Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

2014-15 Annual Report to Parliament

Canada

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11 June 2015

The Honourable Peter Van Loan, P.C., M.P.
Leader of the Government in the House of Commons
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 2014 to 31 March 2015.

Yours sincerely,

Original signed by

Kathleen Fox
Chair

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Message from the Chair

For 25 years, the Transportation Safety Board of Canada (TSB) has advanced transportation safety by investigating accidents and incidents and then reporting publicly on what it finds. That's thousands of investigations and countless lessons learned. Although Canada and the transportation industry have changed significantly over that time, one thing has stayed constant: the TSB's determination to find out what happened, and why, so that steps can be taken to prevent it from happening again.

It's a commitment that hasn't wavered since the TSB's first investigation back in 1990, but today it's facing new challenges. That's because the world has grown ever more connected over the past two and a half decades. Today, information requests arrive within hours of an accident, often before our investigators are on site. The Twittersphere is even quicker: demanding photos, facts, conclusions—sometimes before they exist!

Fortunately, the extraordinary men and women who work at the TSB are up to the challenge, and they know that the increased scrutiny means our standards have to be higher than ever. With the whole world watching, we make sure each investigation takes the time required to ensure that it's done right. That means thorough data-gathering, rigorous analysis, and findings that can withstand the most intense examination.

This year, our Annual Report to Parliament is available in a new electronic format. It features a number of major achievements from the past year, including the 2014 edition of our safety Watchlist, which identifies those issues posing the greatest risk to Canada's transportation system; an update on railway safety actions taken after completion and public release of the investigation report into the devastating derailment and fire in Lac-Mégantic, Quebec; and the re-launch of the TSB's confidential reporting system, known as SECURITAS. As usual, the Annual Report also highlights the recommendations that have received our highest rating of **Fully Satisfactory**, as well as other areas where progress hasn't been as widespread as we'd like, and where the regulator must work with industry stakeholders to carry out further improvements.

Going forward, we plan to spend the next 25 years doing more of what has made us successful so far: investigating accidents from coast to coast to coast, and then making sure that those best placed to effect change are kept well informed. Our Outreach program, for instance, sees TSB personnel make over 160 presentations a year in almost every province and territory. Because no matter where things go wrong—on our waterways, along our pipelines or railways, or in the sky—Canadians need to have confidence that we'll find the answers. For 25 years, they have placed that confidence in us, and it's one we will never stop striving to maintain.

Kathleen Fox

What we do

Mission

The 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 function of the Board 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 that 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 approximately 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, and 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, including airline pilots, air traffic controllers, locomotive, track and chief engineers, rail traffic controllers, human factors and education specialists, pipeline experts, computer technicians, ship masters, naval architects, fishermen, 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, re-creating vessel voyage tracks using electronic technologies, or establishing investigation cooperation arrangements with other state administrations, these men and women have spent a quarter of a century making the TSB a world leader in transportation safety.

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 the successful achievement of 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 2014–2015, the TSB continued to implement the objectives set by senior management in its five-year Strategic Plan. Significant progress was made in such key areas as information management, increasing awareness of the TSB and its work, and maintaining a knowledgeable and professional workforce.

Because the TSB's work is fundamentally reliant on the collection, retention, management and analysis of occurrence information, management continued to prioritize the enhancement of its information-management processes and tools. Progress was made in formally identifying and documenting information resources of business value and the related repositories, and consequently updating information management policies and practices. To the extent possible, the TSB also transitioned to a digital-only approach for information management, and implemented monitoring tools for e-mail and digital records. The department also modernized the database that manages information on Aviation occurrences. Notably, the TSB now publishes data extracts on its website along with other occurrence information, in order to provide public access to more detailed information.

In an effort to increase the uptake of recommendations and other safety communications, the TSB endeavoured to raise awareness of transportation safety issues through continuously improved communication products, and emphasizing outreach activities. As part of this effort, the TSB updated its Watchlist and focused outreach activities around the safety issues representing the greatest risks to Canada's transportation system. The organization also maintained its commitment to providing information in a timely manner.

Strategic human resources management was also improved with investments in training and development of TSB employees. Last year, a particular focus was placed on updating the accident investigator training program; implementing mandatory critical incident stress management training; updating the manual of investigations; and streamlining some components of the report-production process.

Transportation Safety Board awards

In June of each year, the TSB honours outstanding employees for their efforts. In 2014, six individuals were recognized for making valuable contributions to the public service. The recipients of the Transportation Safety Board awards have provided tremendous leadership on critical TSB projects, often under difficult conditions.

Outstanding achievement award: This award was given to Jonathan Lee, the Manager, Regional Operations (Western) in the Aviation Branch, for his work investigating a mid-air collision between two aircraft near Warrenton, Virginia. Because one of its own employees was involved in the accident, and to avoid a conflict of interest, the U.S. National Transportation Safety Board asked the TSB to conduct the investigation on its behalf. The task of leading the high-profile and politically-sensitive investigation fell to Jonathan, whose exemplary performance delivered a report that met the highest standards.

Excellence in leadership award: This award was presented to Don Ross, a Senior Investigator in the Rail Branch, who was recognized for the exemplary job he performed as leader of the Lac-Mégantic investigation team. This difficult task involved overseeing the large on-site team of TSB experts, as well as coordinating efforts with numerous municipal, provincial, and federal agencies—all while simultaneously managing an unprecedented level of media interest.

Impact award: This award was given to Glenn Budden, a Senior Investigator in the Marine Branch, for his tireless efforts to improve the fishing safety culture by conducting thorough investigations, and doing outreach and advocacy to get the safety messages out to fishermen.

Client service award: This award was presented to Emmanuel Salmon, a Senior Analyst with the Access to Information group. Despite particularly challenging circumstances, which included a 40% increase in information requests, Emmanuel consistently demonstrated a positive attitude and an exemplary level of engagement while providing exceptional service to both TSB employees and external clients.

Excellence in investigation award: This award was presented to two teams in 2014. The first, under the leadership of Senior Aviation Investigator Brian MacDonald, investigated the crash of First Air flight 6560 in Resolute Bay, Nunavut. The second, led by the Regional and Head Office Operations Manager Rob Johnston, investigated the fatal derailment of a VIA Rail train in Burlington, Ontario. Both teams carried out ground-breaking work that led to safety recommendations aimed at addressing longstanding issues in the aviation and rail modes.

Public Service Award of Excellence

The TSB's Lac-Mégantic team was also recognized with the **Public Service Award of Excellence**. The team received the award in the category of *Exemplary contribution under extraordinary circumstances*, which "recognizes teams or departments that have performed their duties in an exemplary manner under extraordinary circumstances and in a manner that constitutes a contribution of unusual merit to Canada." This award was presented to the team by the Governor General and the Clerk of the Privy Council at Rideau Hall in September 2014.

25 years of advancing transportation safety

On March 29, 1990, Canada brought together its marine, pipeline, railway, and aviation accident investigation expertise under one roof at the Transportation Safety Board of Canada (TSB). As an independent agency, the TSB's sole objective is to advance transportation safety.

Since its inception, the TSB has conducted thousands of investigations across the modes it investigates. Some major investigations have included:

- The 02 September 1998 in-flight fire and collision into water of Swissair Flight 111 near Peggy's Cove, Nova Scotia.
- The 22 March 2006 striking and subsequent sinking of the passenger ferry Queen of the North in British Columbia.
- The release of over 230 cubic metres of crude oil following the 2007 puncture of the Westridge Dock Transfer Line in Burnaby, British Columbia.
- The 06 July 2013 derailment and fire of a runaway Montreal, Maine and Atlantic crude oil unit train in Lac-Mégantic, Quebec.

The TSB also conducted dozens of smaller investigations each year, and these too have led to numerous advances in transportation safety. For instance, vessels trading internationally must now carry survival suits for all crewmembers. Pipeline companies have integrity management programs to deal proactively with system deficiencies. Railway companies have removed thousands of defective wheels from service and implemented better systems for tracking components. In aviation, a greater number of aircraft now require equipment to help avoid collisions with terrain, and pilots now use improved information to land at smaller airports in low visibility.

Over the years, TSB expertise has also been called upon around the world. In 1991, the TSB provided extensive assistance to the government of Saudi Arabia following a fatal crash of a Canadian-registered aircraft. A TSB investigator served as investigator-in-charge in a Nepalese aviation accident investigation in 1992. More recently, the TSB assisted New Zealand in its investigation of a 2009 ferry accident, which was conducted on behalf of the Kingdom of Tonga. And in 2012, the TSB was asked by the U.S. National Transportation Safety Board to lead an investigation into a mid-air collision in Virginia, in which one of its own employees was involved. The TSB's Laboratory, meanwhile, routinely assists other countries with flight recorder analysis.

These and other efforts have helped contribute to our reputation as a world leader in accident investigation, but we're also busy—and proactive—at home. Our safety Watchlist, first implemented in 2010, has been an excellent tool for drawing attention to the issues posing the greatest risk to Canada's transportation system. As a result, both Canada's regulator and industry members have placed a greater priority in addressing these issues, and we have seen marked progress. We have also been more active in communicating with Canadians, especially via our website and social media, as we strive to make more information about accidents and investigations available sooner.

As transportation continues to evolve, the one constant in all of our work has been change itself: new challenges are constantly arising, and we must adapt and respond in kind. The introduction of safety management systems (SMS), for example, has pushed companies in all transportation modes to take a greater role in managing their own safety—and led investigators to examine not just the organizational processes they put in place to do so, but the oversight that is then provided by the regulator. An increase in North American crude oil production, meanwhile, has led to a staggering increase in oil shipments by rail—and a brighter spotlight on our related investigations. Finally, with technology itself evolving at such a rapid pace, the sheer-amount of technical know-how required to do our jobs grows almost daily. This, combined with the proliferation of 24/7 news channels, portable devices, and the global reach of today's Internet, means that the demand for information—and the requirement for us to respond and deliver—has never been greater.

That's a lot of change for one country, and for one organization. Looking ahead, the TSB will continue to investigate accidents, keep pace with changes in the industry and technology, and effectively communicate what we learn to Canadians and the world.

The transportation safety landscape

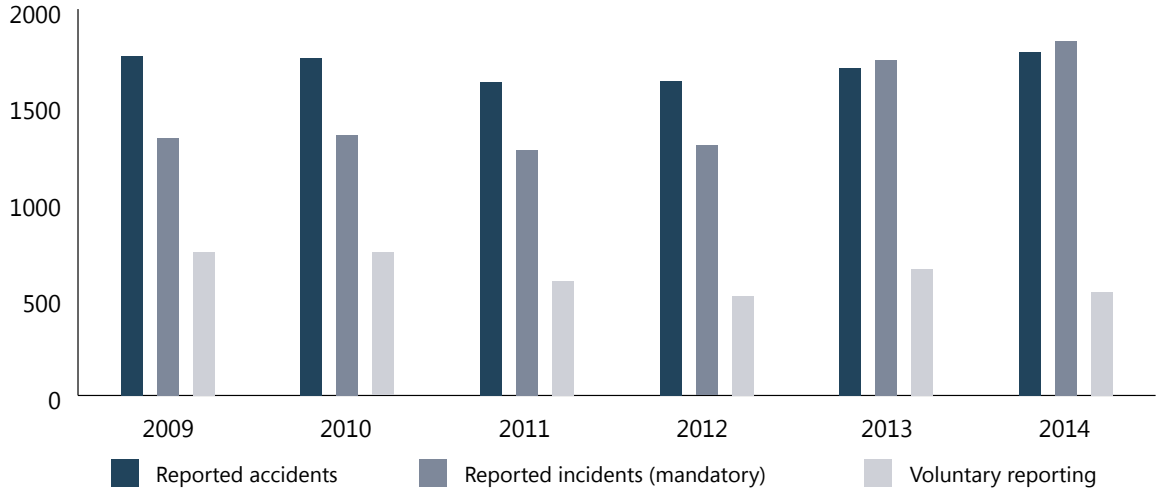
In 2014, 1,780 accidents and 1,834 incidents were reported in accordance with the TSB's regulations for mandatory reporting of occurrences.[1] The number of accidents in 2014 increased by 5% from the 1,697 accidents reported in 2013, and increased by 5% from the 2009–2013 annual average of 1,691 accidents. The number of reported incidents increased to 1,834 in 2014 from 1,736 in 2013, and increased from the 2009–2013 average of 1,396. In 2014, the TSB also received 535 voluntary reports.[2] Fatalities totalled 90 in 2014, down 57% from the 2013 total of 211, and down from the 2009–2013 average of 170.

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 2014–2015, investigations were undertaken for 50 of the occurrences reported to the TSB. In that same period, 51 investigations were completed, compared with 69 in the previous year.[3] The number of investigations in progress decreased slightly to 66 at the end of the fiscal year from 67 at the start. The average time to complete an investigation increased to 506 days in fiscal year 2014–2015 compared to the previous five-year average (495).

Figure 1: Reported occurrences



1 While the Board's operations are for the 2014–2015 fiscal year, occurrence statistics are for the 2014 calendar year unless otherwise indicated. Please note that, in a live database, the occurrence data are constantly being updated. Consequently, 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**.

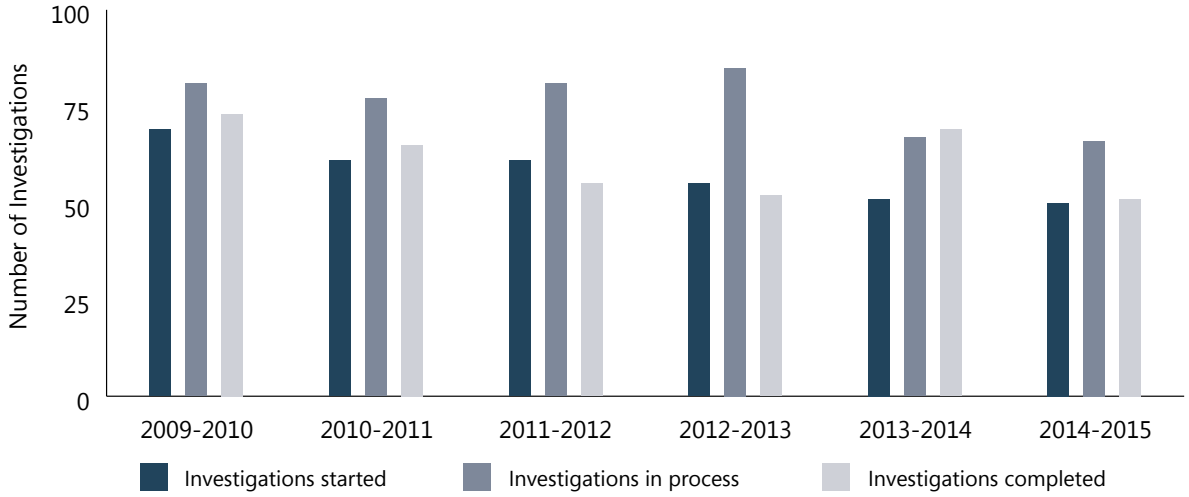
2 "Voluntary reports" refers to all occurrences reported to the TSB that are not required to be reported under the ***Transportation Safety Board Regulations***.

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 2014–2015 by sector.

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, communicating lessons learned, 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 2014–2015, in addition to investigation reports, the TSB issued a total of 50 safety communications,[4] including two recommendations, 26 safety advisories, 20 safety information letters, and two safety concerns.

Table 1: Safety communications

Sector	Recommendations	Safety advisories	Safety information letters	Safety concerns
Marine	0	6	12	0
Pipeline	0	0	0	0
Rail	2	16	5	0
Aviation	0	4	3	2
TOTAL	2	26	20	2

Knowledge 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.

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

For example, regulators such as Transport Canada (TC) have issued emergency directives to the railway industry requiring inspections and replacements based on the TSB's preliminary findings. In these situations, the TSB reports on the corrective actions already taken by industry and government. When an investigation identifies a serious or systemic safety issue, 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 re-assessments of industry and government responses to its recommendations.

Board assessments of responses to recommendations

Since 1990, the Board has reviewed the responses to a total of 559 recommendations. Many of these recommendations have led to positive change. As of 31 March 2015, Board recommendations that achieved **Fully Satisfactory** status increased to 76% from 74% the year before, indicating that change agents have taken action that will substantially reduce the safety deficiency. Another 5% 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.

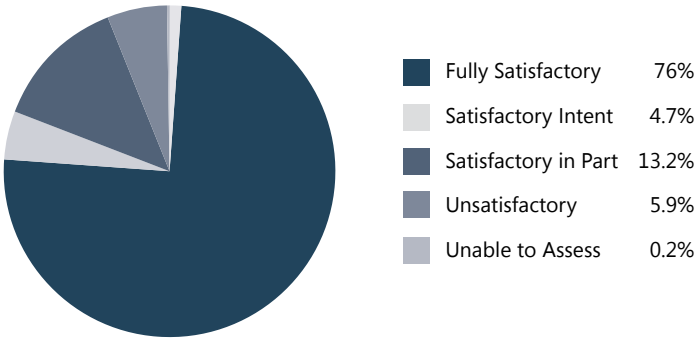
In 13% of cases, a rating of **Satisfactory in Part** was issued, which means change agents have taken or plan to take action that will only partially address the deficiency. The remaining 6% of responses received a rating of **Unsatisfactory**, as change agents have not, and do not plan to, take action that will address the deficiency. The Board has been unable to assess the response to one recommendation due to a lack of new information from 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, 1990–2015

	Marine	Pipeline	Rail	Air	Recommendations	%
Number of recommendations	147	20	139	253	559	100
Fully Satisfactory	122	20	125	158	425	76
Satisfactory Intent	10	0	5	11	26	4.7
Satisfactory in Part	8	0	9	57	74	13.2
Unsatisfactory	7	0	0	26	33	5.9
Unable to Assess	0	0	0	1	1	0.2
Not Yet Assessed	0	0	0	0	0	0

Figure 3: Ratings of assessed responses, 1990–2015



Communicating transportation safety

Communicating by the numbers

Mentions in the media

Keeping Canadians informed, from coast to coast to coast: Over **6700** different mentions of the TSB in radio, web, TV, and print media, an increase of 10% from last year.

Media inquiries

Staying connected to the people who keep you connected. **1357** enquiries received this year.

Social media

More popular all the time: A record-breaking number of views on YouTube and Flickr!

- YouTube: **213 569** views this year—more than double our previous lifetime total
- Flickr: **2 402 695** photo views this year—almost double our previous lifetime total

We surpassed **12K** Twitter followers this year, more than doubling our previous total of 5248!

Web metrics

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

- Total page views: **435 547**
- Total users: **95 258**
- Total sessions: **144 213**

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, and...)

- **73** news releases
- **82** deployment notices
- **9** media advisories

Statistics

The TSB Human Factors and Macro-Analysis Division published annual and monthly statistical reports and responded to **422** requests for complex transportation occurrence database information.

Outreach

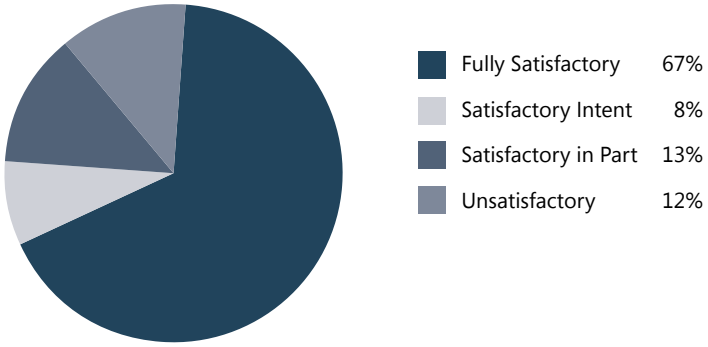
TSB staff and Members of the Board continue to reach out to government and industry stakeholders. There were **164** events this year, an approximate 60% increase from 2013-2014.

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.

This year, one of the issues on the Watchlist is brand new. Another issue, controlled flight into terrain, has been removed thanks to new TC regulations that will require more aircraft to have terrain awareness and warning systems. Three other issues, meanwhile, have been expanded, but the final four remain unsolved. These holdovers from previous editions of the Watchlist are a clear indicator that stakeholders within the transportation industry must up their game, acting in concert with TC, to address these critical issues.

Figure 4: Ratings of assessed responses to Watchlist recommendations, 1990–2015



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

Marine

Loss of life on fishing vessels

Although fish harvesters have long known that their job carries risks, one disturbing statistic stands out: approximately once a month across Canada, someone is killed in the commercial fishing industry. This figure has remained unchanged for too long, but the TSB is convinced things don't have to be this way. In fact, in the three years since the TSB released its ground-breaking 2012 report into fishing safety in Canada, a dialogue has taken place. Whether they're on the wharf or at association meetings, many fishermen are making safety issues top of mind. However, while industry response has been encouraging, growing awareness has not yet translated into a reduction in the number of serious accidents.

Nor has growing awareness translated into regulatory action, as TC has yet to finalize its promised fishing vessel safety regulations. In 2008, TC indicated that pre-publication of the proposed regulations was expected in the fall/winter of 2009-2010, but it has been repeatedly postponed. While the regulations are expected to play an important part in improving safety in Canada's fisheries, the delays are unreasonable. The risk to fishermen, meanwhile, remains. For this reason, six of the Marine Branch's active Watchlist recommendations now languish at the TSB's lowest level of assessment: **Unsatisfactory**.

Rail

Railway crossing safety

Much of the improvement in safety this year stemmed from the implementation of new grade crossing regulations (GCR), which came into force on 17 December 2014. This is a major step. Given that all grade crossings must meet the safety requirements of the GCR within the next five years, 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

This is a new issue on the TSB's Watchlist. Put simply, the increase in the transportation of flammable liquids, such as crude oil, by rail across North America has created emerging risks that need to be effectively mitigated. Although TC now requires emergency response assistance plans whenever large volumes of liquid hydrocarbons are being transported, other associated risks must also be addressed. These include better route planning and analysis, ongoing risk assessments, and the longstanding 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

Since 2004, there has been an average of 30 occurrences per year where a train crew did not respond appropriately to a signal indication displayed in the field. When this type of occurrence results in a train collision or derailment, it may present a significant risk to the public and the environment. 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. This has occurred in a number of recent investigations, with TSB findings, recommendations and other safety communications identifying human factors as an underlying safety issue. Many of these investigations would have benefitted from a recording of crew communications and interactions immediately prior to an accident. What's needed is for the railway industry to ensure that communications and interactions in locomotive cabs are recorded. The TSB is committed to working with the regulator and the railway industry to explore ways of making progress on this issue.

Air

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. These efforts continue to be delayed.

Risk of collisions on runways

There remains an ongoing risk of aircraft colliding with vehicles or other aircraft on the ground at Canadian airports, a situation industry calls an "incursion."

Given the millions of take-offs and landings each year, incursions are relatively rare, but their consequences could be catastrophic. Since the TSB first placed this issue on its Watchlist in 2010, the number of these occurrences has remained at approximately one a day or more. Despite the Board's concern, TC has not done enough 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) does not extend to smaller carriers such as air taxis and commuter airlines, or to other types of operations such as helicopter operators and flight-training schools—even though these are responsible for over 90% of all commercial aviation accidents and fatalities. In the **marine mode**, the TSB continues to push for the introduction of formal safety management processes on smaller commercial vessels, and TC must oversee those processes. In the **rail mode**, meanwhile, two problems have been observed: a failure to identify companies' ineffective processes, and an imbalance between auditing processes and traditional inspections.

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.

Lac-Mégantic investigation

In August 2014, the TSB released the final report into its investigation of the 06 July 2013 Lac-Mégantic train derailment. The TSB investigation identified 18 distinct causes and contributing factors, many of them influencing one another. The investigation report also contained 16 findings as to risk which were related to unsafe acts, unsafe conditions, or safety issues with the potential to degrade rail safety. Two additional recommendations were made to the Minister of Transport and two new safety advisories were issued at that time. Overall, a total of 13 safety communications were issued: five safety recommendations, six safety advisories, and two safety information letters.

The *Canadian Transportation Accident Investigation and Safety Board Act* requires that federal ministers provide formal responses to the TSB describing the action taken or planned in response to its recommendations. The Board then assesses responses to recommendations according to the extent to which the underlying safety deficiency has been, or is being, addressed. The Minister of Transport, and where appropriate, the United States (U.S.) regulatory agencies, have responded to the TSB recommendations. Formal responses to other types of safety communications are not mandated through legislation; however, the regulators have implemented a number of measures following the release of all of our safety communications and the findings contained in our final report. The following tables provide a brief summary of the safety action that was taken, and what still needs to be done to improve railway safety.

Class 111 Tank cars, Route planning, and Analysis of infrastructure

Safety communications	Safety action taken	Action still required
R14-01: Vulnerability of class 111 tank cars R14-02: Route planning and analysis	TC worked with the U.S. regulators to develop enhanced protection standards, including a harmonized tank car standard, retrofit requirements and implementation timelines. TC developed a gradual phase-out schedule for legacy Class 111 tank cars using a risk-based approach after assessing the capacity of industry to retrofit existing tank cars and to build new tank cars. TC issued an Emergency Directive relating to the operation of key trains carrying dangerous goods. Risk assessments prepared by the railways for key routes are being reviewed by TC. For other railways not meeting the key route criteria, TC is monitoring the railway's route planning and analysis and risk assessments. TC issued a Ministerial Order requiring railways to formulate new rules to improve their operating practices for the safe and secure transportation of dangerous goods.	Based on TC's proposed schedule, some Class 111 tank cars can remain in selected flammable liquid service until 2025. Strategies for route planning and analysis must consider the risks when using Class 111 tank cars during the phase-out period. Risk control measures during this transition must be actively managed and must include a thorough review of the operational and infrastructure risks. New rules or regulations relating to key trains and key routes must be developed and implemented.

Train securement

Safety communications	Safety action taken	Action still required
R14-04: Additional physical defences to prevent runaways RSA-08/13: Securement of unattended locomotives RSA-09/13: Securement of equipment and trains left unattended	TC issued an Emergency Directive that mandates the use of a hand brake chart specifying the minimum number of hand brakes required. Additional levels of defence have been mandated including a hand brake effectiveness test, followed by the application of hand brakes on the lead locomotives and air brakes on the entire train. The Emergency Directive also mandates the use of additional physical defences to strengthen the existing rules for securement of equipment. TC issued a Ministerial Order requiring the railways to submit for approval, new rules respecting the securement of railway equipment.	New rules or regulations must be developed and implemented to address the provisions of the Emergency Directive on a permanent basis. If necessary, additional improvements must be implemented during the final rule-making process to ensure that any identified gaps are addressed.

Transportation of flammable liquids by rail

Safety communications	Safety action taken	Action still required
R14-03: Requirement for Emergency Response Assistance Plans (ERAP) RSA-12/13: Determination of petroleum crude oil properties (TC) RSA-13/13: Determination of petroleum crude oil properties (PHMSA) RSA-06/14: Monitoring program for the classification of mined gases and liquids	TC issued a Protective Direction that required any person engaged in importing or offering crude oil for transport to immediately test the classification of the oil, if the testing had not been conducted since 07 July 2013, and to provide the test results to TC upon request. TC prioritized the verification of proper classification documentation as part of its dangerous goods inspections. TC increased the frequency of inspections for the higher risk transportation of dangerous goods (TDG) sites. TC initiated further research into crude oil properties through the testing of samples at different sources in the supply chain. TC issued a Protective Direction that required an approved ERAP for the transportation of higher-risk hydrocarbons and flammable liquids such as petroleum distillates, crude oil, gasoline, diesel, aviation fuel and ethanol. The requirements of the Protective Direction were then incorporated into the *Transportation of Dangerous Goods Regulations*. TC established a task force to focus on ERAP activation processes, cooperative industry approaches and the promotion of unified incident command structures. The task force includes representatives from municipalities, first responders, railways and shippers. The U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) has continued to conduct its Operation Classification initiative to verify that crude oil is being properly classified along the transportation chain. In January 2014, PHMSA issued a Safety Alert indicating that the type of crude oil being transported from the Bakken region may be more flammable than traditional heavy crude oil.	TC must continue to review its monitoring and inspection program to ensure that mined gases and liquids, such as petroleum crude oil, are accurately classified throughout the transportation cycle.

Audit, oversight and training

Safety communications	Safety action taken	Action still required
R14-05: Audit and oversight of Safety Management Systems (SMS) implementation RSA-07/14: Adequacy of shortline railway training	New SMS Regulations were expected to come into effect on 01 April 2015, requiring railway companies to implement a formal framework that integrates safety into their day-to-day operations. TC has committed to auditing every component of a railway's SMS on at least a 3-to-5 year cycle. TC has proposed amendments to the *Railway Safety Act* that will give the Minister the power to order corrective measures if it is believed that a company is applying its safety management system in a way that compromises railway safety. The Railway Association of Canada identified the need for enhanced attention to safety culture amongst its membership, including the need to improve shortline railway training. TC has asked all shortline railways to submit their training plans and will review them to ensure they are adequate.	As the railway industry continues to make progress towards improved safety culture, TC must demonstrate that its oversight regime will ensure that all railways are audited with sufficient scope and at a frequency to confirm that the required processes are effective and that corrective actions are being implemented. TC must ensure that shortline railway employees receive the necessary training to perform their duties in a safe manner.

Although many actions have been taken by TC and the industry, much more remains to be done to fully address the safety deficiencies identified in this investigation. The TSB is committed to continuing its follow-up on the outstanding safety issues, to report publicly on any significant action taken to improve railway safety, and to inform the public on safety issues that have not been resolved.

Outreach program

With the development and implementation of a cross-organization strategy, the TSB has focused its outreach program on meeting with stakeholders who can help advance transportation safety in Canada.

This year, TSB staff and management participated in 106 outreach activities and events. Executives and Members of the Board, meanwhile, took part in an additional 58 activities, for a total of 164. This represents a 60% increase from last year. These activities included speaking engagements and presentations at conferences, along with tours of the TSB's Engineering Lab, in-person and conference-call briefings, and articles in trade magazines. To further broaden our reach, some of the speeches and presentations were posted on the TSB's website. When available, event photos were also uploaded to our Flickr account, and select quotes were tweeted using event hashtags.

While many of our presentations focus on issues that pose the greatest risk to Canada's transportation system, such as those on our Watchlist, specific, issue-based outreach also takes place, either by proactively seeking meeting opportunities or by responding to invitations. Popular subjects included lightweight flight data recorders, fishing-vessel safety, safety management systems and oversight, the TSB's investigation process, and the new TSB Regulations.

As noted, Board Members and executives participated in 58 activities, which included both domestic and international events. Among them were briefings to the Canadian Association of Fire Chiefs, some airport authorities, two Canadian Airport Council committees, and presentations to the Association québécoise du transport aérien (AQTA), the Air Transport Association of Canada, the Shipping Federation of Canada's Mariners Workshop, the International Rail Safety Conference in Australia, two "Crude by Rail" conferences, and the Economic Club of Canada in Ottawa, to name a few. The Chair and Chief Operating Officer also participated in the International Transportation Safety Association's annual meeting, held in New Zealand in 2014.

TSB directors also presented to the Railway Association of Canada's Safety and Operations Management Committee, the Annual Meeting of the Canadian Maritime Law Association's Executive Committee, and gave a presentation on accident investigation and human factors at the University of Toronto. A briefing was also provided on voyage data recorders and the revised TSB Regulations to the Canadian Coast Guard.

TSB employees often provide information to industry groups, including training institutions. For example, one aviation manager gave a presentation at a recurrency seminar hosted by a local chapter of the Canadian Owners and Pilots Association. Other groups included the marine training centre at Georgian College, the Vancouver Police Department, the Toronto Railway Club, and B.C. Coast pilots, in addition to several flight schools.

While some may not always readily accept or agree with our message, there is always general agreement about the importance of transportation safety. Ultimately, TSB outreach activities are multi-purpose: to convince change agents to take action to address TSB-identified safety issues; to maintain stakeholder relationships; and to increase awareness of the TSB role and processes. Those who can address transportation safety risks include, but are not limited to, the regulators, operators, manufacturers, insurers, associations, and other industry stakeholders. Even the Canadian public can help shine a spotlight and raise concerns with their political representatives.

Given the positive feedback we have received, including the increased uptake on our recommendations, we believe we are on the right track to communicate our important messages to those who need to hear them. As we continue to press for change and advance transportation safety, our outreach program is one strategy to help us accomplish that.

SECURITAS re-launch

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, or some employees may not feel comfortable using them. SECURITAS offers an additional way for people to share safety concerns in the aviation, marine, railway, and pipeline industries.

Awareness campaign

Some workers in the transportation industry are aware of the SECURITAS program, but many are not. In fall 2014, the TSB therefore launched a campaign to increase industry workers' and Canadians' awareness of it. An updated SECURITAS brochure and a new animation were released.

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 and/or agencies directly if they are the ones best placed to correct the problem. The TSB may also choose to launch its own investigation, or issue a 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.

Results

Sector	Marine	Pipeline	Rail	Aviation	Total
Number of reports received in 2014–2015	4	0	105	88	197

Marine sector

In 2014–2015, four marine-related reports were received through the SECURITAS program. Two of the reports dealt with regulatory matters, one was related to the failure of equipment, and the other was related to a possible grounding. Below is an example of actions taken.

Possible vessel grounding

A reporter suspected that a passenger vessel had grounded. A TSB Trusted Agent contacted the reporter for more details and investigated further. This included contacting the vessel. The review determined that the vessel had not grounded.

Pipeline sector

There were no pipeline issues raised through the SECURITAS program.

Rail sector

In 2014-15, 105 rail-related reports were received through the SECURITAS program. Some of the common issues included safety at railway crossings, yards, tracks and passenger facilities. Below are examples of actions taken.

Crossing signals

SECURITAS received a report that railway crossing signals located adjacent to a street intersection and integrated with the operation of the roadway signals did not provide adequate signal warning. After clarifying the issue with the reporter and referring to technical documentation, the TSB issued a rail safety information letter to TC. The TSB was informed that the railway and road authority have scheduled this intersection for reconstruction, and will take measures at that time to ensure motor vehicles do not stop on the railway crossing surface.

Access to passenger cars

A reporter was concerned that potential users were not trained to use passenger car wheelchair lifts that had undergone some changes. After confirmation from the reporter about the situation, the TSB issued a rail safety information letter to TC. The regulator confirmed that when modifications are completed, all on-board train and station staff would be trained on how to use the updated lifts.

Condition of brakes

SECURITAS received a report questioning the safe condition of brakes on switcher locomotives. Once it received clarification from the reporter, the TSB issued a rail safety information letter to TC. The regulator followed up to ensure that proper inspection and maintenance procedures were being followed.

Aviation sector

In 2014–2015, 88 aviation-related reports were received through the SECURITAS program. The reports covered a wide range of safety issues including cabin safety; potential hazard/mechanical issues; airworthiness; incident reporting; unsafe pilot/operator; air traffic control–related issues; low flying aircraft; worrisome landing; a near miss; and fatigue/unfit crew. Below are examples of action taken.

Standard operating procedures

A reporter conveyed numerous irregularities regarding a company's maintenance actions and standard operating procedures. The TSB Trusted Agent relayed the information to TC for appropriate action while protecting the identity of the reporter.

Power lines in the dark

A reporter called to advise that all lights were out on power lines that cross a river, concerned for the safety of small aircraft flying low over the river. TC was notified by the TSB because it regulates wire identification. The regulator responded that a NOTAM had been issued.

Obstacle near runway

A reporter informed SECURITAS that while landing at a small airport, they noticed a metal pole located very close to the threshold of a runway, and identified it as a risk to aviation. The TSB Trusted Agent contacted the airport authority who then promptly removed the hazard.

Marine

Making safety a priority from coast to coast to coast

Marine sector

Annual statistics

In 2014, 301 marine accidents were reported to the TSB, down from the 2013 total of 323, and down from the 2009–2013 average of 336. Over the past 10 years, 85% of marine accidents were shipping accidents, while the remainder were accidents aboard ship.

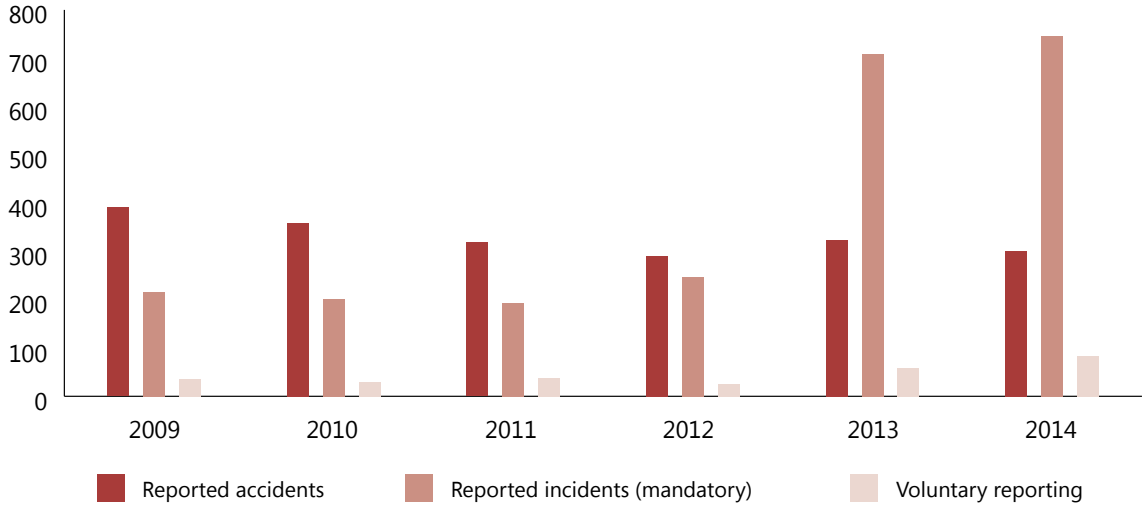
There were 249 shipping accidents in 2014, a 5% decrease from the 2013 total of 262, and a 12% decrease from the 2009–2013 average of 281.

In 2014, there were 52 accidents aboard ship, down from 61 in 2013 and down from the 2009–2013 average of 55. The largest numbers of accidents aboard ship occurred on fishing vessels (33%) and vessels carrying solid cargo (24%).

Marine fatalities totalled 12 in 2014, down from 19 in 2013, and down from the annual average of 16 in 2009–2013. Fishing vessels accounted for 2 of the 4 shipping accident fatalities. In addition, accidents aboard fishing vessels led to 6 of the 8 accident-aboard-ship fatalities. In total, there were 8 fishing vessel fatalities in 2014, down from the annual average of 12 in 2009–2013.

In 2014, there were 746 marine incidents reported in accordance with the TSB mandatory reporting requirements, up from 709 in 2013, and up from the five-year average of 313. 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.

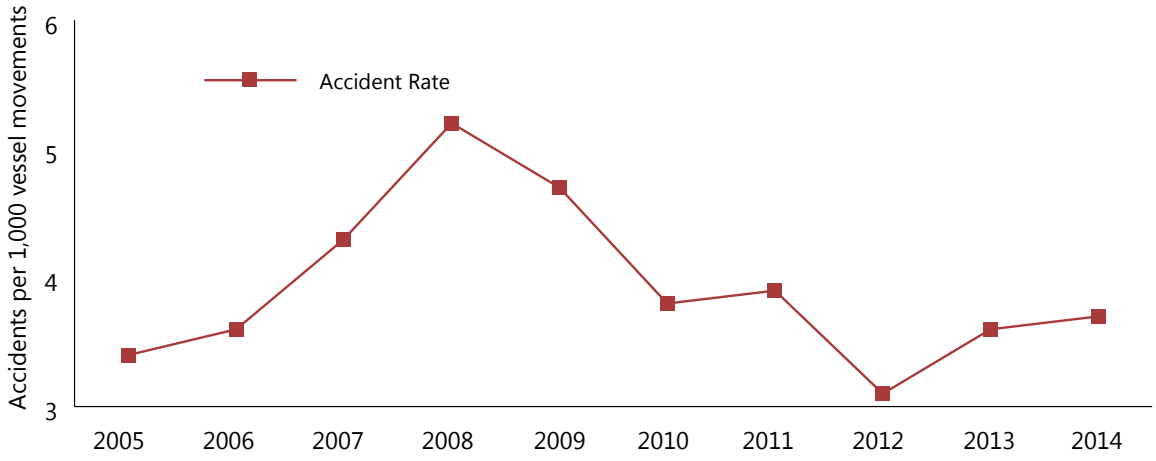
Figure 5: Marine occurrences



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 (GRT) (excluding passenger vessels and cruise ships) increased by 7% from the 2009–2013 average. The 2014 accident rate was 3.7 accidents per 1000 movements, down from the five-year average of 3.8. Marine activity for foreign commercial non-fishing vessels increased by 4.8% from the 2009–2013 average, while the accident rate decreased to 1.5 accidents per 1000 movements from the five-year average of 1.8.

Figure 6: Canadian-flag shipping accident rate



Vessel movements for 2012, 2013 and 2014 are estimated (Source: Transport Canada)

Investigations

In 2014–2015, 12 marine investigations were started, and 12 were completed. On average, investigations were completed within 435 days, an improvement from the 2013–2014 average of 458 and from the previous five-year average of 505.

Table 3: Marine Investigations at a glance

	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015
Investigations started	12	6	9	12	12	12
Investigations completed	9	8	7	10	13	12
Average number of days to complete investigations	530	530	504	522	458	435
Recommendations	1	0	2	0	0	0
Safety advisories	7	5	8	5	6	6
Safety information letters	9	6	6	6	7	12

Recommendations and progress

No marine safety recommendations were issued in 2014–2015. However, the Board reassessed responses to 12 active recommendations. Following the Board reassessments, the ratings were as follows: one **Fully Satisfactory**, four **Satisfactory Intent**, one **Satisfactory in Part**, and six **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 (SMS).

Another 11 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, the Canadian Coast Guard, and TC.

Marine highlights

Twelve marine investigations were concluded in 2014–2015. Some accidents related to Watchlist issues, and a number of occurrences involving passenger vessels (ferries and tour boats) have led the Board to the conclusion that TC enforcement of the amended *Fire and Boat Drills Regulations* is not leading to adequate compliance with regulations as they pertain to passenger safety.

Safety Management Systems (Watchlist)

The TSB has repeatedly emphasized the advantages of Safety Management Systems (SMS) as a framework within which a transportation company may manage safety risks in its operations, such as the risk to passengers' safety in an emergency. Of the three investigations described below, the operating company of the *Louis Jolliet* was not required by TC to implement an SMS and nor had they done so. Although the operators of the *Jiimaan* and the *Princess of Acadia* had implemented SMS on a voluntary basis, third-party audits and inspections were ineffective at ensuring that fundamental safety procedures, such as those pertaining to passenger safety, had been effectively implemented.

The findings of these three investigations are indicative of the key factors in moving forward on the issue of safety management and oversight as identified in the TSB's 2014 Watchlist: a clear regulatory framework requiring companies to implement some form of safety management processes that are effective in identifying hazards and mitigating risks; and balanced regulatory oversight.

Passenger safety on Canadian vessels – *Jiimaan* (M12C0058)

In its investigation into the grounding of the passenger ferry *Jiimaan* on 11 October 2012, the Board found that the vessel's muster list and evacuation procedures did not contain the specific measures called for by the amended regulations and that the crew did not practise their passenger management duties in a realistic way. As a result of that investigation, the Board issued a safety concern stating that if TC inspectors do not assess muster lists and evacuation plans for compliance and adequacy, and if TC does not provide interpretive guidelines, compliance with passenger safety regulations may be inadequate, thereby negating the potential safety benefits of such regulations.

Two further investigations illustrate how the issues persist.

Passenger safety on Canadian vessels – *Louis Jolliet* (M13L0067)

On 16 May 2013, while on a cruise with 57 passengers on board, the passenger vessel *Louis Jolliet* ran aground off Sainte-Pétronille, Île d'Orléans, Quebec. The passengers and some crew members were evacuated, the vessel sustained minor damage, and was refloated at high tide. There were no injuries or pollution reported.

In examining the events following the grounding, the investigation determined that key crew members were not familiar with their emergency duties. The investigation also determined that the emergency procedures in place for the vessel had shortcomings with respect to passenger safety management, and crew members had not practised procedures in a realistic way. Although the task of securing the safety of the passengers was accomplished on the day of the occurrence, the *Louis Jolliet* can carry up to 1000 passengers, highlighting the need for comprehensive and detailed procedures, training, and drills in passenger safety management. The investigation also highlighted the need for effective oversight of passenger safety by TC.

Passenger safety on Canadian vessels – *Princess of Acadia* (M13M0287)

The *Princess of Acadia* was approaching the ferry terminal at Digby, Nova Scotia, on 07 November 2013, with 87 passengers and crew aboard. In preparation for docking, as the bow thruster was started, the main generator blacked out, causing a loss of electrical power and disabling the main propeller pitch control pumps. Once the pitch control pumps stopped, the propeller thrust defaulted toward full astern while the engines were still running, causing the vessel to slow down, stop and travel backwards towards the nearby shoreline until running aground. There were no injuries or pollution reported.

During the course of the investigation, deficiencies were discovered with respect to passenger-related duties, written evacuation procedures, and TC's oversight to ensure compliance with regulations regarding passenger safety emergency procedures.

These three investigations illustrate that not enough has been done by TC to enforce regulations that are in place and to ensure that both operators and inspectors clearly understand the requirements that are intended to ensure that crews are able to manage passengers safely in an emergency.

Pipeline

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

Pipeline sector

Annual statistics

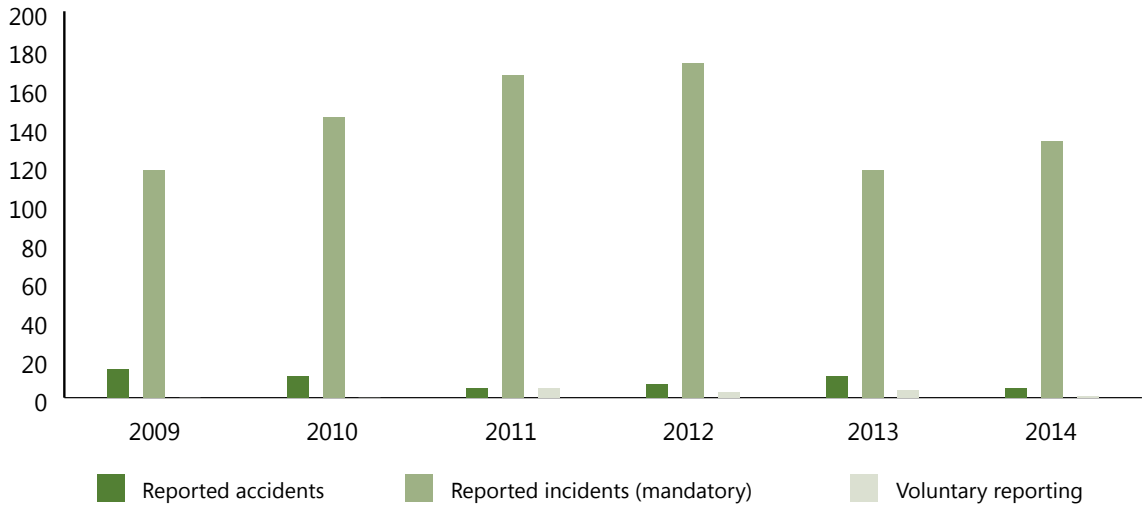
Five pipeline accidents were reported to the TSB in 2014, down from a total of 11 in 2013, and down from the annual average of 10 in the previous five-year period (2009–2013).

The last fatal accident on a federally regulated pipeline system occurred in 1988.

In 2014, 133 pipeline incidents were reported to the TSB, up from 118 in 2013, but down from the annual average of 144 in 2009–2013.

The new TSB Regulations came into effect in July 2014 resulting in changes to the occurrence reporting criteria for the second half of the 2014 calendar year. Under the new reporting provisions, occurrences involving a release of low vapour pressure hydrocarbons are reportable only if they exceed 1.5 m^3.

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 6% from 2013. The 2014 rate was 0.3 pipeline accidents per exajoule,[5] down from 0.8 in 2013, and down from the annual average of 0.8 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 2014–2015, no pipeline investigations were started, and one investigation was completed. The duration of the completed investigation was 665 days, above the average of the previous five years (411 days).

Table 4: Pipeline Investigations at a glance

	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015
Investigations started	3	1	0	3	2	0
Investigations completed	1	3	1	0	2	1
Average number of days to complete investigations	375	432	404	n/a	402	665
Recommendations	0	0	0	0	0	0
Safety advisories	0	2	1	0	1	0
Safety information letters	0	0	0	2	0	0

Recommendations and progress

No pipeline safety recommendations were issued in 2014–2015. With all of the TSB's pipeline recommendations rated as **Fully Satisfactory**, no responses to recommendations were reassessed.

Pipeline highlights

Improved leak-detection technologies (P13H0013)

This year, the TSB released one pipeline investigation report regarding a February 2013 crude oil pipeline leak near Wrigley, Northwest Territories (NWT). The report, published in December 2014, notes that the leak was discovered as part of the industry's proactive efforts to look for leaks and cracks.

During a planned investigative excavation as part of Enbridge Pipelines Inc.'s Line 21 integrity management program, sheen from crude oil was noticed at kilometre post 391 near Wrigley, NWT. Further examination revealed a crack on the pipe surface near a girth weld.

The TSB's subsequent investigation determined that the pipeline failure was a result of internal stress corrosion that had likely initiated prior to the pipeline being commissioned in 1985. The investigation also determined that the methanol used as a drying agent at the time of construction had likely produced an internal pipe environment conducive to the initiation and propagation of stress-corrosion cracking.

As part of the safety action taken, Enbridge Pipelines performed a fitness-for-service assessment of Line 21 and conducted an assessment of currently available leak-detection technologies applicable to the pipeline. A plan was submitted to the National Energy Board outlining the implementation timeline of the updated leak-detection technologies into its engineering assessments of Line 21.

Rail

Influencing changes that improve the safety of the Canadian railway system

Rail sector

Annual statistics

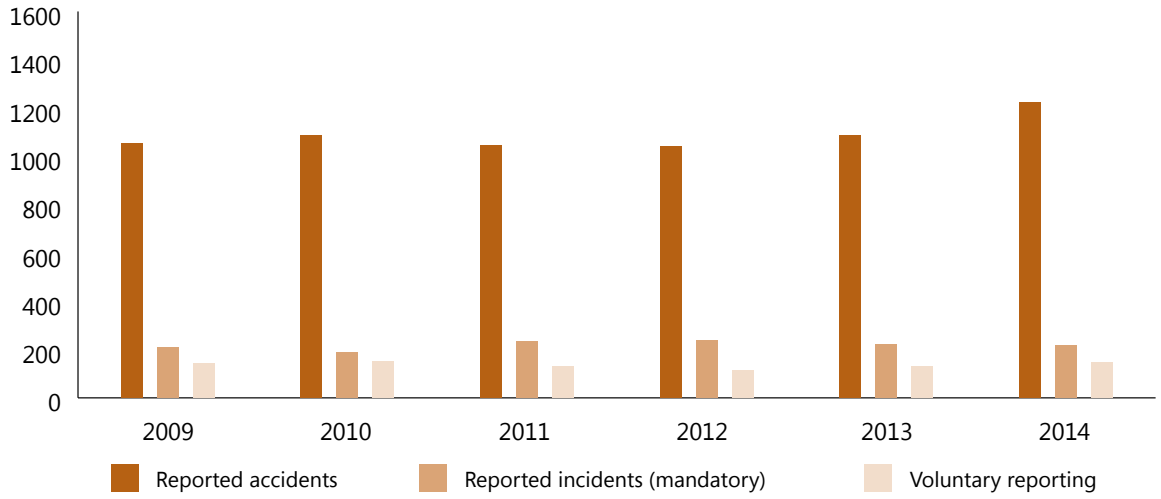
In 2014, 1,225 rail accidents were reported to the TSB, a 13% increase from the 2013 total of 1,087, and up from the five-year average (2009–2013) of 1,063.

Accidents involving dangerous goods totalled 174 in 2014, up from the 2013 total of 145 and up from the five-year average of 131. Of these accidents, five resulted in a dangerous goods release in 2014, compared with the 2013 total of seven and the five-year average of four.

Rail fatalities totalled 57 in 2014, down from the 126 recorded last year and down from the five-year average of 86. Crossing fatalities totalled 21 in 2014, down from 30 in 2013 and from the five-year average of 26. There were 33 trespasser fatalities in 2014, down from 44 the previous year and from the five-year average of 49. In 2014, two rail employees were fatally injured, the same as the five-year average.

In 2014, there were 217 reported rail incidents, down slightly from the 223 recorded in 2013, and comparable to the five-year average of 218. Movement exceeding the limit of authority (59%) continues to be the main incident type since 2006, followed by dangerous goods leakers (29%) and runaway rolling stock (5%).

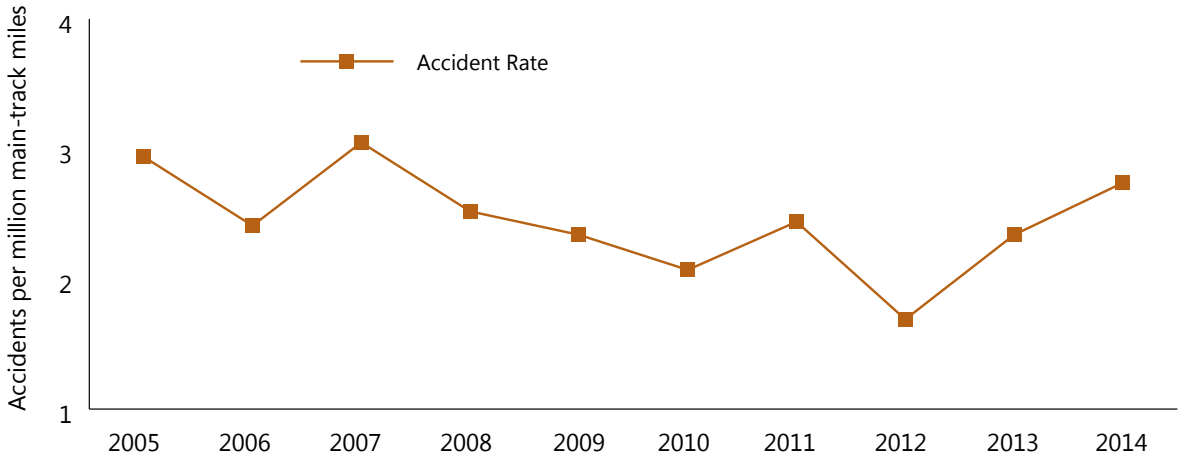
Figure 9: Rail occurrences



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 2014 was 2.7 accidents per million main-track train-miles, up from 2.3 in 2013, and up from the five-year average of 2.2.

Figure 10: Main-track accident rate



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

Investigations

A total of 16 rail investigations were started in 2014–2015, and 16 investigations were completed. The average duration of completed investigations was 494 days, up from the 2013–2014 average of 435 days and above the previous five-year average (455 days).

Table 5: Rail Investigations at a glance

	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015
Investigations started	18	14	17	12	17	16
Investigations completed	13	16	19	16	12	16
Average number of days to complete investigations	499	443	488	409	435	494
Recommendations	4	1	0	0	6	2
Safety advisories	8	9	9	4	17	16
Safety information letters	9	8	18	14	24	5

Recommendations and progress

There were two new rail safety recommendations issued in 2014–2015.

The Board assessed two responses to new recommendations and reassessed responses to 16 active recommendations of the 139 issued since 1990. The Board's reassessments were communicated to change agents for information and action.

Of the 18 active rail recommendations at the end of the fiscal year, four were assessed as **Satisfactory in Part**, four were assessed as having **Satisfactory Intent**, seven were assessed to be **Fully Satisfactory** and three remained to be assessed.

Recommendation R14-04

Both air brake and hand brake systems are subject to failure, as the technology is not fail-proof. And, physical defences that protect against the risk of runaway equipment exist. The TSB has pointed out the need for robust defences to prevent runaways since 1996 (TSB Railway Investigation Report R96C0172). From that time, there have been over 120 runaways in Canada that have affected main-track operations. Equipment runaways are low-probability events, but as the 2013 accident in Lac-Mégantic demonstrated, they can have extreme consequences, particularly if they involve dangerous goods. For this reason, the Board recommended that:

The Department of Transport require Canadian railways to put in place additional physical defences to prevent runaway equipment.

TSB Recommendation R14-04

TC response to Recommendation R14-04

TC will fully implement this recommendation.

On 29 October 2014, TC issued an emergency directive pursuant to Section 33 of the *Railway Safety Act*, requiring railways to improve their operating practices with respect to the securement of railway equipment. TC will be developing monitoring procedures to ensure operators adhere to those requirements.

Also on 29 October 2014, TC issued a ministerial order requiring companies to formulate rules to address the provisions of the emergency directive permanently. The rules are to be filed with TC within 180 days of the issuance of the order.

TC will hire additional specialized staff to strengthen oversight related to train securement and to monitor compliance with these additional levels of defence to prevent runaways.

Furthermore, as of 01 April 2015, enforcement action for any instances of non-compliance will include the option of issuing fines in the event of contraventions to the *Railway Safety Act* and its rules and regulations.

Recognizing that technological solutions may provide for additional improvements to mitigate risks of runaway trains in the coming years, TC will intensify its collaboration with industry through the Railway Research Advisory Board to help lead the implementation of technologies to enhance railway safety.

Board assessment of TC response to Recommendation R14-04

TC has accepted the TSB recommendation.

The Board is pleased with the safety action taken to date and with the accelerated pace of the proposed safety action. These actions include multiple layers of defence such as clarifying the rules for securement, physical defences and enhanced monitoring. If the proposed measures are fully implemented, the risk of runaway equipment will be significantly reduced. As the proposed rules have not yet been developed, and the changes in regulatory oversight (staffing levels, activities, enforcement, and research) are ongoing, some of which will not take place until 2015 or later, the outcome cannot be known until the process is finalized. Therefore, the Board assesses the response to Recommendation R14-04 as having **Satisfactory Intent**.

Recommendation R14-05

Until Canada's railways make the cultural shift to Safety Management Systems (SMS), and TC makes sure that they have effectively implemented SMS, the safety benefits from SMS will not be realized. Therefore, the Board recommended that:

> *The Department of Transport audit the safety management systems of railways in sufficient depth and frequency to confirm that the required processes are effective and that corrective actions are implemented to improve safety.*
>
> *TSB Recommendation R14-05*

TC response to Recommendation R14-05

TC will fully implement this recommendation.

The *Railway Operating Certificate Regulations* now provide for the suspension or cancellation of the Railway Operating Certificate for non-compliance with safety requirements or the *Railway Safety Management Systems Regulations* (SMS Regulations).

TC also proposed changes to the SMS Regulations and published them in the *Canada Gazette*, Part I, on 05 July 2014. The changes improve how railway companies develop, implement, and assess their SMS.

TC is in the process of bringing into force additional enforcement capabilities where it will be able to fine railways for contraventions of the Act, or regulations or rules made under the Act.

TC has also reassessed the required number of inspections and audits. Audits will now be completed on at least a three- to five-year cycle, based on risk. Additional auditors with specialized training will be recruited by June 2015. As well, TC has developed, and is implementing, a management action plan to improve its oversight of railway safety, including SMS. A national review process to closely monitor all operators with compliance or on-going safety issues has also been established. Audits will now involve more rigorous review and timely follow up tied to enforceable penalties for non-compliance.

TC indicated that it did not intend to increase the scope of audits conducted every three to five years. As a result, the Board assessed TC's response as **Satisfactory in Part**.

Subsequently, following the Board's initial assessment, TC indicated it would audit every component of a railway's SMS on at least a three- to five-year cycle.

Board re-assessment of TC response to Recommendation R14-05

As the railway industry continues to make progress towards improved safety culture, TC must demonstrate that its oversight regime will ensure that all railways are audited with sufficient scope and at a frequency to confirm that the required processes are effective and that corrective actions are being implemented.

The Board is pleased that TC has now made a clear commitment to auditing every component of a railway's SMS on at least a three- to five-year cycle. The amended SMS Regulations were to come into effect on 01 April 2015, requiring railway companies to implement a formal framework that integrates safety into their day-to-day operations. In addition, proposed amendments to the *Railway Safety Act* will give the Minister the power to order corrective measures if it is believed that a company is applying its safety management system in a way that compromises railway safety. Therefore, the Board considers the response to the recommendation to have **Satisfactory Intent**.

Rail highlights

The year 2014 will be regarded as a critical year for the advancement of rail safety in Canada and in North America. In August 2014, the TSB released its much-anticipated investigation report into the July 2013 tragic runaway and main-track derailment of the Montreal, Maine & Atlantic Railway freight train in Lac-Mégantic, Quebec. That comprehensive report identified a host of safety deficiencies, which spurred action on the part of industry and the regulator to improve safety for the transportation of flammable liquids. It also contributed to two issues being added to the TSB Watchlist.

Lac-Mégantic and the transportation of flammable liquids (R13D0054) (Watchlist)

The Lac-Mégantic investigation uncovered a diverse set of issues ranging from tank car standards, characteristics of petroleum products, train securement, emergency response, route planning for the transportation of dangerous goods, and the regulatory oversight of SMS. By the end of the investigation, the TSB made a total of five recommendations to TC, one of which was also addressed to the U.S. Pipeline and Hazardous Materials Safety Administration. Additional related recommendations to the Federal Railroad Administration were made by the U.S. National Transportation Safety Board.

Furthermore, the TSB found the railway company had a weak safety culture and did not have a functioning safety management system to manage risks. TC did not audit the railway often and thoroughly enough to ensure it was effectively managing the risks in its operations.

While there has been positive response on the part of the rail industry, shippers, and regulators, a number of serious derailments involving crude oil unit trains have continued to occur in Canada and in the U.S. The TSB will continue to press for required changes and to make public any urgent safety information determined during the course of its investigations.

The transportation of flammable liquids by rail, as well as safety management and regulatory oversight, have been identified as two of the key risks to the transportation system and are included on the TSB's 2014 Watchlist.

Failure of the Bonnybrook Bridge (R13C0069)

Nature played a large role in another train derailment in 2013. In its investigation, the TSB identified intense and unprecedented flooding as the major factor contributing to the failure of the Bonnybrook Bridge in Calgary, Alberta, in June 2013. A Canadian Pacific Railway (CP) freight train derailed six tank cars. The TSB conducted a comprehensive examination of the bridge failure. The investigation determined that, although CP inspections of the bridge before the accident met TC requirements, scouring action of the flooding Bow River on the downstream end of Pier No. 2 resulted in a loss of foundation support to the pier. The flood water flow had attacked the shale bedrock/clay pier foundation, eroding and undermining it.

Following the accident, TC issued a number of safety communications regarding bridge inspections to all railway companies. In addition, CP revised its bridge inspection practices, its inspector training program and is investing in research for the early detection of scour and erosion at railway bridges.

Aviation

Pushing for change—and safer operations—for all Canadians

Aviation sector

Annual statistics

In 2014, 249 aviation accidents were reported to the TSB, a 10% decrease from the 2013 total of 276 and a 12% decrease from the five-year average of 282. Of the total, 212 involved Canadian-registered aircraft (excluding ultra-lights), a 13% decrease from 2013 and a 12% decrease from the five-year average of 241.

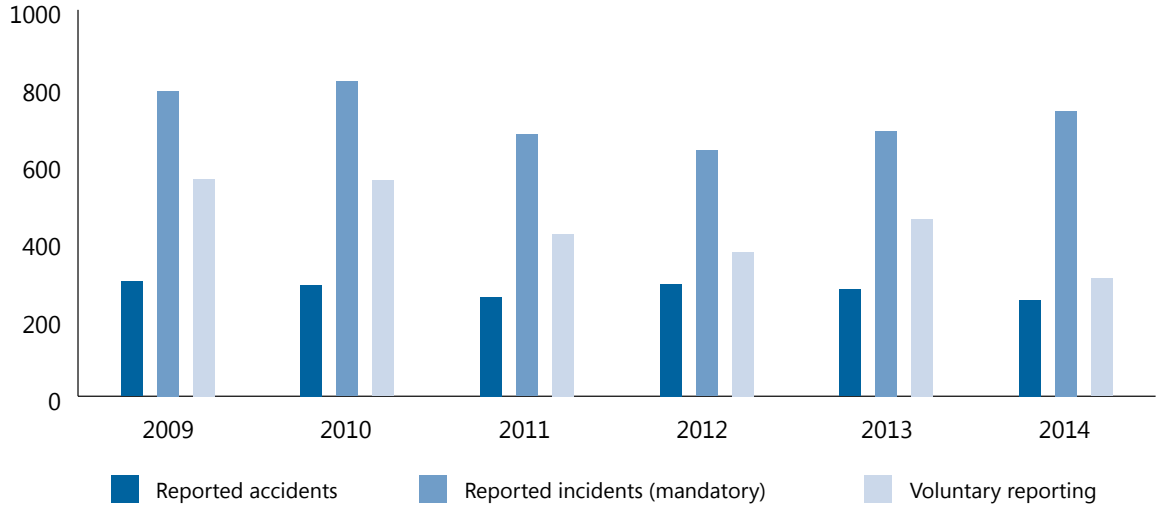
The 212 accidents involving Canadian-registered aircraft included 170 accidents involving aeroplanes (34 of which involved commercially-operated aeroplanes) and 34 accidents involving helicopters. The remaining eight accidents involved gliders, gyrocopters, balloons, or unmanned aerial vehicles (UAVs).

In 2014, 10 fatal accidents involved Canadian-registered aircraft other than ultra-lights, substantially lower than last year's total of 32, and the five-year average of 31. The number of fatalities (15) was substantially lower than the 2013 total of 60 and the five-year average of 61. The number of serious injuries (29) was higher than the 2013 total of 19 but slightly lower than the five-year average of 33.

In 2014, seven accidents involved foreign-registered aircraft in Canada, with two fatal accidents resulting in four fatalities.

In 2014, 738 incidents were reported in accordance with the TSB mandatory reporting requirements. This is an 8% increase from the 2013 total of 686, but a 2% increase from the five-year average of 721. This increase is consistent with a regulation change effective 01 July 2014, that reduced the minimum commercial aircraft weight threshold for reportable incidents to 2,250 kg from 5,700 kg.

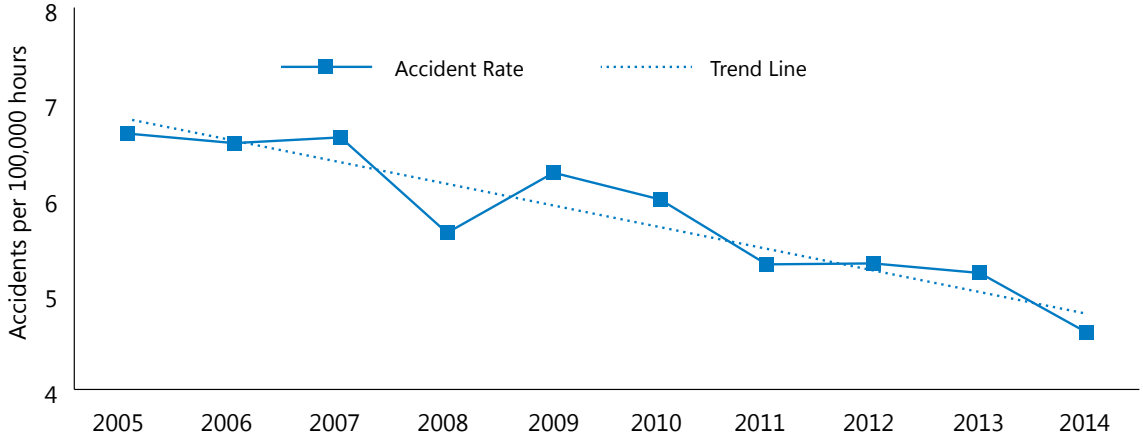
Figure 11: Aviation occurrences



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 2014 is 4,433,000 hours. The accident rate in 2014 was 4.6 accidents per 100,000 flying hours, down from the 2013 rate of 5.2. 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



2013 and 2014 hours flown are estimated (Source: Transport Canada) (R^2=.86, p<.001)

Investigations

A total of 22 aviation investigations were started in 2014–2015, and 22 investigations were completed. This represents a decrease in the number of investigations completed compared with the previous year (42). The average duration of completed investigations was 546 days, down from the 2013–2014 average of 639 days but higher than the previous five-year average (513 days).

Table 6: Aviation investigations at a glance

	2009–2010	2010–2011	2011–2012	2012–2013	2013–2014	2014–2015
Investigations started	36	40	35	28	20	22
Investigations completed	50	38	28	26	42	22
Average number of days to complete investigations	431	504	447	549	639	546
Recommendations	6	6	0	2	4	0
Safety advisories	9	6	5	5	1	4
Safety information letters	2	3	0	2	0	3

Recommendations and progress

In 2014–2015, the Board reassessed responses to 29 of the recommendations issued since 1990. No new aviation safety recommendations were made this year.

Movement on the TSB's aviation recommendations remains challenging. In Canada, we continue to see the same causes and contributing factors year after year—causes and contributing factors that directly relate to outstanding TSB recommendations. Despite this overall trend, there has been some success on a limited number of recommendations. The status of three recommendations has changed to **Fully Satisfactory.**

Of the remaining 26 recommendations, one recommendation remains **Unable to Assess** since no new information was received from TC; eight have been assessed as **Satisfactory Intent**; five recommendations have been assessed as **Satisfactory in Part**; four remain **Unsatisfactory**; and eight were downgraded to **Unsatisfactory** due to the slow pace of action on the part of TC and inadequate information received from TC.

Another 40 older recommendations also remain outstanding and will be reassessed once updated information is received from TC.

The delay in reducing risk in the aviation industry is a troubling recurring theme, and the Board continues to press hard for improvement in the uptake of its recommendations.

Aviation highlights

There were a number of important investigations concluded in 2014–2015, and the launch of a new safety study was announced. A number of these investigations touched on TSB Watchlist issues, and others are relevant to the new study on air taxi operations.

Risk of collision on runways is a TSB Watchlist issue. Airport operations require aircraft and vehicles to move between ramps, taxiways, and runways. Sometimes this movement creates conflicts between aircraft, or between aircraft and vehicles. These conflicts can also happen when aircraft or vehicles mistakenly occupy an active take-off or landing area.

Risk of collisions on runways (A13O0045)

On 11 March 2013, a Sunwing Airlines Inc. maintenance van was left unattended with the engine running and in drive gear near a company aircraft at gate H16 at Toronto's Lester B. Pearson International Airport. The driverless van began to move from the gate area toward the threshold of Runway 24R. When it reached the centre of the runway threshold, air traffic control (ATC) noticed the van. ATC then instructed Air Canada 178, on final approach for Runway 24R, to pull up and go around. The flight crew did not respond to two calls to go around, and the aircraft flew directly over the van, separated by approximately 35 feet. It landed safely on the runway.

The Greater Toronto Airport Authority has undertaken a number of important steps to ensure that this does not reoccur including maintenance of vehicle beacon lighting; personnel training; and safety management system incident reviews.

Safety issues investigation into air taxi operations

The Board is concerned about the number of serious accidents involving air taxi operations. Consequently, in November 2014, the TSB announced that it would conduct a safety issues investigation into Canadian air taxi operations to understand the risks that persist in this important sector of the aviation industry. The study will engage industry, the regulator, and other stakeholders to gain a full understanding of the issues affecting air taxi operations. The Board may make recommendations to address any systemic deficiencies that are identified.

Undocumented effects on performance and handling and aerodynamic stall of an air taxi aircraft (A13P0278)

Arguably, the most intense air taxi activity is on Canada's west coast, where operators serve a large number of remote communities and industries. On 24 October 2013, a Cessna C-185E operating as an air taxi crashed on an island as it maneuvered for a landing on water.

The TSB's investigation found that several modifications made to the aircraft had been approved but that the performance and handling characteristics were not documented. The pilot's expectation of the aircraft's performance capabilities may therefore not have been accurate. The investigation also identified a risk to airworthiness of the aircraft if multiple modifications are installed without adequate guidance on how to evaluate and document the effects on aircraft handling and performance. Further, there is an increased risk of stall accidents if advanced stall warning systems, such as angle of attack indicators, are not incorporated on aircraft.

The company has since taken action by emphasizing an awareness of aircraft modifications and their effects on aircraft handling during pilot training. It is also in the process of implementing a G switch on its aircraft tracking system as a back up to the aircraft's emergency locator transmitter, and installing a disconnect G switch on its aircraft batteries to reduce the risk of a post-crash fire, in response to other issues identified during the investigation.

Operating Eurocopter AS 350 helicopters in winter (A12P0008)

There have been many AS 350 engine power-loss accidents associated with ice/snow/water ingestion over the past 25 years. One such accident involved an RCMP helicopter that landed hard at Cultus Lake, British Columbia, on 17 January 2012. The TSB investigation focused on how design and operational factors played a role in the fatal accident.

The investigation found that the protective engine covers had not been installed when the helicopter was parked during a heavy snowfall, and that the air intake system was not cleaned and dried prior to engine start. After the helicopter was started and running at low power, soft ice built up inside the air intake. During take-off at high power, the ice broke free and was ingested into the engine compressor, which led to a complete engine power loss. This caused the rapid loss of the main rotor speed, an extremely high rate of descent, and impact with terrain, which was not survivable.

Since the accident, Eurocopter, the RCMP, and TC have reminded pilots of the need to ensure the engine air intake system is clean prior to takeoff. However, the investigation concluded that the full range of recommended preventative measures cannot easily be accomplished in field operations, and this presents a risk. Given this risk, TC has undertaken to review the engine inlet design of these helicopters.

In the meantime, more than 500 Eurocopter AS 350 and EC 130 helicopters are being flown by 132 operators in Canada. The investigation found these helicopters are susceptible to ice formation in cold weather operations, and the Board is concerned that in certain conditions, these helicopters may be at increased risk of engine flame-out shortly after takeoff.

Appendix A – Reports released in 2014–2015

This Appendix provides an overview of investigation reports released and 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 M12L0147

Date	28 November 2012
Location	Sainte-Anne-de-Sorel, Quebec
Vessel	*Tundra*
Type	Bulk carrier
Event	Grounding
Safety action taken	**The vessel owner** reminded officers of the entire fleet to regularly verify/monitor the vessel's course when the vessel is under the conduct of a pilot. This issue was to be discussed at a safety meeting, and feedback then communicated to the company. The **Laurentian Pilotage Authority (LPA)** and the **Corporation des Pilotes du Saint-Laurent Central (CPSLC)** will undertake a study on the risks related to fatigue. In addition, the LPA, in collaboration with the CPSLC and the **Corporation of Lower St. Lawrence Pilots**, published a brochure on the master-pilot exchange. This brochure is provided by the pilot to the master upon boarding and outlines the particulars of the exchange.

Marine investigation report M13N0001

Date	24 January 2013
Location	Off Cape Race, Newfoundland and Labrador
Vessel	*Charlene Hunt* *Lyubov Orlova*
Type	Tug Passenger vessel
Event	Loss of tow
Safety action taken	No safety action was taken as a result of this investigation.

Marine investigation report M13L0055

Date	08 May 2013
Location	Baie-Comeau, Quebec
Vessel	*Federal Yoshino*
Type	Bulk carrier
Event	Accidental death
Safety action taken	**Fednav Limited** immediately instructed Intership Navigation Company Limited to stop using provision cranes for lifting personnel. **Intership Navigation Company Limited** had on-board safety training carried out on all vessels it manages. **Det Norske Veritas Germanischer Lloyd** issued a casualty information newsletter intended for the maritime industry, focusing on the suitability of lifting equipment for the transport of personnel and addressing the importance of checking safety functions before lifting operations; e.g., by limiting switches for all lifting appliances. **The Marshall Islands** (the vessel's administrator and flag state) made recommendations to Intership Navigation Company Limited.

Marine investigation report M13N0014

Date	10 May 2013
Location	33 nm southwest of Burgeo, Newfoundland and Labrador
Vessel	*Western Tugger* *Arctic Lift I*
Type	Tug Barge
Event	Capsizing of tow and accidental death
Safety action taken	**TC** is currently consulting on the expansion of the *Safety Management Regulations*. Under the current proposal, the *Western Tugger* would be required to have a safety management system in accordance with the International Safety Management Code. The **vessel operator** is repairing the vessel's towing winch, which will not incorporate a second brake.

Marine investigation report M13L0067

Date	16 May 2013
Location	Off Sainte-Pétronille, Île d'Orléans, Quebec
Vessel	*Louis Jolliet*
Type	Passenger vessel
Event	Grounding
Safety action taken	In response to a **TSB** Marine Safety Information Letter, **Croisières AML** responded that the vessel's equipment and emergency procedures would be revised to address the stowage of items on the deck. **TC** issued a FLAGSTATENET notice to all TC inspectors and others authorized to carry out inspections to remind them of the requirements under section 7 of the *Fire and Boat Drill Regulations*. TC also added new fields to the System Inspection Reporting System to remind inspectors to ensure that these requirements are met. **Croisières AML** had tracks for the cruises traced onto the marine chart and began evaluating crew members' understanding of safety matters on board the vessels. The company has issued a new procedure to the chief mates of the vessels, ensuring that crew members are aware of their respective positions according to the muster list, to avoid confusion in an emergency. A summary of emergency procedures was developed, as well as a guidance document for the conduct of the various emergency procedures and drills, including a new pre-evacuation drill. Employees have been provided with new equipment to wear during emergencies to identify them as crew members.

Marine investigation report M13M0102

Date	18 May 2013
Location	Tabusintac Bay, New Brunswick
Vessel	*Marie J*
Type	Small fishing vessel
Event	Grounding and subsequent sinking
Safety action taken	The **Canadian Coast Guard** Aids to Navigation design and review specialists conducted a review and as a result, five green port-hand buoys were added to the channel. **Public Works and Government Services Canada**, on behalf of **Fisheries and Oceans Canada**, commissioned a coastal study to assess alternative strategies for improving navigational safety to access McEachern's Point harbour at Tabusintac Bay.

Marine investigation report M13L0123

Date	03 August 2013
Location	Port of Montreal, Quebec
Vessel	*Heloise* *Ocean Georgie Bain*
Type	Bulk carrier Tug
Event	Collision
Safety action taken	No safety action was taken as a result of this investigation.

Marine investigation report M13C0071

Date	06 November 2013
Location	Iroquois, Ontario
Vessel	*Claude A. Desgagnés*
Type	General cargo vessel
Event	Striking and subsequent grounding
Safety action taken	**Transport Desgagnés Inc.** revised and updated the Bridge Manual Instructions included in its Quality, Safety, Security and Environmental Management System. This revision includes the bridge resource management procedures required while the vessel is under the conduct of a pilot and, in particular, the responsibilities of the master and officer of the watch, supervision of the pilot, safe conduct of the vessel, and access to the vessel's bridge and equipment.

Marine investigation report M13M0287

Date	07 November 2013
Location	Digby, Nova Scotia
Vessel	*Princess of Acadia*
Type	Roll-on/roll-off passenger vessel
Event	Grounding
Safety action taken	**Lloyd's Register** changed the frequency of testing for the generator breakers on the *Princess of Acadia* to yearly, citing the age and usage of the breakers. **Bay Ferries Ltd**. has required the bow thruster to be on and tested at Checkpoint 1 Delta when the *Princess of Acadia* arrives in Digby. In addition, the engine room assistant is now required to stay in the engine room until the vessel secures to the dock in Digby. An uninterrupted power supply has been installed to provide battery back-up to the gyro compass. A simplified voyage data recorder has also been installed, which will record 12 hours of bridge audio and data from the radars, the automatic identification system and other available sensors.

Marine investigation report M13L0185

Date	15 December 2013
Location	Gros-Morne, Quebec
Vessel	*Andre H.* *I.V. NO. 8* *I.V. NO. 9* *I.V. NO. 10*
Type	Tug Barge 2 service vessels
Event	Loss of tow and subsequent grounding
Safety action taken	No safety action was taken as a result of this investigation.

Marine investigation report M14P0014

Date	25 January 2014
Location	Fraser River, British Columbia
Vessel	*Cap Blanche*
Type	Container vessel
Event	Grounding
Safety action taken	The **TSB** issued a marine safety advisory letter to the **Pacific Pilotage Authority (PPA)** on 08 May 2014, providing information about the discrepancy between input from a vessel's automatic identification system and input from the pilots' wide area augmentation system based differential global positioning system antennas. The **PPA** distributed the safety advisory letter to all pilots in a notice to pilots.

Marine investigation report M14P0023

Date	11 February 2014
Location	South Arm Fraser River, British Columbia
Vessel	*Jose Navarez* *TCT 8000*
Type	Tug Barge
Event	Loss of propulsion
Safety action taken	**Lafarge Canada** established weekly meetings within the Lafarge Marine Division to review safety procedures, drills, and preventive maintenance at the beginning of a shift. The company also replaced the tug's main engine and cooling system, including an upgrade to the monitoring system and alarm panel.

Pipeline

Pipeline investigation report P13H0013

Date	02 August 2013
Location	Near Wrigley, Northwest Territories
Company	Enbridge Pipelines Inc.
Event	Crude oil pipeline leak
Safety action taken	The **National Energy Board** issued a Board order requiring **Enbridge** to complete and submit assessments and to submit a plan outlining how and when Enbridge will implement selected technology. **Enbridge** complied with all of the conditions of the Board order and submitted a plan outlining how and when it would implement leak-detection technologies on Line 21 into its engineering assessments.

Rail

Rail investigation report R12E0182

Date	26 December 2012
Location	Clover Bar, Alberta
Company	Canadian National
Event	Contractor employee injury
Safety action taken	**TC** approved the updated *Canadian Rail Operating Rules* that were formulated and submitted by the **Railway Association of Canada** to include rules on safety watch and lone worker protection.

Rail investigation report R13C0008

Date	19 January 2013
Location	Tilley, Alberta
Company	Canadian Pacific
Event	Crossing collision
Safety action taken	**TC** asked the Transportation Development Centre to undertake a research project pertaining to the audibility of train horns.

Rail investigation report R13E0015

Date	24 January 2013
Location	Paynton, Saskatchewan
Company	Canadian National
Event	Crossing collision
Safety action taken	**TC** indicated that it had asked the Transportation Development Centre to undertake a research project on the audibility of horns to analyze a horn's effectiveness when long hood leading. TC acknowledged the importance of this to railway safety in Canada, and indicated that the research project would be assigned high priority in the next fiscal year.

Rail investigation report R13W0083

Date	26 March 2013
Location	Carlyle, Saskatchewan
Company	Canadian National
Event	Crossing accident
Safety action taken	The **Province of Saskatchewan** amended the *School Bus Operating Regulations* to require drivers, when approaching a railroad crossing that does not have an automatic signal indicating the approach of a train, to stop the bus, open the front door of the bus, and look in both directions.

Rail investigation report R13T0060

Date	03 April 2013
Location	White River, Ontario
Company	Canadian Pacific
Event	Main-track train derailment
Safety action taken	The **Association of American Railroads (AAR)** Tank Car Committee undertook a study on the general performance of tank car bottom outlet valves in transport, and on the possible retrofit of existing valve actuating devices built according to an old standard. The committee is proposing upgrades to the protection of bottom outlet valves. **TC's** Transportation of Dangerous Goods Directorate participates on an AAR task force set up to investigate the behaviour of bottom outlet valves in derailments and to propose possible solutions.

Rail investigation report R13W0124

Date	28 April 2013
Location	Togo, Saskatchewan
Company	VIA Rail Canada Inc.
Event	Subgrade collapse and derailment
Safety action taken	**TC** approved the *Railway Locomotive Inspection and Safety Rules* formulated and submitted by the **Railway Association of Canada**, which prescribe that fuel tanks on new and remanufactured locomotives are to be of a high impact resistant design that meets or exceeds current recommended practices. **Canadian National (CN)** produced a video on spring readiness inspections, and two supporting documents were produced and provided to all track inspectors and supervisors as a refresher.

Rail investigation report R13Q0012

Date	02 May 2013
Location	Québec, Quebec
Company	VIA Rail Canada Inc.
Event	Collision at a level crossing
Safety action taken	**TC** met with representatives of the **City of Québec**, the **White Birch Paper mill**, and **CN** to review the operation of the systems at this level crossing and to examine solutions. **VIA Rail Canada Inc**. amended its procedures so that trains no longer stop upon exiting the Gare du Palais.

Rail investigation report R13C0049

Date	18 May 2013
Location	Dunmore, Alberta
Company	Canadian Pacific
Event	Main-track train collision
Safety action taken	**TC's** Advisory Council on Railway Safety Working Group will provide TC with a written report on options and recommendations concerning physical fail-safe train control by the fall of 2015.

Rail investigation report R13T0122

Date	02 June 2013
Location	Wanup, Ontario
Company	Canadian Pacific
Event	Main-track derailment
Safety action taken	No safety action was taken as a result of this investigation.

Rail investigation report R13C0069

Date	27 June 2013
Location	Bonnybrook Bridge Calgary, Alberta
Company	Canadian Pacific
Event	Bridge failure and derailment
Safety action taken	**TC** is updating its Guideline for Bridge Safety Management and Guideline for Culvert Safety Management. Scour, erosion, and stream stability hazards, including those associated with spread foundations, will be addressed.

Rail investigation report R13D0054

Date	06 July 2013
Location	Lac Mégantic, Quebec
Company	Montreal, Maine & Atlantic Railway
Event	Runaway and main-track derailment
Safety action taken	See Lac-Mégantic investigation section in this report.

Rail investigation report R13C0087

Date	11 September 2013
Location	Inglewood, Alberta
Company	Canadian Pacific
Event	Main-track derailment
Safety action taken	**CP** removed the crossover switches at Mile 0.30 to prevent any risk of a subsequent incident.

Rail investigation report R13E0142

Date	19 October 2013
Location	Gainford, Alberta
Company	Canadian National
Event	Non main-track derailment
Safety action taken	**CN** has commenced a program for rail grinding on high-speed sidings such as Gainford.

Rail investigation report R13D0077

Date	06 November 2013
Location	Taschereau Yard Montreal, Quebec
Company	Canadian National
Event	Derailment
Safety action taken	**TC** issued a circular with specific instructions for when a train is occupying the 15-degree curve.

Rail investigation report R13W0257

Date	10 November 2013
Location	Nickel Lake, Ontario
Company	Canadian National
Event	Main-track derailment
Safety action taken	**CN** has reviewed the track geometry and train speed in this area.

Rail investigation report R13W0260

Date	19 November 2013
Location	Tisdale, Saskatchewan
Company	Canadian National
Event	Employee fatality
Safety action taken	**TC** identified the issue of trainee supervision in its risk-based business plan for the upcoming program year, and is developing risk-control actions to address it. **CN** issued an Operating Bulletin to remind employees who are assigned a trainee that they must be in a position that allows for continuous monitoring of the trainee, and for immediate intervention and corrective action of any non-compliant or unsafe activity.

Aviation

Aviation investigation report A12P0008

Date	17 January 2012
Location	Cultus Lake, British Columbia
Aircraft	Eurocopter AS 350 B3 (helicopter)
Event	Engine power loss and hard landing
Safety action taken	**Royal Canadian Mounted Police** chief pilots are now providing all pilots with "Cold Weather and Warm Weather Operations" briefings at the beginning of each season, reviewing critical aspects in relation to the operational environment and aircraft flown. A complete safety risk profile involving all stakeholders was completed on the human external transportation system program. All stakeholders were educated on the flight envelope and aircraft limitations within which these operations take place. **TC** has initiated a review of the engine inlet design in accordance with the Airworthiness Manual. This review is a National Aircraft Certification project requiring international coordination. **TC** has published a civil aviation safety alert regarding the AS 350, to raise operator awareness of the problem with moisture collection in the plenum chambers of this aircraft. **Eurocopter** issued a safety information notice regarding ice and rain protection.

Aviation investigation report A12Q0029

Date	21 February 2012
Location	Montréal/Saint-Hubert Airport, Quebec
Aircraft	Beechcraft B100
Event	Smoke in the cabin
Safety action taken	**Pascan Aviation Inc.** reminded its maintenance personnel to closely inspect the hot air ducts and under-floor bleed air line installation. In addition, flight crews have been reminded to report any problems relating to the bleed air and heating system.

Aviation investigation report A12Q0161

Date	10 September 2012
Location	Gaspé Airport, Quebec
Aircraft	de Havilland DHC-8-301
Event	Hard landing and aft fuselage strike
Safety action taken	**Jazz Aviation LP** has issued a pilot memo on duck-under (glideslope adherence) events and made amendments to the aircraft operating manual. It added the "Dash-8 Q400 Pitch Awareness" video to DH8 100/300 training and issued an all-pilots memo regarding stabilized approach and landing.

Aviation investigation report A12Q0182

Date	15 October 2012
Location	Victoriaville, Quebec
Aircraft	Piper PA-34-200
Event	In-flight engine fire leading to a forced landing
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A12C0154

Date	18 November 2012
Location	Snow Lake, Manitoba
Aircraft	Cessna 208B
Event	Loss of control and collision with terrain
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A13F0011

Date	23 January 2013
Location	Mount Elizabeth, Antarctica
Aircraft	de Havilland DHC 6 300
Event	Controlled flight into terrain
Safety action taken	**Kenn Borek Air Ltd.** has taken over flight-following in the Antarctic from a third-party flight-following organization, amended its GPS standard operating procedures to prevent incorrect data input, improved the accuracy of aviation navigational charts in the Antarctic, and developed company visual flight rules routes for flights exceeding 400 nautical miles. It also implemented a terrain awareness and warning system limitation awareness program for flights above the 70th parallel north and below the 70th parallel south; and improved administrative oversight of daily aircraft inspections.

Aviation investigation report A13W0009

Date	27 January 2013
Location	Fox Creek, Alberta
Aircraft	Robinson R44 Raven II (Helicopter)
Event	Loss of control and in-flight breakup
Safety action taken	**Gemini Helicopters Inc.** amended its operations manual and its flight following procedures. It has also developed and implemented a daily flight risk-assessment document that is used by the operations and dispatch departments. **ACR Electronics** has modified emergency locator transmitter mounting.

Aviation investigation report A13O0045

Date	11 March 2013
Location	Toronto Lester B. Pearson International Airport, Ontario
Aircraft	Embraer EMB190
Event	Runway incursion and risk of collision
Safety action taken	**Greater Toronto Airports Authority** (GTAA) issued an operational directive to secure vehicles airside. GTAA aviation safety officers undertook spot checks and airside traffic stops of any vehicle that appeared to have a weak or inoperative roof beacon, and directed drivers to have vehicle beacons repaired or replaced. It also issued an advisory to inform the Toronto Pearson aviation community of minimum luminosity expectations for vehicle beacons. **Sunwing Airlines** reported to TC Civil Aviation that it had inspected all of its airside vehicles' rotating beacon bulbs, and replaced bulbs found not to meet specifications.

Aviation investigation report A13O0049

Date	19 March 2013
Location	Hamilton Airport, Ontario
Aircraft	Boeing 727-281
Event	Risk of collision
Safety action taken	**Kelowna Flightcraft Air Charter Ltd.** issued a memo to all flight crews discussing air traffic control-initiated rejected takeoffs and standard terminology, and it included these takeoffs in recurrent training exercises.

Aviation investigation report A13A0033

Date	27 March 2013
Location	St. Anthony, Newfoundland and Labrador
Aircraft	de Havilland DHC-6-300
Event	Nosewheel failure on landing
Safety action taken	**Air Labrador Limited** amended the Twin Otter standard operating procedures, including to restrict all landings to crosswinds of 30 knots at 90°.

Aviation investigation report A13O0098

Date	26 May 2013
Location	Sault Ste. Marie Airport, Ontario
Aircraft	Bombardier DHC-8-402
Event	Hard landing and tail strike
Safety action taken	**Porter Airlines Inc.** initiated a safety management system investigation. Part of the immediate corrective action involved a revision of the Pitch Awareness Training document to highlight previous occurrences and the need to arrest high descent rates with power and not pitch.

Aviation investigation report A13P0127

Date	29 June 2013
Location	Pemberton, British Columbia
Aircraft	Cessna 150F and STEMME S10-VT
Event	Mid-air collision
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A13C0073

Date	01 July 2013
Location	Gull Lake, Manitoba
Aircraft	Bell 206B (Helicopter)
Event	Collision with water
Safety action taken	**Custom Helicopters Ltd.** incorporated the *Pilot Competencies for Helicopter Wildfire Operations* guide into its spring training program. The purpose of the guide is to promote effective helicopter operations in wildfire operations, and the competencies it outlines are standards that pilots must meet before being dispatched to work in wildfire operations.

Aviation investigation report A13A0075

Date	03 July 2013
Location	Moosehead Lake, Newfoundland and Labrador
Aircraft	CL-415
Event	Loss of control – collision with water
Safety action taken	The **Government of Newfoundland and Labrador** Air Services Division has made aircraft-related changes such as ensuring life vests are secured in the cockpit and cabin, the life raft is installed in a manner that provides ease of removal, and storage cases and cargo straps are used to secure cargo and loose items. It has also equipped each aircraft with a portable satellite telephone, and made improvements to the training programs and to its procedures.

Aviation investigation report A13O0125

Date	04 July 2013
Location	Griffith Island, Ontario
Aircraft	Cessna 182
Event	Loss of control – collision with water
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A13P0163

Date	04 August 2013
Location	Bella Coola, British Columbia
Aircraft	Kamov Ka-32
Event	Engine power loss, emergency landing, and rollover
Safety action taken	The **Russian aviation regulator** issued a revised airworthiness directive that increased maintenance requirements for engines installed in Kamov Ka-32 helicopters used for external load operations. **VIH Helicopters Ltd.** has increased "load release" training and added it to the yearly recurrent training requirements, and is field testing an improved electrical release guard.

Aviation investigation report A13P0165

Date	06 August 2013
Location	Kamloops, British Columbia
Aircraft	Cessna 172L
Event	Loss of control – collision with terrain
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A13P0166

Date	16 August 2013
Location	Hesquiat Lake, British Columbia
Aircraft	de Havilland DHC-2 Beaver
Event	Controlled flight into terrain
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A13C0105

Date	22 August 2013
Location	Ivanhoe Lake, Northwest Territories
Aircraft	de Havilland DHC-3 Otter
Event	Loss of control – collision with water
Safety action taken	**Transwest Air** issued and circulated a safety directive to all employees that expands on its expectation of compliance with section 605.06 of the *Canadian Aviation Regulations*.

Aviation investigation report A13P0278

Date	24 October 2013
Location	West Cracroft Island, British Columbia
Aircraft	Cessna C-185E
Event	Aerodynamic stall – collision with terrain
Safety action taken	**Air Cab** has begun emphasizing an awareness of aircraft modifications and their effect on aircraft handling during pilot initial and recurrent training. The company is also implementing a back-up to the aircraft's emergency locator transmitter, and the installation of a disconnect G switch on its aircraft batteries to reduce the risk of fire.

Aviation investigation report A13Q0186

Date	04 November 2013
Location	Montreal, Quebec
Aircraft	Boeing 767-36N/ER
Event	Belt loader fire leading to cabin smoke and evacuation of passengers
Safety action taken	No safety action was taken as a result of this investigation.

Aviation investigation report A14Q0011

Date	23 January 2014
Location	Alma, Quebec
Aircraft	Piper PA-46-350P
Event	Runway excursion
Safety action taken	No safety action was taken as a result of this investigation.

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 *Transportation Safety Board Regulations*)
Occurrence	A transportation accident or incident
Recommendation	A formal way to draw attention to systemic safety issues, normally warranting ministerial attention
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 the risks posed by this unsafe condition warrant highlighting
Safety advisory	A less formal means for communicating lesser safety deficiencies to officials within and outside the government
Safety information letter	A letter that communicates safety-related information, often concerning local safety hazards, to government and corporate officials