

Transportation Safety Board
of Canada



Bureau de la sécurité des transports
du Canada



ANNUAL REPORT

to Parliament 2011–2012

Transportation Safety Board of Canada
Place du Centre
200 Promenade du Portage
4th floor
Gatineau QC K1A 1K8
819-994-3741
1 800 387-3557
www.bst-tsb.gc.ca
communications@bst-tsb.gc.ca

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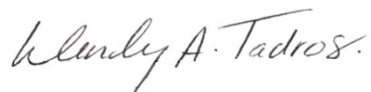
14 June 2012

The Honourable Peter Penashue, P.C., M.P.
President of the Queen's Privy Council for Canada
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 2011 to 31 March 2012.

Yours sincerely,

A handwritten signature in cursive script that reads "Wendy A. Tadros".

Wendy A. Tadros
Chair

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The Chair's message

At the Transportation Safety Board of Canada (TSB), we have a straightforward mandate: investigate accidents and uncover what went wrong. Our experts work tirelessly to conduct thorough, independent investigations so that—hopefully—we can prevent accidents from happening again. Whether it's a plane crash in the Canadian Arctic, a derailed locomotive in southern Ontario, or a capsized fishing vessel off the coast of Vancouver Island or Labrador, we are always looking to learn lessons from what happened, and then communicate those lessons to the people and organizations that can best take action.

And because we serve the Canadian public—and because the consequences of our work are so great—we take extra care when drafting each recommendation and report. We rely on painstaking examination of the evidence, detailed analysis, and the scientific rigor of highly trained experts in a number of fields.

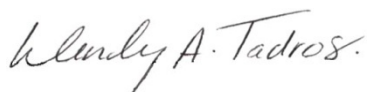
This year, our Annual Report to Parliament once again identifies a number of important safety issues in addition to highlighting some of the gains we've made in several key areas. Of the 68 outstanding recommendations assessed this past year, seven received the Board's highest rating of "Fully Satisfactory". In the marine industry, for example, progress has been made to the carriage of voyage data recorders and lifesaving equipment aboard small passenger vessels. Similarly, in the aviation sector, industry has successfully mitigated risks involving safety limitation warnings.

Canadian railways, meanwhile, have seen improved track safety rules, the adoption of wheel set tracking technologies, and advancements in safety management systems. The lack of video and voice recorders onboard trains, however, continues to deprive investigators of valuable information.

Real safety, though, also involves looking forward. That's why we aim to identify risks in advance and push for pre-emptive safeguards and mitigating measures. To that end, this year we're releasing an updated version of our safety Watchlist, which highlights the transportation issues posing the greatest risks to Canadians. By identifying new issues and new targets, we're striving to meet the challenges of an ever-evolving transportation system.

As we embark upon our 23rd year serving Canadians, the TSB will continue to advocate for change and call upon government and industry to implement effective safety strategies. With accidents steadily trending downward, our focus remains on improving the safety even more for the long-term success of our transportation system.

It is this, I believe, that sets us on a path to ensuring Canada remains at the forefront of transportation safety.



Wendy A. Tadros
Chair

Section 1: Overview

1.1 Members of the Board



Chair Wendy A. Tadros

Transportation and legal experience includes Director of Legal Services for the National Transportation Agency of Canada; Inquiry Coordinator for *The Road to Accessibility: An Inquiry into Canadian Motor Coach Services*; and counsel to the Canadian Transport Commission before the Commission of Inquiry into the Hinton Train Collision.



Member Kathy Fox

Transportation safety and air traffic services experience includes air traffic controller, commercial pilot, flight instructor, various management positions at Transport Canada, and Vice President of Operations at NAV CANADA. In 1999, she received the Transport Canada Aviation Safety Award. She was inducted into the Quebec Air and Space Hall of Fame in November 2004.



Member Ian S. MacKay

Transportation and legal experience includes working as a lawyer for Transport Canada and the National Transportation Agency (subsequently the Canadian Transportation Agency), with duties ranging from training inspector to conducting public hearings. He served as Vice President and member of the executive team of the Canadian Air Transport Security Authority.



Member John Clarkson

Transportation and marine management experience includes working as Director, Marine Personnel Standards and Pilotage, at Transport Canada with duties ranging from marine training and certification to occupational safety and health and the federal pilotage portfolio. He served as Associate Dean in charge of the Marine Campus at BCIT's School of Transportation, and Master of Canadian merchant ships.



Member Joseph Hincke

Transportation and air operations experience includes serving as a military pilot for 30 years including command of a Sea King helicopter squadron; Operations Officer and Commander of an air wing; responsibility for air force contracted flying training; Assistant Chief of the Air Force; Commander of the Canadian Defence Liaison Staff and Defence Advisor at the Canadian Mission in the U. K. Served as the RCMP's first Professional Integrity Officer.

1.2 Senior management

Chief Operating Officer	J. L. Laporte
General Counsel	A. Harding
Director General, Corporate Services	C. Lemyre
Director, Air Investigations	M. Clitsome
Director, Marine Investigations	M.-A. Poisson
Director, Rail/Pipeline Investigations	K. Jang
Director, Operational Services	L. Donati
Director, Communications	J. Roy

1.3 Mission of the Transportation Safety Board of Canada

We conduct independent safety investigations and communicate risks in the transportation system.

1.4 Independence

To promote public confidence in transportation accident investigation, the investigating agency must be, and be seen to be, objective, independent and free from any conflicts of interest. The key feature of the TSB is its independence. It reports to Parliament through the President of the Queen's Privy Council for Canada and is separate from other government agencies and departments. Its independence enables it to be objective in arriving at its conclusions and recommendations. The TSB's continuing independence and credibility rest on its competence, openness, integrity and the fairness of its processes.

Section 2: Activities

2.1 Occurrences, investigations and safety action

This year, accident rates in Canada continued to trend downward. We are pleased with the progress made, but every year we investigate many new accidents. As our investigations reveal important safety lessons, we will continue to call upon industry and government to make the meaningful changes needed to ensure our pipelines, our railways, our waters and our skies will be safer for Canadians.

In 2011, a total of 1607 accidents and 1265 incidents were reported in accordance with the TSB's regulations for mandatory reporting of occurrences.¹ The number of accidents in 2011 decreased by 7% from the 1729 accidents reported in 2010, and by 17% from the 2006–2010 annual average of 1928 accidents. The number of reported incidents decreased to 1265 in 2011 from

1355 in 2010, and was below the 2006–2010 average of 1385. In 2011, the TSB also received 585 voluntary reports. Fatalities across all modes of transportation totalled 156 in 2011, down 13 from the 2010 total, and down from the 2006–2010 average of 163.

Improving the safety of Canada's transportation system is the TSB's number one priority.

Wendy Tadros, TSB Chair

All reported occurrences were assessed in accordance with the Board's Occurrence Classification Policy to identify those with the greatest potential for advancing transportation safety. Information was entered into the TSB database for historical record, trend analysis and safety deficiency validation purposes.

In fiscal year 2011–2012, investigations were undertaken for 60 of the occurrences reported to the TSB. In that same period, 55 investigations were completed compared with 65 in the previous year.² There were 80 investigations in process at the end of the fiscal year compared with 75 at the beginning. The average time it took the TSB to complete an investigation decreased to 467 days in 2011–2012 compared with the previous five-year average (537).

¹ While the Board's operations are for the 2011–2012 fiscal year, the occurrence statistics are for the 2011 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 to the last 5 or 10 years. For definitions of terms such as accident, incident and occurrence, see Appendix B.

² Investigations are considered complete after the final report has been issued. See Appendix A for a list of reports released by the TSB in 2011–2012 for each sector.

Figure 1. Occurrences reported to the TSB

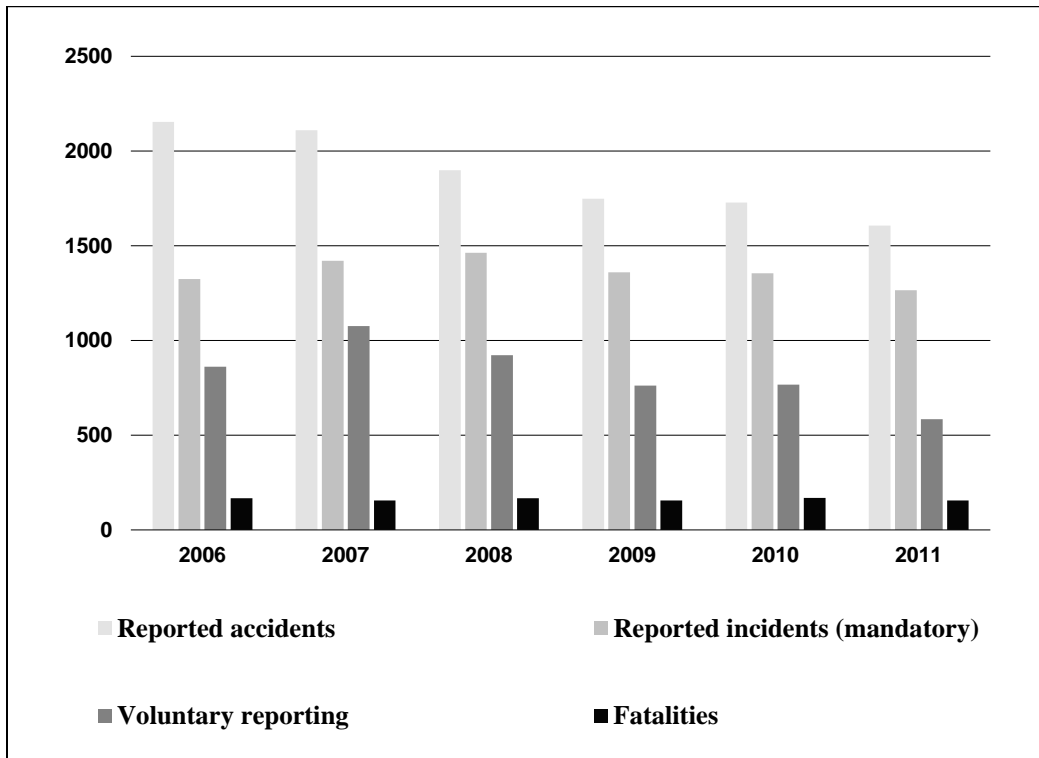
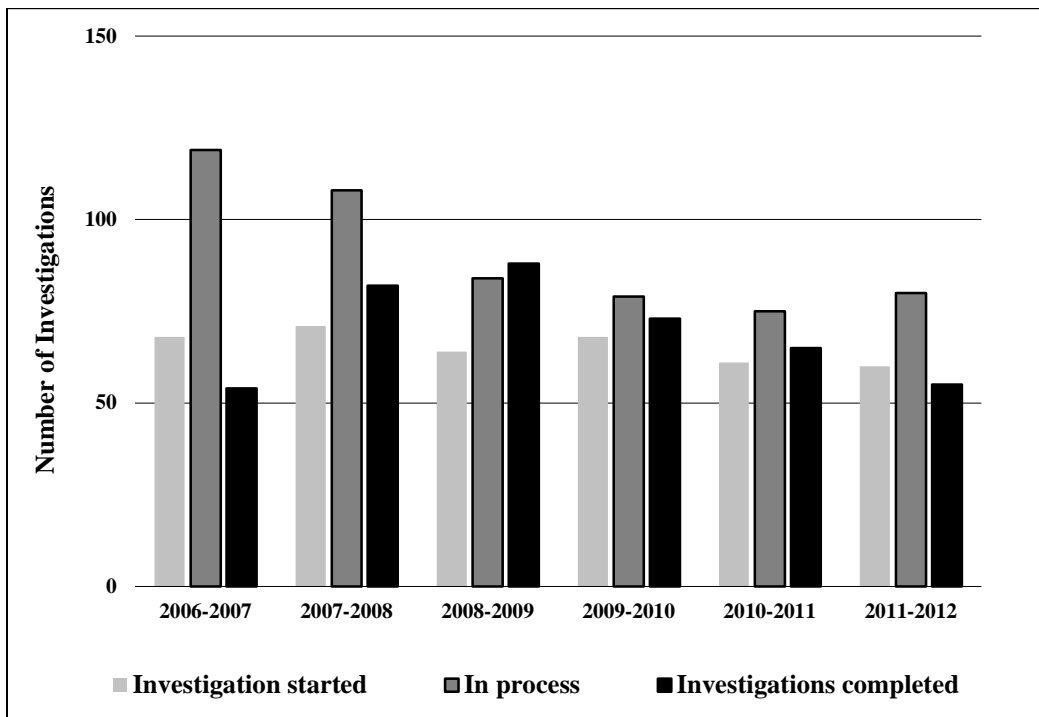


Figure 2. Investigations started, in process and completed



TSB investigations culminate in reports that may identify safety deficiencies and, where appropriate, contain recommendations aimed at reducing risks. All of the investigations concluded in 2011–2012 found safety deficiencies or factors that contributed to the occurrence, and these were communicated in the investigation reports.

TSB recommendations were also considered to be effective. Nearly two-thirds (63%) of surveyed stakeholders felt that our recommendations were at least somewhat effective.

TSB Stakeholder Consultation 2011

This reflects the careful application of the TSB’s Occurrence Classification Policy in deciding whether to investigate, and the thorough implementation of the investigation methodology. This systematic approach ensures that TSB investigation resources are invested where there is the greatest potential for a safety dividend.

In 2011–2012, in addition to investigation reports, the TSB issued a total of 52 safety communications: 2 recommendations, 22 safety advisories and 28 safety information letters, as well as one safety concern (see Table 1 for a breakdown by sector).

Table 1. Safety communications by the TSB, 2011–2012

Sector	Recommendations	Safety advisory letters	Safety information letters	Safety concerns
Marine	2	7	10	0
Pipeline	0	1	0	0
Rail	0	9	18	0
Air	0	5	0	1
Total	2	22	28	1

Note: For definitions of the types of safety communications, see Appendix B.

Safety information is also provided informally to key stakeholders throughout the investigation process so that they can take immediate safety actions, which they commonly do. Such safety actions range widely in scope and importance: an operator may clear the sight-lines at a railway crossing by trimming bushes and vegetation; regulators such as Transport Canada (TC) and the Federal Aviation Administration in the United States often issue mandatory directives requiring inspections and/or component replacement based on the TSB’s preliminary findings. In such situations, rather than issuing recommendations, the TSB then reports on the corrective actions already taken by industry and government agencies.

In accordance with 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 in response, or the reasons for not taking action. The Board considers each response, assessing the extent to which the related safety deficiency was or will be addressed. When a recommendation generates responses from within and outside Canada, the Board’s assessment is based primarily on the Canadian response.

Table 2 shows that from 29 March 1990 to 31 March 2012, the Board has reviewed the responses to a total of 545 recommendations: it has assessed 544 to be either Fully Satisfactory, of

Satisfactory Intent, Satisfactory in Part, or Unsatisfactory. It has been unable to assess the response to one recommendation.

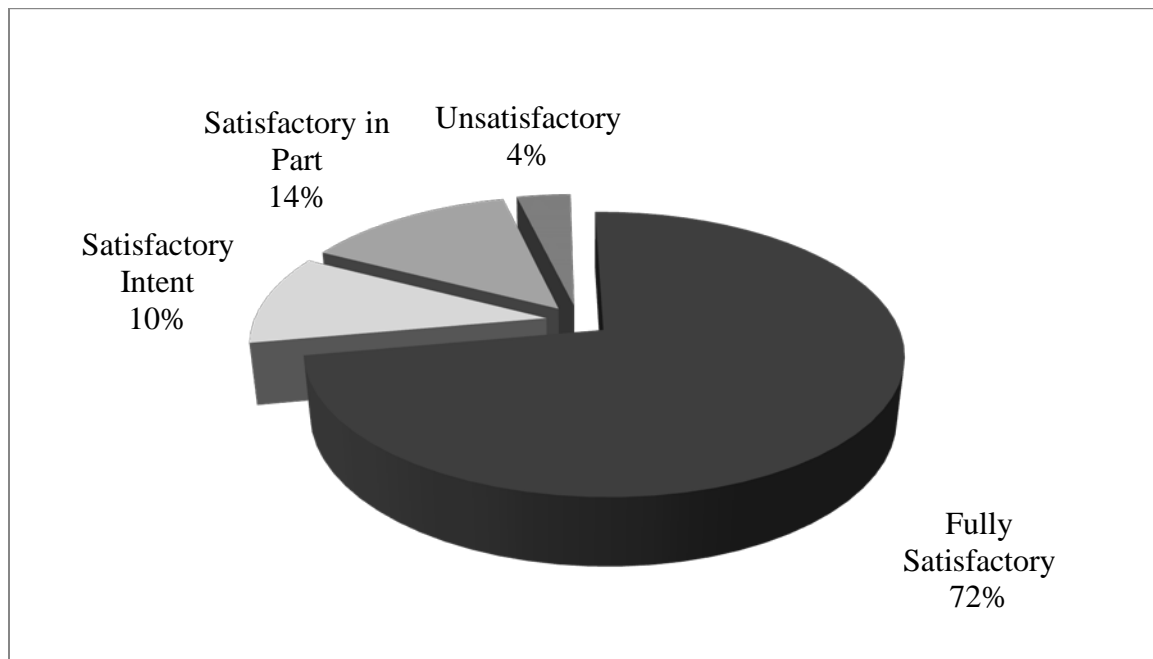
Table 2. Board assessments of responses to its recommendations, 1990–2012

	Marine	Pipeline	Rail	Air	Total recommendations
Number of recommendations	147	20	131	247	545
Fully Satisfactory	114	20	114	146	394
Satisfactory Intent	22	0	8	27	57
Satisfactory in Part	9	0	8	57	74
Unsatisfactory	1	0	1	17	19
Unable to assess	1	0	0	0	1

In the 22-year period from 1990 to 2012, the majority of Board recommendations have led to positive change: as shown in Figure 3, in 82% of cases (72% Fully Satisfactory and 10% satisfactory intent), change agents have taken action or plan to take action that will substantially reduce the deficiency noted in the recommendation. However, in 14% of cases (Satisfactory in Part), change agents have taken or plan to take action that will only partially address the deficiency noted in the recommendation, and in 3% of cases (Unsatisfactory), change agents have neither taken nor plan to take action that will address the deficiency noted in the recommendation.

The Board is aiming to have 80% of its recommendations assessed as Fully Satisfactory in the next four years.

Figure 3. Board ratings of assessments of responses to its recommendations, 1990–2012



2.2 Communicating transportation safety to Canadians and the transportation community

At the TSB, communicating is one of our top strategic objectives. When we investigate an occurrence, our goal is to find out what happened and why—and then share what we learned with the Canadian public and the organizations and individuals that can best effect change: industry and regulators. It can be as simple as picking up the phone, or holding a news conference to communicate basic facts and prevent misinformation at the beginning of an investigation. Other times, we take a more formal route: information and advisory letters, safety concerns and Board recommendations—all of which can be used in addition to the published investigation reports.

Professional is the top adjective used to describe the TSB. Thorough, cooperative and positive also come to mind.

TSB Stakeholder Consultation 2011

In 2011–2012, the TSB released 55 reports on investigations in the marine, pipeline, rail and air sectors. We issued 17 news releases and responded to over 200 media inquiries on the central media line, and held four media events that generated almost 500 news articles across the country.

The TSB website (www.bst-tsb.gc.ca) is our primary communications vehicle, showcasing everything we do. We use it to announce the TSB’s deployment of investigators to occurrence sites, provide updates on high-profile investigations, and release media materials, investigation reports, Watchlist items and recommendations. With an average of 5400 visits daily, the website is a key source of information about transportation safety for Canadians—and the attention it is garnering is growing: daily visits are up 20% over last year. New web initiatives to communicate the TSB’s work have proven successful: the first of the website’s new “occurrence pages”, for the First Air accident last August in Resolute Bay, received nearly 11,500 views. We also improved the website’s navigation and accessibility.

The website could be more user friendly and more easily searched.

TSB Stakeholder Consultation 2011

A second strategic objective for the TSB is advocacy—pushing for change—so that the action taken on recommendations we issue make transportation safer for everyone. Our growing outreach program has had a significant impact, with the TSB taking advantage of nearly 100 advocacy opportunities in 2011–2012, from articles in newspapers or

international magazines and presentations to local organizations by staff in all four modes, to participation by Board members at stakeholder conferences and meetings.

We also made sure to listen: when we surveyed our stakeholders, they made it clear that we needed to take a more modern approach, and embrace today’s new media. That’s why we’re moving ahead with major improvements to the website and embarking on a new social media venture, starting with a timely stream of updates on Twitter, videos on YouTube, photo galleries on Flickr, and a blog site to encourage further dialogue.

Consequently, 2011–2012 was a very busy year, but we are just getting started. We are very excited about introducing our new website, launching our social media presence and enhancing our outreach efforts. Along with our traditional communications activities, these will help us improve the accessibility of our products and services and get key safety information to stakeholders faster so that we can realize our ultimate objective—the advancement of transportation safety in Canada.

2.3 Watchlist update

2.3.1 What it is and why it matters

In 2010, the TSB released its inaugural safety Watchlist. The list, based on extensive research into years of TSB investigation reports, findings, safety concerns and dozens of Board recommendations, identified the nine transportation issues posing the greatest risk to Canadians. We envisioned the Watchlist as a blueprint for change—and that’s exactly what it became: the Watchlist generated discussion, including meetings with TC and industry.

In many areas we see safety risks, risks that will persist until concrete action is taken.

TSB Stakeholder Consultation 2011

Those meetings bore fruit and, by the end of 2011-2012, two more of the 41 recommendations underpinning the Watchlist had received our highest rating of Fully Satisfactory (Figure 4), with large passenger vessels now required to carry voyage data recorders, and improved safety management systems on Canadian railways.

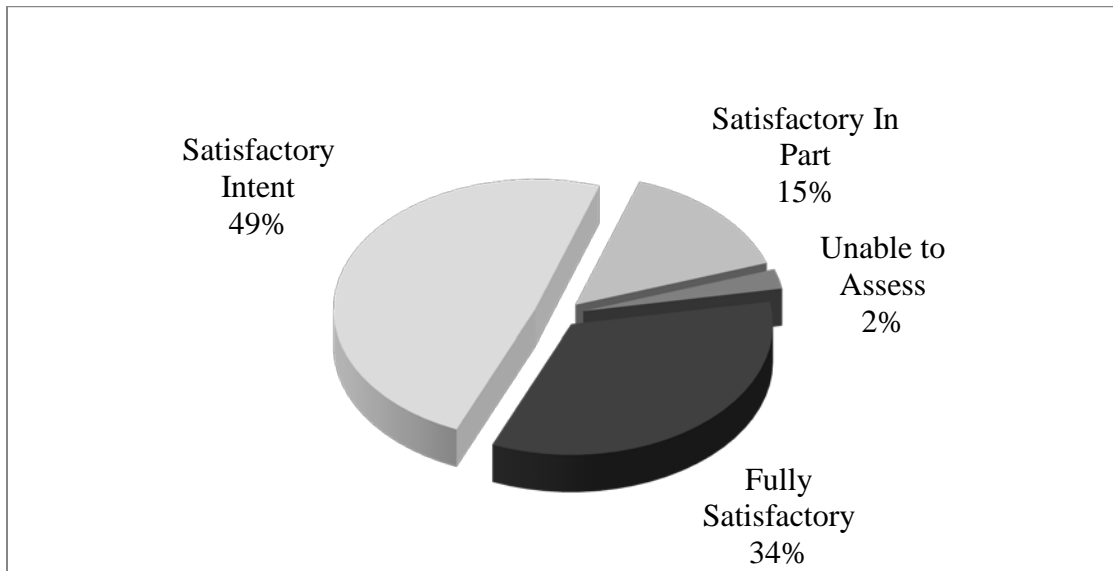
As the Annual Report went to press, 14—just over a third—of all Watchlist-related recommendations had been fully addressed. Our goal, however, is to have all 41 addressed—and we will not relax our efforts until we have achieved it. We will be focusing especially sharply on aviation, where little has been accomplished to date. And in June 2012, we are releasing our second Watchlist. Some issues are new, but some remain from the previous incarnation.

All of this work is part of our never-ending quest to fulfill our mandate and advance transportation safety across this vast land. Because wherever Canadians are, and wherever they are going, they deserve the safest system possible, whether on our waterways, along our pipelines, on our railroads or in our skies.

2.3.2 Progress achieved in 2011–2012

Underpinning the nine Watchlist issues are 41 safety recommendations—action items aimed at both industry and regulators. Before the Watchlist came out in March 2010, only five of the responses to these recommendations had received our highest rating of Fully Satisfactory. Since then, we have rated 9 more of the 41 recommendations as Fully Satisfactory. This means that 14 are now Fully Satisfactory, and we have come more than a third of the way to addressing these crucial safety issues.

Figure 4. Board ratings of responses to recommendations associated with the Watchlist, 1990-2011



2.3.2.1 Marine

Safety in the marine sector has improved slightly in the past year. In addition to two Watchlist-related recommendations being assessed as Fully Satisfactory, we observed a significant decline in marine occurrences reported to the TSB. This is an encouraging trend we hope to see continue over the coming years.

Voyage data recorders

The domestic carriage of voyage data recorders (VDRs) on large passenger and commercial vessels will become mandatory on July 1, 2012. However both the TSB and foreign investigation agencies have begun to note problems with the reliability of VDRs and the familiarity of crew with their use.

Emergency preparedness on ferries

Progress has been made with respect to emergency preparedness on ferries. Small passenger vessels are required to adhere to a number of stricter safety standards including requirements to provide pre-departure briefings; be equipped with a liferaft that is readily deployable; have life-saving equipment that is easily accessible; and possess the means to alert others immediately of an emergency situation.

The recent implementation of TC's training standards for personnel on board passenger-carrying vessels, which ferry crew must take to obtain a passenger safety management certificate or endorsement, is a step in the right direction toward ensuring the safety of passengers in Canada. However, the training is required only for crew on vessels greater than 500 gross tonnes, carrying more than 12 passengers and operating on voyages outside sheltered waters. Since about 60% of Canadian passenger ferries operate in sheltered waters, their crews are exempt from having to obtain the endorsement and therefore the training in passenger safety management.

Loss of life on fishing vessels

New fishing vessel safety regulations are being drafted by TC, and they are expected to directly address recommendations regarding survival suits, the stowage and launching of liferaft, and vessel stability. This work is progressing very slowly, however, and greater priority needs to be placed on this long-standing issue in order to improve the safety of Canadians who earn their living fishing at sea.

Safety management systems

In 2004, a TC study recommended that a safe operating plan (SOP) program be implemented for smaller passenger and cargo vessels. An SOP is a scaled-down version of a safety management system, and is aimed at providing a practical and affordable set of safety requirements for small commercial vessels. Individual operators draw up an SOP, which includes a written record of the vessel's maintenance and safe operating procedures. It also details the conditions under which a vessel operates and the conditions for carrying passengers. However, TC has indicated that its proposed amendments to the *Safety Management Regulations* will not apply to commercial vessels under 24 metres, to vessels carrying fewer than 50 passengers, or to fishing vessels under 24 metres. There has been no change to address the safety deficiency posed by the possibility of small passenger-vessel operators being unaware of the risks associated with the operation of their vessels or not possessing the competence to manage those risks, and there is no evidence that TC intends to undertake further initiatives in this regard.

2.3.2.2 Rail

Safety in Canada's rail sector continued to see notable improvements in 2011. Four recommendations attained the Board's highest rating of Fully Satisfactory, three of which were directly linked to the Watchlist. Fatalities also reached a five-year low, with significant improvements being made in the number of crossing accidents and non-main track derailments.

Safety management systems

Progress has been made by the regulator with respect to the audit and enforcement oversight of railway safety management systems (SMS). Guidelines and tools have also been developed to assist railways with their SMS implementation.

Passenger trains colliding with vehicles

TC, meanwhile, is ensuring that safety assessments are conducted on railway crossings in the busy Québec–Windsor corridor. Significant progress has been made by industry in this area. There has also been some progress toward developing special signage at crossings for emergency contact numbers and low ground clearance advance warning signs.

Operation of longer, heavier trains

With regard to train marshalling and handling, TC has undertaken multi-stakeholder research into train-track interaction. Industry has also taken steps to improve train marshalling practices by implementing new technologies and strategies for operating longer, heavier trains. Over the past two years, there has been no indication that the number of derailments involving this type of train has increased.

Data recorders

Through equipment upgrades, the ongoing renewal of locomotives and the use of distributed power for main-track operations, the industry has made good progress toward reducing the risk of losing event-recorder information during an accident.

2.3.2.3 Air

As noted earlier, the Board remains concerned that not enough is being done in the aviation sector to address identified risks. In 2011, no Watchlist-related recommendations achieved Fully Satisfactory status, leaving 11 active Watchlist-related recommendations with significant room for improvement.

Collisions with land and water

Some movement has occurred since the issue appeared in the 2010 Watchlist. Proposed regulatory changes were pre-published on December 3, 2011, in the *Canada Gazette*, Part 1, Volume 145, No. 49. The proposed regulatory amendments would introduce requirements for the installation of terrain awareness warning systems (TAWS) in private and commercial aircraft of a certain size. Operators would have two years from the date on which the regulations come into force to equip their airplanes with TAWS and five years to equip with enhanced altitude accuracy function.

The TSB is a world leader, and it is important that it continue to pursue its high level of standards.

TSB Stakeholder Consultation 2011

The proposed regulatory amendment brought forward by TC, if adopted and implemented, will substantially reduce the safety deficiency identified.

Safety management systems

In September 2011, TC indicated that they had finished drafting the new subpart 604 of the *Canadian Aviation Regulations* that will require holders of a private operator certificate to establish a safety management system. Once the new subpart comes into effect, all new applicants will need to satisfy this requirement, and existing operators will need to do so as well before they can obtain a private operator certificate from TC. A two-year transition period is anticipated, after which all operators will have to be compliant with the new regulatory requirements.

Data recorders

TC has taken significant action on this Watchlist issue. The TSB will monitor the implementation of the planned actions, as indicated in a notice of proposed amendment to the *Canadian Aviation Regulations* (Notice of Proposed Amendment [NPA] 2011-2012) regarding cockpit voice recorders and independent power supplies.

Risk of collision on runways

No new technological defenses have been implemented in Canada and TC needs to take a leadership role. Despite some success at preventing collisions on runways, greater use of enhanced collision warning systems is still required.

Landing accidents and runway overruns

Since the TSB first placed this issue on its Watchlist, the annual number of landing accidents and runway overruns has not decreased. Compared to the United States, we have almost three times the rate of overruns.

In Canada, there is no requirement to meeting international standards and recommended practices for safety areas. Until TC's risk assessment activities lead to an effective mitigation strategy, this safety deficiency will remain.

2.3.3 Looking forward

When we launched the Watchlist in March 2010, we called upon government and industry to take concrete action to eliminate critical safety issues in Canada. Now, nearly two years later, encouraging progress has been made. And as we move to release a new, updated version of the Watchlist in June 2012, we will be able to remove some of the issues that have been addressed by our stakeholders.

To foster the discussion on transportation safety, Watchlist 2012 will leverage the momentum built and refocus efforts on outstanding and newly identified issues. We will continue to monitor action taken and provide change agents with periodic scorecards. By increasing our efforts to promote these important issues, we will move even closer to improving the safety of the transportation system.

In the end, our goal remains the same: to achieve Fully Satisfactory status for every single Watchlist recommendation—all 41 of them.

2.4 Marine sector

2.4.1 Annual statistics

There was a downward trend in marine accidents last year. In all, 322 marine accidents were reported to the TSB in 2011, a 9% decrease from 354 in 2010, and a 23% decrease from the annual average of 420 in 2006–2010.³ There were 15 marine fatalities in 2011, down from 18 in 2010, and from the average of 19 in 2006-2010.

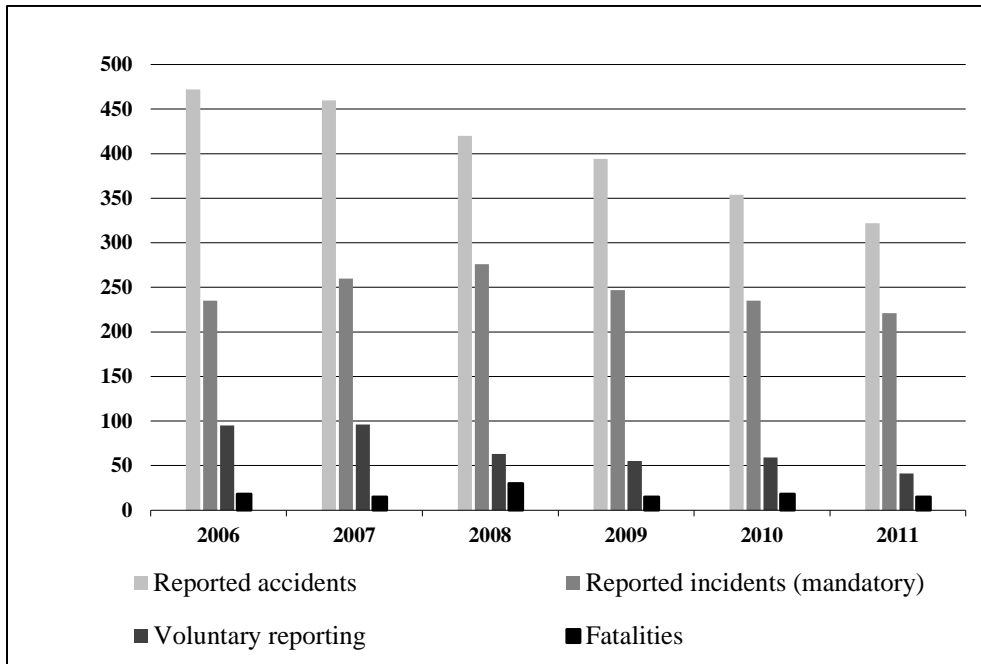
Shipping accidents, which accounted for 89% of marine accidents in 2011, were down to 285 from 299 in 2010, and from the five-year average of 364. A total of 38% of all vessels involved in shipping accidents were fishing vessels. In 2011, there were 37 accidents to persons aboard ship—which include falls, electrocution and other types of injuries requiring hospitalization—down from 55 in 2010 and down from the five-year average of 56.

In 2011, shipping accidents resulted in three fatalities, down from 11 in 2010 and down again from the five-year average of 10. Accidents aboard ship resulted in 12 fatalities, up from the seven in 2010 and the five-year average of nine.

In all, 22 vessels involved in accidents reportable to the TSB were reported lost in 2011, down from the 2010 total of 27 and the five-year average of 31.

In 2011, 221 marine incidents were reported to the TSB in accordance with mandatory reporting requirements. This represents a 6% decrease from the 2010 total of 235, and is down 12% compared with the five-year average of 251.

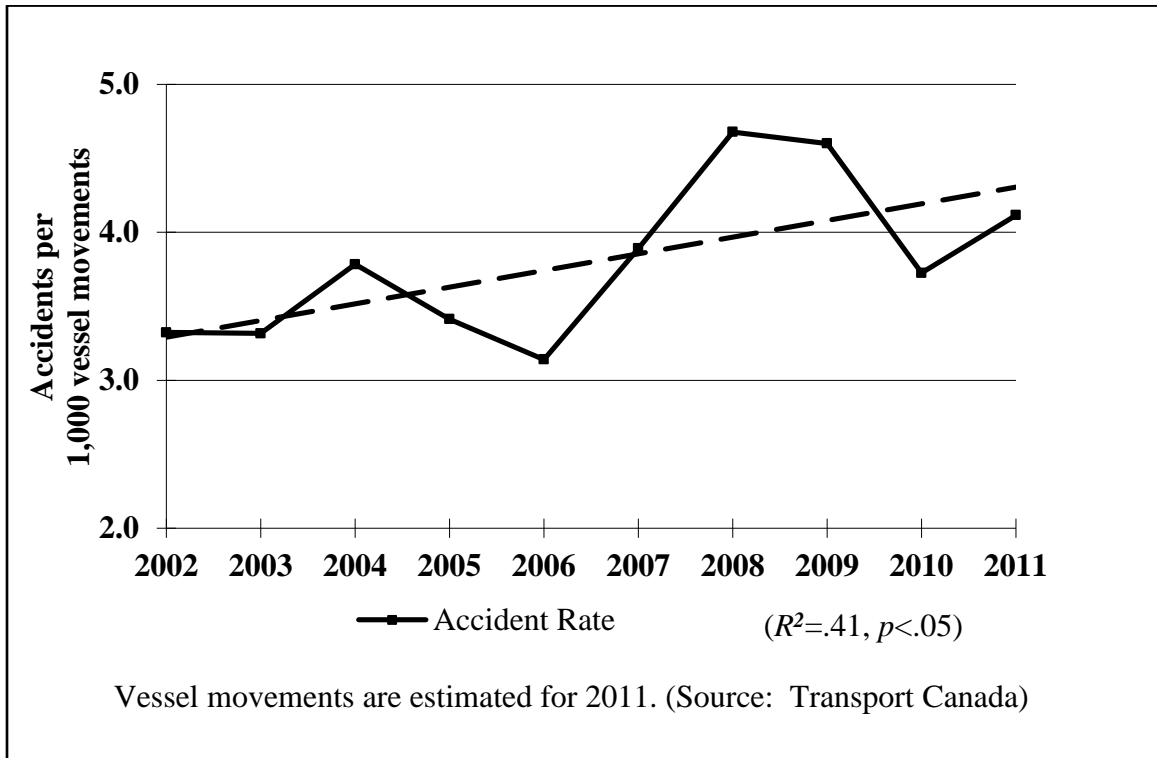
Figure 5. Marine occurrences and fatalities



³ The occurrence statistics are for the calendar year unless otherwise indicated.

According to information provided by TC, marine activity for Canadian commercial non-fishing vessels over 15 gross tonnes (excluding passenger vessels and cruise ships) decreased by 16% from the 2006–2010 average. This yields an accident rate of 4.1 accidents per 1000 movements, up from the 2010 rate of 3.7, and up from the five-year average of 3.9. There has been a significant upward trend in the accident rate for Canadian commercial non-fishing vessels over 15 gross tonnes (excluding passenger vessels and cruise ships) over the past 10 years. Marine activity for foreign commercial non-fishing vessels decreased by 3% from the 2006–2010 average while the accident rate decreased to 1.4 accidents per 1000 movements, down from the five-year average of 1.8.

Figure 6. Canadian-flag shipping accident rates



2.4.2 Investigations

In 2011–2012, nine marine investigations were started and seven investigations were completed. This represents a small decrease in the number of investigations completed compared to the eight completed in the previous year. The average duration of completed investigations was 503 days, down from the 2010–2011 average (529 days) and below the average of the previous five years (718 days).

Table 3. Marine productivity

	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Investigations started	8	7	6	11	6	9
Investigations completed	8	19	18	9	8	7
Average duration of completed investigations (days)	801	936	796	529	529	503
Recommendations	0	3	2	1	0	2
Safety advisories	8	12	7	7	5	7
Safety information letters	8	4	12	9	6	10

2.4.3 Safety actions taken

In 2011–2012, the Board assessed responses to 19 active recommendations; its assessments were communicated to the appropriate change agents for information and action.

2.4.3.1 Marine recommendations issued in 2011–2012

Two marine safety recommendations were issued in 2011–2012.

2.4.3.2 Assessment of responses to marine recommendations issued in 2011–2012

TSB Investigation Report M10F0003: Knockdown and capsizing of sail training yacht *Concordia*, 300 miles SSE off Rio de Janeiro, Brazil, February 17, 2010

Recommendation M11-01

The TSB recommends that the Department of Transport ensure that those officers to whom it issues sailing vessel endorsements are trained to use the stability guidance information that it requires to be on board sailing vessels.

Response If fully implemented, officers on board sailing vessels will be required to be trained and have the knowledge necessary to use the stability guidance information that is required to be on board sail training vessels. The response to this recommendation is assessed as Satisfactory Intent.

Recommendation M11-02

The TSB recommends that the Department of Transport undertake initiatives leading to the adoption of international standards for sail training vessels on the provision of stability guidance to assist officers in assessing the risk of a knockdown and capsize, and for the training of officers in the use of this information.

Response TC's proposal that Sail Training International (STI) support the development of a training syllabus for endorsing Officers of the Watch on sailing including techniques to mitigate stability risks, such as squall curves, and STI's support, shows potential to improve the overall training for sail training vessel officers. TC's response does not indicate any further initiatives leading to the development (and adoption) of international standards for the provision of stability guidance to assist officers in assessing the risk of a knockdown and capsize, as recommended by the Board. The Board still believes that, as a highly respected and authoritative flag and port state, Canada continues to be well placed to take a leadership role in advocating for international standards in this regard. The response to this recommendation is assessed as Satisfactory in Part.

2.4.3.3 Other marine safety actions

This section highlights marine safety action taken by regulators, operators and manufacturers on various issues as a result of TSB investigations.

TSB Investigation Report M09C0029

On 24 July 2009, while proceeding westward in eastern Lake Ontario, the petro-chemical tanker *AlgoCanada* experienced an explosion in the bow thruster compartment. The vessel sustained minor damage to the bow thruster compartment and forecastle. There were no injuries or damage to the environment and the vessel continued its voyage.

Following this occurrence, the vessel's managers implemented physical changes to the vessel's inert gas system. In addition, shipboard procedures pursuant to the vessel's safety management manual were amended and fleet-wide tank venting permits and procedures were implemented, reflecting international best practices. Training was also conducted for all crew members in the use of the inert gas systems on board their vessels, and all vessels equipped with inert gas systems will now operate in an inert condition at all times.

TSB Investigation Report M09W0193

On 25 September 2009, at 2246 Pacific Daylight Time, the open hatch bulk carrier *Petersfield* experienced a malfunction of its gyro heading feed and struck the west shore of Douglas Channel, B.C. The vessel sustained extensive damage to its bulbous bow, forepeak and collision bulkhead. There were no injuries or pollution and the vessel returned to Kitimat, B.C. under its own power.

The vessel's owner implemented several safety actions after this occurrence:

- 8 of 11 similar synchro converter units in use by the fleet were replaced.
- A gyro-GPS compass alarm visible from the helm position will be installed on board 25 vessels per year over a three-year period.
- Various navigational procedures have been developed or updated regarding the setup of an electronic chart display information system (ECS/ECDIS) alarms and passage planning.

TSB Investigation Report M10L0074

On 09 July 2010, the small passenger vessel *Le Survenant III* sailed from its home port on the Chenal du Moine, east of Sorel, Quebec, with 49 passengers and crew for a 90-minute tour of the Sorel Islands. On the return leg of the voyage, the vessel encountered a heavy squall and, in near-zero visibility, grounded near the mouth of the Chenal des Raisins at 1435 Eastern Daylight Time. No one was injured, nor was there any damage to the vessel.

On 19 August 2010, the TSB issued Marine Safety Information (MSI) Letter No. 06/10, Liferaft Packing Straps, Pictograms, and Instructions. The letter, addressed to TC, states that the packing straps and cellophane tape arrangement surrounding the starboard liferaft may be confusing to users. To ensure these packing straps are not cut inadvertently, they are covered with cellophane tape showing a pictogram of a red X across the black scissors to indicate that the straps should not be cut. The X, however, had faded and was almost invisible. As a result, the pictogram appeared to indicate that the straps should be cut.

On 5 October 2010, TC acknowledged receiving the MSI. TC has advised the company that serviced this liferaft of the problem of the fading ink on the cellophane tape, and TC will explore whether a similar issue exists with other companies.

TSB Investigation Report M10C0043

On 29 July 2010, at approximately 1030 Central Daylight Time, the passenger vessel *River Rouge* with 71 passengers and crew on board ran aground in the Quarry Rapids on the Red River, north of Winnipeg, Manitoba. Following an unsuccessful attempt to refloat the vessel, all 63 passengers and 6 of the crew were evacuated by the Canadian Coast Guard. The vessel was refloated one week later. There were no injuries, damage to the vessel, or pollution.

The vessel was re-certified in the spring of 2011. TC Marine Safety has worked with the master, engineer and authorized representative to correct the outstanding regulatory deficiencies, including those relating to the development of procedures for the safe operation of the vessel, dealing with emergencies, and crew/passenger safety training.

While not always timely, investigation reports were considered effective in conveying the circumstances of an occurrence or accident with an average rating of 7.9 out of 10.

TSB Stakeholder Consultation 2011

In June 2011, TC advised ship inspectors that they must verify the accuracy and validity of the Certificate of Registry before conducting inspections and issuing certificates of inspection. Modifications to the SIRS database were made to include additional checkboxes for inspectors to use during inspections including a checkbox for Certificate of Registry verification. Additionally, inspectors must ensure the presence of on-board written procedures, records of training, and emergency drills. Each checkbox in SIRS references the applicable regulation. TC communicated the changes made to SIRS to all ship inspectors in August 2011.

In July 2010, TC created a working group called “Internal Domestic Vessel Regulatory Oversight” to modernize and standardize the ship inspection process through the implementation of a risk-based inspection regime. The long-term goal of this group is to enhance the regulatory compliance of domestic vessels throughout the life of the vessel and not just at the time of inspection.

TSB Investigation Report M10C0092

On 09 December 2010, the electric cable ferry *Ecolos* was undertaking its last crossing of the year from Thurso, Quebec to Rockland, Ontario on the Ottawa River. At 2045, Eastern Standard Time, the ferry experienced cable, drive assembly and shore attachment failures as ice pans accumulated against the upstream side of the hull. The ferry remained tethered to the shore at Rockland by the damaged west cable. It then drifted downriver until coming alongside the shore ice. The six people on board were evacuated. There were neither injuries nor pollution.

Following the occurrence and the TSB report, the owner of the cable ferry modified the mechanical design of the vessel’s drive system, incorporating updated materials and improved drive cables.

TSB Investigation Report M10F0003

On 17 February 2010, at approximately 1423, the sail training yacht *Concordia* was knocked down and capsized after encountering a squall off the coast of Brazil. All 64 crew, faculty, and students abandoned the vessel into liferafts. They were rescued two days later by two merchant vessels and taken to Rio de Janeiro, Brazil. One crew member suffered broken bones.

On 14 October 2010, the TSB issued Marine Safety Advisory Letter 06/10, Considerations and Precautions Regarding Knockdown of Sailing Vessels. This document was addressed to Sail Training International, the Canadian Sail Training Association, and the American Sail Training Association. It briefly outlined the events of the occurrence and highlighted the risks associated with knockdowns for sail training vessels. It also advised that operators may wish to review their tactics and procedures for squalls, as well as their drills and the stowage of emergency equipment, in order to ensure that adequate precautions are taken in advance.

Following the occurrence, the flag state Barbados Maritime (an executive agency of the Barbados Ministry of International Business and International Transport) launched an investigation. Barbados Maritime now requires vessels in its registry to confirm annually that no changes have been made to either the emergency position-indicating radio beacon (EPIRB) on board or to the information recorded concerning that EPIRB in the relevant database.

On 02 March 2011, TC held a meeting with industry stakeholders representing eight sail training vessels. In addition to discussions regarding the development of standards for approved and on-board training programs, TC gave a presentation on the dangers of squalls as they affect sailing vessels and the risk mitigation measures for them to consider. All attendees were made aware of TSB's Marine Safety Advisory Letter No. 06/10.

Topics discussed during the meeting included

- the need to review safety management systems, standing orders as well as other instructions to, and training programs for, their crew and trainees to ensure that squalls are adequately covered as a key risk for their vessel type;
- the importance of having a crew that has the knowledge and training to recognize squall conditions, the risks posed to the stability of their vessel and the importance of appropriate mitigating actions being taken upon encountering a squall;
- the location and placement of emergency lifesaving equipment and communication equipment; and
- the incorporation of squall tactics into drills and training for both the crew and the trainees as is done for man-over board, fire and boat drills.

TSB Occurrence M11L0160

Following the steering failure and subsequent grounding of a bulk carrier in the St. Lawrence River in December 2011, the TSB sent a marine safety advisory letter to the International Association of Classification Societies (IACS) informing them of technical issues surrounding the failure. Subsequently IACS redistributed the TSB's safety information to classification societies and vessel operators worldwide.

TSB Occurrence M11W0050

Following the grounding of a bulk carrier while it was berthing in Crofton, British Columbia on 16 April 2011, the TSB sent a marine safety information letter to the local pilotage authority outlining the circumstances of the grounding. In response, the pilotage authority sent a memorandum to its pilots reminding them of the limits of the dredged area near the berth.

TSB Occurrence M11W0060

After an occurrence on the west coast in which a ferry backed away from its berth on 05 May 2011, the TSB sent a marine safety information letter to the vessel's operators outlining the circumstances of the incident. In response, the operators indicated that they had taken measures immediately after the incident, including changes to bridge procedures to include more robust cross-checking of all pre-departure steps and improvements to bridge checklists.

2.5 Pipeline sector

2.5.1 Annual statistics

Five pipeline accidents were reported to the TSB in 2011, down from 11 in 2010 and the 2006-2010 average of 9.⁴ According to information provided by the National Energy Board, estimated pipeline activity increased 4% from the previous year. The last fatal pipeline accident in the portion of the industry under federal jurisdiction occurred in 1988. One accident resulting in a serious injury occurred in 2006 and another serious injury occurred in 2009.

In 2011, 165 pipeline incidents were reported to the TSB in accordance with the mandatory reporting requirements, up from 145 in 2010 and the five-year average of 95.⁵ In all, 82% of those incidents involved uncontained or uncontrolled release of small quantities of gas, oil and high vapour-pressure products.

The pipeline industry reported 5 accidents, the lowest number since 2005.

Transportation Safety Board of Canada

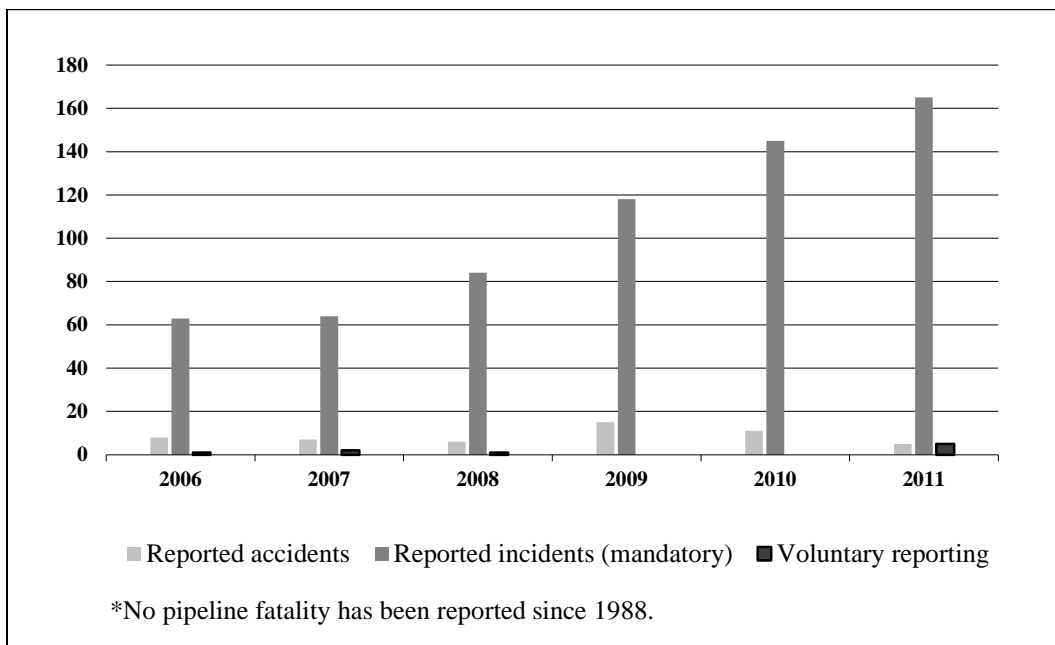
The significant increase in pipeline incidents since 2002 may in part be accounted for by the progressive implementation of improved inspection technologies across the pipeline industry, which has resulted in increased detection of small releases. Also, some of the uncontained releases were associated with the repair or start-up of new facilities. In addition, the conversion of a gas pipeline to an oil pipeline, and the associated change in the operating pressure, may have increased the number of oil leaks. Finally, some pipeline infrastructure was constructed in the 1950s, and may be becoming more susceptible to leaking with age.

Over the coming year the TSB will be examining these and other potential factors to determine their relative contribution to the overall incident increase.

⁴ The occurrence statistics are for the calendar year unless otherwise indicated.

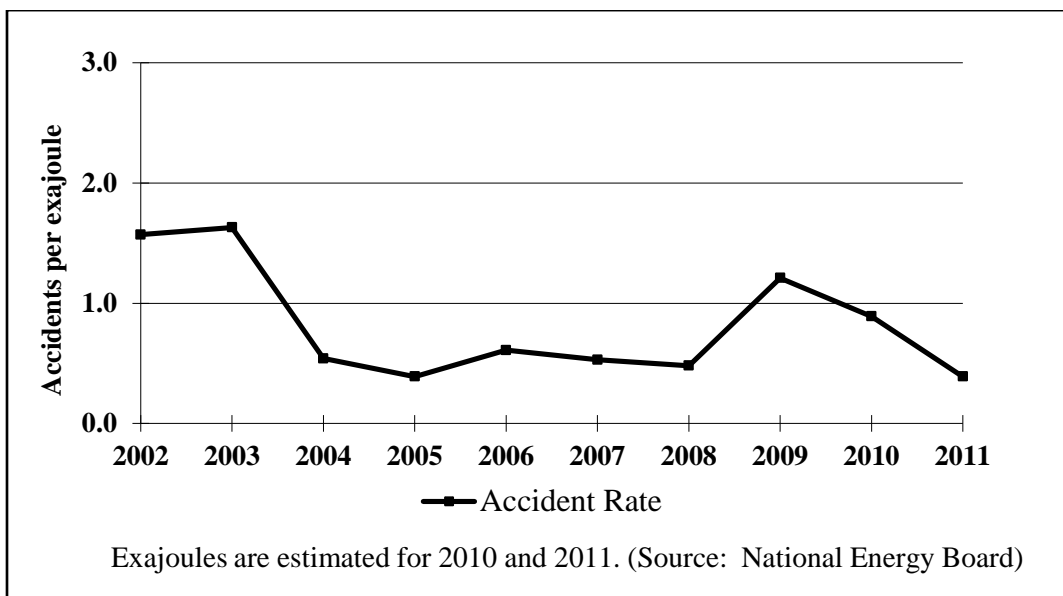
⁵ In 2009, there was a 38% increase in federally regulated pipeline and associated facilities when an additional 23 705 kilometres of pipeline was transferred from provincial jurisdiction.

Figure 7. Pipeline occurrences



One indicator of pipeline transportation safety in Canada is the pipeline accident rate.⁶ The 2011 rate was 0.4 pipeline accidents per exajoule, down from 2010 (0.9) and the 2006–2010 (0.7) five-year average.

Figure 8. Pipeline accident rates



⁶ Pipeline accident rates after 2003 reflect the impact of clarifications to the pipeline industry of the TSB's accident and incident reporting requirements, and of internal adjustments to the data in TSB's Pipeline Occurrence Database.

2.5.2 Investigations

In 2011–2012, no new pipeline investigations were started and one pipeline investigation was completed. This investigation was completed in 403 days, down from the 2010 average of 431 days and below the average of the previous five years (520 days).

Table 4: Pipeline productivity

	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Investigations started	1	2	1	3	1	0
Investigations completed	1	2	2	1	3	1
Average duration of completed investigations (days)	407	489	542	374	431	403
Recommendations	0	0	0	0	0	0
Safety advisories	0	0	0	0	2	1
Safety information letters	1	0	1	0	0	0

2.5.3 Safety actions taken

In 2011–2012, there were no new recommendations issued and no active recommendations requiring Board assessment.

2.5.3.1 Other pipeline safety actions

TSB Investigation Report P11H0011

At approximately 2305 Eastern Standard Time, on 19 February 2011, TransCanada PipeLines Limited’s gas control operator received notification through its emergency notification line of a pipeline fire and explosion near Beardmore, Ontario. At the time of the occurrence, TransCanada was transporting sweet natural gas. Escaping gas from a pipeline rupture had ignited, resulting in the explosion. A large crater was created and three pieces of pipe broke from the system, with pipe and other debris being ejected up to 100 m from the rupture site. Six residents near the site evacuated until the fire was extinguished. There were no injuries.

Following this explosion and fire, the National Energy Board initiated reviews of valve integrity; the requirements for redundancy in the isolation of an operating pipeline; and TransCanada’s risk evaluation associated with asphalt enamel and coal tar–coated sections of pipeline.

TransCanada hydrostatically retested some segments of pipeline and instituted a pressure de-rating program for Line 100-2. In addition, TransCanada modified its pipeline maintenance program to conduct in-line inspections for stress corrosion cracking (SCC) using an electromagnetic acoustic transducer tool. TransCanada has implemented tools to identify SCC on the exterior surface of the pipe.

TransCanada implemented a comprehensive review of its SCC program; instituted a total management system process and implementation review; and amended its valve maintenance program.

2.6 Rail sector

2.6.1 Annual statistics

There was also a downward trend in rail accidents last year (Figure 9). A total of 1023 rail accidents were reported to the TSB in 2011, a 5% decrease from 1076 in 2010 and a 15% decrease from the 2006–2010 average of 1198.⁷ There were 71 rail-related fatalities in 2011, down from the total of 81 in 2010 and the five-year average of 81.

Three main-track collisions occurred in 2011, compared to four in 2010 and the five-year average of five. In 2011, there were 103 main-track derailments, an increase of 29% from the 2010 total of 80 but a 10% decrease from the five-year average of 115. Non main-track derailments decreased to 485 in 2011 from 541 in 2010 and from the five-year average of 588.

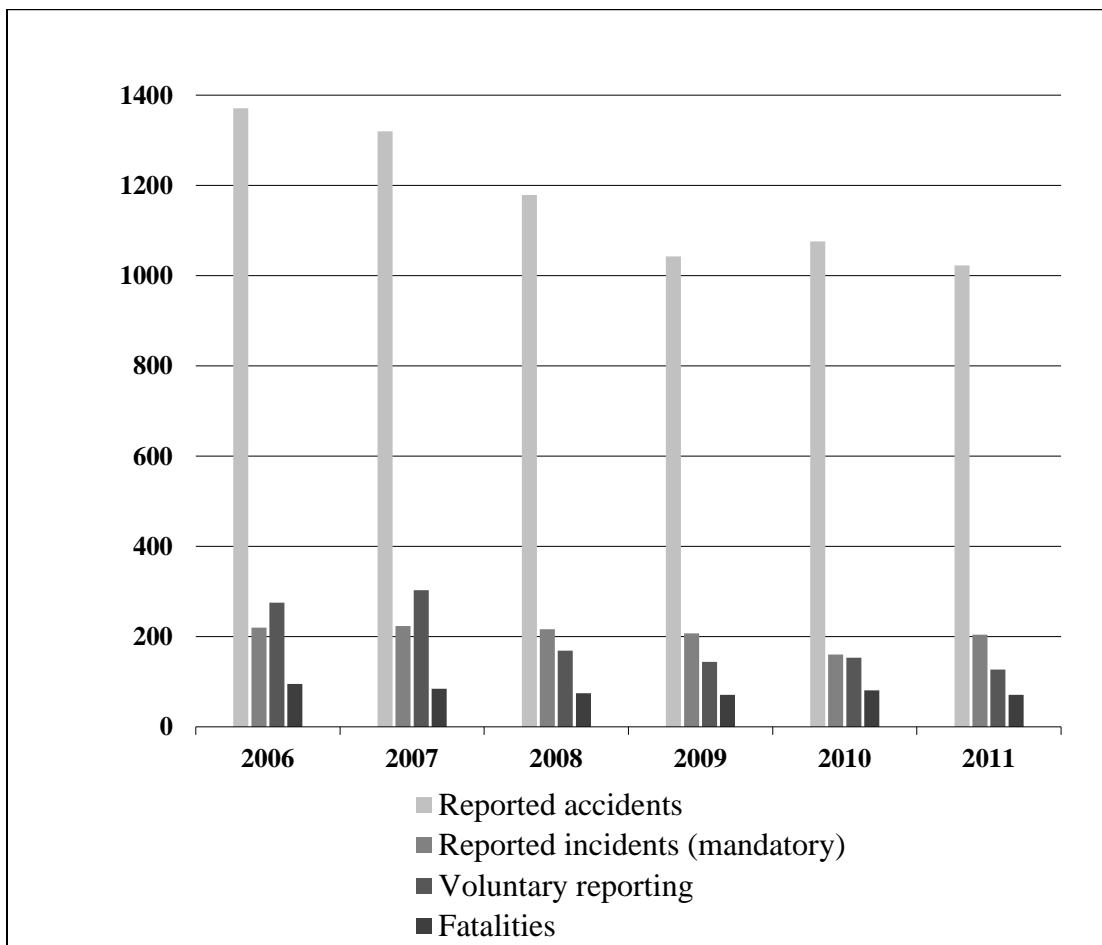
In 2011, crossing accidents decreased to 169 from the 2010 total of 181 and the five-year average of 210. Crossing-related fatalities numbered 25, comparable to 24 in 2010 and the five-year average of 24. Trespasser accidents decreased by 17% to 67 in 2011, down from 81 in 2010, and down by 20% from the five-year average of 84. With a total of 45 fatalities in 2011, trespasser accidents continued to account for the majority of rail fatalities.

In 2011, 118 rail accidents involved dangerous goods (this includes crossing accidents involving a motor vehicle carrying a dangerous good), which is down from 141 in 2010 and below the five-year average of 160. Three of these accidents resulted in a release of product.

In 2011, rail incidents reported to the TSB in accordance with the mandatory reporting requirements totalled 204, up from 160 in 2010 but comparable to the five-year average of 205. Movements exceeding limits of authority incidents (118) made up the largest proportion of the 204 reportable incidents. The second-largest contributor was dangerous goods leaker incidents (51).

⁷ The occurrence statistics are for the calendar year unless otherwise indicated.

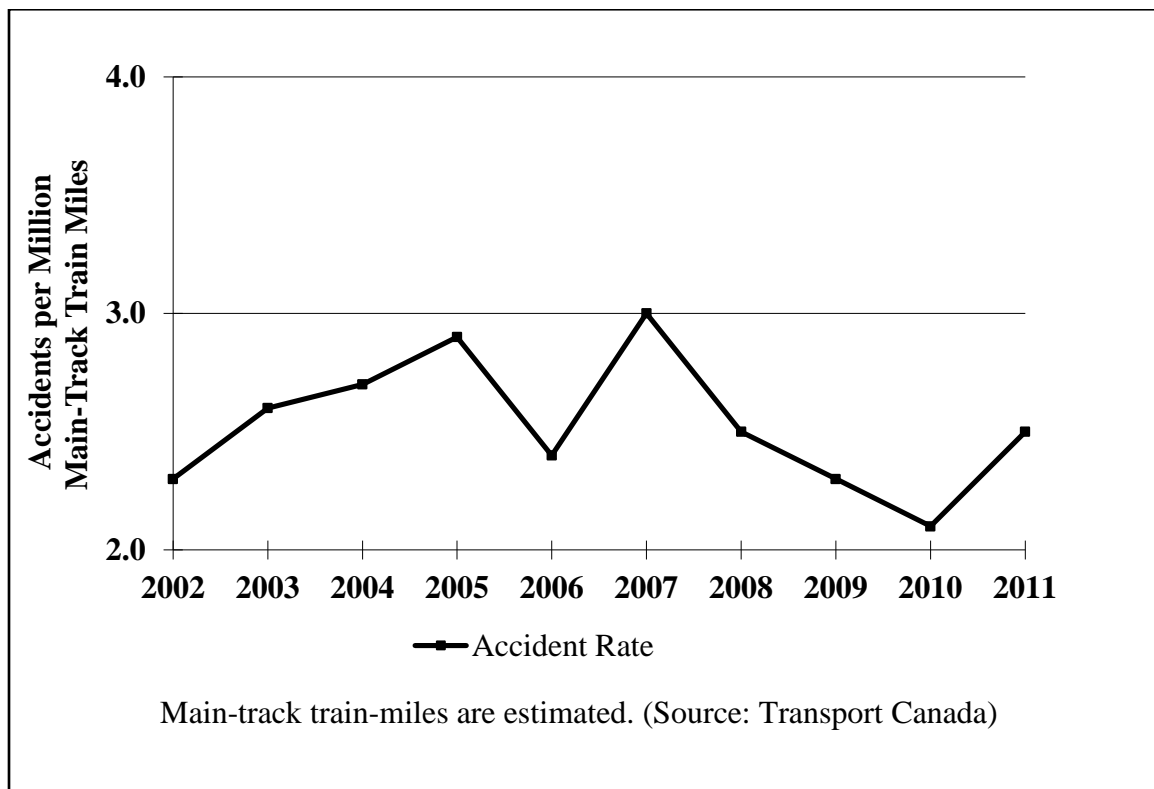
Figure 9. Rail occurrences and fatalities



According to data provided by TC, estimated rail activity in 2011 increased by 1.3% from 2010 but was down 3.6% from the five-year average. The accident rate decreased to 12 accidents per million train-miles in 2011 from 12.8 in 2010 and the five-year rate of 13.6.

Another indicator of rail transportation safety in Canada is the main-track accident rate (Figure 10). This rate increased to 2.5 accidents per million main-track train-miles in 2011 from 2.1 in 2010, and is the same as the five-year average of 2.5.

Figure 10. Main-track accident rates



2.6.2 Investigations

A total of 17 rail investigations were started in 2011–2012, and 19 investigations were completed, an increase over the 16 completed in the previous year. The average duration of completed investigations was 487 days, up from the 2010–2011 average (442 days), but below the previous five-year average (555 days).

Table 5. Rail productivity

	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Investigations started	18	13	14	18	14	17
Investigations completed	11	14	22	13	16	19
Average duration of completed investigations (days)	598	697	539	498	442	487
Recommendations	2	4	2	4	1	0
Safety advisories	8	16	11	8	9	9
Safety information letters	2	13	12	9	8	18

2.6.3 Safety actions taken

In 2011–2012, the Board assessed responses to 16 active recommendations, and its assessments were communicated to the appropriate change agents for information and action.

2.6.3.1 Other rail safety actions

This section highlights rail safety action taken by regulators and operators on various issues as a result of TSB investigations.

TSB Investigation Report R11T0016

On 26 January 2011, at approximately 0310 Eastern Standard Time, as Canadian Pacific Railway (CP) freight train 220-24 was travelling southward at about 45 mph, one of its cars derailed at Mile 105.1 of the CP MacTier Subdivision, near Buckskin, Ontario. The train continued on to the Buckskin north siding switch at Mile 103.7 where an additional 20 cars, including dangerous goods tank car PROX 33743, loaded with non-odorized liquefied petroleum gas, derailed. Some of the derailed cars side-swiped northbound CP freight train 221-25, which was stationary in the Buckskin siding, derailing its lead locomotive and damaging the second locomotive and the first 9 cars on train 221. As a precaution, 15 families from the nearby area were evacuated. There were no injuries and no loss of product.

Following the occurrence, CP installed hot box detectors at Mile 4.7 of the Parry Sound Subdivision and at Mile 3.3 of the Nemegos Subdivision. In addition, CP reviewed the spacing of hot box detectors across its network, resulting in the installation and upgrading of an additional 77 detector sites. These upgrades were part of CP's integrated strategy to implement a system that will communicate wayside detector readings to a back-office computer application for data trending analysis, which will help identify at-risk car components and enable proactive set-off and repair of rail equipment.

The Association of American Railroads (AAR) and the North American railway industry have developed a comprehensive equipment performance monitoring program to monitor and track the fabrication, installation and performance of specific components, including individual rail car wheel sets.

TSB Investigation Report R10T0056

At approximately 1500 Eastern Daylight Time, on 30 March 2010, Canadian National (CN) freight train M37631-30 was proceeding eastward from Toronto to Montréal, when 4 of its locomotives and 11 of its cars derailed near the GO Train station at Mile 1.40 of CN's York Subdivision in Pickering, Ontario. The fuel tank on one of the locomotives was punctured and released approximately 50 litres of diesel fuel, which caught fire. The fire was quickly extinguished by the local fire department. There were no dangerous goods involved and no injuries.

TC issued a notice to CN under Section 31 of the *Railway Safety Act* concerning its failure to effectively manage in-train forces on freight trains operating on the Kingston Subdivision. CN subsequently limited train size on this corridor and committed to a progressive implementation of distributed power (DP), with the intention that in the future, all trains operating in this area would be equipped with DP. Train length was limited a maximum of 10 000 feet and trains over 8500 feet had to be equipped with DP. CN also revised its process for handling specific types of locomotives on the trains.

TSB Investigation Report R09W0259

On 19 December 2009, at 0223 Central Standard Time, southward Canadian Pacific Railway (CP) freight train 870-013 collided with the tail-end of southward CP freight train 2-298-16, which was stationary on the same track at Mile 159.31 of the Weyburn Subdivision at North Portal, Saskatchewan. Eight residue tank cars (last contained gasoline) from freight train 2-298-16 derailed and struck 2 auto-rack cars from CP freight train 2-199-15, which was stationary in an adjacent track. One locomotive from train 870-013 and 24 freight cars from the other 2 trains were damaged. There were no injuries. No product was released.

After the occurrence, CP revised its proficiency testing guidelines for cab communications and audits of written documentation such as clearances, authorities and restrictions. Peer observations were also increased with specific attention paid to identified and applicable rules. In addition, CP developed and implemented the On Board Job Briefing Form.

When asked to rate the level of effectiveness of the TSB in influencing changes that advance transportation safety, nearly two thirds rated the TSB as very effective or somewhat effective.

TSB Stakeholder Consultation 2011

TSB Investigation Report R09T0151

At 1415 Eastern Daylight Time, on 05 June 2009, westward Canadian Pacific Railway freight train 235-04 derailed 4 head-end locomotives and 27 cars at Mile 174.41 of the Belleville Subdivision in Oshawa, Ontario. The derailed cars included a dangerous goods tank car loaded with hydrogen peroxide, which was not breached. Locomotive fuel tanks were punctured and about 3000 gallons of diesel fuel were released and ignited. Emergency responders extinguished the fire and contained the spilled diesel fuel. As a precaution, 105 nearby homes were evacuated. There were no injuries.

In response to a derailment involving a failed axle on a locomotive, CP reviewed and revised its locomotive wheel set handling process and wheel set assembly process at locomotive maintenance shops.

TSB Investigation Report R10Q0037

On 23 August 2010, at 1630 Eastern Daylight Time, 17 cars (16 loads and 1 empty) from Canadian National train M-365-21-23 derailed at Mile 165.80 of the Saint-Maurice Subdivision, near Clova, Quebec. Approximately 1300 feet of track was destroyed. There were no injuries and no permanent damage to the environment.

Following the occurrence, CN revised its procedures concerning the action required after ties are laid and the dynamic stabilizer is used. Before normal train speed is resumed following this type of work, a 10 mph slow order must now be in place for the first two trains and 30 mph for the next two trains, and the track must be inspected after the passage of each of these trains.

TSB Investigation Report R10V0038

On 03 March 2010 at about 1410 Pacific Standard Time, Canadian Pacific (CP) Railway Train 300-02 operating eastward on the north track of the Mountain Subdivision approaching KC Junction, British Columbia, side collided with westward Canadian Pacific Railway Train 671-037 that was departing Golden from the north track through the crossovers onto the south track. As a result of the collision, 3 locomotives and 26 cars derailed. The crew on Train 300-02

were transported to hospital for observation. The locomotive engineer was later air-lifted to a Calgary hospital in serious condition.

In response to this occurrence, CP developed and implemented a crew resource management program, including training materials, for all train crew members. CP also implemented a number of new administrative safety defenses to help ensure that signal indications are consistently recognized and followed.

CP has implemented oral fluid testing, in addition to the current breath alcohol concentration and urine drug testing for reasonable cause and post incident/accident testing.

TC increased compliance monitoring of activities relating to signal recognition and will assess the results of the monitoring activities to determine possible further action.

TSB Investigation Report R10T0020

On 09 February 2010, at 0555 Eastern Standard Time, a Canadian National (CN) yard assignment was shoving freight cars into track R-011 at CN's MacMillan Yard in Toronto, Ontario, when it was advised to stop. Subsequent inspection revealed that dangerous goods tank car ACFX 73936 had failed catastrophically and derailed. The tank car had broken into 2 sections, and released its entire load of approximately 57,000 litres (15,000 US gallons) of ferric sulphate along the roadway and adjacent tracks. A total of two cars had derailed and three additional cars were damaged. There were no injuries.

Following the occurrence, TC, the United States Federal Railroad Administration, the Association of American Railroads and tank car builders evaluated the use of normalized steel for constructing tank car shells and the use of reinforcing pads wherever brackets are attached to the tank car shell. An inspection program involving 1156 tank cars built with brackets welded directly to the tank is underway.

TSB Investigation Report R10M0026

On 13 June 2010, at approximately 1359 Atlantic Daylight Time, a Cape Breton and Central Nova Scotia Railway (CBNS) freight train travelling westward at 24 mph derailed, damaging 15 rail cars, including 8 tank cars (7 loads of liquefied petroleum gas and 1 residue hydrogen peroxide). The derailment occurred at Mile 65.6 of the CBNS Hopewell Subdivision near Avondale, Nova Scotia. There were no injuries or release of dangerous goods. Ten residences were evacuated for approximately one week. The TSB investigated the derailment at the request of the provincial government.

Following the occurrence, the car repair facility (PROCOR) reviewed the condition and performance of 27 other cars identified as having the same repair. PROCOR also initiated a separate shop program and is progressing with its inspection of these cars. PROCOR has also reviewed the correct repair procedures with its shop staff.

TSB Investigation Report R10E0080

On 06 July 2010, at 1320 Mountain Daylight Time, Canadian National Railway freight train Q101 31 04, proceeding westward through Track YC01 of Jasper Yard (Mile 0.16, Albreda Subdivision) in Jasper, Alberta, side collided with VIA Rail No. 1 while the train was disembarking passengers on the station track. VIA Rail passenger car 8328 was struck on the south side and was pushed to a 45° angle. VIA Rail passenger car 8328 and CN locomotive 8904 sustained damage. There were no injuries.

Following the occurrence, VIA Rail issued a notice to operating employees indicating that locomotive engineers will be responsible for the handling of all switches in Jasper Yard. This notice clarified the role, responsibilities and related procedures for VIA crew members at Jasper Yard.

TSB Investigation Report R10D0077

On 23 September 2010, at approximately 2335 Eastern Daylight Time, Canadian Pacific Railway freight train 159-23 derailed 2 locomotives and 11 loaded cars at Mile 22.2 of the Winchester Subdivision near Saint-Lazare, Quebec. Approximately 500 feet of track was damaged. The accident caused two minor injuries and a small spill of dangerous goods.

Following the occurrence, the Ministère de la Sécurité publique du Québec, in coordination with the Ministère des Affaires municipales, des Régions et de l'Occupation du territoire, undertook a review of government guidelines on land-use planning and applicable legislation regulating non-railway activities in areas adjacent to the railway right-of-way.

TSB Investigation Report R10E0096

On 18 August 2010, at approximately 0330 Mountain Daylight Time, CN switching assignment L602-23-17 was shoving 50 loaded and 5 empty cars eastward into track VC-64 at Scotford Yard when the movement collided with a cut of 46 empty cars in the track. As a result of the collision, 43 cars derailed including 21 cars of dangerous goods or residue. There was no release of product and there were no injuries. The cars were intended for track VC-63.

In response to this occurrence, CN installed additional lighting at to increase visibility at the center of the yard during night switching operations.

TSB Investigation Report R10D0088

On 18 October 2010, at about 0945 Eastern Daylight Time, eastward Canadian National freight train M36831-18 derailed 18 cars, including 6 cars containing dangerous goods, at Mile 58.20 on the Kingston Subdivision near Lancaster, Ontario. A small amount of sodium cyanide (solid) was spilled. As a precautionary measure, residents in close vicinity to the accident site left their homes. There were no injuries. About 1000 feet of track were damaged or destroyed.

TC is monitoring CN's train marshalling strategies for the Kingston Subdivision, including the use of distributed power and various marshalling rules, which will be implemented system-wide.

In addition, an inspection and training blitz was conducted by the railway industry after it was determined that a defective coupler pin assembly was causal in this accident.

TSB Investigation Report R10E0056

On 04 May 2010, at 0832 Mountain Daylight Time, westbound VIA Rail passenger train No. 1 struck a 4-door pick-up truck at the Winterburn Road level crossing, Mile 10.76 of the Edson Subdivision. As a result of the collision, the three occupants of the truck sustained fatal injuries. The crew and passengers on the train were uninjured.

After this serious crossing accident at Winterburn Road in Edmonton, CN upgraded the crossing protection system with a grade crossing predictor constant warning system and LED lights. CN also issued instructions to its maintenance personnel to ensure that crossing event recorders are verified for correct time stamps, and to inspect and download crossing event recorders according to GI-307.

TSB Investigation Report R10T0213

At approximately 1050 Eastern Daylight Time, on 01 October 2010, Canadian National freight train M31451-28, proceeding southward from Capreol, Ontario to Toronto, Ontario, derailed 21 cars just south of the James Bay Junction Road crossing at Mile 144.19 of the Bala Subdivision near Falding, Ontario. The derailed cars included eight loaded tank cars containing non-odorized liquefied petroleum gas and seven loaded tank cars containing fuel oil. A number of homes in the vicinity of the derailment were evacuated. There were no injuries and no product was released.

Following this derailment, CN enhanced its fatigue management plan, which included a number of practices and programs to mitigate crew fatigue. In addition, CN and its operating unions embarked on a pilot project in a number of terminals to assess scheduling for unassigned service.

TSB Investigation Report R10C0016

On 03 February 2010, at 1720 Mountain Standard Time, Canadian Pacific Railway freight train 292-02 was proceeding eastward on track 2 through Medicine Hat Yard in Medicine Hat, Alberta, when seven empty auto carrier cars derailed. Derailed cars contacted equipment on adjacent tracks to the north and south, derailing two locomotives and an additional auto carrier car. Fuel tanks from the two derailed locomotives were punctured, releasing 9100 litres of diesel fuel. There were no injuries. No other dangerous goods were involved.

Subsequent to this occurrence, CP enhanced its train area marshalling system (TrAM 3) to assess the impact of marshalling lighter cars (i.e., less than 45 tonnes) near the head end of a train.

TSB Investigation Report R10C0086

On 03 August 2010, at 0643 Mountain Daylight Time, Canadian Pacific Railway freight train 2-269-02, proceeding southward from Red Deer to Calgary, Alberta derailed 32 cars at Mile 21.4 of the Red Deer Subdivision near Airdrie, Alberta. The derailed cars included 12 pressure tank cars containing anhydrous ammonia. No product was lost and there were no injuries.

Following this occurrence, CP added an additional ultrasonic rail inspection to this corridor each year. In addition, CP revised its rail testing protocol.

TSB Investigation Report R11T0113

On 22 May 2011, at approximately 1225 Eastern Daylight Time, Canadian National Railway 0600 Plank Road switching assignment was pulling westward out of track A-6 with a cut of 72 cars when the lead locomotive collided with the 28th car of the 0800 Bunkhouse switching assignment, which was also pulling westward through a converging lead track. As a result of the collision, two loaded bi-level auto carriers and the locomotive consist of the 0600 assignment as well as six dangerous goods tank cars from the 0800 assignment derailed. There was no release of product and no injuries.

Following this collision, CN installed signs on the switches in the current point protection zone to remind employees that they must call the yardmaster prior to entering the other zones. In addition, CN increased its safety program on point protection and on communications within the yard.

2.7 Aviation sector

2.7.1 Annual statistics

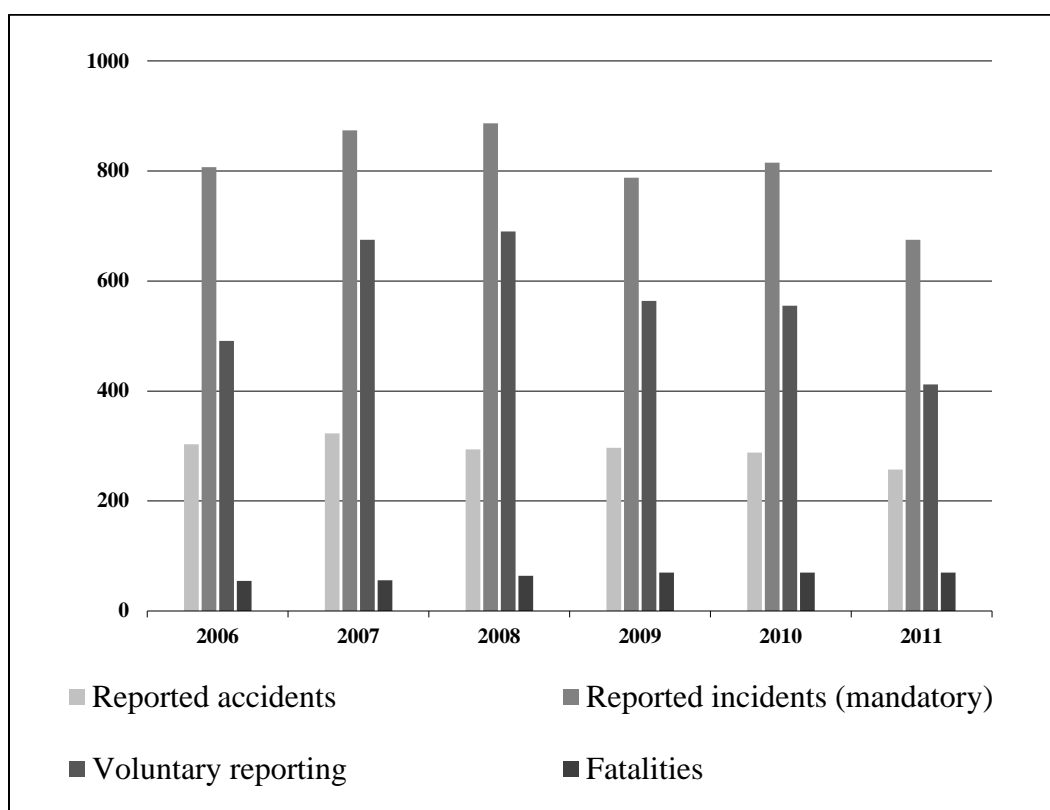
Canadian-registered aircraft, other than ultralights, were involved in 230 reported accidents in 2011, a 6% decrease from the 2010 total of 244 and 11% below the 2006–2010 average of 258.⁸

Canadian-registered aircraft, other than ultralights, were involved in 30 fatal occurrences with 65 fatalities in 2011, comparable to the 31 fatal occurrences with 64 fatalities in 2010 and the five-year average of 30 fatal occurrences with 56 fatalities. A total of 16 fatal occurrences involved commercial aircraft (10 aeroplanes and 6 helicopters), and 10 of the remaining 14 fatal occurrences involved privately-operated aeroplanes. The number of accidents involving ultralights decreased to 17 in 2011 from 30 in 2010; there were three fatal ultralight accidents in 2011, unchanged from 2010.

There were 10 foreign-registered aircraft accidents in Canada in 2011, down from 14 in 2010. There were two fatal accidents in 2011 and two in 2010.

In 2011, 675 incidents were reported to the TSB in accordance with mandatory reporting requirements. This represents a 17% decrease from the 2010 total of 815 and a 19% decrease from the 2006–2010 average of 834.

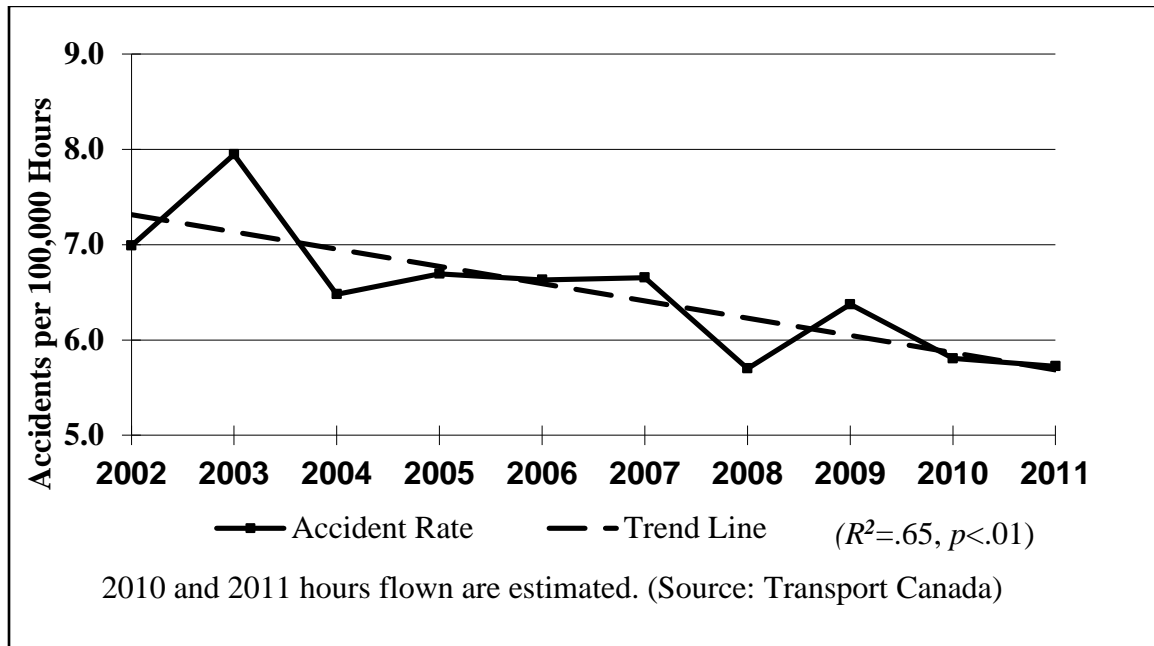
Figure 11. Air occurrences and fatalities



⁸ The occurrence statistics are for the calendar year unless otherwise indicated.

According to data provided by TC, estimated flying activity for 2011 was 3,966,000 hours, yielding an accident rate of 5.7 accidents per 100,000 flying hours, down from the 2010 rate of 5.8, and down from the five-year rate of 6.2. 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 rates



2.7.2 Investigations

A total of 34 air investigations were started in 2011–2012, and 28 investigations were completed, fewer than the 38 completed the previous year. The average duration of completed investigations was 446 days, less than the 2010–2011 average (503 days) and the previous five-year average (474 days).

Table 6. Air productivity

	2006–2007	2007–2008	2008–2009	2009–2010	2010–2011	2011–2012
Investigations started	41	49	43	36	40	34
Investigations completed	34	47	46	50	38	28
Average duration of completed investigations (days)	516	493	430	430	503	446
Recommendations	4	11	1	6	6	0
Safety advisories	16	13	13	9	6	5
Safety information letters	12	9	8	2	3	0

2.7.3 Safety actions taken

In 2011–12, the Board assessed the responses to 33 active recommendations; its assessments were communicated to change agents for information and action.

2.7.3.1 Other air safety actions

This section highlights air safety action taken by regulators, operators and manufacturers on various issues as a result of TSB investigations.

TSB Investigation Report A09P0187

On 09 July 2009, the Canadian Air Charters Piper PA-31-350 Chieftain (registration C-GNAF, serial number 31-8052130) was operating under visual flight rules as APEX 511 on the final leg of a multi-leg cargo flight from Vancouver to Nanaimo and Victoria,

British Columbia, with a return to Vancouver. The weather was visual meteorological conditions and the last 9 minutes of the flight took place during official darkness. The flight was third for landing and turned onto the final approach course 1.5 nautical miles behind and 700 feet below the flight path of a heavier Airbus A321, approaching Runway 26 Right at the Vancouver International Airport. At 2208, Pacific Daylight Time, the target for APEX 511 disappeared from tower radar. The aircraft impacted the ground in an industrial area of Richmond, British Columbia, 3 nautical miles short of the runway. There was a post-impact explosion and fire. The 2 crew members on board were fatally injured. There was property damage, but no injuries on the ground. The onboard emergency locator transmitter was destroyed in the accident and no signal was detected.

TSB investigation reports were considered thorough and clear.

TSB Stakeholder Consultation 2011

As a result of this occurrence, the airline held wake turbulence refresher sessions for all pilots; the TSB issued two safety advisory letters as well. A letter to NAV CANADA suggested that the company may wish to address ways of reducing hazardous encounters in situations similar to those that prevailed in the accident. A letter to TC suggested that it may want to consider how non-carrier time commitments affect crew fatigue management.

TSB Investigation Report A10A0032

On 24 March 2010, at 0120 Atlantic Daylight Time, a Boeing 727-225 aircraft (registration C-GCJZ, serial number 21854) operated as Cargojet flight 620, departed Hamilton/John Munro International Airport, Ontario, on a scheduled cargo flight to the Greater Moncton International Airport, New Brunswick, with 3 crew members on board. An instrument landing system approach was carried out and at 0307, the aircraft touched down on the 6,150 foot-long Runway 06. Following touchdown, the flight crew was unable to stop the aircraft prior to the end of the runway. The aircraft came to rest in deep mud, the nose wheel approximately 340 feet beyond the runway end and 140 feet beyond the edge of the paved runway end strip. A local fire department responded and arrived on-scene approximately 20 minutes after the aircraft departed the runway. The flight crew exited the aircraft using a ladder provided by the fire fighters. There were no injuries and the aircraft had minor damage.

This occurrence initiated follow-up safety action on several fronts. The airline updated its flight operations manual and standard operating procedures to include enhanced information on

contaminated runway operations; the importance of anti-skid; the effects of hydroplaning; and the importance of flying accurate speeds and profiles on limiting runways. NAV CANADA issued a mandatory briefing to all airport operations staff on the importance of providing timely information about runway surface conditions. The agency responsible for the 727-200 Performance Handbook amended the document to include separate dry and wet unfactored landing distance charts for inflight use only.

TSB Investigation Report A10A0041

On 23 April 2010, the Forest Protection Limited Grumman TBM-3E fire-fighting aircraft (registration C-GFPL, serial number 86020) departed Miramichi Airport, New Brunswick, for a practice water drop flight at about 1338 Atlantic Daylight Time. Approximately 2 minutes later, the aircraft collided with terrain just south of the airport. Emergency responders and workers from nearby businesses responded immediately. The aircraft was destroyed by the impact forces. There was no reported emergency locator transmitter signal. Medical examination determined that the pilot had suffered a heart attack prior to the aircraft impacting the ground.

Following this occurrence, the Board expressed a concern that medical practitioners may not always be aware of the need for, or importance of, transmitting reportable medical conditions and, further, that deficiencies exist in the guidelines designed to screen for cardiovascular risks. TC is in the process of re-writing its cardiovascular assessment guidelines.

TSB Investigation Report A10W0171

On 25 October 2010, the Kenn Borek Air Ltd. Beechcraft 100 (registration C-FAFD, serial number B-42), operating as KBA103, was on an instrument flight rules flight from the Edmonton City Centre Airport to Kirby Lake, Alberta. At approximately 1114 Mountain Daylight Time, during the approach to Runway 08 at the Kirby Lake Airport, the aircraft struck the ground, 174 feet short of the threshold. The aircraft bounced and came to rest off the edge of the runway. There were two flight crew members and eight passengers on board. The captain sustained fatal injuries. Four occupants, including the co-pilot, sustained serious injuries. The five remaining passengers received minor injuries. The aircraft was substantially damaged. A small, post impact, electrical fire in the cockpit was extinguished by survivors and first responders. The emergency locator transmitter was activated on impact.

Following this occurrence, the airline instituted several corrective measures: it amended the weight and balance calculation procedure to require flight crews to confirm the correct aircraft configuration and passenger weights; it implemented a company line check program to include *Canadian Aviation Regulations* subparts 703 and 704 (operations) to ensure adherence to standard operating procedures (SOP), including sterile cockpit procedures; it developed and implemented a procedures-review exam for flight crew, emphasizing SOP and company procedures for stabilized approaches, sterile cockpit, and crew roles and duties during non-precision approaches at remote airports with limited services; and it amended company SOP and placarded aircraft equipped with a Garmin 155XL with information on conducting GPS approaches (these approaches will now be flown from the left seat only).

TSB Investigation Report A10P0388

On 15 December 2010, the Bell 407 helicopter (registration C-GNVI, serial number 53847), operated by VIH Helicopters Ltd., was transporting five skiers and one guide to a drop-off site at about 6000 feet above sea level, eight nautical miles southeast of Blue River, British Columbia. At 1035 Pacific Standard Time, as the helicopter neared the site, a bang and shudder occurred, immediately followed by the low rotor rpm and engine-out horns. Moments later, the helicopter

landed heavily and the pilot and the ski guide, respectively seated in the right and left front seats, sustained back injuries. The five skiers seated in the middle and rear seats were not injured. The helicopter was substantially damaged. The emergency locator transmitter activated automatically on impact and was manually shut off by the pilot once help arrived. There was no fire.

This occurrence led Rolls-Royce to issue a commercial engine bulletin requiring the replacement of parts by new parts incorporating several design changes that addressed the various issues identified in the investigation. The improved design is able to meet maneuver requirements across its allowable manufacturing and installation variation.

Appendix A – Reports released by the TSB in 2011–2012, by sector

Marine reports released in 2011–2012

Date of occurrence	Location	Vessel	Type	Event	Report no.
24-Jul-09	Eastern Lake Ontario	AlgoCanada	Oil tanker	Explosion	M09C0029
25-Sep-09	Douglas Channel, BC	Petersfield	Bulk carrier	Grounding	M09W0193
5-Jan-10	Margaree Harbour, NS	Craig and Justin	Fishing vessel	Capsize and sinking	M10M0014
17-Feb-10	300 miles SSE off Rio de Janeiro, Brazil	Concordia	Sail training vessel	Capsize and sinking	M10F0003
29-Jul-10	Île aux Raisins, Sorel, QC	Le Survenant III	Passenger vessel	Grounding	M10L0074
29-Jul-10	Red River, Winnipeg, MB	River Rouge	Passenger vessel	Grounding	M10C0043
1-Dec-10	Ottawa River, Rockland, ON	Ecolos	Cable ferry	Mechanical failure	M10C0092

Pipeline reports released in 2011–2012

Date of occurrence	Location	Company	Event	Report no.
19-Feb-11	Beardmore, ON	TransCanada PipeLines Limited	Natural gas pipeline rupture	P11H0011

Rail reports released in 2011–2012

Date of occurrence	Location	Company	Event	Report no.
5-Jun-09	Oshawa, ON	Canadian Pacific Railway Limited	Derailment	R09T0151
19-Dec-09	North Portal, SK	Canadian Pacific Railway Limited	Collision	R09W0259
3-Feb-10	Medicine Hat, AB	Canadian Pacific Railway Limited	Derailment	R10C0016
9-Feb-10	Concorde, ON	Canadian National Railway Company	Derailment	R10T0020
25-Feb-10	St-Charles-de-Bellechase, QC	VIA Rail Canada Inc.	Derailment	R10Q0011
3-Mar-10	Golden, BC	Canadian Pacific Railway Limited	Collision	R10V0038
30-Mar-10	Pickering, ON	Canadian National Railway Company	Derailment	R10T0056
4-May-10	Edmonton, AB	Canadian National Railway Company	Crossing	R10E0056

13-Jun-10	Avondale, NS	Cape Breton and Central Nova Scotia Railway	Derailment	R10M0026
14-Jun-10	Grande Pointe, MB	Canadian Pacific Railway Limited	Crossing	R10W0123
6-Jul-10	Jasper, AB	Canadian National Railway Company	Collision	R10E0080
3-Aug-10	Ardrie, AB	Canadian Pacific Railway Limited	Derailment	R10C0086
18-Aug-10	Scotford, AB	Canadian National Railway Company	Derailment	R10E0096
23-Aug-10	Clova, QC	Canadian National Railway Company	Derailment	R10Q0037
23-Sep-10	St. Lazare, QC	Canadian Pacific Railway Limited	Derailment	R10D0077
1-Oct-10	Falding, ON	Canadian National Railway Company	Derailment	R10T0213
18-Oct-10	Lancaster, ON	Canadian National Railway Company	Collision	R10D0088
26-Jan-11	Buckskin, ON	Canadian Pacific Railway Limited	Derailment	R11T0016
22-May-11	Sarnia, ON	Canadian National Railway Company	Collision	R11T0113

Air reports released by the TSB in 2011–2012

Date of occurrence	Location	Aircraft	Event	Report no.
9-Jul-09	Richmond, BC	Piper PA-31-350 Chieftain	Wake turbulence encounter – collision with terrain	A09P0187
12-Nov-09	Franquelin, QC	Robinson R44 II Raven (helicopter)	Collision with cable	A09Q0190
16-Dec-09	Montréal, QC	Robinson R44 II (helicopter)	Decrease in rotor speed followed by collision with terrain	A09Q0210
2-Jan-10	Sept-Îles Airport, QC	Beech 200	Cabin fire	A10Q0019
23-Jan-10	Madoc, ON	Vans RV-7A	In-flight separation and impact with terrain	A1000018
24-Mar-10	Moncton, NB	Boeing 727-225	Runway excursion	A10A0032
23-Apr-10	Miramichi, NB	Grumman TBM-3E	Loss of control and collision with terrain	A10A0041
11-May-10	Toronto / Billy Bishop Toronto City Airport, ON	De Havilland DHC-8-400 De Havilland DHC-8-400	Risk of collision	A1000089
19-May-10	L'Île-aux-Grues, QC	Cessna 172	Collision with terrain	A10Q0070
26-May-10	Cartwright, NL	Piper Navajo PA31-350	Controlled flight into terrain	A10A0056
29-May-10	Ahousat, BC	Cessna 185F	Loss of control – collision with water	A10P0147

20-Jun-10	Toronto-Buttonville Municipal Airport, ON	Cessna 172K	Stall and spin and collision with terrain	A1000125
29-Jun-10	Winnipeg, MB	Dehavilland DHC-8-102	Insufficient fuel	A10C0104
14-Jul-10	Ottawa, ON	Hot air balloon	In-flight fire and precautionary landing	A1000137
16-Jul-10	Lake Péribonka, QC	De Havilland DHC-2 MK I	Controlled flight into terrain at cruising speed	A10Q0111
23-Jul-10	Elk Lake, ON	Bell 206B (helicopter)	Collision with tower	A1000145
5-Aug-10	Sydney, NS	Cessna 414A	Collision with water	A10A0085
16-Aug-10	Clyde River, NU	Bell 206I (helicopter)	Collision with sea	A10Q0133
1-Sep-10	Chibougamau, QC	Eurocopter AS350 B-2 (helicopter)	Loss of visual reference - collision with trees	A10Q0148
10-Sep-10	Pickle Lake, ON	Piper PA 31-310 Navajo	Engine shut-down and forced landing	A10C0159
22-Sep-10	Montmagny Airport, QC	Beechcraft B100	Bird strike on take-off and collision with terrain	A10Q0162
24-Sep-10	Sundre, AB	Cirrus Design Corporation SR22	Loss of control and collision with terrain	A10W0155
25-Oct-10	Kirby Lake, AB	Beechcraft King Air 100	Stall on approach/loss of control	A10W0171
18-Nov-10	Toronto/Buttonville Municipal Airport, ON	Bonanza F33A	Loss of control and collision with terrain	A1000240
12-Dec-10	Pickle Lake, ON	Eurocopter AS 350 B2 (helicopter)	Engine loss and autorotative landing	A10C0214
14-Dec-10	Pokemouche, NB	Cessna 310R	Controlled flight into terrain	A10A0122
15-Dec-10	Blue River, BC	Bell 407 (helicopter)	Engine failure - hard landing	A10P0388
20-May-11	Slave Lake, AB	Bell 212 (helicopter)	Loss of control - collision with water	A11W0070

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 <i>Transportation Safety Board Regulations</i>)
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 <i>Transportation Safety Board Regulations</i>)
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

Appendix C – Assessment categories and ratings for responses to Board recommendations

Responses to recommendations are assessed based on the extent to which the underlying safety deficiency has been or is being addressed. The acceptance or understanding of a deficiency is not a criterion for the assessment rating. The assessment criterion is the potential or actual effectiveness of action planned or taken to reduce or eliminate the deficiency.

Four categories are used to assess responses: Fully Satisfactory, Satisfactory Intent, Satisfactory in Part and Unsatisfactory.

Fully Satisfactory	A Fully Satisfactory rating is assigned if the action taken will substantially reduce or eliminate the safety deficiency. An acceptable alternative course of safety action to the one suggested by the recommendation may have been taken.
Satisfactory Intent	A Satisfactory Intent rating is assigned if the planned action, when fully implemented, will substantially reduce or eliminate the safety deficiency. However, for the present, the action has not been sufficiently advanced to reduce the risks to transportation safety. The TSB will monitor the progress of the implementation of the planned actions and will reassess the deficiency on an annual basis or when otherwise warranted.
Satisfactory in Part	A Satisfactory in Part rating is assigned if the planned action or the action taken will reduce but not substantially reduce or eliminate the deficiency. The TSB will follow up with the respondent as to options that could further mitigate the risks associated with the deficiency. The TSB will reassess the deficiency on an annual basis or when otherwise warranted.
Unsatisfactory	An Unsatisfactory rating is assigned if no action has been taken or proposed that will reduce or eliminate the deficiency. This rating applies to situations where the TSB has received inadequate explanations to convince it that the risks are not worth pursuing. In the Board's view, the safety deficiency will continue to put persons, property or the environment at risk. In such a situation, the TSB should reassess the statement of the deficiency and pursue the issue with the respondent, in the hope of acquiring additional convincing information. The TSB will reassess the deficiency on an annual basis or when otherwise warranted.
Unable to Assess	An Unable to Assess rating is assigned if insufficient information has been provided to make an assessment. The TSB will reassess the deficiency when additional information is received.