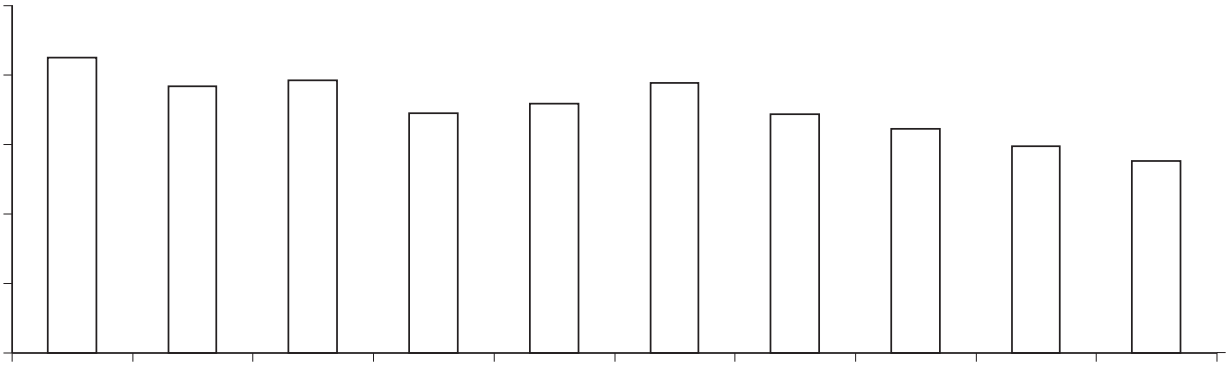
Transportation Safety Board of Canada
Bureau de la sécurité des transports du Canada

TSB Statistical Summary
Aviation Occurrences
2002



Canada

Foreword

This document provides users of Canadian aviation safety data with an annual summary of selected statistics on aviation occurrences. Information in this summary is also posted on the Transportation Safety Board of Canada (TSB) Internet site at http://www.tsb.gc.ca.

Users of these statistics are advised that, in a live database, the occurrence data are constantly being updated. Consequently, the statistics can change slightly over time. Further, as many occurrences are not formally investigated, information recorded on some occurrences may not have been verified. Therefore, caution should be used when utilizing these statistics. The 2002 statistics presented here reflect the TSB database updated as of 11 April 2003.

To enhance awareness and increase the safety value of the material presented in the *TSB Statistical Summary, Aviation Occurrences 2002*, readers are encouraged to copy or reprint in whole, or in part, for further distribution of the data presented (with acknowledgement of the source).

The TSB is an independent agency operating under its own Act of Parliament. Its sole aim is the advancement of transportation safety.

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AVIATION OCCURRENCES IN 2002

ACCIDENTS

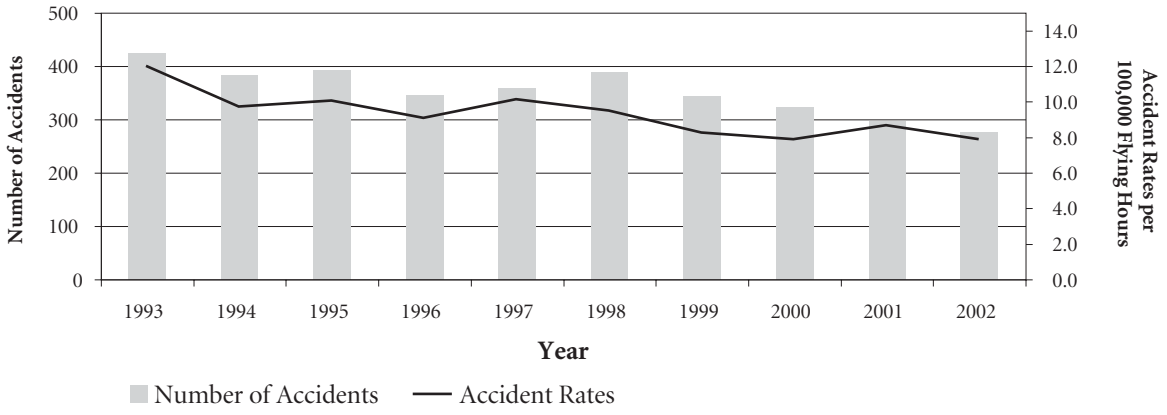
Overview of Accidents and Fatalities (Tables 1 - 2)

In 2002, a total of 323 aviation accidents were reported to the TSB. Of this number, which excludes ultralights, 274 accidents involved Canadian-registered aircraft, a decrease of 7% from 2001 (Figure 1). Statistical analysis using linear regression indicates there has been a significant downward trend ($p<.001$)[1] of reported aircraft accidents over the last 10 years.

Based on a relatively unchanged estimate in flying activity, the accident rate is estimated to have fallen from 8.6 accidents per 100 000 flying hours in 2001 to 7.8 in 2002, the lowest figure in over 10 years.

The 274 accidents to Canadian-registered aircraft (excluding ultralights) involved 210[2] aeroplanes (65 of which were commercially operated) and 56 helicopters. The remaining 10 were either balloons, gliders or gyrocopters.

Figure 1 – Accidents and Accident Rates[3], 1993-2002



1 It is agreed by convention that for a result to be considered statistically significant, its probability must be lower than 1 in 20 (i.e., $p < .05$).

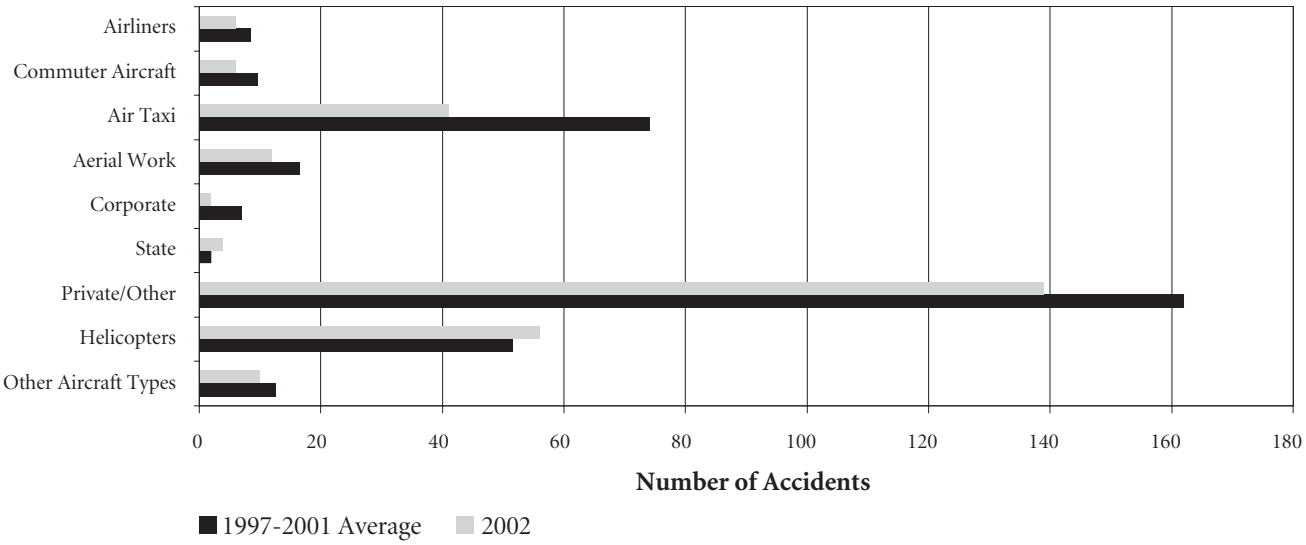
2 As some occurrences involve more than one aircraft, users are cautioned to note differences between number of occurrences and number of aircraft involved in occurrences. All tables except Table 1 exclude ultralight aircraft; all tables except tables 1 and 3 also exclude balloons, gliders and gyrocopters.

3 Canadian-registered aircraft (excluding ultralights)

There were 65 commercial aeroplanes (6 airliners, 6 commuter aircraft, 41 air taxi and 12 aerial work) involved in accidents in 2002 (Figure 2). Of these, 4 air taxi and 1 aerial work aircraft were involved in fatal accidents. There were no fatal accidents involving airliners or commuters.

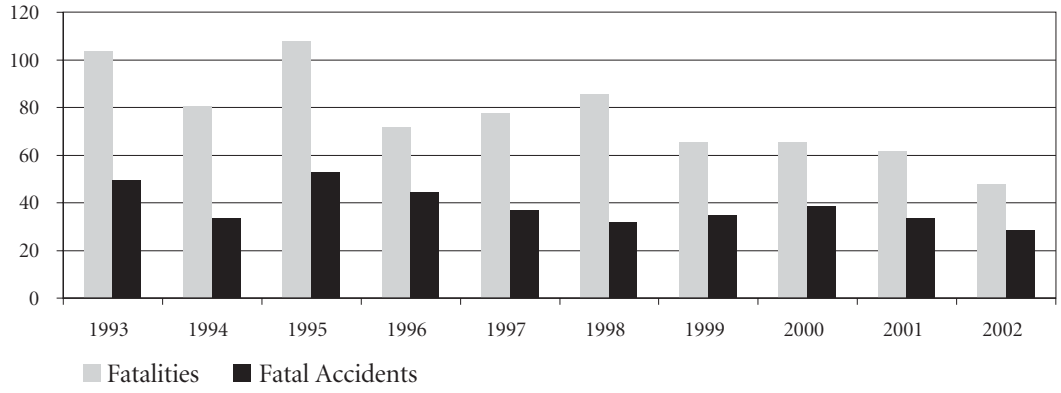
A total of 139 private aeroplanes were involved in accidents, 14% lower than the five-year average of 162. In 2002, 13 such accidents resulted in fatalities, a decrease from 2001 and the five-year average of 17 and 16 fatal accidents respectively.

Figure 2 - Canadian-Registered Aircraft Accidents by Aircraft Type, 2002



In 2002, Canadian-registered aircraft, excluding ultralights, were involved in 28 fatal accidents[4] (Figure 3), 18% less than the 1997-2001 average of 34. The number of fatalities and serious injuries (47 and 42 respectively) decreased by 33% and 15% from the five-year average (71 and 50 respectively).

Figure 3 - Fatalities and Fatal Accidents, 1993-2002



4 Three of the 33 accidents involved a glider, a balloon and a gyrocopter.

Aeroplanes operated by the state (i.e., operated by federal or provincial governments) were involved in 4 accidents in 2002 with 2 fatalities.

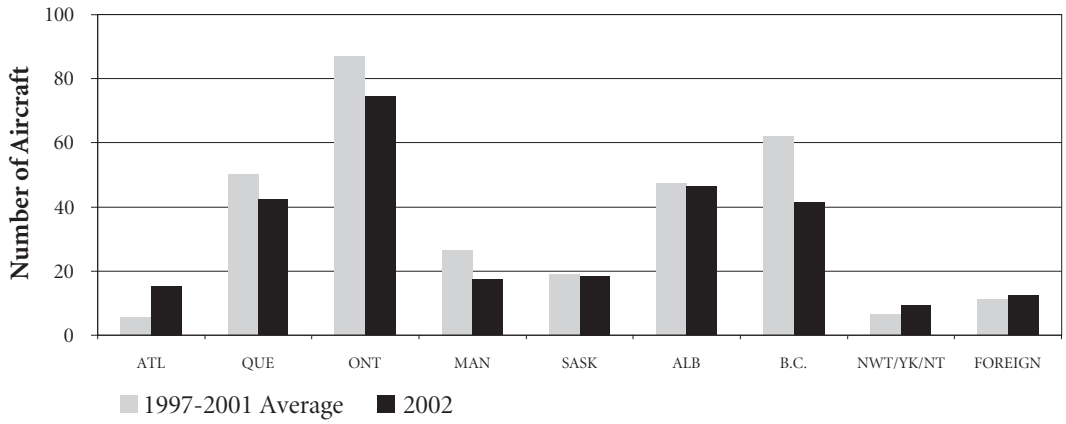
In 2002, there were 56 helicopter accidents, a 9% increase from the five-year average of 52. Of the 56 helicopter accidents, 6 were fatal, resulting in 6 fatalities. The highest proportion of helicopter accidents occur during air transport operations (25%) and training (16%).

In 2002, 36 ultralight aircraft and 13 foreign-registered aircraft were involved in accidents in Canada. Of the accidents involving ultralight aircraft, 9 resulted in 12 fatalities, which is consistent with previous years. Of the accidents involving foreign-registered aircraft, 1 resulted in 2 fatalities.

Accidents by Selected Categories

Province (Table 3): Although there was a decrease in the number of accidents for Canadian-registered aircraft from 295 in 2001 to 274 in 2002, there were a few notable changes by province (Figure 4). The Northwest Territories, Manitoba and British Columbia saw a substantially lower number of accidents (12, 26 and 62 respectively) compared to the previous five-year average (4, 17 and 41 respectively).

Figure 4 - Aircraft Involved in Accidents by Province



Events and Phases (Tables 4 - 6): Accidents are frequently classified according to the first event (or abnormal condition) in the sequence of events that led to the occurrence. This classification serves to demonstrate the nature and distribution of safety-significant events, and how these events shift over time. However, the first event should not be construed to be the cause of the accident. In 2002, the most common first event in aeroplane accidents was take-off/landing event (21%). Power loss (14%), control loss (11%), collision with object (8%) and collision with terrain (8%) were the next most common first events. Collision with terrain (16%), power loss (16%) and control loss (11%) were the most common first events in helicopter accidents.

The statistics show that the first event leading to an accident varies substantially according to the flight phase of the aircraft involved. For aeroplanes, accidents during the landing phase account for about 35% of total accidents. The most common first events in such accidents were landing (such as nose-over, tire blow-out, etc.) and control loss. Approximately 24% of aeroplane accidents occur during the take-off phase; in these accidents, power loss and control loss were the more common first events. The en-route phase accounted for about 15% of aeroplane accidents, power loss being the most common first event in that flight phase.

The approach/landing phase accounted for 28% of helicopter accidents, with the most common first events being collision with object and control loss. About 17% of helicopter accidents occurred in the en-route phase; power loss and weather-related being common first events. The manoeuvring phase (16%) had collision with object as the most common first event. The hover/lift phase (15%) had sling-related event as the most common first event.

Pilot Licences (Table 7): First events vary with the licence type of the pilot. Students and aeroplane pilots with private pilot licences were more commonly involved in accidents where the first event was control loss, power loss or take-off/landing event. However, commercial or air transport pilots were involved in proportionally more accidents where collision with terrain, component system malfunction or a weather-related event was the first event than pilots with other licence types.

Operation Type (Table 8): In 2002, aeroplane accidents occurred mainly on recreational flights (49%), followed by air transport (23%) and training flights (10%). In 2002, helicopter accidents occurred mainly on air transport flights (25%) and during flight training (16%).

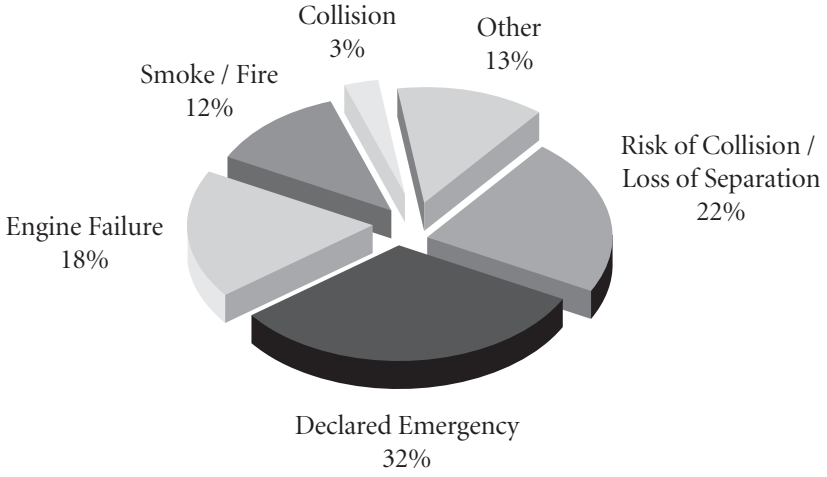
INCIDENTS

Overview of Incidents (Tables 1, 9 and 10)

Pursuant to TSB mandatory incident reporting requirements, 865 incidents were reported in 2002, 733 of which involved Canadian-registered aircraft.

In 2002, the most frequent incident types were declared emergency (32%), risk of collision or loss of separation (22%), and engine failure (18%). The remainder were mostly smoke/fire incidents (Figure 5).

Figure 5 - Incidents Involving Aircraft by Type, 2002



The first event in declared emergency on Canadian-registered aircraft usually involved component failures, the most common of which were landing gear, hydraulic system, and electrical system.

Over the past five years, the majority of risk of collision incidents involving Canadian-registered aircraft had air traffic services (ATS)-related or air proximity events[5] as their first event.

5 Please refer to the definitions in Appendix 1 for explanations for ATS-related and air proximity events.

Table 1

Aviation Occurrences and Casualties
1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Canadian-Registered Aircraft Accidents[1]	**422**	**381**	**390**	**342**	**356**	**386**	**341**	**320**	**295**	**274**
Aeroplanes Involved[2]	365	304	314	273	295	316	286	258	243	210
Airliners	13	6	7	4	8	14	6	9	5	6
Commuter Aircraft	9	8	19	12	13	10	13	4	8	6
Air Taxi	108	100	128	91	110	108	70	45	37	41
Aerial Work	13	16	6	13	10	18	18	19	18	12
Corporate	17	14	10	6	9	11	6	5	4	2
State	4	4	2	2	2	2	2	1	3	4
Private/Other[3]	201	156	142	145	143	153	171	175	168	139
Helicopters Involved	52	61	68	56	56	57	46	53	46	56
Other Aircraft Involved[4]	9	21	13	13	10	17	15	12	9	10
Hours Flown (thousands)[5]	3,490	3,776	3,810	3,642	3,477	3,940	4,040	3,967	3,356	3,396
Accident Rate (per 100 000 hours)[6]	11.9	9.7	10.0	9.0	10.1	9.5	8.2	7.8	8.6	7.8
Fatal Accidents	**49**	**33**	**52**	**44**	**36**	**31**	**34**	**38**	**33**	**28**
Aeroplanes Involved[2]	47	30	45	34	29	24	28	26	25	20
Airliners	2	0	1	1	0	0	1	1	0	0
Commuter Aircraft	0	2	2	1	0	1	2	1	1	0
Air Taxi	15	12	20	11	11	8	5	3	5	4
Aerial Work	2	2	1	0	0	0	1	2	1	1
Corporate	3	1	2	0	1	1	2	0	1	0
State	0	1	0	0	1	0	0	1	0	2
Private/Other[3]	25	12	19	21	16	14	17	18	17	13
Helicopters Involved	3	3	11	7	8	6	4	11	6	6
Other Aircraft Involved[4]	0	0	0	3	0	2	4	1	3	3
Fatalities	**103**	**80**	**107**	**71**	**77**	**85**	**65**	**65**	**61**	**47**
Serious Injuries	**63**	**36**	**54**	**38**	**69**	**49**	**42**	**53**	**35**	**42**
Canadian-Registered Ultralight Aircraft Accidents	49	36	43	30	55	39	35	38	35	36
Fatal Accidents	3	8	8	4	7	5	12	5	6	9
Fatalities	4	11	10	5	9	9	19	9	8	12
Serious Injuries	8	5	12	8	7	7	7	10	8	4
Foreign-Registered Aircraft Accidents in Canada	**17**	**22**	**18**	**22**	**16**	**21**	**21**	**17**	**29**	**13**
Fatal Accidents	1	4	5	4	5	5	5	6	8	1
Fatalities	2	9	17	13	11	236	8	16	10	2
Serious Injuries	3	1	2	2	5	3	0	2	5	0
All Aircraft: Reportable Incidents	**589**	**563**	**603**	**705**	**685**	**771**	**699**	**725**	**853**	**865**
Risk of Collision/Loss of Separation	136	144	138	193	213	181	168	161	204	194
Declared Emergency	184	134	185	197	192	226	207	225	255	280
Engine Failure	148	165	159	174	144	170	155	161	175	160
Smoke/Fire	55	61	53	75	61	106	87	84	107	100
Collision	10	10	5	2	11	4	7	8	19	22
Other	56	49	63	64	64	84	75	86	93	109

1 Ultralight Aircraft excluded.
2 As some accidents may involve multiple aircraft, the number of aircraft involved may differ from the total number of accidents.
3 Other: Contains, but is not limited to, organizations that rent aircraft (flying schools, flying clubs, etc.).
4 Includes gliders, balloons and gyrocopters.
5 Source: Transport Canada (2002 hours flown are estimated).
6 Accident rate does not include "Other Aircraft Involved".

Table 2

Canadian-Registered Aircraft Involved in Accidents, Accident Rates, and Fatalities by Operator Type 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Accidents										
Aeroplanes Involved										
Airliners	13	6	7	4	8	14	6	9	5	6
Commuter Aircraft	9	8	19	12	13	10	13	4	8	6
Air Taxi	108	100	128	91	110	108	70	45	37	41
Aerial Work	13	16	6	13	10	18	18	19	18	12
State	4	4	2	2	2	2	2	1	3	4
Corporate/Private/Other[1]	218	170	152	151	152	164	177	180	172	141
Helicopters Involved	52	61	68	56	56	57	46	53	46	56
Total	**417**	**365**	**382**	**329**	**351**	**373**	**332**	**311**	**289**	**266**
Hours Flown (Thousands)[2]										
Aeroplanes										
Airliners	980	1,049	1,122	1,085	1,070	1,213	1,245	1,203	1,009	1,028
Commuter Aircraft	284	302	316	300	294	330	343	338	278	285
Air Taxi	820	860	863	838	776	864	897	905	768	770
Aerial Work	102	125	115	107	98	116	123	109	93	93
State	140	145	134	126	120	146	142	139	130	131
Corporate/Private/Other[1]	698	728	645	610	575	660	682	666	556	560
Helicopters	466	567	615	576	544	611	608	607	522	529
Total	**3,490**	**3,776**	**3,810**	**3,642**	**3,477**	**3,940**	**4,040**	**3,967**	**3,356**	**3,396**
Accident Rates (per 100 000 hours)										
Aeroplanes										
Airliners	1.3	0.6	0.6	0.4	0.7	1.2	0.5	0.7	0.5	0.6
Commuter Aircraft	3.2	2.6	6.0	4.0	4.4	3.0	3.8	1.2	2.9	2.1
Air Taxi	13.2	11.6	14.8	10.9	14.2	12.5	7.8	5.0	4.8	5.3
Aerial Work	12.7	12.8	5.2	12.1	10.2	15.5	14.6	17.4	19.4	12.9
State	2.9	2.8	1.5	1.6	1.7	1.4	1.4	0.7	2.3	3.1
Corporate/Private/Other[1]	31.2	23.4	23.6	24.8	26.4	24.8	26.0	27.0	30.9	25.2
Helicopters	11.2	10.8	11.1	9.7	10.3	9.3	7.6	8.7	8.8	10.6
Total (all aircraft)	**11.9**	**9.7**	**10.0**	**9.0**	**10.1**	**9.5**	**8.2**	**7.8**	**8.6**	**7.8**
Fatalities: Crew										
Aeroplanes										
Airliners	5	0	1	1	0	0	2	2	0	0
Commuter Aircraft	0	4	4	2	0	2	2	2	2	0
Air Taxi	16	15	18	10	13	9	6	2	4	1
Aerial Work	3	3	1	0	0	0	1	3	1	1
State	0	1	0	0	1	0	0	2	0	1
Corporate/Private/Other[1]	29	11	20	22	16	17	17	20	18	13
Helicopters	3	3	8	4	9	5	5	10	7	6
Total	**56**	**37**	**52**	**39**	**39**	**33**	**33**	**41**	**32**	**22**
Fatalities: Passengers										
Aeroplanes										
Airliners	4	0	0	0	0	0	0	0	0	0
Commuter Aircraft	0	3	4	0	0	9	0	0	0	0
Air Taxi	25	21	31	9	9	16	4	5	8	6
Aerial Work	0	0	0	0	0	0	0	1	1	0
State	0	1	0	0	2	0	0	0	0	0
Corporate/Private/Other[1]	14	11	12	15	15	11	18	6	13	15
Helicopters	3	7	8	2	12	13	6	8	2	0
Total	**46**	**43**	**55**	**26**	**38**	**49**	**28**	**20**	**24**	**21**

1 Other: Contains, but is not limited to, organizations that rent aircraft (flying schools, flying clubs, etc.).
2 Source: Transport Canada (2002 hours flown are estimated).

Table 3

Accidents Involving Canadian-Registered Aircraft by Province 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Accidents										
Newfoundland and Labrador	8	10	9	10	9	7	5	14	10	6
Prince Edward Island	2	0	0	2	1	0	0	1	1	0
Nova Scotia	7	9	8	5	4	7	4	9	3	7
New Brunswick	8	4	5	1	6	6	7	5	4	2
Quebec	73	70	78	39	60	41	46	55	48	42
Ontario	120	84	74	72	84	105	106	73	64	74
Manitoba	25	12	29	18	25	29	32	17	28	17
Saskatchewan	18	23	28	24	22	21	22	9	18	18
Alberta	39	51	46	56	46	62	52	39	36	46
British Columbia	88	81	72	83	72	70	40	68	58	41
Nunavut[1]	0	0	0	0	0	0	0	4	2	1
Northwest Territories	19	17	16	13	10	13	14	11	12	4
Yukon	7	8	11	11	5	8	4	6	4	4
Outside Canada	8	12	14	8	12	17	9	9	7	12
Total	**422**	**381**	**390**	**342**	**356**	**386**	**341**	**320**	**295**	**274**
Fatal Accidents										
Newfoundland and Labrador	0	0	0	2	1	1	1	2	1	1
Prince Edward Island	0	0	0	1	0	0	0	0	0	0
Nova Scotia	0	0	3	0	0	2	0	3	0	2
New Brunswick	4	1	1	0	0	0	0	0	0	0
Quebec	9	9	7	6	7	8	5	5	6	5
Ontario	12	6	10	9	7	4	9	4	6	3
Manitoba	0	1	4	3	1	2	4	0	2	1
Saskatchewan	1	2	2	1	4	2	1	2	0	2
Alberta	8	3	4	3	2	4	5	3	2	2
British Columbia	10	7	14	12	11	5	8	10	11	9
Nunavut[1]	0	0	0	0	0	0	0	3	1	0
Northwest Territories	1	0	1	4	0	0	1	1	3	0
Yukon	1	1	3	0	0	0	0	1	0	0
Outside Canada	3	3	3	3	3	3	0	4	1	3
Total	**49**	**33**	**52**	**44**	**36**	**31**	**34**	**38**	**33**	**28**
Fatalities										
Newfoundland and Labrador	0	0	0	5	2	1	1	3	3	2
Prince Edward Island	0	0	0	1	0	0	0	0	0	0
Nova Scotia	0	0	4	0	0	4	0	4	0	2
New Brunswick	5	2	2	0	0	0	0	0	0	0
Quebec	19	20	9	12	18	27	9	8	13	12
Ontario	24	16	31	12	8	9	14	5	8	4
Manitoba	0	2	7	4	4	5	7	0	4	1
Saskatchewan	4	3	3	1	9	5	1	2	0	2
Alberta	12	5	5	3	4	10	8	3	4	3
British Columbia	25	23	32	20	22	12	24	19	17	16
Nunavut[1]	0	0	0	0	0	0	0	5	3	0
Northwest Territories	7	0	4	5	0	0	1	3	8	0
Yukon	2	1	7	0	0	0	0	2	0	0
Outside Canada	5	8	3	8	10	12	0	11	1	5
Total	**103**	**80**	**107**	**71**	**77**	**85**	**65**	**65**	**61**	**47**

1 This territory was created on 1 April 1999.

Table 4

Canadian-Registered Aircraft Involved in Accidents by First Event and Phase of Flight 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Aeroplanes Involved in Accidents by First Event										
Control Loss	48	51	45	31	33	34	30	41	37	23
Power Loss	53	50	51	44	46	54	41	37	37	29
Collision with Object	46	28	35	39	33	40	36	24	21	16
Collision with Terrain	27	15	18	21	18	18	22	30	18	16
Collision with Moving Aircraft	5	0	6	0	3	3	9	3	3	2
Operations-Related Event	10	16	17	14	12	10	12	5	6	4
Component System Malfunction	27	16	22	13	16	15	18	15	13	14
Landing Gear Collapsed/Retracted	22	17	3	15	18	18	15	8	7	10
Runway Overrun	5	3	6	5	5	5	4	2	1	1
Take-Off/Landing Event	63	50	46	48	47	59	53	46	47	45
Wheels-Up Landing	3	5	7	4	13	6	9	4	5	9
Component System-Related Event	8	7	18	4	16	13	4	10	9	7
Weather-Related Event	13	13	16	12	12	10	7	15	12	12
Aircraft Damage	12	8	4	8	7	10	1	5	4	3
Other/Unknown	23	25	20	15	16	21	25	13	23	19
Total	**365**	**304**	**314**	**273**	**295**	**316**	**286**	**258**	**243**	**210**
Helicopters Involved in Accidents by First Event										
Control Loss	7	5	9	3	6	10	3	3	5	6
Power Loss	5	13	6	5	9	6	12	9	5	9
Collision with Object	12	8	11	7	6	12	8	14	8	5
Collision with Terrain	4	3	1	3	5	3	6	5	4	9
Collision with Moving Aircraft	2	2	2	0	0	0	0	0	1	0
Operations-Related Event	5	2	8	6	10	5	1	2	0	
Sling-Related Event	1	2	9	5	2	2	2	2	2	5
Dynamic System Malfunction	2	3	1	2	3	1	0	2	2	1
Dynamic Roll-over	2	2	0	0	1	2	0	3	1	3
Autorotative Landing	1	2	1	3	6	1	2	2	3	4
Weather-Related Event	1	3	3	2	0	1	1	3	4	2
Aircraft Damage	1	4	5	11	5	6	3	2	3	1
Other/Unknown	9	12	12	9	12	13	4	7	6	11
Total	**52**	**61**	**68**	**56**	**56**	**57**	**46**	**53**	**46**	**56**
Aeroplanes Involved in Accidents by Phase of Flight										
Standing/Taxiing	44	17	22	19	22	26	17	21	18	22
Take-off	81	102	80	57	64	71	72	59	52	51
En Route	58	46	56	44	43	52	38	39	34	30
Manoeuvring	21	20	18	19	14	22	21	17	15	10
Approach	38	23	40	27	40	27	29	24	36	18
Landing	122	95	97	104	109	112	105	91	87	72
Post-Impact	0	0	0	0	0	0	1	0	0	0
Unknown	1	1	1	3	3	6	3	7	1	7
Total	**365**	**304**	**314**	**273**	**295**	**316**	**286**	**258**	**243**	**210**
Helicopters Involved in Accidents by Phase of Flight										
Standing	3	6	6	7	4	1	4	2	3	2
Take-off	9	10	13	5	9	3	4	9	5	9
En Route	11	13	11	7	14	9	6	8	10	7
Hover/Lift	5	7	14	13	6	13	10	4	5	3
Manoeuvring	10	7	6	11	9	13	8	14	2	9
Approach/Landing	13	17	17	13	14	17	12	13	19	21
Unknown	1	1	1	0	0	1	2	3	2	5
Total	**52**	**61**	**68**	**56**	**56**	**57**	**46**	**53**	**46**	**56**

Table 5

Canadian-Registered Aircraft Involved in Accidents
First Event vs. Phase of Flight
1993-2002

	Phase of Flight							
	Standing/ Taxiing	Take-off	En Route	Manoeuvring	Approach	Landing	Other/ Unknown	**Total**
Aeroplanes Involved in Accidents by First Event								
Control Loss	12	135	18	35	26	144	3	**373**
Power Loss	0	138	195	38	65	3	3	**442**
Collision with Object	68	74	22	31	45	76	2	**318**
Collision with Terrain	2	56	48	26	31	31	9	**203**
Collision with Moving Aircraft	8	6	5	8	6	1	0	**34**
Operations-Related Event	10	46	20	3	10	14	3	**106**
Component System Malfunction	16	33	13	1	37	68	1	**169**
Landing Gear Collapsed/Retracted	18	12	0	0	0	103	0	**133**
Runway Overrun	1	6	0	0	0	29	1	**37**
Take-Off/Landing Event	4	98	5	1	28	368	0	**504**
Wheels-Up Landing	0	0	0	0	1	64	0	**65**
Component System-Related Event	8	25	20	3	9	30	1	**96**
Weather-Related Event	6	27	46	7	22	13	1	**122**
Aircraft Damage	40	5	1	1	0	13	2	**62**
Other/Unknown	35	28	47	23	22	37	8	**200**
Total	**228**	**689**	**440**	**177**	**302**	**994**	**34**	**2,864**

	Standing	Take-off	En Route	Hover/Lift	Manoeuvring	Approach/ Landing	Unknown	**Total**
Helicopters Involved in Accidents by First Event								
Control Loss	5	15	1	6	6	22	2	**57**
Power Loss	0	11	26	12	15	15	0	**79**
Collision with Object	5	16	4	15	22	26	3	**91**
Collision with Terrain	4	6	12	4	8	8	1	**43**
Collision with Moving Aircraft	0	0	5	0	0	1	1	**7**
Operations-Related Event	2	7	2	4	3	12	0	**30**
Sling-Related Event	1	4	2	16	5	4	0	**32**
Dynamic System Malfunction	0	3	6	4	2	2	0	**17**
Dynamic Roll-over	2	7	0	0	1	4	0	**14**
Autorotative Landing	0	0	2	1	5	16	1	**25**
Weather-Related Event	0	1	13	2	0	4	0	**20**
Aircraft Damage	11	0	2	8	2	16	2	**41**
Other/Unknown	8	6	21	8	20	26	6	**95**
Total	**38**	**76**	**96**	**80**	**89**	**156**	**16**	**551**

Table 6

Canadian-Registered Aeroplanes Involved in Accidents
First Event vs. Aeroplane Type
1993-2002

	Aeroplane Type						
	Airliner	Commuter	Air Taxi	Aerial Work	Corporate	State	Private/ Other
Aeroplanes Involved in Accidents by First Event							
Control Loss	3	12	100	11	7	1	239
Power Loss	8	2	112	36	13	1	270
Collision with Object	14	12	82	26	11	8	165
Collision with Terrain	2	7	76	9	4	2	103
Collision with Moving Aircraft	0	1	6	4	2	1	20
Operations-Related Event	0	4	29	8	2	0	63
Component System Malfunction	7	12	62	7	10	2	69
Landing Gear Collapsed/Retracted	4	9	47	2	5	1	65
Runway Overrun	3	0	10	1	1	0	22
Take-Off/Landing Event	12	19	151	12	14	8	288
Wheels-Up Landing	1	2	27	2	4	0	29
Component System-Related Event	6	6	22	3	3	0	56
Weather-Related Event	3	7	41	7	3	0	61
Aircraft Damage	6	4	15	2	0	0	35
Other/Unknown	9	5	58	13	5	2	108
Total	**78**	**102**	**838**	**143**	**84**	**26**	**1,593**
Aeroplanes Involved in Fatal Accidents by First Event							
Control Loss	1	1	15	3	2	1	34
Power Loss	1	0	7	0	2	0	18
Collision with Object	0	0	5	2	1	1	16
Collision with Terrain	2	3	35	3	3	2	46
Collision with Moving Aircraft	0	1	4	0	2	1	9
Operations-Related Event	0	2	3	0	0	0	8
Component System Malfunction	0	1	2	0	0	0	4
Landing Gear Collapsed/Retracted	0	0	0	0	0	0	1
Runway Overrun	0	0	0	0	0	0	0
Take-Off/Landing Event	0	1	1	1	0	0	4
Wheels-Up Landing	0	0	0	0	0	0	0
Component System-Related Event	1	0	1	0	0	0	1
Weather-Related Event	0	0	6	0	0	0	9
Aircraft Damage	0	0	0	0	0	0	3
Other/Unknown	1	1	15	1	1	0	19
Total	**6**	**10**	**94**	**10**	**11**	**5**	**172**

Table 7

Canadian-Registered Aeroplanes Involved in Accidents
First Event vs. Pilot Licence Type
1993-2002

	Pilot Licence Type[1]					
	Student	Private	Commercial	Senior[2] Commercial	Air Transport	**Total**
Aeroplanes Involved in Accidents by First Event						
Control Loss	7	62	33	0	14	**116**
Power Loss	3	55	30	1	22	**111**
Collision with Object	3	31	23	2	11	**70**
Collision with Terrain	0	27	39	0	23	**89**
Collision with Moving Aircraft	0	10	6	0	0	**16**
Operations-Related Event	3	16	12	0	3	**34**
Component System Malfunction	1	13	17	1	15	**47**
Landing Gear Collapsed/Retracted	0	8	4	2	6	**20**
Runway Overrun	0	3	3	0	3	**9**
Take-Off/Landing Event	10	39	12	0	22	**83**
Wheels-Up Landing	0	1	2	0	1	**4**
Component System-Related Event	1	5	6	0	5	**17**
Weather-Related Event	0	12	12	0	8	**32**
Aircraft Damage	0	4	3	0	1	**8**
Other/Unknown	1	25	24	0	18	**68**
Total	**29**	**311**	**226**	**6**	**152**	**724**

1 Accident pilots for whom the licence type is unknown and pilots with other licence types were excluded.
2 This column represents pilots who had senior commercial licences at the time of their accidents. This licence type was discontinued by Transport Canada on 15 November 1994.

Table 8

Canadian-Registered Aircraft Involved in Accidents by Operation Type 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Aeroplanes Involved in Accidents										
Training	38	28	34	31	42	49	43	45	46	20
Pleasure/Travel	199	146	147	130	138	129	130	116	108	102
Business	22	19	17	9	9	15	10	9	10	6
Test/Demonstration/Ferry	10	12	10	15	9	13	9	5	7	7
Aerial Application	10	19	13	17	11	17	9	12	13	6
Fire Fighting/Fire Management	2	4	1	0	2	3	2	3	2	2
Survey/Inspection	2	2	1	3	4	3	2	0	2	5
Air Ambulance	3	1	3	1	3	3	3	0	3	2
Air Transport	65	51	76	50	63	67	67	53	43	49
Sightseeing	2	5	1	1	4	1	0	5	1	1
Other/Unknown	12	17	11	16	10	16	11	10	8	10
Total	**365**	**304**	**314**	**273**	**295**	**316**	**286**	**258**	**243**	**210**
Aeroplanes Involved in Fatal Accidents										
Training	3	0	1	0	2	5	2	2	2	0
Pleasure/Travel	25	14	20	16	16	11	14	12	10	11
Business	4	1	2	1	2	2	3	3	4	0
Test/Demonstration/Ferry	3	3	5	5	1	1	1	1	2	3
Aerial Application	1	2	1	0	0	0	1	2	0	0
Fire Fighting/Fire Management	1	0	1	0	1	0	0	0	1	0
Survey/Inspection	1	1	1	1	1	0	1	0	0	2
Air Ambulance	0	1	1	0	0	0	0	0	1	0
Air Transport	9	7	12	6	6	4	5	4	4	4
Sightseeing	0	1	0	1	0	0	0	1	0	0
Other/Unknown	0	0	1	4	0	1	1	1	1	0
Total	**47**	**30**	**45**	**34**	**29**	**24**	**28**	**26**	**25**	**20**
Helicopters Involved in Accidents										
Training	3	8	4	4	9	5	6	11	11	9
Pleasure/Travel	6	3	5	1	6	0	0	3	4	2
Business	5	5	2	1	2	5	1	1	4	6
Test/Demonstration/Ferry	4	1	4	4	4	0	3	4	1	5
Aerial Application	1	3	4	2	0	1	1	2	1	1
Fire Fighting/Fire Management	2	1	9	5	2	10	7	2	2	6
Survey/Inspection	1	4	2	7	5	7	4	4	0	3
Air Ambulance	0	2	0	0	0	1	0	0	1	0
Air Transport	22	21	21	17	15	14	10	11	12	14
Sightseeing	0	0	0	1	0	0	1	0	0	0
Other/Unknown	8	13	17	14	13	14	13	15	10	10
Total	**52**	**61**	**68**	**56**	**56**	**57**	**46**	**53**	**46**	**56**
Helicopters Involved in Fatal Accidents										
Training	0	0	0	0	0	0	0	2	1	0
Pleasure/Travel	0	0	1	0	0	0	0	1	2	0
Business	0	0	0	0	0	3	0	0	0	1
Test/Demonstration/Ferry	2	0	1	2	1	0	0	1	1	2
Aerial Application	0	0	1	0	0	0	0	0	0	0
Fire Fighting/Fire Management	0	1	3	0	1	0	0	0	0	0
Survey/Inspection	0	0	0	1	1	0	0	1	0	0
Air Ambulance	0	1	0	0	0	0	0	0	0	0
Air Transport	0	0	4	3	3	2	1	1	1	0
Sightseeing	0	0	0	0	0	0	1	0	0	0
Other/Unknown	1	1	1	1	2	1	2	5	1	3
Total	**3**	**3**	**11**	**7**	**8**	**6**	**4**	**11**	**6**	**6**

Table 9

Incidents Involving Canadian-Registered Aircraft by Incident Type 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Incidents										
Risk of Collision/Loss of Separation	117	115	120	156	181	149	142	130	168	169
Declared Emergency	153	108	165	165	157	183	173	174	209	232
Engine Failure	115	124	120	133	115	133	121	129	157	135
Smoke/Fire	46	52	45	68	46	86	71	71	92	82
Collision	7	8	3	1	11	3	7	8	17	19
Control Difficulties	24	14	22	19	13	28	18	25	28	28
Crew Unable to Perform Duties	4	6	3	8	13	8	17	15	13	37
Dangerous Goods-Related	1	1	0	7	4	3	3	2	6	0
Depressurization	7	7	13	12	12	19	6	4	15	18
Fuel Shortage	1	1	2	0	2	6	7	1	2	1
Failure to Remain in Landing Area	8	6	11	8	9	8	10	13	4	6
Incorrect Fuel	1	0	0	0	0	0	0	0	0	1
Slung Load Released	1	1	3	1	2	1	5	6	8	3
Transmission or Gearbox Failure	4	0	0	2	1	1	3	2	2	2
Total[1]	**489**	**443**	**507**	**580**	**566**	**628**	**583**	**580**	**721**	**733**

1 Incidents involving Canadian-registered aircraft only; Table 1 includes those involving foreign aircraft.

Table 10

Canadian-Registered Aircraft Involved in Incidents Selected Incident Types vs. First Event 1998-2002

Incident Type	First Event	
Risk of Collision/ Loss of Separation 1230 Aircraft Involved	Air Proximity	341
	ATS-Related Event	713
	Altitude-Related Event	42
	Runway Incursion	69
	Other	65
Declared Emergency 971 Aircraft Involved	Landing Gear Failure	214
	Hydraulic Failure	165
	Electrical Failure	47
	Other Component Failure	321
	Other	224
Engine Failure 675 Aircraft Involved	Power Loss – First Engine	307
	Component Failure	304
	Other	64
Smoke/Fire 402 Aircraft Involved	Fire/Explosion	287
	Component Failure	96
	Other	19
Control Difficulties 127 Aircraft Involved	Component Failure	57
	Weather-Related Event	22
	Other	48

APPENDIX A

DEFINITIONS

The following definitions apply to aviation occurrences that are required to be reported pursuant to the *Canadian Transportation Accident Investigation and Safety Board Act* and the associated Regulations.

Aviation Occurrence

a) Any accident or incident associated with the operation of an aircraft;
b) Any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident described in (a) above.

Reportable Aviation Accident

An accident resulting directly from the operation of an aircraft where

a) a person sustains a serious injury or is killed as a result of
   i) being on board the aircraft;
   ii) coming into contact with any part of the aircraft or its contents; or
   iii) being directly exposed to the jet blast or rotor downwash of the aircraft;
b) the aircraft sustains damage that adversely affects the structural strength, performance or flight characteristics of the aircraft and that requires major repair or replacement of any affected component part; or
c) the aircraft is missing or inaccessible.

Reportable Aviation Incident

An incident resulting directly from the operation of an aeroplane having a maximum certificated take-off weight (MCTOW) greater than 5 700 kg, or from the operation of a rotorcraft having a MCTOW greater than 2 250 kg, where

a) an engine fails or is shut down as a precautionary measure;
b) a transmission gearbox malfunction occurs;
c) smoke or fire occurs;
d) difficulties in controlling the aircraft are encountered owing to any aircraft system malfunction, weather phenomena, wake turbulence, uncontrolled vibrations or operations outside the flight envelope;
e) the aircraft fails to remain within the intended landing or take-off area, lands with all or part of the landing gear retracted, or drags a wing tip, an engine pod, or any other part of the aircraft;
f) any crew member whose duties are directly related to the safe operation of the aircraft is unable to perform the crew member's duties as a result of physical incapacitation that poses a threat to the safety of any person, property, or the environment;
g) depressurization occurs that necessitates an emergency descent;
h) a fuel shortage occurs that necessitates a diversion or requires approach and landing priority at the destination of the aircraft;
i) the aircraft is refuelled with the incorrect type of fuel or contaminated fuel;
j) a collision, risk of collision, or loss of separation occurs;
k) a crew member declares an emergency or indicates any degree of emergency that requires priority handling by an air traffic control unit or the standing by of emergency response services;
l) a slung load is released unintentionally or as a precautionary or emergency measure from the aircraft; or
m) any dangerous goods are released in or from the aircraft.

Serious Injury

An injury that is sustained by a person in an accident and that

a) requires hospitalization for more than 48 hours, commencing within seven days of the date the injury was received; or
b) results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
c) involves lacerations which cause severe haemorrhage or nerve, muscle or tendon damage; or
d) involves injury to any internal organ; or
e) involves second or third degree burns, or any burns affecting more than 5% of the body surface; or
f) involves verified exposure to infectious substances or injurious radiation.

ATS-Related Event

Any event related to the provision of air traffic control services including, but not limited to, failure or inability to provide service, emergency handling, or loss of in-flight separation.

Air Proximity Event

A situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their positions and speed have been such that the safety of the aircraft involved may have been compromised.

Commercial Operators

Commercial operators include carriers that offer a "for-hire" service to transport people or goods or to undertake specific tasks such as aerial photography, flight training, or crop spraying.

Airliner

An aeroplane used by a Canadian air operator in an air transport service or in aerial work involving sightseeing operations, that has a MCTOW of more than 8 618 kg (19 000 pounds) or for which a Canadian type certificate has been issued authorizing the transport of 20 or more passengers.

Commuter Aircraft

An aeroplane used by a Canadian air operator, in an air transport service or in aerial work involving sightseeing operations, of any of the following aircraft:

a) a multi-engined aircraft that has a MCTOW of 8 618 kg (19 000 pounds) or less and a seating configuration, excluding pilot seats, of 10 to 19 inclusive;
b) a turbo-jet-powered aeroplane that has a maximum zero fuel weight of 22 680 kg (50 000 pounds) or less and for which a Canadian type certificate has been issued authorizing the transport of not more than 19 passengers.

Aerial Work Aircraft

A commercially operated aeroplane or helicopter used in aerial work involving

a) the carriage on board of persons other than flight crew members;
b) the carriage of helicopter external loads;
c) the towing of objects; or
d) the dispersal of products.

Air Taxi Aircraft

A commercially operated aircraft used in an air transport service or in aerial work involving sightseeing operations, in which the aircraft is:

a) a single-engined aircraft;
b) a multi-engined aircraft, other than a turbo-jet-powered aeroplane, that has a MCTOW of 8 618 kg (19,000 pounds) or less and a seating configuration, excluding pilot seats, of nine or less; or
c) any aircraft that is authorized by the Minister of Transport to be operated under Part VII, Subpart 3, Division 1 of the Canadian Aviation Regulations (CARs).

State Operators

State operators include the federal and provincial governments.

Corporate Operators

Corporate operators include companies flying for business reasons.

Private Operators

Private operators include individuals flying for pleasure. Included are flights on which it is not possible to transport people or cargo on a "for-hire" basis.