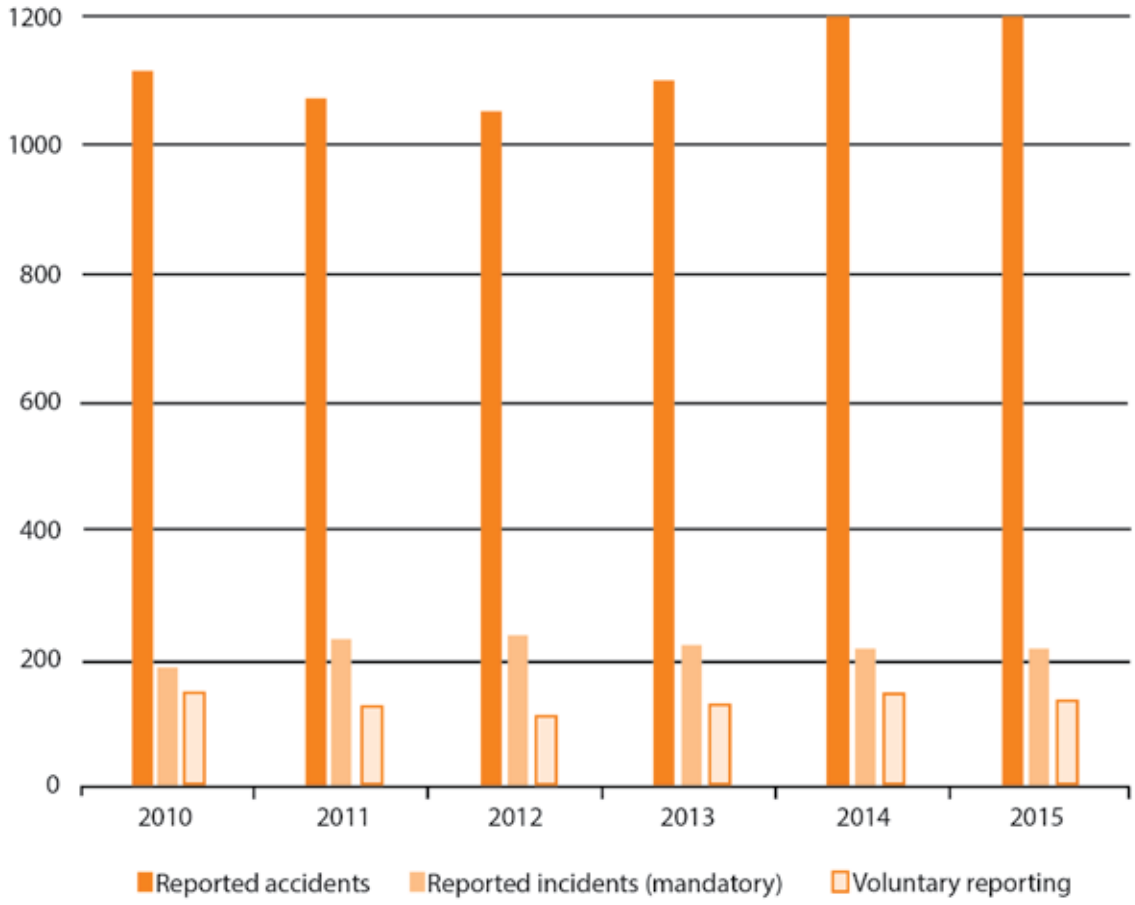
In 2015, 1,200 rail accidents were reported to the TSB, a 3% decrease from the 2014 total of 1,238, but an 8% increase from the 2010–2014 average of 1,115.

Accidents involving dangerous goods totalled 144 in 2015, down from the 2014 total of 174 and comparable to the five-year average of 140. Of these accidents, six resulted in a dangerous goods release in 2015, compared with the 2014 total of four and the five-year average of 3.8. Two of the six accidents involved a release of petroleum crude oil, one involved a release of liquid petroleum gas (LPG), and one resulted in a release of diesel fuel from a tanker truck involved in a crossing accident.

Rail fatalities totalled 46 in 2015, down from the 57 recorded in 2014 and down from the five-year average of 83. Crossing fatalities totalled 15 in 2015, down from 21 in 2014 and down from the five-year average of 27. There were 30 trespasser fatalities in 2015, down from 33 the previous year and down from the five-year average of 44. In 2015, one rail employee was fatally injured, down from the five-year average of 2.6.

In 2015, there were 216 reported rail incidents, comparable to the 218 incidents recorded in 2014, and comparable to the five-year average of 220. Movement exceeding the limit of authority (66%) continues to be the main incident type since 2006, followed by dangerous goods leakers (15%).

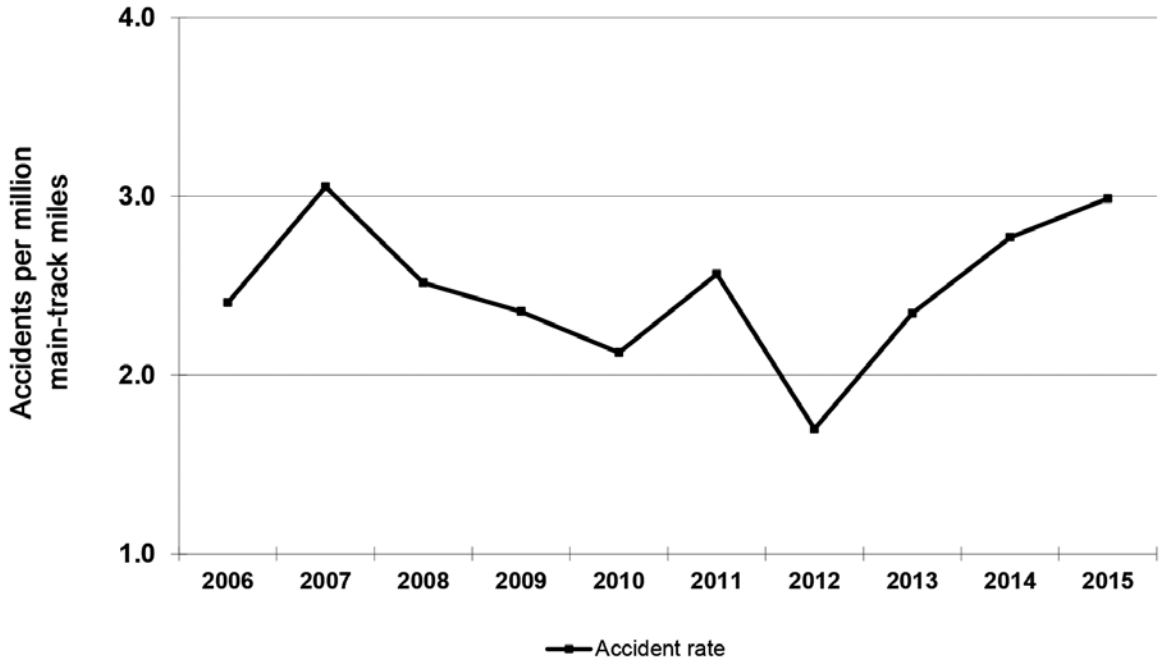
Figure 9: Rail occurrences



Accident rate

One indicator of rail transportation safety in Canada is the main-track accident rate (Figure 10). According to data provided by TC, rail activity on main track decreased by 3% from the previous year. The main-track accident rate in 2015 was 3.0 accidents per million main-track train miles, up from 2.8 in 2014, and up from the five-year average of 2.3.

Figure 10: Main-track accident rate



Main-track train miles are estimated (Source: Transport Canada)

Investigations

A total of 15 rail investigations were started in 2015-16, and 12 investigations were completed. The average duration of completed investigations was 525 days, up from the 2014-15 average of 494 days and above the previous five-year average (456 days).

Table 6: Rail investigations at a glance

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Investigations started	14	17	12	17	16	15
Investigations completed	16	19	16	12	16	12
Average number of days to complete investigations	443	488	409	435	494	525
Recommendations	1	0	0	6	2	5
Safety advisories	9	9	4	17	16	20
Safety information letters	8	18	14	24	5	20

Rail highlights

A number of rail investigations concluded in 2015-16 were related to Watchlist issues, and some others were related to track issues. One tragic rail accident took place in Ottawa when a city bus collided with a passenger train at a level crossing. The accident cost six lives. The report was made public in December 2015, and is expected to have a major impact on how TC and municipal governments assess the need for grade-separated crossings and how buses interact with level crossings. In another occurrence involving a CN freight train on the Fort Frances subdivision between Winnipeg, Manitoba, and Chicago, Illinois, the investigation determined that the derailment was due to poor track condition and maintenance deficiencies and that TC and CN inspection and maintenance issues existed.

Derailment of a Canadian National (CN) train (R14W0137)

In its investigation into the May 2014 derailment of a CN train near Fort Frances, Ontario, the TSB found that CN did not consistently apply its Engineering Track Standards, while TC's inspection and enforcement activities did not ensure timely maintenance action. Despite CN company maintenance and TC's regulatory inspection activities prior to the accident, the weakened track structure had not been adequately addressed, and speed reductions were not applied.

Importantly, this track met the criteria for a key route that was subject to additional safety measures, including a formal risk assessment, requirements put in place following the Lac-Mégantic investigation. While CN's risk assessment for this corridor and its engineering processes took into account a number of factors, the mitigating strategies in place were insufficient.

Following the occurrence, TC issued a Notice and Order to limit speeds and increase track inspections between Mile 90.1 and 1142.8 of the Fort Frances Subdivision. For its part, CN conducted additional track inspections with professional engineers and installed new ties between Mile 87.0 and 143.6 of the same track. Once TC was satisfied with the corrective measures taken, the Notice and Order was revoked.

Collision between an OC Transpo bus and a VIA Rail train (R13T0192)

The TSB investigation into the September 2013 collision of a city transit bus and passenger train in Ottawa, Ontario, focused on why the bus driver didn't see the train and stop in time. It determined that, while accelerating toward the railway crossing, the bus was negotiating a significant left curve in the road. The driver's view of the crossing was obstructed, and there was only a short time when the activated crossing signals were visible to the driver. During this critical time, the driver was also distracted by surrounding conversations about seating on the upper deck, and by the perceived need to monitor the upper deck on a small screen that was positioned up and to the left of the driver's seat, and to make an announcement about no standing on the upper deck. At the speed the bus was travelling, the driver was unable to stop in time, even after passengers began to shout "Stop!"

The TSB made five recommendations which covered distracted driving guidelines (R15-01), bus crashworthiness (R15-02), vehicle event data recorders (R15-03), grade separation guidelines (R15-04), and grade separation at the crossing in question (R15-05) which are described in the next section.

Recommendations and progress

Five new rail safety recommendations were issued in 2015-16.

The Board assessed five responses to new recommendations and reassessed responses to 11 active recommendations of the 144 issued since 1990. The Board's reassessments were communicated to change agents for information and action.

Of the 16 active rail recommendations at the end of the fiscal year, seven were assessed as **Satisfactory in Part**, eight were assessed as having **Satisfactory Intent,** and one was assessed to be **Fully Satisfactory.**

Recommendation R15-01

All provinces have some form of distracted driving legislation in place. With the rapid development of technology and in-vehicle displays, distracted driving is an emerging safety issue. Many jurisdictions, including the Province of Ontario, also have laws in place to limit the potential for driver distraction. However, for the OC Transpo double-decker bus that collided with a VIA Rail passenger train, the video monitor was deemed to be necessary for the safe operation of the bus and was therefore exempt from the *Ontario Highway Traffic Act* (OHTA) restricting the use of display screens.

Activities related to distracted driving fall under provincial or state jurisdiction and as such can vary between provinces or states. It is important for TC to take a leadership role and develop a framework that provides consistent guidance to both the industry and provinces to address the emerging issues related to distracted driving. The Board considers this framework to be an important element in mitigating the associated risks, particularly with regards to railway crossing safety. To minimize any potential distraction while driving a vehicle, the Board recommends that

> *the Department of Transport, in consultation with the provinces, develop comprehensive guidelines for the installation and use of in-vehicle video monitor displays to reduce the risk of driver distraction.*
>
> *TSB Recommendation R15-01*

TC response to Recommendation R15-01

TC has indicated it will request that the Canadian Council of Motor Transport Administrators (CCMTA) Distracted Driver Working Group consider developing these guidelines. As co-chair of this group, TC will also suggest that experts and industry stakeholders be consulted to identify the challenges and effective strategies for limiting distracted driving due to video displays.

Board assessment of TC response to Recommendation R15-01

Although meaningful results from the planned action will not likely occur in the short term, the Board is encouraged that TC will be taking a leadership role in the development of the guidelines. Therefore, the Board assesses the response to this recommendation as having **Satisfactory Intent**.

Recommendation R15-02

Survivability is influenced by how well the impact is absorbed by features of a vehicle and directed away from the occupants. Any structural damage of the container should not reduce the size of the survivable volume or open it up to the elements to the point where it compromises occupant survivability. TC, through its Motor Vehicle Safety Directorate, sets safety standards for the design, construction, and importation of motor vehicles in Canada. However, the *Motor Vehicle Safety Standards* contain no requirements for frontal impact, side impact, or rollover or crush protection for vehicles over 11 793 kg (26 000 pounds), which includes most transit buses. As a result, buses in this weight category can have different structural features that may not adequately protect the travelling public. Considering the consequences of this accident, the Board recommends that

the Department of Transport develop and implement crashworthiness standards for commercial passenger buses to reduce the risk of injury.

TSB Recommendation R15-02

TC response to Recommendation R15-02

TC has said it will conduct a review of accident data from urban centres around the world to evaluate the existing crashworthiness of commercial passenger buses.

Board assessment of TC response to Recommendation R15-02

Beyond this commitment, there are no explicit plans to develop and/or implement crashworthiness standards for commercial passenger buses. Furthermore, no specific timeline has been provided for the planned review and analysis. Therefore, the Board assesses the response to this recommendation as being **Satisfactory in Part**.

Recommendation R15-03

Although accidents involving transit buses at level crossings are rare, they are considered to be high-risk events due to the number of passengers transported in each bus and the potential for injury to the travelling public. When these accidents occur, it is imperative that all investigators have access to real-time recorded data that are consistent and meaningful to quickly identify safety deficiencies and prevent recurrence. Early recovery of the information can result in more timely communication of safety deficiencies and accident reports to industry, regulators, and the public, which in turn can result in the implementation of measures to prevent a recurrence. Because today's vehicles are capable of supporting crashworthy technology that has the capacity to record safety-critical information, which enables safety improvements as well as comprehensive and timely accident investigation, the Board recommends that

the Department of Transport require commercial passenger buses to be equipped with dedicated, crashworthy event data recorders.

TSB Recommendation R15-03

TC response to Recommendation R15-03

TC has committed to researching event data recorder (EDR) technologies and reviewing available international commercial vehicle EDR standards and recommended practices. TC will then review the results of the research and the review to evaluate the feasibility of developing an EDR standard or guideline for commercial passenger buses.

Board assessment of TC response to Recommendation R15-03

While the Board is encouraged by TC's response, the work will take time; no specific outcome or timeline has been provided. In addition, there are no explicit plans for the development of EDR standards for commercial passenger buses. Therefore, the Board assesses the response to this recommendation as being **Satisfactory in Part**.

Recommendation R15-04

In Canada, there are no guidelines and no specific cross-product value at which grade separation should be built. In comparison, the United States Department of Transportation (DOT) Federal Highway Administration (FHA) Railroad-Highway Grade Crossing Handbook (2007) provides specific guidance as to when grade separation should be considered.

Considering the 2013 train and traffic volume cross-product values of Woodroffe Avenue (699,108) and Fallowfield Road (406,592), both roads met the United States FHA cross-product criteria for grade separation. If occupant cross-product is also considered, the Transitway (532,703) would also meet the FHA cross-product criteria.

It is recognized that federal guidelines are generally not enforceable, particularly in other jurisdictions. However, the Board considers that guidance similar to that contained in the United States DOT FHA Railroad-Highway Grade Crossing Handbook would be a useful framework that provides consistent guidance on issues related to grade separation for the industry as well as federal, provincial, and municipal road authorities. Since Canada has no such guidelines for grade separation, the Board recommends that

> *the Department of Transport provide specific guidance as to when grade separation should be considered.*
>
> *TSB Recommendation R15-04*

TC response to Recommendation R15-04

TC has acknowledged that the new *Grade Crossings Regulations (2014)* do not specify when grade separation should be implemented at existing level grade crossings. TC has committed to working with the provinces and railways to develop guidelines to help determine when grade separation should be considered.

Board assessment of TC response to Recommendation R15-04

The Board is encouraged that TC will work with key stakeholders to develop guidelines for determining when grade separation should be considered. Although no timelines have

been established yet for this work, the Board assesses the response to this recommendation as having **Satisfactory Intent**.

Recommendation R15-05

Originally, grade separations had been planned for Woodroffe Avenue, the Transitway, and Fallowfield Road. Due to public opposition, overpass options were not considered. As unexpected subsurface conditions brought funding and timing challenges, an underpass alternative was eventually not pursued.

Grade separation projects usually involve multiple jurisdictions, with funding provided by the railways, the respective road authority, and the federal government. The decision to proceed with level crossings was based on known risk factors in 2004. Since that time, changes have occurred in the risk factors, such as area population, number of trains, train speed, number of vehicles, the resulting cross-product, and the average number of vehicle occupants. These risk factors will continue to increase with further urban and potential railway development in the area, with a commensurate risk that existing level-crossing protection may no longer be adequate. Therefore, the Board recommends that

> *the City of Ottawa reconsider the need for grade separation at the Woodroffe Avenue, Transitway and Fallowfield Road level crossings.*
>
> *TSB Recommendation R15-05*

City of Ottawa response to Recommendation R15-05

The City has responded that, in financial partnership with VIA Rail, it will conduct a feasibility study to review the technical requirements for providing grade separation at those crossings, as well as at two additional crossings.

Board assessment of City of Ottawa response to Recommendation R15-05

The action proposed by the City is a positive first step towards more effectively managing the risk of vehicle–train collisions at these five level crossings. The Board assesses the response to this recommendation as having **Satisfactory Intent**.

Aviation sector

Pushing for change—
and safer
operations—
for all Canadians

Aviation sector

Annual statistics

In 2015, 251 aviation accidents were reported to the TSB, comparable to the 2014 total of 249 and an 8% decrease from the five-year average of 272. Of the total, 227 involved Canadian-registered aircraft (excluding ultra-lights), a 7% increase from the 2014 total of 212, but a 3% decrease from the five-year average of 234. The 227 accidents involved 229 Canadian-registered aircraft, including 189 aeroplanes (50 commercially operated), 33 helicopters, 5 gliders, 1 gyroplane, and 1 powered hang-glider with an inflatable boat hull.

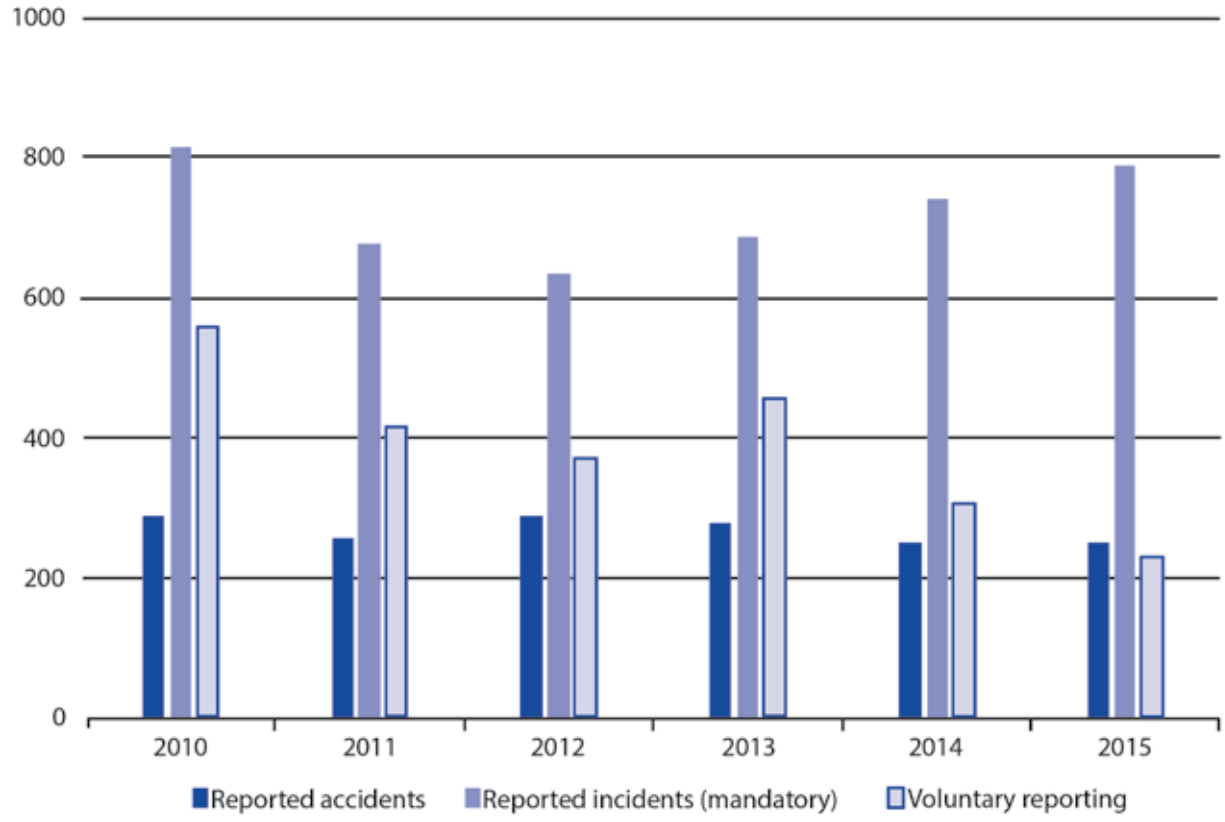
In 2015, 23 fatal accidents involved Canadian-registered aircraft other than ultra-lights, substantially higher than last year's total of 10, but lower than the five-year average of 27. The number of fatalities (40) was substantially higher than the 2014 total of 15, but lower than the five-year average of 51.The number of serious injuries (28) was slightly lower than the 2014 total of 29 and the five-year average of 32.

In 2015, nine accidents involved foreign-registered aircraft in Canada, with three fatal accidents resulting in a total of four fatalities.

In 2015, 789 incidents were reported in accordance with the TSB mandatory reporting requirements. This is a 7% increase from the 2014 total of 739, and an 11% increase from the five-year average of 710.

This increase is consistent with a regulation change effective 01 July 2014, which reduced the minimum commercial aircraft weight threshold for reportable incidents to 2 250 kg from 5 700 kg.

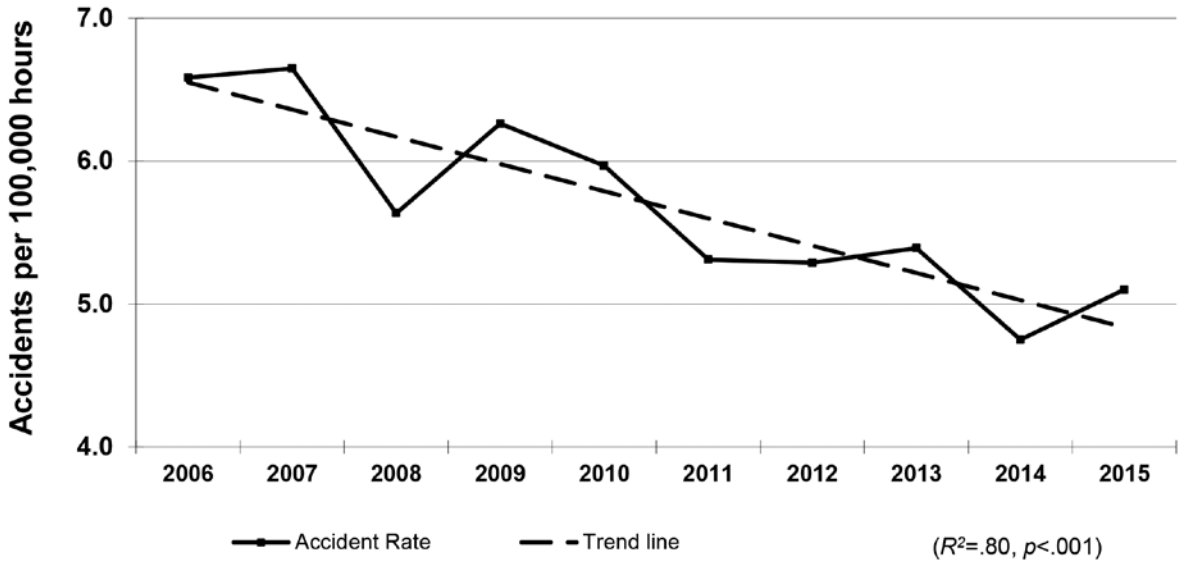
Figure 11: Aviation occurrences



Accident rate

One indicator of aviation transportation safety in Canada is the aircraft accident rate (Figure 12). According to data provided by TC, the estimate of flying activity for 2015 is 4,353,000 hours. The accident rate in 2015 was 5.1 accidents per 100,000 flying hours, up from the 2014 rate of 4.8. Nevertheless, there has been a significant downward trend in the accident rate for Canadian-registered aircraft over the past 10 years.

Figure 12: Canadian-registered aircraft accident rate



2012-2015 hours flown are estimated (Source: Transport Canada)

Investigations

A total of 21 new investigations were started in 2015-16, and 19 investigations were completed, of which 18 were class 3 and one was class 2. This represents a decrease in the number of investigations completed compared to the previous year (22). The average duration of completed investigations was 548 days, up from the 2014-15 average of 546 days and above the previous five-year average (537 days).

Table 7: Aviation investigations at a glance

	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Investigations started	40	35	28	20	23	21
Investigations completed	38	28	26	42	22	19
Average number of days to complete investigations	504	447	549	639	546	548
Recommendations	6	0	2	4	0	2
Safety advisories	6	5	5	1	4	1
Safety information letters	3	0		0	3	1

Aviation highlights

Watchlist issues continued to present themselves in some of the 19 accident investigations completed by the TSB's Air Investigations Branch. Two investigations in particular highlighted persistent Watchlist issues. The first involved circumstances where it was found that TC did not provide adequate oversight; the transporter had an SMS that did not function as it should have. The second involved an approach-and-landing accident during which, tragically, a small child died for lack of a proper child restraint system.

Engine failure after take-off and collision with terrain (A13W0120)

In its investigation into an August 2013 collision with terrain involving a Buffalo Airways Ltd. Douglas DC-3C, the TSB found that the operator did not have an effective SMS in place to identify and mitigate risk in its operations. The flight was operating as a scheduled passenger flight from Yellowknife to Hay River, Northwest Territories. Along with the findings as to cause, the investigation uncovered a number of findings as to risk, both for the air operation and with regard to TC oversight.

As identified in this occurrence, TC's current approach to regulatory oversight, which focuses on an operator's SMS processes almost to the exclusion of verifying compliance with the regulations, is at risk of failing to address unsafe practices and conditions. The TSB is concerned that if TC does not adopt a balanced approach that combines inspections for compliance with audits of safety management processes, unsafe operating practices may not be identified, thereby increasing the risk of accidents.

Low-energy rejected landing and collision with terrain (A12Q0216)

The TSB's investigation into the December 2012 accident involving a Perimeter Aviation LP, Fairchild SA227-AC Metro III, in Sanikiluaq, Nunavut, determined that infants and children who are not properly restrained are at risk of injury and possibly death, and may cause injury or death to other passengers.

Following an attempted visual approach and two non-precision, non-directional beacon (NDB) approaches, a rejected landing was initiated, but the aircraft struck the ground beyond the departure end of the runway. An infant was fatally injured; everyone else survived.

The TSB issued two recommendations to TC to address this safety deficiency: one related to collecting and reporting the number of infants travelling; and the other relating to the requirement for age- and size-appropriate child restraint systems (CRS) for infants and young children travelling on commercial aircraft.

The Board is concerned that until the use of age- and size-appropriate CRS is required, parents and guardians will continue to travel with infants and children without the safety benefits provided by CRS, and lap-held infants and young children will remain exposed to undue risk and not be provided with an equivalent level of safety compared to adult passengers.

The investigation also identified issues associated with pre-flight planning, crew communication, and unstable approaches. Approach-and-landing accidents are on the TSB Watchlist. The TSB continues to call on TC and operators to do more to reduce the number of unstable approaches that are continued to a landing.

Recommendations and progress

In 2015-16, the Board reassessed responses to 37 of the recommendations issued since 1990, and assessed two new aviation safety recommendations made this year.

Although movement on the TSB's aviation recommendations remains challenging, we have successfully been able to change the status of 10 recommendations to **Fully Satisfactory**. However, we continue to see the same causes and contributing factors year after year, even though they have been identified in outstanding TSB recommendations.

Of the remaining 29 recommendations, two remain **Unable to Assess**. More information is required by TC for one. Because the FAA has been silent on the other, we are unable to properly assess the recommendation. Eleven have been assessed as **Satisfactory Intent**; four as **Satisfactory in Part**; and 12 have an **Unsatisfactory** rating.

Recommendation A15-01

TC statistics show that passenger traffic at Canadian airports increased 2.9% in 2013, to reach 85.2 million enplaned and deplaned passengers. Domestic, Canada–U.S., and

other international traffic increased year over year by 2.8%, 4.4%, and 1.6%, respectively. However, the number of infants and child passengers travelling by air is not available.

Currently, under the *Transportation Information Regulations*, Canadian air carriers must provide to the Minister of Transport a wide range of information on their overall operations. However, information on the number of infant and child passengers travelling is not required to be reported.

If more complete data on the number of infants and children travelling are not available, there is a risk that their exposure to injury or death in the event of in-flight turbulence or a survivable accident will not be adequately assessed and mitigated. For this reason, the Board recommends that

> *the Department of Transport require commercial air carriers to collect and report, on a routine basis, the number of infants (under 2 years old), including lap-held, and young children (2 to 12 years old) travelling.*
>
> *TSB Recommendation A15-01*

TC response to Recommendation A15-01

TC indicated that it is working to determine the best options for collecting this data, including a stakeholder consultation to be completed by March 2016.

Board assessment of TC response to Recommendation A15-01

TC's proposed action indicates that, after consultation with appropriate stakeholders, the best way to gather and report the required data to TC will be determined. However, these actions do not indicate how and when industry will be required to report this information. While the actions proposed by TC constitute a first step in the right direction, much more work is required.The Board therefore assesses this response as having **Satisfactory Intent**.

Recommendation A15-02

Biomechanical research has found that it is not always possible for adults to restrain children adequately in their laps by holding onto them. Infants are therefore exposed to undue risk of injury when seated on an adult's lap. In most countries around the world, including Canada, infants are not required to be restrained in an age- and size-appropriate child restraint system (CRS) at any time during a flight. Although research has been conducted over the last 25 years, there has been no progress on the required use of appropriate CRS on commercial aircraft.

A number of aircraft accidents have demonstrated the risk to infants and young children who are not properly restrained. Given the overall safety performance of commercial aviation, passengers may underestimate the risks associated with unexpected in-flight turbulence and emergency situations.

Until new regulations on the use of CRS are implemented, lap-held infants and young children are exposed to undue risk and are not provided with an equivalent level of safety compared to adult passengers. Therefore, the Board recommends that

> *the Department of Transport work with industry to develop age- and size-appropriate child restraint systems for infants and young children travelling on commercial aircraft, and mandate their use to provide an equivalent level of safety compared to adults.*
>
> *TSB Recommendation A15-02*

TC response to Recommendation A15-02

TC said that it will explore ways to increase the range of child restraint systems approved for use in aircraft in the short term. In the medium term, TC is planning an awareness campaign focused on the risks to children travelling on commercial aircraft. And in the long term, it will initiate an in-depth regulatory examination into these issues next year.

Board assessment of TC response to Recommendation A15-02

TC indicated that it will take a threefold approach to address this recommendation and reduce the risk to which infants and young children are exposed when travelling by air.

The Board is encouraged to note that TC is planning to take some short- and medium-term actions, while initiating an in-depth review to address the safety deficiency. However, the Board also notes that the International Civil Aviation Organization (ICAO) has recently published guidance to regulators on implementing regulations for child restraint systems. The availability of this material may be useful in accelerating the regulatory examination. Although TC's proposed actions may have some benefits, its response does not yet identify specific solutions that will ensure that infants and young children are provided a level of safety comparable to adults. The Board therefore assesses this response as having **Satisfactory Intent.**

Appendix A – Reports released in 2015-16

This Appendix provides an overview of investigation reports released and, where applicable, an overview of the safety actions taken.

For a more comprehensive list of safety actions taken, please see the final investigation reports.

Marine

Marine investigation report M14A0051

Date	14 March 2014
Location	Off the southwest coast of Newfoundland and Labrador
Vessel	*John I*
Type	Bulk carrier
Event	Flooding and subsequent grounding
Safety action taken	No safety action was reported to the TSB further to this investigation.

Marine investigation report M15A0045

Date	09 March 2015
Location	Off the southwest coast of Newfoundland and Labrador
Vessel	*Four Ladies 2003*
Type	Small fishing vessel
Event	Person overboard and subsequent loss of life
Safety action taken	No safety action was reported to the TSB further to this investigation.

Marine investigation report M14C0045

Date	22 April 2014
Location	Grondines, Quebec
Vessel	*Halit Bey*
Type	Chemical/products tanker
Event	Grounding
Safety action taken	Following the grounding, and a TSB issued Marine Safety Advisory, **the company** posted complete emergency change-over procedures on the bridge of the *Halit Bey* and the *Nilufer Sultan* and issued a fleet-wide navigation safety circular with a photograph of the selector switch, located on the centre steering control panel. Crew members were trained on the *Halit Bey*'s specific steering arrangements, and a protective guard was installed over the joystick on the centre steering control panel on each of the two vessels.

Marine investigation report M14P0110

Date	06 June 2014
Location	Queen Charlotte Sound, British Columbia
Vessel	*Diane Louise*
Type	Chemical/products tanker
Event	Grounding
Safety action taken	The TSB issued a Marine Safety Information Letter to WorkSafeBC to advise them that the crew on board were not using personal flotation devices (PFDs) while working on deck, nor were there any on board available for use. The letter also notes that the Workers Compensation Board *Occupational Health and Safety regulations* regarding PFD usage currently place the onus on the vessel masters to determine whether they or their crew members are at risk of drowning if not wearing a PFD.

Marine investigation report M14C0106

Date	12 June 2014
Location	Port Colborne, Ontario
Vessel	*Atlantic Erie*
Type	Self-discharging bulk carrier
Event	Grounding
Safety action taken	Following the occurrence, **the master** wrote a letter to explain what had happened during the occurrence and why. The letter was circulated to the fleet masters to solicit feedback and to create a forum for open discussion that might help to avoid similar occurrences in future. The master's letter was also used to develop a case-study exercise based on the occurrence that has been incorporated into Human Element Leadership Management (HELM) training. HELM mentors have been hired for the 2015 season to sail in the fleet, observe, and further coach the vessel's crew on HELM principles. This is a refresher for the training previously provided on the simulator.

Marine investigation report M14P0121

Date	12 June 2014
Location	Johnstone Strait, British Columbia
Vessel	*Five Star*
Type	Small fishing vessel
Event	Sinking and loss of life
Safety action taken	**TC** has used this report (among other relevant reports) to validate the need for expanded emergency position-indicating radio beacon (EPIRB) carriage requirements under the proposed Navigation Safety Regulations for fishing vessels such as the Five Star. **Fish Safe** has translated the report in Chinese and Vietnamese. It distributed the report electronically as well as during dock walks. FishSafe also expanded their Safest Catch program to a minimum of 2 days with more emphasis on follow-up briefings.

Marine investigation report M14A0289

Date	26 June 2014
Location	Off Little Port Head, Newfoundland and Labrador
Vessel	*Sea Serpent 25*
Type	Small fishing vessel
Event	Capsizing and subsequent loss of life
Safety action taken	No safety action was reported to the TSB further to this investigation.

Marine investigation report M14P0150

Date	14 July 2014
Location	Prince Rupert, British Columbia
Vessel	*Amakusa Island*
Type	Bulk carrier
Event	Grounding
Safety action taken	The **Canadian Hydrographic Service (CHS)** updated Chart 3957 to indicate the type of bottom composition as rock or rocky. The **Canadian Coast Guard** issued a Notice to Mariners advising of the changes made by the CHS. The **United Kingdom Hydrographic Office** issued a similar notice to update Chart 4936 to indicate the seabed type. The **British Columbia Coast Pilots Ltd. (BCCP)** has completed safety corridors for all areas of the coast, excluding Haida Gwaii. The area around Gull Rocks, British Columbia, is outside of a safety corridor. The BCCP and the **Pacific Pilotage Authority (PPA)** reached an agreement to require all pilots to undergo mandatory assessments. The **PPA** initiated a joint review committee to solicit views from industry stakeholders regarding the current pilotage system and practice, identify existing hazards, and evaluate current defences. The Joint Review Committee's report was completed and approved by the PPA Board on 30 July 2015. The **management company** responsible for the *Amakusa Island* installed an electronic chart display and information system (ECDIS) on board. The company also initiated training for the crew in various aspects of human performance.

Marine investigation report M14A0348

Date	01 August 2014
Location	Saint John, New Brunswick
Vessel	*Captain A.G. Soppitt* *Bayliner*
Type	Pilot boat Passenger vessel
Event	Collision
Safety action taken	**DMK Marine Services Ltd.** has fitted the *Bayliner* with a Class B automatic identification system (AIS). This means that other vessels fitted with AIS will be able to obtain navigational information for the *Bayliner* (position, heading, etc.) that can help them when determining if there is a risk of collision.

Marine investigation report M14C0156

Date	11 August 2014
Location	Havre-Saint-Pierre, Quebec
Vessel	*La Relève II*
Type	Small passenger vessel
Event	Fire and abandonment
Safety action taken	**Survitec Group Limited** conducted a preliminary investigation and identified a number of potential failure modes for further investigation and testing. **TC** issued a FLAGSTATENET Notice reminding inspectors to review the approved plans for vessels and to verify any notations in red to ensure a thorough inspection. Another FLAGSTATENET Notice informed inspectors of the contents of a TSB Marine Safety Information letter and reminded them to pay particular attention to surface material requirements for each vessel being inspected.

Marine investigation report M14C0193

Date	12 September 2014
Location	Port-Cartier, Quebec
Vessel	*Vachon* *Orient Crusader*
Type	Tug Bulk carrier
Event	Striking of the breakwater
Safety action taken	**TC** issued a FLAGSTATENET notice reminding TC inspectors and Recognized Organization surveyors of the regulatory requirements concerning tow-abort equipment. **Lloyd's Register of Shipping** added a requirement for its surveyors to examine the emergency release arrangements for the towing hook and check for operability as far as practicable. The **Orient Crusader Shipping Company** added the requirement for a hook test under tension to be undertaken every 3 months on the tugs. **Interorient Marine Services Ltd.** issued a Navigation Item to all of the vessels in its fleet requiring all bridge team members to review Chapter 3 of their Safe Navigation Manual (Pilotage) and reminded all masters to ensure that the bridge is properly manned. The **master of the *Orient Crusader*** conducted a second navigational assessment to identify any deficiencies. The **company** started to conduct external navigational assessments on its vessels; this is ongoing. The Safe Navigation Manual and Vessel Contingency Plans have been amended to mandate the saving of the voyage data recorder (VDR) information for any type of incident.

Marine investigation report M14C0219

Date	14 October 2014
Location	Deer Island, Chesterfield Inlet, Nunavut
Vessel	*Nanny*
Type	Tanker
Event	Bottom contact
Safety action taken	**Det Norske Veritas – Germanischer Lloyd (DNV-GL)** conducted a review of the SMS audit reports on the company and on the *Nanny*. **The operating company** sent a memo to all vessels reminding crew of a number of issues, including vigilance and rest hours, and alerting them about upcoming changes to the confined waters checklist. The company also acquired fatigue management software. The company indicated that the software was up and running on one of the vessels and will be installed on the other four vessels in the company fleet.

Marine investigation report M15C0006

Date	11 January 2015
Location	Îles de la Madeleine, Quebec
Vessel	*Atlantic Erie*
Type	Self-discharging bulk carrier
Event	Grounding
Safety action taken	**Canada Steamship Lines (CSL Group Inc.)** provided the entire fleet with charts and detailed instructions for replacing existing charts on the Electronic Chart Precise Integrated Navigation System (ECPINS). The company also conducted Human Element Leadership Management (HELM) training sessions and has committed to delivering this training to all senior officers in the fleet by the end of winter 2016. HELM mentors, trained to deliver on-board mentoring and coaching to help embed the principles of HELM, bridge resource management, and engine-room resource management, circulated through the fleet for the 2015 navigation season.

Marine investigation report M15P0035

Date	14 March 2015
Location	Sutil Point, British Columbia
Vessel	*Lasqueti Daughters*
Type	Self-propelled barge
Event	Foundering and abandonment
Safety action taken	The **British Columbia Forest Safety Council** (BCFSC) is forming a group to address current marine transportation safety issues, specifically those within forestry operations. The group would consist of members from the BCFSC, Ministry of Forestry, Lands and Natural Resource Operations, Brinkman Group (Reforestation Company), WorkSafeBC, Western Silvicultural Contractors' Association, BC Timber Sales, Interfor (licensee via the Coast Harvest Advisory Group) Transport Canada and the TSB.

Marine investigation report M15P0037

Date	18 March 2015
Location	Off Sechelt, British Columbia
Vessel	*Syringa*
Type	Tug
Event	Sinking
Safety action taken	The **TSB** issued a Marine Safety Advisory Letter to the owners advising them of the unsafe conditions that affected the tug's watertight integrity and rendered it vulnerable to downflooding.

Pipeline

Pipeline investigation report P13H0107

Date	17 October 2013
Location	Near Fort McMurray, Alberta
Company	TransCanada PipeLines Limited (NOVA Gas Transmission Ltd.)
Event	Rupture
Safety action taken	The **National Energy Board** (NEB) initiated an investigation to verify compliance with its regulations. It issued an Inspection Officer Order, limiting the pressure for the valve section and restricting the discharge temperature at the Woodenhouse compressor station. Following the evaluation of an engineering assessment submitted by TransCanada PipeLines Limited (TransCanada), the NEB allowed the pipeline to operate at a maximum pressure of 7750 kPa. **TransCanada** excavated 16 elbows on the NCC Loop Buffalo Creek West Section. Thirteen of the elbows were measured for geometry and it was confirmed that there were no gross deformations in the elbow at these locations. It also enhanced its third-party inspection requirements and third-party auditing protocol to validate compliance of fittings to applicable standards and specifications. TransCanada also initiated a three-year research program with CANMET to develop improved quality assurance and quality control measures, and an inspection test protocol for validating the yield strength of pipeline fittings.

Pipeline investigation report P14H0011

Date	25 January 2014
Location	Near Otterburne, Manitoba
Company	TransCanada PipeLines Limited
Event	Natural gas pipeline rupture
Safety action taken	The **NEB** required TransCanada to investigate all remaining valve sites along Line 400-1 and to submit an engineering assessment demonstrating its fitness for service prior to its return to service. TransCanada was also required to undertake a review of its valve installations to evaluate whether similar valve assemblies exist throughout its system. TransCanada completed a ground-based leak detection and initiated a program to excavate, inspect, and, where applicable, repair all of the mainline valve assemblies on the line.

Rail

Rail investigation report R13T0192

Date	18 September 2013
Location	Ottawa, Ontario
Company	VIA Rail Canada and OC Transpo
Event	Crossing collision
Safety action taken	The **City of Ottawa (City)** initiated a number of safety actions soon after the occurrence, such as clearing the sight line, reducing speed limits on the Transitway, revising signage, and installing an active advance warning sign (AAWS). The OC Transpo Fallowfield Station signage was also relocated. The City also amended Transit by-law 2007-268, which governs the operation of vehicles on the Transitway. **VIA** undertook a safety blitz to verify the accuracy of the light unit alignment on all of the crossings on VIA track that are protected by automatic warning devices (AWD) and maintained by VIA. Of these 134 crossings, 20 of 1300 crossing lights were realigned. Additional information about safety action taken can be found in the investigation report R13T0192.

Rail investigation report R14W0041

Date	15 February 2014
Location	Keyes, Manitoba
Company	Canadian Pacific (CP) Rail
Event	Main-track derailment
Safety action taken	No safety action was reported to the TSB further to this investigation.

Rail investigation report R14D0011

Date	23 February 2014
Location	Montréal, Quebec
Company	Canadian National (CN) Rail
Event	Main-track collision
Safety action taken	**CN** conducted an internal investigation into this derailment. It shared its findings during a weekly Greater Montréal Area safety call, as well as during a national CN safety call.

Rail investigation report R14W0137

Date	23 May 2014
Location	Fort Frances, Ontario
Company	CN Rail
Event	Main-track derailment
Safety action taken	**TC** issued a Notice and Order under the authority of section 31 of the *Railway Safety Act* to restrict speeds until the track was inspected by a professional engineer and deemed safe for railway operation. **CN** conducted a walking inspection with professional engineers. As a result of the inspection and subsequent track repairs, speed restrictions for some sections of the track were either raised or removed. CN replaced ties between Mile 87.0 and Mile 143.6.

Rail investigation report R14E0081

Date	11 June 2014
Location	Faust, Alberta
Company	CN Rail
Event	Main-track derailment
Safety action taken	**TC** asked CN to implement mitigation measures to address safety concerns. It also issued an Emergency Directive on the Rail Transportation of Dangerous Goods. **CN** conducted a focused risk assessment that looked at the risks associated with track infrastructure and ground hazards. Mitigation approaches for each item were identified, and CN submitted them to TC. Railway companies operating key trains were ordered to file with the Minister of Transport all measures that had been put in place or that were being used to ensure track was compliant with the Rules Respecting Track Safety. Additional information about safety action taken can be found in the investigation report R14E0081.

Rail investigation report R14M0002

Date	07 July 2014
Location	Plaster Rock, New Brunswick
Company	CN Rail
Event	Main-track derailment
Safety action taken	No safety action was reported to the TSB further to this investigation.

Rail investigation report R14T0160

Date	10 July 2014
Location	Brockville, Ontario
Company	CN Rail
Event	Main-track train derailment
Safety action taken	Both **CN** and **CP** reintroduced speed restrictions for all empty centrebeam bulkhead flat cars. CN used truck hunting detector data to evaluate the risk of excessive truck hunting for different types of cars and undertook a program to target the two highest-risk series of centrebeam flat cars for upgrading to long travel (LT) constant contact side bearings (CCSB).

Rail investigation report R14T0180

Date	01 August 2014
Location	Gananoque, Ontario
Company	VIA Rail Canada
Event	Main-track train derailment and collision
Safety action taken	Both **CN** and **Canadian Pacific (CP)** reintroduced speed restrictions for all empty centrebeam bulkhead flat cars. **CN** used truck hunting detector data to evaluate the risk of excessive truck hunting for different types of cars and undertook a program to target the two highest-risk series of centrebeam flat cars for upgrading.

Rail investigation report R14T0294

Date	28 October 2014
Location	Newtonville, Ontario
Company	VIA Rail Canada
Event	Exceeding limits of authority
Safety action taken	**VIA** issued Notice HQ14-21 to address the risk of three locomotive engineers in an operating cab in the pre-trip briefing. In response to a **TC** notice, **VIA** increased both physical and computerized monitoring on the Kingston Subdivision to ensure that train crews were complying with speed restrictions and implemented an internal oversight program to ensure that this monitoring was conducted regularly.

Rail investigation report R14Q0045

Date	06 November 2014
Location	Near Tellier, Quebec
Company	Quebec North Shore and Labrador Railway (QNS&L)
Event	Main-track derailment
Safety action taken	**QNS&L** implemented several measures aimed specifically at managing ground hazards and improving rail operation.

Rail investigation report R14Q0047

Date	05 December 2014
Location	Parent, Quebec
Company	VIA Rail Canada
Event	Crossing collision with vehicle
Safety action taken	Following a **TC** inspection at the St-Maurice Subdivision crossing, **CN** installed the railway crossing sign, the private crossing sign, and the stop sign on a single post to avoid obstructing the view of other signs. Following the accident, more medical equipment and medication are available at the Haut-Saint-Maurice health and social services centre point of service in Parent so that several patients can be treated at the same time. The **La Tuque fire department** (Parent area) acquired hydraulic spreader extrication equipment, extensible poles, and various small tools, and all personnel received training on the equipment.

Rail investigation report R14C0142

Date	26 December 2014
Location	Banff, Alberta
Company	CP Rail
Event	Main-track derailment
Safety action taken	**TC** requested that the railway industry formulate rules with regards to joint bar inspections and repairs in continuous welded rail territory.

Aviation

Aviation investigation report A12Q0216

Date	22 December 2012
Location	Sanikiluaq, Nunavut
Aircraft	Fairchild SA227-AC Metro III
Event	Low-energy rejected landing and collision with terrain
Safety action taken	**Perimeter Aviation LP** has centralized various dispatch/operations functions in a systems operations control centre (SOCC) at the Winnipeg main base, and procedures have been enhanced. Route/charter packages have been developed and populated on the company intranet site and the charters checklist has been improved. Also, the passenger briefing procedure has been changed to ensure uniformity in the briefing delivered. Metro II and Metro III Standard Operating Procedures (SOPs) were modified to include a section on stabilized approaches, each of the GPWS warnings, and associated mandatory action.

Aviation investigation report A13Q0021

Date	03 February 2013
Location	Sept-Îles Airport, Quebec
Aircraft	Eurocopter AS350 BA Helicopter
Event	Loss of control during hydraulic pressure failure training
Safety action taken	**TC** has issued an Airworthiness Directive requiring a protection flap on the identified HYD TEST switch.

Aviation investigation report A13W0120

Date	19 August 2013
Location	Yellowknife Airport, Northwest Territories
Aircraft	Douglas DC-3C
Event	Engine failure after take-off and collision with terrain
Safety action taken	**Buffalo Airways** has begun to enforce the practice of weighing individual passengers and baggage in order to calculate a weight and balance prior to departure. The company has also contracted the development of net take-off flight path charts for its flights. **TC** approved a revised Company Operations Manual for Buffalo Airways. As a result of this occurrence, the company revised and reissued a new Company Operations Manual; re-organized the roles and responsibilities of management personnel; and appointed new staff.

Aviation investigation report A13H0002

Date	09 September 2013
Location	M'Clure Strait, Northwest Territories
Aircraft	MBB BO 105 S CDN-BS-4 (helicopter)
Event	Collision with water
Safety action taken	**TC's Aircraft Services Directorate (ASD)** issued information to all Canadian Coast Guard (CCG) helicopter pilots to remind them of the hazards and of the ASD Company Operations Manual directions related to low-level flight operations and established new minimum operating altitudes. New and improved life jackets and personal locator beacons with simple activation systems were obtained for the new helicopter fleet acquired to replace the BO 105. An Operations Quality Assurance and Control system was implemented. **Canadian Coast Guard (CCG)** personnel involved in shipboard operations were reminded to ensure that all vessels engaged in helicopter operations activate the rendezvous feature on the flight following system (FFS). CCG issued an Operations Circular to inform ships fitted with an FFS that the display of GPS coordinates associated with tracking of a helicopter can be easily misinterpreted by the user community and that an incorrect reading will result in incorrectly tracking the helicopter. CCG also issued an operations safety bulletin outlining the roles and responsibilities with respect to the new requirement for all passengers aboard CCG helicopters to wear a CCG-authorized "dry-type" immersion suit, with appropriate thermal protection underneath, under specific conditions.

Aviation investigation report A13C0150

Date	10 November 2013
Location	Red Lake, Ontario
Aircraft	Fairchild SA227-AC Metro III
Event	Loss of engine power – Collision with terrain
Safety action taken	**Bearskin Airlines** updated its SA227 single-engine procedures and amended the aircraft training program to include engine-failure drills. **TC** published a Civil Aviation Safety Alert emphasizing the necessity for securing and verifying that propellers are feathered and secured, for these particular engines, after an engine power loss event. **Honeywell** will require that all turbine blades undergo a hot isostatic pressing process to reduce or eliminate porosity issues in turbine wheel blades and will amend maintenance and fuel nozzle overhaul manuals to eliminate the discrepancy between fuel nozzle testing procedures contained in the two manuals.

Aviation investigation report A13H0003

Date	01 December 2013
Location	Ottawa/Macdonald-Cartier International Airport, Ontario
Aircraft	Piaggio P-180 and de Havilland DHC-8-311
Event	Runway incursion and risk of collision
Safety action taken	**NAV CANADA** reviewed its procedures and published a directive for operating when short-staffed. It also issued an Operational Directive to instruct controllers on the procedure to be followed when a vehicle or aircraft is cleared to cross a runway, and incorporated the information in the Unit Operations Manual. **Ottawa tower** supervisors are encouraging controllers to ask the Ottawa terminal controller for additional spacing when short-staffed.

Aviation investigation report A14C0112

Date	19 March 2014
Location	Winnipeg Richardson International Airport, Manitoba
Aircraft	de Havilland DHC-8-402
Event	Runway incursion
Safety action taken	The **Winnipeg Airport Authority Inc. (WAA)** repainted the degraded hold-short line on Runway 31 and realigned the runway guard light located on the left side of Runway 31 southeast of Runway 36. The WAA has also incorporated new procedures for return-to-service inspections and computer-based inspection tracking software that contains checklists and intervals for specific airfield elements inspections.

Aviation investigation report A14W0046

Date	29 March 2014
Location	Calgary International Airport, Alberta
Aircraft	Beech 1900D
Event	Runway incursion
Safety action taken	The **Calgary Airport Authority (CAA)** issued a letter to all operators at the Calgary International Airport (CYYC), detailing changes to the Airside Traffic Directives, such as the necessity to have an airside vehicle operator's permit (AVOP) licence for aircraft maintenance engineers who tow or taxi aircraft, and equipping all of the CAA's airside vehicles with transponders. **Air Georgian Limited** developed new policies and procedures along with a training program to support maintenance activities related to the taxiing of aircraft. Personnel have been restricted from taxiing aircraft until they have completed training.

Aviation investigation report A14Q0060

Date	13 May 2014
Location	Sept-Îles, Quebec
Aircraft	Eurocopter AS 350 BA (Helicopter)
Event	Collision with wires
Safety action taken	**NAV CANADA** published an Aeronautical Information Circular to provide clarity as to the intended use of individual Aeronautical Information Publications (AIP). An agreement was reached with Hydro-Québec for the exchange of power-line data that may be used as navigational reference on selected charts. **Héli-Boréal Inc**. implemented a safety program to provide financial compensation to its pilots for the purchase of flight helmets. The flight training program has been amended to include flight training improvement techniques for power-line inspection flights and flight training for obstacle avoidance.

Aviation investigation report A14O0077

Date	24 May 2014
Location	Taylor Lake, Ontario
Aircraft	Cessna 185E – Private operator
Event	Loss of control – Collision with water
Safety action taken	No safety action was reported to the TSB further to this investigation.

Aviation investigation report A14H0002

Date	05 June 2014
Location	Ottawa/Macdonald-Cartier International Airport, Ontario
Aircraft	Agusta AW 139 (helicopter) and Airbus 300B4-622R
Event	Runway incursion and risk of collision
Safety action taken	**Ornge Rotor Wing** issued a safety bulletin reminding flight crews to be diligent when receiving and acknowledging air traffic control (ATC) clearances and to ask for clarification when doubt exists. A second safety bulletin describing the pilot's account of the occurrence was also issued to be used by other flight crews as a lessons-learned opportunity. **NAV CANADA** included a review of the event in the Ottawa tower local refresher training for all staff, with emphasis on the importance of using standard phraseology.

Aviation investigation report A14O0105

Date	25 June 2014
Location	Kennedy Lake, Ontario
Aircraft	de Havilland DHC-2 Mk. I
Event	Loss of control on landing
Safety action taken	No safety action was reported to the TSB further to this investigation.

Aviation investigation report A14W0127

Date	04 August 2014
Location	Fort McMurray, Alberta
Aircraft	Boeing 737-36Q and de Havilland DHC-8-402
Event	Risk of collision
Safety action taken	**Canadian North** issued a memo to all pilots raising awareness to avoid mistaking the CYMM Taxiway J for Runway 25. **Fort McMurray Airport Authority** has issued a Notice to Airmen (NOTAM) to caution pilots, stating: "Caution: Do not confuse Txy J with Rwy 07/25." **NAV CANADA** worked with the **CYMM Airport Authority** to ensure caution notes were added to the CFS and CAP about the danger of confusing the Taxiway with the runway. **Meteorological Service of Canada** advised NAV CANADA that the production of an updated Fort McMurray Tower Visibility Chart would be placed on high priority.

Aviation investigation report A14A0067

Date	16 August 2014
Location	Grand Manan, New Brunswick
Aircraft	Piper PA-31 Navajo
Event	Collision with terrain
Safety action taken	No safety action was reported to the TSB further to this investigation.

Aviation investigation report A14O0164

Date	03 September 2014
Location	Sault Ste. Marie Airport, Ontario
Aircraft	de Havilland DHC-8-102 and ZLIN Z242L
Event	Risk of collision
Safety action taken	**Sault College** established an internal notification process for operational issues. A message was distributed to all pilots, requesting them to advise the control tower if spins were planned within 10 nm of the control zone. It also published a memorandum detailing new procedures.

Aviation investigation report A14O0178

Date	26 September 2014
Location	Timmins Victor M. Power Airport, Ontario
Aircraft	Beechcraft B100
Event	Gear-up landing
Safety action taken	**Air Creebec** performed a safety management system investigation, and all findings, and actions taken as a result of findings, were provided to the TSB. An inspection of Air Creebec's other Beechcraft King Air A100 aircraft was performed. As a precaution, the wiring harnesses surrounding the landing-gear drive shaft were resecured to ensure that there would be no possibility of contact in future operations. An in-house maintenance advisory was issued to staff to check for proximity of wiring harnesses to surrounding rotating parts. Contact was made with other operators using the same type of aircraft to make them aware of the potential for this type of event.

Aviation investigation report A14Q0148

Date	28 September 2014
Location	La Tabatière, Quebec
Aircraft	de Havilland DHC-6-300
Event	Runway excursion
Safety action taken	**Air Labrador Limited** issued a directive to all crews on landing restrictions for first officers (FO) with less than 1,000 hours on type. A directive regarding flap setting on airstrips shorter than 2 000 feet was also issued, and the SOPs and normal landing checklist were amended.

Aviation investigation report A14W0181

Date	20 November 2014
Location	Yellowknife, Northwest Territories
Aircraft	Cessna 208B
Event	Severe icing encounter and forced landing
Safety action taken	**Air Tindi Ltd.** Cessna 208B operations were completely suspended immediately after this accident. The company conducted a safety management system investigation into the accident to determine the root cause and contributing factors. Following the implementation of, among other things, enhanced C208 captain training, improved procedures, and the creation of a service desk, Cessna 208B service was restored. The company training in surface contamination and Caravan captain training syllabi were amended to mitigate negative transference of training. A new emergency response plan that encompasses each department has been developed. Training and drills are being conducted to ensure that employees are comfortable with the manual. The *Cessna 208B Quick Reference Handbook* (QRH) / Emergency Checklist has been amended to add activation of SKYTRAC emergency mode.

Aviation investigation report A14O0217

Date	11 November 2014
Location	Whitney, Ontario
Aircraft	Cessna 150M
Event	Collision with terrain
Safety action taken	**Flyblocktime Incorporated** issued a safety bulletin to associated pilots, reminding them of the company's requirement to obtain flight following on all cross-country flights at night and reminding them to file flight plans. Pilots were informed that they may not have an instructor supervise their actions without advising the company in writing and obtaining company approval. All pilots were asked to sign an agreement stating that they will not use the aircraft for training purposes.

Appendix B – Glossary

Accident	In general, a transportation occurrence that involves serious personal injury or death, or significant damage to property, in particular to the extent that safe operations are affected (for a more precise definition, see the *Transportation Safety Board Regulations*)
Incident	In general, a transportation occurrence whose consequences are less serious than those of an accident, or that could potentially have resulted in an accident (for a more precise definition, see the *TSB Regulations*)
Occurrence	A transportation accident or incident and any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident
Recommendation	A formal way to draw attention to systemic safety issues, normally warranting ministerial attention
Safety advisory	A less formal means for communicating lesser safety deficiencies to officials within and outside the government
Safety concern	A formal way to draw attention to an identified unsafe condition for which there is insufficient evidence to validate a systemic safety deficiency, but where the risks posed by this unsafe condition warrant highlighting
Safety information letter	A letter that communicates safety-related information, often concerning local safety hazards, to government and corporate officials