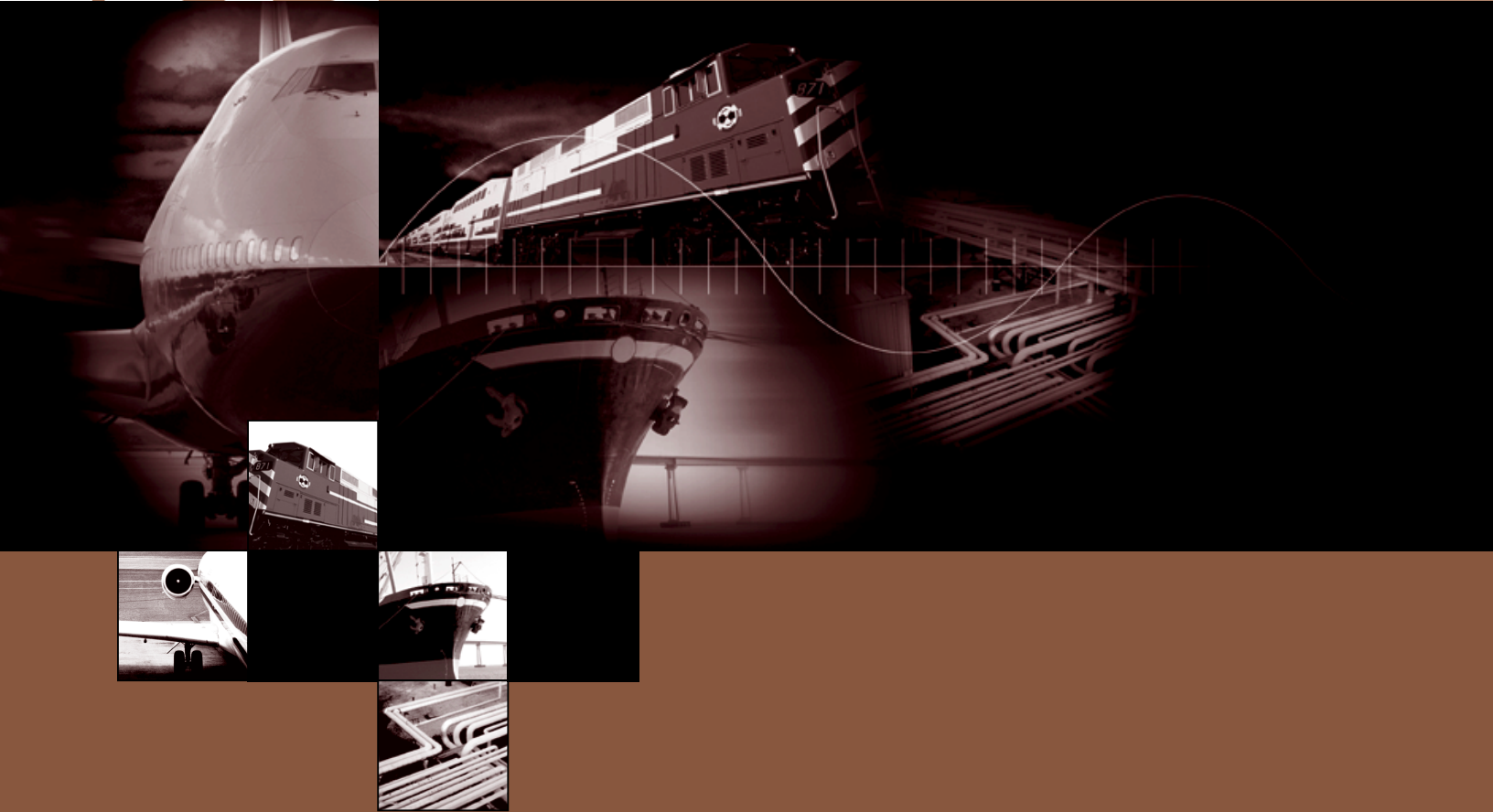




TSB

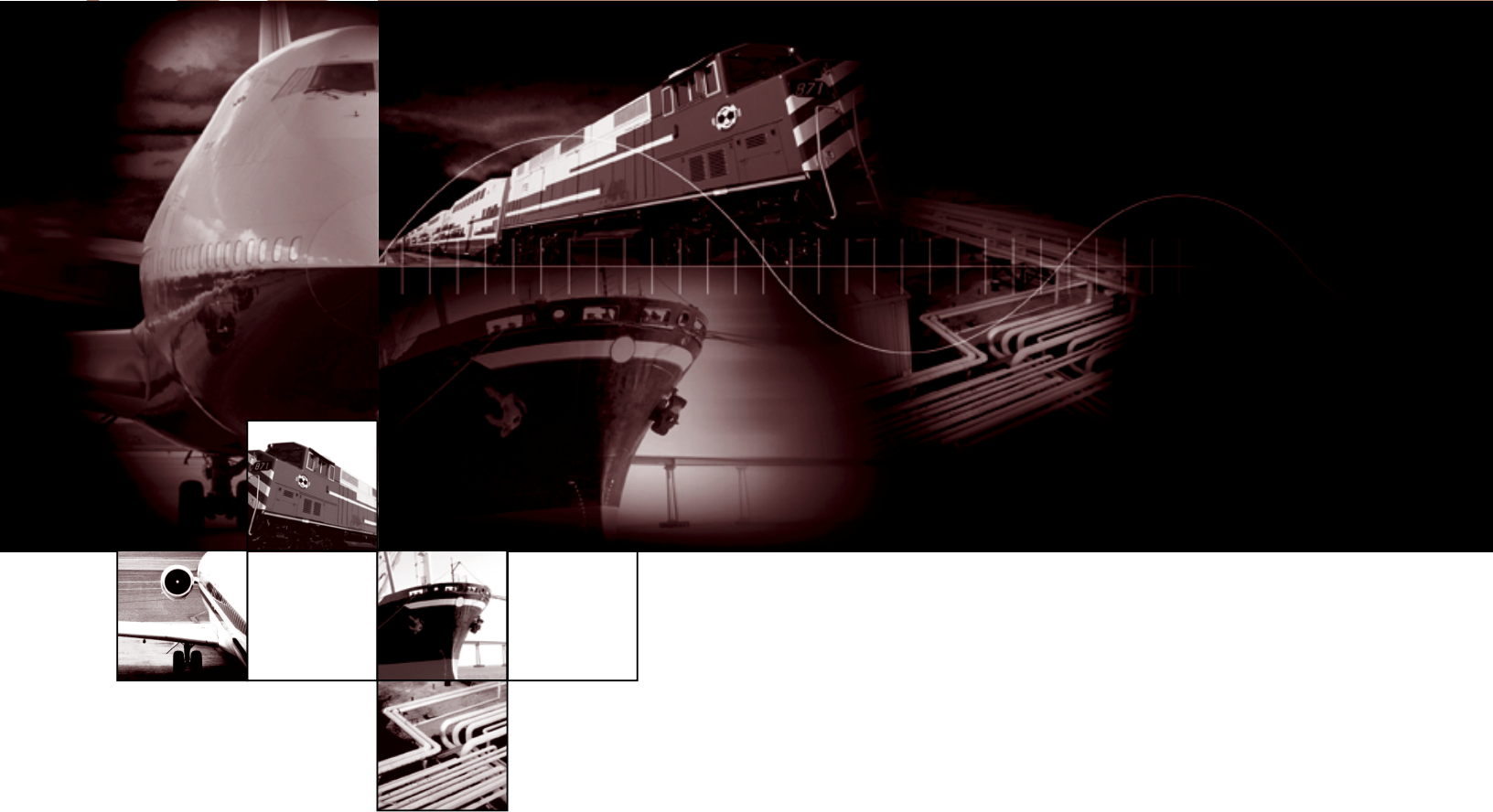


ANNUAL REPORT

TO PARLIAMENT 2000-2001



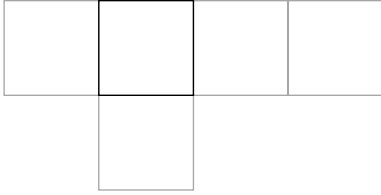
TSB



ANNUAL REPORT

TO PARLIAMENT 2000-2001

MANDATE OF THE TSB



The *Canadian Transportation Accident Investigation and Safety Board Act* provides the legal framework governing the TSB's activities.

The TSB has a mandate to advance safety in the marine, pipeline, rail, and aviation modes of transportation by

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

It is not the function of the Board to assign fault or to determine civil or criminal liability.

Independence

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



Place du Centre
200 Promenade du Portage
4th Floor
Hull, Quebec K1A 1K8


29 June 2001

The Honourable Stéphane Dion, P.C., M.P.
President of the Queen's Privy Council for Canada
House of Commons
Ottawa, Ontario K1A 0A6

Dear Minister:

In accordance with subsection 13(3) of the *Canadian Transportation Accident Investigation and Safety Board Act*, the Board is pleased to submit, through you, its annual report to Parliament for the period 01 April 2000 to 31 March 2001.

Yours sincerely,

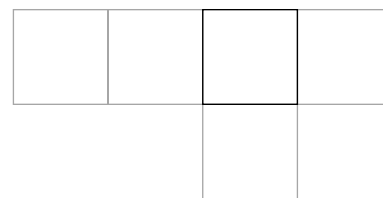


Benoit Bouchard

ANNUAL REPORT
TO PARLIAMENT 2000-2001



TABLE OF CONTENTS



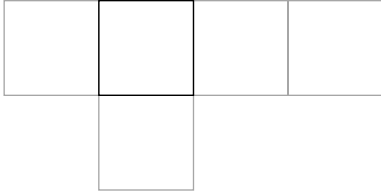
Members of the Board	2
Chairperson’s Message	3
Marine	12
Pipeline	22
Rail	26
Air	36
Appendix A—Safety Recommendations Approved in 2000–2001	51
Appendix B—Finance	57

LIST OF FIGURES

Figure 1. Occurrences Reported to the TSB 1996–2000	4
Figure 2. Investigations In Process / Completed 1996/1997–2000/2001.....	6
Figure 3. Safety Actions by the TSB 2000–2001	7
Figure 4. Board Assessment of Responses to Recommendations 2000–2001	8
Figure 5. Marine Occurrences and Fatalities 1996–2000	13
Figure 6. Significant Marine Safety Issues.....	21
Figure 7. Pipeline Occurrences 1996–2000	23
Figure 8. Rail Occurrences and Fatalities 1996–2000	27
Figure 9. Significant Rail Safety Issues.....	35
Figure 10. Air Occurrences and Fatalities 1996–2000.....	37
Figure 11. Significant Air Safety Issues	49

MEMBERS OF THE BOARD

2



Chairperson **the Honourable Benoît Bouchard, P.C.** Cabinet, transportation, and international experience includes Ambassador of Canada to France; Minister of Transport; Minister of Industry, Science and Technology; and Minister of National Health and Welfare.



JONATHAN SEYMOUR

Member **Jonathan Seymour.** Transportation policy and marine management experience includes Executive Director of International Maritime Centre—Vancouver; chartering, commercial, and general manager for several shipping companies; marine policy advisor to the British Columbia government; and policy and economic consultant.



CHARLES H. SIMPSON

Member **Charles H. Simpson.** Transportation executive experience includes Executive Vice-President, Operations, for Air Canada; President of the Canadian Air Line Pilots Association; and Vice-President of the International Federation of Air Line Pilots Association.



WENDY A. TADROS

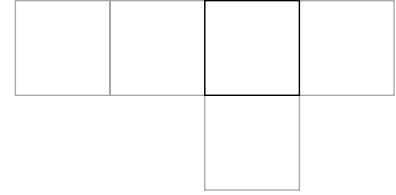
Member **Wendy A. Tadros.** Transportation and legal experience includes Director of Legal Services for the National Transportation Agency of Canada, Inquiry Coordinator for “The Road to Accessibility: An Inquiry into Canadian Motor Coach Services”, and counsel to the Canadian Transport Commission before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



R.HENRY WRIGHT

Member **R. Henry Wright.** Management and consulting experience includes auditor for the Ontario Ministry of Community and Social Services, senior management administrator of several non-profit organizations, and consultant in government and public relations.

CHAIRPERSON'S MESSAGE



BENOÎT BOUCHARD

In March 2000, we marked the 10th anniversary of the Transportation Safety Board of Canada (TSB). Reaching this milestone caused us to reflect on how we had grown and what we had accomplished over the years. We saw that the Board had developed a worldwide reputation for competence, compassion, dedication, and analysis. As we look at our past, we also look at where we are and where we hope to go.

Canada depends on safe, efficient, sustainable transportation that will unite our communities with each other and with the world. Our nation's products and services are exported around the world by Canadian carriers on land, on the sea, and in the air. Canadian companies build state-of-the-art means of transportation that are sold domestically and internationally. The TSB is a key, independent player in the advancement of the safety of marine, pipeline, rail, and aviation transportation in this country and, as such, contributes to Canada's transportation needs at home and abroad.

The TSB's Board members and staff are highly dedicated professionals who are committed to the safety of the travelling Canadian public and of the transportation systems from coast to coast. The Board and the staff take pride in the agency's investigative work and in the recommendations, reports, and other safety communications produced. They work equally hard to remain objective, independent, and free from conflict of interest.

This annual report to Parliament serves as a record of our investigations, safety actions, and recommendations. Canadians want to know what we are doing for them—not just in finding the problems but in helping to find the solutions—that will ensure their safety as they travel or as they are affected by the transportation of goods and services in and around their communities. We know that our investigations begin the process that saves lives and property. One challenge in the coming year will be to find the best tool for communicating our actions and the results of those actions, when we next report to Parliament and to all Canadians.

The level of public interest in transportation accidents is high. The TSB must manage the flow of information resulting from investigations to ensure its timeliness and its accuracy, while safeguarding the integrity of the investigation process.

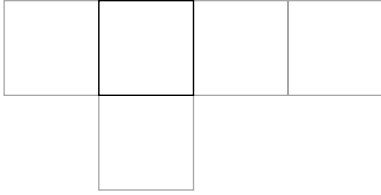
Day by day, we see the growing global reach of transportation. We see how the independent safety investigation agencies of various countries cooperate in their efforts to advance transportation safety. We also see the effects of global opinion and global technology on the safety of the transportation system.

International organizations cooperate in setting safety standards. The TSB is part of this global information-sharing arrangement. The TSB shares its knowledge with other countries and, in return, benefits from their knowledge for the advancement of safety worldwide. It is our goal to make transportation safer for all Canadians, now and in the future.

Benoît Bouchard

GENERAL ACTIVITIES AND FINDINGS

4

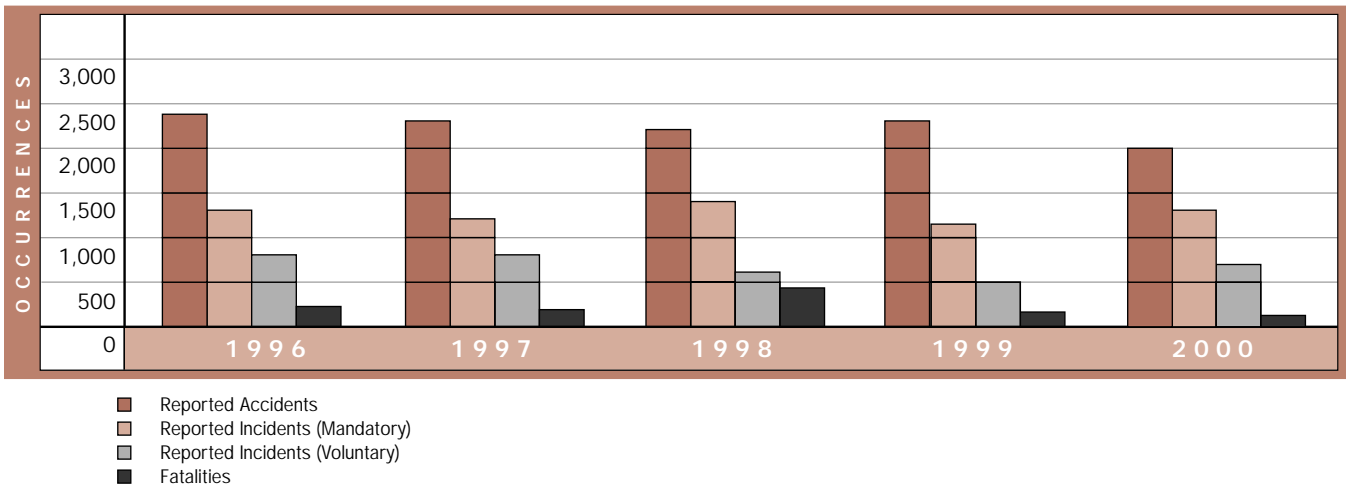


OCCURRENCE REPORTING

In 2000, a total of 1,992 accidents and 1,347 incidents were reported in accordance with the TSB's regulations for mandatory reporting of occurrences.¹ There were also 571 voluntary incident reports. The number of accidents in 2000 decreased by 7% from the 2,151 accidents reported in 1999 and by 17% from the 2,386 accidents reported in 1996.

The total of 209 fatalities in 2000 is lower than the preceding year's total of 228 and the 1995–1999 annual average of 291. The five-year average reflects the effect of a single aviation accident with 229 fatalities (Swissair Flight 111, on 02 September 1998) and a single marine accident with 21 fatalities (the "FLARE", on 16 January 1998).

Figure 1 Occurrences Reported to the TSB 1996–2000



All reported occurrences were examined in accordance with the Board's Occurrence Classification Policy to identify those with the greatest potential for advancing transportation safety. Investigations were undertaken for 115 of the approximately 4,000 occurrences reported to the TSB in fiscal year 2000–2001. Information on all reported occurrences was entered in the TSB database for historical record, trend analysis, and safety deficiency validation.

1. While the Board's operations are for the 2000–2001 fiscal year, occurrence statistics are for the 2000 calendar year.

All TSB investigations result in a public investigation report. In this fiscal year, 90 reports were finalized and released to the public, some for investigations initiated in previous years. Investigation reports are widely disseminated in Canada and abroad by mail, via the TSB Internet site, and as the subject of articles in *REFLEXIONS*, the TSB safety periodical.

Examples of investigations in progress or completed in fiscal year 2000-2001 for each of the four transportation modes within the Board's jurisdiction are described in the mode-specific sections of this report.



LOUISE HENRY
Chief, Human Resources
Head Office

REPORT TIMELINESS

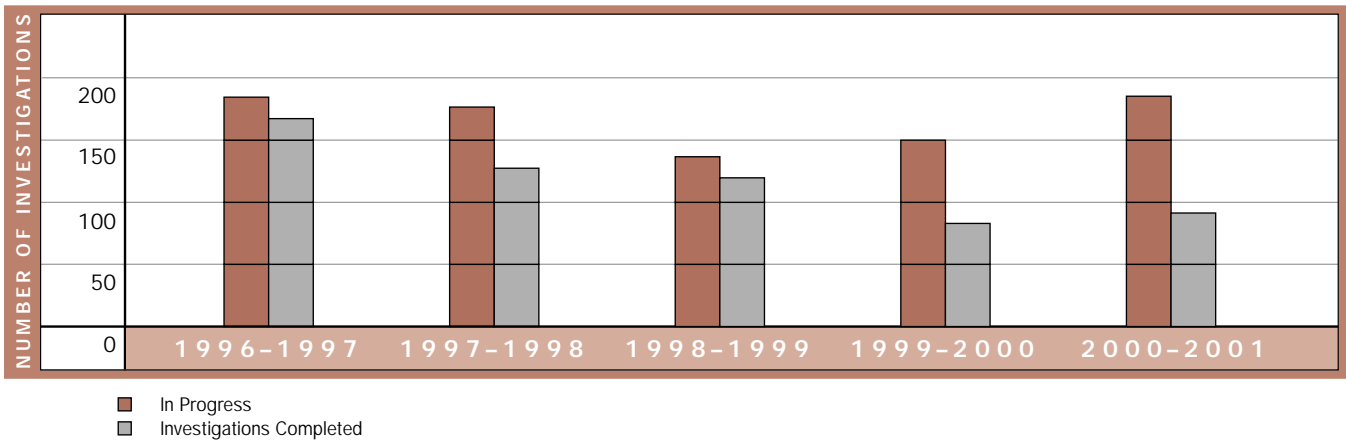
TSB investigation reports, in order to be relevant, must be completed and made public in a timely fashion. The Board aims to finalize the majority of its reports within one year of the occurrence date. Efforts to achieve the one-year standard have been hampered by the significant budget reductions in the 1990s, the need to collect data on the thousands of reported accidents and incidents each year that aren't investigated, the intensity of investigative resources assigned to several high-profile occurrences (the most notable being the ongoing investigation of the Swissair Flight 111 accident), and staff involvement in other nondiscretionary activities (such as the government-wide Universal Classification System project).

Various initiatives to improve report timeliness were discussed in previous annual reports. These include organizational changes, a new standardized methodology for investigation and safety analysis, and increased staff training. These efforts have generated some encouraging results in fiscal year 2000-2001. The number of investigations completed increased to 90, compared to 81 in the previous year. The average time in process decreased to about 20 months from 21 months, and the 115 new investigations started constitutes a 25% increase. Unfortunately, the number of investigations in process at year end also increased, by 19%. A large backlog of work in process is itself one of the factors that impact achievement of the one-year standard.



JENNY LEMIRE
Coordinator, Financial
Services
Head Office

Figure 2 Investigations In Process / Completed 1996/1997-2000/2001



SAFETY ACTIONS TAKEN

The Board's mandate includes making recommendations designed to eliminate or reduce safety deficiencies that can cause or contribute to transportation occurrences. These recommendations are an important and highly visible means by which the Board can contribute to advancing transportation safety. The TSB also forwards safety advisories and safety information letters to various action agents. Recommendations address systemic safety issues, normally warranting ministerial attention. Safety advisories are a less formal means for communicating lesser safety deficiencies to officials within and outside of government. Safety information letters communicate safety-related information, often concerning local safety hazards, to government and corporate officials.

These are not the only means of contributing to safety action in transportation. The Board also encourages TSB investigative staff to maintain dialogue with transportation industry operators, manufacturers, and regulators. Such dialogue includes early communication of safety issues that arise during an investigation. It can therefore lead to timely safety improvement before the completion of the TSB's public report and so obviate the need for Board recommendations. In recognition of the importance of this approach, the final section in the Board's investigation reports is titled "Safety Action" and begins with a listing of pertinent "Actions Taken" before discussing any "Action Required".



ELAINE SUMMERS
Senior Technical Analyst
Engineering Laboratory

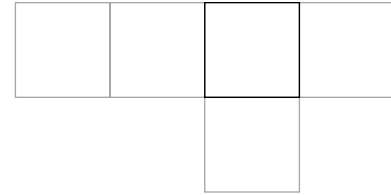


Figure 3 Safety Actions by the TSB 2000-2001

	RECOMMENDATIONS	SAFETY ADVISORIES	SAFETY INFORMATION LETTERS
MARINE	9	6	12
PIPELINE	0	0	1
RAIL	8	4	2
AIR	12	11	9
TOTAL	29	21	24

RESPONSES TO RECOMMENDATIONS

In accordance with the *CTAISB Act*, a federal minister who is notified of Board recommendations must, within 90 days, advise the Board in writing of any action taken or proposed to be taken in response or reasons for not taking action. In the 12-month period of 2000-2001, the Board received replies to 30 recommendations. These included several from foreign agencies and from Canadian organizations outside the federal government. The Board considered each response, assessing the extent to which the related safety deficiency was being addressed. With the increase in safety actions taken (as discussed in the previous section), the number of formal safety recommendations issued by the Board has declined in recent years. A summary of the Board's assessments for 2000-2001 is shown in Figure 4. In instances where a recommendation generates responses from within and outside Canada, the Board's assessment is based primarily on the Canadian response.

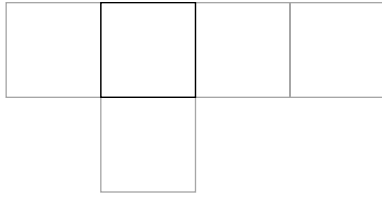


Figure 4 Board Assessment of Responses to Recommendations 2000-2001

	FULLY SATISFACTORY ATTENTION TO SAFETY DEFICIENCY	SATISFACTORY INTENT TO ADDRESS SAFETY DEFICIENCY	ATTENTION TO SAFETY DEFICIENCY SATISFACTORY IN PART	UNSATISFACTORY ATTENTION TO SAFETY DEFICIENCY	TO BE ASSESSED	TOTAL
MARINE	3	2	0	0	0	5
PIPELINE	0	0	0	0	0	0
RAIL	2	3	0	0	2	7
AIR	3	11	4	0	2	20
TOTAL	8	16	4	0	4	32

LIAISON WITH CANADIAN TRANSPORTATION COMMUNITY



DON LANGDON
 Manager, Systems and
 Engineering Services
 Engineering Laboratory

To maintain contact with industry and to keep abreast of technological changes, TSB representatives presented papers and participated in various Canadian conferences and technical meetings pertinent to transportation safety. Examples include the Air Transportation Association of Canada Symposium, the Canadian Business Aircraft Association 2000 convention, the Transport Canada Safety Through Partnership Conference, and meetings of the Northern Air Transport Association, the Aerospace Industries Association of Canada, Transport Canada, Canadian Pacific Railway, the Canadian Marine Advisory Council, the Search and Rescue Needs Review Workshop, and the Canadian Emergency Preparedness Association. Papers were also presented at the Canadian Passenger Vessel Association Annual Meeting, the Canadian Institute of Marine Engineering's High Speed Vessel Conference, and the Canadian Safe Boating Council Symposium.

The TSB Chairperson spoke at various events throughout Canada. These events included the Interstate Natural Gas Association of America and Canadian Energy Pipeline Association Conference, the Canadian Aviation Safety Seminar, Aerospace 2000 and Aerospace North America, the Millennium Transportation Conference, and the Aviation Safety Alliance. He also participated in the public release of the bulk carrier "FLARE" investigation report in Halifax, Nova Scotia, and in the public release of five aviation safety recommendations. These aviation recommendations concerned in-flight firefighting measures and resulted from the investigation into the Swissair Flight 111 accident.



INTERNATIONAL COOPERATION AND KNOWLEDGE TRANSFER

Notwithstanding the demands of business at home, part of the TSB's mandate is to enhance transportation safety worldwide. For this reason, TSB representatives participate in international transportation forums. The TSB Chairperson participated in the International Conference on Safety in Transportation held in Italy and continued the TSB's involvement in the International Transportation Safety Association. As part of the ongoing Swissair Flight 111 investigation, he also travelled to Europe to meet with the president of SAirGroup (Swissair), Switzerland's Minister of Transport, and officials from France's Bureau Enquête-Accidents. The Chairperson also met informally with members of the European association representing the victims' families.

TSB staff attended international conferences and meetings, including those of the International Civil Aviation Organization, the Financial Times World Aerospace and Air Transport, the European Civil Aviation Conference, the US National Transportation Safety Board, the Aviation Safety Committee at Oxford University, and Embry-Riddle Aeronautical University. Staff also participated in the Marine Accident Investigators International Forum and attended the Human Factors and Ergonomics Conference. Papers were presented at the Eleventh International Rail Safety Conference, the International Fishing Industry Safety and Health Conference, the Marine Log—United States Coast Guard Marine Human Factors Conference, and the International Transportation Safety Conference. In addition, a TSB representative was a guest speaker at the Taipei University Flight Safety Conference.

Further underlining the TSB's commitment to international cooperation, a TSB representative testified in the second part of the Ladbrooke Grove Rail Inquiry in the United Kingdom concerning general rail safety. Another representative provided technical assistance to the Australian Transportation Safety Bureau on an aviation fuel contamination investigation. TSB representatives also attended the release of the US National Transportation Safety Board's investigation report into the Trans World Airlines Flight 800 accident. Finally, the TSB continues to actively support the work of two organizations of the United Nations: the International Maritime Organization and the International Civil Aviation Organization.



PAUL SPENCE
Accounting Services
Assistant
Head Office



YVES TELLIER
Chief, Finance, Planning and
Administration
Head Office



JULIE HÉBERT
Public Affairs Advisor
(Communications)
Head Office

ANNUAL REPORT

TO PARLIAMENT 2000-2001

10



PAMELA BRUNETTE
Systems Analyst (Informatics)
Head Office



JACYNTHE RICHARD
Systems Analyst (Informatics)
Head Office



PRATIMA ALEXANDER
Regional Investigation
Operations Assistant
Richmond Office

The TSB has continued to make its Integrated Safety Investigation Methodology (ISIM) training course available to investigators from other transportation safety organizations worldwide, including those from the Netherlands, New Zealand, and the United States, as well as to representatives of Transport Canada and Canadian railway and airline industries. Through this ISIM training, the TSB promotes its safety philosophy and demonstrates to industry and to other government agencies the openness with which it conducts its investigations.

Thirteen investigation agencies in eight different countries are currently using the Recovery, Analysis and Presentation System (RAPS) software, first developed at the TSB Engineering Laboratory in 1986. This software has gained international recognition as a world standard for the decoding, analysis, and presentation of flight recorder information and is used at the world's leading flight recorder laboratories. Aircraft manufacturers and others in the aviation safety industry have shown increasing interest in RAPS. Since the TSB sees substantial benefits in an expanded user base and in order to alleviate itself from the ongoing administrative overhead of supporting the system, the TSB has decided to allow RAPS to be commercialized and supported in the private sector.

The TSB is also customizing commercially available software to aid marine accident investigations. Canadian investigators have been the first to cooperate with manufacturers of electronic chart systems to develop a system to download information from electronic chart display information systems. Investigators from six countries, including the United States, Australia, and South Korea, have since asked for TSB expertise to develop this system for use in their marine investigations.

The Board continues to encourage implementation of improved recording devices in the marine, rail, and aviation industries. The TSB has participated actively in the development of the world's first international standard for marine voyage data recorders, which are now being introduced into service on newly manufactured ships around the world. The TSB has met with the US National Transportation Safety Board to discuss the development of a North American standard for rail event recorders. The proposals include crashworthiness standards and requirements for voice, both of which are currently lacking in the rail industry. The TSB also continues to monitor improvements in flight recorders, improvements that the Board recommended following the Swissair Flight 111 accident.



DENNIS PHAROAH
Voice/Data Recorder Analyst
Engineering Laboratory



CLAUDE GIRARD
Branch Administration
Officer (Air)
Head Office

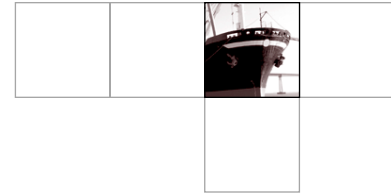


ANNUAL STATISTICS

A total of 528 marine accidents were reported to the TSB in 2000. This represents a 25-year low, with a 12% decrease from the 602 reported in 1999 and a 16% decrease from the 1995–1999 annual average of 632. Almost 90% of the accidents are shipping accidents, which involve events such as groundings, strikings, collisions, fires, and sinkings. In 2000, 451 shipping accidents were reported, a 50% decrease from the 904 reported in 1991. Shipping accidents have been decreasing by approximately 7% per year since 1991. This coincides with a continuing decrease in fishing activities and a reduction in the level of shipping movements. The other marine accident category, accidents to persons aboard ship, includes falls, electrocution, and other types of injuries requiring hospitalization. The number of accidents aboard ship increased to 77 in 2000, compared to 69 in 1999 and the 1990–1999 average of 62. The Canadian commercial vessel accident rate per 1,000 trips has decreased slightly to 4.13 in 2000 from 4.81 in 1999. The foreign commercial vessel accident rate per 1,000 trips also decreased slightly in Canada to 1.86 in 2000 from 1.91 in 1999. Despite this apparent accident rate stability in 1999 and 2000, the rates have decreased about 41% and 51%, respectively, over the last 10 years. In 1991, the Canadian commercial vessel accident rate was 7.01, and the foreign commercial vessel accident rate was 3.82.

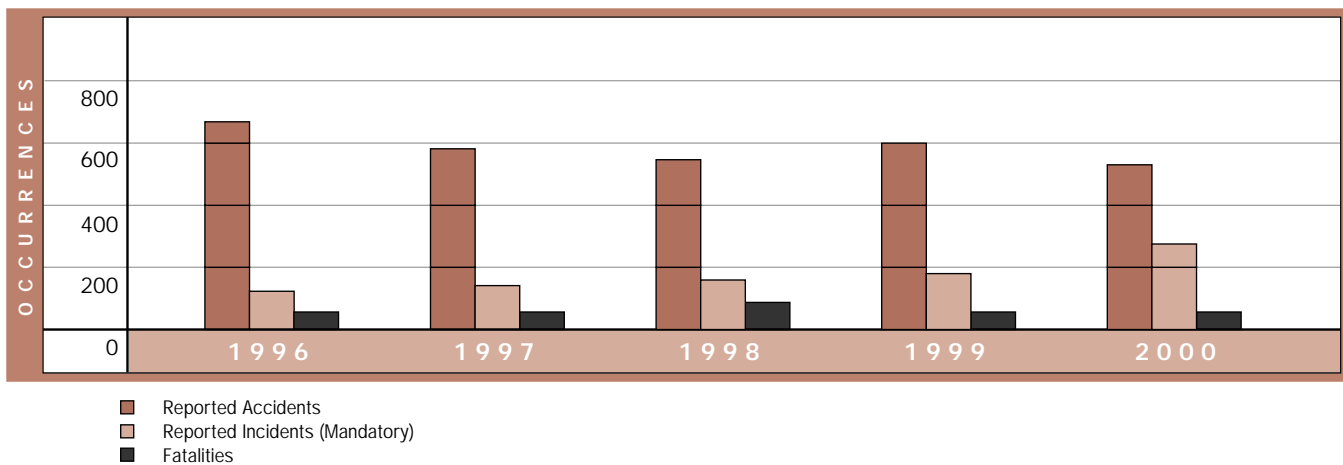
In 2000, shipping accidents resulted in 16 fatalities, and accidents aboard ship resulted in 15 fatalities. Five fatal accidents resulted in multiple casualties. In 1999, shipping accidents resulted in 14 fatalities, and accidents aboard ship resulted in 15 fatalities. The number of vessels reported lost has been dropping steadily over the last 10 years. Thirty-four vessels were reported lost in 2000, 24% fewer than the 45 reported lost in 1999.





In 2000, 249 marine incidents were reported in accordance with TSB mandatory reporting requirements. This represents a 38% increase over the 1999 figure of 180 and a 49% increase over the 1995-1999 average of 167. This increase is primarily attributable to a rise in the reporting of mechanical failures and close-quarters situations by the marine industry.

Figure 5 Marine Occurrences and Fatalities 1996-2000



SELECTED MARINE INVESTIGATIONS STARTED IN 2000-2001

Fall overboard, passenger vessel "MISS GATINEAU", Ottawa River, Quebec

On the night of 12 May 2000, the passenger vessel "MISS GATINEAU" was conducting a cruise on the Ottawa River with 132 passengers on board. When the vessel was midway between the Macdonald-Cartier and Alexandra Bridges in midstream, one passenger fell overboard from a window. The vessel was held in position. Despite a search using the vessel's lifeboat and by water rescue units from two local fire departments, the victim could not be found. His body was recovered two weeks later. The investigation focused on the ready availability of safety equipment and on the capacity to quickly retrieve individuals who fall overboard from passenger vessels.



Sinking, laker "ALGOWOOD", Bruce Mines, Ontario

On 02 June 2000, the Canadian self-unloading laker "ALGOWOOD" developed a severe hogging attitude while alongside the loading berth at Bruce Mines, Lake Huron, Ontario. Consequently, the vessel's bottom structure, bilges, and sides fractured, and all cargo holds and side ballast tanks flooded. No injuries or pollution occurred. After salvage and temporary repairs were completed, the vessel was towed to the Port Weller, Ontario, dry docks for repairs and reconstruction. The investigation is assessing possible shortcomings in safety support mechanisms both afloat and ashore and in the loading, ballasting, and deballasting processes.



PAUL VAN DEN BERG
Senior Investigator/Safety
Analyst (Marine)
Head Office

Sinking, small passenger vessel "TRUE NORTH II", off Flowerpot Island, Georgian Bay, Ontario

On 16 June 2000, while returning to Tobermory from Flowerpot Island, Georgian Bay, Ontario, the small passenger vessel "TRUE NORTH II" was swamped by a series of waves. The waves stove in the vessel's bridge front door, flooded the main deck, and down-flooded into the hull. The vessel sank rapidly in 15 metres of water approximately 200 metres off Flowerpot Island. Of the 20 people on board, 18 drifted ashore on two buoyant apparatuses. Two children drowned. The investigation focused on several safety issues, including safe crewing levels, the availability of lifesaving and emergency equipment, pre-departure safety briefings, operating limitations of small passenger vessels in Canada, and the adequacy of the Transport Canada, Marine Safety, inspection program.





Capsizing, fishing vessel "AVATAQ", off Arviat, Nunavut

On the night of 24–25 August 2000, the fishing vessel "AVATAQ" encountered gale-force winds while bound from Churchill, Manitoba, toward Arviat, Nunavut, with 15,823 kilograms of general cargo. When the vessel was approximately 16 kilometres south of Arviat, the crew reported that the cargo had shifted, that the vessel was taking water, and that the bilge pumps were not working. The vessel subsequently foundered, and all four crew members perished. The safety issues being examined include crew training, safety equipment, and regulatory overview of vessels in the Arctic.

Release of lifeboat, bulk carrier "PACMONARCH", English Bay, British Columbia

On 26 October 2000, while at anchor in English Bay, British Columbia, the crew of the Bahamian-flag bulk carrier "PACMONARCH" were launching a lifeboat into the water. The self-launching, totally enclosed lifeboat was fitted with "on load" release hooks. Four crew members boarded the lifeboat, while two others removed the securing pins at the davits and prepared for the launch from outside. The launch began smoothly. However, soon after the davits hit their stops, the hooks suddenly came apart from the falls, and the boat plummeted stern-first about 15 metres into the sea. Three of the four people in the boat perished. The investigation is focusing on the design and operational aspects of the lifeboat release mechanism.



ERIC SNOW
Chief, Investigation
Operations (Marine)
Head Office

MARINE SAFETY DEFICIENCIES IDENTIFIED

Several marine safety deficiencies, identified through investigations conducted in 2000–2001, involved issues that the TSB had noted previously. The Board continued to identify safety deficiencies in the operation of fishing vessels. In particular, the water-tight integrity of fishing vessels, the importance of closing devices, such as hatch covers, and the availability of lifesaving equipment, such as liferafts and distress alerting equipment, were highlighted in connection with the loss of the fishing vessel “BRIER MIST”. After the sinking of the large fishing vessel “BCM ATLANTIC”, the Board raised the issue of the serviceability of immersion suits on fishing vessels and the importance of the crew conducting regular boat drills.

As a result of the investigation into the sinking of the “FLARE”, the Board identified safety deficiencies in the operation of bulk carriers. In particular, the Board was concerned with the significant number of lives lost in accidents involving bulk carriers in North Atlantic waters in the past several years. Safety deficiencies identified by the Board pertained to the proper stowage and installation of emergency position-indicating radio beacons, the availability of thermal protection for crews in emergency situations, the adequacy of carriage requirements, and the adequacy of ship personnel’s knowledge about the consequence of improper loading and ballasting, especially when encountering winter sea conditions in the North Atlantic.

SUMMARY OF MARINE SAFETY RECOMMENDATIONS AND ACTIONS

The Board issued nine marine safety recommendations in 2000–2001. In addition, the TSB forwarded six marine safety advisories and 12 marine safety information letters to various action agents.

In connection with the 1998 break-up and sinking of the Cypriot bulk carrier “FLARE” off Newfoundland, the Board issued five safety recommendations. The Board identified deficiencies associated with the improper stowage and installation of emergency position-indicating radio beacons on vessels. These deficiencies expose crew members to undue risks in emergency situations. It also identified safety deficiencies concerning the carriage, stowage, and availability of adequate thermal protection, such as immersion suits, on convention vessels that operate in waters where hypothermia can greatly reduce an individual’s survival time. The Board also recommended that measures be taken to increase



international awareness and understanding of potential structural failure associated with high-frequency stresses on the hull, due to slamming and pounding, resulting from improper loading and inadequate draughts of vessels operating in ballast conditions.

As a result of the 1998 swamping and sinking of the scallop dragger "BRIER MIST", the Board issued four safety recommendations. It again found safety deficiencies associated with the design, manufacture, installation, maintenance, inspection, and securement of hatch covers on small fishing vessels. In addition, concerned with the difficult conditions in which abandonments are often carried out on small fishing vessels, the Board recommended that Transport Canada (TC) alert builders and owners of fishing vessels to the criticality of an adequate release mechanism—one that allows the inflatable raft to be safely released when the vessel sinks. Further, the Board recommended that TC require small fishing vessels engaging in coastal voyages to carry emergency position-indicating radio beacons or other appropriate equipment that, without relying on human intervention, automatically alerts the search and rescue system.

Given the risks associated with year-round operation in ice conditions, a marine safety advisory addressed the importance of regular boat drills, including the donning of immersion suits to ensure their serviceability. The TSB issued this advisory in connection with the sinking of the fishing vessel "BCM ATLANTIC".

As a result of the fatal occurrence involving the passenger vessel "MISS GATINEAU" in the Ottawa River, and similar fatalities involving passengers falling overboard, the TSB forwarded a marine safety advisory to TC emphasizing the need for adequate means and equipment on board to expediently locate and recover individuals who fall overboard.

Breach of watertight integrity, due to unsecured hatches, has been a contributing factor in several occurrences involving fishing vessels. As a result of the sinking of the Canadian fishing vessel "BRIER MIST", a TSB marine safety advisory again stressed the importance of fish-hold hatch covers in preserving the watertight integrity of fishing vessels.

The design, operation, and maintenance of lifeboat release mechanisms have been identified as factors in several occurrences, in Canada and abroad, involving the premature release of lifeboats. The TSB has investigated at least three accidents involving these premature releases in recent years. This deficiency was again highlighted within the past year in a TSB marine safety advisory forwarded to TC as a result of an occurrence involving the Bahamian-flag bulk carrier "PACMONARCH".



RAYMOND MATHEW
Regional Senior
Investigator/Nautical
(Marine)
Richmond Office



Three marine safety information letters addressed operational safety in the West Coast towing industry. In particular, these letters addressed safe practices when working aloft, towline abort mechanisms fitted on tugs, and navigation lights used in log towing. Inadequacy of navigation lights in the towing industry has been identified in several accidents previously investigated by the Board. This deficiency continues to exist.

The Board continues to identify deficiencies in the safety of fishers and fishing vessels. Two marine safety information letters dealt with survival techniques, unsafe practices for fishing vessels, and vessel stability. These safety information letters resulted from investigations into accidents involving the open lobster boat "JOSEPH & SISTERS" and the small fishing vessel "LORI CATHLYNN".

The adequacy of shipboard firefighting, hazards during shipboard fire, the safety of river-rafting operations, deficient circuit contractor material, and navigational safety at Port-Cartier, Quebec, were the subject of other marine safety advisories and information letters issued in 2000-2001.

The Board also noted during its investigations that safety measures were taken by members of the marine transportation industry. At least 26 such actions were identified, including the formal presentation of an information document by TC to the Subcommittee on Radio Communications and Search and Rescue at the International Maritime Organization. Another safety action of note was the publication of a technical alert by Lloyd's Register of Shipping (a member of the International Association of Classification Societies) concerning compliance with approved loading manuals, following the "FLARE" investigation report.

REPLIES TO MARINE RECOMMENDATIONS

The Board received replies to five of its recommendations issued in 2000-2001. These five recommendations resulted from the investigation into the break-up and sinking of the bulk carrier "FLARE" off Newfoundland. The Board identified safety deficiencies related to improper stowage and installation of emergency position-indicating radio beacons (M00-01), the provision of immersion suits to crew members for adequate thermal protection (M00-02, M00-03), and dynamic loads on the ship's hull due to improper loading and distribution of ballast (M00-04, M00-05).



Transport Canada (TC) submitted an information document concerning the proper stowage and installation of emergency position-indicating radio beacons to the Sub-Committee on Radio Communications and Search and Rescue at the International Maritime Organization (IMO). The paper, subsequently published by the IMO, advised Flag States and Port State members to focus on emergency position-indicating radio beacon installations during Flag State and Port State inspections. The Board considers the response to recommendation M00-01 to be *Fully Satisfactory*.

TC agreed with recommendation M00-02 and has since submitted the proposal to the 74th session of the IMO Maritime Safety Committee, scheduled for June 2001. The proposal recommends adoption of requirements similar to those currently in place in Canada, that is, immersion suits for each person aboard vessels operating in harsh environments. The proposal has been included in the agenda of the Maritime Safety Committee meeting for discussion. The response to recommendation M00-02 is considered to be *Fully Satisfactory*.

In support of recommendation M00-03, TC indicated that Port State Control (PSC) officers must ensure, during their PSC inspections, that crew members are familiar with the use and location of safety equipment. Consequently, TC will raise this issue at future PSC meetings. In the spring of 2001, TC submitted an information document to the IMO Ship Design and Equipment Sub-Committee informing members of the importance of the use and location of safety equipment. The response to recommendation M00-03 is considered to have *Satisfactory Intent*.

With respect to recommendation M00-04, TC advised that PSC officers are placing greater importance on educating ships' officers on the importance of loading and ballasting. TC will bring the matter to the attention of IMO members through the Formal Safety Assessment Working Group on Bulk Carriers. This group submitted a progress report to the 73rd session of the IMO Maritime Safety Committee in December 2000. TC has taken the necessary steps to ensure that the deficiency is addressed in an international forum; consequently, the response to recommendation M00-04 is considered to be *Fully Satisfactory*.

In response to recommendation M00-05, TC advised that port wardens and PSC officers will closely monitor loading plans to ensure that vessels are loaded in accordance with approved loading plans. TC will bring the matter to future PSC meetings of the members of the Paris and Tokyo memoranda of understanding to ensure the importance of compliance. The response to recommendation M00-05 is considered to have *Satisfactory Intent*.



ALOAK TEWARI
Regional
Investigator/Engineering
(Marine)
Richmond Office



SIGNIFICANT MARINE SAFETY ISSUES

Most of the issues on the Significant Marine Safety Issues list from last year continue to be of concern to the Board. However, on the 2000-2001 list, the emerging issue of "Carriage, Ready Availability, and Effective Use of Lifesaving Equipment on Vessels" replaces "Carriage of Voyage Data and Voice Recorders on Large Vessels". The TSB has successfully taken a leading role in assisting the international marine community to establish and adopt international technical standards for voyage data recorders during the past three years. Although universal carriage requirements for all large vessels have yet to be developed, the international marine community is continuing work to establish carriage requirements progressively, beginning with large passenger vessels.

Several TSB investigations in 2000-2001 revealed safety shortcomings associated with the carriage, ready availability, and adequacy of lifesaving equipment such as life jackets, immersion suits, and liferafts. These deficiencies are common to various types and sizes of vessels, including small passenger vessels (ex. "TRUE NORTH II"), fishing vessels (ex. "BRIER MIST"), and large safety convention vessels (ex. "FLARE"). It appears that while such ships may have had lifesaving equipment, the crew and the passengers were often not made aware of the stowage locations. In some instances, ship personnel did not have adequate knowledge of proper stowage and installation to ensure that the equipment was readily available in emergency conditions. In other instances, adequate lifesaving equipment was not provided to improve crews' and passengers' chances of survival in adverse conditions.



Figure 6 Significant Marine Safety Issues

- Controlling Risk on Small Fishing Vessels

- Carriage, Ready Availability, and Effective Use of Lifesaving Equipment on Vessels

- Safety of Small Passenger Vessel Operations

- Adequacy of Work/Rest Cycles of Ships' Crews and Pilots

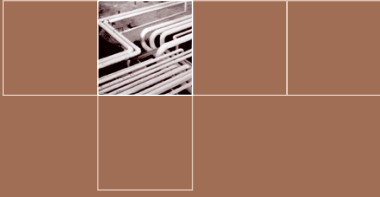
- Passenger Safety

- Overview of Safe Operations by Shipowners and Managers Ashore



PIPELINE

22



ANNUAL STATISTICS

A total of 22 pipeline accidents were reported to the TSB in 2000, which is equal to the 1995–1999 annual average. The last fatal pipeline accident in the portion of the industry under federal jurisdiction occurred in 1988. In 2000, one serious injury occurred as a result of a pipeline occurrence. Between 1995 and 1999, six serious injuries occurred, including four from one accident in 1998.

Since 1995, pipeline activity level has increased by an average of 5% per year. In 2000, the pipeline accident rate was estimated at 1.71 accidents per exajoule, which is comparable to the 1999 accident rate of 1.76 but lower than the 1995–1999 average rate of 2.20.²

In 2000, 37 pipeline incidents were reported in accordance with TSB mandatory reporting requirements. This is comparable to the 38 incidents reported in 1999 and the 1995–1999 average of 35. Historically, most incidents have involved the uncontained or uncontrolled release of small quantities of gas, oil, and high vapour-pressure products.

2. Source: National Energy Board

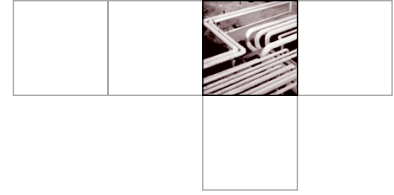
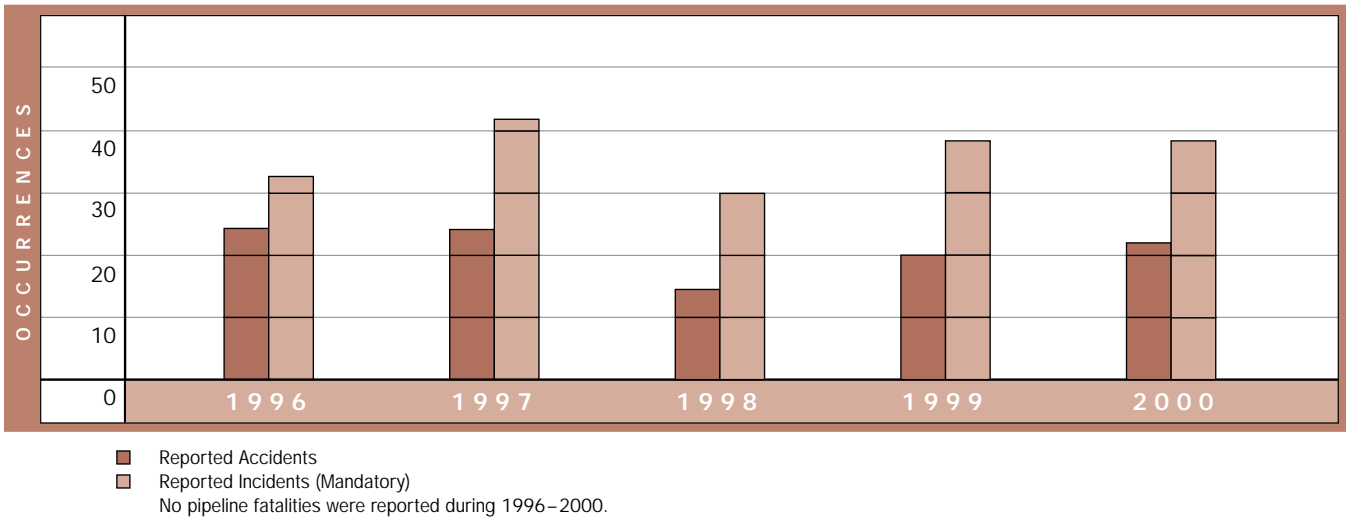


Figure 7 Pipeline Occurrences 1996-2000

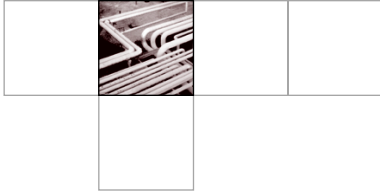


SELECTED PIPELINE INVESTIGATIONS STARTED IN 2000-2001

Westcoast Energy Inc., rupture of the Mainline, Coquihalla Highway, British Columbia

On 07 August 2000, the 30-inch mainline ruptured at mile post 569.9 near the Zopkios Rest Stop on the Coquihalla Highway, British Columbia. Approximately $3,252 \times 10^3$ cubic metres of natural gas were released as a result. The highway was closed to traffic for four hours following the rupture.

Metallurgical testing of the section of line in which the fracture originated revealed some shallow pitting corrosion coincident with a localized "hard spot" on the exterior surface of the pipe. Following the rupture, Westcoast completed in-line inspections for hard spots on certain sections of the mainline.



**Trans Québec & Maritimes Pipeline Inc., explosion and fire on Line 3000,
near East Hereford, Quebec**

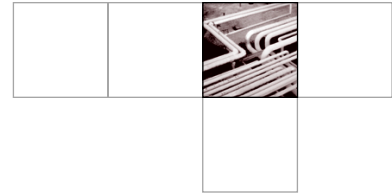
On 28 December 2000, an explosion and fire occurred at the main control building at Trans Québec & Maritimes Pipeline's compressor station located at kilometre post 217.094 on Line 3000, near East Hereford, Quebec. The accident resulted in power outages in the surrounding countryside. Because of the nature of the accident and the proximity of the general public, the Sûreté du Québec (Quebec police) closed the main highway adjacent to the compressor station and restricted local residents from the immediate area around the site.



The preliminary field examination determined that high-pressure natural gas leaked from an adjacent building at the compressor station; the building housed the electric motor-driven natural gas compressor unit. Before the explosion and the fire, natural gas migrated down two high-tension, power-electric teck cables located at the bottom of a terminal box inside the compressor building and into the control building, where the flowing natural gas ignited. The explosion and the fire destroyed the compressor and the control building and heavily damaged two adjacent buildings and other station facilities. Final clean-up and rebuilding of the complete East Hereford compressor station could take approximately one year. The investigation is focusing on the nature of the failure and on the potential for a recurrence of this type of problem in the pipeline system.

Enbridge Pipelines Ltd., rupture of Line 4, Hardisty, Alberta

On 17 January 2001, the 34-inch Line 4 ruptured at mile post 109.42, approximately one-half kilometre downstream of the Hardisty, Alberta, pump station. The pipeline ruptured in the vicinity of the longitudinal weld, releasing approximately 3,800 cubic metres of heavy crude oil. Almost 95% of the oil was recovered and transferred to tankage at the Hardisty pump station. This section of line was internally inspected for cracking in



October 2000; however, at the time of the rupture, Enbridge had not yet received a report from the in-line inspection company. After the rupture, Enbridge lowered the maximum operating pressure by 10% on certain sections of its 34-inch pipeline between Edmonton, Alberta, and Regina, Saskatchewan. The section of pipe containing the fracture was removed for detailed metallurgical testing.

PIPELINE SAFETY DEFICIENCIES IDENTIFIED

No pipeline safety deficiencies were identified in 2000-2001.

SUMMARY OF PIPELINE SAFETY RECOMMENDATIONS AND ACTIONS

The TSB issued one pipeline safety information letter as a result of the Westcoast Energy Inc. mainline rupture. No pipeline safety recommendations were issued in 2000-2001.

SIGNIFICANT PIPELINE SAFETY ISSUES

The pipeline industry in Canada has recently introduced a comprehensive pipeline integrity program. The objective of this program is to reduce the likelihood of major accidents, such as pipeline ruptures and explosions, and to enhance the safety of the general public and the protection of the environment. To ensure pipeline integrity, in-line inspection tools are used for regular internal pipeline inspections, usually every two to three years. However, recent TSB investigations have shown that the types of in-line inspection tools being used are not always appropriate for the type of problems existing on the pipeline system.

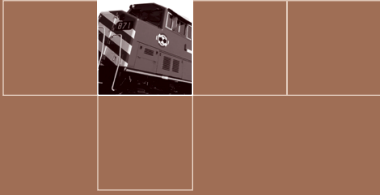


NATHALIE LEWIS
Senior Statistical Analyst -
Rail/Pipeline (Macro-Analysis)
Head Office



KEN TRUESDELL
Manager, Regional
Operations (Rail/Pipeline)
Head Office





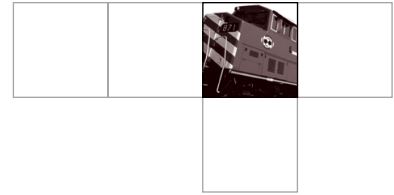
ANNUAL STATISTICS

A total of 1,064 rail accidents were reported to the TSB in 2000. This represents a 6% decrease from the 1,129 accidents reported in 1999 and a 10% decrease from the 1995–1999 annual average of 1,180. The 2000 accident rate is 13.3 rail accidents per million train-miles, which is lower than the 1999 accident rate of 14.4 and the 1995–1999 average of 15.1. Main-track accidents (collisions and derailments) in 2000 totalled 129, which is unchanged from 1999. Main-track derailments numbered 120, a 19% decrease from the 1995–1999 average of 148. Non-main-track train collisions totalled 113 in 2000, a 13% increase over the 100 reported in 1999 but unchanged from the 1995–1999 average of 113. Non-main-track derailments numbered 388 in 2000, down from 403 in 1999 but a 3% increase over the 1995–1999 average of 378.

There were 262 crossing accidents in 2000, down from 283 in 1999 and well below the 1995–1999 annual average of 321. Trespasser accidents (individuals, primarily pedestrians, struck by rolling stock on railway rights-of-way other than at railway crossings) totalled 79 in 2000, a 17% decrease from the 95 reported in 1999. In 2000, 86 fatalities were associated with crossing and trespasser accidents, a 13% decrease from the 99 fatalities in 1999 and a 19% decrease from the 1995–1999 average of 106.

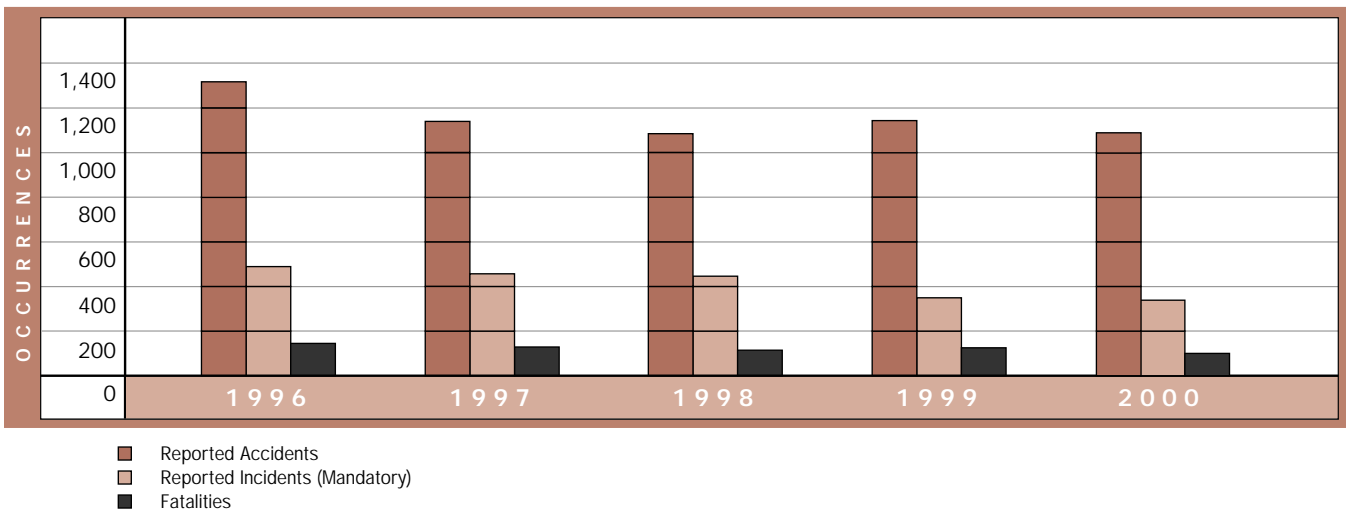
In 2000, 247 accidents involved railcars carrying or having recently carried dangerous goods (23% of all accidents); 4 of these accidents resulted in release of product. Accidents involving passenger trains numbered 61, a 16% decrease from the 1995–1999 average of 73. Most accidents involving passenger trains either occur at crossings or involve trespassers being struck by the train.





Rail incidents reported in accordance with TSB mandatory reporting requirements numbered 330 in 2000. This figure is comparable to the 1999 total of 333 but is 24% lower than the 1995-1999 average of 436. Dangerous-goods leakers not related to train accidents annually account for the largest proportion of total incidents. There were 188 dangerous-goods leakers in 2000, a 13% increase over the 167 reported in 1999 but well below the 1995-1999 average of 281.

Figure 8 Rail Occurrences and Fatalities 1996-2000





SELECTED RAIL INVESTIGATIONS STARTED IN 2000-2001

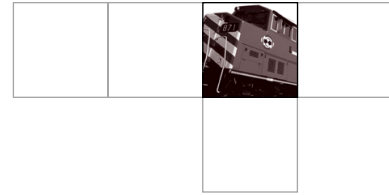
Main-track derailment, Cressman, Quebec

On 22 May 2000, while proceeding eastward on the Canadian National Saint-Maurice Subdivision, a freight train derailed 20 cars, including 14 cars on a bridge over the Saint-Maurice River. Four of the derailed cars contained fuel oil residue. One of the tank cars fell into the river and floated downstream. Two cars came to rest hanging from the bridge. Safety issues under consideration include train marshalling practices as well as standards for track inspection and maintenance on secondary main track.



Reversed main-track switch, Rockwood, Ontario

On 09 July 2000, a Via Rail passenger train travelling between Toronto and London, Ontario, encountered a reversed main-track switch. The train diverged into a siding at approximately 60 miles per hour, where it collided with stationary construction equipment belonging to a private contractor. Nine passengers and one crew member sustained minor injuries; the locomotive was extensively damaged. Safety issues under consideration include the adequacy of advance warning of main-track switch position for approaching trains in non-signalled territory, verification procedures for the handling of main-track switches, and the protection of track work involving private contractors.



Collision at a public crossing, Acton, Ontario

On 28 September 2000, a westward Via Rail passenger train operating between Toronto and London, Ontario, struck an automobile at a public road crossing equipped with flashing light signals and a bell. Construction vehicles and contractor personnel were near the crossing. At the time of the accident, highway traffic control personnel were not stationed at the crossing. Safety issues under consideration include the protection of vehicular and pedestrian traffic while maintenance and construction activities are ongoing at public crossings and the protection of track work involving private contractors.



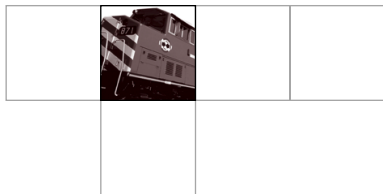
THOMAS WOZNY
Specialist/Senior Investigator
- Roadbed (Rail/Pipeline)
Calgary Office

Main-track derailment, Mallorytown, Ontario

On 16 January 2001, an eastward Canadian National freight train derailed 27 cars while travelling between Toronto, Ontario, and Montréal, Quebec. An undesired emergency brake application preceded the derailment. Two loaded cars of liquefied petroleum gas derailed but did not leak. The train obstructed the adjacent main track where passenger trains are authorized to operate at 95 miles per hour. No passenger trains were operating in the area at the time of the derailment. Safety issues under consideration include the effects of train marshalling practices and the effects of train length and weight on locomotive engineers' abilities to control in-train forces.

Derailment and release of dangerous goods, Red Deer, Alberta

On 02 February 2001, a Canadian Pacific Railway train switching at Red Deer, Alberta, derailed five cars loaded with anhydrous ammonia. Two of the cars came to rest on their sides. One car sustained a breach to the tank in the stub sill area and a large crack in a man-way area weld. The entire content of the car, approximately 135,000 litres, was released, leading to the evacuation of approximately 1,500 persons and the closure of a number of businesses. Thirty-four individuals were injured as a result of exposure to the anhydrous ammonia and were treated in hospital. One person sustained a severe respiratory tract injury. Safety issues under consideration include the service life of tank cars and the material specifications for tank car construction.



RAIL SAFETY DEFICIENCIES IDENTIFIED

An investigation into the derailment of a train carrying sulphuric acid has identified procedural safety deficiencies in the handling of identified track defects. Remedial measures taken as a temporary repair were allowed to remain in place and masked the continued deterioration of the track.

Two investigations of fatal crossing accidents have identified issues regarding the procedures for managing construction activities in the vicinity of crossings. In both occurrences, there are indications that motorists may have perceived activity at the crossing as indicating that the crossings were safe for passage when they were not.

Two ongoing investigations of main-track derailments have identified an issue relating to train marshalling. In one investigation, issues related to the length of the train and the location of loaded and empty cars in the train are emerging as potential antecedents to the occurrence. In the other investigation, the marshalling issue may be linked to the magnitude of the consequences of the derailment.

SUMMARY OF RAIL SAFETY RECOMMENDATIONS AND ACTIONS

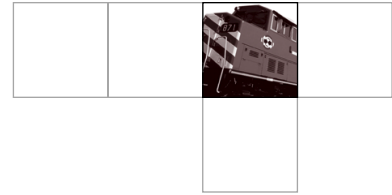
The Board issued eight rail safety recommendations in 2000–2001. In addition, the TSB forwarded four rail safety advisories and two rail safety information letters to various action agents.

One recommendation addressed system-wide track and turnout inspection, reporting, and supervisory review. This recommendation resulted from the investigation into a main-track derailment near Lyn, Ontario, on 01 March 1998.

The Board issued two recommendations as a result of an investigation into a rear-end collision between two trains near Obed, Alberta, on 01 March 1998. The first recommendation concerned assessing technologies that are available for the safe separation of railway rolling stock movements, with the intent of establishing a minimum safety standard. The second advised assessment of the current Canadian Rail Operating Rules and railway instructions regarding the immediate reporting of operating delays to all concerned when there is a safety risk.



ROGER HORNSEY
Senior Technical Coordinator
(Rail/Pipeline)
Head Office



Following an investigation into a rear-end collision between two trains near Notch Hill, British Columbia, on 11 August 1998, the Board issued two recommendations. One advised additional back-up safety defences to help ensure that signal indications are consistently recognized and followed. The second recommended assessing the impact of noise on voice communications in locomotive cabs to help ensure that crew members can effectively communicate safety-critical information.

The Board issued three recommendations after an investigation into the derailment of a passenger train and the subsequent collision with stored railcars loaded with dangerous goods in Thamesville, Ontario, on 23 April 1999. The first recommendation highlighted the development of additional permanent system defences that help ensure safety when trains approach main-track switches on occupancy control system outside automatic block signal system territory. The second recommendation concerned reviewing the system design specifications for computer-assisted and non-computer-assisted occupancy control system in Canada to ensure all the system components are designed with sufficient regard to human error. A final recommendation concerned the need to review the current regulatory framework and industry policy to help ensure that an adequate level of safety is maintained when dangerous goods are stored within and moved to or from the rail transportation system.

The TSB issued three rail safety advisories in connection with an ongoing investigation of a train derailment near Chalk River, Ontario, on 20 June 2000. The first safety advisory apprised Transport Canada (TC) of generally poor track conditions on jointed sections of the railway. It also urged TC to consider an assessment of all jointed sections of the railway's track and to develop a risk mitigation process with stakeholders. The second safety advisory highlighted the continued operation of freight trains when a train is known to contain a car that causes an emergency brake application each time the train brakes are used to control train speed. TC was urged to review the railway's procedures and practices for the handling of trains with kickers and the applicability of the "operative brake" requirements of the *Railway Freight and Passenger Train Brake Rules*. The third advisory concerned the identification of railway/pipeline crossings.



A fourth rail safety advisory concerned a reported signal problem in Montréal, Quebec, on 24 November 2000. This advisory identified a situation where, subsequent to a train passing a stop signal and damaging a main-track switch, the signal system permitted the lining of the train through the suspect controlled location. A rail traffic control alarm system did not activate until 13 seconds after the train passed the stop signal. TC was apprised of the situation and was urged to review the potential safety issues in this type of system.

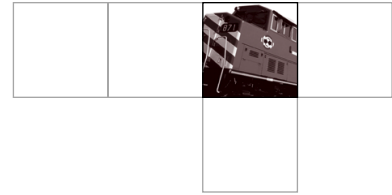
The TSB issued two rail safety information letters in 2000-2001. One letter, regarding the accuracy of train length information, was issued in connection with the aforementioned investigation of a train derailment near Chalk River, Ontario. The second letter was issued following an occurrence where a Via Rail passenger train separated while in motion between Smiths Falls and Brockville, Ontario, on 27 August 2000.

REPLIES TO RAIL RECOMMENDATIONS

In 2000-2001, the Board received replies to five recommendations. The Board completed its assessment of three of these replies and of two replies from last fiscal year.

The Board completed its assessment of two replies to recommendations that stemmed from the investigation into a main-track runaway, collision, and derailment in Mont-Joli, Quebec, on 24 September 1998. These recommendations dealt with the communication of operating policies and practices (R99-06) and with safety infrastructure for new federal railway companies (R99-08). In response to R99-06, Transport Canada (TC) stated it has noted very few communications problems, but that it will discuss the issue with the Railway Association of Canada (RAC) and with federally regulated railways that are not members of the RAC. In response to R99-08, TC detailed its continuing work on safety initiatives for new federal railway companies. In particular, the Railway Safety Management System Regulations, which came into effect 31 March 2001, address safety issues raised in both recommendations. The Board considers that the response to R99-06 has *Satisfactory Intent* and that the response to R99-08 is *Fully Satisfactory*.

The Board issued one recommendation (R00-01) relating to a system-wide assessment of track and turnout inspection reporting and supervisory review. The recommendation resulted from the investigation into a main-track freight train derailment near Lyn,



Ontario, on 01 March 1998. TC stated that it has discussed turnout conditions and inspections with Canadian National (CN) officials and that CN is planning to standardize its Standard Practice Circular entitled "Turnouts Installation, Inspection and Maintenance" to ensure universal applicability. The Board considers that the response to R00-01 has *Satisfactory Intent*.

The investigation into a rear-end train collision near Obed, Alberta, on 01 March 1998, resulted in two recommendations. One recommendation concerned collision avoidance, specifically an assessment of available technologies and the establishment of a minimum safety standard (R00-02). The other recommendation concerned the reporting of operating delays (R00-03). TC agreed with both recommendations. TC stated that it is conducting research on new train control technologies and participating in the development of new train control standards. TC is following up with the RAC in response to R00-03, requesting a review of current rules and requirements for reporting delays. The Board has assessed the response to R00-02 as *Fully Satisfactory* and the response to R00-03 as showing *Satisfactory Intent*.

The Board received replies to two further recommendations (R00-04, R00-05), stemming from a rear-end train collision near Notch Hill, British Columbia, on 11 August 1998, late in the fiscal year; consequently, its assessment was not completed as of 31 March 2001. Three other recommendations (R00-06, R00-07, R00-08) related to a derailment and collision of a passenger train in Thamesville, Ontario, were issued late in the fiscal year; replies are not expected until some time in the next fiscal year.



SIGNIFICANT RAIL SAFETY ISSUES

Most of the issues on the Significant Rail Safety Issues list from last year continue to be of concern to the Board. However, on the 2000-2001 list, the Board has combined "Adequacy of Operational Overview" with "Efficacy of Existing Safety Management Systems".

Recent TSB reports have identified inadequacies in wayside inspection systems and in inspection and maintenance programs for rolling stock, roadbed, and track. Regulatory oversight, under the *Railway Safety Act*, continues to evolve toward more of an auditing and monitoring role than one of direct oversight through inspection. Consistent with that approach, the railways have assumed greater responsibility for managing their own safety. However, indications are that in the transition some safety responsibilities may not be adequately fulfilled. Railway safety management plans, which are being developed in Canada, are as yet untested. Further, safety oversight at some of the smaller, short-line operations may be inadequate to ensure a safe operation.

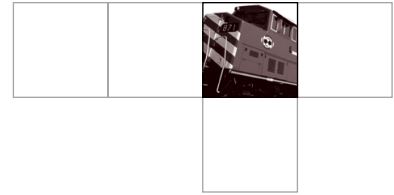
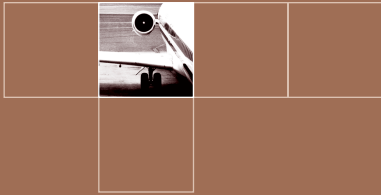


Figure 9 Significant Rail Safety Issues

- Adequacy of Safety-Critical Systems Controlling Railway Movements
- Safety Overview and Efficacy of Existing Safety Management Systems
- Crossing Collisions
- Adequacy of Defences in Cautionary Limits
- Adequacy of Crew Work/Rest Schedules
- Passenger Safety
- Voice and Data Recorder Capabilities
- Unauthorized Use of Railway Right-of-Way (Trespassing)





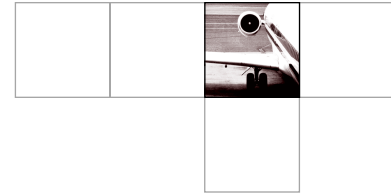
ANNUAL STATISTICS

Canadian-registered aircraft (other than ultralights) were involved in 321 reported accidents in 2000. This represents a 6% decrease from the 341 reported in 1999 and a 12% decrease from the 1995–1999 annual average of 363. Flying activity in 2000 increased 4% over 1999 to 4,260,000 hours.³ This yields a 2000 accident rate of 7.5 accidents per 100,000 flying hours, which is lower than the 1999 accident rate of 8.3 and the five-year average rate of 9.2. Canadian-registered aircraft (other than ultralights) were involved in 36 fatal accidents in 2000, with 63 fatalities. This is slightly fewer than the 1995–1999 average of 39 fatal accidents, with 81 fatalities. Of the fatal accidents in 2000, 18 involved private- or state-operated aircraft and 10 involved helicopters.

The number of accidents involving ultralights increased slightly to 38 in 2000 from the 35 in 1999. However, fatal accidents decreased to 5 in 2000, with 9 fatalities, from 12 fatal accidents in 1999, with 19 fatalities.

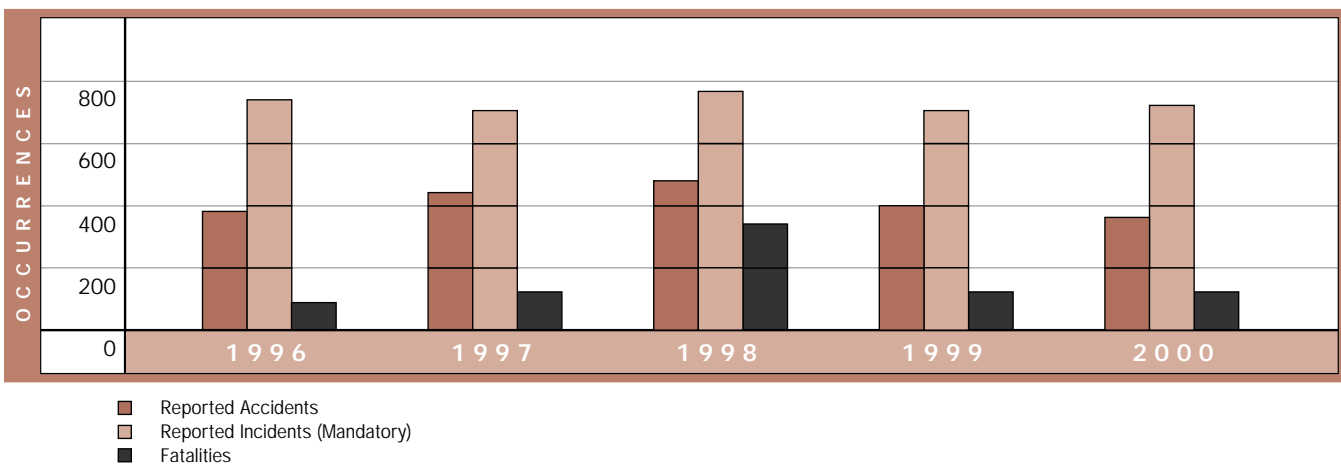
The number of foreign-registered aircraft involved in accidents in Canada decreased to 18 in 2000 from 24 in 1999. However, fatal accidents increased to 7 in 2000, with 18 fatalities, from 6 fatal accidents in 1999, with 9 fatalities.

3. Source: Transport Canada.



In 2000, 731 incidents were reported in accordance with TSB mandatory reporting requirements. This represents a 4% increase over the 705 reported in 1999 and the 1995-1999 average of 702.

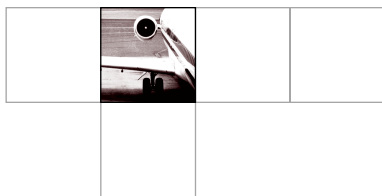
Figure 10 Air Occurrences and Fatalities 1996-2000



SELECTED AIR INVESTIGATIONS STARTED IN 2000-2001

Loss of main rotor, Bell 206B, Saint-Mathieu-de-Beloeil, Quebec

On 27 April 2000, a Bell 206B helicopter took off from the Beloeil airport, Quebec, with the pilot and an aircraft maintenance engineer (AME) on board. The purpose of this visual flight rules flight was to check the functioning of the transponder. Shortly after the pilot informed the area control centre of his return to the airport, the main rotor separated from the mast. The helicopter pitched nose-down and crashed in a field. A post-impact fire destroyed the aircraft; the two occupants were fatally injured. The investigation is focusing on the company's maintenance program, maintenance entries in the aircraft logbook, and verification of completed repairs on critical aircraft components, such as the control systems and the flight control surfaces. The investigation is also examining the supervision of apprentice AMEs and regulatory requirements concerning preflight checks.



Loss of control and crash at sea, Bell 212, near Cabot Island, Newfoundland

On 10 May 2000, a Canadian Coast Guard Bell 212 helicopter crashed into the ocean while involved in slinging operations to resupply a lighthouse on Cabot Island, Newfoundland. Debris was found in the water a short distance from Cabot Island. The wreckage, most of which was recovered, was found 11 days after the accident. The pilot was killed. The investigation is focusing on the lack of underwater locating devices on aircraft that operate primarily over water and on the survival equipment for flights over water. The TSB forwarded an aviation safety information letter to Transport Canada on the carriage of underwater locating devices on non-recorder-equipped aircraft that fly frequently over water.



MICHAEL DORÉ
Aviation Safety Information
System (ASIS) Assistant
Head Office



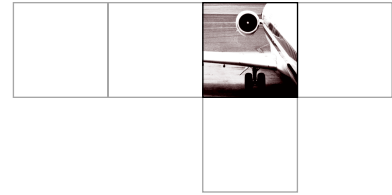
MIKE MUIRHEAD
Senior Statistical Analyst - Air
(Macro-Analysis)
Head Office

Tail-rotor gearbox seizure, Bell 47G-2, Abbotsford, British Columbia

On 10 May 2000, a helicopter student pilot and his flight instructor took off from the Abbotsford airport, British Columbia, in visual meteorological conditions for a training flight. On departure, as the helicopter climbed through about 700 feet above ground level, still over the airport, it lost tail-rotor thrust and began to spin to the right. The nose dropped, and the spinning turned into a spiral. As it descended, the helicopter appeared to be totally out of control. It struck the ground in a steep, nose-down attitude on the infield of the airport and broke apart; a post-impact fire ensued. Both occupants died. The investigation is focusing on maintenance practices and procedures, supervision, emergency procedures, and immediate aircrew action following the loss of the tail rotor.

Runway incursion, Airbus A319-114, Montréal, Quebec

On 26 August 2000, a Bombardier Regional Jet was on approach to runway 24R (right) at Montréal / Dorval International Airport, Quebec. An Airbus A319 was preparing to depart en route to Denver, Colorado. The Airbus crew contacted the clearance delivery controller and was issued an instrument flight rules clearance, with instructions that specified runway 24L (left). During the clearance readback, the crew of the Airbus read back runway 24R instead of 24L; the discrepancy was not challenged by the controller. When the Regional Jet was one and a half miles on final approach to runway 24R and cleared to land by the airport controller, the crew noticed the Airbus taking position on runway 24R and advised the tower. The airport controller cleared the Airbus for an

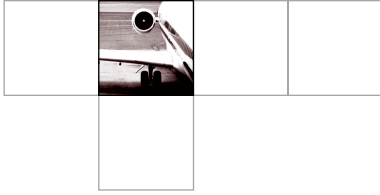


immediate take-off, and the crew complied. However, the crew of the Regional Jet decided they could not land safely and initiated a go-around at about 500 feet above ground level. The investigation is focusing on the challenge and response procedures by pilots and controllers concerning clearance delivery and on the methods and procedures to amend flight progress strips.

Fan cowl separation, Airbus A320-232, Toronto, Ontario

On 13 September 2000, an Airbus A320 was departing Lester B. Pearson International Airport in Toronto, Ontario, on a domestic charter flight to Edmonton, Alberta. During rotation, there was a loud bang and a simultaneous shudder of the aircraft. The master caution chimed; however, no electronic centralized aircraft monitor (ECAM) messages were displayed. At 1,500 feet above ground level, the ECAM began to display numerous faults related to the left engine. The flight crew declared an emergency and immediately returned to Toronto for an overweight landing. Several pieces of debris on the runway were later identified as the fan cowlings of the left engine. The investigation is focusing on human factors associated with servicing tasks, operations procedures, and fan cowl position indication and is analyzing the need for safety action.

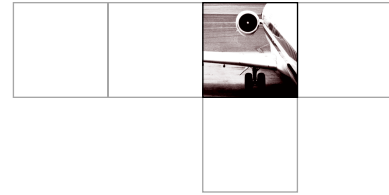
Nine other occurrences of fan cowling separation have been reported worldwide since the Airbus Single Aisle (SA)-series entered service, powered by the International Aero Engine V2500-series engine. Four of these incidents occurred in 2000. In all nine occurrences, the separation happened at rotation, and the engine cowls had been opened before the occurrence flights. To minimize the likelihood of recurrence, Airbus and International Aero Engine have developed four improvements: painted latches, caution decals, anti-swivel plates, and a hold-open device. This occurrence aircraft was fitted with the painted latches and the caution decals but had not been fitted with modified anti-swivel plates or a hold-open device.



Runway excursion, Boeing 727-200, Iqaluit, Nunavut

On 22 September 2000, a Boeing 727-200 was conducting a scheduled flight between Ottawa, Ontario, and Iqaluit, Nunavut. The flight, a combo configuration (passenger and freight), had seven crew members and 52 passengers. The crew was conducting an instrument landing system approach to Iqaluit. After touchdown, the aircraft departed the side of the runway and stopped with 2,000 feet of the runway remaining; the left main undercarriage and the nose gear were off the runway surface. The tires of the left main gear burst during the landing sequence, and as the aircraft came to a stop, the nose gear buried in the gravel to the top of the gear assembly. The captain ordered an emergency evacuation of the aircraft, but the message was not heard in the cabin. The crew and the passengers were not injured. At the time of the landing, the runway was slush-covered, and there was a strong crosswind. The investigation is focusing on the provision of runway conditions to aircrew, passenger evacuation checklist procedures, and the installation of the public announcement system.





SWISSAIR FLIGHT 111 INVESTIGATION

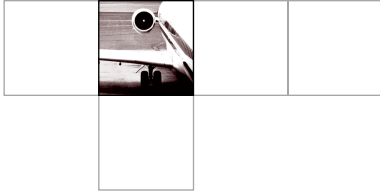
The TSB investigation continues into the Swissair Flight 111 accident in which 229 persons perished off Peggy's Cove, Nova Scotia, on 02 September 1998. The complex and challenging investigation has uncovered a number of safety deficiencies. The Board has issued 11 interim safety recommendations. The Board issued five such recommendations in 2000-2001 to highlight in-flight firefighting deficiencies, detailed later in the report. The TSB also disseminated a number of other safety communications concerning the investigation.

The technical investigation was centred in Shearwater, Nova Scotia, until December 2000. The front nine metres of the aircraft was partially reconstructed in Shearwater. This was an essential part of the investigation process because the results of this work will allow investigators the best opportunity to analyze and assess the events that occurred. The investigation team is now based at the TSB Engineering Laboratory in Ottawa, Ontario. Several pieces of aircraft wreckage were also moved to the TSB Engineering Laboratory for further analysis.

The complexity of the investigation has led investigators to develop new techniques and tools to manage the inordinate number of wreckage pieces and documents. For example, three-dimensional computer models have been built, and computer simulations are being used to assess the condition of the aircraft during flight. Comprehensive information management systems were also developed to allow investigators to efficiently track and search the information gathered by the team.

AIR SAFETY DEFICIENCIES IDENTIFIED

During this past fiscal year and in recent years, air investigators have noted a marked increase in the number of incidents and accidents that have occurred on the first flight after maintenance work has been performed. Among identified issues are the inadequate supervision of apprentice maintenance personnel by licensed aircraft maintenance engineers, the lack of adherence to proper maintenance log entry procedures, and work completed in a rushed manner, due to time or resource constraints. Some of the incidents investigated could easily have resulted in accidents, while a number of accidents resulted in destruction of the aircraft and loss of life.



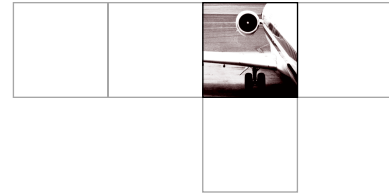
Aircraft crashes while the aircrew were conducting approaches in ceiling and visibility conditions at or below the minima recommended for these approaches continued to occur in 2000-2001. Another factor in losses of aircraft and life is private operators, and to a lesser extent air taxi operators, who conduct night operations and unexpectedly encounter instrument meteorological conditions during visual flight rules flight.

The number of commercial and private aircraft flights continues to grow. However, air proximity, risk of collision, and runway incursion events have not increased in parallel. Notwithstanding, occurrences of this nature still happen regularly and with enough significance to warrant continued efforts to reduce the risk.

SUMMARY OF AIR SAFETY RECOMMENDATIONS AND ACTIONS

The Board issued 12 aviation safety recommendations in 2000-2001. In addition, the TSB forwarded 11 aviation safety advisories and nine aviation safety information letters to various action agents.

In connection with a practice-spin accident in Lake Saint-François, Quebec, on 18 July 1998, the Board issued four recommendations. The investigation revealed systemic deficiencies with the rudder stop mechanism of Cessna 150-type aircraft. As a result, Cessna has redesigned the rudder-horn stop bolt to prevent over-travel of the rudder following a hard-rudder input. Cessna has also notified the Federal Aviation Administration (FAA) Aircraft Certification Office about this matter and expects to issue a Service Bulletin. In addition, Transport Canada issued a Service Difficulty Alert concerning inspection of the rudder control system. The Board is concerned that any mandatory airworthiness actions to retrofit Cessna 150's and 152's with redesigned rudder-horn stop bolt systems would likely take considerable time to complete. Also, while Cessna's intent to develop a Service Bulletin was appropriate, the Board is concerned that, since the proposed Service Bulletin is a voluntary document, not all Canadian-registered Cessna 150's and 152's will be modified. The Board also found that a lack of appropriate maintenance logbook entries created a situation where the aircraft was flown in an unserviceable condition without the crew being aware.



The Board has issued five additional recommendations resulting from the continuing investigation into the Swissair Flight 111 accident. These recommendations dealt with

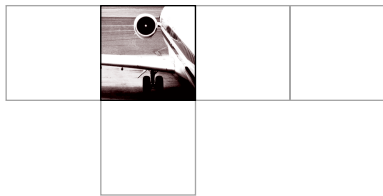
- the danger associated with smoke of unknown origin;
- the methodology for establishing designated fire zones within the pressurized portion of the aircraft;
- appropriate checklist procedures for smoke or fire of unknown origin;
- the adequacy of firefighting equipment and aircraft crew preparation to respond immediately, effectively, and in a coordinated manner to any in-flight fire; and
- the urgency to land the aircraft expeditiously whenever an in-flight smoke condition exists in the cockpit.

On 18 January 1999, a loss of separation occurred between two Boeing 767's near Langruth, Manitoba. The Board subsequently issued a recommendation to establish an automated conflict-prediction and alerting system at the nation's air traffic control facilities within a set time frame. Such a system is now undergoing testing. The TSB has investigated other similar loss-of-separation occurrences that contain many of the same elements addressed in the report on this investigation. In another recent occurrence under investigation, two Airbus A340's were at the same altitude on undetected collision courses over the Gulf of St. Lawrence when the pilot of one aeroplane received a traffic alert and collision-avoidance system advisory and alerted the controller. The lack of sufficient ground-based systems to defend against normal levels of human error leading to losses of separation has been identified previously by the Board.

The Board issued two recommendations following an Aerospatiale AS 355 F1 Twinstar helicopter accident near Fairview, Alberta, on 28 April 1999. One recommendation was aimed at enclosing survival gear in flame-resistant material. The second recommendation concerned ensuring that helicopters used by private operators to transport passengers receive a standard of maintenance equivalent to that for fixed-wing aircraft for the same type of operation. An arcing battery cable caused a fire, which was fuelled by emergency flares and flammable nylon bags. As a result, the helicopter lost all electrical



PETER KRAMAR
Senior Aerospace Engineer
Engineering Laboratory



CHARLES LAURENCE
Senior Investigator/
Operations (Air)
Head Office



JOHN STONIER
Senior Investigator/
Operations Specialist (Air)
Head Office

power and the cockpit and the cabin filled with smoke and fumes. The bags containing the survival and emergency equipment were not required to be flame-resistant. The private company was operating high-performance twin-engine helicopters to transport company employees. According to the *Canadian Aviation Regulations*, private operators who transport passengers in turbine-powered, pressurized airplanes or large airplanes must comply with the conditions and the specifications of either a private or an air operating certificate. However, regulations do not require private helicopter operators, carrying passengers as described above, to operate under an operating certificate or to maintain the helicopters in accordance with an approved maintenance control system.

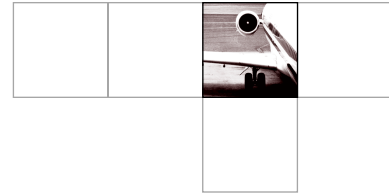
The TSB forwarded two aviation safety advisories in connection with the in-flight loss of a helicopter main-rotor blade on 13 August 1998, near Windsor, Ontario. The advisories concerned inspection of Bell 47 main-rotor blade grips.

Following the crash of a helicopter near Cabot Island, Newfoundland, on 10 May 2000, the TSB forwarded two aviation safety advisories. The first advisory addressed the use of helicopter personnel restraint systems, especially when performing vertical-reference flying during external load operations. The second advisory concerned the carriage of survival equipment for over-water flights.

The TSB forwarded two aviation safety advisories following an operating irregularity / risk of collision on 27 May 2000 at Montréal / Dorval International Airport, Quebec. These advisories addressed the use of alternate operating procedures without built-in defences.

Other aviation safety advisories concerned the use of grid maps to guide vehicles during airport emergency responses, controller awareness of the status of special-use airspaces, factors affecting the loss of engine fan cowls, collision avoidance following loss of separation, and the installation of unapproved parts on aircraft.

The use of aerodrome traffic frequency, mandatory frequency procedures, the carriage of underwater locating devices, routing changes to instrument flight rules flights, overhead aisle and emergency lights, and flight crew reading lights were the subject of aviation safety information letters.



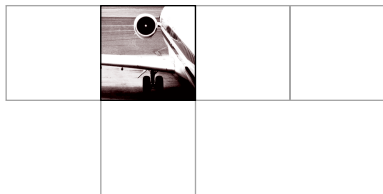
REPLIES TO AIR RECOMMENDATIONS

In 2000-2001, the Board received replies to 20 recommendations and completed its assessment of 18 of these replies.

The Board issued four recommendations (A00-09, A00-10, A00-11, A00-12) stemming from the investigation into the Cessna 152 spin-practice accident in Lake Saint-François, Quebec, on 18 July 1998. These recommendations dealt with improper maintenance procedures that released the aircraft for flight in an unsafe condition, a missing rudder cable return spring that was not properly recorded in the aircraft log, and a design anomaly in the rudder stop mechanism that also contributed to the accident. Recommendation A00-12 requested the US National Transportation Safety Board to evaluate the need for mandatory airworthiness action.

The Board considers that the response to recommendation A00-09 has *Satisfactory Intent* and that the responses to recommendations A00-10, A00-11, and A00-12 are *Fully Satisfactory*. In response to recommendation A00-09, Transport Canada (TC) replied that its airworthiness department had been in discussions with the Federal Aviation Administration (FAA), which is the State of design and the airworthiness authority for this and similar types of aircraft. TC also issued an emergency Airworthiness Directive prohibiting intentional spins until a full inspection of the rudder system is carried out. In support of recommendation A00-10, TC issued a Service Difficulty Alert to all operators to inform them of the circumstances and the safety issues related to this accident. With respect to recommendation A00-11, TC agreed that the improper maintenance of aircraft journey logbooks was not an isolated condition and outlined measures to redress the situation. In response to recommendation A00-12, the FAA has assigned the recommendation to its appropriate program office and will notify the TSB of the action taken.

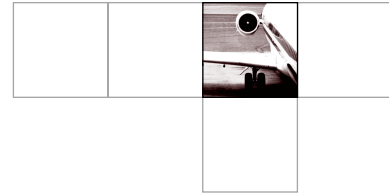
The Board issued two recommendations (A00-13, A00-14) related to the deficiencies found in the arcing battery cable fire that destroyed an Aerospatiale AS 355 F1 Twinstar helicopter in Fairview, Alberta. TC agreed with the intent of recommendation A00-13. TC will develop and distribute a Commercial and Business Aviation Advisory Circular incorporating the recommendation to store flares in survival equipment to International Civil Aviation Organization Technical Instruction packing standards. TC is also preparing a Notice of Proposed Amendment to the *Canadian Aviation Regulations*, which it plans to submit to the Canadian Aviation Regulation Advisory Council for consultation with stakeholders. With respect to recommendation A00-14, TC replied that there has been no demonstrated systemic safety deficiencies in this type of helicopter operation that



ECKHARD DITTBRENNER
Regional Senior Investigator/
Technical (Air)
Winnipeg Office

would justify increasing regulatory requirements and the level of TC's overview. TC's safety overview philosophy is based on risk management principles, with consideration given to the size of the aircraft, the number of passengers carried, the technical sophistication of the aircraft, and the complexity of the environment in which the aircraft operates. The AS 355 would not be considered to meet the criteria that would require the acquisition of a private operator certificate, even if helicopters were to be included in the regulations governing corporate aeroplanes. TC believes that enhanced safety awareness of the necessity to follow proper maintenance procedures would be the best approach to addressing the safety concern raised by the Board in this recommendation. Therefore, an article highlighting the safety lessons learned from this occurrence will be published in the *Aviation Safety Letter* and the *Aviation Safety Maintainer* newsletters. The Board considers that the response to recommendation A00-13 shows *Satisfactory Intent* and that the response to recommendation A00-14 is *Satisfactory in Part*.

The Board issued one recommendation after two Boeing 767's near Langruth, Manitoba, lost separation on 18 January 1999. The Board recommended (A00-15) that Nav Canada commit, with a set date, to the installation and the operation of an automated conflict prediction and alerting system installed at the nation's air traffic control facilities to reduce the risk of midair collisions. Nav Canada indicated it was developing an air traffic control conflict-alert system, which it began testing in the Toronto Area Control Centre on 26 March 2001. TC will monitor this testing and assess the necessity of a regulatory approach to address the Board's recommendation. Nav Canada also indicated that a Notice of Proposed Amendment was presented at a June 2000 Canadian Aviation Regulation Advisory Council Technical Committee meeting. It requires turbine-powered aeroplanes with a maximum certificated take-off weight exceeding 15,000 kilograms or with a type certificate authorizing the transport of more than 30 passengers to be equipped with an airborne collision-avoidance system conforming to the Aircraft Equipment and Maintenance Standards by 01 January 2003. The amendment to the *Canadian Aviation Regulations* will exceed the International Civil Aviation Organization standard that will come into effect in 2003. The Board has assessed this response as *Satisfactory in Part*.



The TSB issued five interim recommendations (A00-16, A00-17, A00-18, A00-19, A00-20) dealing with in-flight firefighting measures in relation to the Swissair Flight 111 accident. The continuing safety investigation has raised concerns with the overall approach taken by the aviation community in addressing the means that are available for aircraft crews to systematically detect, locate, assess, control, and suppress in-flight fires within some areas of the fuselage of transport-category aircraft. The TSB has reviewed a number of databases to look for fire events with similarities to the Swissair Flight 111 accident. Fifteen such events were identified; for these, the time when fire was first detected until the aircraft crashed ranged from 5 to 35 minutes. In each of these 15 surveyed accidents, the in-flight fire spread rapidly and became uncontrollable. The TSB has identified safety deficiencies in several aspects of the current government requirements and industry standards involving in-flight firefighting. Each deficiency has the potential to increase the time it takes for an aircraft crew to control what could be a rapidly deteriorating situation. The Board believed these recommendations warranted coordinated international action: the recommendations were sent to the Minister of Transport, as well as to the US National Transportation Safety Board, the Federal Aviation Administration (FAA), and the European Joint Aviation Authorities. The FAA has responded that it will coordinate its efforts to address these safety issues. The Board assessed these responses as showing *Satisfactory Intent*.



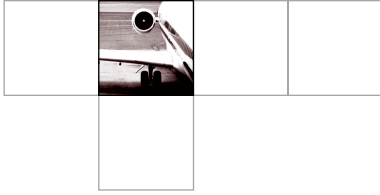
TONY ALLINSON
Regional Senior
Investigator/Technical (Air)
Edmonton Office



DAMIEN LAWSON
Regional Senior Investigator/
Operations (Air)
Richmond Office

SIGNIFICANT AIR SAFETY ISSUES

Most of the issues on the Significant Air Safety Issues list from last year continue to be of concern to the Board. In addition, accidents and incidents involving maintenance procedures and logbook-keeping, human errors on the part of aircraft maintenance engineers, and inadequate supervision of maintenance apprentices have risen significantly in recent years. The TSB is examining maintenance-related safety issues in ongoing investigations into two fatal accidents. Wide-ranging advances in technology over the last 40 years have made aircraft mechanical components extremely reliable. The downside of



this reliability is systems that are now very complex, requiring particular attention to detail and expertise from the people tasked with maintaining these components. The Board is concerned about the issues behind this recent rise in maintenance-related occurrences.

Runway incursions and risks of collision also continue to be of concern to the Board. During this reporting year, risks of collision occurred over Canada's skies and at its airfields and aerodromes because of errors, misunderstandings, and omissions between aircrews and Air Traffic Services personnel. The steady increase in air traffic and the integration of complex technology in aircraft and in air traffic control systems require more focused and continued attention from all involved. The Board has reiterated its recommendation to have ground-based automated conflict-prediction and alerting systems put in place at Air Traffic Services units as an additional safety barrier to further reduce the risk of midair collision. The Board has asked that this recommendation be implemented within a set time frame.

The Board remains concerned about the number of approach and landing accidents involving commercial aircraft. On 20 February 2001, a Piper PA-31-350 Navajo Chieftain departed Rouyn, Quebec, on a cargo flight to Val d'Or. The aircraft crashed two miles short of the runway while the pilot was conducting an approach. The pilot was seriously injured. The accident happened at night in reported weather conditions appropriate for a visual approach and landing. Runway overruns and runway excursions have also occurred at other Canadian airports. On 18 December 2000, an Antonov 124 was on an instrument flight rules flight from Mirabel, Quebec, to Windsor, Ontario, with a crew of 20. The aircraft overran the runway during the landing and came to rest approximately 300 feet beyond the end. The TSB is also continuing its analysis of the safety issues involving controlled-flight-into-terrain occurrences during approaches in the last 10 years to identify systemic deficiencies related to instrument approaches in conditions of low ceiling and/or visibility.



TRAVIS SHELONGOSKY
Regional Investigator/
Technical (Air)
Richmond Office

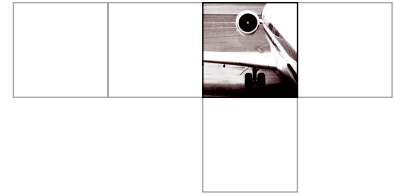


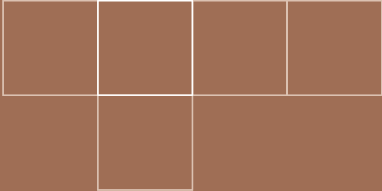
Figure 11 Significant Air Safety Issues

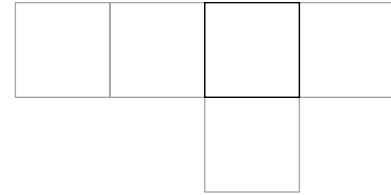
- Frequency of Approach and Landing Accidents in Commercial Passenger Operations
- Air Proximity Events (Losses of Separation) / Runway Incursions
- Maintenance Procedures and Practices
- Supervision of Apprentice Technicians
- Ad hoc Use of Global Positioning Systems (GPS)
- Adequacy of Flight Recorder Requirements
- Adequacy of Safeguards in Night Visual Flight Rules (VFR) Operations
- Commuter, Air Taxi, and Charter Operations Accidents—Management Factors
- Maintenance of Situational Awareness in Automated Cockpits



APPENDICES

50





SAFETY RECOMMENDATIONS APPROVED IN 2000–2001

MARINE

OCCURRENCE	SUBJECT	RECOMMENDATION
Break-up and sinking Bulk carrier "FLARE" Cabot Strait, Newfoundland 16 January 1998 M98N0001	Stowage and installation of emergency position- indicating radio beacon	The Department of Transport, working through the appropriate agencies, advocate increased international measures aimed at ensuring that emergency position-indicating radio beacons are properly installed and deployable on vessels so that their distress signals are transmitted without delay in distress situations. M00-01
	Immersion suits for opera- tions in cold waters	The Department of Transport advocate international measures requiring that an adequate immersion suit be provided for each person on board vessels operating in waters where hypothermia can greatly reduce an individual's survival time. M00-02
	Ready availability of critical lifesaving equipment	The Department of Transport advocate international measures to help ensure that critical life-saving equipment, such as immersion suits and thermal protective aids, are stowed so that they are readily retrievable, without confusion, and that all crew members are familiar with their use and their stowage location. M00-03
	Dynamic loads on the hull due to waves and ship motions	The Department of Transport promote increased awareness and understanding in the international maritime community of potential structural failure associated with high frequency stresses on the hull due to slamming and pounding as a result of inadequate draughts of vessels operating in ballast conditions. M00-04
	Adherence to approved loading manuals	The Department of Transport, in coordination with international agencies (including the International Maritime Organization and the International Association of Classification Societies), bring the need for stricter adherence to approved loading manuals to the attention of shipowners, ship operators and ship masters in order to avoid undue structural stresses in bulk carriers. M00-05

ANNUAL REPORT

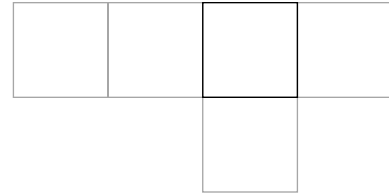
TO PARLIAMENT 2000-2001

52

OCCURRENCE	SUBJECT	RECOMMENDATION
Swamping and sinking Fishing vessel "BRIER MIST" off Rimouski, Quebec 27 November 1998 M98L0149	Effectiveness of hatch covers on small fishing vessels	The fishing industry and the Department of Transport give increased attention to small fishing vessel hatch covers to help ensure that these covers are watertight and can be effectively secured. M00-06
	Liferaft release mechanism for easy launching	The Department of Transport alert builders and owners of fishing vessels to the need for the liferafts on all vessels to be stowed with a launching system fitted with a release mechanism that allows the inflatable raft to be easily released when the vessel sinks. M00-07
	Effectiveness of liferaft release mechanism	The Department of Transport examine the effectiveness of liferaft automatic release mechanisms to prevent premature activation of these mechanisms on small fishing vessels in rough sea conditions. M00-08
	Emergency position-indicating radio beacons	The Department of Transport require small fishing vessels engaging in coastal voyages to carry an emergency position-indicating radio beacon or other appropriate equipment which floats free, automatically activates, alerts the search and rescue system and provides position updates and homing-in capabilities. M00-09

PIPELINE

OCCURRENCE	SUBJECT	RECOMMENDATION
Nil		



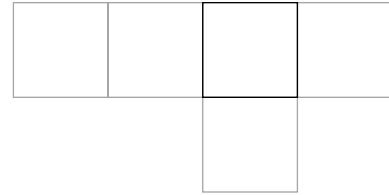
RAIL

OCCURRENCE	SUBJECT	RECOMMENDATION
<p>Main-track derailment Canadian National Train Q-107-11-28 Mile 127.54, Kingston Subdivision Lyn, Ontario 01 March 1998 R98T0042</p>	<p>Track inspection reporting and supervisory review evaluation</p>	<p>A system-wide assessment of Canadian National's track and turnout inspection reporting and supervisory review procedures be conducted by either Transport Canada or the railway. R00-01</p>
<p>Rear-end train collision Canadian National Trains A-447-51-01 and C-771-51-28 Mile 165.4, Edson Subdivision Obed, Alberta 01 March 1998 R98C0022</p>	<p>Collision avoidance</p>	<p>The Department of Transport ensure that an assessment is made of the technologies designed for the safe separation of railway rolling stock movements, with the intent of establishing a minimum safety standard. R00-02</p>
	<p>Reporting delays</p>	<p>The Department of Transport ensure that an assessment is made of the suitability of current Canadian Rail Operating Rules and railway instructions concerning the immediate reporting of operating delays to all concerned when there is a safety risk. R00-03</p>
<p>Rear-end train collision Canadian Pacific Railway Trains 839-020 and 463-11 Mile 78.0, Shuswap Subdivision Notch Hill, British Columbia 11 August 1998 R98V0148</p>	<p>Signal identification and communication</p>	<p>The Department of Transport and the railway industry implement additional backup safety defences to help ensure that signal indications are consistently recognized and followed. R00-04</p>
	<p>Intra-cab communication</p>	<p>The Department of Transport assess the impact of noise on voice communication in locomotive cabs and ensure that crew members can effectively communicate safety-critical information. R00-05</p>

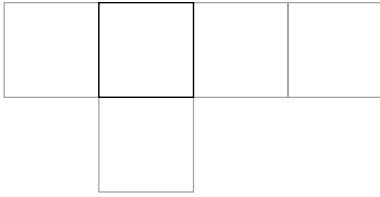
OCCURRENCE	SUBJECT	RECOMMENDATION
Derailment/Collision Via Rail Canada Inc. Passenger Train 74 Mile 46.7, Canadian National Chatham Subdivision Thamesville, Ontario 23 April 1999 R99H0007	Inadequate defences	The Department of Transport require the development of additional permanent system defences that permit a means to help ensure safety when trains approach main track switches in Occupancy Control System outside Automatic Block Signal System territory. R01-01
	Error tolerance	The Department of Transport, the Railway Association of Canada and provincial authorities responsible for train operations review the system design specifications for computer-assisted and non-computer-assisted Occupancy Control System in Canada to ensure all components of these systems are designed with sufficient regard to human error. R01-02
	Storing dangerous goods	The Department of Transport review the current regulatory framework and industry policy to help ensure that an adequate level of safety is maintained regarding the storage of dangerous goods within the rail transportation system and during the transition of shipments of dangerous goods to or from the rail transportation system. R01-03

AIR

OCCURRENCE	SUBJECT	RECOMMENDATION
Spin—Loss of directional control Laurentide Aviation Cessna 152 C-GZLZ Lake Saint-François, Quebec 18 July 1998 A98Q0114	Design change of the rudder horn	The Department of Transport issue an Airworthiness Directive to all Canadian owners and operators of Cessna 150 and 152 aircraft addressing a mandatory retrofit design change of the rudder horn stop bolt system to preclude over-travel and jamming of the rudder following a full rudder input. A00-09



OCCURRENCE	SUBJECT	RECOMMENDATION
	Restriction to spin operations	The Department of Transport, in conjunction with the Federal Aviation Administration, take steps to have all operators of Cessna 150 and 152 aircraft notified about the circumstances and findings of this accident investigation and the need to restrict spin operations until airworthiness action is taken to prevent rudder jamming. A00-10
	Maintenance of aircraft journey logbooks	The Department of Transport take steps to ensure that operators and maintenance personnel are aware, in the interests of safety, of the importance of proper maintenance of aircraft journey logbooks and are aware of their responsibilities in this regard. A00-11
	Mandatory airworthiness action requirement	The National Transportation Safety Board review the circumstances and findings of this investigation and evaluate the need for mandatory airworthiness action by the Federal Aviation Administration. A00-12
In-flight fire Nova Corporation Aerospatiale AS 355 F1 Twinstar C-GTUI Fairview, Alberta, 10 nm E 28 April 1999 A99W0061	Storage of aircraft survival gear	The Department of Transport ensure that air operators store aircraft survival gear on aircraft in flame-resistant material and package emergency pyrotechnics and other highly flammable survival equipment at least to the standards required by International Air Transport Association (IATA) Dangerous Goods Regulations. A00-13
	Standard of maintenance for private helicopters	The Department of Transport ensure that helicopters used by private operators to transport passengers receive a standard of maintenance equivalent to that for fixed-wing aircraft for the same type of operation. A00-14
Loss of separation Air Canada Boeing 767-233 C-GPWB and Canadian Airlines International Boeing 767-300 C-FCAG Langruth, Manitoba, 35 nm W 18 January 1999 A99H0001	Automated conflict prediction and alerting system	Nav Canada commit, with a set date, to the installation and operation of an automated conflict prediction and alerting system at the nation's air traffic control facilities to reduce the risk of a midair collision. A00-15



OCCURRENCE	SUBJECT	RECOMMENDATION
Smoke in the cockpit Swissair MD-11 HB-IWF Peggy's Cove, Nova Scotia 02 September 1998 A98H0003	In-flight firefighting	Appropriate regulatory authorities, in conjunction with the aviation community, review the adequacy of in-flight firefighting as a whole, to ensure that aircraft crews are provided with a system whose elements are complementary and optimized to provide the maximum probability of detecting and suppressing any in-flight fire. AOO-16
	Designated fire zones	Appropriate regulatory authorities, together with the aviation community, review the methodology for establishing designated fire zones within the pressurized portion of the aircraft, with a view to providing improved detection and suppression capability. AOO-17
	Industry standards—smoke from unknown source	Appropriate regulatory authorities take action to ensure that industry standards reflect a philosophy that when odour/smoke from an unknown source appears in an aircraft, the most appropriate course of action is to prepare to land the aircraft expeditiously. AOO-18
	Emergency checklist procedures	Appropriate regulatory authorities ensure that emergency checklist procedures for the condition of odour/smoke of unknown origin be designed so as to be completed in a time frame that will minimize the possibility of an in-flight fire being ignited or sustained. AOO-19
	In-flight firefighting standards	Appropriate regulatory authorities review current in-flight firefighting standards including procedures, training, equipment, and accessibility to spaces such as attic areas to ensure that aircraft crews are prepared to respond immediately, effectively and in a coordinated manner to any in-flight fire. AOO-20



FINANCE

MANAGEMENT REPORT

We have prepared the accompanying financial statement of the Canadian Transportation Accident Investigation and Safety Board (CTAISB) in accordance with the reporting requirements and standards of the Receiver General for Canada. This financial statement was prepared in accordance with the significant accounting policies set out in Note 2 of the statement on a basis consistent with that of the preceding year.

Responsibility for the integrity and objectivity of data in this financial statement rests with the management of the CTAISB. The information included in the financial statement is based on management's best estimates and judgements with due consideration to materiality. To fulfil its accounting and reporting responsibilities, the CTAISB maintains a set of accounts which provides a centralized record of its financial transactions. Financial information contained in the departmental statements and elsewhere in the Public Accounts of Canada is consistent in all material respects with this financial statement.

The CTAISB's Corporate Services Branch develops and disseminates financial management and accounting policies, and issues specific directives which maintain standards of accounting and financial management. The CTAISB maintains systems of financial management and internal control which give due consideration to costs, benefits and risks. They are designed to provide reasonable assurance that transactions are properly authorized by Parliament and are executed in accordance with prescribed regulations, and are properly recorded so as to maintain accountability of Government funds and safeguard the CTAISB's assets. The CTAISB also seeks to assure the objectivity and integrity of data in its financial statements by the careful selection, training and development of qualified staff, by organizational arrangements that provide appropriate divisions of responsibility, and by communication programs aimed at ensuring that its regulations, policies, standards and managerial authorities are understood throughout the organization.

Management presents this financial statement to the Auditor General of Canada who audits and provides an independent opinion which has been appended to this financial statement.

APPROVED BY:

David Kinsman
Executive Director

Jean L. Laporte, CGA
Director, Corporate Services
Senior Financial Officer

Yves Tellier, CMA
Chief, Finance, Planning and Administration
Senior Full-Time Financial Officer

May 30, 2001

STATEMENT OF OPERATIONS FOR THE YEAR ENDED MARCH 31, 2001

	2001	2000
Expenditures (Note 5)	(\$000)	(\$000)
Investigation Operations		
Salaries and employee benefits	17,218	18,276
Employee termination benefits	128	311
Professional and special services	1,798	7,211
Transportation and communications	1,764	2,549
Accommodation	1,223	1,306
Construction and/or acquisition of machinery and equipment	758	531
Utilities, materials and supplies	326	292
Purchased repair and upkeep	305	253
Rentals	279	1,345
Information	108	115
Other	13	21
	23,920	32,210
Corporate Services		
Salaries and employee benefits	3,957	3,624
Employee termination benefits	103	—
Professional and special services	2,518	1,622
Construction and/or acquisition of machinery and equipment	581	790
Transportation and communications	579	556
Information	295	254
Accommodation	295	298
Purchased repair and upkeep	217	322
Utilities, materials and supplies	94	118
Rentals	21	18
	8,660	7,602
Total Expenditures	32,580	39,812
Non-Tax Revenue		
Miscellaneous revenues	56	8
Refunds of previous years' expenditures	34	24
Sale of surplus Crown assets	4	32
Total Revenues	94	64
Net Cost of Operations	32,486	39,748
Ex gratia Payment to the Province of Nova Scotia (Note 6)	—	1,500
Net Cost to Government (Note 3)	32,486	41,248

The accompanying notes are an integral part of this financial statement.

NOTES TO THE STATEMENT OF OPERATIONS FOR THE YEAR ENDED MARCH 31, 2001

1. Authority and Purpose

The Canadian Transportation Accident Investigation and Safety Board (CTAISB) was established in 1990 under the *Canadian Transportation Accident Investigation and Safety Board Act* and is a departmental corporation named in Schedule II to the *Financial Administration Act*. The objective of the Board is to advance transportation safety. It seeks to identify safety deficiencies in transportation occurrences and to make recommendations designed to eliminate or reduce any such safety deficiencies. In addition to investigations, including where necessary public inquiries into selected occurrences, the Board may conduct studies into more general matters pertaining to transportation safety. The CTAISB has the exclusive authority to make findings as to causes and contributing factors when it investigates a transportation occurrence. The Board's operating expenditures are funded by a budgetary lapsing authority whereas contributions to employee benefit plans are funded by statutory authorities.

2. Significant Accounting Policies

The statement of operations has been prepared in accordance with the reporting requirements and standards established by the Receiver General for Canada for departmental corporations. The most significant accounting policies are as follows:

a) *Expenditure Recognition*

All expenditures are recorded on an accrual basis, except normal termination benefits, vacation pay and compensatory leave. Termination benefits are recorded in the year of the signing of the termination agreement with the employee. Vacation pay and compensatory leave are recorded on the cash basis.

b) *Revenue Recognition*

Revenues are recorded on the cash basis.

c) *Capital Purchases*

Acquisitions of capital assets are charged to operating expenditures in the year of purchase.

- d) *Services Provided Without Charge by Other Government Departments*
Estimates of the costs of services provided without charge by other Government departments are included in operating expenditures.
- e) *Refunds of Previous Years' Expenditures*
Refunds of previous years' expenditures are recorded as revenue when received and are not deducted from expenditures.

3. Parliamentary Appropriations

	2001	2000
	(\$000)	(\$000)
Privy Council - Vote 15	21,025	20,294
Special Warrants	3,026	—
Privy Council - Supplementary Vote 15a	2,958	15,372
Transfers from Treasury Board - Vote 10	100	100
Transfers from Treasury Board - Vote 15	354	1,166
	27,463	36,932
Lapsed	776	1,260
	26,687	35,672
Spending of proceeds from the disposal of surplus Crown Assets	23	12
Statutory contributions to employee benefit plans	3,435	3,444
Use of Appropriations	30,145	39,128
Adjustment for new collective agreements	—	(316)
Add: Services provided without charge by other Government departments (Note 4)	2,435	2,500
Less: Non-tax revenue	(94)	(64)
Net Cost to Government	32,486	41,248

4. Services Provided Without Charge by Other Government Departments

The table below summarizes the services provided by other departments without charge to the CTAISB.

	2001	2000
	(\$000)	(\$000)
Public Works and Government Services Canada (accommodation, accommodation alteration and other services)	1,518	1,604
Treasury Board (employer's contributions to the health insurance plan)	879	821
Human Resources Development Canada (administration of workers' compensation)	18	33
Auditor General of Canada (audit services)	20	42
Total	2,435	2,500

5. Expenditures Related to the Swissair Flight 111 Accident Investigation

On September 2, 1998 Swissair Flight 111 crashed in the Atlantic Ocean at approximately 5 nautical miles from Peggy's Cove, Nova Scotia. Under Canadian legislation and international conventions, the CTAISB has the responsibility to conduct a thorough investigation of the accident. This investigation is very complex and involves considerable resources, much of which were provided by National Defence, Fisheries and Oceans and the Royal Canadian Mounted Police. Supplementary funding was obtained from Parliament as normal CTAISB appropriations were insufficient to cover such a large and complex investigation.

The expenditures relating to the investigation are included in the Statement of Operations and are detailed in Table 1 below. These expenditures include direct costs incurred by the CTAISB and additional costs incurred by other government departments and agencies in support of the CTAISB's investigation. The supplementary funding received by the CTAISB also covered the additional costs incurred by these departments and agencies. Table 2 shows the amounts reimbursed to these entities by the CTAISB. The investigation is ongoing and additional expenditures are expected in future years.

Various other activities relating to the accident, such as search and rescue operations, were conducted by a number of departments. The costs of these activities are not disclosed in the CTAISB's Statement of Operations but in the accounts of the respective organizations.

TABLE 1	2001	2000
Expenditures Relating to the Investigation of the Swissair Accident (including services provided by other Government departments and agencies)	(\$000)	(\$000)
Salaries and employee benefits	1,617	2,757
Professional and special services	720	6,006
Transportation and communications	561	1,349
Rentals	243	1,313
Construction and/or acquisition of machinery and equipment	237	160
Purchased repair and upkeep	77	44
Utilities, materials and supplies	61	130
Information	37	100
Other	3	20
Total	3,556	11,879

TABLE 2	2001	2000
Amounts Reimbursed for Services Provided by Other Government Departments and Agencies Relating to the Investigation	(\$000)	(\$000)
Royal Canadian Mounted Police	717	2,186
National Defence	177	1,866
Others	131	470
Total	1,025	4,522

6. Ex gratia Payment to the Province of Nova Scotia

At the request of the Nova Scotia government, the CTAISB made an ex gratia payment of \$1,500,000 in March 2000 to offset the costs incurred by the Province as a result of the Swissair Flight 111 accident. Although there were no legal obligations to compensate the Province, it was decided that such a payment was in the public interest due to the exceptional circumstances of this accident.

7. Specified Purpose Account

The Flight Recorder Software System Account was established in 1997 to record cash contributions and expenditures related to a cost sharing agreement with foreign government safety organizations. Those organizations have acquired under licence a software

system developed by the CTAISB for use in aircraft accident investigations and are now contributing financially to its on-going enhancement. These receipts and disbursements are not included in the statement of operations of the CTAISB. Effective March 31, 2001 the CTAISB has made arrangements to transfer the maintenance, support and on-going enhancement of the software system to a private sector supplier. This special purpose account has therefore been closed as each user will deal directly with the private sector supplier.

	2001	2000
	(\$000)	(\$000)
Opening Balance	201	156
Receipts	44	240
Disbursements	(245)	(195)
Closing Balance	—	201

8. Implementation of the Government's Financial Information Strategy (FIS)

The CTAISB is implementing the government's Financial Information Strategy as of April 1, 2001. This includes a change to full accrual accounting for the year ended March 31, 2002. The CTAISB has therefore chosen to provide the following supplementary information about its assets and liabilities as at March 31, 2001. The amounts disclosed will constitute the CTAISB's opening balances for fiscal year 2001-2002.

Accounts Receivable

At year-end, accounts receivable from other government departments and agencies pursuant to inter-departmental transactions are as follows:

	2001
	(\$000)
Gouvernement of Canada	15
Total	15

The revenues associated with these accounts receivable are not reflected in the Statement of Operations under current accounting policies.

Inventories

The purchase of commodities and departmental publications (for public distribution) are currently charged to expenditures at the time of purchase. In preparation for the implementation of the Financial Information Strategy, inventories on hand at year-end have been identified and are valued at cost.

	2001
	(\$000)
Stationery and office supplies	57
Clothing	51
Total	108

Capital Assets and Accumulated Amortization

The accounting policies of the Government of Canada currently do not require the capitalization of assets. Consequently, the purchase of capital assets is charged to expenditures at the time of acquisition. In preparation for the implementation of FIS, the CTAISB has established appropriate accounting policies, identified all its capital assets and determined their respective historical costs. Capital assets are recorded at cost and are amortized on a straight-line basis over their useful lives. Assets are capitalized only if the cost is greater than or equal to \$2,000. Assets acquired at a cost less than \$2,000 have been expensed.

Useful lives have been estimated as follows:

Building	30 years
Furniture	10 years
Office equipment	5 years
Laboratory equipment	10 years
Forklifts	15 years
Informatic equipment	4 years
Motor vehicles	7 years

	HISTORICAL COST	ACCUMULATED AMORTIZATION	NET VALUE AT MARCH 31, 2001
	(\$000)	(\$000)	(\$000)
Building	2,715	1,485	1,230
Furniture	901	592	309
Office equipment	358	246	112
Laboratory equipment	3,694	3,079	615
Forklifts	83	34	49
Informatic equipment	4,033	2,681	1,352
Motor vehicles	873	460	413
Total	12,657	8,577	4,080

In accordance with government policy, software and leasehold improvements will be capitalized on a prospective basis starting April 1, 2001.

Liabilities

As of March 31, 2001 the liabilities of the CTAISB are as follows:

	2001
	(\$000)
Accounts payable	235
Accrued salaries and employee benefits	756
Vacation pay	721
Compensatory time	39
Total	1,751

The costs associated with the accounts payable and accrued salaries are reflected in the Statement of Operations. The costs associated with vacation pay and compensatory time are not included in the Statement of Operations. Under present accounting policies, these costs are recognized only when paid (see note 2a). Employee termination benefits are not recorded as liabilities by the CTAISB, these liabilities are recorded on a consolidated basis in the Public Accounts by the Receiver General for Canada.

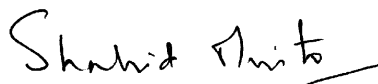
AUDITOR'S REPORT

To the Chairman of the Canadian Transportation Accident Investigation and Safety Board and to the President of the Queen's Privy Council for Canada

I have audited the statement of operations of the Canadian Transportation Accident Investigation and Safety Board for the year ended March 31, 2001. This financial statement is the responsibility of the Board's management. My responsibility is to express an opinion on this financial statement based on my audit.

I conducted my audit in accordance with Canadian generally accepted auditing standards. Those standards require that I plan and perform an audit to obtain reasonable assurance whether the financial statement is free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statement. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In my opinion, this financial statement presents fairly, in all material respects, the results of operations of the Board for the year ended March 31, 2001 in accordance with the accounting policies set out in Note 2 to the financial statement.



Shahid Minto, CA
Assistant Auditor General
for the Auditor General of Canada

Ottawa, Canada
May 30, 2001