Transportation Safety Board of Canada

Bureau de la sécurité des transports du Canada

Annual Report to Parliament 2017-18

Transportation Safety Board of Canada

Canada

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20 June 2018

The Honourable Karina Gould, P.C., M.P.
Minister of Democratic Institutions and
President of the Queen's Privy Council for Canada
House of Commons
Ottawa, Ontario K1A 0A3

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 1 April 2017 to 31 March 2018.

Yours sincerely,

Original signed by

Kathleen Fox
Chair


AIR CANADA

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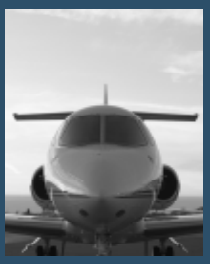
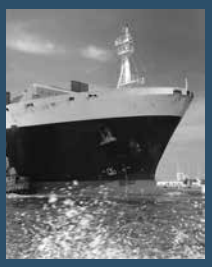




Message from the Chair

This annual report looks back on a busy year for the Transportation Safety Board of Canada (TSB).

We issued 66 investigation reports into aviation, marine, pipeline and rail occurrences across Canada. This is a 50% increase in the number of investigations we concluded compared to 2016-17.

This notable result is a testament to our substantial efforts to address our backlog of investigations and to modernize how we do business. We reviewed and improved procedures, enhanced our project management approach to ensure files progress efficiently and piloted a limited-scope, short-form report for some occurrences so we can more quickly release factual information to the public. With these and other actions, we are taking concrete steps to ensure our continued relevance, efficiency and effectiveness.

The government's move in May 2017 on a longstanding Board concern—that is, the need for voice and video recorders in locomotives—was a welcome step in advancing rail safety. The amendments to the *Railway Safety Act* will require the installation of these devices, which provide essential information to TSB investigators about crew activities and interactions in the locomotive cab leading up to and during occurrences.

During 2017-18, TSB senior officials appeared six times before House of Commons and Senate committees on a variety of topics. The interest of Parliament is a positive development, since it puts a brighter spotlight on our work and provides opportunities for us to broaden the public policy discussion on the topic of transportation safety.

In 2017-18, we also stepped up our efforts to be more open and transparent by providing more information about our investigations to industry and Canadians through the traditional media, social media and our website.

None of the past year's accomplishments would have been possible without our dedicated staff. Given the TSB's mandate and role, employees often work in difficult conditions on matters of crucial importance to Canadians. That is why we are making further investments in investigator training, employee occupational health and safety, and well-being.

As we move into 2018-19, we will launch the new Policy on Occurrence Classification, along with a number of changes to modernize our business processes and products, including how we interact with Indigenous peoples. We will review how we record and analyze data trends. These changes will ensure we continue to deliver effectively on our mandate and have a positive impact on transportation safety in Canada. To prompt further improvement, we will also look at the evolving safety landscape and forge ahead with a new edition of our Watchlist of key safety concerns.

As usual, we will continue to push for positive change to help enhance the safety of Canada's transportation system and of all Canadians who work in it and use it.

Kathleen Fox

The TSB's mandate and activities

The Transportation Safety Board of Canada (TSB) advances transportation safety related to aviation, marine, pipeline and rail activities in Canada:

- It conducts independent investigations into selected occurrences and makes findings about their causes and any contributing factors.
- It identifies safety deficiencies arising in transportation occurrences and makes recommendations to eliminate or reduce them.
- It reports publicly about its investigations and findings.

As part of its investigations, the TSB also reviews developments in transportation safety and identifies safety risks governments and the transportation industry must address in order to reduce the risk of injury and loss.

Role of the Board

The Board, which comprises up to five members, including the Chair, approves all investigation reports, makes findings and issues recommendations.

In making findings, the Board does not assign fault or determine civil or criminal liability for an occurrence. Rather, it seeks to find out what happened and why in an objective manner, independent from government, and all other departments and agencies involved in transportation, and free from any conflict of interest. It also draws impartial conclusions and makes recommendations to those best placed to take action.

About the TSB

A staff of 215, led by the Chief Operating Officer and senior management, supports the Board. The work of the organization is guided by a five-year strategic plan and five core values:

- Respect: We are committed to treating all individuals and organizations with consideration, courtesy, discretion and fairness.
- Openness: We actively share and exchange information to advance transportation safety.
- Safety: We maintain and promote a positive and proactive safety culture.
- Integrity: We are guided by honesty, impartiality, propriety and accountability for our actions and decisions.
- 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.

The Board

Kathleen Fox
Chair

Joseph Hincke
Board member

Faye Ackermans
Board member

Hélène Gosselin
Board member

Paul Dittmann
Board member

The TSB website contains biographies of each Board member.

TSB investigators are professionals with years of experience in the various transportation modes the TSB covers or in their specialized area of work.

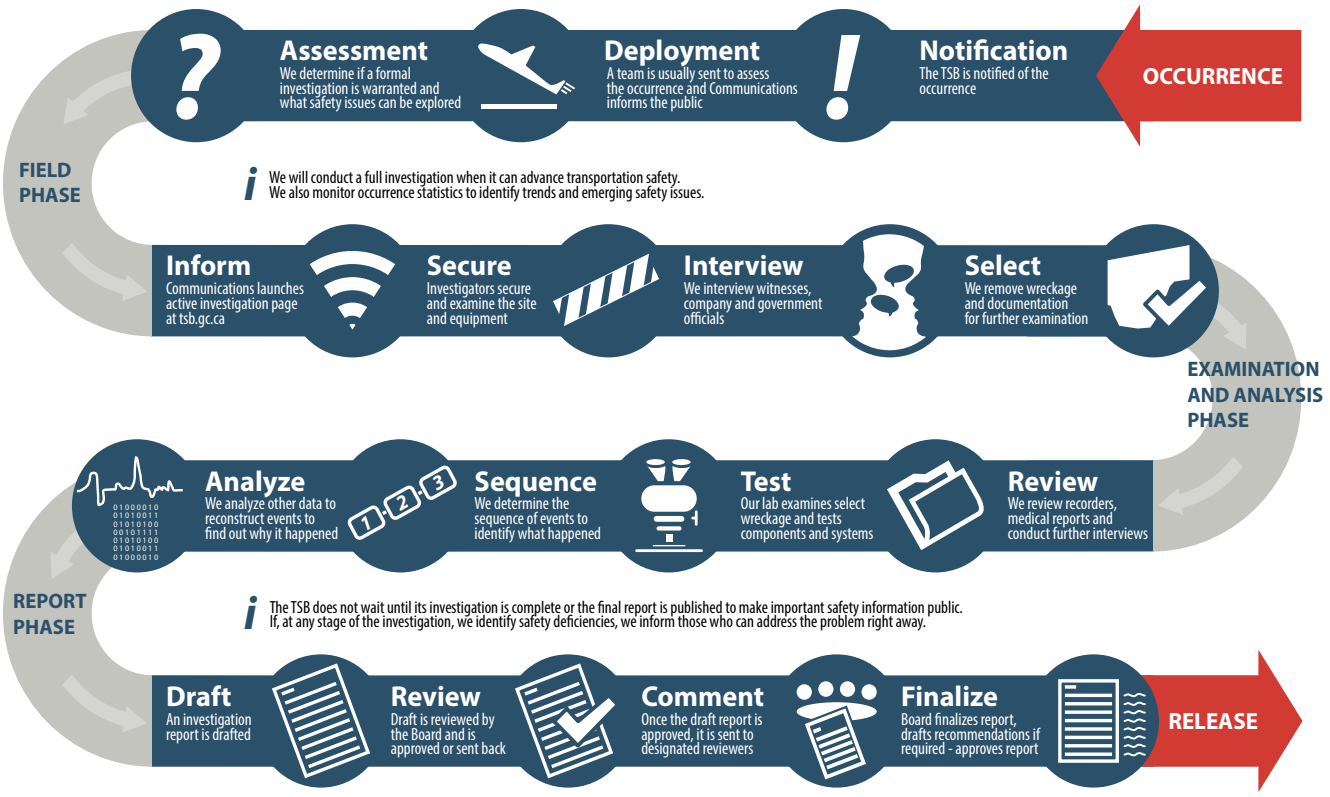
A small and experienced team of communications, human resources and administrative professionals supports the investigators and their work.

The TSB's headquarters are in Gatineau, Quebec. There is also a laboratory in Ottawa, and regional offices in Vancouver, Edmonton, Calgary, Winnipeg, Toronto, Montréal, Quebec City and Halifax.

The investigation process

There are three main phases of the investigation process, as illustrated in Figure 1. During the **field phase**, investigators collect data and assess the occurrence. This generally involves travelling to the scene of the occurrence, securing the site and documenting it, conducting interviews and selecting wreckage for further examination. If a formal investigation is launched, the **examination and analysis phase** begins. The TSB initiates this phase by opening—and maintaining—a page about the investigation on its website. Meanwhile, investigators begin to examine and analyze the data required to determine the sequence of events leading to the occurrence and the causes. In the **report phase**, investigators draft a report on the investigation, which then goes through a review and approval process, prior to public release.

Figure 1. TSB investigation process: from occurrence to report



Once the Board approves the final report, it is released to the public on the TSB website and through traditional and social media.

The transportation safety landscape

Reported occurrences

Canada is reputed to have one of the safest transportation systems in the world. In 2017-18, the TSB assessed all reported occurrences under the Policy on Occurrence Classification to identify those with the greatest potential for advancing transportation safety. It is in these cases that the TSB conducts a thorough, formal investigation and issues a final public report. However, regardless of whether an investigation takes place, the TSB collects relevant information and enters it into its databases in order to keep records, analyze trends and validate safety issues.

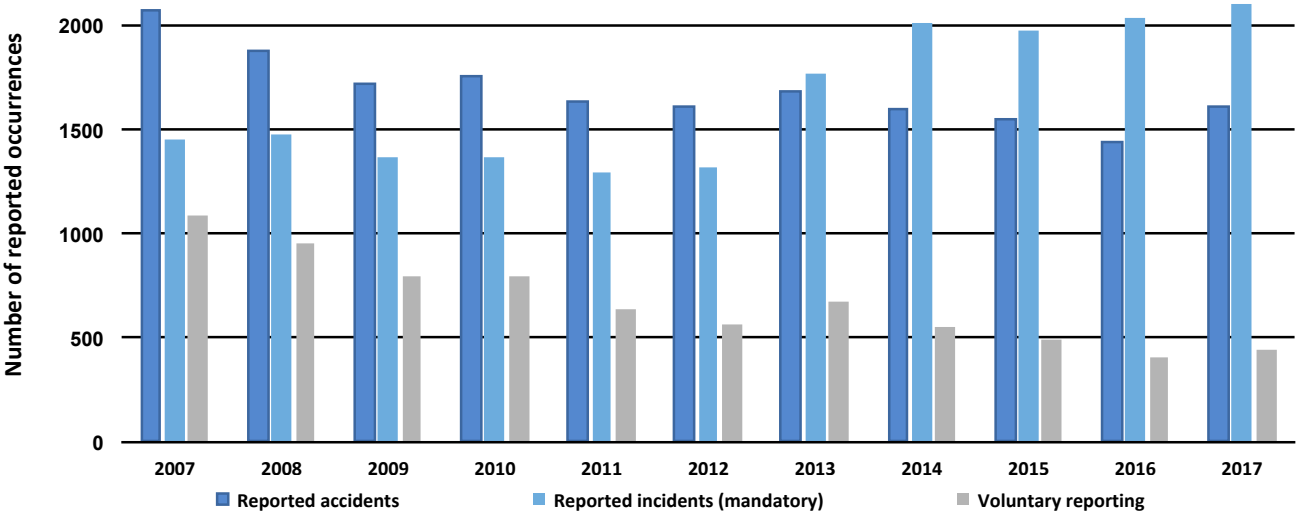
After a consistent downward trend since 2013, the overall number of occurrences reported rose in 2017, despite improvements in some sectors.[1] In 2017, 1,614 accidents and 2,210 incidents were reported in accordance with the TSB's regulations for mandatory reporting of occurrences (see Figure 2).[2]

The 1,614 accidents reported in 2017 represented a 12% increase from the 1,437 reported in 2016. However, the 2017 total was 5% lower than the 10-year average of 1,694. There were 120 fatalities in 2017, up 2% from the 2016 total of 118, but 19% below the 10-year average of 149.

The 2,210 incidents reported in 2017 represented a 9% increase from the 2,030 reported in 2016. The 2017 total was 38% higher than the 10-year average of 1,606.

The TSB also received 435 voluntary reports in 2017.[3]

Figure 2. Reported occurrences, 2007 to 2017



1. Occurrence statistics are for the 2017 calendar year, unless otherwise indicated. Note that in a live database, the occurrence data are constantly being updated. As a result, the statistics can change slightly over time. Comparisons are generally for the last 5 or 10 years.

2. See Appendix B: Glossary for the definitions of "accident" and "incident."

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

Investigations

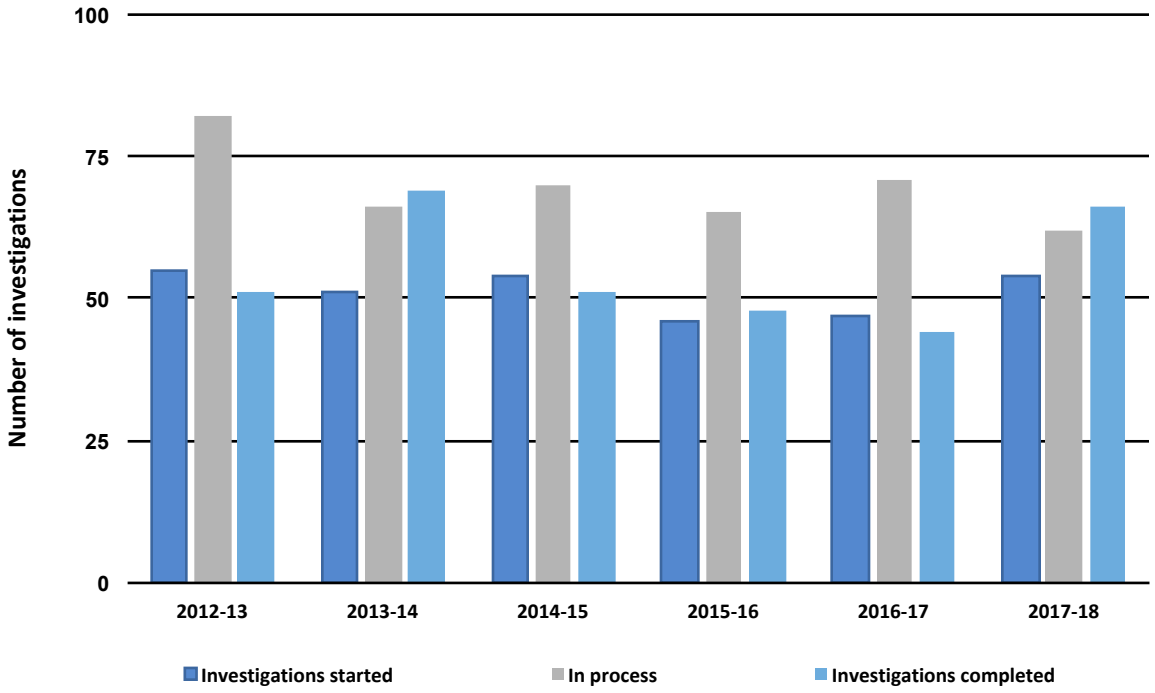
In 2017-18, the TSB launched investigations for 54 of the reported occurrences (see Table 1). During the year, it completed 66 investigations, compared with 44 in the previous year.[4] The number of investigations in progress at the end of the fiscal year decreased to 62 from 71 at the start (see Figure 3). The average time to complete an investigation was 503 days, compared to 569 days in 2016-17 and the five-year average of 527 days. The reduction in average time over the past year is due to the TSB's efforts to streamline processes and fine-tune its project management approach.

Table 1. Investigations at a glance 2017-18

	Aviation	Marine	Pipeline	Rail	Total
Investigations started	18	17	0	19	54
Investigations completed	29	16	1	20	66
Average number of days to complete investigations*	545	466	275	481	503
Recommendations	2	4	0	2	8
Safety concerns	0	0	0	1	1
Safety advisories	5	4	0	12	21
Safety information letters	0	4	0	24	28

* The figures in this row represent the sum of the number of days to complete each investigation divided by the number of investigations completed over the year.

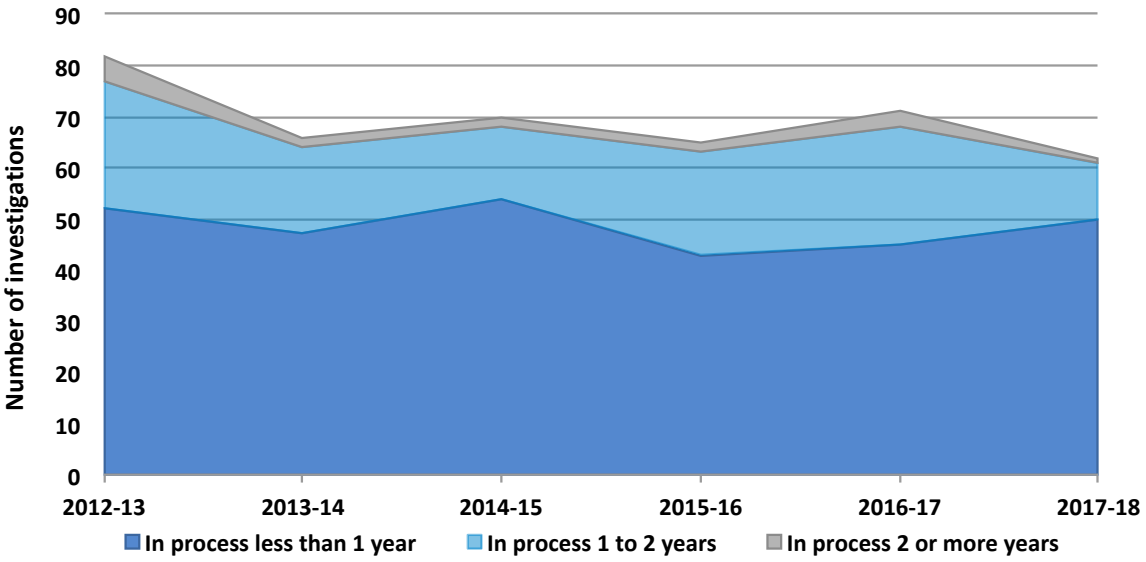
Figure 3. Investigations, 2012-13 to 2017-18



4. Investigations are considered complete after the final report has been issued. See Appendix A for a list, by transportation sector, of the reports released by the TSB in 2017-18.

Figure 4 depicts the number of investigations in process as of 31 March for the past six fiscal years based on how long the investigation file had been open. The increase in investigations in process for less than a year in 2017-18, and the corresponding decrease in those in process for longer, illustrate the results of the TSB's efforts to improve investigation timeliness.

Figure 4. Investigations in process as of 31 March by number of years open



Safety communications

As TSB investigators work to determine the causes and contributing factors of a transportation occurrence, they may identify safety deficiencies that need to be urgently communicated. In that case, the TSB does not wait until the end of the investigation to alert industry and government. Instead, it promptly communicates safety issues and concerns to stakeholders through safety letters and advisories, allowing stakeholders to take immediate action.

In 2017-18, the TSB issued 58 safety communications, including 8 recommendations, 1 safety concern, 21 safety advisories and 28 safety information letters (see Table 1).[5] For example, shortly after launching an investigation into a fatal helicopter accident near Tweed, Ontario, the Aviation Investigation Branch issued a safety advisory about the risks associated with unsecured cargo and unrestrained passengers in helicopters, advising the regulator—Transport Canada—and air transport and helicopter associations to take prompt action.

The Marine Investigation Branch issued a safety advisory to a wide range of industry and government stakeholders while investigating a fluid-coupling malfunction onboard a tug that had caused a fire in the engine compartment. The post-occurrence examination revealed a number of unsafe conditions that affected the crew's health

5. The glossary in Appendix B defines each type of safety communication.

and safety, and the operation of the tug's machinery, rendering it vulnerable to extensive damage in any future coupling malfunction. The ongoing investigation determined that at least 798 vessels worldwide might have similar arrangements.

Following a fatal accident at a railway crossing in Sainte-Anne, Manitoba, the Rail/Pipeline Investigation Branch sent an information letter to the town authority, Canadian National Railway and Transport Canada to share some observations about hazards the configuration of the crossing creates for cyclists and individuals using assistive devices, and to outline some possible safety upgrades.

Board assessments of responses to recommendations

Under the *Canadian Transportation Accident Investigation and Safety Board Act*, a federal minister who is notified of a recommendation from the Board must, within 90 days, advise the Board in writing of any action taken or proposed to be taken in response, or of the reasons for not taking action. The Board carefully considers each response, assessing the extent to which the safety deficiency is addressed, and provides its rating of the response and its reasoning soon after. Every year, the Board also reassesses industry and government responses to all active recommendations, and the reassessments are published on the TSB website.

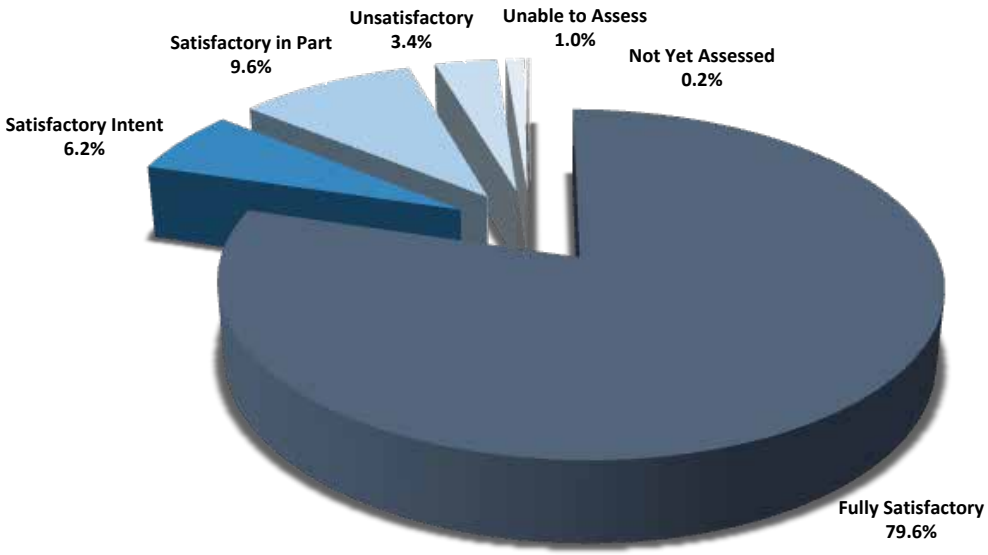
Since 1990, the Board has made 594 recommendations, many of which have led to positive change. As Table 2 and Figure 5 show, by the end of fiscal year 2017-18, the Board had given 79.6% of the responses to its recommendations its highest rating, **Fully Satisfactory**, indicating that Transport Canada and other organizations to whom the recommendations were directed (known as change agents) had taken action that would substantially reduce the safety deficiencies. This represents an increase of 3.3 percentage points compared to March 2017.

The Board had assessed another 6.2% of the responses as **Satisfactory Intent**. This indicates that change agents were taking or had planned to take action that, when fully implemented, would substantially reduce the safety deficiencies. In 9.6% of cases, the Board had issued a rating of **Satisfactory in Part**, which means that change agents were taking or had planned to take action that would not substantially reduce or eliminate the deficiencies. The Board had assessed 3.4% of responses as **Unsatisfactory**, since change agents had not taken or were not planning to take action that would address the deficiencies, or the planned action was taking too long. In the remaining cases, the Board had received insufficient information to be able to assess the response, or the recommendations were too new and had yet to be assessed.

Table 2. Board assessments of responses to all recommendations, 1990 to 2018

Rating	Aviation	Marine	Pipeline	Rail	Total	Percentage of total recommendations
Fully Satisfactory	195	130	20	128	473	79.6
Satisfactory Intent	19	8	0	10	37	6.2
Satisfactory in Part	34	15	0	8	57	9.6
Unsatisfactory	17	3	0	0	20	3.4
Unable to Assess	6	0	0	0	6	1.0
Not Yet Assessed	0	0	0	1	1	0.2
Total	271	156	20	147	594	100.0

Figure 5. Board assessments of responses to all recommendations, 1990 to 2018



Current status of recommendations

In 2017-18, the TSB made concerted efforts to reach out to Transport Canada—the federal regulator for aviation, marine and rail transportation—to work collaboratively to review recommendations that had been active for more than 10 years. All old recommendations in the rail sector, and the majority of marine recommendations, were reviewed during the year. Based on input from Transport Canada and its own supplementary research, the TSB was able to gather sufficient information to enable the Board to reassess 28 old aviation recommendations during the year.

As a result of these efforts, the Board closed 28 recommendations across all sectors in 2017-18, 26 of them as **Fully Satisfactory**. Twenty-four recommendations (21 in aviation and 3 in marine) have yet to be reassessed due to the late receipt of updated responses from Transport Canada. The Board will reassess these recommendations in 2018-19.

As of 31 March 2018, there were 116 outstanding recommendations. This number includes 37 dormant recommendations and 79 active recommendations.[6] As Table 3 and Figure 6 illustrate, slightly less than half of the active recommendations date from more than 10 years ago.

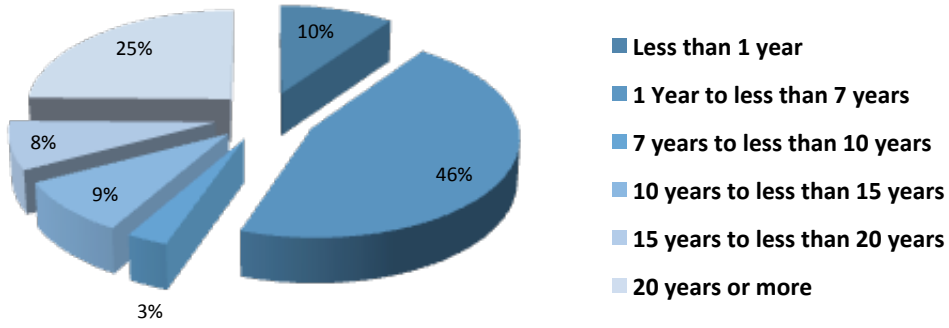
The large proportion of **Fully Satisfactory** recommendations highlights the progress being made by various parties to mitigate the safety deficiencies associated with recommendations, but there are a number of difficult and longstanding issues that remain unresolved. Furthermore, the TSB has observed little, if any, progress on Transport Canada's part to improve its processes for taking action on safety-related recommendations.

6. The TSB considers a recommendation to be dormant when its assessment determines that there is a residual risk but that no further action is planned to be taken and continued re-assessment is unlikely to yield further results. However, the Board may revisit dormant recommendations during occasional reviews or when a safety action is taken that reduces the residual risk.

Table 3. Age of active recommendations as of 31 March 2018

Age of recommendations	Aviation	Marine	Rail	Total
Less than 1 year	2	4	2	8
1 year to less than 7 years	19	6	11	36
7 years to less than 10 years	1	1	0	2
Sub-total (current recommendations)	22	11	13	46
10 years to less than 15 years	3	2	2	7
15 years to less than 20 years	3	2	1	6
20 years or more	14	6	0	20
Sub-total (old recommendations)	20	10	3	33
Total	42	21	16	79

Figure 6. Percentage of active recommendations by age as of 31 March 2018



Watchlist 2016

Every two years, the TSB updates its Watchlist. This list sets out the key safety issues that must be addressed to make Canada's transportation system even safer in each sector or across all or several modes of transportation (multi-modal). The update reflects progress that has been made and identifies new issues. The Watchlist is supported by hundreds of accident investigations, thousands of hours of research and dozens of recommendations.

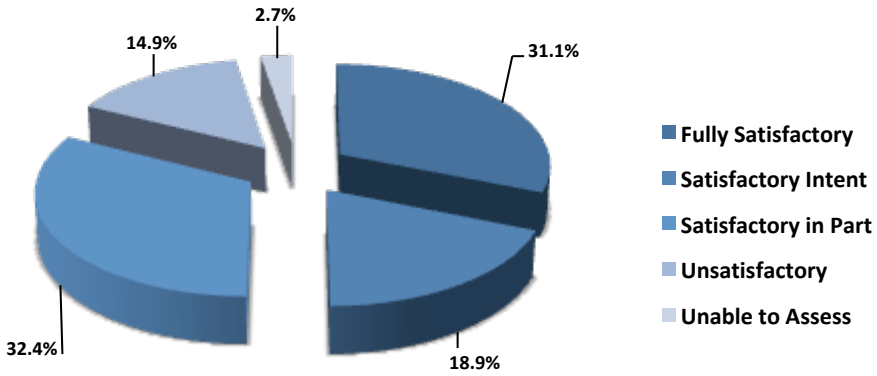
Following the Board's 2017-18 reassessment of outstanding recommendations related to Watchlist issues, about 30% were closed as being **Fully Satisfactory** (see Table 4 and Figure 7). The slow progress implies that work is still needed to raise awareness among industry players and to get government authorities and industry leaders to take more timely and effective follow-up and remedial actions. This section provides a summary of the 2016 Watchlist issues and developments to address the corresponding safety deficiencies.

Table 4. Board assessments of responses to recommendations supporting Watchlist 2016, 2016–2018*

Rating	Aviation	Marine	Rail	Total
Fully Satisfactory	20	1	2	23
Satisfactory Intent	3	6	5	14
Satisfactory in Part	13	8	3	24
Unsatisfactory	8	3	0	11
Unable to Assess	2	0	0	2
Total	46	18	10	74

* The recommendations included in this table are a subset of the total number of recommendations.

Figure 7. Ratings of assessed responses to recommendations supporting Watchlist 2016, 2016–2018*



*The data for this figure covers a subset of the total number of recommendations.

Aviation sector

Unstable approaches

Every year, there are millions of successful landings on Canadian runways. However, as an investigation (A16A0032) featured in this report demonstrates, unstable approaches significantly increase the risk of accidents during the landing phase of flight. The TSB kept the focus on this issue in the forefront during the year through presentations in various forums and the publication of articles in trade magazines. As the regulator, Transport Canada must ensure that airlines find ways to effectively track and enforce compliance with their stable approach policies.

This issue was featured prominently at the 2018 Canadian Aviation Operator's Safety Forum, during which several operators shared their initiatives. Transport Canada is monitoring a trial project with industry to test new procedures for facilitating go-arounds when pilots face an unstable approach. The regulator has also revised its crew resource management standards to include enhanced training on the risks of unstable approaches.

Runway overruns

Several factors, including weather conditions affecting runway surface conditions, can lead to accidents during the landing phase or at takeoff. Pilots need timely and accurate information about runway surface conditions in all seasons to prevent runway overruns. They also need adequate runway-end safety areas in case an overrun does occur.

In 2017-18, Transport Canada published new guidance materials to mitigate the risks of runway overruns. It is also working on regulatory initiatives to address contaminated runways. In addition, NAV CANADA is working to improve runway condition reporting in the Notice to Airmen (NOTAM) system, which is designed to alert pilots of potential hazards. As of March 2018, it was still not clear which regulatory option Transport Canada intends to adopt for runway-end safety areas.

Risk of collisions on runways

At airports, aircraft and vehicles have to share and move between ramps, taxiways and runways, which increases the risk of conflicts or collisions, also known as runway incursions. The Board remains concerned that serious runway incursions will continue until better defences are put in place, particularly technological mechanisms to alert flight crews and vehicle operators of runway conflicts.

In 2017-18, Transport Canada introduced new regulations to enhance vehicle control at Canadian airports. NAV CANADA is updating the runway incursion alert system at certain airports. It is also looking at augmenting its procedures and adopting new strategies to maintain runway safety.

Marine sector

Commercial fishing safety

Through a number of investigations into fatal fishing vessel accidents—such as that of the *Pop's Pride* (M16A0327)—the TSB has found a range of safety deficiencies, often systemic in nature. These deficiencies relate to vessel stability, crew training, operating practices, emergency preparedness, lifesaving equipment, regulatory oversight and fisheries resource management, among others. Improvements require greater coordination and concerted efforts across all levels of government and the fishing industry.

In 2017-18, among other efforts to influence change, the Board made a recommendation to the Government of New Brunswick and WorkSafeNB regarding the wearing of personal flotation devices. TSB officials raised safety issues during a presentation at the Canadian Marine Advisory Council, and also before two parliamentary committees.

The coming into force in 2017 of the new Fishing Vessel Safety Regulations for fishing vessels up to 24.4 m should help lower some of the risks associated with outstanding safety deficiencies. Transport Canada also did the following with regard to the new regulations:

- provided policy documents, inspector training and guidance on the application of the regulations;
- provided information and held consultation sessions with the fishing community;
- implemented a program to help owners and operators ensure their vessels meet applicable regulations;
- provided funding to the commercial fishing industry for the expansion of the Safest Catch program; and
- began exploring additional ways to address the issue of fatigue beyond those set out in the regulations.

The fishing industry in some provinces has also taken increasing leadership in developing guidelines for vessel modifications and stability, and imposing fines for unsafe practices.

Rail sector

Transportation of flammable liquids by rail

The volume of flammable liquids transported by rail across North America is expected to remain significant, creating an elevated risk that must be mitigated effectively. The more robust Class 117 tank car will be the only acceptable tank car for the transportation of flammable liquids in Canada after April 2025. A phase-out or retrofit plan is being implemented for other tank cars. However, regulatory monitoring and enforcement must continue. As part of route planning and analysis, railways must carefully choose the routes on which flammable liquids are to be carried. In addition, they must identify and implement risk control measures and conduct periodic risk assessments to ensure that train operations over those routes will be safe.

After completing an analysis of the tank car industry in July 2017, Transport Canada is examining the feasibility of further accelerating the phasing out of older tank cars. The regulator also modified its national oversight plan to include a dedicated inspection program for railways operating key trains. With the increased number of regulatory inspections to be conducted on key routes due to the revised risk-based planning process, continued safety improvement is expected on these routes.

The Board has acknowledged Transport Canada's progress on these and other integrated measures to improve safety and reduce risk for the transportation of dangerous goods by rail. It has reassessed the response to the associated recommendation, R14-02, and closed it as **Fully Satisfactory**.

Following railway signal indications

Train crews do not always recognize or follow railway signals, which convey operating speed and limits, posing a risk of serious

collisions or derailments. After identifying and communicating the signals among themselves, crew members must take the required action to safely operate the train. However, when signals are misperceived or misinterpreted, existing administrative defences are inadequate to ensure safe operation in signalled territory. Additional physical defences are needed to ensure signals are consistently recognized and followed.

The TSB reiterated the need for physical defences in a number of investigation reports issued in 2017-18, particularly to address the risk of misinterpretation, misperception and/or misapplication of wayside signal indications (R16E0051). Transport Canada organized a number of workshops on enhanced train control systems with key stakeholders. In addition, specific work began on defining a train control roadmap and implementation approach for Canada.

Onboard video and voice recorders

There are safety benefits to having locomotive voice and video recorders (LVVR) on all lead locomotives operating on main track. The recordings provide invaluable information that can help investigators understand the sequence of events and the human factors, such as crew actions or interactions, that may have contributed to the accident. LVVR can also provide railways with a means to identify and address operational and human factor issues within a proactive safety management system. However, the expanded use of this information must ensure that the rights and obligations of all parties are appropriately balanced.

In May 2017, the Minister of Transport tabled the proposed Transportation Modernization Act (Bill C-49) in the House of Commons, which includes provisions for onboard recorders in locomotive cabs.[7]

Fatigue management systems for train crews

Sleep-related fatigue among members of an operating crew can impair the safe operation of freight trains. Since the 1990s, a number of working groups have studied the issue of fatigue in the rail industry, but limited action has been implemented. In 2015, the Railway Safety Management System Regulations came into force requiring that safety management systems include a "process with respect to scheduling" and that the process apply the principles of fatigue science. As part of implementing the scheduling processes, Transport Canada and the railways must ensure that the specific actions within the process will effectively mitigate the risk of fatigue for operating crew members on freight trains.

Following the addition of fatigue to the Watchlist in 2016, the TSB released four investigation reports related to occurrences in which sleep-related fatigue had affected the safe operation of a train. The TSB also issued eight safety communication letters (stemming from reports to SECURITAS, the TSB's confidential reporting program) relating to fatigue management for operating employees. TSB officials promoted the importance of adequate fatigue management at several industry conferences in 2017-18. Transport Canada, as the regulator, has initiated a number of workshops focussed on fatigue in transportation.

Multi-modal

Safety management and oversight

All transportation companies are responsible for managing safety risks in their operations. However, as numerous investigations continue to reveal, many operators are not doing it effectively or are not required to have formal safety management processes in place. The TSB repeatedly emphasizes the advantages of safety management systems (SMS). Yet progress has been slow in expanding the application of SMS to a broader range of companies.

7. Bill C-49 received Royal Assent on May 23, 2018.

The move toward an SMS regime must be supported by appropriate regulatory oversight, including traditional compliance inspections, proactive auditing of companies' safety management processes, and ongoing education and training.

In 2017-18, Transport Canada provided its aviation inspectors with more efficient tools to determine whether hazards are properly identified and mitigated, including the risk of unstable approaches that continue to a landing. It introduced guidance materials to better document findings of non-compliance and help companies understand their safety requirements when developing corrective action plans.

In the marine sector, the regulator is amending the Safety Management Regulations to expand the range of vessels and companies required to adopt an SMS, and has produced guidance materials to help operators develop their own SMS. Following the fatal capsizing of the *Leviathan II* off Tofino, B.C., in October 2015, the TSB recommended that risk management processes—a core SMS component—be required for all passenger vessels, including those carrying fewer than 50 passengers.

In the rail sector, Transport Canada has indicated its commitment to conduct comprehensive audits of railway SMS on a three-to-five-year cycle. Following an audit, railways will have to file corrective action plans, and Transport Canada will monitor their implementation.

Slow progress on addressing Board recommendations

To date, the Board has issued 594 recommendations aimed at fixing systemic safety issues, most of them directed at Transport Canada. In many cases, the regulator has replied positively to the recommendations and agreed with the safety deficiency identified, but has not taken timely action to address it.

As a result of concerted efforts by the Board to review as many of the old recommendations as possible, the number of recommendations active for more than 10 years dropped from 52 to 33 during 2017-18. Despite these efforts, almost half of the active recommendations remaining were older than 10 years, and one quarter were 20 years old or more.

Action is required on three fronts to improve the process for addressing Board recommendations:

- The regulator should commit to taking timely action on all outstanding recommendations with which it agrees.
- The Government of Canada should improve and accelerate the process for implementing safety-related recommendations.
- Change agents must collaborate to make a marked reduction in the backlog of outstanding TSB recommendations, particularly those that will bring Canada back in line with international standards.

SECURITAS

The TSB operates a program called SECURITAS for transportation employees and the Canadian public to report, in confidence, unsafe transportation acts and conditions they observe.

Confidential reporting

While employees are urged to use their company's internal safety reporting systems, not all transportation firms have such systems in place, and, even when they do, employees may not always feel comfortable using them. SECURITAS offers an additional way for individuals to share safety concerns in the aviation, marine, pipeline and rail industries in absolute confidence and without fear of reprisal.

How the TSB handles reports

When the TSB receives a confidential report, a designated TSB trusted agent analyzes the information, communicates with the person who filed the report (known as the reporter) and determines the appropriate action to be taken. The TSB may forward information to the appropriate regulatory authority for follow-up.

Table 5. SECURITAS confidential reports

	Aviation	Marine	Rail	Total
Number of reports received in 2017-18	70	25	44	139
Cases closed (outside SECURITAS mandate)	21	6	8	35
Cases closed (within SECURITAS mandate)	44	11	33	88
Cases remaining open as of 31 March 2018	5	8	3	16

The TSB may also contact specific transportation organizations, companies or agencies directly when they are the parties best placed to address the problem. The TSB may also choose to launch its own investigation or issue a formal safety communication. However, the TSB will not take any action that might reveal the identity of the person who reported the concern. That always remains confidential.

Activities

The TSB received 139 SECURITAS reports in 2017-18 (see Table 5). All were carefully assessed, and 35 pertained to topics outside the scope of the SECURITAS mandate. In those cases, the individuals making the report were contacted and informed, and, when appropriate, directed to contact other organizations.

Including cases that remained open from the previous year, 123 files were closed this year, with 16 remaining open for follow-up. When reported information pertained to an ongoing TSB investigation, it was communicated to the respective investigator-in-charge. In other cases, the information was communicated in confidence to Transport Canada, the operator mentioned in the report or to another organization for follow-up.

Of the 16 SECURITAS cases that remained open at the end of 2017-18, 5 pertained to the aviation sector, 18 to marine and 3 to rail.

Results

Aviation sector

In 2017-18, 70 aviation-related reports were received through SECURITAS. This represents a decrease of 18% from the previous year. In total, 65 reports were closed and 5 remained open at the end of the year. Of the 70 reports, 21 did not fall within the SECURITAS mandate, and 44 were directed to another stakeholder, such as the air operator or Transport Canada. In all but five cases, the reporter received a response, which allowed the TSB to close the file.

The reports once again covered a wide variety of issues, including Canadian Aviation Regulations violations, airport security weaknesses, baggage handling, onboard safety demonstrations, evacuation practices, maintenance issues, risks of collision, unsafe low flying and pilot-related issues, such as an airline employee not being mentally or physically fit to fly, substance abuse and fatigue. Many reports focused on issues not covered by the SECURITAS mandate, such as passenger rights, wind farms and the use of electronic devices.

The TSB found that no formal communication products were required in response to any of the aviation-related SECURITAS reports. The following are examples of reports resolved by the TSB's trusted agents.

Pilot fatigue

A pilot wrote to SECURITAS to report that he and some colleagues were concerned about a fellow captain. The report alleged that the captain consistently took extra work assignments and regularly mixed day and night flying. This individual also had a long commute, which added to the length of his workdays. The pilot who made the report suspected this captain suffered from pilot fatigue, since he was reported as regularly sleeping in the flight deck during both daytime and nighttime flights. Although sleeping during flights is allowed by the Canadian Aviation Regulations, his rest periods were reported to be well in excess of the allowable controlled rest periods set out in the regulations. A trusted agent sent this report to Transport Canada for follow-up. The department and the air operator investigated this issue, determining that the captain's schedule complied with the regulatory requirements. However, the captain was briefed to increase his awareness of the importance of adequate rest.

Canadian Aviation Regulations violation

The reporter in this instance was concerned that an air operator was violating regulations related to visual flight rules by allowing pilots to fly using instrument flight rules when not certified to do so. Transport Canada was advised and in turn performed in-flight inspections of this operator. These inspections did not reveal any evidence of non-compliance. More inspections are planned.

Foreign object debris on the apron

While sitting at an airport in Toronto waiting for her flight, the reporter noticed two plastic bags being blown around by the wind near the aircraft. She was concerned that the bags would end up on the runway and present a potential hazard if an aircraft engine ingested them. The woman was unsure whether this was an actual threat, so she raised her concerns with the gate agent, who said it was not an issue. The reporter, who substantiated her report with pictures, also said that even though there had been many ramp employees working in the area, no one had picked up the bags. The trusted agent informed the airline, which reviewed its foreign object debris training to confirm that it was current and sufficient. The airline also advised the trusted agent of other related awareness activities, such as posters displayed in ramp crew rooms, daily briefings and audits. The trusted agent relayed this information to the reporter.

Marine sector

In 2017-18, the TSB received 25 marine-related reports through SECURITAS. This represents a 20% decrease compared to last year. Six reports were considered to be outside the SECURITAS mandate. Six others dealt with regulatory matters and were resolved in collaboration with Transport Canada's regional offices. Five of the reports contained confidential information about reportable occurrences or related to an ongoing TSB investigation. At the end of the reporting period, the trusted agent had closed 17 of the 25 files focusing on valid safety concerns or outside the SECURITAS mandate, while 8 more complex cases reported in 2017-18 remained open. Communication is ongoing to resolve these outstanding concerns.

Safe parking on ferry

One SECURITAS report related to the way vehicles were being loaded onto a ferry, such that it was difficult for people to exit their vehicle during the transit and for the vehicles to leave the ferry at the destination. The information was transmitted to Transport Canada, which carried out an inspection. Following the inspection, painted markings were added to the deck to designate parking areas with sufficient space between cars. In addition, the ferry's master and crew were instructed to ensure the vessel's safety announcement reminds passengers of the importance of maintaining a safe distance between their vehicles and others when exiting the vessel.

Pipeline sector

As was true in the previous reporting period, no safety issues related to pipelines were reported to SECURITAS in 2017-18.

Rail sector

In 2017-18, SECURITAS received 44 rail-related reports. This represents a 35% decrease over the previous year. Eight were outside the SECURITAS mandate. By the end of the year, 41 cases had been closed and three remained open.

A total of 23 safety communication products were issued as a direct result of these reports. The trusted agent communicated directly with Transport Canada for 22 and directly with the operator for the remaining case. One report was resolved directly with the reporter. Among the common issues reported were fatigue of train crew members, the inspection and maintenance of locomotives, the safety of vehicle drivers at rail crossings, and training for operating employees. The following is an example of a case that led to follow-up and safety action.

Deteriorated rail and concrete ties

SECURITAS received a report alleging that several concrete ties within a rail subdivision were cracked or broken and, at a number of locations, that the rail head had been flattened. After verifying the details with the reporter, the TSB issued a rail safety information letter to Transport Canada, with a copy to the railway. Upon receiving the letter, the company informed the TSB that it immediately performed track inspections at the identified locations. The company verified that the concrete tie standards at each location were met, and said it would monitor these locations for any deterioration. The flattened rail head was located and the rail replaced.

Aviation sector

Annual statistics

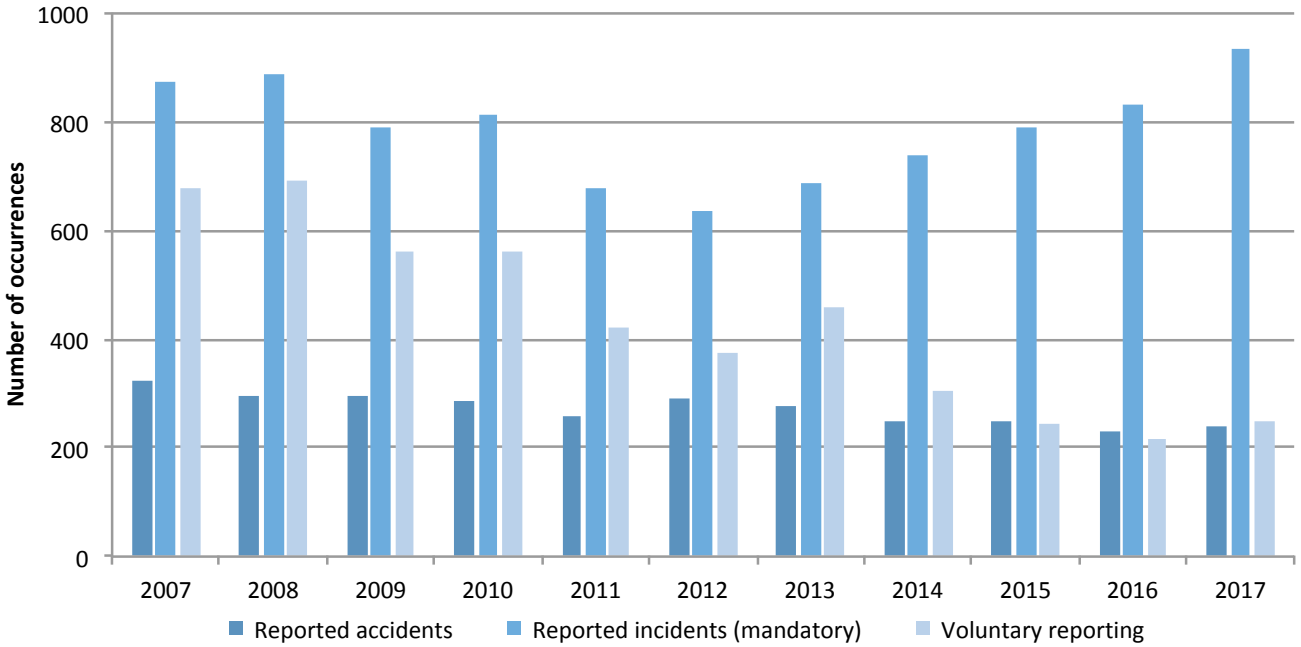
In 2017, 240 aviation accidents were reported to the TSB (see Figure 8), a 4% increase from the 2016 total of 230, but 13% below the 10-year average of 276. Of the total, 208 involved Canadian-registered aircraft (excluding ultra-lights), a 4% increase from the 2016 total of 200, but 13% below the 10-year average of 238. More precisely, the 208 accidents involved 213 Canadian-registered aircraft, 176 of which were aeroplanes (75 commercially operated), 27 helicopters, 5 gliders, 1 gyroplane, 1 balloon and 3 unmanned aerial systems (two fixed-wing and one rotary-wing).

There were 71 accidents in 2017 involving 75 Canadian-registered commercially operated aeroplanes: 10 airliners, 5 commuters, 19 air taxis, 13 aerial work aircraft and 28 flight-training aircraft. This was a 69% increase from the 42 commercial accidents in 2016, and was above the 10-year average of 67. Every category of operator had an increase in commercial accidents, but, most notably, there were 9 airliner accidents (involving 10 aircraft), up from 1 in 2016. This is also above the 10-year average of 5.

Two of the 9 airliner accidents that occurred in 2017 were formally investigated by the TSB. Three were low-speed ground collisions, 2 involved injuries to cabin crew, 1 involved a lightning strike and 1 involved damage related to engine failure. A further 27 accidents involved commercially operated flight-training aircraft (in the category "other commercial type"), which is up from 16 accidents in 2016, and above the 10-year average of 19.

In 2017, 20 fatal accidents involved Canadian-registered aircraft other than ultra-lights. This is down from last year's total of 24, and below the 10-year average of 27. The total

Figure 8. Reported aviation occurrences, 2007 to 2017



of 31 fatalities was lower than the 2016 total of 34, and below the 10-year average of 49. The total of 33 serious injuries was higher than the 2016 total of 18, but lower than the 10-year average of 40.

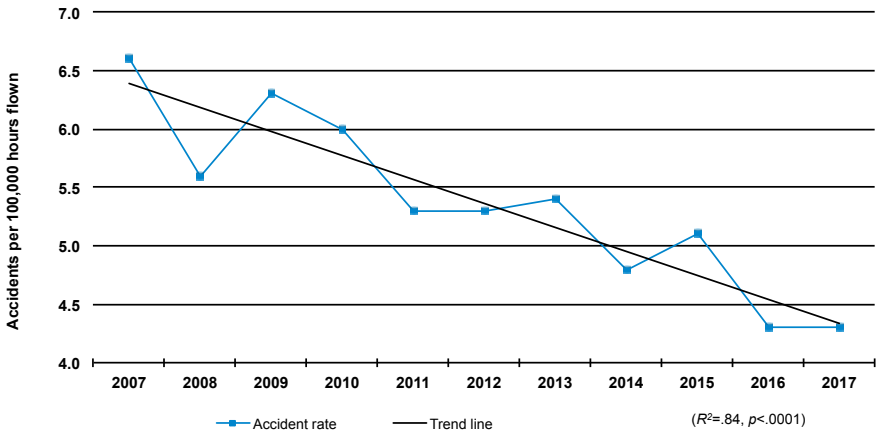
In 2017, 7 accidents involved foreign-registered aircraft in Canada, with no resulting fatalities.

In 2017, 934 incidents were reported in accordance with the TSB mandatory reporting requirements. This is a 12% increase from the 2016 total of 833, and 21% above the 10-year average of 772.

Accident rate

One indicator of aviation transportation safety in Canada is the aircraft accident rate. Transport Canada has estimated there were 4,565,000 hours of flying activity in 2017. The accident rate in 2017 was 4.3 accidents per 100,000 flying hours, unchanged from 2016. There has been a significant downward trend in the accident rate for Canadian-registered aircraft over the past 10 years (see Figure 9).

Figure 9. Canadian-registered aircraft accident rate, 2007 to 2017



Source: Transport Canada

Since aviation activity data (flight hours, takeoffs and landings) is not collected by industry segment, it is not possible to provide accident rates, for example, for large scheduled airlines in comparison with regional commuters or air taxis.

Investigations

In 2017-18, the TSB began 18 new aviation investigations and completed 29 (see Table 6). This is the second-highest number of investigations completed in a given year over the past six years, and a 45% increase from last year.

Of the 29 completed investigations, there were two Class 2 investigations and 27 Class 3 investigations, including three that resulted in limited-scope, short-form reports, which the TSB piloted during the year.

The average time to complete an investigation in 2017-18 was 545 days. This is a significant improvement (17%) over last year's average of 656 days, and is the shortest average duration of the last six years.

Table 6. Aviation investigations at a glance

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Investigations started	28	20	23	21	20	18
Investigations completed	26	42	22	19	20	29
Average number of days to complete investigations	549	639	546	548	656	545
Recommendations	2	4	0	2	14	2
Safety concerns	1	1	2	0	0	0
Safety advisories	5	1	4	1	2	5
Safety information letters	2	0	3	1	0	0

Aviation highlights

A number of the 29 aviation investigations concluded in 2017-18 highlighted Watchlist issues. The following three investigations also presented an opportunity for the TSB to communicate new safety messages. In addition to highlighting the factors that led to a landing accident, the first of these investigations served to remind passengers of their responsibility to ensure their own safety while travelling. The second, involving an in-flight breakup, saw the Board recommend that requirements be established for a substance abuse program for the industry and reiterate the need for lightweight flight recorders. The third investigation, which followed a fatal collision with terrain, underlined the risks of continuing an unstable approach to landing.

A number of factors contributed to 2015 landing accident in Halifax

Through an investigation concluded in 2017-18 (A15H0002), the TSB found that approach procedures, poor visibility and airfield lighting led to the 2015 collision with terrain of an Air Canada Airbus A320 at Halifax's Stanfield International Airport.

Investigators found that the flight crew had set the autopilot appropriately for the circumstances of the approach to the airport. However, because company procedures did not require the flight crew to monitor the aircraft's altitude and distance to the runway, the crew did not notice that wind variations had caused the aircraft's flight path to deviate below the selected flight path. Meanwhile, the runway lights had not been adjusted to their maximum setting, which was not clear to the crew due to the weather, or evident to the tower controller, who was preoccupied with snowplows on the runway and nearby aircraft on the taxiway.

Air Canada, the airport authority and NAV CANADA all took safety actions to address the deficiencies the TSB identified.

In releasing the investigation report on this occurrence, the TSB Chair reminded the public that, while travelling, they are expected to pay attention to pre-flight safety briefings, to review the safety features card and to wear appropriate clothing for the season. During an evacuation, passengers must also leave any carry-on items behind to avoid creating delays.

This accident also reinforced the need to address the outstanding TSB recommendation for Transport Canada to require child restraint systems for infants and young children on commercial aircraft. This recommendation (A15-02) stemmed from the low-energy rejected landing and collision with terrain of a Fairchild SA227-AC Metro III in Nunavut in late 2012 (A12Q0216).

A15H0002

A15P0081

TSB recommends requirements for substance abuse program

Pilot incapacitation almost certainly played a role in the fatal 2015 in-flight breakup of a cargo aircraft north of Vancouver International Airport. The TSB released its investigation report in 2017-18 (A15P0081).

While the TSB was unable to determine exactly why the aircraft entered a steep dive leading to its subsequent in-flight breakup, toxicology tests later revealed that the captain had a blood alcohol content of 0.24%, meaning that he had consumed a significant amount of alcohol on the day of the occurrence.

In light of this, the TSB recommended that Transport Canada work with the aviation industry and employee representatives to develop requirements for a comprehensive substance abuse program. The goal of the program would be to reduce the risk of impairment of persons engaged in safety-sensitive functions. It would include mandatory testing as well as education, employee assistance, rehabilitation and peer support initiatives. To meet industry concerns, the program would have to balance the need to incorporate human rights principles with the responsibility to protect public safety.

This investigation also recalled TSB Recommendation A13-01 on the installation of lightweight flight recording systems aboard small commercial aircraft and flight data monitoring by operators (A11W0048). Had such a device been onboard, the TSB might have been able to determine with more certainty what happened in the final minutes of this flight.

A16A0032

Investigation underlines risks of unstable approaches

The TSB's investigation into a March 2016 fatal collision with terrain of a Mitsubishi MU-2B-60 aircraft in Îles-de-la-Madeleine underlines the risks of pilots continuing unstable approaches to landings. The TSB concluded its investigation into the occurrence in 2017-18 (A16A0032).

Unstable approaches carried through to landing have been on the TSB Watchlist of key safety issues since 2010. Regulators, operators and aircraft manufacturers have defined stable-approach criteria, which pilots are trained to follow, to make landings more consistent, predictable and safer. However, pilots must also consider conducting a go-around when an approach is unstable.

In this investigation, a crucial source of information was the lightweight recorder that the pilot had developed and installed, even though it was not required by regulation. The device provided investigators with highly valuable acceleration and GPS data, as well as cockpit audio, allowing them to piece together a detailed history of the flight.

Recommendations and progress

In 2017-18, the Board reassessed responses to 33 recommendations pertaining to aviation transportation safety and assessed responses to 2 new recommendations, which are discussed below.

Of the 35 recommendations that were assessed or reassessed this year, 25 were closed: 23 with a **Fully Satisfactory** rating and 2 with a **Satisfactory in Part** rating. In addition, 1 was assessed as **Satisfactory in Part**, 6 as **Satisfactory Intent**, 1 as **Unsatisfactory** and 2 as **Unable to Assess**. In the last case, this was due to stakeholders not providing enough information or details to properly evaluate the changes that would result from the proposed actions, if any.

As of 31 March 2018, the Board had yet to complete its reassessment of 21 outstanding recommendations.

Recommendation A17-01: Stall warning system

In a fatal August 2015 floatplane accident (A15Q0120) near Tadoussac, Quebec, the aircraft and its six occupants entered a stall at insufficient altitude for the pilot to recover. The pilot had regularly conducted stall exercises under controlled conditions as an instructor and he was aware of the DHC-2's tendency to stall abruptly during steep turns. Despite this experience, he did not detect the impending stall before losing control of the aircraft.

Until, at a minimum, commercially operated DHC-2s registered in Canada are required to be equipped with a stall warning system, pilots and passengers who travel on these aircraft will remain exposed to an elevated risk of injury or death as a result of a stall at low altitude.

Therefore, the Board recommended that

the Department of Transport require all commercially operated DHC-2 aircraft in Canada to be equipped with a stall warning system.

In its response to the recommendation, Transport Canada acknowledged the safety benefits of stall warning systems and indicated that it would initiate an in-depth examination of the issue to determine the most effective means of addressing the recommendation. It also plans to consult industry stakeholders and to continue its participation in related international efforts to improve passenger safety.

However, it is unclear when or how the safety deficiency identified in this recommendation will be addressed. Therefore, the Board assessed the response to Recommendation A17-01 as **Satisfactory Intent**.

Recommendation A17-02: Substance abuse program

The investigation into the April 2015 in-flight breakup of a Carson Air aircraft near Vancouver, British Columbia, found that alcohol intoxication almost certainly played a role in the events leading up to the accident (A15P0081).

The TSB has identified drug and alcohol use as a factor in a number of investigations. As well, several incidents involving pilots who reported for work while impaired have been covered prominently in the media. Without a regulated drug- and alcohol-testing requirement in place to reduce the risk of impairment of persons engaged in safety-sensitive functions, employees may undertake these duties while impaired, posing a risk to public safety.

Therefore, the Board recommended that

the Department of Transport, in collaboration with the Canadian aviation industry and employee representatives, develop and implement requirements for a comprehensive substance abuse program, including drug and alcohol testing, to reduce the risk of impairment of persons while engaged in safety-sensitive functions. These requirements should consider and balance the need to incorporate human rights principles in the Canadian Human Rights Act *with the responsibility to protect public safety.*

Transport Canada agreed in principle with the recommendation. Its response indicated that it intends to complete an in-depth policy analysis on impairment in the aviation industry to

examine whether it can establish a comprehensive substance abuse program that effectively balances safety with other policy considerations. It also intends to implement more stringent regulatory and enforcement measures for detecting, preventing and treating impairment in the aviation industry. In the fall of 2018, it plans to hold an awareness campaign on substance abuse in aviation.

Until Transport Canada reaches conclusions as to the most effective means of addressing the risks underpinning the recommendation and provides the TSB with its plan of action moving forward following those conclusions, it is unclear when or how the safety deficiency identified in this recommendation will be addressed. Therefore, the Board assessed the response to Recommendation A17-02 as **Satisfactory Intent**.

All the aviation transportation safety recommendations, and the corresponding responses and assessments are available on the TSB website.

Marine sector

Annual statistics

In 2017, 278 marine accidents were reported to the TSB, down from 307 in 2016 (see Figure 10). This is below the 10-year average of 320. Over the past decade, 83% of marine accidents have been shipping accidents, while the remainder have been accidents aboard ship.

There were 233 shipping accidents in 2017, down 12% from the 2016 total of 264 and 12% below the 10-year average of 265.

In 2017, there were 45 accidents aboard ship, up from 43 in 2016 but below the 10-year average of 55. Most accidents aboard ship took place on cargo vessels (40%) and fishing vessels (31%).

There were 11 marine fatalities in 2017: 4 as a result of 3 shipping accidents and 7 resulting from 7 accidents aboard ship. This total is up from the 7 fatalities reported in 2016 but below the 10-year average of 16 fatalities.

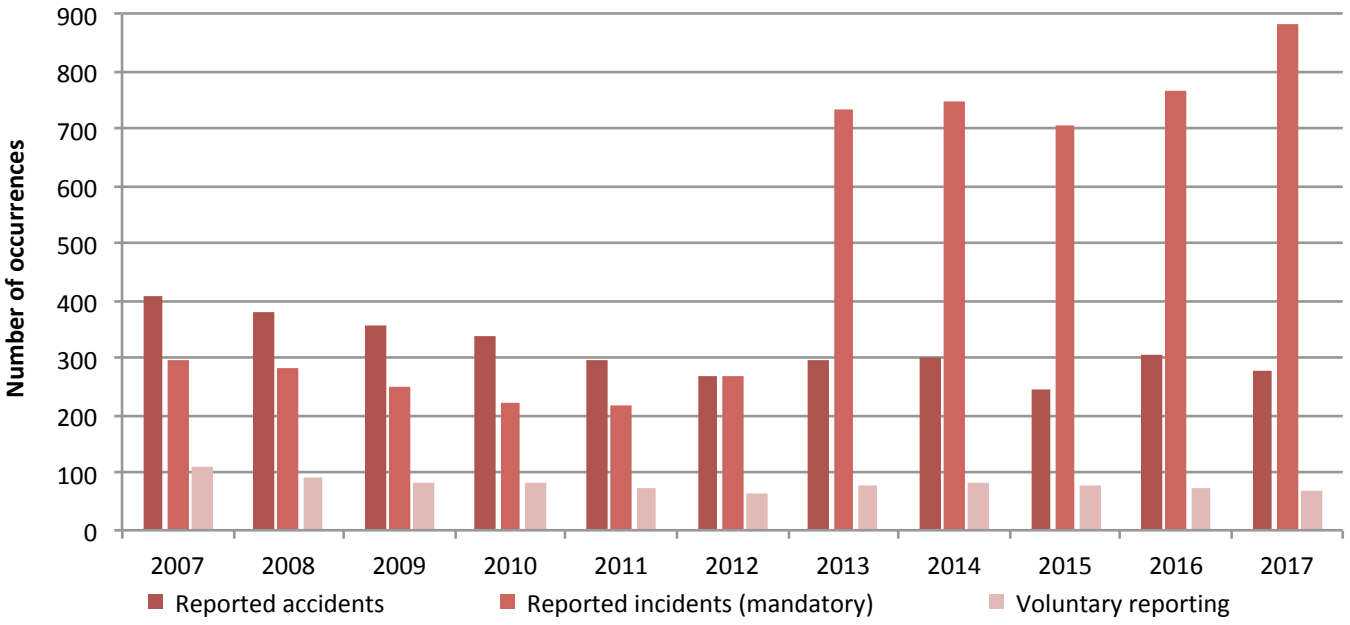
One of the 4 shipping accident fatalities resulted from an accident involving a fishing vessel; 2 resulted from an accident involving a sport-fishing vessel (ferry/passenger); and 1 resulted from an accident involving a workboat.

Two of the 7 fatalities aboard ship occurred aboard fishing vessels. The total of 3 fishing vessel fatalities in 2017 was well below the 10-year average of 10 fatalities.

In 2017, there were 882 marine incidents reported in accordance with the TSB mandatory reporting requirements, up from 768 in 2016. This is also more than the 10-year average of 450.

The higher number of marine incidents reported since 2013 can be largely attributed to changes in reporting requirements. In 2013 the TSB clarified the threshold used to classify incidents in the engine/rudder/propeller category. In 2014, the TSB issued new regulations that also clarified the reporting requirements for a total failure of machinery or technical system, including engine/rudder/propeller incidents.

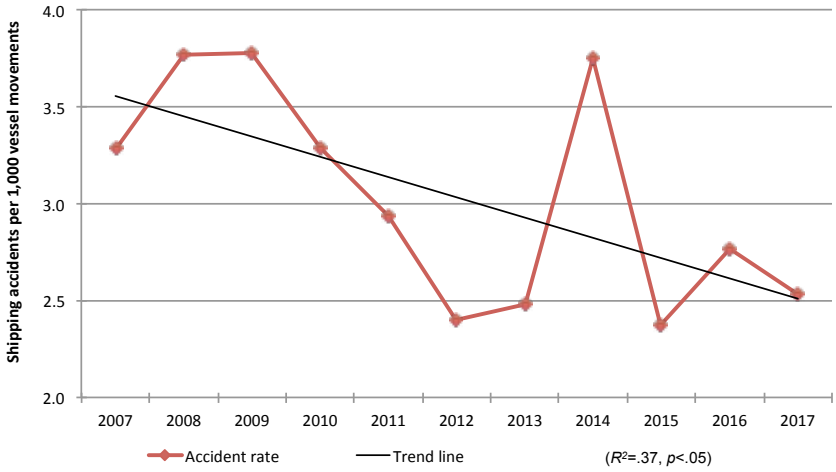
Figure 10. Reported marine occurrences, 2007 to 2017



Accident rate

One indicator of marine transportation safety in Canada is shipping accident rates for Canadian-flag commercial vessels. According to information provided by Transport Canada, marine activity for Canadian commercial non-fishing vessels over 15 gross tons (excluding passenger vessels and cruise ships) was 4% above the 10-year average.[8] The 2017 accident rate was 2.5 accidents per 1,000 movements (see Figure 11), lower than the 10-year average of 3.1. There has been a significant downward trend in the accident rate for Canadian commercial non-fishing vessels over the past decade.

Figure 11. Accident rate for Canadian-flag commercial shipping, 2007 to 2017



Source: Transport Canada

Marine activity for foreign commercial non-fishing vessels was 7% below the 10-year average, and the accident rate was 1.3 accidents per 1,000 movements, below the 10-year average of 1.5.

Investigations

In 2017-18, the TSB began 17 new marine investigations and completed 16 (see Table 7). This is the most investigations started and completed in a given year over the past six years. Of the 16 completed investigations, 2 were Class 2 investigations and 14 were Class 3 investigations. On average, investigations were completed in 466 days, which is higher than the number recorded for the previous year.

Table 7. Marine investigations at a glance

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Investigations started	12	12	15*	11*	13	17
Investigations completed	10	13	12	15	7	16
Average number of days to complete investigations	522	458	435	406	438	466
Recommendations	0	0	0	0	5	4
Safety concerns	0	2	0	1	0	0
Safety advisories	5	6	6	1	5	4
Safety information letters	6	7	12	11	11	4

* Inaccurate numbers were published in previous annual reports. This table contains corrected figures.

8. Transport Canada updated how it counted commercial vessel movements from 2014 to 2017. Movements for 2014 are likely under-reported as a result.

Marine highlights

The 16 marine investigations that were completed in 2017-18 mostly involved tugs, fishing vessels and passenger vessels. One investigation into the fatal capsizing of a passenger vessel operating in British Columbia in 2015 resulted in the Board making three recommendations. Another investigation, this one into the fatal 2016 capsizing of a fishing vessel in New Brunswick, led the Board to issue a recommendation to the Government of New Brunswick for it to require that personal floatation devices (PFDs) be worn on commercial fishing vessels.

Transport Canada must work with vessel operators to improve passenger safety

In concluding the investigation (M15P0347) in 2017-18 into the fatal October 2015 capsizing of the passenger vessel *Leviathan II* on a wildlife-spotting trip in British Columbia's Clayoquot Sound, the TSB recommended that Transport Canada work with the operators of these and other vessels to improve passenger safety.

The investigation found that moments after the master became aware of the approach of a large breaking wave, he tried to turn the vessel to minimize the impact, but there was no time for this action to be effective. Similarly, the crew did not have time to transmit a distress call before the vessel capsized, nor was the vessel able to automatically send a distress call. It was only by chance that the crew retrieved and activated a parachute flare, alerting nearby fishermen.

The TSB issued three recommendations stemming from its investigation to improve passenger safety.

PFDs essential to saving lives when fishermen go overboard

The TSB investigation (M16A0140) into the June 2016 fatal capsizing of a fishing vessel off Salmon Beach, New Brunswick, underlines the urgency of regulators to require fishermen to wear PFDs at all times.

A small fishing vessel, with three crew members on board, capsized just 240 m offshore. While crew members were hauling in lobster traps, one of the lines became entangled. The strain pulled the right rear side of the vessel downward, such that when two waves broke over the deck, more than a foot of water came in. A final wave broke over the side and the vessel capsized.

M15P0347

The investigation determined that none of the crew members were wearing PFDs when they entered the water, which diminished their chance of survival. The one crew member who survived crawled out of the water onto a piece of wreckage.

In December 2016, in its report on a similar occurrence in British Columbia (M15P0286), the Board recommended that both WorkSafeBC and Transport Canada require crews on fishing vessels to wear suitable PFDs at all times on deck and that these organizations develop ways to confirm compliance (recommendations M16-04 and M16-05). The Board repeated this recommendation in response to the New Brunswick occurrence, being of the view that the implementation of explicit requirements for fishermen to wear PFDs would significantly reduce the loss of life when individuals go overboard.

Recommendations and progress

In 2017-18, the Board reassessed responses to 16 recommendations pertaining to marine transportation safety and assessed responses to 4 new recommendations, which are discussed below. As of 31 March 2018 the Board had yet to complete its reassessment of three recommendations.

Of the 20 recommendations that were assessed or reassessed this year, 2 recommendations were closed with a **Fully Satisfactory** rating; 7 received a **Satisfactory Intent** rating; 8 received a **Satisfactory in Part** rating; and 3 received an **Unsatisfactory** rating.

Three of the new recommendations issued in 2017-18 stemmed from the investigation (M15P0347) into the capsizing of the *Leviathan II* in October 2015, with the loss of six passengers. Finding Transport Canada's initial responses unacceptable, the Board asked the department to reconsider its position. As a result, Transport Canada submitted revised responses.

Recommendation M17-01: Hazard identification and risk mitigation

Given the tidal effects and water depths in the area of Clayoquot Sound where the *Leviathan II* capsized in October 2015, there is always the possibility that steep, breaking waves will form, with potentially catastrophic consequences for small shallow-draft vessels. Two other passenger vessels have been overcome by hazardous waves in that area of Clayoquot Sound and in Barkley Sound since 1992, resulting in 10 fatalities. Passenger vessels operating elsewhere along the west coast of Vancouver Island may also be in areas that pose similar hazards.

As the investigation into the most recent occurrence found, the measures the company had in place did not mitigate the risks associated with these hazards. Instead, it relied on the master's experience and judgment.

Therefore the Board recommended that

the Department of Transport ensure that commercial passenger vessel operators on the west coast of Vancouver Island identify areas and conditions conducive to the formation of hazardous waves and adopt practical risk mitigation strategies to reduce the likelihood that a passenger vessel will encounter such conditions.

Transport Canada agrees with this recommendation and has taken some measures to alert operators. However, until all commercial passenger vessel operators off the west coast of Vancouver Island identify and address environmental hazards in their area of operation, such as the potential formation of hazardous waves, there is a risk of similar capsizing and loss of life. Therefore, the Board assessed the response to the recommendation as **Satisfactory in Part**.

Recommendation M17-02: Implementation of risk management

Although Transport Canada provides guidance on developing and implementing safety management systems for vessels, the TSB has noted the need for a comprehensive risk assessment process, and that guidance to the industry on how to implement such a process in their operations is minimal.

Therefore the Board has recommended that

the Department of Transport require commercial passenger vessel operators to adopt explicit risk management processes, and develop comprehensive guidelines to be used by vessel operators and Transport Canada inspectors to assist them in the implementation and oversight of those processes.

While Transport Canada has not committed to making explicit risk management processes mandatory for all small passenger vessels, it intends to re-examine the risk associated with such vessels. Therefore, the Board assessed the response to Recommendation M17-02 as **Satisfactory in Part**.

Recommendation M17-03: Automatic distress alert

When a vessel rapidly capsizes or sinks, the survival of passengers and crew often depends on the successful transmission of a distress signal to search-and-rescue resources. Only vessels travelling more than 20 nautical miles from shore are required to carry an emergency position-indicating radio beacon (EPIRB) that deploys automatically when immersed in water and emits a continuous signal. This means that passengers travelling on vessels not equipped with EPIRBs continue to be exposed to additional risk, even when the vessels operate close to shore.

Therefore the Board recommended that

the Department of Transport expedite the proposed changes to the Navigation Safety Regulations and expand its current emergency position-indicating radio beacon (EPIRB) carriage requirements to require that all commercial passenger vessels operating beyond sheltered waters carry an EPIRB, or other appropriate equipment that floats free, automatically activates, alerts search-and-rescue resources, and provides continuous position updates and homing-in capabilities.

Transport Canada's proposed consolidation of the Navigation

Safety Regulations, which includes expanded carriage requirements for EPIRBs, is encouraging. The Board notes the department's concerns associated with the carriage of float-free EPIRBs on small commercial vessels. While the proposed regulations would not ensure carriage of a float-free device that can send an automatic distress signal on vessels less than 15 gross tons, they do expand the requirements for this class of vessels. The proposed regulations could substantially reduce the safety deficiency.

Since the proposed regulations have not yet been implemented, the Board assessed the response to the recommendation as **Satisfactory Intent**.

Recommendation M17-04: Use of flotation devices

The investigation into the June 2016 capsizing of a small fishing vessel off Salmon Beach, New Brunswick, determined that the crew members were not wearing PFDs at the time of entering water (M16A0140).

Fishermen often operate in harsh physical and environmental conditions, and the risk of going overboard is high. If a fisherman ends up in the water, the consequences can be fatal, especially when the individual is not wearing a PFD.

Despite risk-based regulations and industry initiatives to change behaviours and create awareness about the importance of wearing PFDs, as well as design improvements by PFD manufacturers to address concerns about comfort and constant wear, many fishermen continue to work on deck without wearing a PFD. The TSB considers that the implementation of explicit requirements for fishermen to wear PFDs would significantly reduce the loss of life associated with going overboard.

Therefore the Board recommended that

the Government of New Brunswick and WorkSafeNB require persons to wear suitable personal flotation devices at all times when on the deck of a commercial fishing vessel or on board a commercial fishing vessel without a deck or deck structure and that WorkSafeNB ensure that programs are developed to confirm compliance.

The Government of New Brunswick has said it will implement a two-pronged approach to respond to the recommendation. The Board is of the view that the province's plan to implement an education, awareness and training campaign, and establish a fishing safety working group should raise awareness of the importance of wearing a PFD. This may increase usage and reduce the loss of life. However, the Board is concerned that the province has provided no specific timelines for its consultations about amending the *Occupational Health and Safety Act*. Therefore, the Board assessed the response to the recommendation as **Satisfactory in Part**.

All the marine transportation safety recommendations, and the corresponding responses and assessments are available on the TSB website.

Pipeline sector

Annual statistics

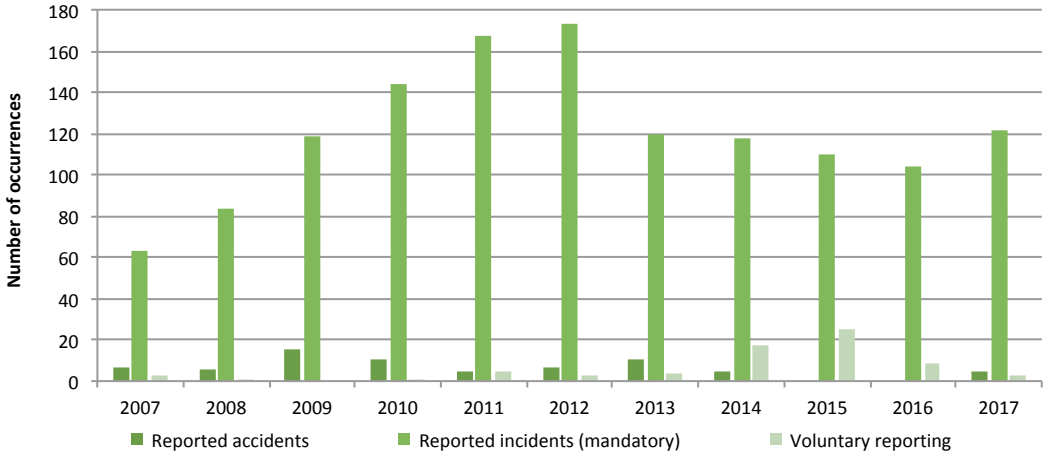
Five pipeline accidents were reported to the TSB in 2017, up from zero in 2016 (see Figure 12), but below the 10-year average of seven.

There have been no fatal accidents on a federally regulated pipeline system directly resulting from the operation of a pipeline since the inception of the TSB in 1990.

In 2017, 122 pipeline incidents were reported to the TSB, up from 104 in 2016, but similar to the 10-year average of 120.

The majority of reported pipeline occurrences involving a release of product occurred at facilities. There were no major releases of liquid product outside company property or the right-of-way.

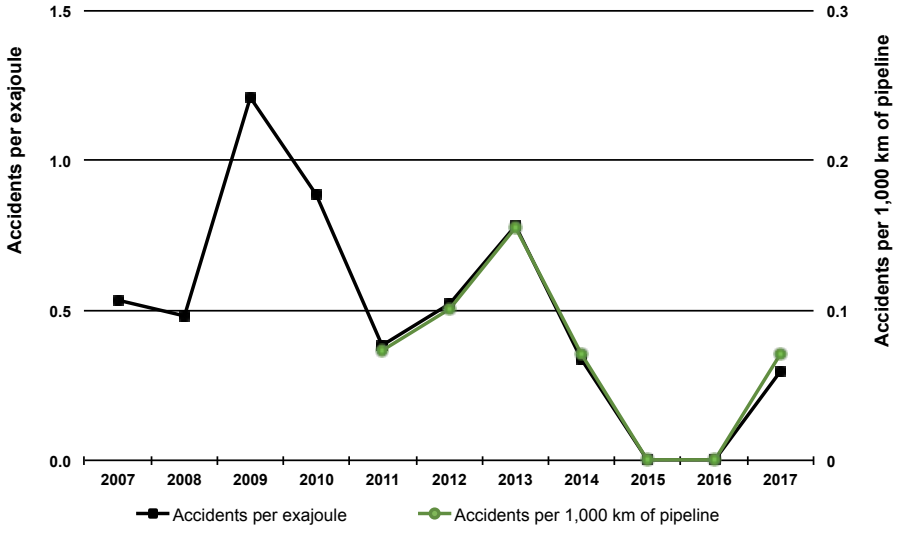
Figure 12. Reported pipeline occurrences, 2007 to 2017



Accident rate

One indicator of pipeline transportation safety in Canada is the pipeline accident rate. According to data provided by the National Energy Board, pipeline activity (exajoules) increased by 5% in 2017 compared to 2016.[9] The 2017 accident rate based on quantity of product shipped was 0.3 pipeline accidents per exajoule (see Figure 13), up from 0 in 2016, but below the 10-year average of 0.5. The 2017 accident rate based on length of operating pipelines was 0.07 pipeline accidents per 1,000 km of pipeline, up from 0 in 2016, but equal to the 10-year average of 0.07.

Figure 13. Pipeline accident rate, 2007 to 2017



Exajoules are estimated. Pipeline length available from 2011.
Source: National Energy Board

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

Investigations

The TSB completed one pipeline investigation in 2017-18. No new pipeline investigations were started (see Table 8).

Table 8. Pipeline investigations at a glance

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Investigations started	3	2	0	0	2	0
Investigations completed	0	2	1	2	0	1
Average number of days to complete investigations	n/a	402	665	650	n/a	275
Safety advisories	0	1	0	0	1	0
Safety information letters	2	0	0	1	0	0

Pipeline highlights

Lack of detailed inspection procedures contributed to crude oil leak

In an investigation concluded in 2017-18, the TSB found that a lack of detailed inspection procedures contributed to a crude oil leak from a storage tank at Enbridge Pipelines Inc.'s Edmonton Terminal in Sherwood Park, Alberta (P17H0019).

The source of the March 2017 leak was a three-inch ball valve. An estimated 10 m^3 of oil was released into the tank's secondary containment berm and some of that was then released through the berm's storm water drainage system into a creek. All the released oil was recovered prior to its reaching the nearby North Saskatchewan River.

The TSB's investigation determined that the leak occurred when a gasket between the two halves of the ball valve was displaced, likely due to water expanding in the valve when it froze. A corroded valve in the sluice gate at the end of the berm's storm water drain pipe let the oil flow into the creek. Although Enbridge conducts regular inspections of its equipment, it had no detailed procedures in place to help inspectors decide whether the components were suitable for continued service.

Following the occurrence, Enbridge took steps to ensure that all tank and containment berm components are thoroughly inspected. The company also reviewed its inspection and maintenance procedures, and hazard assessment and emergency response plans. The National Energy Board monitored the clean-up process and initiated a review of the occurrence to verify Enbridge's compliance with regulatory requirements.

Recommendations and progress

The Board issued no pipeline safety recommendations in 2017-18 and had previously assessed all recommendations as **Fully Satisfactory**.

Rail sector

Annual statistics

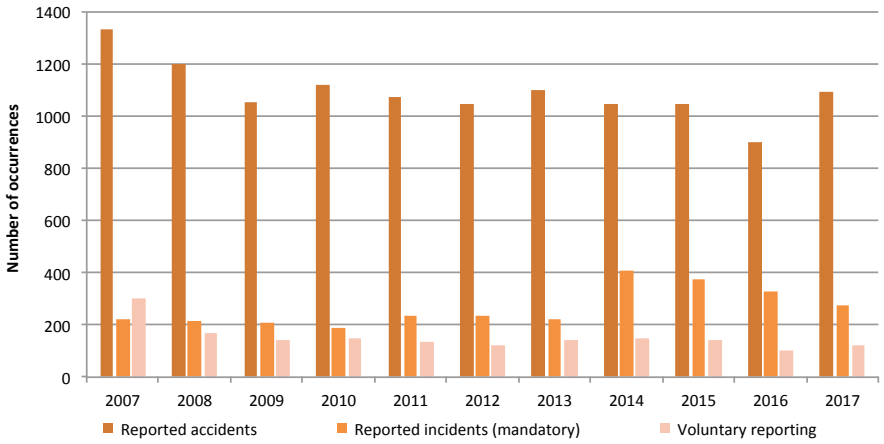
In 2017, 1,091 rail accidents were reported to the TSB (see Figure 14), a 21% increase from the 2016 total of 900, but comparable to the 10-year average of 1,092.[10]

Rail accidents involving dangerous goods totalled 115 in 2017, up from 101 in 2016, but below the 10-year average of 138. Four of these accidents resulted in a dangerous goods release, compared to one in 2016; however, the 2017 figure is the same as the 10-year average. Two of the four accidents resulted in a release of molten sulphur, one in a release of sodium chlorate and one in a release of petroleum crude oil.

Rail fatalities totalled 77 in 2017, up from 66 in 2016 and comparable to the 10-year average of 76. Crossing fatalities totalled 19 in 2017, the same as in 2016 but below the 10-year average of 24. There were 53 trespasser fatalities in 2017, up from 47 the previous year and above the 10-year average of 45. In 2017, 4 railway employees were fatally injured working on or around the track structure, up from the 10-year average of 2.

In 2017, there were 272 reported rail incidents, down from 325 in 2016. Movement exceeding the limit of authority (45% of reportable incidents) continues to be the main incident type since 2007, followed by non-main-track train derailments (no damage: 24%), dangerous goods leaks (14%), uncontrolled movement of rolling stock (4%) and instances of main-track switches being in an abnormal position (4%).

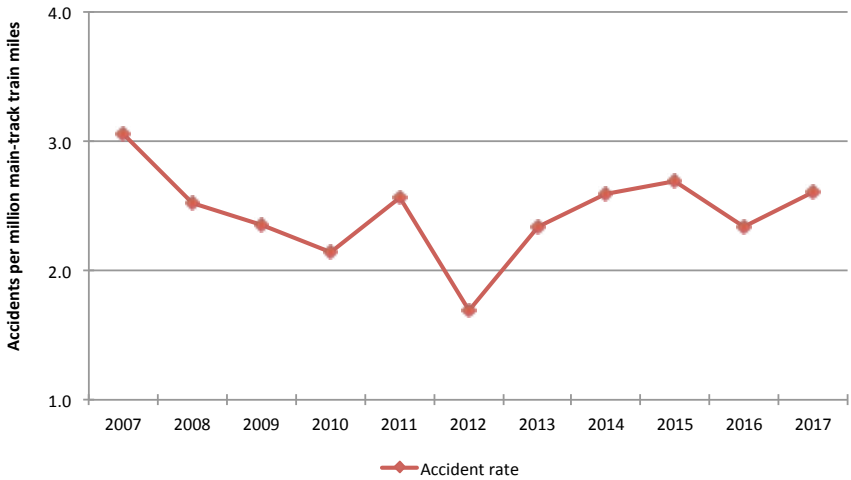
Figure 14. Reported rail occurrences, 2007 to 2017



Accident rate

An indicator of rail transportation safety in Canada is the main-track accident rate. According to Transport Canada data, 2017 main-track rail activity increased by 6% from the previous year. The main-track accident rate in 2017 was 2.6 accidents per million main-track train miles, up from 2.3 in 2016 and above the 10-year average of 2.4 (see Figure 15).

Figure 15. Main-track accident rate



Main-track train miles are estimated. Source: Transport Canada

10. The numbers of rail accidents and incidents reflect adjustments to the 2014, 2015 and 2016 figures made since their initial publication.

Investigations

The TSB started 19 new rail investigations in 2017-18, and completed 20, including two Class 2 investigations. Of the 18 completed Class 3 investigations, three resulted in limited-scope, short-form reports, which the TSB piloted during the year. The average duration of completed investigations was 481 days, down from the 2016-17 average of 519 days and close to the previous five-year average (476 days).

Table 9. Rail investigations at a glance

	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Investigations started	12	17	16	15	12	19
Investigations completed	16	12	16	12	17	20
Average number of days to complete investigations	409	435	494	525	519	481
Recommendations	0	6	2	5	1	2
Safety concerns	2	2	0	2	1	1
Safety advisories	4	17	16	20	12	12
Safety information letters	14	24	5	20	19	24

Rail highlights

A number of rail investigations concluded in 2017-18 were related to Watchlist issues, and some others were related to track, train operations and crossing accidents.

TSB recommends the use of leading indicators to help better focus track inspections

The TSB investigation into a 2015 derailment and fire involving a Canadian National freight train highlighted how having predictive data on rail surface conditions could help Transport Canada improve its regulatory track inspections. The Board issued a recommendation to this effect (R17-02) at the conclusion of the investigation in 2017-18 (R15H0021).

The March 2015 derailment near Gogama, Ontario, resulted in about 2.6 million litres of crude oil being spilled. The oil then ignited, causing explosions, and contaminated the nearby Makami River. A rail bridge was destroyed, along with roughly 300 m of track.

The investigation found that the derailment occurred after a recently but improperly repaired rail within a joint broke under the weight of the train. Given the state of the repair, Canadian National should have required trains to reduce speed at this location; however, it did not.

The TSB also found that Transport Canada does not always consider certain data on deteriorating rail surface conditions, including localized surface collapse, rail end batter and crushed heads, when it plans its inspections.

In recommending that the department integrate data on these leading indicators of future rail failures, the Board suggests that the targeted inspections Transport Canada carries out would be better focused.

Finally, the investigation found weaknesses in Canadian National's procedures and training related to making certain repairs to tracks and testing them.

TSB calls for improvements to pedestrian rail crossings

Following a July 2016 accident involving a person in a wheelchair and a Canadian National freight train at a crossing in downtown Moncton, the Board called on Transport Canada, railways and road authorities across Canada to improve safety at crossings designated for persons using assistive devices (R16M0026).

The recommendation (R18-01) asks Transport Canada to collaborate with these stakeholders to assess the effectiveness of various engineering options for designated crossings and to update its regulatory provisions accordingly.

In the Moncton occurrence, the wheelchair had become immobilized in the gravel at the edge of the sidewalk at the crossing. The investigation found that several crossing conditions contributed to the accident, including a void in the asphalt and the lack of visual cues to navigate safely.

Despite new standards for grade crossings introduced in 2014, the TSB found that there is a clear need for additional improvements, such as enhanced lighting and textured surfaces. And, while regulations required railways and road authorities to share information about crossings by November 2016—including identifying those crossings equipped with a sidewalk, path or trail designated for persons using assistive devices—some of this information has yet to be shared.

R16C0065

Derailment highlights importance of risk assessments for operational changes

The TSB's investigation (R16C0065) into a September 2016 collision and derailment involving two Canadian Pacific Railway trains in Calgary highlights the importance of railways conducting risk assessments when they propose to make operational changes.

On 3 September 2016, a westbound train collided with the tail end of a second train, which had stopped on a non-main-track. A number of cars derailed; however, there were no injuries and no dangerous goods were released.

The investigation found that the collision occurred when the moving train, which had been instructed to follow the other, was unable to stop in time despite the locomotive engineer applying the emergency brakes when the second train came into view.

The investigation found that the locomotive engineer had overheard parts of a radio conversation that led him to believe that the other train was undergoing a passing inspection three miles further west. This belief was reinforced when his train was not held prior to entering the yard, which was normal practice when a preceding train was delayed.

The investigation also found that the train entered the non-main-track too quickly to stop within half the range of vision, as required. Following a 2013 track reconfiguration, Canadian Pacific had changed how it controls trains in the area from centralized traffic control to non-main-track, but did not reduce the maximum track speed.

At the time of this operational change, a risk assessment was not mandatory, unlike now. When risk assessments are not conducted for changes to rail operations, companies may not identify and,

R17H0015

therefore, are unable to address potential hazards, increasing the risk of occurrences. Safety management and oversight is on the TSB Watchlist of key issues to be addressed to make Canada's transportation system even more secure.

TSB investigation emphasizes need for current data on bus tires and stopping distances

The TSB concluded its investigation in 2017-18 (R17H0015) into the February 2017 crossing collision between a school bus and a Canadian Pacific Railway train near Colborne, Ontario. Through its investigation, the TSB determined that a number of factors had played a role in the occurrence. There were no casualties, since the driver and two occupants had time to leave the bus and move a safe distance away.

The investigation found that, after stopping as required at the crossing, the bus became immobilized when the driver slowed down to look both ways a second time while driving over the crossing. Given that snow had accumulated on the road, the rear tires could not provide the traction required to propel the bus up the incline.

At the time of this occurrence, there were no regulatory or industry standards to evaluate school bus tire traction test results, similar to those for passenger vehicles or light trucks, to determine which tires were most suitable for winter driving. As such, bus operators relied on their experience and information from tire manufacturers. If school bus operators do not have access to independent and objective assessments of winter tire performance, there is an increased risk that the most suitable winter tire will not always be chosen.

Many jurisdictions require school buses to stop in advance of all crossings, even when crossing warning systems are not activated. Although this is believed to improve safety, there have been a number of recent instances of a school bus stopping in advance of a crossing protected by warning systems, continuing onto the crossing and then being struck by an oncoming train. In the absence of up-to-date risk analysis to determine whether buses should stop at crossings, even when warning devices are not activated, there is a risk of railway crossing safety not being optimized.

Recommendations and progress

In 2017-18, the Board reassessed responses to 16 outstanding recommendations, including 2 dormant recommendations, pertaining to rail transportation safety. One recommendation was closed as **Fully Satisfactory**, 10 were reassessed as **Satisfactory Intent**, and 5 others were assessed as **Satisfactory in Part**.

The Board also assessed one of two new recommendations, discussed below, for which it received a response.

Recommendation R17-02: Indicators for inspections

The March 2015 main-track derailment near Gogama, Ontario, was the sixth occurrence since May 2014 in which the TSB investigation (R15H0021) found that a track joint or rail failure had happened in the immediate vicinity of pre-existing localized surface collapse or rail end batter conditions, and/or a regulatory track inspection had not been conducted in over two years.

Rail flaw technology to detect localized surface collapse, rail end batter conditions and crushed head conditions is relatively new, such that these conditions had usually been detected by visual inspection, although relatively few were identified. After the technology was implemented, the number of identified rail surface conditions increased significantly. However, Transport Canada does not generally receive information on these conditions.

Therefore the Board recommended that

the Department of Transport acquire rail surface condition data, including information on localized surface collapse, rail end batter and crushed heads, and incorporate it into its risk-based planning approach for targeted regulatory track inspections.

The Board is very encouraged that Transport Canada has rapidly taken action to implement the recommendation. Until the proposed action for 2018-19 has taken place, however, the Board has assessed the response to Recommendation R17-02 as **Satisfactory Intent**.

Recommendation R18-01: Additional safety measures at designated crossings

The July 2016 rail accident (R16M0026) in Moncton, New Brunswick, gave prominence once again to the issue of pedestrian safety at railway grade crossing in Canada. This issue has been the subject of multiple research projects and studies over past decades, both nationally and internationally. In addition, the number of Canadians using an assistive device such as a wheelchair is on the rise, according to Statistics Canada.

To prompt action towards making grade crossings safer for individuals using assistive devices as the crossings are upgraded to meet Transport Canada's Grade Crossings Regulations and associated standards, the Board recommended that

the Department of Transport work with stakeholders to identify engineering options for the improvement of crossings designated for persons using assistive devices, conduct an assessment of their effectiveness, and update its regulatory provisions as appropriate.

As of 31 March 2018, the Board had not yet received the response to Recommendation R18-01.

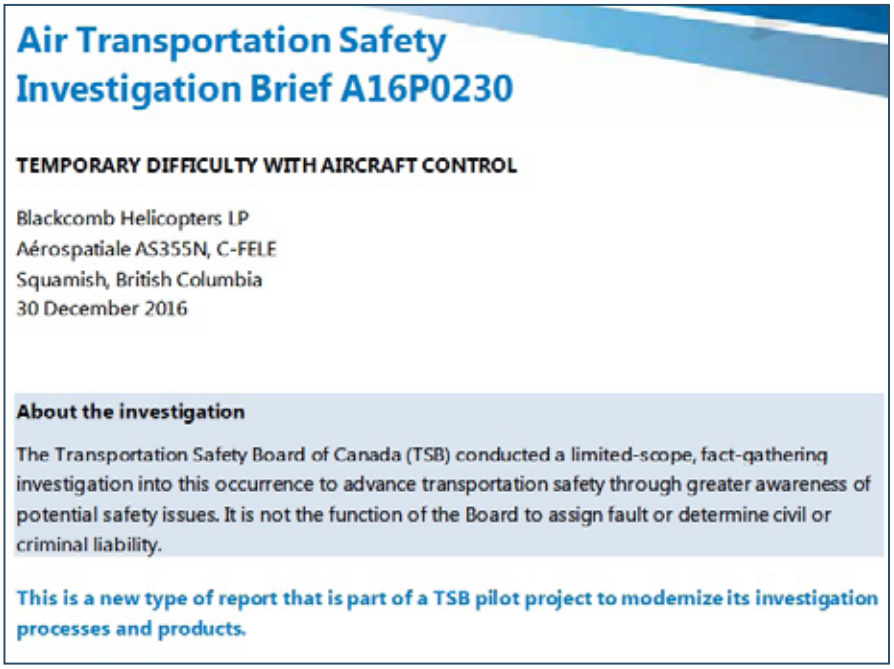
All the rail transportation safety recommendations, and the corresponding responses and assessments are available on the TSB website.

Communicating transportation safety

Raising awareness through facts and findings

An essential part of the TSB mandate is to report publicly on the launch, progress and findings of all investigations, from deployment to report release.

- In 2017-18, the TSB's Media Relations team issued 68 deployment notices, a slight decrease from 73 the previous year.
- The team created 54 investigation webpages, one for each formal investigation launched during the year and 15% more than the previous year. Through these pages, the TSB shares basic information about the occurrence, introduces the investigator-in-charge and provides subsequent investigation updates.



Air Transportation Safety Investigation Brief A16P0230

TEMPORARY DIFFICULTY WITH AIRCRAFT CONTROL

Blackcomb Helicopters LP
Aérospatiale AS355N, C-FELE
Squamish, British Columbia
30 December 2016

About the investigation

The Transportation Safety Board of Canada (TSB) conducted a limited-scope, fact-gathering investigation into this occurrence to advance transportation safety through greater awareness of potential safety issues. It is not the function of the Board to assign fault or determine civil or criminal liability.

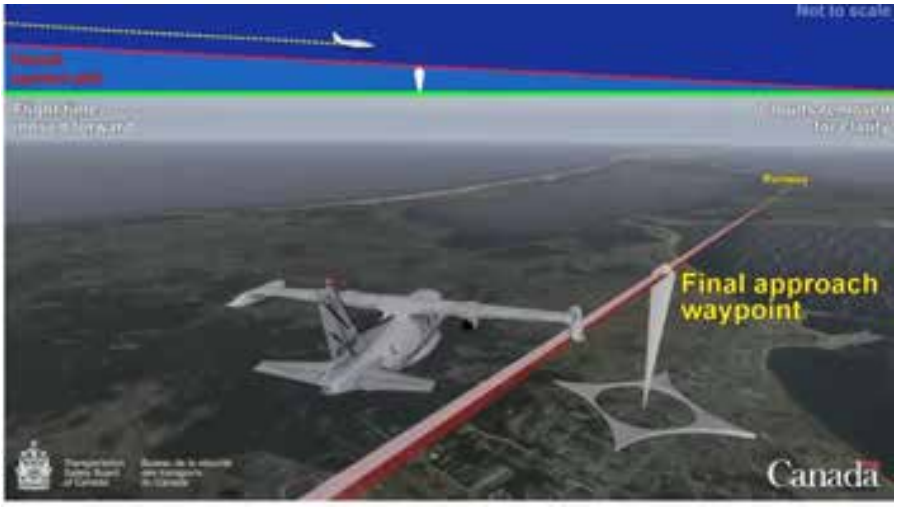
This is a new type of report that is part of a TSB pilot project to modernize its investigation processes and products.

- As a prelude to more regular and consistent investigation updates in 2018-19, the TSB provided updates on four high-profile investigations.
- The TSB's Publishing team edited and posted 66 investigation reports. This is 50% more than in 2016-17, when the TSB published 44 reports.

Investigation reports are often technical in nature. The TSB's Communications staff help explain and disseminate the information and safety messages they contain to members of the media and the public.

- In 2017-18, the Media Relations team issued 67 news releases and 16 media advisories, a combined 26% increase over the previous year.

- Across the country, a total of 12 media events were organized for high-profile investigations or reports containing Board recommendations, 50% more than in 2016-17.
- Halfway through the year, the TSB began producing its own webcasts of media events, sharing them on YouTube, along with other multimedia products. In 2017-18, the TSB posted 10 videos to its YouTube channel in both official languages.
- Specialists from the TSB laboratory assisted with the production of three multimedia products in 2017-18. These include the animation of a March 2016 unstable approach to landing that had resulted in a collision with terrain; the animation of fatal mooring operations in the Port of Trois-Rivières in May 2017; and the demonstration of a deck crane failure that had fatally injured the operator in April 2016.
- The TSB uses Twitter to alert subscribers to urgent safety communications, deployments, and the release of investigation reports and updates. In 2017-18, the TSB issued 1,316 tweets in both official languages and shared 59 photos on its Flicker account.
- The Media Relations team facilitated 165 requests for interviews with investigators and senior TSB officials.
- The team also addressed or followed up on more than 800 media requests, a 30% decline compared with the previous year. This decrease can be partially explained by continued efforts to provide reporters with clear and comprehensive information on a timely basis, as well as direct access to statistical data and analysis.



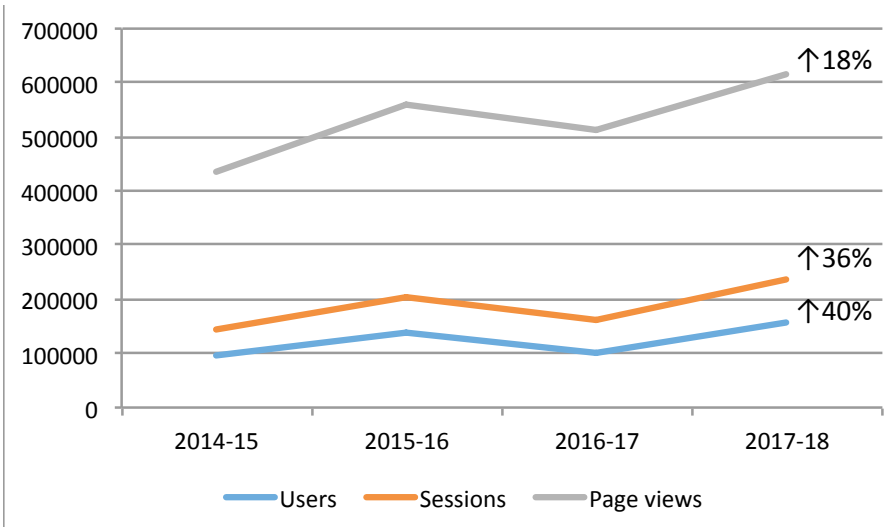
The TSB closely monitors media coverage and social media conversations to ensure key stakeholders and the wider public have access to accurate and up-to-date information about TSB investigations, findings and safety messages.

Of a total of 4,227 news stories dealing with transportation safety in Canada in 2017-18, more than 3,000 directly mentioned the TSB. Most stories covering the release of investigation reports reflected the TSB's key messages.

In keeping with open government commitments, the TSB publishes a wide range of corporate reports in addition to occurrence-related information. Many TSB datasets are already accessible in machine-readable formats from the website or the government's Open Data portal, and the TSB is working to further expand the data available.

Figure 16 and the accompanying table illustrate the reach of TSB safety and communications products on the Web and through social media, and the increase since April 2017.

Figure 16. Usage of TSB website, 2014-15 to 2017-18



Social media engagement

Twitter followers	Lifetime views on YouTube	Lifetime views on Flickr
20,575 (↑11%)	968,165 (↑42%)	6,696,832 (↑14%)

Helping effect meaningful change through outreach

Advancing safety means more than conducting investigations and publishing reports. A crucial component of the TSB's work to enhance the safety of the Canadian transportation system is outreach—connecting with the people and groups best placed to effect meaningful change. Sometimes that means offering an article or op-ed to a newspaper or professional magazine. Other times, outreach involves delivering a presentation or keynote speech at a conference or seminar, or holding face-to face meetings with senior industry executives, company operators, unions, grassroots organizations, and those whose personal safety the TSB always has in mind: fishermen, mariners, pilots, railway and pipeline workers.

In 2017-18, TSB investigators, managers and Board members carried out 69 outreach activities across the country, in all four sectors. For example, in the fall of 2017, investigators attended the Canadian Passenger Vessel Annual Meeting in Niagara Falls, Ontario, to share their findings from recent marine investigations. The TSB Chair addressed the CN Safety Culture Symposium in Halifax and the National Railway Day Conference in Ottawa to promote the components for a robust safety culture in that industry. Board Member Faye Ackermans took the same message and approaches to building a strong safety culture to the Canadian Energy Pipeline Association Incident Forum in Calgary. For his part, Board member Joe Hincke spoke before the Annual Conference of the Helicopter Association of Canada about recent TSB investigations involving helicopter operations.

The outreach activities focused primarily on longstanding Watchlist issues, but the TSB also informed Canadians about, and advocated for, individual Board recommendations. In 2017-18, these included recommendations on introducing a comprehensive substance abuse program in the aviation industry, improving passenger vessel safety, and engineering better options for pedestrians to pass safely over railway crossings.

Engaging parliamentarians on challenges and opportunities

In 2017-18, TSB senior officials appeared before several parliamentary committees on matters related to advancing transportation safety in Canada.

On 4 April 2017, TSB representatives spoke about aviation safety to the House of Commons Standing Committee on Transport, Infrastructure and Communities. The remarks focused on the TSB's Watchlist, and specifically the issues relating to aviation safety, such as unstable approaches, runway overruns and the risk of collisions on runways. Watchlist issues involving more than one mode of transportation were also discussed, namely, safety management and oversight, and Transport Canada's slow progress in following up on numerous TSB recommendations.

On 11 September 2017, TSB officials appeared before the same committee to discuss proposals under Bill C-49 regarding the installation of voice and video recorders on lead locomotives, and the use of these recorders for safety purposes. On 30 January 2018, TSB officials again spoke to this issue, this time to the Standing Senate Committee on Transport and Communications.

On 23 November 2017, the Standing Committee on Government Operations and Estimates invited the Chair to present the TSB's Departmental Results Report for 2016-17. The TSB also made its case for funding to cover a budgetary shortfall stemming from the implementation of recent collective agreements.

On 8 February 2018, TSB officials appeared before the Senate Committee on Fisheries and Oceans to discuss findings from the investigation (M16A0327) into the fatal 2016 sinking of the small fishing vessel *Pop's Pride*, along with some of the improvements the Board would like to see in Canada's commercial fishing sector.

A month later, on 22 March 2018, TSB officials testified before the House of Commons Standing Committee on Fisheries and Oceans about commercial fishing vessel length and licensing policies in Atlantic Canada.

Appendix A: Investigation reports released in 2017-18 and related safety actions

This appendix provides a list of the investigation reports released during the year and an overview of any safety actions taken during the investigation or after the report was published. The list is organized by transportation sector and in the order in which the occurrences took place, with a link to the investigation report.

Aviation sector

Investigation report A15H0002

Occurrence	Collision with terrain of Airbus A320-211 (C-FTJP), Stanfield International Airport, Halifax, Nova Scotia, 29 March 2015
Safety actions	**Air Canada** provided its pilots with more specific guidance on the required visual references for landing approaches and issued explicit warnings about the limitations of autopilot and vertical navigation using the Airbus Flight Path Angle mode. The airline now requires instrument monitoring during all approaches when below the minimum descent altitude. Air Canada also amended its practical flight attendant training. **Air Canada's Express regional partner airlines** aligned their policies with Air Canada's new guidance on approaches. **Airbus** revised its maintenance manual for the aircraft to reflect an update by the seat manufacturer to its component maintenance manual. The **Halifax International Airport Authority** improved the approach lighting for Runway 05, reviewed its emergency response plan and upgraded the airport's emergency assets, including backup power. **NAV CANADA** published a satellite-based approach on Runway 05 that provides lateral and vertical guidance to suitably equipped aircraft. NAV CANADA also issued guidance for air traffic controllers on lighting settings.

Investigation report A15P0081

Occurrence	In-flight breakup of Swearingen SA226-TC Metro II (C-GSKC), North Vancouver, British Columbia, 13 April 2015
Safety actions	**Carson Air Ltd.** increased the period for which employees must abstain from alcohol prior to reporting to work, introduced a company drug and alcohol awareness campaign, and implemented policies for dealing with suspected substance abuse. All employees received training on these policies. In addition, the company improved its emergency response plan and introduced an anonymous online reporting tool to encourage timely reporting of safety concerns.

Investigation report A15Q0075

Occurrence	Runway overrun of Boeing 737-6CT (C-GWCT), Pierre Elliott Trudeau International Airport, Montréal, Quebec, 5 June 2015
Safety actions	**WestJet** debriefed all training pilots on this occurrence. In addition, the company's annual flight safety ground school now covers overrun characteristics and reviews this occurrence with students. Simulator sessions now feature wet runway landings with a crosswind.

Investigation report A15A0054

Occurrence	Hard landing and runway excursion of Beechcraft King Air A100 (C-FDOR), Margaree, Nova Scotia, 16 August 2015
Safety actions	**Maritime Air Charter Limited** introduced revised procedures to improve safety. These include a pre-flight risk assessment checklist, a requirement to calculate accelerate-stop distance when taking off from shorter runways, and enhanced training. This training places increased emphasis on stabilized approach criteria and how to avoid controlled flight into terrain.

Investigation report A15Q0120

Occurrence	Loss of control and collision with terrain of de Havilland DHC-2 (Beaver) (C-FKRJ), seven nautical miles north of Tadoussac, Quebec, 23 August 2015
Safety actions	**Air Saguenay** increased oversight of its sightseeing flights and made adjustments to its employee training.

Investigation report A15Q0126

Occurrence	Loss of directional control and collision with terrain of Bell Helicopter 206B (C-GYBK), Sept-Îles, Quebec, 2 September 2015
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A15O0188

Occurrence	Collision with terrain of Cessna 182H (C-GKNZ), near Parry Sound Area Municipal Airport, Ontario, 9 November 2015
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, the TSB continues to monitor steps being taken by **Transport Canada** in response to Recommendation A16-08, which called for the department to amend regulations to clearly define the visual references required for night visual flight rules flying.

Investigation report A15P0217

Occurrence	Loss of control during night approach and near collision with terrain of Sikorsky S-76C+ helicopter (C-GHHJ), Long Beach Airport, Tofino, British Columbia, 15 November 2015
Safety actions	The helicopter operator, **Helijet International Inc.**, had two safety management system assessments done by an independent auditor and updated its safety management program. The company also reviewed its standard operating procedures and increased employee training, specifically on crew resource management, night visual flight rules flights, the black-hole effect and unprepared landing sites. The company developed a risk management plan for night visual flight rules flights and added pre-flight safety meetings. Helijet is also providing night vision goggles to its flight crews. The **Long Beach Airport** installed the necessary infrastructure for night operations and was fully night-certified by Transport Canada.

Investigation report A15C0163

Occurrence	Icing encounter, loss of control and collision with terrain of Cessna 208B (C-FKDL), 10 nautical miles north of Pickle Lake, Ontario, 11 December 2015
Safety actions	**Wasaya Airways Limited Partnership** conducted two safety management system investigations. As a result, the company amended requirements and processes relating to weather and icing, improved procedures and made a number of other revisions to enhance safety. In October 2017, Wasaya distributed memos clearly outlining management's commitment to safety regarding operations in icing conditions and provided a winter operations brief to all flight crew in Pickle Lake. **Transport Canad**a conducted a process inspection of Wasaya. The company, in turn, submitted a corrective action plan, which Transport Canada subsequently accepted.

Investigation report A16O0016

Occurrence	Runway incursion and risk of collision between Embraer 190-100 IGW (C-FNAW) and Airbus 320-214 (C-FZQS), Lester B. Pearson International Airport, Toronto, Ontario, 30 January 2016
Safety actions	**Air Canada** convened a working group to review this and other incursions to identify common causal factors and to develop recommendations to prevent future incursions. **NAV CANADA** performed a site review that resulted in adjustments to the runway incursion monitoring and alert system. These changes will increase the warning time to air traffic controllers when a departing aircraft enters the arrivals area without authorization.

Investigation report A16Q0020

Occurrence	Temporary difficulty with aircraft control of DHC-8-102 (C-GJMO), Mont-Joli Airport, Quebec, 3 February 2016
Safety actions	The Board is unaware of any safety actions being taken following this occurrence.

Investigation report A16P0045

Occurrence	Loss of control and collision with terrain of Airbus Helicopters AS 350 FX2 (C-FBLW), 82 nautical miles northwest of Smithers, British Columbia, 16 March 2016
Safety actions	**TRK Helicopters Ltd.** amended its training curriculum to emphasize emergency procedures related to hydraulic system failures and the conditions that increase the risk of servo transparency. **Airbus Helicopters** has begun developing flight data monitoring systems and has undertaken to revise its training syllabus, with the possible inclusion of a video on servo transparency.

Investigation report A16A0032

Occurrence	Collision with terrain of Mitsubishi MU-2B-60 (N246W), 1.4 nautical miles west-southwest of Îles-de-la-Madeleine Airport, Quebec, 29 March 2016
Safety actions	**NAV CANADA** worked with flight-planning providers to correct their processes such that they comply with Transport Canada Aeronautical Information Manual requirements for filing flight plans in Canada. NAV CANADA also accelerated the publication of revised global navigation satellite system procedures for the Îles-de-la-Madeleine airport.

Investigation report A16A0041

Occurrence	Nose landing gear failure on landing of Beechcraft 1900D (C-FEVA), Gander International Airport, Newfoundland and Labrador, 20 April 2016
Safety actions	The **Gander International Airport Authority** supplemented its emergency response supplies and updated its emergency coordination centre contact list.

Investigation report A16P0069

Occurrence	Loss of tail-rotor effectiveness of Bell 206B Jet Ranger-III helicopter (C-GOPK), Tchentlo Lake, British Columbia, 4 May 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16P0078

Occurrence	Hard landing on water of de Havilland DHC-2 (Beaver) (C-FJOM), Kitkatla, British Columbia, 24 May 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16O0066

Occurrence	Avionics compartment fire on board Embraer ERJ 190-100 IGW (C-FHOS), 97 nautical miles west-northwest of Boston, Massachusetts, 25 May 2016
Safety actions	**Embraer** proposed changes to its electrical emergency procedure and checklist.

Investigation report A16W0094

Occurrence	Collision with terrain of North American Aviation Inc. T-28B (C-GKKD), Canadian Forces Base Cold Lake, Alberta, 17 July 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16P0161

Occurrence	Collision with terrain of Bell 206B helicopter (C-FWHF), Deception Mountain, British Columbia, 2 September 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16A0084

Occurrence	Collision with wires of Bell 206B helicopter (C-GVJT), Flatlands, New Brunswick, 4 September 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16W0126

Occurrence	Loss of power and collision with trees of Bell 206B helicopter (C-GHHU), 12 nautical miles southwest of Fox Creek Airport, Alberta, 5 September 2016
Safety actions	**Transport Canada** conducted a process inspection of the helicopter's operator, Ridge Rotors Inc. **Ridge Rotors** subsequently implemented corrective actions to address Transport Canada's minor findings of non-compliance. The company also changed its standard operating procedures and trained pilots accordingly.

Investigation report A16Q0119

Occurrence	Loss of control and collision with terrain of Cessna U206F (C-FWBQ), Kuashkuapishiu Lake, 143 nautical miles north of Baie-Comeau, Quebec, 25 September 2016
Safety actions	**Transport Canada** issued a civil aviation safety alert targeting unapproved batteries that do not conform to the approved design of the emergency locator transmitter.

Investigation report A16P0180

Occurrence	Loss of control and collision with terrain de Havilland DHC-2 (Beaver) (C-GEWG), Laidman Lake, British Columbia, 10 October 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A16O0149

Occurrence	Risk of collision between Porter Airlines Inc. DHC-8-402 (C-GKQA) and Jazz Aviation LP (dba Air Canada Express) DHC-8-402 (C-GXJZ), Sudbury Airport, Ontario, 14 October 2016
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, the TSB continues to gather information about any lack of coordination and planning by air traffic control, the circumstances that led to this occurrence.

Investigation report A16W0170

Occurrence	Runway incursion, Calgary International Airport, Calgary, Alberta, 2 December 2016
Safety actions	**NAV CANADA** took a number of steps to improve procedures related to the operation of little-used Runway 29 at the Calgary airport. For example, it created a new “monitor” control position to provide more effective surveillance of the runway. It also improved the display systems controllers use as memory aids when coordination is required, and took steps to ensure controllers use correct phraseology.

Investigation report A16P0230

Occurrence	Temporary difficulty with aircraft control of Aérospatiale AS355N helicopter (C-FELE), Squamish, British Columbia, 30 December 2016
Safety actions	**Blackcomb Helicopters LP** grounded the aircraft for several weeks during the investigation to determine the cause of the flight-control binding. With no definitive cause identified, the operator replaced all of the main-rotor flight-control servos as a precaution.

Investigation report A17P0007

Occurrence	Collision with trees and power lines after rejected landing of Cessna 172 (C-GZXB), Duncan Aerodrome, British Columbia, 19 January 2017
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report A17W0024

Occurrence	Loss of control and collision with terrain of Tecnam P2006T (C-GRDV), 32 nautical miles northwest of Springbank Airport, Calgary, Alberta, 13 February 2017
Safety actions	The aircraft's operator, **Mount Royal University**, took a number of safety actions in the wake of this occurrence, including the following: increasing the minimum altitude at which an aircraft should be recovered from a stall; clarifying the roles of the designated instructor and the designated student, when two instructors are conducting staff training flights together; acquiring a different type of aircraft for its multi-engine training program; and producing revised multi-engine standard operating procedures.

Investigation report A17Q0162

Occurrence	In-flight collision with drone of a Beechcraft King Air A100 (C-GJBV), Jean-Lesage International Airport, Quebec City, Quebec, 12 October 2017
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, it notes that **Transport Canada** had published, prior to the occurrence, proposed regulatory amendments governing the operation of drones for both recreational and non-recreational purposes.

Marine sector

Investigation report M15P0347

Occurrence	Capsizing of passenger vessel *Leviathan II* and loss of life, Clayoquot Sound, British Columbia, 25 October 2015
Safety actions	The **Canadian Coast Guard** increased the scope of its outreach to remote First Nations communities on the B.C. coast. First Nations' members, representatives from the Royal Canadian Mounted Police and Parks Canada, and Canadian Coast Guard and Royal Canadian Marines search and rescue staff attended two days of classroom and on-water training. **Jamie's Whaling Station**, the vessel's owner, took steps to improve various safety measures, including the following: simplifying the 30-minute call-in procedure and installing a timer in the office; modifying vessel storage lockers to permit lifejackets to float free in the event of a sudden capsizing; adding free-floating life rings and emergency position-indicating radio beacons on vessels; having passengers don manually inflating personal flotation devices (other than on rigid-hull inflatable boats); and improving the launching capabilities of life rafts on two of its vessels. The company is also formalizing its safety management practices and communication procedures regarding weather and sea-condition standards for tours with fellow tour operators.

Investigation report M16C0005

Occurrence	Grounding of container vessel *MSC Monica*, Deschaillons-sur-Saint-Laurent, Quebec, 22 January 2016
Safety actions	The owners of the vessel, **Mediterranean Shipping Company Shipmanagement Limited**, had the back-up steering control correctly reinstalled, in accordance with the manufacturer's recommendations. Although no steering malfunction was identified, the owners preventively overhauled several steering gear system components and replaced various pieces of control and navigation equipment on the bridge.

Investigation report M16C0014

Occurrence	Mechanical failure and sinking of fishing vessel *Bessie E.*, Mamainse Harbour, Ontario, 16 February 2016
Safety actions	The **Transportation Safety Board of Canada** sent a marine safety advisory letter to the Ontario Minister of Labour, noting that it had found safety-critical deficiencies on the vessel that breached a number of regulations and that there was inadequate safety oversight of the *Bessie E.* The letter also stated that the investigation determined that Ontario's *Occupational Health and Safety Act* does not apply in practice to all Ontario fishermen.

Investigation report M16C0016

Occurrence	Striking of ice by and subsequent flooding of fishing vessel *Saputi*, Davis Strait, Nunavut, 21 February 2016
Safety actions	**Qikiqtaaluk Fisheries** sent all the immersion suits onboard *Saputi* to be inspected. Several suits were condemned and replaced. Several others were exchanged for those of a different design, enhancing the wearer's mobility. The company also took steps to ensure everyone on board has access to a properly fitting suit.

Investigation report M16P0062

Occurrence	Grounding of tug *H.M. Scout* towing barges *HM Blue Horizon* and *HM Tacoma*, Victoria, British Columbia, 2 March 2016
Safety actions	Although the Board is unaware of any safety actions taken following this occurrence, safety management and oversight is a Watchlist issue. The TSB has repeatedly emphasized the advantages of safety management systems, an internationally recognized framework to allow companies to effectively manage risk and make operations safer.

Investigation report M16C0036

Occurrence	Capsizing and sinking of tug *Ocean Uannaq*, Champlain Bridge construction site, St. Lawrence River, Montréal, Quebec, 1 April 2016
Safety actions	The tug's operator, **Signature sur le Saint-Laurent**, invited those involved in the occurrence, along with other key individuals from the construction site, and the tug and barge owners, to conduct an internal accident investigation. Following that investigation, the existing shore-side procedures were extended to marine construction operations, and the operator implemented procedures to help workers identify and mitigate risks on the work site. The operator also hired an assistant marine superintendent to specifically oversee the marine safety aspects of its operations.

Investigation report M16A0115

Occurrence	Deck crane failure and fatality on unregistered aquaculture vessel, Milligan's Wharf, Prince Edward Island, 29 April 2016
Safety actions	**Transport Canada** prohibited the owner of a sister vessel and crane from using that crane until it had been certified by an engineer. **Workers Compensation Board of Prince Edward Island** developed and distributed a hazard alert related to cranes, recommending that they feature an engineered design, be regularly inspected and maintained, and be designed and positioned to minimize overhead hazards for workers.

Investigation report M16P0162

Occurrence	Collision of tugs *Albern* and *C.T. Titan*, and sinking of *Albern*, Northumberland Channel, British Columbia, 24 May 2016
Safety actions	**Jones Marine Group Ltd.**, the company that owned both vessels, hired a consultant to conduct a safety management system gap analysis based on the International Safety Management Code and to recommend an action plan. As a result, company staff attended situational awareness and bridge resource management training. The company also corrected safety deficiencies related to the securing of life rafts.

Investigation report M16A0140

Occurrence	Capsizing of small fishing vessel C19496NB and loss of life, Salmon Beach, New Brunswick, 16 June 2016
Safety actions	In response to Recommendation M17-04, issued as part of this investigation, the **Government of New Brunswick** advised that it is planning to make wearing personal floatation devices mandatory by changing the definition of "place of employment" in the *Occupational Health and Safety Act* to specifically include fishing vessels. The government is also planning an education and awareness campaign.

Investigation report M16A0141

Occurrence	Close quarters crossing of passenger vessels *Grandeur of the Seas* and *Summer Bay*, Halifax Harbour, Halifax, Nova Scotia, 29 June 2016
Safety actions	**Murphy Sailing Tours Limited**, the owner of *Summer Bay*, developed standard operating procedures for vessel masters working with reduced visibility and commissioned an external audit of its safety management system.

Investigation report M16P0241

Occurrence	Fire and abandonment of tug *Ken Mackenzie*, Fraser River, British Columbia, 11 July 2016
Safety actions	The **Transportation Safety Board of Canada** issued a marine safety advisory letter to Transport Canada and a marine safety information letter to Tidal Towing Ltd., the vessel's owner, about shortcomings in the control cables for the vessel's emergency fuel tank shut-offs.

Investigation report M16C0137

Occurrence	Collision of rigid-hull inflatable passenger vessel *Aventure 6* with an unidentifed object, Les Bergeronnes, Quebec, 29 August 2016
Safety actions	**Croisières Essipit**, the vessel's owner, modified the location and stowage of lifebuoys on its entire fleet, acquired new equipment with digital selective calling capability, equipped its fleet with a removable ladder as a re-boarding device, and updated its standard pre-departure passenger briefing.

Investigation report M16A0327

Occurrence	Sinking of small open fishing vessel *Pop's Pride* and subsequent loss of life, Cape Spear, Newfoundland and Labrador, 6 September 2016
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, it continues to gather information about the use and availability of lifesaving appliances on board, such as emergency-position indicating radio beacons, and about unsafe operating practices.

Investigation report M16P0362

Occurrence	Grounding and abandonment of passenger vessel *Stellar Sea*, Tofino, British Columbia, 1 October 2016
Safety actions	The vessel's owner, **Jamie's Whaling Station Ltd.**, updated the vessel's emergency and operational procedures manual to emphasize the requirement to contact the Canadian Coast Guard in an emergency. The company also increased the frequency of safety drills.

Investigation report M17A0004

Occurrence	Grounding of bunkering tanker *Arca 1*, Little Pond, Nova Scotia, 8 January 2017
Safety actions	The vessel's owner, **Petroil Marine**, brought *Arca 1* to its final destination (Mazatlán, Mexico) on board a heavy-lift transport. The company signed an agreement with Lloyd's Register to certify the vessel and the company's management processes under international safety management rules. The company also contracted Lloyd's and Mexican (flag) maritime authorities to certify the vessel for operations in ports and short-distance coastal navigation.

Investigation report M17A0039

Occurrence	Catastrophic machinery failure on board fishing vessel *Atlantic Destiny*, 200 nautical miles southwest of Halifax, Nova Scotia, 14 March 2017
Safety actions	The vessel's owner, **55104 Newfoundland & Labrador Inc.**, installed shielding around the fluid couplings and replaced the aluminum floor plates above the fluid couplings with stronger ones.

Pipeline sector

Investigation report P17H0019

Occurrence	Crude oil leak, Enbridge Pipelines Inc., Edmonton North Terminal, Sherwood Park, Alberta, 20 March 2017
Safety actions	**Enbridge Pipelines Inc.** took steps to ensure that all tank and containment berm components were thoroughly inspected. The company also reviewed its maintenance procedures, and hazard assessment and emergency response plans. The **National Energy Board**, which is responsible for regulating pipelines under federal jurisdiction, monitored the clean-up process and reviewed the occurrence to verify Enbridge's compliance with regulatory requirements and ensure the company took adequate corrective, preventive and safety actions.

Rail sector

Investigation report R15H0021

Occurrence	Main-track derailment, Canadian National Railway, Mile 88.75, Ruel Subdivision, Gogama, Ontario, 7 March 2015
Safety actions	**Transport Canada** issued a notice to Canadian National Railway about the track condition on the Ruel Subdivision. Transport Canada officials also inspected the track in question, reviewed previous inspection reports and issued a report containing 67 non-compliant conditions requiring repair and 59 other concerns and observations. **Canadian National Railway** put a plan in place to address these concerns, and took some actions, including introducing speed restrictions, and mechanical and engineering-related measures. A joint track inspection found the deficiencies to be reduced. With further actions, Canadian National was able to assure Transport Canada that it had addressed all the deficiencies.

Investigation report R15T0173

Occurrence	Non-main-track runaway, collision and derailment, Canadian National Railway, Mile 0.0, Halton Subdivision, MacMillan Yard, Concord, Ontario, 29 July 2015
Safety actions	**Canadian National Railway** issued guidance to employees on how to ensure that couplers are properly locked. **Transport Canada** conducted a follow-up inspection at the yard where the occurrence took place to verify compliance against data for all hard-coupling events. Transport Canada also undertook a tank car monitoring project with the National Research Council of Canada to provide a better understanding of the environment in which tank cars and their commodities operate while in transit.

Investigation report R15V0191

Occurrence	Grade crossing collision, Canadian National Railway, Langley, British Columbia, 11 September 2015
Safety actions	**B.C.'s Ministry of Transportation and Infrastructure** and **Canadian Pacific Railway** took a number of steps to improve the safety of vehicle drivers at this crossing. These improvements include relocating the warning system and upgrading equipment, installing flashing lights overhead for better visibility, repainting some pavement markings, and adding an LED sign warning of an approaching train.

Investigation report R15E0173

Occurrence	Non-main-track derailment, Canadian Pacific Railway, Mile 138.0, Scotford Yard, Scotford, Alberta, 8 December 2015
Safety actions	**Canadian Pacific Railway** took a number of safety actions related to switching practices. These actions included increasing performance monitoring, implementing pre-shift briefings, and providing mentoring and coaching sessions to ensure improved performance.

Investigation report R16C0012

Occurrence	Non-main-track derailment, Canadian Pacific Railway, Mile 0.40, Red Deer Subdivision, Alyth Yard, Calgary, Alberta, 18 February 2016
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, the TSB continues to gather information on occurrences relating to inadequate train handling and fatigue management among operating crew members. Fatigue management systems for train crews are a Watchlist 2016 issue.

Investigation report R16H0024

Occurrence	Collision between train and track unit, Canadian Pacific Railway, Mile 118.36, Nemegos Subdivision, Nemegos, Ontario, 6 March 2016
Safety actions	**Canadian Pacific Railway** issued a safety bulletin for all engineering employees reviewing the occurrence and applicable rules. The company then tested more than 2,500 employees on track protection procedures. Canadian Pacific is also exploring methods for electronically requesting track occupancy permits.

Investigation report R16W0074

Occurrence	Uncontrolled movement of railway equipment, Canadian Pacific Railway, Mile 109.7, Sutherland Subdivision, Saskatoon, Saskatchewan, 27 March 2016
Safety actions	**Canadian Pacific Railway** returned switching in Sutherland Yard to being performed with air applied on the railway cars and with conventional three-person crews. Canadian Pacific also made a number of changes to its internal risk assessment policy and procedure, including clearly defining roles and responsibilities, and clarifying the steps for evaluating the effectiveness of remedial actions and which operational changes require a risk assessment and ministerial notification. The company rolled out an online risk assessment training program to all operation managers in Canada and revised its risk assessment e-tool.

Investigation report R16E0051

Occurrence	Main-track train collision, Canadian National Railway, Mile 34.9, Edson Subdivision, Carvel, Alberta, 4 June 2016
Safety actions	Although the Board is unaware of any safety action taken following this occurrence, the TSB is continuing to gather information on the systemic risks of not following railway signal indications, which is a Watchlist issue.

Investigation report R16M0026

Occurrence	Crossing accident involving death of a person in a wheelchair, Canadian National Railway, Mile 124.43, Springhill Subdivision, Moncton, New Brunswick, 27 July 2016
Safety actions	**Canadian National Railway** made several repairs to the crossing, including to the sidewalks. The **City of Moncton** notified Canadian National that the crossing in question and another one nearby have been designated for persons using assistive devices, such that upgrades to the crossings could be made to improve the safety of individuals using them. The city is also developing its own crossing standards in 2018.

Investigation report R16D0073

Occurrence	Misaligned switch and derailment, St. Lawrence & Atlantic Railroad, Mile 93.22, Sherbrooke Subdivision, Acton Vale, Quebec, 11 August 2016
Safety actions	**St. Lawrence & Atlantic Railroad** engineering employees received refresher training on the Canadian Rail Operating Rules, and on the company's special instructions for handling main-track switches.

Investigation report R16D0076

Occurrence	Crossing collision, Canadian National Railway, Mile 90.61, Joliette Subdivision, Saint-Norbert, Quebec, 18 August 2016
Safety actions	**Canadian National Railway** published a safety bulletin on flagging procedures for track units passing through crossings. The bulletin dictates a number of items that flag-persons must have, including a tool to access crossing warning devices. Canadian National also distributed a Safety Flash to its entire engineering staff describing the facts of the occurrence and setting out guidelines to prevent something similar from taking place in the future.

Investigation report R16T0162

Occurrence	Main-track collision and derailment, Canadian Pacific Railway, Mile 3.3, North Toronto Subdivision, Toronto, Ontario, 21 August 2016
Safety actions	**Canadian Pacific Railway** issued bulletins to clarify speed reduction requirements when passing railway signals and the need for a radio broadcast of the signal indication being displayed at certain locations. **Transport Canad**a conducted an administrative investigation into railway signal rules violations and issued an administrative monetary penalty to Canadian Pacific.

Investigation report R16C0065

Occurrence	Non-main-track collision and derailment involving two trains, Canadian Pacific Railway, Mile 171.7, Brooks Subdivision, Calgary, Alberta, 3 September 2016
Safety actions	**Canadian Pacific Railway** reduced track speeds in the occurrence area and reminded crews of the requirements for entering non-main-track from signalled track. Canadian Pacific also reinstalled centralized traffic control in the area, having removed it several years earlier.

Investigation report R16D0092

Occurrence	Crossing collision, VIA Rail Canada, Mile 75.34, Joliette Subdivision, Sainte-Ursule, Quebec, 20 September 2016
Safety actions	Quebec's **Ministère des Transports, de la Mobilité durable et de l'Électrification** des transports evaluated the crossing and committed to installing an advance warning sign with flashing lights on the approach to it in 2018.

Investigation report R16E0102

Occurrence	Main-track derailment, Canadian National Railway, Mile 96.38, Grande Cache Subdivision near Grande Cache, Alberta, 29 October 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report R16W0242

Occurrence	Uncontrolled movement, collision and derailment, Canadian Pacific Railway, Mile 138.70, Weyburn Subdivision, Estevan, Saskatchewan, 29 November 2016
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report R17H0015

Occurrence	Crossing collision, Canadian Pacific Railway, Mile 121.36, Belleville Subdivision, Colborne, Ontario, 13 February 2017
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report R17W0199

Occurrence	Main-track derailment, Canadian Pacific Railway, Mile 90.21, Sutherland Subdivision, Blucher, Saskatchewan, 15 September 2017
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report R17C0074

Occurrence	Main-track derailment, Canadian National Railway, Mile 26.4, Maple Creek Subdivision, Antelope, Saskatchewan, 3 October 2017
Safety actions	The Board is unaware of any safety action being taken following this occurrence.

Investigation report R17Q0088

Occurrence	Crossing collision, VIA Rail Canada Inc., Mile 77.2, Canadian National Railway, La Tuque Subdivision, Hervey-Jonction, Quebec, 25 October 2017
Safety actions	**Transport Canada** inspected the crossing and determined that the sightlines were insufficient to allow a heavy truck to clear the crossing safely. **Canadian National** communicated with the owner of the crossing regarding the need for additional sightline distance. The company also cleared the sightlines to accommodate heavy trucks and the current track speed, which had been reduced to 25 miles per hour immediately following the occurrence.

Appendix B: Glossary

Occurrence: A transportation accident or incident, and any situation or condition that the Board has reasonable grounds to believe could, if left unattended, lead to an accident or incident.

Accidents involve serious personal injury or death, or significant damage to property, in particular when safe operations are affected. (The Policy on Occurrence Classification sets out in detail what comprises an accident for each of the four modes.)

Incidents have less serious consequences than accidents, or could potentially have resulted in an accident. (The Policy on Occurrence Classification sets out in detail what comprises an incident for each of the four modes.)

Safety communications: Means or products through which the TSB communicates safety-related issues or information.

Recommendation: A formal way under the *Canadian Transportation Accident Investigation and Safety Board Act* by which the Board addresses systemic safety deficiencies that pose significant risks to the transportation system and, therefore, warrant the attention of regulators and industry.

Safety concern: A formal way for the Board to draw attention, within an investigation report, to an identified unsafe condition for which there is insufficient evidence to validate a systemic safety deficiency but the risks it poses warrant highlighting.

Safety advisory: A less formal means for the TSB to inform regulatory or industry stakeholders of a safety deficiency that poses low to medium risks, and to suggest solutions.

Safety information letter: A letter from the TSB to government or corporate officials that communicates safety deficiencies posing relatively low risks, transmits information to promote safety or clarifies issues that a stakeholder is examining.