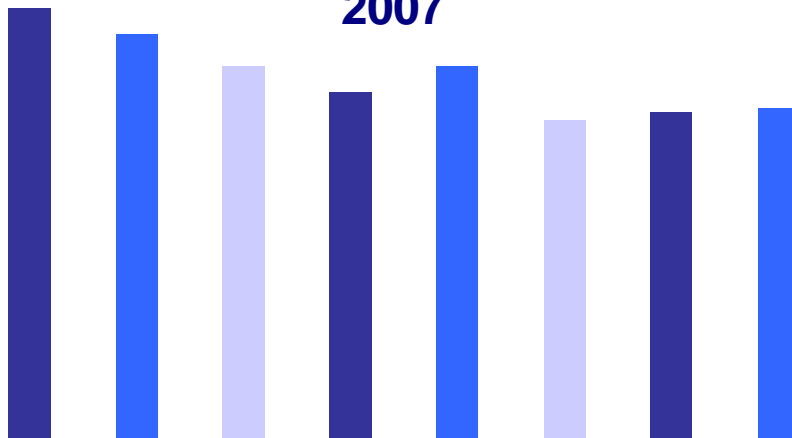




## Statistical Summary Aviation Occurrences 2007



## 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) website at [www.bst-tsb.gc.ca](http://www.bst-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 2007 statistics presented here reflect the TSB database updated as of 16 June 2008.

To enhance awareness and increase the safety value of the material presented in the TSB *Statistical Summary, Aviation Occurrences 2007*, readers are encouraged to copy or reprint the data presented, in whole or in part, for further distribution (with acknowledgements 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 2007

## ACCIDENTS

### *Overview of Accidents and Fatalities (Tables 1, 2, 3 and 8)*

In 2007, a total of 324 aviation accidents were reported to the TSB. Of this number, 284 involved Canadian-registered aircraft (excluding ultralights), an 8.4% increase from 2006 (Figure 1).

Although flying activity increased from last year, the accident rate also increased to 6.5 accidents per 100 000 flying hours from the 2006 accident rate of 6.3 accidents per 100 000 flying hours. Nevertheless, statistical analysis using linear regression indicates a significant downward trend ( $p < 0.001$ )<sup>1</sup> in accident rates over the past 10 years.

The 287 accident-involved Canadian-registered aircraft (excluding ultralights) included 237 aeroplanes<sup>2</sup> (59 of which were commercially operated) and 46 helicopters. The remaining 4 were balloons, gliders or gyrocopters.

**Figure 1 – Accidents and Accident Rates,<sup>3</sup> 1998–2007**



<sup>1</sup> It is agreed by convention that, for a result to be considered statistically significant, its probability must be lower than 1 in 20 (that is,  $p < 0.05$ ).

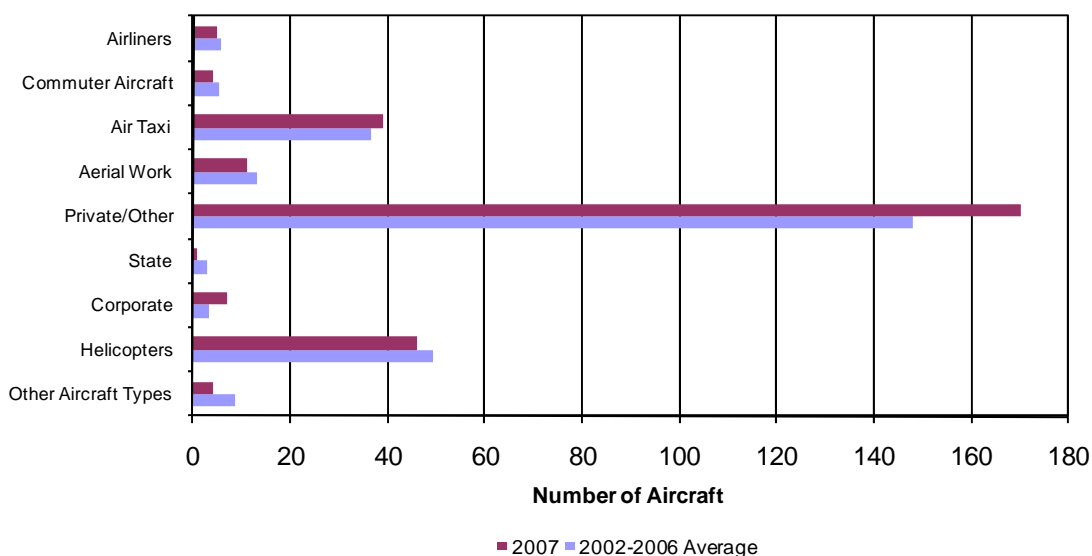
<sup>2</sup> As some occurrences involve more than one aircraft, users are cautioned to note differences between the number of occurrences and the number of aircraft involved in occurrences. All tables except Table 1 exclude ultralight aircraft; all tables except tables 1 and 4 also exclude balloons, gliders and gyrocopters.

<sup>3</sup> Canadian-registered aircraft (excluding ultralights)

Of the 59 commercial aeroplanes (5 airliners, 4 commuter aircraft, 39 air taxi and 11 aerial work) involved in accidents in 2007 (Figure 2), 5 air taxi aircraft, 1 commuter aircraft and 1 aerial work aircraft were involved in fatal accidents. One corporate aircraft was involved in a fatal accident. There were no fatal accidents involving airliners or state aircraft.

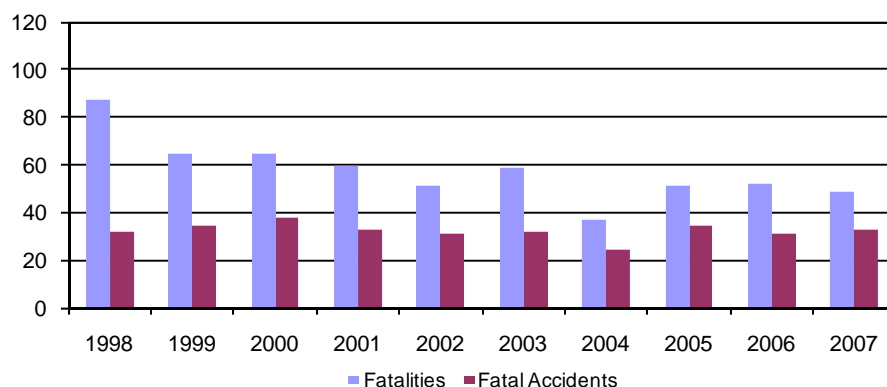
A total of 177 private/corporate/other aeroplanes were involved in accidents, 17% higher than the five-year average of 151. In 2007, 18 such accidents resulted in fatalities, up from 16 in 2006 and up from the five-year average of 15.

**Figure 2—Canadian-Registered Aircraft Involved in Accidents by Aircraft Type, 2007**



In 2007, Canadian-registered aircraft, excluding ultralights, were involved in 33 fatal accidents (Figure 3), 6% higher than last year's total of 31 and 9% higher than the 2002–2006 average of 30. The number of fatalities (49) decreased from the five-year average (50), but the number of serious injuries (56) increased from the five-year average (38). Passenger fatalities accounted for 33% of aeroplane fatalities in 2007, and crew member fatalities accounted for 67% (excluding fatalities from ultralight accidents).

**Figure 3 – Fatalities and Fatal Accidents, 1998–2007**



Aeroplanes operated by the state (that is, operated by federal or provincial governments) were involved in 1 accident in 2007 with no fatalities.

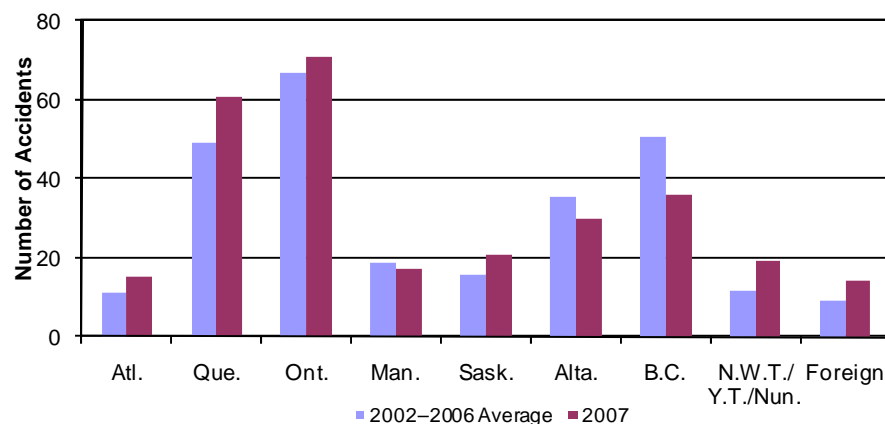
In 2007, there were 46 helicopter accidents, a 7% decrease from the five-year average of 49. Of the 46 helicopter accidents, 7 were fatal, resulting in 7 fatalities. Over the past 10 years, the highest proportion of helicopter accidents occurred during air transport operations (31%) and training (12%).

In 2007, 30 ultralight aircraft were involved in accidents in Canada, with 5 accidents resulting in 6 fatalities. Ten foreign-registered ultralight aircraft were involved in accidents in Canada, with no fatalities.

## Accidents by Selected Categories

**Province (Table 3):** In 2007, Ontario accounted for 25% of Canadian-registered aircraft accidents, while Quebec and British Columbia accounted for 21% and 13% respectively. Canadian-registered aircraft accidents were lower than the five-year average in Alberta, Manitoba and British Columbia, and higher than the five-year average in the Atlantic provinces, Quebec, Ontario and the Territories (Figure 4).

**Figure 4 – Canadian-Registered Aircraft Involved in Accidents by Province, 2007**



**Events and Phases (Tables 4 to 7):** 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 2007, the most common first event in aeroplane accidents was a take-off/landing event (27%). Collision with object (11%) and collision with terrain (11%) were the next most common first events. In helicopter accidents, power loss (17%), collision with terrain (15%), collision with object (13%), and control loss (11%) were the most common first events.

The 1998–2007 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 37% 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 22% of aeroplane accidents occur during the take-off phase; in these accidents, power loss and control loss were the most common first events. The en-route phase accounted for about 14% of aeroplane accidents, with power loss being the most common first event in that flight phase.

The approach/landing phase accounted for 31% of helicopter accidents, with the most common first events being collision with object, power loss and control loss. The en-route phase (17%) had power loss and collision with terrain as the most common first events. The manoeuvring phase (16%) had collision with object and power loss as the most common first events. About 13% of helicopter accidents occurred in the take-off phase, with collision with object being a common first event.

**Operation Type (Table 8):** In 2007, aeroplane accidents occurred mainly on recreational flights (51%), followed by air transport (17%) and training flights (14%). Helicopter accidents occurred mainly on air transport flights (35%).

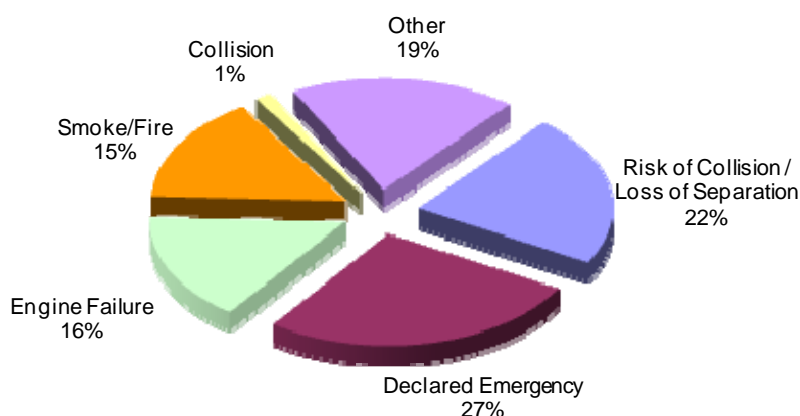
## INCIDENTS

### *Overview of Incidents (Tables 1, 9 and 10)*

Pursuant to TSB mandatory incident reporting requirements, 895 incidents were reported in 2007, 691 of which involved Canadian-registered aircraft.

In 2007, the most frequent incident types were declared emergency (27%), risk of collision or loss of separation (22%), engine failure (16%), and smoke/fire incidents (15%), as shown in Figure 5.

**Figure 5 – Reportable Incidents by Type, 2007**





Over the past five years, the first event in declared emergency incidents on Canadian-registered aircraft usually involved component failures, the most common of which were landing gear or hydraulic system failures.

The majority of risk of collision incidents involving Canadian-registered aircraft had air traffic services (ATS)-related or air proximity events<sup>4</sup> as their first event.

---

<sup>4</sup> Refer to the definitions in Appendix B for explanations for ATS-related and air proximity events.

# APPENDIX A – AVIATION OCCURRENCE TABLES

**Table 1**  
**Aviation Occurrences and Casualties**  
**1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Canadian-Registered Aircraft<sup>1</sup></b>										
<b>Accidents</b>	<b>388</b>	<b>341</b>	<b>320</b>	<b>295</b>	<b>274</b>	<b>295</b>	<b>252</b>	<b>259</b>	<b>262</b>	<b>284</b>
Aeroplanes Involved <sup>2</sup>	318	286	258	243	210	242	206	206	208	237
Airliners	14	6	9	5	6	7	3	5	7	5
Commuter Aircraft	10	13	4	8	6	9	1	6	4	4
Air Taxi	108	70	45	37	41	35	43	33	31	39
Aerial Work	18	18	19	18	12	17	8	14	14	11
Corporate	11	6	5	4	2	2	4	6	2	7
State	2	2	1	3	4	3	2	1	4	1
Private/Other <sup>3</sup>	155	171	175	168	139	169	145	141	146	170
Helicopters Involved	57	46	53	46	56	44	41	50	56	46
Other Aircraft Involved <sup>4</sup>	17	15	12	9	10	12	9	8	4	4
Hours Flown (thousands) <sup>5</sup>	3931	4046	3982	3885	3713	3790	3961	4079	4161	4373
Accident Rate (per 100 000 hours) <sup>6</sup>	9.5	8.2	7.8	7.4	7.2	7.5	6.2	6.3	6.3	6.5
<b>Fatal Accidents</b>	<b>32</b>	<b>34</b>	<b>38</b>	<b>33</b>	<b>31</b>	<b>32</b>	<b>24</b>	<b>34</b>	<b>31</b>	<b>33</b>
Aeroplanes Involved <sup>2</sup>	25	28	26	25	23	26	18	22	23	25
Airliners	0	1	1	0	0	0	0	0	0	0
Commuter Aircraft	1	2	1	1	0	0	0	1	0	1
Air Taxi	8	5	3	5	5	5	3	6	5	5
Aerial Work	0	1	2	1	1	3	0	2	1	1
Corporate	1	2	0	1	0	0	0	0	0	1
State	0	0	1	0	2	0	0	0	1	0
Private/Other <sup>3</sup>	15	17	18	17	15	18	15	13	16	17
Helicopters Involved	6	4	11	6	6	3	4	10	9	7
Other Aircraft Involved <sup>4</sup>	2	4	1	3	3	4	2	2	0	2
<b>Fatalities</b>	<b>87</b>	<b>65</b>	<b>65</b>	<b>60</b>	<b>51</b>	<b>59</b>	<b>37</b>	<b>51</b>	<b>52</b>	<b>49</b>
<b>Serious Injuries</b>	<b>49</b>	<b>42</b>	<b>53</b>	<b>37</b>	<b>42</b>	<b>43</b>	<b>27</b>	<b>37</b>	<b>40</b>	<b>56</b>
<b>Canadian-Registered Ultralight Aircraft</b>										
Accidents	37	35	38	35	36	46	36	31	28	30
Fatal Accidents	4	12	5	6	9	7	6	5	1	5
Fatalities	7	19	9	8	12	9	10	6	1	6
Serious Injuries	7	7	10	8	4	14	7	9	12	7
<b>Foreign-Registered Aircraft</b>										
Accidents in Canada	21	21	17	29	13	30	20	18	14	10
Fatal Accidents	5	5	6	8	1	6	3	6	2	0
Fatalities	236	8	16	10	2	8	10	10	2	0
Serious Injuries	3	0	2	5	0	3	2	15	1	2
<b>All Aircraft: Reportable Incidents</b>	<b>771</b>	<b>699</b>	<b>725</b>	<b>853</b>	<b>865</b>	<b>834</b>	<b>910</b>	<b>822</b>	<b>826</b>	<b>895</b>
Risk of Collision/Loss of Separation	181	168	161	204	193	154	223	180	171	171
Declared Emergency	226	207	225	255	280	293	278	224	260	302
Engine Failure	170	155	161	175	160	132	143	148	136	137
Smoke/Fire	106	87	84	107	101	103	94	103	107	125
Collision	4	7	8	19	22	16	21	12	21	14
Other	84	75	86	93	109	136	151	155	131	146

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 (that is, flying schools, flying clubs, etc.)

4 Includes gliders, balloons and gyrocopters

5 Source: Transport Canada (hours flown are estimated from 2003)

6 Accident rate does not include "Other Aircraft Involved"

Data extracted 16 June 2008.

**Table 2****Canadian-Registered Aircraft Involved in Accidents, Accident Rates and Fatalities by Operator Type  
1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Accidents</b>										
Aeroplanes Involved										
Airliners	14	6	9	5	6	7	3	5	7	5
Commuter Aircraft	10	13	4	8	6	9	1	6	4	4
Air Taxi	108	70	45	37	41	35	43	33	31	39
Aerial Work	18	18	19	18	12	17	8	14	14	11
Corporate	11	6	5	4	2	2	4	6	2	7
State	2	2	1	3	4	3	2	1	4	1
Private/Other <sup>1</sup>	155	171	175	168	139	169	145	141	146	170
Helicopters Involved	57	46	53	46	56	44	41	50	56	46
<b>Total</b>	<b>375</b>	<b>332</b>	<b>311</b>	<b>289</b>	<b>266</b>	<b>286</b>	<b>247</b>	<b>256</b>	<b>264</b>	<b>283</b>
<b>Hours Flown (thousands)<sup>2</sup></b>										
Aeroplanes	3321	3437	3377	3281	3135	3200	3351	3450	3516	3685
Airliners	1210	1247	1198	1168	1124	1148	1244	1334	1387	1469
Commuter Aircraft	329	344	337	322	311	318	326	335	348	367
Air Taxi	805	825	792	754	683	651	655	633	624	647
Aerial Work	173	197	219	242	262	313	337	360	383	407
State	174	196	220	240	258	307	344	385	401	403
Private/Other/Corporate	630	629	612	555	496	463	445	403	372	392
Helicopters	610	609	604	604	578	590	610	629	645	688
<b>Total</b>	<b>3931</b>	<b>4046</b>	<b>3982</b>	<b>3885</b>	<b>3713</b>	<b>3790</b>	<b>3961</b>	<b>4079</b>	<b>4161</b>	<b>4373</b>
<b>Accident Rates (per 100 000 hours)</b>										
Aeroplanes										
Airliners	1.2	0.5	0.8	0.4	0.5	0.6	0.2	0.4	0.5	0.3
Commuter Aircraft	3.0	3.8	1.2	2.5	1.9	2.8	0.3	1.8	1.1	1.1
Air Taxi	13.4	8.5	5.7	4.9	6.0	5.4	6.6	5.2	5.0	6.0
Aerial Work	10.4	9.1	8.7	7.4	4.6	5.4	2.4	3.9	3.7	2.7
State	1.1	1.0	0.5	1.3	1.6	1.0	0.6	0.3	1.0	0.2
Private/Other/Corporate	26.3	28.1	29.4	31.0	28.4	36.9	33.5	36.5	39.8	45.2
Helicopters	9.3	7.6	8.8	7.6	9.7	7.5	6.7	7.9	8.7	6.7
<b>Total (all aircraft)</b>	<b>9.5</b>	<b>8.2</b>	<b>7.8</b>	<b>7.4</b>	<b>7.2</b>	<b>7.5</b>	<b>6.2</b>	<b>6.3</b>	<b>6.3</b>	<b>6.5</b>
<b>Fatalities: Crew</b>										
Aeroplanes										
Airliners	0	2	2	0	0	0	0	0	0	0
Commuter Aircraft	2	2	2	2	0	0	0	2	0	0
Air Taxi	9	6	2	4	1	5	2	6	5	6
Aerial Work	0	1	3	1	1	4	0	2	1	1
Corporate	2	1	0	1	0	0	0	0	0	1
State	0	0	2	0	1	0	0	0	1	0
Private/Other	16	16	20	17	15	15	14	11	16	17
Helicopters	5	5	10	7	6	3	4	8	6	6
<b>Total</b>	<b>34</b>	<b>33</b>	<b>41</b>	<b>32</b>	<b>24</b>	<b>27</b>	<b>20</b>	<b>29</b>	<b>29</b>	<b>31</b>
<b>Fatalities: Passengers</b>										
Aeroplanes										
Airliners	0	0	0	0	0	0	0	0	0	0
Commuter Aircraft	9	0	0	0	0	0	0	0	0	1
Air Taxi	16	4	5	8	7	10	14	2	10	2
Aerial Work	0	0	1	1	0	0	0	3	0	0
Corporate	1	4	0	1	0	0	0	0	0	0
State	0	0	0	0	0	0	0	0	0	0
Private/Other	11	14	6	12	16	16	1	7	7	11
Helicopters	13	6	8	2	0	3	0	7	5	1
<b>Total</b>	<b>50</b>	<b>28</b>	<b>20</b>	<b>24</b>	<b>23</b>	<b>29</b>	<b>15</b>	<b>19</b>	<b>22</b>	<b>15</b>

1 Other: Contains, but is not limited to, organizations that rent aircraft (that is, flying schools, flying clubs, etc.)

2 Source: Transport Canada (hours flown are estimated from 2003)

Data extracted 16 June 2008.

**Table 3****Accidents Involving Canadian-Registered Aircraft by Province/Territory****1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Accidents</b>										
Newfoundland and Labrador	7	5	14	10	6	9	5	5	3	5
Prince Edward Island	0	0	1	1	0	1	0	1	0	0
Nova Scotia	7	4	9	3	7	1	3	0	0	3
New Brunswick	6	7	5	4	2	1	5	5	2	7
Quebec	42	46	55	48	42	55	44	56	48	61
Ontario	106	106	73	64	74	80	71	57	52	71
Manitoba	29	32	17	28	17	28	12	18	18	17
Saskatchewan	21	22	9	18	18	16	13	13	18	21
Alberta	62	52	39	36	46	34	29	28	41	30
British Columbia	70	40	68	58	41	54	46	59	53	36
Nunavut <sup>1</sup>	0	0	4	2	1	0	2	2	6	4
Northwest Territories	13	14	11	12	4	5	7	5	6	9
Yukon	8	4	6	4	4	4	6	3	4	6
Outside Canada	17	9	9	7	12	7	9	7	11	14
<b>Total</b>	<b>388</b>	<b>341</b>	<b>320</b>	<b>295</b>	<b>274</b>	<b>295</b>	<b>252</b>	<b>259</b>	<b>262</b>	<b>284</b>
<b>Fatal Accidents</b>										
Newfoundland and Labrador	1	1	2	1	1	2	1	1	0	1
Prince Edward Island	0	0	0	0	0	0	0	0	0	0
Nova Scotia	2	0	3	0	2	0	1	0	0	0
New Brunswick	0	0	0	0	0	0	0	1	0	0
Quebec	9	5	5	6	6	5	4	9	3	4
Ontario	4	9	4	6	5	11	2	6	4	6
Manitoba	2	4	0	2	1	0	2	2	0	3
Saskatchewan	2	1	2	0	2	1	2	0	3	4
Alberta	4	5	3	2	2	3	2	2	6	3
British Columbia	5	8	10	11	9	8	6	12	9	9
Nunavut <sup>1</sup>	0	0	3	1	0	0	1	0	0	0
Northwest Territories	0	1	1	3	0	0	1	0	1	1
Yukon	0	0	1	0	0	1	0	0	1	1
Outside Canada	3	0	4	1	3	1	2	1	4	1
<b>Total</b>	<b>32</b>	<b>34</b>	<b>38</b>	<b>33</b>	<b>31</b>	<b>32</b>	<b>24</b>	<b>34</b>	<b>31</b>	<b>33</b>
<b>Fatalities</b>										
Newfoundland and Labrador	1	1	3	3	2	3	1	2	0	1
Prince Edward Island	0	0	0	0	0	0	0	0	0	0
Nova Scotia	4	0	4	0	2	0	1	0	0	0
New Brunswick	0	0	0	0	0	0	0	1	0	0
Quebec	29	9	8	12	14	9	4	12	6	5
Ontario	9	14	5	8	6	27	14	10	6	7
Manitoba	5	7	0	4	1	0	2	2	0	4
Saskatchewan	5	1	2	0	2	1	2	0	3	5
Alberta	10	8	3	4	3	4	2	4	9	5
British Columbia	12	24	19	17	16	13	6	19	16	15
Nunavut <sup>1</sup>	0	0	5	3	0	0	1	0	0	0
Northwest Territories	0	1	3	8	0	0	2	0	6	3
Yukon	0	0	2	0	0	1	0	0	1	1
Outside Canada	12	0	11	1	5	1	2	1	5	3
<b>Total</b>	<b>87</b>	<b>65</b>	<b>65</b>	<b>60</b>	<b>51</b>	<b>59</b>	<b>37</b>	<b>51</b>	<b>52</b>	<b>49</b>

1 This territory was created on 01 April 1999.

Data extracted 16 June 2008.

**Table 4**  
**Canadian-Registered Aircraft Involved in Accidents by First Event and Phase of Flight**  
**1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Aeroplanes Involved in Accidents</b>										
<b>by First Event</b>										
Control Loss	35	30	41	37	23	27	30	24	21	22
Power Loss	55	41	37	37	28	36	20	32	27	22
Collision with Object	40	36	24	21	16	25	16	19	29	25
Collision with Terrain	18	22	30	17	16	25	19	20	24	27
Collision with Moving Aircraft	3	9	3	3	2	1	3	1	8	5
Operations-Related Event	10	12	5	6	6	5	4	10	5	7
Component System Malfunction	15	18	15	13	14	7	16	11	10	14
Landing Gear Collapsed/Retracted	18	15	8	7	10	9	10	3	3	9
Runway Overrun	5	4	2	1	1	1	2	4	3	1
Take-off/Landing Event	59	53	46	47	45	55	39	34	43	64
Wheels-up Landing	6	9	4	5	9	5	6	5	3	6
Component System-Related Event	13	4	10	9	7	13	3	7	4	11
Weather-Related Event	10	7	15	12	12	9	16	13	5	5
Aircraft Damage	10	1	5	4	3	4	2	4	5	3
Other/Unknown	21	25	13	24	18	20	20	19	18	16
<b>Total</b>	<b>318</b>	<b>286</b>	<b>258</b>	<b>243</b>	<b>210</b>	<b>242</b>	<b>206</b>	<b>206</b>	<b>208</b>	<b>237</b>
<b>Helicopters Involved in Accidents</b>										
<b>by First Event</b>										
Control Loss	10	3	3	5	6	3	3	5	7	5
Power Loss	6	12	9	5	9	11	3	5	10	8
Collision with Object	12	8	14	8	5	3	3	6	11	6
Collision with Terrain	3	6	5	4	9	5	7	9	8	7
Collision with Moving Aircraft	0	0	0	1	0	0	0	0	0	2
Operations-Related Event	0	5	1	2	0	2	6	2	1	2
Sling-Related Event	2	2	2	2	4	2	2	0	4	1
Dynamic System Malfunction	1	0	2	2	2	1	1	0	0	1
Dynamic Rollover	2	0	3	1	3	1	3	4	0	1
Autorotative Landing	1	2	2	3	4	4	0	1	0	0
Weather-Related Event	1	1	3	4	2	1	2	2	3	3
Aircraft Damage	6	3	2	3	1	3	4	5	2	1
Other/Unknown	13	4	7	6	11	8	7	11	10	9
<b>Total</b>	<b>57</b>	<b>46</b>	<b>53</b>	<b>46</b>	<b>56</b>	<b>44</b>	<b>41</b>	<b>50</b>	<b>56</b>	<b>46</b>
<b>Aeroplanes Involved in Accidents</b>										
<b>by Phase of Flight</b>										
Standing/Taxiing	26	17	21	18	22	23	16	19	22	16
Take-off	72	72	59	52	50	47	49	47	44	46
En Route	52	38	39	34	30	40	20	29	35	26
Manoeuvring	22	21	17	15	11	11	8	14	11	12
Approach	28	30	24	36	18	21	23	24	20	21
Landing	112	105	91	87	72	93	83	70	73	109
Post-Impact	0	1	0	0	0	1	1	0	0	0
Unknown	6	2	7	1	7	6	6	3	3	7
<b>Total</b>	<b>318</b>	<b>286</b>	<b>258</b>	<b>243</b>	<b>210</b>	<b>242</b>	<b>206</b>	<b>206</b>	<b>208</b>	<b>237</b>
<b>Helicopters Involved in Accidents</b>										
<b>by Phase of Flight</b>										
Standing	1	4	2	3	2	1	6	5	5	2
Take-off	3	4	9	5	9	5	6	9	10	6
En Route	9	6	8	10	7	6	6	8	12	12
Hover/Lift	13	10	4	5	3	4	4	3	7	3
Manoeuvring	13	8	14	2	9	9	7	4	7	8
Approach/Landing	17	12	13	19	21	18	11	15	13	13
Unknown	1	2	3	2	5	1	1	6	2	2
<b>Total</b>	<b>57</b>	<b>46</b>	<b>53</b>	<b>46</b>	<b>56</b>	<b>44</b>	<b>41</b>	<b>50</b>	<b>56</b>	<b>46</b>

Data extracted 16 June 2008.

**Table 5**  
**Canadian-Registered Aircraft Involved in Accidents**  
**First Event vs. Phase of Flight**  
**1998–2007**

	Phase of Flight							
	Standing/ Taxiing	Take-off	En Route	Manoeuvring	Approach	Landing	Other/ Unknown	Total
Aeroplanes Involved in Accidents by First Event								
Control Loss	9	102	12	25	13	126	3	290
Power Loss	0	106	143	27	56	2	1	335
Collision with Object	56	58	21	26	36	51	3	251
Collision with Terrain	7	53	42	27	28	43	18	218
Collision with Moving Aircraft	17	7	4	7	2	1	0	38
Operations-Related Event	7	23	14	3	8	14	1	70
Component System Malfunction	9	25	18	4	35	41	1	133
Landing Gear Collapsed/Retracted	16	8	0	0	0	68	0	92
Runway Overrun	1	1	0	0	0	21	1	24
Take-off/Landing Event	5	82	2	2	11	381	2	485
Wheels-up Landing	0	0	0	0	0	58	0	58
Component System-Related Event	1	19	25	4	11	21	0	81
Weather-Related Event	5	27	28	5	24	14	1	104
Aircraft Damage	30	4	1	1	0	3	2	41
Other/Unknown	37	23	33	11	21	51	18	194
Total	200	538	343	142	245	895	51	2414

	Phase of Flight							
	Standing	Take-off	En Route	Hover/Lift	Manoeuvring	Approach/ Landing	Unknown	Total
Helicopters Involved in Accidents by First Event								
Control Loss	4	9	2	5	11	17	2	50
Power Loss	0	7	25	10	15	20	1	78
Collision with Object	3	10	1	12	17	31	2	76
Collision with Terrain	5	8	17	4	10	15	4	63
Collision with Moving Aircraft	0	1	1	0	0	1	0	3
Operations-Related Event	1	6	1	3	3	5	2	21
Sling-Related Event	0	4	1	7	7	2	0	21
Dynamic System Malfunction	0	2	3	1	3	1	0	10
Dynamic Rollover	1	8	0	0	1	7	1	18
Autorotative Landing	0	0	0	0	1	15	1	17
Weather-Related Event	1	1	12	2	0	6	0	22
Aircraft Damage	7	3	1	5	1	10	3	30
Other/Unknown	9	7	20	7	12	22	9	86
Total	31	66	84	56	81	152	25	495

Data extracted 16 June 2008.

**Table 6**  
**Canadian-Registered Aeroplanes Involved in Accidents**  
**First Event vs. Aeroplane Type**  
**1998–2007**

	Aeroplane Type						
	Airliner	Commuter	Air Taxi	Aerial Work	Corporate	State	Private/Other
<b>Aeroplanes Involved in Accidents by First Event</b>							
Control Loss	2	5	42	10	8	0	223
Power Loss	3	0	55	35	5	1	236
Collision with Object	12	14	49	26	7	6	137
Collision with Terrain	3	5	62	17	3	2	126
Collision with Moving Aircraft	2	0	5	4	1	1	25
Operations-Related Event	0	0	16	5	0	0	49
Component System Malfunction	5	11	33	7	2	6	69
Landing Gear Collapsed/Retracted	1	4	22	2	0	1	62
Runway Overrun	1	1	7	0	0	0	15
Take-off/Landing Event	15	13	92	21	11	3	330
Wheels-up Landing	2	1	14	3	3	1	34
Component System-Related Event	4	1	11	4	4	0	57
Weather-Related Event	1	4	28	6	0	0	65
Aircraft Damage	7	3	5	1	1	1	23
Other/Unknown	9	3	41	8	4	1	128
<b>Total</b>	<b>67</b>	<b>65</b>	<b>482</b>	<b>149</b>	<b>49</b>	<b>23</b>	<b>1579</b>
<b>Aeroplanes Involved in Fatal Accidents by First Event</b>							
Control Loss	0	1	9	1	1	0	20
Power Loss	0	0	2	1	0	0	19
Collision with Object	0	0	3	2	0	1	16
Collision with Terrain	2	3	22	6	2	2	59
Collision with Moving Aircraft	0	0	0	0	1	1	9
Operations-Related Event	0	0	1	0	0	0	3
Component System Malfunction	0	1	0	0	0	0	2
Landing Gear Collapsed/Retracted	0	0	0	0	0	0	0
Runway Overrun	0	0	0	0	0	0	0
Take-off/Landing Event	0	2	1	1	0	0	1
Wheels-up Landing	0	0	0	0	0	0	0
Component System-Related Event	0	0	0	0	0	0	4
Weather-Related Event	0	0	4	0	0	0	6
Aircraft Damage	0	0	0	0	0	0	1
Other/Unknown	0	0	8	1	1	0	21
<b>Total</b>	<b>2</b>	<b>7</b>	<b>50</b>	<b>12</b>	<b>5</b>	<b>4</b>	<b>161</b>

Data extracted 16 June 2008.

**Table 7**  
**Canadian-Registered Aeroplanes Involved in Accidents**  
**First Event vs. Pilot Licence Type**  
**1998–2007**

Pilot Licence Type <sup>1</sup>					
	Student	Private	Commercial	Air Transport	Total
Aeroplanes Involved in Accidents by First Event					
Control Loss	7	17	19	8	51
Power Loss	3	19	15	8	45
Collision with Object	3	13	20	5	41
Collision with Terrain	1	17	34	17	69
Collision with Moving Aircraft	0	8	7	0	15
Operations-Related Event	3	5	5	0	13
Component System Malfunction	1	4	3	10	18
Landing Gear Collapsed/Retracted	0	4	0	2	6
Runway Overrun	0	2	2	3	7
Take-off/Landing Event	2	15	12	16	45
Wheels-up Landing	0	0	0	1	1
Component System-Related Event	0	2	3	2	7
Weather-Related Event	0	8	10	5	23
Aircraft Damage	1	1	2	1	5
Other/Unknown	2	14	16	11	43
Total	23	129	148	89	389

1 Accident pilots for whom the licence type is unknown, and pilots with other licence types were excluded.

Data extracted 16 June 2008.



**Table 8****Canadian-Registered Aircraft Involved in Accidents by Operation Type  
1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Aeroplanes Involved in Accidents</b>										
Training	49	43	45	46	20	34	25	16	34	33
Pleasure/Travel	130	130	116	108	102	122	118	116	96	120
Business	15	10	9	10	6	8	5	6	8	15
Test/Demonstration/Ferry	14	9	5	7	7	5	7	5	6	8
Aerial Application	17	9	12	13	6	13	3	6	8	8
Fire Fighting/Fire Management	3	2	3	2	2	2	3	2	5	0
Survey/Inspection	3	2	0	2	5	2	1	7	3	2
Air Ambulance	3	3	0	3	2	1	2	1	3	2
Air Transport	67	67	53	43	49	42	37	36	38	41
Sightseeing	1	0	5	1	1	4	0	2	3	1
Other/Unknown	16	11	10	8	10	9	5	9	4	7
<b>Total</b>	<b>318</b>	<b>286</b>	<b>258</b>	<b>243</b>	<b>210</b>	<b>242</b>	<b>206</b>	<b>206</b>	<b>208</b>	<b>237</b>
<b>Aeroplanes Involved in Fatal Accidents</b>										
Training	5	2	2	2	1	3	4	0	4	3
Pleasure/Travel	11	14	12	10	11	15	10	12	11	10
Business	2	3	3	4	0	0	0	0	1	1
Test/Demonstration/Ferry	2	1	1	2	3	0	0	1	1	4
Aerial Application	0	1	2	0	0	1	0	0	0	1
Fire Fighting/Fire Management	0	0	0	1	0	1	0	0	0	0
Survey/Inspection	0	1	0	0	2	0	0	2	1	0
Air Ambulance	0	0	0	1	0	0	0	0	0	1
Air Transport	4	5	4	4	5	4	3	7	5	4
Sightseeing	0	0	1	0	1	0	0	0	0	1
Other/Unknown	1	1	1	1	0	2	1	0	0	0
<b>Total</b>	<b>25</b>	<b>28</b>	<b>26</b>	<b>25</b>	<b>23</b>	<b>26</b>	<b>18</b>	<b>22</b>	<b>23</b>	<b>25</b>
<b>Helicopters Involved in Accidents</b>										
Training	5	6	11	11	9	6	4	3	2	3
Pleasure/Travel	0	0	3	4	2	1	5	11	4	4
Business	5	1	1	4	6	1	0	1	0	4
Test/Demonstration/Ferry	0	3	4	1	5	0	2	0	2	3
Aerial Application	1	1	2	1	1	2	1	2	0	2
Fire Fighting/Fire Management	10	7	2	2	6	6	4	1	3	0
Survey/Inspection	7	4	4	0	3	8	2	1	1	2
Air Ambulance	1	0	0	1	0	0	0	1	0	0
Air Transport	14	10	11	12	14	11	16	19	29	16
Sightseeing	0	1	0	0	0	0	0	0	0	0
Other/Unknown	14	13	15	10	10	9	7	11	15	12
<b>Total</b>	<b>57</b>	<b>46</b>	<b>53</b>	<b>46</b>	<b>56</b>	<b>44</b>	<b>41</b>	<b>50</b>	<b>56</b>	<b>46</b>
<b>Helicopters Involved in Fatal Accidents</b>										
Training	0	0	2	1	0	0	0	0	0	0
Pleasure/Travel	0	0	1	2	0	0	1	5	0	0
Business	3	0	0	0	1	0	0	1	0	1
Test/Demonstration/Ferry	0	0	1	1	2	0	0	0	1	0
Aerial Application	0	0	0	0	0	0	0	0	0	0
Fire Fighting/Fire Management	0	0	0	0	0	1	0	0	2	0
Survey/Inspection	0	0	1	0	0	1	1	0	0	1
Air Ambulance	0	0	0	0	0	0	0	0	0	0
Air Transport	2	1	1	1	0	0	2	3	2	3
Sightseeing	0	1	0	0	0	0	0	0	0	0
Other/Unknown	1	2	5	1	3	1	0	1	4	2
<b>Total</b>	<b>6</b>	<b>4</b>	<b>11</b>	<b>6</b>	<b>6</b>	<b>3</b>	<b>4</b>	<b>10</b>	<b>9</b>	<b>7</b>

Data extracted 16 June 2008.

**Table 9****Incidents Involving Canadian-Registered Aircraft by Incident Type  
1998–2007**

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
<b>Incidents</b>										
Risk of Collision/Loss of Separation	149	142	130	170	169	123	182	150	150	152
Declared Emergency	183	173	174	208	231	229	204	152	184	186
Engine Failure	133	121	129	157	134	104	118	116	106	108
Smoke/Fire	86	71	71	92	83	82	81	85	86	106
Collision	3	7	8	17	19	16	21	8	18	9
Control Difficulties	28	18	25	28	28	41	41	41	31	38
Crew Unable to Perform Duties	8	17	15	13	37	48	51	67	56	63
Dangerous Goods-Related	3	3	2	6	0	2	0	1	2	3
Depressurization	19	6	4	15	18	17	7	12	9	11
Fuel Shortage	6	7	1	2	1	6	10	5	6	4
Failure to Remain in Landing Area	8	10	13	4	6	3	10	10	6	7
Incorrect Fuel	0	0	0	0	1	0	2	1	1	0
Slung Load Released	1	5	6	8	3	4	5	1	3	3
Transmission or Gearbox Failure	1	3	2	2	2	1	2	1	0	1
<b>Total<sup>1</sup></b>	<b>628</b>	<b>583</b>	<b>580</b>	<b>722</b>	<b>732</b>	<b>676</b>	<b>734</b>	<b>650</b>	<b>658</b>	<b>691</b>

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

Data extracted 16 June 2008.

**Table 10**  
**Canadian-Registered Aircraft Involved in Incidents**  
**Selected Incident Types vs. First Event**  
**2003–2007**

<b>Incident Type</b>	<b>First Event</b>	
<b>Risk of Collision/ Loss of Separation</b>	Air Proximity	367
1225 Aircraft Involved	ATS-Related Event	685
	Altitude-Related Event	32
	Runway Incursion	55
	Other	86
<b>Declared Emergency</b>	Landing Gear Failure	187
955 Aircraft Involved	Hydraulic Failure	125
	Electrical Failure	37
	Other Component Failure	355
	Other	251
<b>Engine Failure</b>	Power Loss – First Engine	252
552 Aircraft Involved	Component Failure	259
	Other	41
<b>Smoke/Fire</b>	Fire/Explosion	321
440 Aircraft Involved	Component Failure	113
	Other	6
<b>Control Difficulties</b>	Component Failure	84
194 Aircraft Involved	Weather-Related Event	59
	Other	51

Data extracted 16 June 2008.

## APPENDIX B – 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; and
- 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 5700 kg, or from the operation of a rotorcraft having a MCTOW greater than 2250 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 that 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 8618 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, in which the aircraft is:

- a) a multi-engined aircraft that has a MCTOW of 8618 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 8618 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.