

Aviation Safety Report

Intelligence, Safety and Risk Analysis Unit

1 January 2018 to 31 December 2018

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Introduction and Executive Summary

Introduction

This safety report is produced using data from the Civil Aviation Authority's Aviation Safety Management System. It primarily covers the period from 1 January 2018 to 31 December 2018.¹

Key Indicators

- Key measures of industry activity have increased as follows in the above period.
 - Aircraft on CAA records increased slightly by 1.0% to 5280 aircraft.
 - The number of organisational certificates currently held has decreased by 3% to 1060
- The number of accidents in the period was 88, down from 100 in the last 12 month period, and the trend is downward relative to the average of the preceding three years (99.3 accidents pa 2015 to 2017).
- There were 10 fatalities, 2 less than in the previous 12 months and the third lowest in the last ten years. The average of the last four years was 11.5 fatalities pa and the highest in the last ten years was 21 fatalities in 2012
- The accident statistics are now led by private sport aircraft, and sport transport sectors, but the principal contributors to the fatalities and therefore the social cost statistics are the airline helicopter, private sport and private helicopter sectors.
- The rise in the airspace incident rate per 100,000 hours flown continues. This period the number of reported airspace occurrences (all types) has increased by 7.9% on the last 12 months while the total flying hours in the same period fell by 20%. This is happening in a climate of an increase in aerodrome movements.

J.D. Stanton

Manager Intelligence Safety and Risk Analysis

¹ This report uses December years. Where quarters are referred to the first quarter is 1 January to 31 March.

Data in tables may not sum exactly to the total shown due to rounding

Executive Summary

Industry status as at 31 December 2018 and trend over the preceding 9 years

This section is organised into three parts

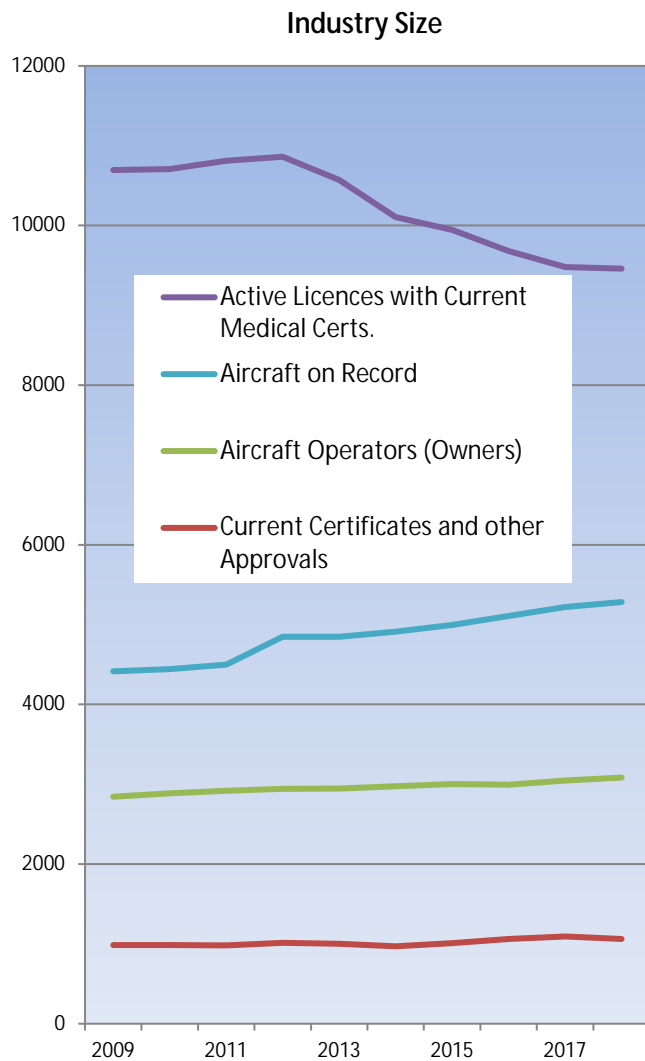
- Industry Size
- Industry Activity
- Safety Outcomes

Industry Size

Several different measures of industry size are available. No single measure is likely to meet the needs of all readers. Available measures are

- Number of licenses (with current medical certificates as appropriate) at the year end
- Number of certificates and other operational approvals at the year end
- Number of aircraft operators (owners) at the year end
- Number of aircraft recorded as active at the year end

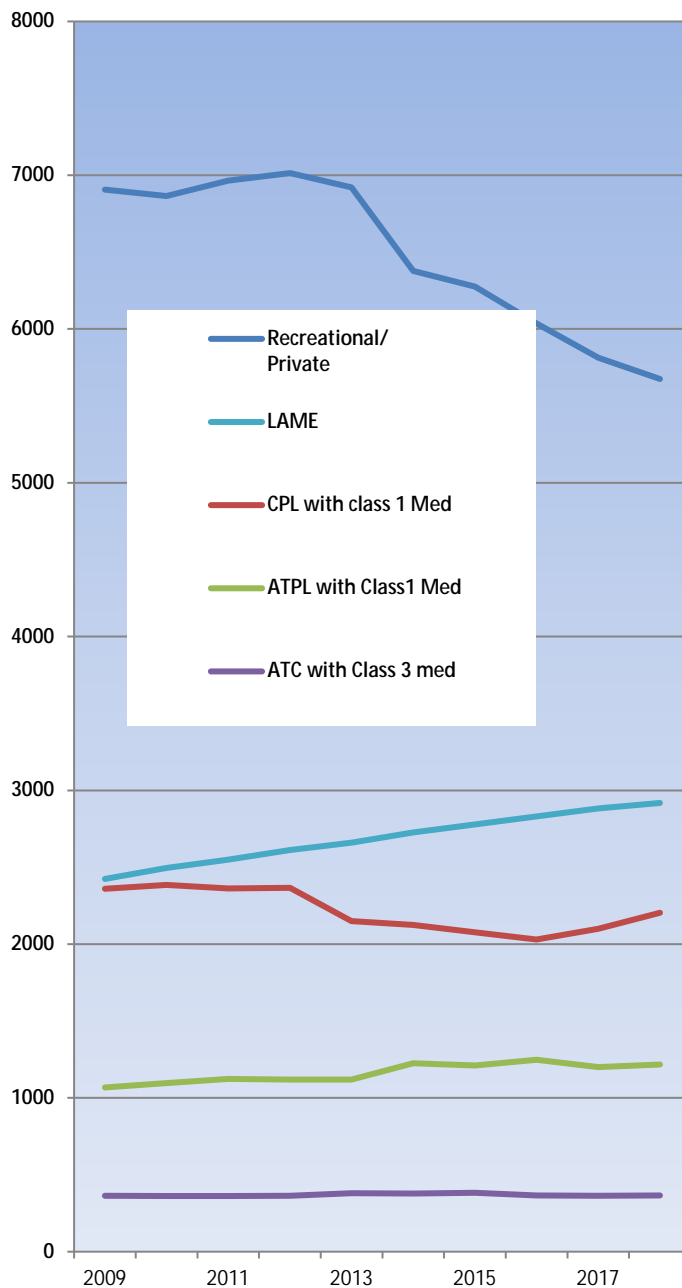
Ten year movements of these measures are summarised in the following graph.



The main points to note are the steady decline in the number of crew licences held and the relatively steady long term increase in the number of aircraft on record.

The graphs that follow show that the decline in licence numbers comes mostly from a decline in the recreational and private pilot sector and the increase in aircraft numbers comes mostly from the commercial and adventure sectors.

Licences Held as at 31 December



The 'Recreational/Private' group consists of holders of RPL licences who have appropriate current medical certificates plus holders of any pilot licence who have current class 2 medical certificates plus holders of PPL licenses only who hold a current class 1 medical certificate.

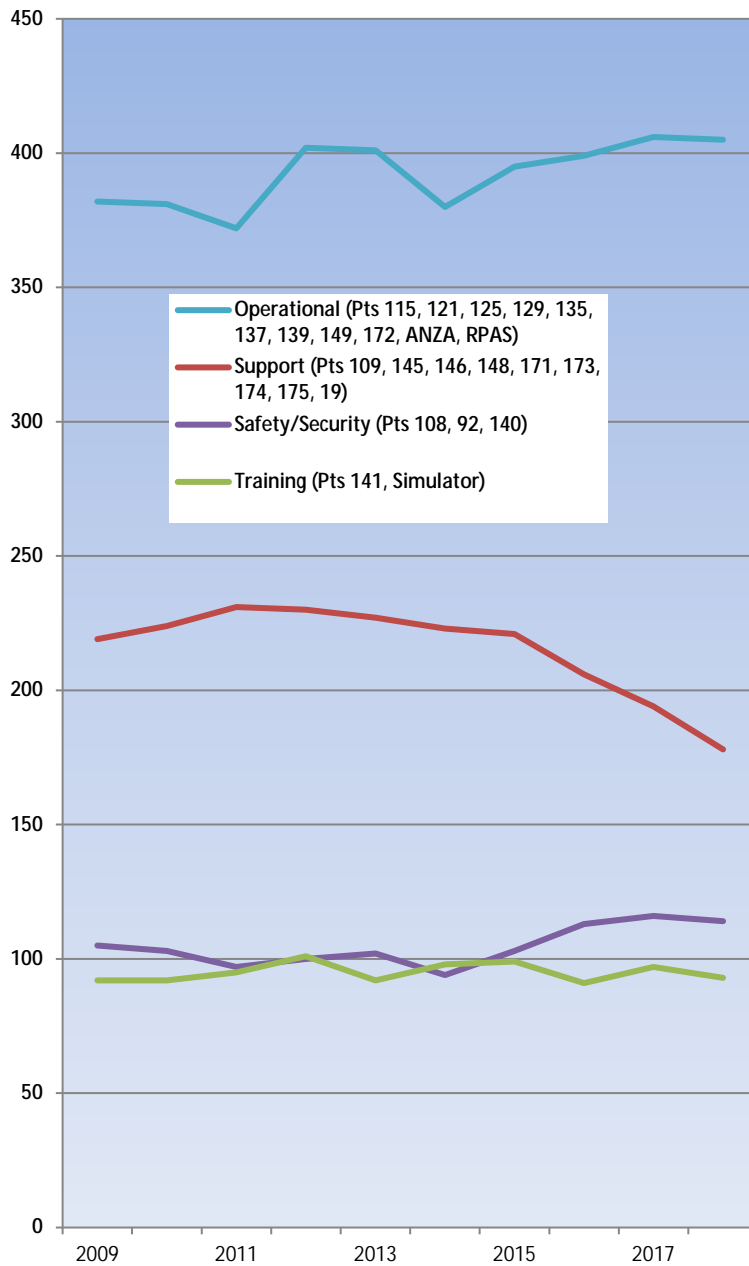
There is no medical requirement for holders of LAME licences which are issued on a lifetime basis. The increase in their numbers is simply an indication that more licences are being issued than holders' lifetimes are terminating.

Both the ATPL and the CPL groups have been flat numbers over the last 3 years, with a 5.5% uptick in the last 12 months for CPLs.

The recreational/Private numbers do not include Microlight certificates issued by Part 149 organisations.

For more detail see: [Licences](#)

Approvals Held as at 31 December



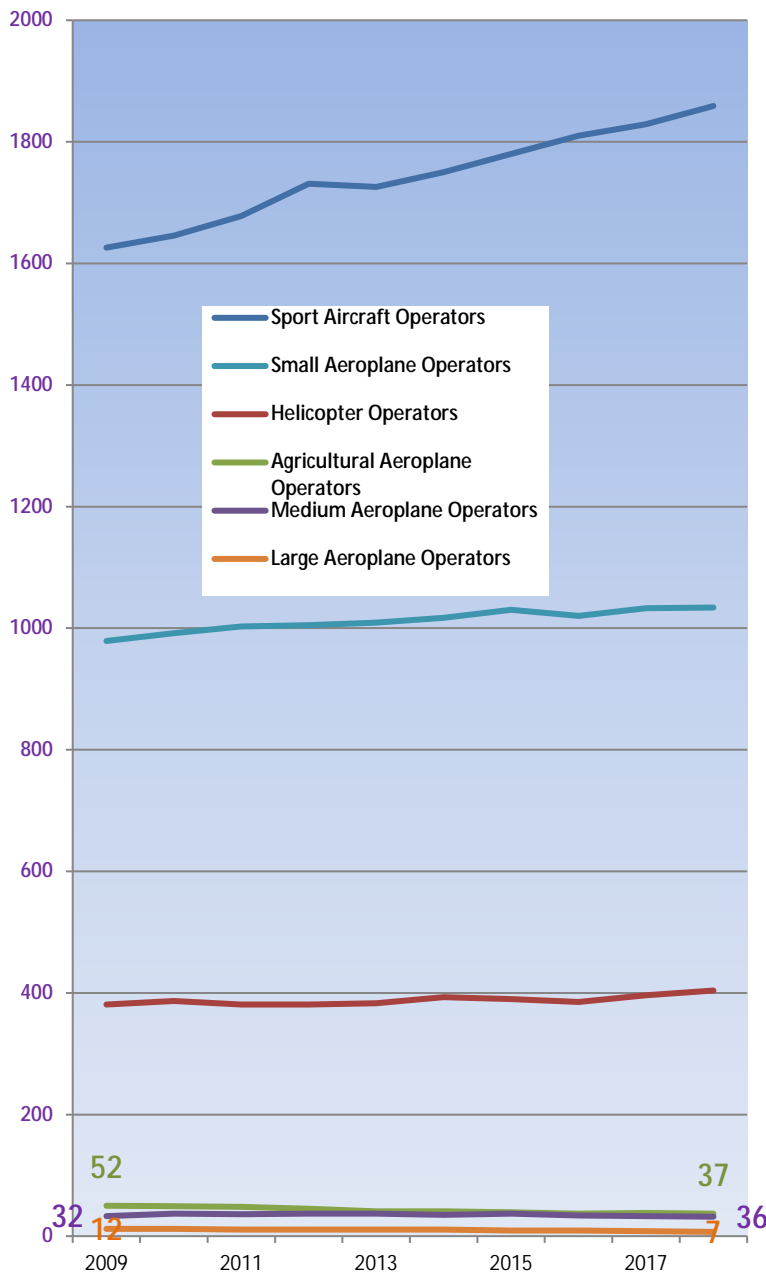
The number of Part 145 Aircraft Maintenance Organisation approvals peaked 6 years ago at 67 and has since declined to 51.

The number of Part 121 Large Aeroplane Operator approvals has risen from 7 at the end of 2016 to 13 at the end of 2018. This sector is closely monitored.

The numbers of Part 137 Agricultural Aircraft Operator approvals rose from 99 at the end of 2007 to 113 at the end of 2018.

For more detail see: [Approvals](#)

Aircraft Operators (Owners) as at 31 December



Those operators who operate more than one category of aircraft have been counted in each category. This means that totalling the numbers will lead to more operators than actually exist.

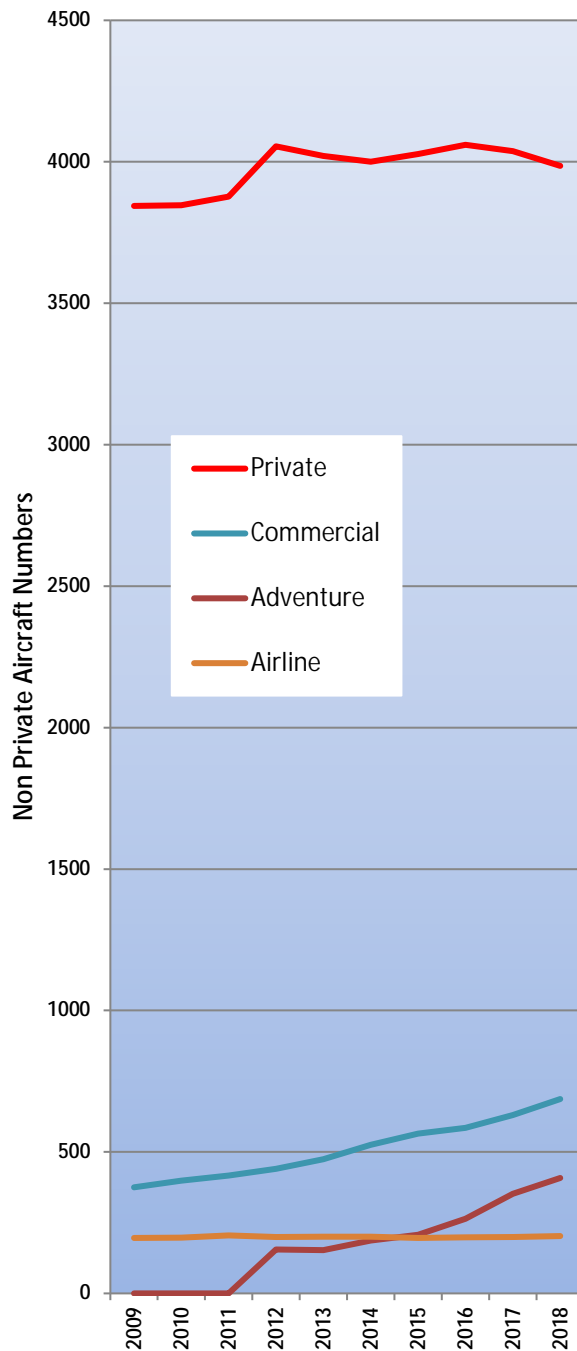
The number of Large Aeroplane operators shows no significant trend but has declined by 4 since 2009. The number of Agricultural Aeroplane operators peaked at 52 in 2010 declined until 2017 and has remained steady since then.

The number of Medium Aeroplane operators has been between 38 and 32 since 2011.

The only categories showing significant growth is the number of operators for the Sport Aircraft category. This is driven by growth in Class 2 Microlights and commercial paraglider and parachutes, see page 19.

For more detail see: [Owners](#)

Aircraft on Record as at 31 December



Aircraft have been counted in the Adventure group if there was a current Part 115 approval for the aircraft at the 31 December year end. Most of these are aircraft are tandem parachutes and paragliders.

Aircraft have been counted in the Private group if they have no Part 119 or Part 115 approval and they are not an agricultural aeroplane. So this includes standard/restricted and special category aircraft (including microlights). The vast majority of aircraft recorded in the CAA database are private and their numbers increased until 2012 and have declined since then.

The most notable trend is in the commercial group where the numbers have increased by 90% since December 2007. Both fixed wing and rotary have contributed to this increase but the rotary component is the major factor having gone from 185 at the end of 2009 to 665 at the middle of 2018, an increase of 259%.

Note from the previous graph that the number of helicopter operators has remained almost constant, suggesting that existing operators are expanding their fleets.

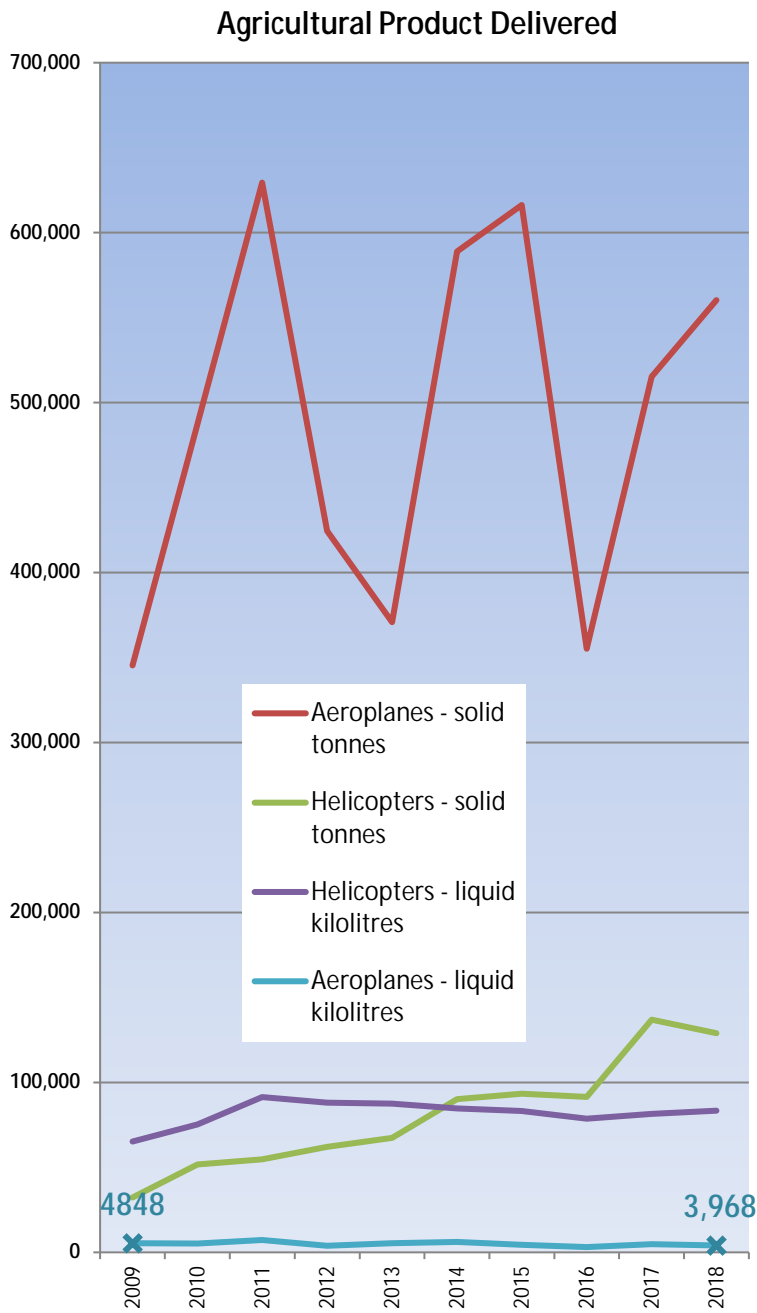
For more detail see: [Aircraft](#)

Industry Activity

Most activity measures depend on operations statistics returns supplied by operators under the requirements of rule part 12.151 or rule part 19.103 for agricultural aviation statistics.

- Compliance statistics for 2018
- Part 115 operators
- Part 135 operators
- Part 137 Operators

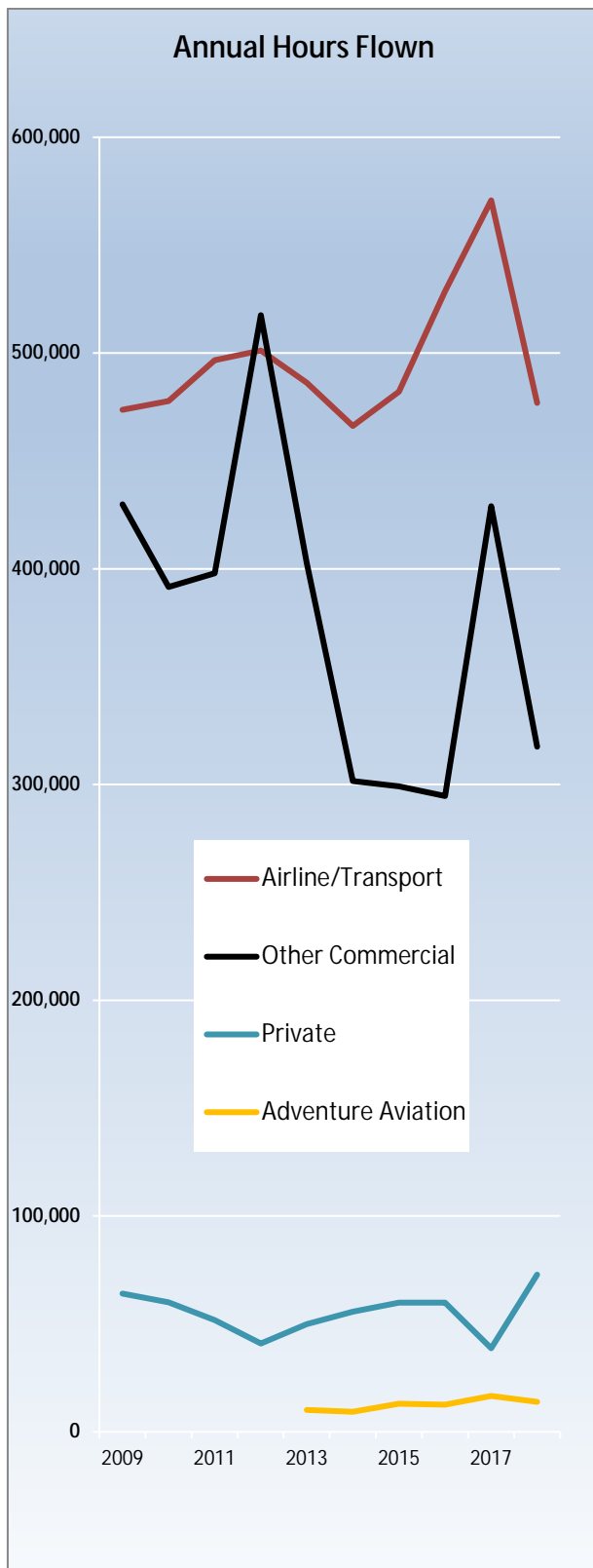
These measures are summarised in the following graphs that relate to years ending 31 December.



Trends in agricultural product delivery vary by aircraft type.

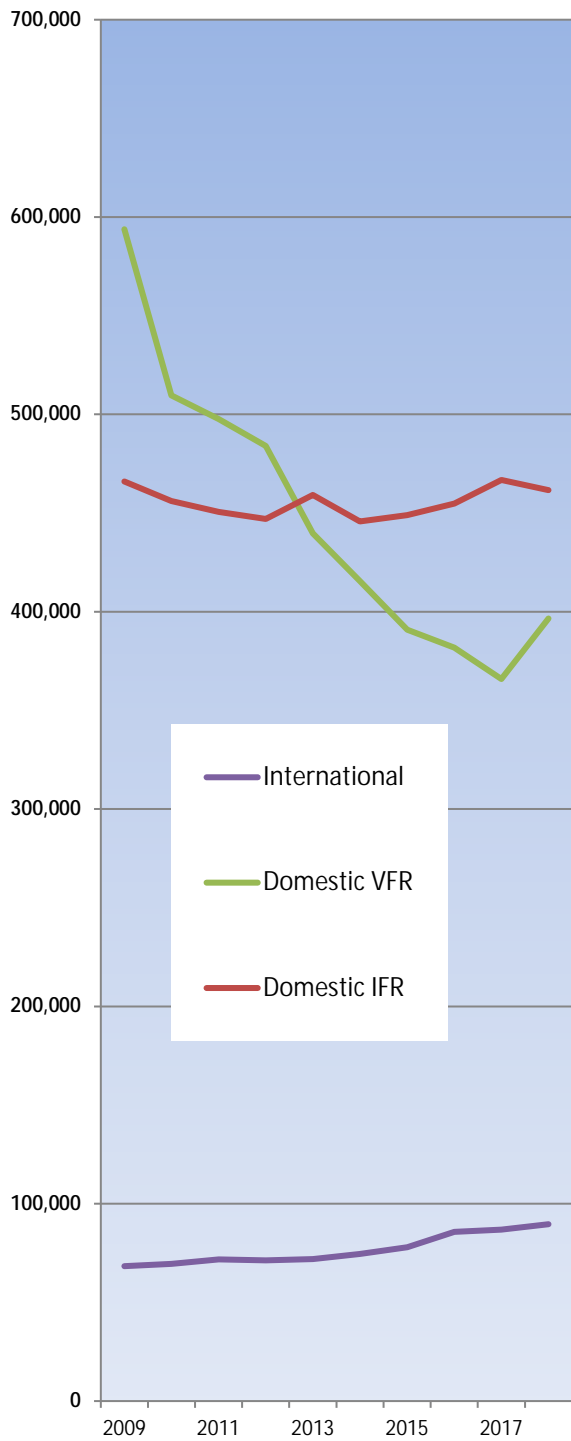
Liquid quantities applied by helicopter have plateaued from 2012 – 2018, while solid tonnage has increased significantly.

Solid tonnage applied by aeroplane has fluctuated significantly from 2009 – 2018



For more detail follow these links: [Hours Flown](#)

Aerodrome Movements



This data covers only aerodromes that have an Airways presence either as Air Traffic Control or Flight Service.

There has been a steady decline in VFR movements at Airways monitored aerodromes since a peak of 646710 in 2009. This may be a consequence of a move of private flying away from busy commercial airports or may be an indication that private flying is declining in New Zealand generally.

For more detail see: [Aerodrome Movements](#)

Safety Outcomes

Safety outcome measures covered in this report include

1. Fatality and serious injury rates
2. Accident rates
3. Airspace, Operational, Aerodrome, Defect, Bird and Security incident rates
4. Social costs
5. Participant Risk-Assessments

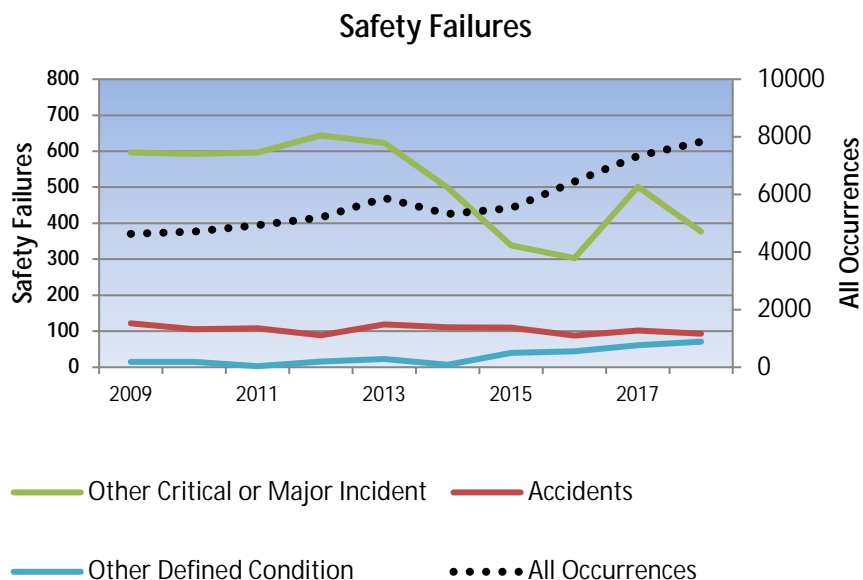
It is not practicable to summarise all of these measures in a concise form so this summary focusses on a concept of Safety Outcomes which classifies all reported occurrences into three groups, Safety Failures, Close Calls and Safety Successes. Aviation-Related Concerns and Risk Assessments are summarised separately.

The values relate to years ending 31 December

Safety Failures

We have taken a Safety Failure as:

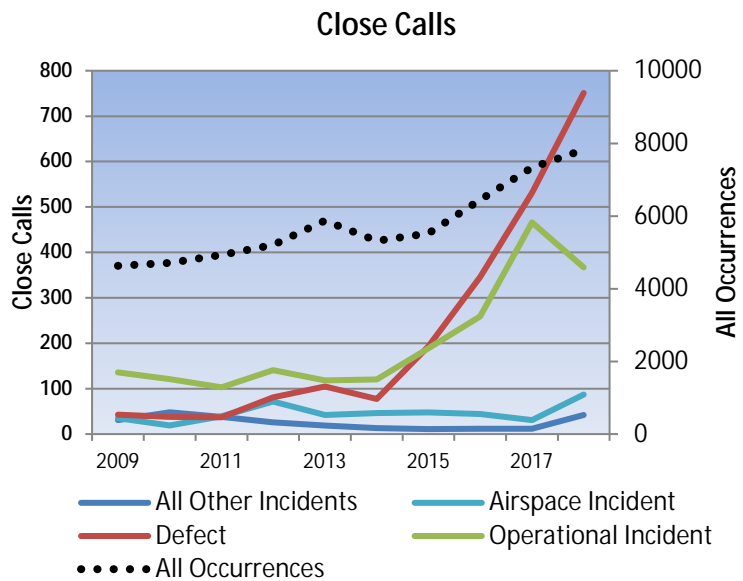
- an accident including hang glider and parachute accidents or
- an incident where the aircraft is written off, destroyed or missing or
- a critical or major incident or
- an incident that has any of 31 selected descriptors ([see appendix](#)), most of which relate to collision, serious landing outcomes, serious aircraft technical or operational failures or acts of violence



Whilst the goal for Safety Failures must be continuous reduction, it is difficult to identify a clear trend because of the small population. It is worthy of note that the number of 'Other Critical or Major' incidents does seem to be declining in recent years. These 'Other' incidents are mostly (87%) made up of Operational Incidents, Airspace Incidents and Defects in decreasing order of frequency.

Close Calls

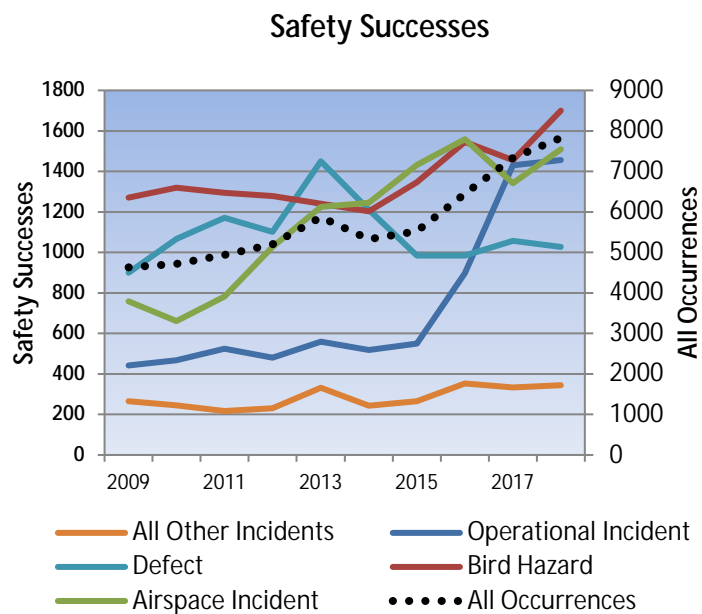
We have defined a Close Call as an incident that is not a safety failure but that has any of 112 selected descriptors ([see appendix](#)) that support the assumption that failure would have been the outcome if either the condition had escalated or adequate compensating action had not been taken



The most obvious trend is the recent increase in the number of defect incidents are close calls (733 in 2018). The majority of these are due to apparent navigation system faults on ATR aircraft. This issue has been closely monitored and the cause isolated to a magnetic anomaly in a section of taxiway at Auckland International Airport. Safety mitigations have been implemented.

Safety Successes

We have defined a Safety Success as a reported incident (i.e. something unexpected) that was managed to a safe outcome using normal operational procedures



Precursors to Safety Failure

The CAA operates two processes that generate indicators of possible future safety failure of a particular activity type by a particular operator. They are the Routine Audit and Client Risk Assessment processes.

The Client Risk Assessment Process

This process generates a 'score' representing a weighted assessment of a range of factors all of which have the ability to indicate possible risk to an operation. A new score is generated any time any one of the relevant factors changes or if a manual assessment is initiated.

Client Risk Assessment scores are unique to a particular activity type and are not comparable between one activity and another.

The next table shows how the average of annual Risk Assessments has changed over the last 9 years within each certificate type. A value of 100 would represent the highest risk possible.

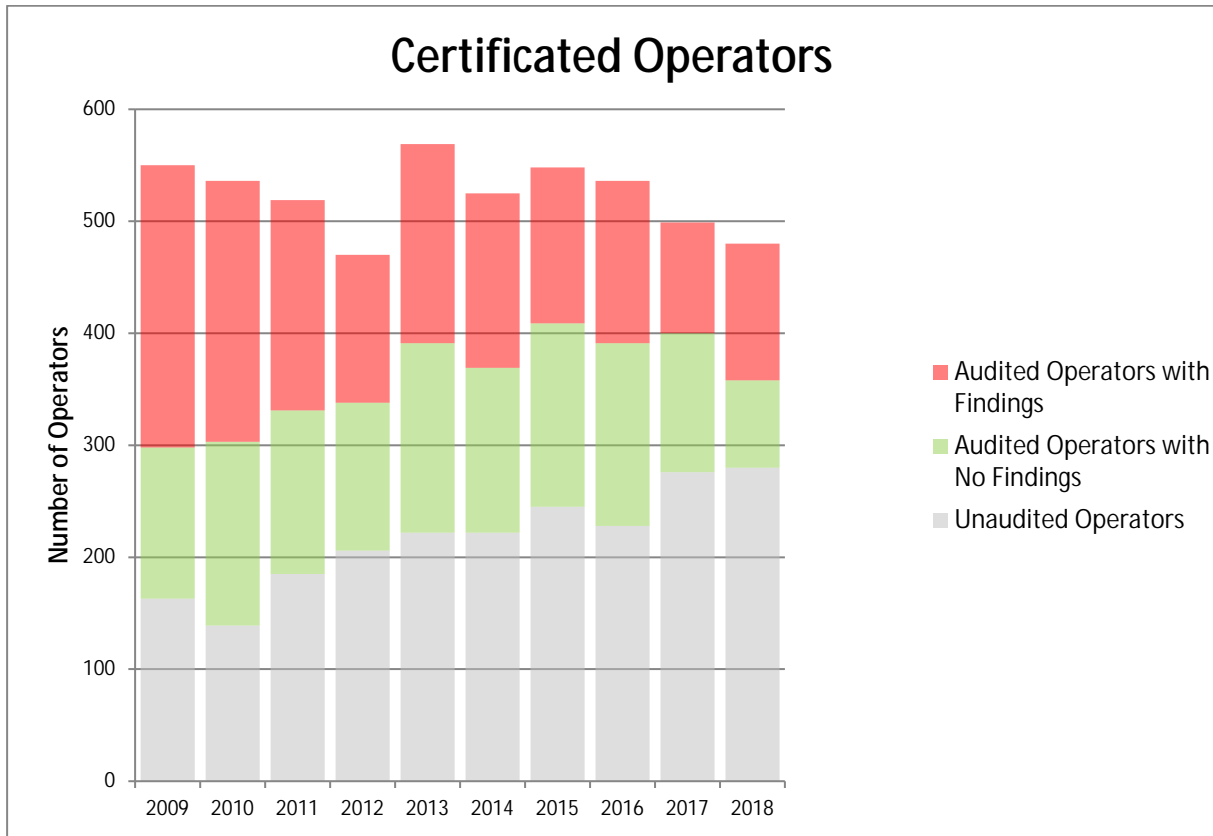
Activity	Year ending 31 December									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Part 137 Agricultural Aircraft Operator	17.5	16.1	16.2	15.2	15.3	14.9	15.0	14.6	14.6	15.6
Part 135 Air Operator Helicopters and Small Aeroplanes	16.7	16.4	15.9	15.2	14.7	14.3	14.7	14.1	13.9	15.1
Part 125 Air Operator Medium Aeroplanes	14.7	15.6	15.0	13.7	13.2	15.1	16.4	13.5	13.5	13.3
Part 115 Adventure Aviation Operator Certificate				43.6	17.3	12.2	12.9	13.4	12.5	12.4
Part 149 Aviation Recreation Organisation	15.8	7.5	14.7	10.8	14.5	16.3	14.4	12.9	10.0	10.1
Part 172 Air Traffic Service Organisation	8.7	9.3	16.9	22.7	15.0	13.8	13.1	12.8	13.4	18.2
Part 109 Regulated Air Cargo Agent	10.5	12.6	10.3	10.7	11.8	13.1	11.5	10.9	10.7	12.1
Part 129 Foreign Air Transport Operator	9.6	8.6	10.0	8.2	7.8	6.4	8.2	10.4	11.0	7.8
Part 148 Aircraft Manufacturing Organisation	9.0	12.1	11.0	9.5	10.7	11.4	10.7	9.8	9.7	10.8
Part 92 Dangerous Goods Packaging Approval Holder	2.6	5.6	13.7	8.7	3.4	8.7	11.6	9.7	7.0	6.0
Part 140 Aviation Security Service Organisation	5.2	5.0	4.6	4.9	5.3	6.4	7.2	9.5	10.4	16.3
Part 121 Air Operator Large Aeroplanes	10.7	9.7	9.5	7.6	7.9	8.2	7.6	9.5	7.8	8.3
Part 19F Supply Organisation	12.4	11.0	10.7	8.8	10.0	11.2	10.2	9.3	9.4	8.8
Part 145 Maintenance Organisation	10.8	9.8	11.7	10.0	9.5	10.0	9.9	8.9	8.2	9.7
Part 146 Aircraft Design Organisation	7.9	9.6	12.7	9.3	8.7	8.3	8.5	8.8	8.9	9.0
Australia AOC with ANZA Privileges Part 108 Security Programme	6.7	5.6	6.5	6.9	5.8	6.2	8.2	8.3	7.1	7.1
Part 173 Instrument Flight Procedure	5.4	7.2	11.4	15.8	11.3	11.2	12.0	8.2	4.1	4.2
Part 139 Aerodrome Operator	5.0	5.8	6.4	5.7	6.4	7.0	8.3	7.6	7.2	6.9
Part 141 Aviation Training Organisation	11.1	9.9	10.7	9.5	8.5	9.1	9.5	7.5	7.4	8.1
Part 108 Security Programme	7.0	8.4	7.2	7.1	7.0	6.8	7.0	7.4	6.7	7.0
Part 171 Telecom Service Organisation	5.3	5.0	14.5	16.2	9.2	5.6	5.1	5.0	5.7	14.3
Part 174 Meteorological Service Organisation	6.8	10.6	12.5	13.3	7.3	5.1	6.0	4.9	4.6	11.1
Part 137 Agricultural Aircraft Operator	6.1	9.2	16.9	18.5	11.2	22.5	14.4	3.6	3.3	6.0

When a client is initially certificated their risk score is automatically high. It gradually declines as the client builds up operational experience. The Part 115 holders illustrate this effect well.

The Routine Audit Process

This process generates findings as a result of inspections of compliance with CAA rules.

The following chart shows the numbers of certificated operators. They are separated into those that have not been audited, those that have been audited and for whom no non-compliances were discovered and finally those for whom one or more non-compliances were discovered either as a result of an audit, an inspection or an investigation. The chart uses calendar years.



It is worth noting that as the CAA moves to risk-based auditing decisions, fewer operators are being audited than in previous years. It is also worth noting that over the last three years only about half of the operators who are audited have generated findings. This is a change from earlier years when for most years significantly more than half of all audited operators generated findings. This is reflected in the table of client risk scores which is to be expected since non-compliance findings are one component of the risk score.

Industry Size and Activity Data

Registered Aircraft

The following table summarises the number of registered aircraft or Part 115 approved aircraft as at 31 December of each year.

Aircraft Category and Class	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Aeroplane	118	119	127	125	128	128	125	136	134	136
Medium Aeroplane	78	78	78	80	79	78	77	69	74	76
Small Aeroplane	1513	1518	1521	1527	1513	1496	1507	1509	1525	1528
Helicopter	760	761	767	787	795	831	840	845	863	880
Agricultural Aeroplane	110	110	109	107	103	97	93	94	93	95
Sport Aircraft - Aeroplanes	119	117	126	143	150	164	167	174	176	179
Sport Aircraft - Amateur Built Aeroplane	244	246	254	264	269	270	279	286	291	294
Sport Aircraft - Amateur Built Glider	4	4	4	3	3	3	3	3	3	3
Sport Aircraft - Amateur Built Helicopter	20	20	22	23	24	24	24	23	24	24
Sport Aircraft - Balloons	69	69	72	74	61	64	64	61	64	63
Sport Aircraft - Glider	303	299	299	295	292	287	288	286	284	286
Sport Aircraft - Gyroplane	38	42	36	42	46	53	62	70	77	78
Sport Aircraft - Hang Glider	0	0	0	13	17	18	18	23	24	21
Sport Aircraft - Helicopter	5	3	5	6	4	5	5	5	5	5
Sport Aircraft - Microlight Class 1	239	235	228	232	222	219	213	213	215	216
Sport Aircraft - Microlight Class 2	748	773	803	827	827	849	880	891	895	909
Sport Aircraft - Power Glider	47	48	48	46	46	46	49	51	51	52
Sport Aircraft - Parachute	0	0	0	194	188	210	209	256	324	334
Sport Aircraft - Para Glider	0	0	0	61	82	69	89	105	91	101
Total	4415	4442	4499	4849	4849	4911	4992	5100	5213	5280

Statistically significant growth areas are:

- gyroplanes – from 36 in 2011 to 77 in 2018
- sport aeroplanes – from 117 in 2009 to 175 in 2018
- Part 115 hang gliders – from 13 in 2012 to 21 in 2018
- Part 115 parachutes – from 195 in 2012 to 331 in 2018
- Part 115 para gliders – from 35 in 2012 to 97 in 2018

Moderate declines are evident for

- class 1 microlights - from 244 in 2009 to 210 in 2018
- agricultural aeroplanes – from 111 in 2009 to 95 in 2018

The totals for sport aircraft need to be interpreted with care because the figures before 2011 did not include Hang Gliders, Parachutes or Para Gliders. These aircraft classes have only been recorded since the need to approve them for Part 115 operations arose in late 2011. Even now any private aircraft of these classes do not appear in the CAA records

Licences

The following table summarises the number of airline transport, commercial, private and recreational pilot, air traffic controller, and aircraft maintenance engineer licences on the register as at 31 December of each year.

Licences	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Private & Recreational	6907	6865	6964	7014	6921	6377	6275	6036	5814	5675
CPL with class 1 Med	2359	2385	2362	2366	2150	2125	2076	2030	2100	2203
ATPL with Class1 Med	1068	1096	1124	1119	1120	1226	1210	1248	1201	1217
ATC with Class 3 Med	363	362	362	363	380	379	383	366	364	365
LAME	2424	2496	2549	2611	2660	2726	2779	2830	2882	2918
Total	13121	13204	13361	13473	13231	12833	12723	12510	12361	12378

Note — the statistics above for pilot licences count only those with active medical certificates of a class appropriate for the licence type. This means that for CPL and ATPL licences, the number with a class 2 medical only, must only be exercising PPL privileges (or not flying at all). The statistics for ATCL holders count only those with an active class 3 medical certificate.

(‘Private & Recreational’ is the combined total of any PPLs with a valid medical certificate, any aircrew licence with only Class2 medical certificate and any RPLs with current DL9 medical)

These statistics show the number of licences held and the totals therefore overestimate the number of licence holders, as each holder may hold more than one licence.

The numbers of ‘Private & Recreational’ Pilot licence holders have been declining since 2012 and those of Commercial Pilot licence holders have been declining since 2010 and have increased slightly this year.

Operators (Owners)

The following table summarises the number of registered operators of aircraft on the register as at 31 December of each year.

Operators of:	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Aeroplanes	12	12	11	11	11	11	9	9	8	7
Medium Aeroplanes	33	37	36	37	37	35	37	34	33	32
Agricultural Aeroplanes	50	49	48	45	41	41	39	37	38	37
Helicopters	381	387	381	381	383	393	390	385	396	404
Small Aeroplanes	979	992	1003	1005	1009	1017	1030	1020	1033	1034
Sport Aircraft	1626	1646	1678	1731	1726	1750	1780	1810	1829	1859

No attempt has been made to total these figures because many operators own aircraft from multiple categories making totals meaningless.

The most notable trends are a 33% drop in the number of large aeroplane operators and a 26% drop in the number of agricultural aeroplane operators over the last ten years along with increases of 6%, and 15% in the numbers of helicopter and sport aircraft operators over the same period.

Certificated Operators

The following table shows the number of Civil Aviation Rule Part certificate holders as at 31 December of each year.

Approval	Years 20--									
	09	10	11	12	13	14	15	16	17	18
Part 109 Regulated Air Cargo Agent	62	63	63	65	66	65	66	66	64	60
Part 115 Adventure Aviation Operator	0	0	1	33	34	27	30	29	29	27
Part 119 Air Operator	184	187	185	179	178	175	174	175	175	170
Part 119 Air Operator - Pacific	1	0	0	0	0	0	0	0	0	4
Part 129 Foreign Air Operator	38	34	30	32	31	31	33	40	45	49
Part 137 Agricultural Aircraft Operator	107	108	105	104	99	97	104	102	105	106
Part 139 Aerodromes	25	26	26	27	27	27	27	27	26	26
Part 140 Aviation Security Service	1	1	1	1	1	1	1	1	1	1
Part 141 Aviation Training Organisation	55	56	57	59	56	55	55	52	50	48
Part 141 Restricted Training Organisation	0	0	0	0	0	0	0	0	0	0
Part 145 Aircraft Maintenance Organisation	57	60	63	67	63	56	56	54	53	52
Part 146 Aircraft Design Organisation	11	14	14	14	14	14	13	12	12	12
Part 148 Aircraft Manufacturing Organisation	21	22	23	20	20	20	20	16	15	14
Part 149 Aviation Recreation Organisation	9	8	8	7	8	8	8	8	8	8
Part 171 Aeronautical Telecommunication Service Organisation	2	2	2	2	2	2	2	2	2	2
Part 172 Air Traffic Service	2	2	2	2	2	2	3	2	2	1
Part 173 Instrument Flight Procedure Service Organisation	3	3	3	3	3	3	2	2	2	2
Part 174 Meteorological Service Organisation	2	2	2	2	2	2	2	2	2	2
Part 175 Aeronautical Information Service Organisation	2	1	1	1	1	2	2	2	2	2
Part 19 Supply Organisation Certificate of Approval	59	57	60	56	56	59	58	50	42	32
Part 92 Dangerous Goods Packaging Approval	57	57	57	58	59	55	59	62	59	56
Part 129/108 Security Programme	28	26	21	23	23	22	25	33	39	43
Part 119/108 Security Programme	19	19	18	18	19	16	18	17	17	14
Part 121 Large Aeroplanes	10	10	9	9	9	8	8	7	6	5
Part 125 Medium Aeroplanes	15	16	15	15	15	12	15	15	13	11
Part 135 Helicopters and Small Aeroplanes	173	175	175	168	166	165	164	164	167	163
Part 119 Pacific/108 Security Programme	1	0	0	0	0	0	0	0	0	0
Pacific - Part 121 Large Aeroplanes	1	0	0	0	0	0	0	0	0	0
Pacific - Part 125 Medium Aeroplanes	1	0	0	0	0	0	0	0	0	0
Pacific - Part 135 Helicopters and Small Aeroplanes	1	0	0	0	0	0	0	0	0	0
Australian AOC Operating with ANZA Privileges	2	2	1	2	2	1	3	5	5	5
Synthetic Training Device (Airlines)	8	10	9	9	10	13	13	11	11	8
Synthetic Training Device (General Aviation)	29	26	29	33	26	30	31	28	36	37
Pilotless Aircraft Authorisation	0	0	0	3	8	2	0	0	0	0
Part 102 Unmanned Aircraft Operator Certificate	0	0	0	0	0	0	16	76	105	100
Total	986	987	980	1012	1000	970	1008	1060	1093	1060

* Note:

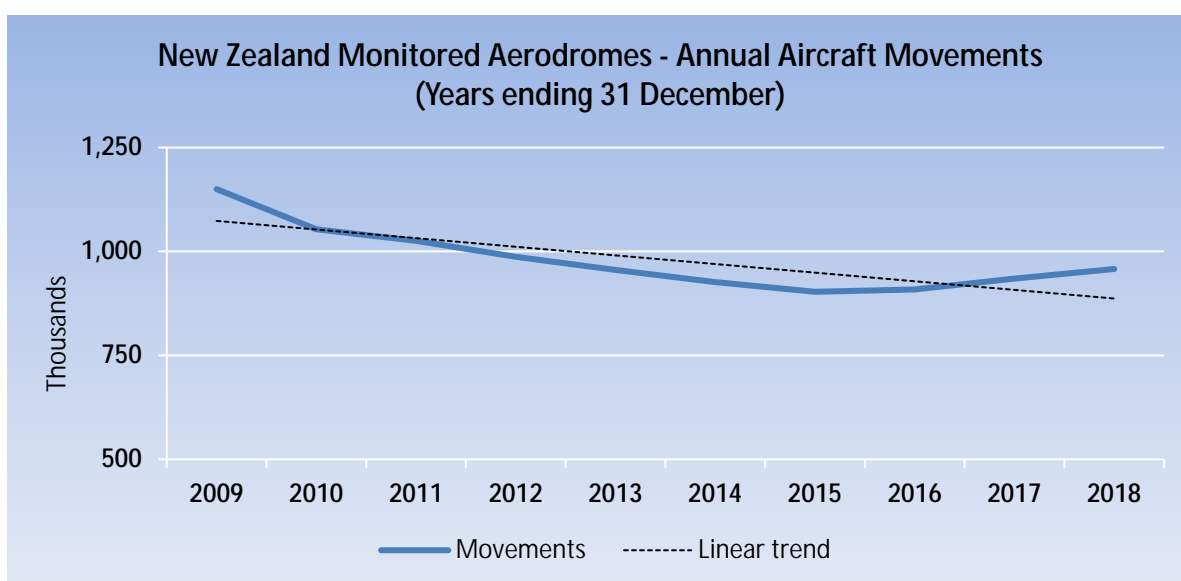
For organisations with Part 92 and for those with Part 172 certificates the figures show the total number of services that are certificated. This does not necessarily equate to the number of organisations that hold the certificate.

Aircraft Movements

Quarterly aircraft movement numbers are supplied to CAA by Airways Corporation for all aerodromes that they service, either by way of a control service or an information service. In addition Taupo airport voluntarily supplies movement information on a regular basis. A movement is defined as a take-off or a landing but touch-and-go operations are not defined. Airways counts each as a single movement, Taupo Airport counts each as two movements. This means that Taupo's values may not be validly compared with other aerodromes' but can of course be used to inform trends over time.

Long-Term Change in Aircraft Movements

The following graph shows the annual number of aircraft movements for the ten-year period ending 31 December 2018. Paraparaumu Airport has been omitted from this long term analysis because the available data is incomplete because there has only been a flight information service available since October 2011.



Breakdown by Aerodrome

The following table shows the number of aircraft movements reported at the following aerodromes: Auckland, Christchurch, Dunedin, Gisborne, Hamilton, Invercargill, Milford Sound, Napier, Nelson, New Plymouth, Ohakea, Palmerston North, Paraparaumu, Queenstown, Rotorua, Taupo, Tauranga, Wellington, Whenuapai and Woodbourne.

Annual Aircraft Movements at Aerodromes

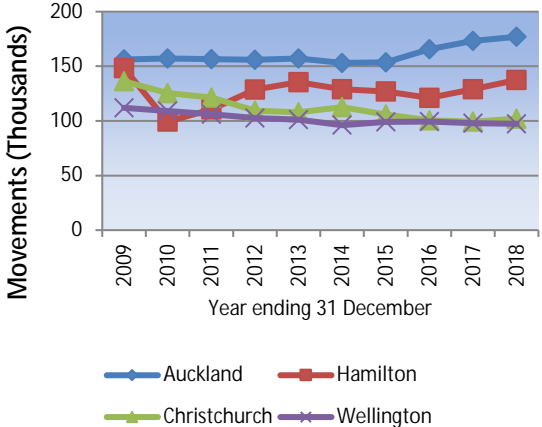
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Auckland	156325	157201	156655	156062	157141	153092	153561	165692	173204	176977
Hamilton	148380	99308	110419	128744	135404	129050	127044	121084	129058	137510
Christchurch	136249	125611	121469	109444	107754	112568	105760	100548	99293	101894
Wellington	111969	109193	105988	102488	101279	96084	99053	99443	97995	97305
Tauranga	97144	86935	74400	72652	70450	58448	52662	58340	62155	60014
Queenstown	45966	42347	41769	43776	43012	45620	49794	54347	59079	59715
Palmerston North	58761	56439	65708	67395	55960	52655	49494	48870	42819	42518
Nelson	48273	51570	50094	48073	45677	46770	45180	48469	46348	46378
Paraparaumu	6305	0	12832	33702	31241	24279	26115	27274	24052	22922
Ohakea	72997	61896	55726	30959	28807	36512	29632	26264	28796	31924
Napier	24114	27172	27332	25242	24386	22728	21268	23090	23082	24388
Dunedin	53602	44003	29229	25328	22758	22750	23276	21905	24342	26731
Taupo	30680	28774	26376	25536	23814	22642	22009	20792	20808	19688
Woodbourne	24058	22829	23660	22689	21826	20451	22374	20372	22714	22246
New Plymouth	43518	37097	32791	30773	24910	21831	19678	19684	19466	19587
Rotorua	20734	23380	22682	22092	22532	20143	19256	17870	19225	19199
Milford	14227	14042	13043	12902	13482	13980	16658	17475	20204	19022
Invercargill	25805	29279	30840	28491	23058	19960	15910	16939	18002	18046
Gisborne	23955	22174	22459	19594	17671	15897	16003	15331	17372	23037
Whenuapai	13220	14347	14675	14915	15419	14946	14392	12188	10687	9495
Total (excluding Paraparaumu)	1149977	1053597	1025315	987155	955340	926127	903004	908703	937893	958908

Movements data for individual aerodromes are graphed on the next page.

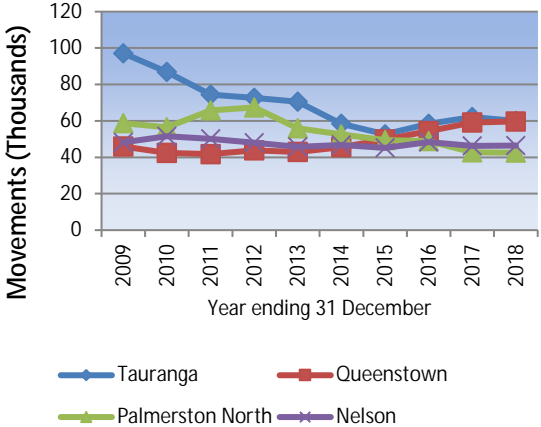
The aerodromes are grouped by the number of movements over the last year covered by this report.

Note that the scales are different for each chart to prevent the smaller aerodromes' graphs from becoming unreadable which would happen if all the charts had the same scales.

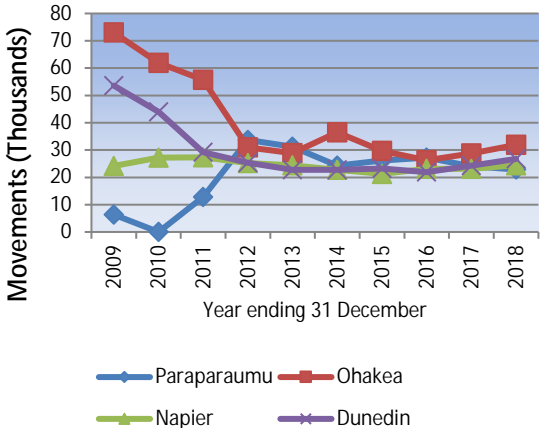
Annual Aircraft Movements at Aerodromes



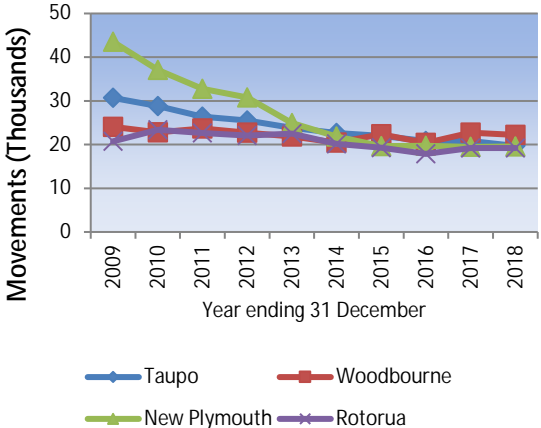
Annual Aircraft Movements at Aerodromes



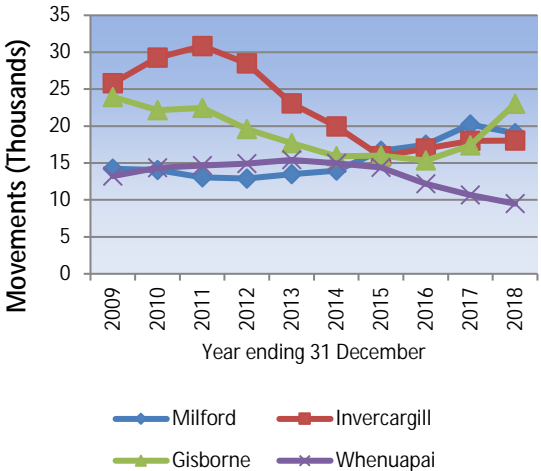
Annual Aircraft Movements at Aerodromes



Annual Aircraft Movements at Aerodromes



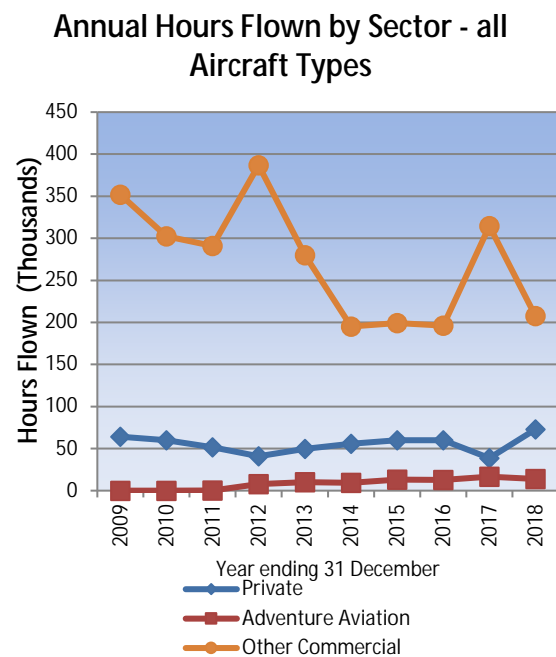
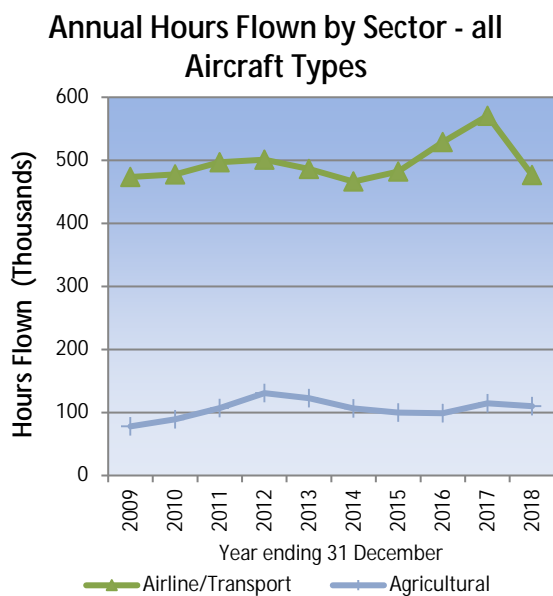
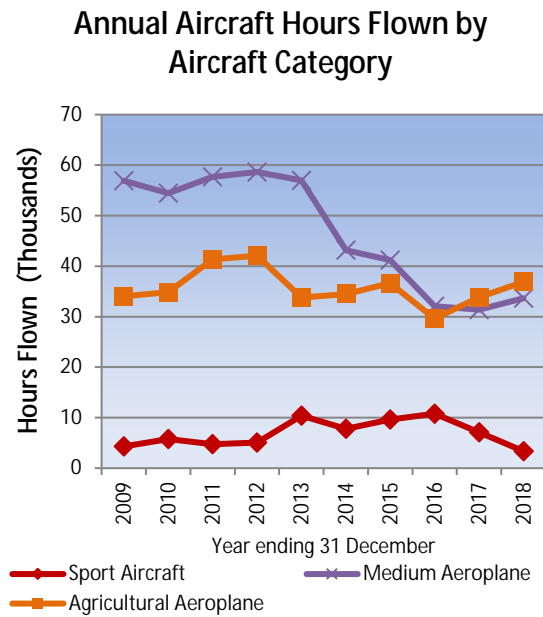
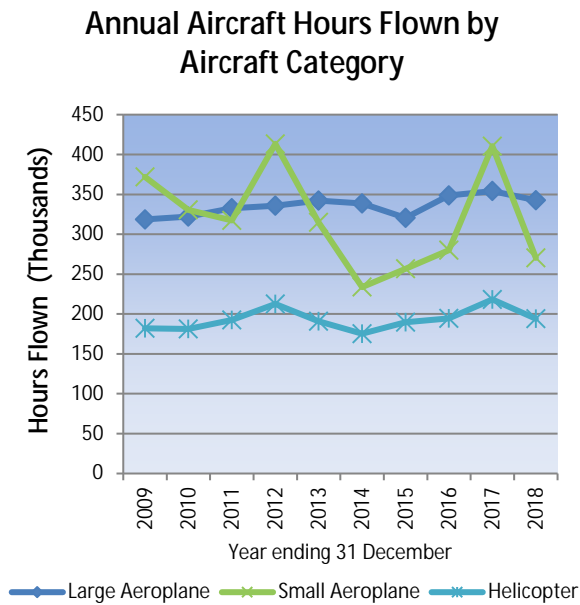
Annual Aircraft Movements at Aerodromes



Hours Flown

The following graphs show the estimated number of annual hours flown during the ten year period ending 31 December 2018. The estimates are based on the reported hours with an allowance for aircraft for which reports were not received. Recent improvements in the collection procedure for operating statistics data have resulted in improved return rates with a consequent improvement in confidence in the published data.

Note that these graphs exclude the aircraft statistics categories Sport Aircraft and Hang Gliders except where the aircraft are approved for use in Part 115 operations. Foreign registered aircraft that are operated in New Zealand and parachutes are also excluded.



Seat-Hours

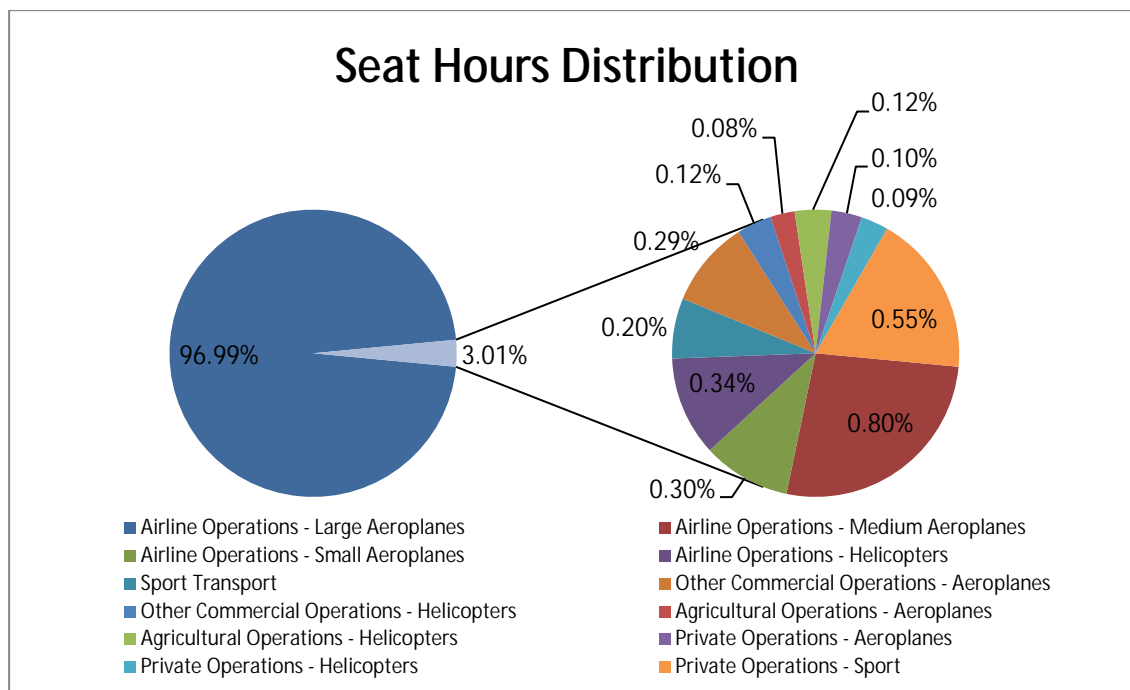
The following table indicates the size of the aviation industry as determined from Aircraft Operating Statistics in the relevant 2010 Safety Target Group categories for years ending 31 December.

A seat-hours measure is used as an indication of person exposure. For each Safety Target Group the total number of hours flown is multiplied by the average number of seats and an appropriate load factor, to give the number of seat hours utilised by the group (person exposure). For Safety Target Groups that are not predominantly passenger carrying a surrogate of 500 kg of aircraft weight is used instead of seats.

The values in the table are thousands of seat hours.

Safety Outcome Target Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Airline Operations - Large Aeroplanes	46,862	45,786	47,733	49,110	49,715	49,332	47,295	49,402	51,387	50,318
Airline Operations - Medium Aeroplanes	728	663	697	717	695	534	469	410	339	343
Airline Operations - Small Aeroplanes	102	102	111	110	96	73	105	152	195	113
Airline Operations - Helicopters	123	114	129	131	126	116	149	172	207	172
Sport Transport	122	122	103	66	98	89	97	104	114	117
Other Commercial Operations - Aeroplanes	277	262	234	294	272	179	151	150	203	246
Other Commercial Operations - Helicopters	101	101	97	98	73	60	71	60	54	67
Agricultural Operations - Aeroplanes	35	35	48	50	43	45	47	42	40	49
Agricultural Operations - Helicopters	95	98	114	84	91	77	63	63	76	76
Private Operations - Aeroplanes	56	53	50	42	39	46	51	53	41	60
Private Operations - Helicopters	52	48	40	34	39	46	48	47	32	46
Private Operations - Sport	206	206	216	252	271	267	272	279	291	313

Most sport aircraft do not report hours or seats, so a standard estimate of seat hours offered is used as well as reported data for such aircraft in these groups.



This chart shows that for the year ending June 2018 approximately 96.9% of seat hours were offered by the Airline Operations – Large Aeroplanes group, approximately 0.9% by the Airline Operations – Medium Aeroplanes group, with the remaining 2.2% of seat hours offered being split between the other safety target groups.

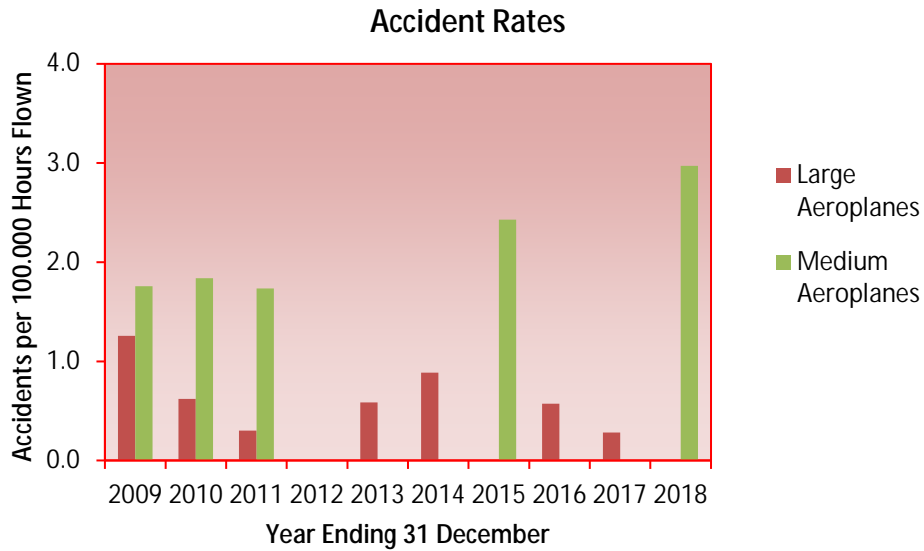
By comparison the 350,000 hours flown by the 136 large aircraft is only approximately 40% more than the 250,000 hours flown by the 1508 small aeroplanes on the register. The difference in passenger exposure is thus largely a function of the seating capacity.

Occurrence Analysis

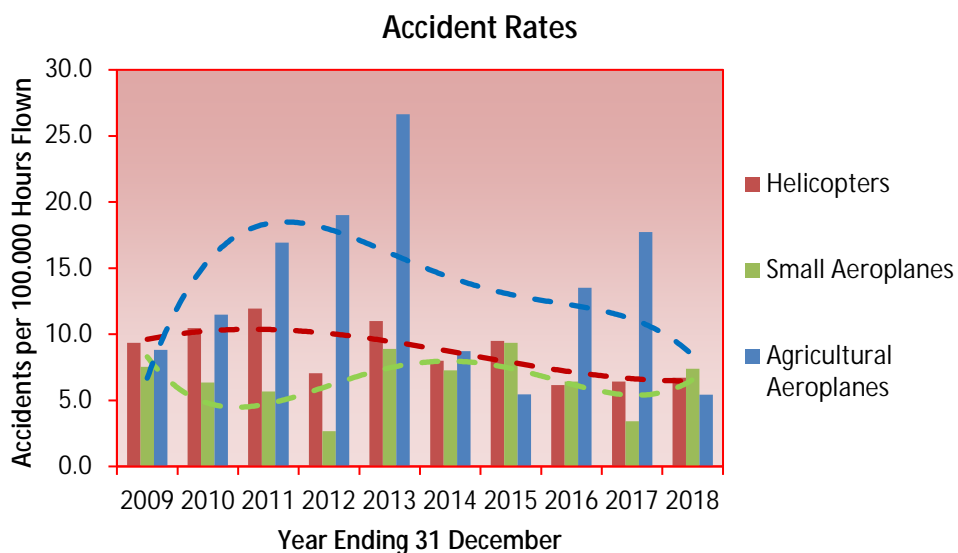
Aircraft Accidents

The following graphs show the annual aircraft accident rates (accidents per estimated 100,000 hours flown) for the ten calendar years up to and including 2018 (excluding the Sport Aircraft statistics category).

Breakdown by Aircraft Category

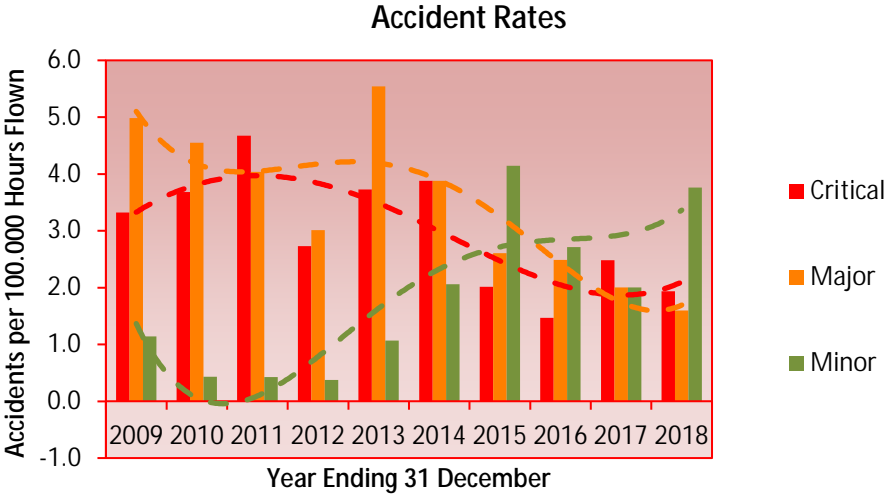


The numbers and rates of accidents in these two aircraft categories are too small for any trend analysis to be useful



Trends are indicated by dashed lines colour coded the same as the corresponding aircraft categories.

Breakdown by Severity



The definitions of Accident and Severity (see [Appendix](#)) are such that most accidents fall into the critical or major categories so the recent resurgence in the numbers of minor accidents is noteworthy.

Yearly Comparisons – counts, not rates

The tables below show the numbers of reported accidents broken down by aircraft type and accident severity.

The values relate to years ending 31 December

Critical Accidents

Aircraft Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Aeroplanes	0	0	0	0	1	0	0	0	0	0
Medium Aeroplanes	1	0	0	0	0	0	0	0	0	0
Small Aeroplanes	8	8	9	2	8	9	2	1	3	2
Helicopters	5	9	19	9	11	9	10	6	8	8
Sport Aircraft excluding Hang Gliders and Parachutes	17	15	15	15	12	12	5	4	11	5
Hang Gliders	6	3	6	8	9	5	5	4	6	11
Parachutes	1	3	3	5	1	7	2	3	8	10
Agricultural Aeroplanes	1	2	1	3	2	2	0	2	3	1
Unknown	0	0	0	0	1	0	0	0	1	1
Total	39	40	53	42	45	44	24	20	40	38

Major Accidents

Aircraft Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Aeroplanes	0	1	1	0	1	1	0	2	0	0
Medium Aeroplanes	0	0	1	0	0	0	1	0	0	0
Small Aeroplanes	16	12	9	7	18	3	8	7	2	4
Helicopters	12	10	4	6	9	5	4	4	6	4
Sport Aircraft excluding Hang Gliders and Parachutes	18	17	17	13	18	21	7	9	9	6
Hang Gliders	10	4	3	2	2	4	5	5	7	2
Parachutes	4	3	4	6	2	2	3	3	5	0
Agricultural Aeroplanes	2	2	4	5	6	0	2	0	3	0
Unknown	0	0	2	1	0	2	0	0	1	0
Total	62	49	45	40	56	38	30	30	33	16

Minor Accidents

Aircraft Type	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Large Aeroplanes	4	1	0	0	0	2	0	0	1	0
Medium Aeroplanes	0	1	0	0	0	0	0	0	0	1
Small Aeroplanes	4	1	0	2	2	5	14	10	9	14
Helicopters	0	0	0	0	1	0	4	2	0	1
Sport Aircraft excluding Hang Gliders and Parachutes	3	1	1	2	5	9	17	9	10	16
Hang Gliders	8	12	2	2	4	9	18	10	4	5
Parachutes	2	1	4	1	4	3	3	4	4	1
Agricultural Aeroplanes	0	0	2	0	1	1	0	2	0	1
Unknown	0	0	1	0	1	0	0	1	1	0
Total	21	17	10	7	18	29	56	38	29	39

Significant Accidents

This section describes [significant](#) accidents reported as occurring during the period covered by this report. The section is grouped by safety outcome target group. Groups with no significant events have been omitted. For each incident the location is stated before the description.

Sport Transport

- Queenstown: During a tandem sky diving operation, parachute malfunction resulted in the tandem pair landing in Lake Wakatipu. The tandem master was recovered from the lake with serious injuries but the passenger is still missing. Occurrence Id: 18/84

Other Commercial Operations -Helicopters

- Wanaka: A/c crash in vicinity Stevenson rd. 3 fatalities. Occurrence Id: 18/7324

Safety Target Structure

The 2010 Safety Targets classify all New Zealand aviation under three broad group headings: Public Air Transport, Other Commercial Operations, and Non-commercial Operations. Thirteen further sub-groups enable differentiation between aeroplanes, helicopters, and sport aircraft, and also allow for different weight groups. This section presents the same accidents as the previous section but classified by type of operation (sector) rather than type of aircraft.

Number of Accidents

The following table shows, for each safety target group, the number of accidents each year for the last ten calendar-years ending with 2018. All aircraft types are included.

Safety Outcome Target Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Airline Operations - Large Aeroplanes	4	2	1	0	2	3	0	2	1	0
Airline Operations - Medium Aeroplanes	1	1	1	0	0	0	1	0	0	0
Airline Operations - Small Aeroplanes	3	2	3	0	3	1	1	1	1	1
Airline Operations - Helicopter	0	0	0	0	0	0	0	0	0	0
Sport Transport	17	10	11	8	4	12	13	12	14	11
Other Commercial Operations - Aeroplane	0	0	0	0	0	0	0	0	0	0
Other Commercial Operations - Helicopter	0	0	0	0	0	0	0	0	0	0
Agricultural Operations - Aeroplane	0	0	0	0	0	0	0	0	0	0
Agricultural Operations - Helicopter	0	0	0	0	0	0	0	0	0	0
Private Operations - Aeroplane	0	0	0	0	0	0	0	0	0	0
Private Operations - Helicopter	0	0	0	0	0	0	0	0	0	0
Private Operations - Sport	53	50	46	40	43	53	45	38	44	36
Other	1	0	2	1	2	1	0	0	3	0
None	0	0	0	0	0	0	0	0	0	2
Total	79	65	64	49	54	70	60	53	63	50

Not all accidents generate equal consequences and the usefulness of the above data for focussing intervention decisions is limited. The 'Sport Transport' group ranks 2nd in this data but when consequential factors like fatalities, serious injuries and aircraft damage are taken into account the ranking changes to 3rd as can be seen from the next section.

Annual Social Cost

Social cost is a measure of the impact of fatal, serious and minor injuries and aircraft destroyed. The measure has been developed and maintained by the Ministry of Transport, and is updated annually. The following table displays the social cost expressed in millions of 2015 dollars for each safety target group for the last ten calendar-years ending with 2017. The table is sorted by the social cost in the 2017 year

Safety Outcome Target Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Private Operations - Aeroplane	1.5	8.7	0.2	6.7	0.4	4.3	18.3	0.1	1.1	0.0
Other Commercial Operations - Helicopter	0.8	0.0	19.4	16.5	0.4	0.9	14.8	0.0	6.7	5.1
Private Operations - Sport	13.8	24.5	25.3	30.4	14.9	12.7	6.9	14.4	34.2	29.4
Airline Operations - Helicopter	2.5	1.3	0.4	0.4	6.1	9.2	10.0	31.0	2.4	0.0
Agricultural Operations - Helicopter	1.1	0.0	1.3	5.8	0.0	11.4	6.1	0.5	11.0	0.0
Private Operations - Helicopter	4.5	1.7	8.4	0.0	5.5	8.7	5.7	5.3	4.5	0.0
Airline Operations - Small Aeroplanes	0.2	0.6	0.0	0.2	0.8	1.0	5.2	0.0	0.0	0.0
Sport Transport	23.3	1.9	1.8	47.3	0.7	1.0	2.4	1.0	4.5	6.1
Agricultural Operations - Aeroplane	5.1	1.8	0.0	0.0	5.9	1.8	0.8	0.0	9.3	0.0
Airline Operations - Large Aeroplanes	0.1	0.0	0.0	0.1	0.1	3.5	0.1	0.1	1.4	0.2
Other Commercial Operations - Aeroplane	0.2	4.7	48.1	0.2	0.2	11.8	0.2	0.0	0.5	0.0
Airline Operations - Medium Aeroplanes	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Other	8.3	0.0	0.0	0.0	8.7	0.0	0.0	0.4	2.4	0.0
Total	61.5	45.3	104.8	107.6	43.5	66.4	70.7	52.6	78.0	40.9

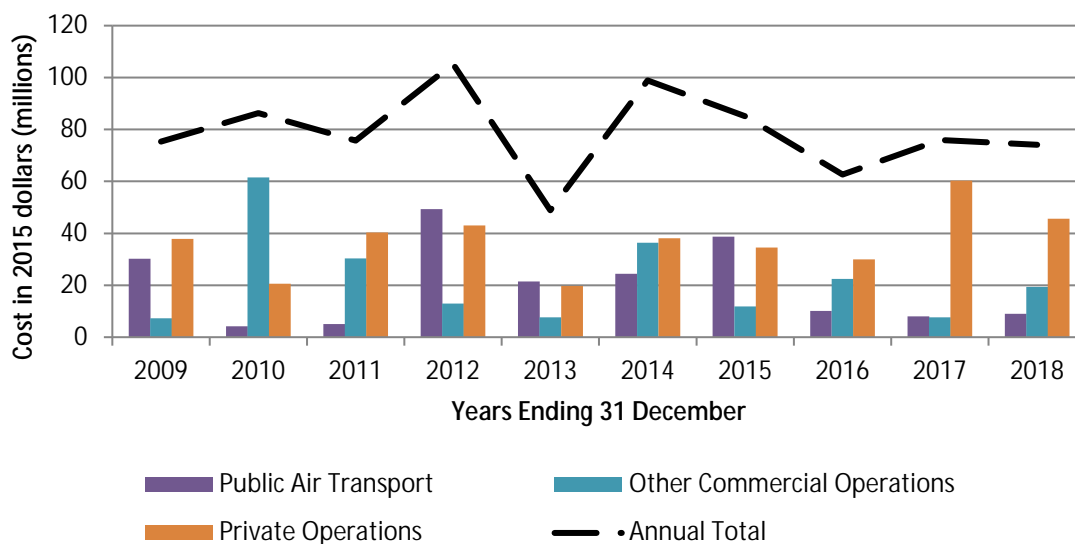
Social Cost Analysis

The extreme value of 107.6 million dollars in the year ending 31 December 2012 is largely a result of a multiple fatality accident in the ballooning sector. The year ending 30 December 2018 has incurred a social cost lower than the average of the previous nine years.

The following charts show the annual social cost for each Safety Outcome Target Group for the ten calendar years ending with 2018. Note that the Sport groups include hang gliders and parachutes. These charts show the same data as the table above but are intended to give a more visual perspective on the Safety performance of the industry as measured by the Social Cost.

The first chart shows a breakdown into the three major groups, Public Air Transport (including Adventure Aviation), Other Commercial (including Agricultural) and Private operations.

Annual Social Cost - New Zealand Aviation



Arising from:

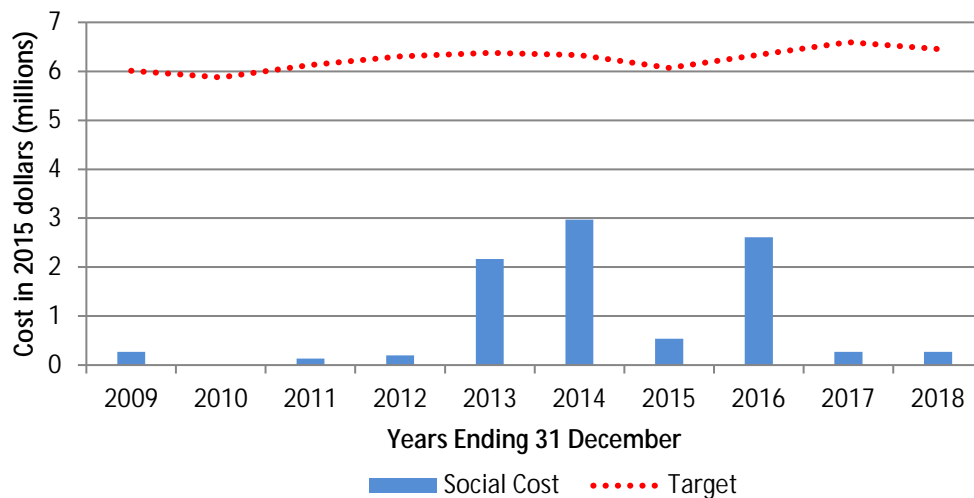
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	13	15	11	21	7	12	16	8	12	14
Serious Injuries	17	18	23	19	26	44	20	27	31	15
Minor Injuries	28	26	17	15	44	34	52	36	38	39
Aircraft Unusable	18	16	23	12	19	28	15	9	13	5

The next charts show the breakdowns by individual Safety Outcome Target Group.

Each chart also shows the social cost target for the group. These targets were set in 2005 as a 'social cost dollars per seat-hour flown' value. For the graphs below, these target figures have been scaled by the seat hours estimated to have been flown within the group and adjusted by the general consumer price index for the intervening years.

Each chart is followed by a table showing the numbers of injuries or events that contributed to the social cost.

Annual Social Cost Airline Operations - Large Aeroplanes



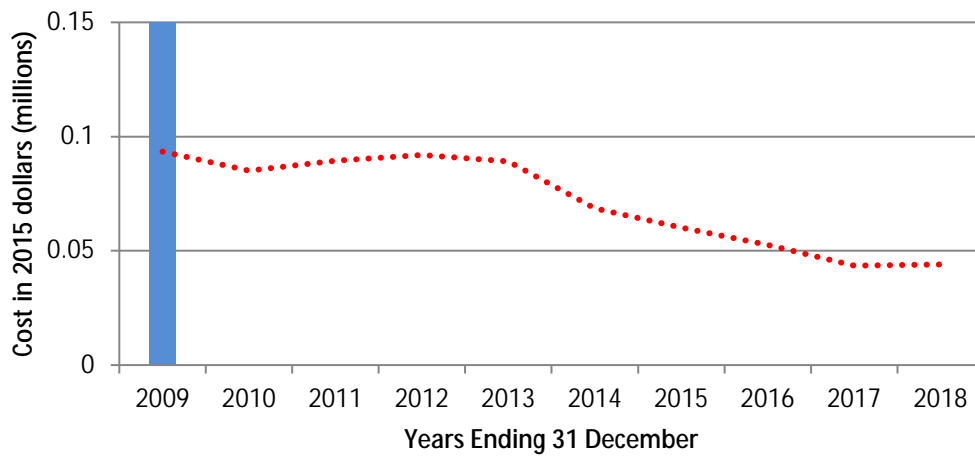
Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	0	0	0	0	0	0	0	0
Serious Injuries	1	0	0	0	2	1	0	3	0	0
Minor Injuries	4	0	2	3	9	1	8	4	4	12
Aircraft Unusable	0	0	0	0	0	1	0	0	0	0

The most significant contribution was one aircraft written off in 2014

Because of the number of seats offered within this group the potential exists for a single event to be catastrophic. Accordingly the operators give priority to safety and the CAA maintains relatively tight surveillance. The outcome is a level of safety well within the target level.

Annual Social Cost Airline Operations - Medium Aeroplanes



Arising from:

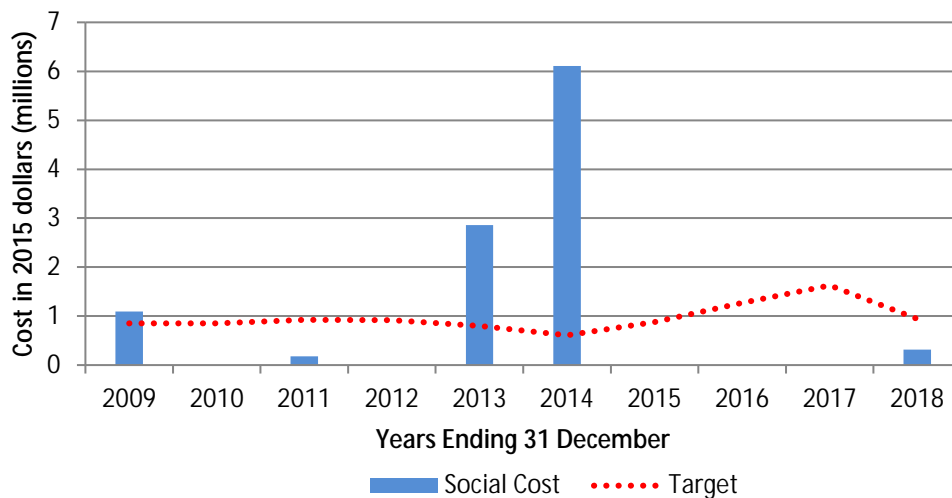
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	0	0	0	0	0	0	0	0
Serious Injuries	0	0	0	0	0	0	0	0	0	0
Minor Injuries	3	0	0	0	0	0	0	0	0	0
Aircraft Unusable	0	0	0	0	0	0	0	0	0	0

The only contribution is three minor injuries in 2009

Because of the number of seats offered within this group the potential exists for an event to be catastrophic. Accordingly the operators give priority to safety and the CAA maintains relatively tight surveillance. The outcome is a level of safety well within the target level.

The much lower level of activity within this sector (1.0% of all the seat-hours in the industry) means that a single event has the ability to cause the social cost to exceed the target in the year the event occurred. This is not seen as a problem as long as the target is met on average over an extended period.

Annual Social Cost Airline Operations - Small Aeroplanes



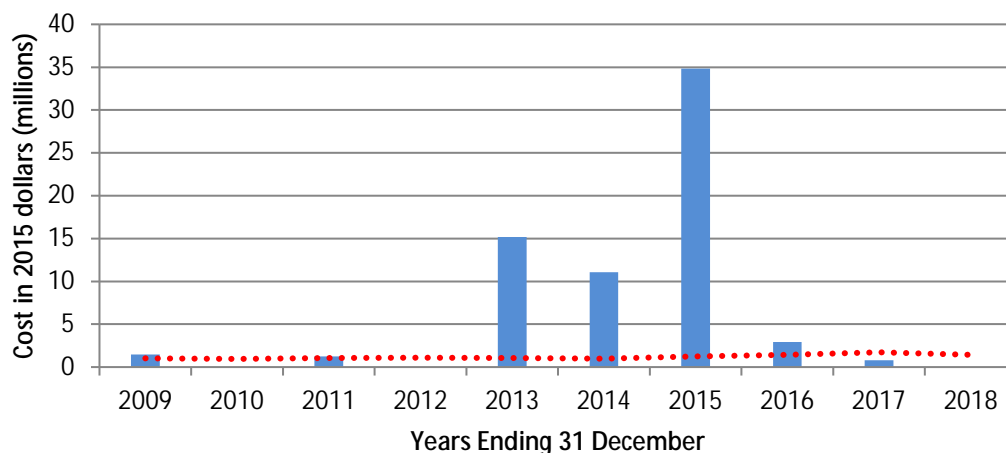
Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	0	0	0	1	0	0	0	0
Serious Injuries	1	0	0	0	3	2	0	0	0	0
Minor Injuries	2	0	0	0	0	2	0	0	0	2
Aircraft Unusable	1	0	1	0	2	2	0	0	0	1

One fatal accident in 2014 is the major contributing factor in this group coupled with an average aeroplane write-off rate of 0.6 per year over the last ten years. There have also been 6 serious injuries 5 of which occurred in the last five years.

The safety trend in this group is a concern with this measure having exceeded the target for two of the last five years. This was one of the reasons for commencing the Part 135 sector risk profile, published November 2015.

Annual Social Cost Airline Operations - Helicopters



Arising from:

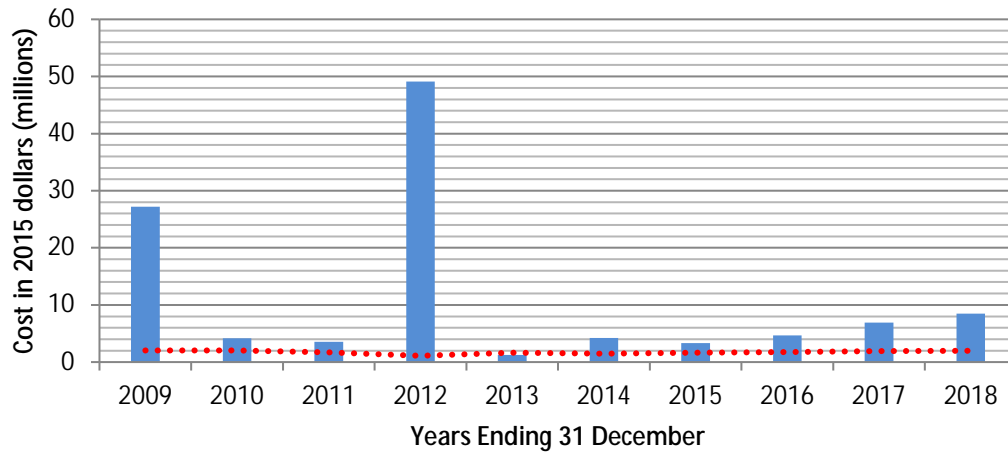
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	0	0	2	1	7	0	0	0
Serious Injuries	0	0	1	0	1	4	2	1	1	0
Minor Injuries	2	0	2	0	5	4	1	2	0	0
Aircraft Unusable	1	0	1	0	3	4	2	1	0	0

This group has generated ten fatalities in the last ten years, all of them in the last four years. This coupled with three aircraft write-offs in 2013 and an increasing number of serious and minor injuries in the recent years means there is concern about the safety trend in this group.

The social cost target has been met or very closely approached in six of the last ten years.

The helicopter sector has been identified as a priority area for the CAA in the 2018/19 strategic safety plan. This sector was also examined by the Part 135 Sector Risk Profile Published November 2015 on the CAA website.

Annual Social Cost Sport Transport



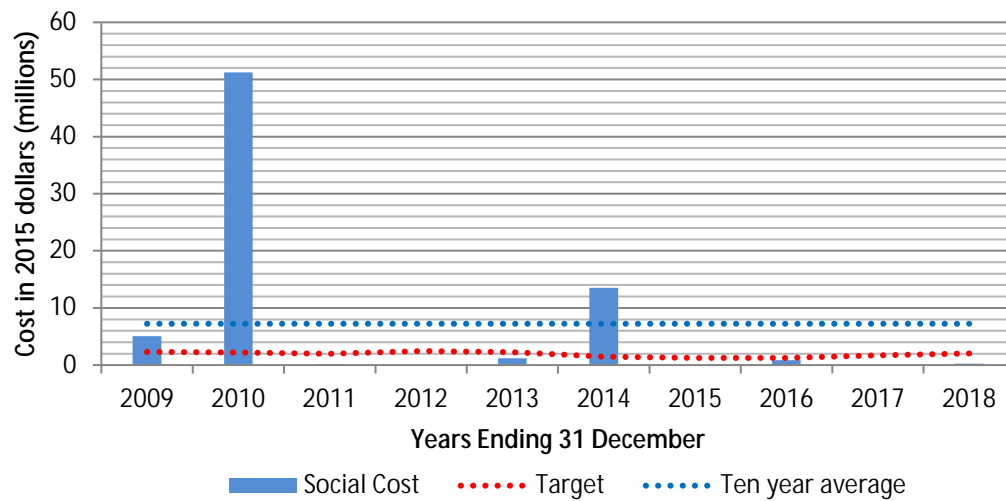
Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	5	0	0	11	0	0	0	0	0	1
Serious Injuries	6	5	4	3	3	7	3	5	9	4
Minor Injuries	7	4	7	4	4	7	11	11	10	6
Aircraft Unusable	4	1	0	1	1	7	1	0	0	0

Eleven fatalities in 2012 dominate the safety performance of this group. Since November 2011 this group has included the Adventure Aviation (Rule Part 115) operations. The slightly higher social cost target for this operation category reflects the greater degree of risk.

The group has exceeded, met or approached the social cost targets in nine of the last ten years.

Annual Social Cost Other Commercial Operations - Aeroplanes



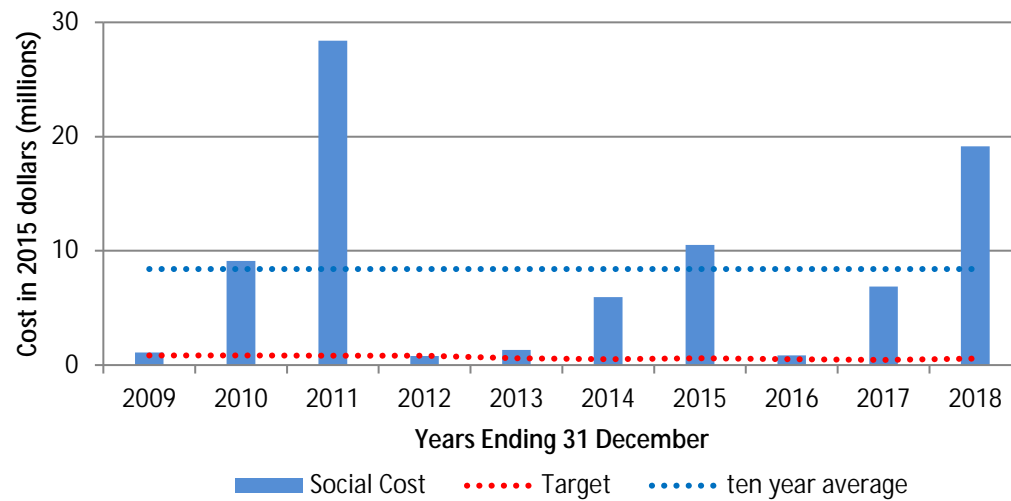
Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	1	11	0	0	0	2	0	0	0	0
Serious Injuries	0	2	0	0	1	5	0	1	0	0
Minor Injuries	0	0	0	0	1	5	0	1	0	2
Aircraft Unusable	3	5	1	0	2	5	0	0	0	0

The most noteworthy event in this group is an accident in 2010 in which five crew and four passenger fatalities occurred during a parachuting transport flight.

The low level of activity within this sector (0.3% of all the seat-hours in the industry) means that a single event has the ability to cause the social cost to exceed the target in the year the event occurred. This is not seen as a problem as long as the target is met on average over an extended period. This is not the case in this group.

Annual Social Cost Other Commercial Operations - Helicopters



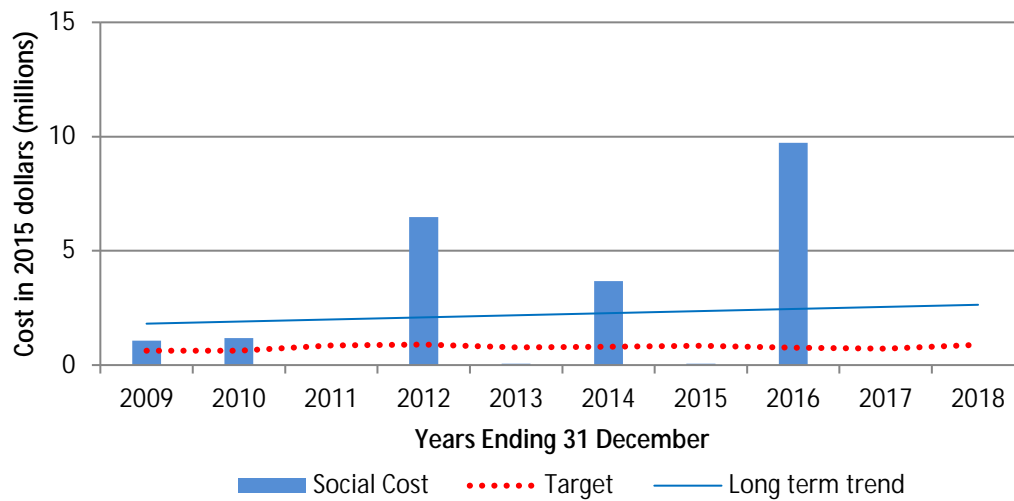
Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	4	3	0	1	3	0	1	1
Serious Injuries	1	0	1	1	0	3	0	0	2	2
Minor Injuries	2	0	1	2	2	2	3	1	0	4
Aircraft Unusable	1	0	4	3	1	1	5	0	2	0

This group seems to display an almost cyclic pattern of safety failure. It is possible that economic pressures might influence behaviour but difficult to show any reliable correlation.

The low level of activity within this sector (0.13% of all the seat-hours in the industry) means that a single event has the ability to cause the social cost to exceed the target in the year the event occurred. While this may not be a problem as long as the target is met on average over an extended period, this is not the case in this group. The ten year average significantly exceeds the target. For this reason commercial helicopter operations are one of the CAAs ongoing focus areas.

Annual Social Cost Agricultural Operations - Aeroplanes

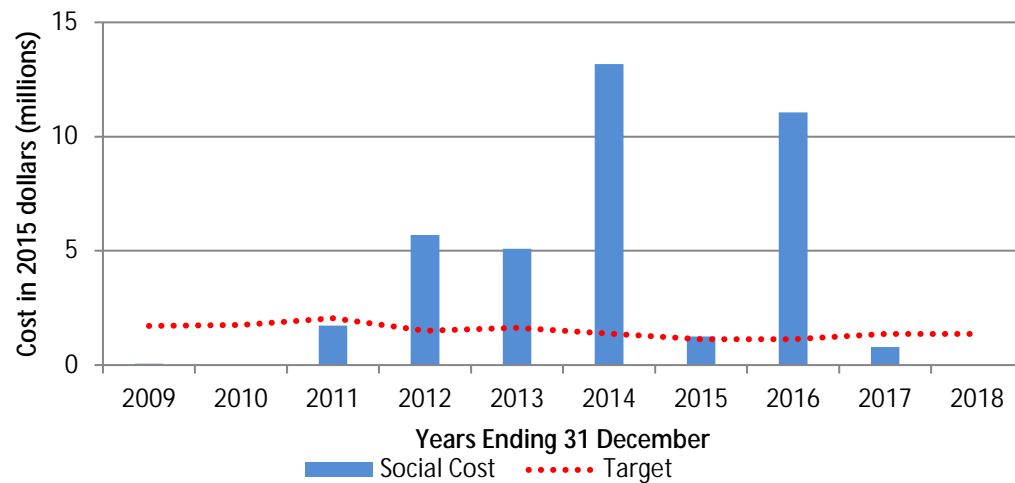


Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	1	0	0	0	1	0	0	0	2	0
Serious Injuries	0	1	0	0	1	2	1	0	0	0
Minor Injuries	0	2	0	0	1	0	1	0	0	0
Aircraft Unusable	1	2	0	0	2	1	1	0	1	0

This group's safety performance is closely monitored and following significant safety failures the performance usually improves for a few years before rising again, often with increase in activity as evidenced by tonnage spread (see graph on page 12). The long term linear trend in social cost was downward in the previous report but is now trending slightly upwards and is well above the target level.

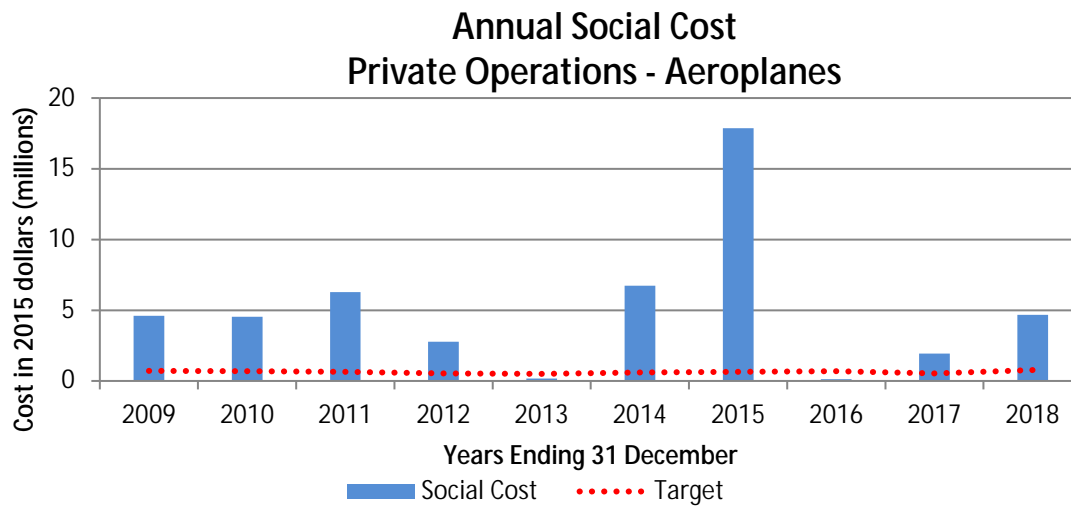
Annual Social Cost Agricultural Operations - Helicopters



Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	0	0	1	0	1	1	0	2	0
Serious Injuries	1	0	0	0	0	0	0	1	1	0
Minor Injuries	2	0	0	0	0	1	1	1	0	0
Aircraft Unusable	2	0	0	2	0	2	3	0	2	0

Although the absolute social costs of the safety failures in this group are on a par with those of the agricultural aeroplanes group, it must be remembered that this group operates about twice the number of hours of the aeroplane group, representing a better safety performance per flying hour. Nevertheless social cost levels in four of the last five years are a cause of concern. Significant longer term interventions are in place with the support of the industry, including distributing accident and incident information and a campaign to raise awareness about wire strike risks.

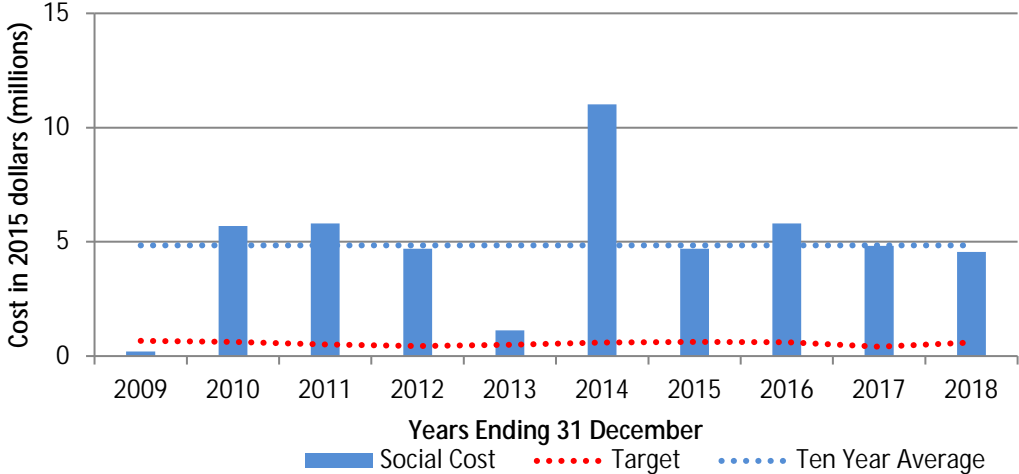


Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	0	1	0	1	0	1	4	0	0	0
Serious Injuries	3	0	0	5	0	0	2	0	2	0
Minor Injuries	1	1	0	0	1	0	4	3	2	2
Aircraft Unusable	1	2	1	2	2	1	4	0	1	1

Until 2014 there was some optimism that the safety performance in this group was improving but the 2014 and 2015 results are trending the wrong way. The social cost target has been met or bettered on only three of the last ten years.

Annual Social Cost Private Operations - Helicopters

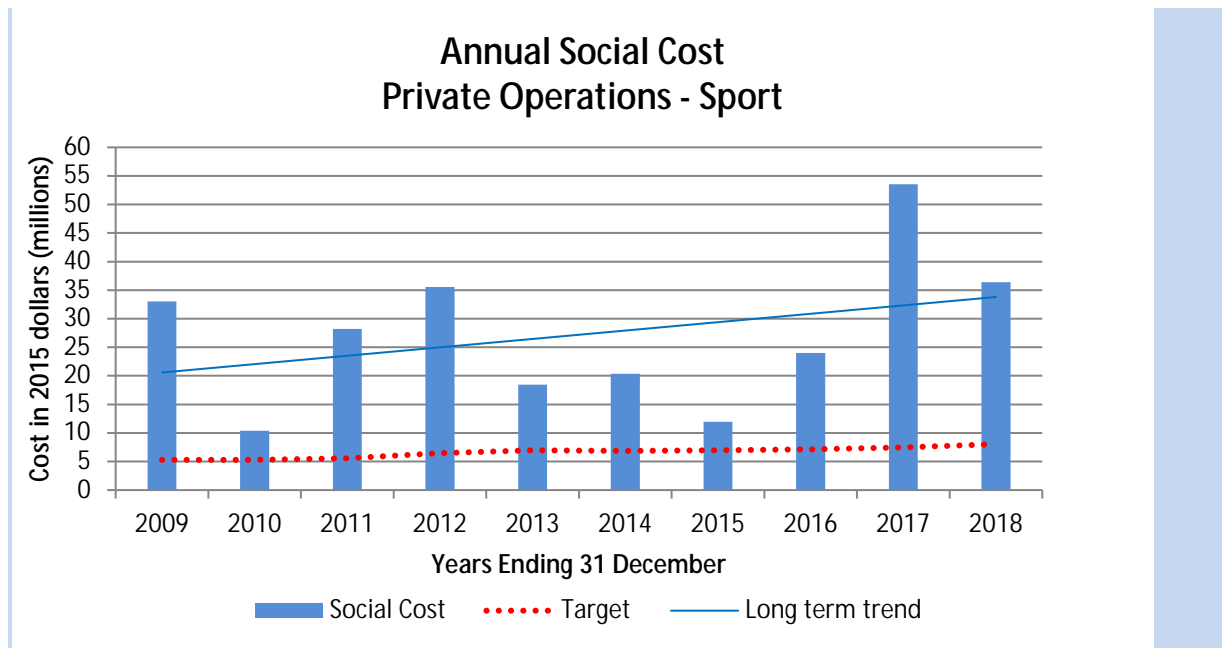


Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	1	0	1	0	1	2	1	1	1	0
Serious Injuries	0	0	3	0	0	0	2	1	0	0
Minor Injuries	0	5	1	0	2	0	1	0	2	1
Aircraft Unusable	1	2	5	0	4	1	2	2	1	0

The last three years are trending the wrong way.

This is a small group and the social costs can be expected to vary considerably from year to year. Even so the long term average is well above target.



Arising from:

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Fatalities	2	6	5	6	2	2	0	2	7	6
Serious Injuries	12	8	11	11	14	9	14	13	11	10
Minor Injuries	5	17	5	4	11	12	21	19	6	10
Aircraft Unusable	3	6	7	6	4	3	7	2	4	3

This group clearly stands out as the major contributor to the social cost in the private operations sector. The group includes the microlight, amateur-built, parachute and paraglider aircraft types and accordingly represents a large number of aircraft.

The social cost trend over the last three years has been increasing. The long term trend is increasing and is well above the target.

Of note are the significant increases in the numbers of minor injuries in four of the last seven years and serious injuries over the last six years.

Flight Phase

The following table shows the flight phase recorded for accidents for the ten one-year periods ending 31 December. The figures include all aircraft types. The table is ordered by the 2018 values.

Flight Phase	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
LANDING	37	43	37	35	48	42	48	44	40	39
TAKEOFF	30	19	20	11	17	20	16	12	17	14
CRUISE	15	5	14	7	16	13	14	8	11	13
UNKNOWN	1	2	1	2	2	5	3	5	14	5
APPROACH	5	3	8	5	5	9	3	6	2	4
CLIMB	7	8	8	2	6	8	7	3	3	5
PARKED	2	4	2	5	5	0	3	3	1	0
DESCENT	5	6	0	6	4	3	6	2	5	3
HOVER	3	4	4	2	5	1	3	2	0	2
AGRICULTURAL MANOEUVRES	4	3	1	5	2	2	2	1	1	2
TAXIING	5	3	5	3	3	4	5	1	3	1
HOVER TAXI	0	0	0	1	2	0	0	1	0	0
CIRCUIT	0	1	1	0	0	1	0	0	2	0
Not Recorded	8	5	7	4	4	2	0	0	2	3
HOLDING	0	0	0	0	0	0	0	0	0	0
AEROBATICS	0	0	0	1	0	1	0	0	1	0

The most common phase of flight during which accidents occurred in the year ending 31 December 2018 was the Landing phase (44%). This proportion of accidents by flight phase is largely unchanged from previous years and reflects the fact that landing is the highest risk phase of flight.

The most common descriptor assigned to Landing Phase accidents during the 2018 year was 'Damage to aircraft' at 12%.

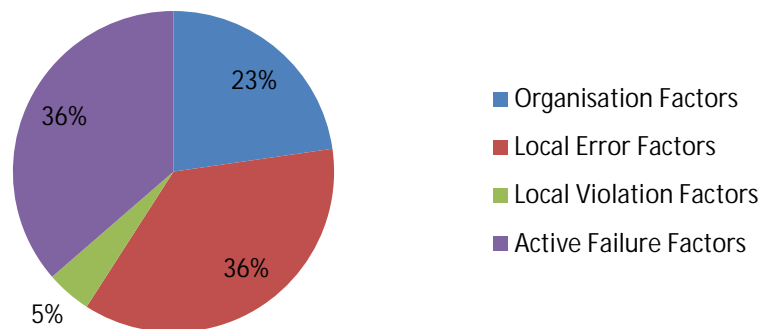
The most common causes (at 8%, 7% and 6% respectively) recorded for Landing phase accidents during the year ending 31 December 2018 were 'Active Failure Factors - POOR PROCEDURE "ACTION", ' Active Failure Factors - PRIMARILY "STRUCTURAL/MECHANICAL", "Local Error Factors - RISK MISPERCEPTION".

Accident Causal Factors

795 causal factors have been assigned to 373 (40%) of the 944 accidents that were reported as occurring during the ten years ending 31 December 2018.

The following chart shows the distribution of cause categories (groupings of causal factors) recorded for those accidents.

Distribution of Cause Categories

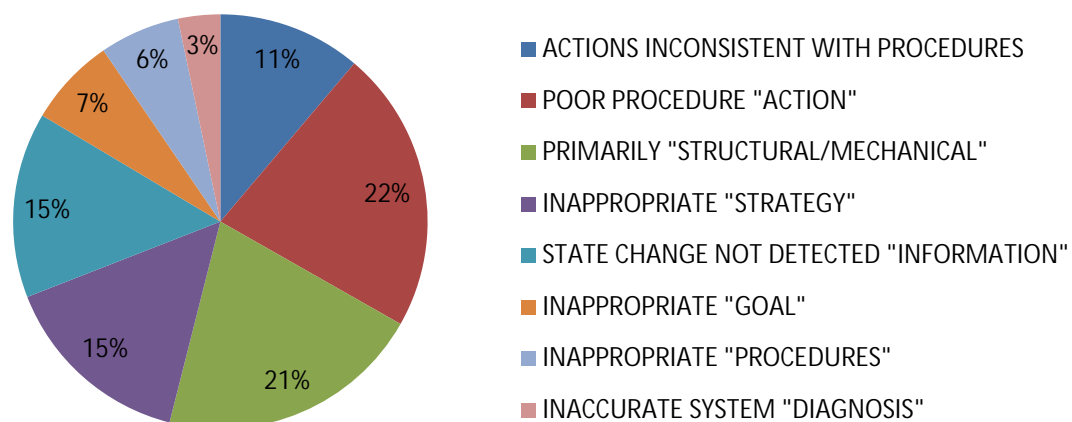


Active Failure Factors

The Active Failure cause category has been further analysed on the grounds that whatever precursor latent failures may exist and be discovered during a subsequent investigation, at least one 'Unsafe Act' (e.g. Omitted checklist item, Exceeded ability etc.) must occur for an accident to result. These unsafe acts are collectively grouped as Active Failure Factors.

The following chart shows the distribution of Active Failure factors during the same period as above.

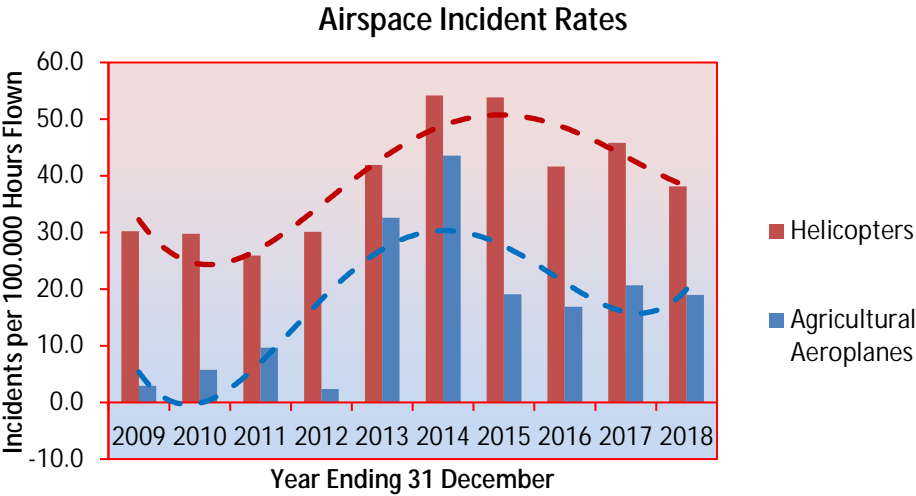
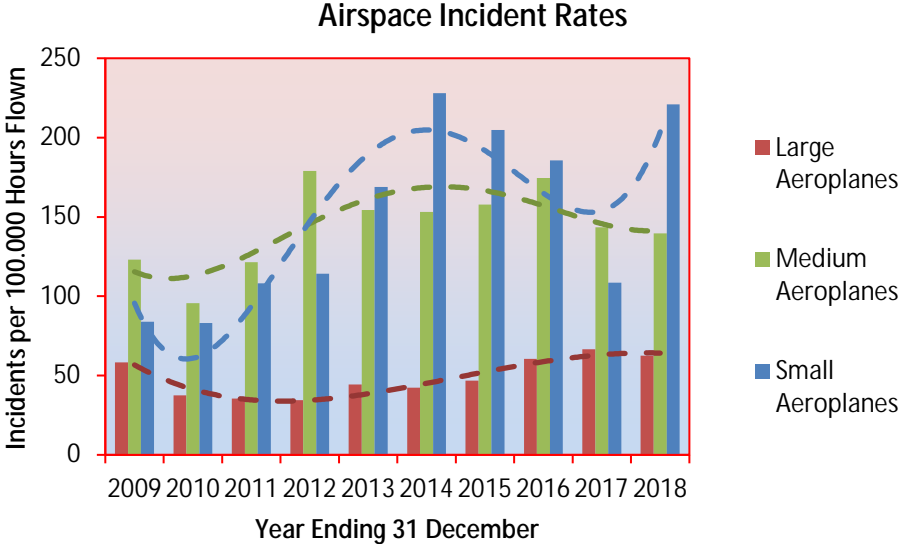
Distribution of Active Failure Factors



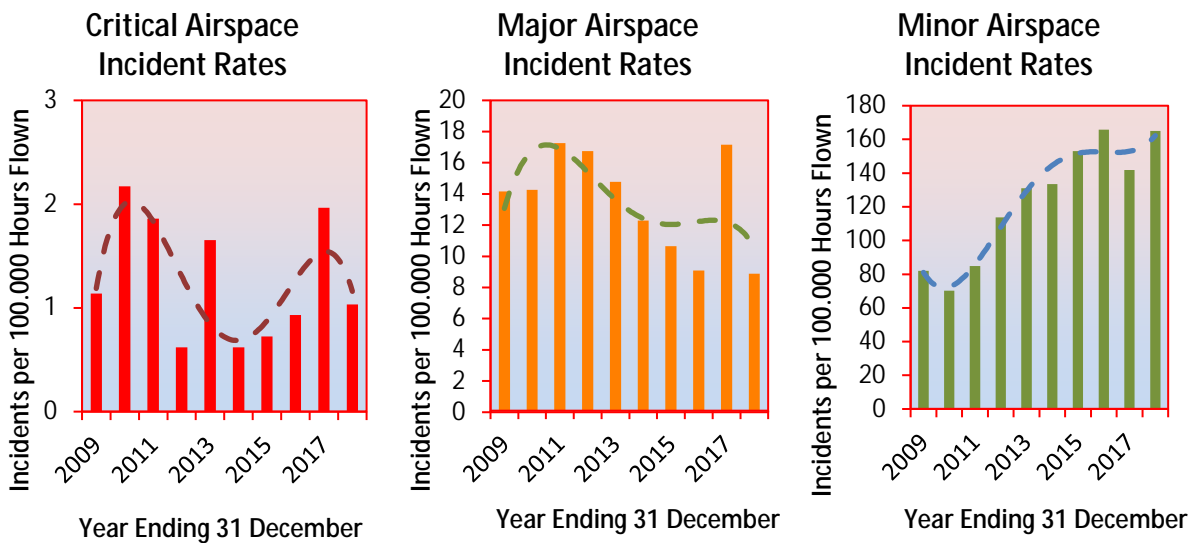
Airspace Incidents

The following graphs show the reported annual airspace incident rates (incidents per 100,000 hours flown) for the ten one-year periods ending 31 December 2018 (excluding the Sport Aircraft category). The graphs do not differentiate between incidents that are pilot or ATS attributable.

Breakdown by Aircraft Category

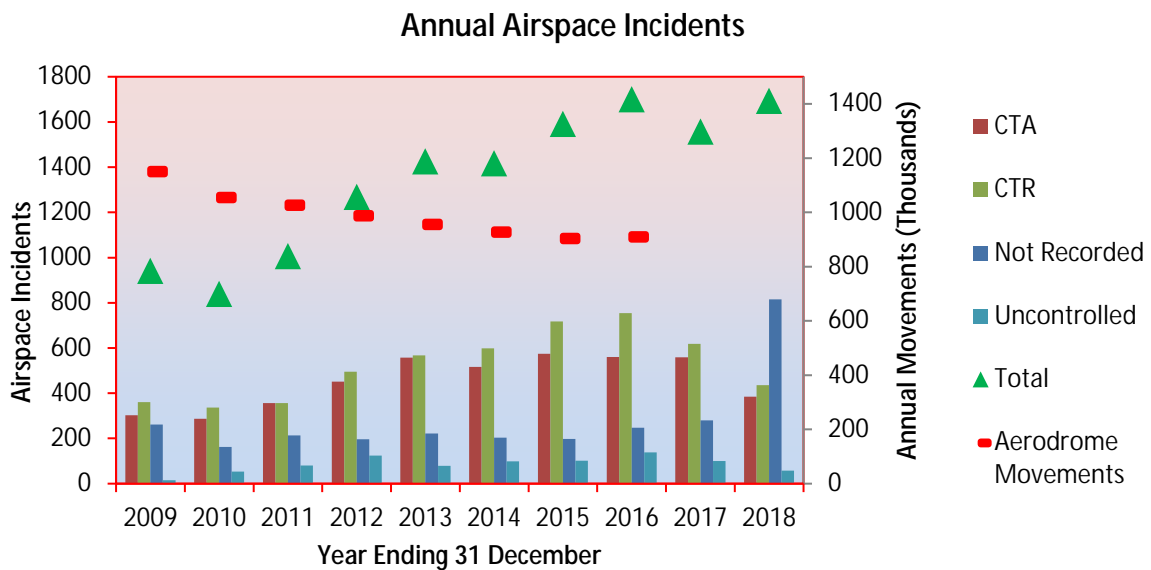


Breakdown by Severity



Breakdown by Airspace Designation

(Counts not Rates)



After June 2011 a sudden onset of a steady increase in the total numbers of reported airspace incidents is evident. This was in an environment of a steady but slower decrease in the reported number of aerodrome movements. No single underlying cause for this increase has been identified, although Airways Corporation began several safety enhancement training initiatives around this time.

Breakdown of Airspace Incidents in Control Zones by Aerodrome

Aerodrome	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Hamilton	45	59	54	172	136	125	168	182	105	75
Auckland	39	41	38	39	59	45	73	106	78	40
Christchurch	40	36	33	32	52	53	92	72	92	44
Tauranga	15	15	38	46	57	66	86	54	34	28
Wellington	47	29	37	34	38	29	42	58	39	19
Queenstown	21	23	39	24	34	57	47	46	63	43
Nelson	26	23	28	19	17	26	35	40	28	28
Palmerston North	34	22	20	29	37	61	36	37	37	27
Dunedin	5	20	8	26	31	39	32	40	29	28
Rotorua	15	15	17	14	14	10	14	22	16	20
Woodbourne	31	16	12	10	15	19	24	17	22	6
Napier	7	8	6	13	17	18	17	17	23	12
Gisborne	4	3	5	5	13	10	13	13	6	19
Ohakea	10	5	7	8	14	15	11	7	5	5
Whenuapai	6	3	7	8	12	10	9	8	9	4
Invercargill	2	6	3	2	3	4	5	10	5	8
New Plymouth	6	10	3	3	13	4	8	2	16	6

Airspace Incident Attributability

Introduction

Airspace incidents are categorised as

- ATS or
- Pilot or
- ATS and pilot attributable.

The categorisation is based on the result of an investigation if available otherwise it is based on the descriptor assignment.

For the purposes of this analysis airspace incidents have been divided into those that have been identified to have an ATS-attributable element and those that have a pilot-attributable element. Accordingly there is some overlap in the number of occurrences reported where both ATS and pilot elements are involved.

Note: ATS-attributable airspace occurrences include those that are attributable to both New Zealand and external ATS organisations. External ATS organisations are included where information coordination problems have arisen or where a New Zealand registered aircraft has reported a conflict in non-NZ airspace.

Descriptors

Airspace occurrence descriptors have been established for 1588 of the 1665 reported airspace incidents in the year ending 31 December 2018. This means that most but not quite all airspace incidents are accounted for in the following attributability tables and graphs.

Note: each airspace incident may have more than one airspace incident descriptor.

Descriptor Categories

Airspace incident descriptors can be broadly grouped into those that are solely associated with Air Traffic Service provision, those that are associated with Pilot activity and those that may be associated with either.

The following table shows the breakdown into these broad categories.

Descriptor is associated with	Number of times descriptor applied
ATS	327
Pilot	1313
Either	356

The following table shows the assignment of airspace occurrence descriptors that are associated with airspace incidents that have an ATS-attributable component.

Descriptor	Number assigned in 2018
ATS Clearance/Instruction Deficiency	168
ATS Coordination Deficiency	146
ATS Flight Information Deficiency	13
ATS Flight Planning System Deficiency	31

The following table shows the assignment of airspace occurrence descriptors that are associated with airspace incidents that have a pilot-attributable component.

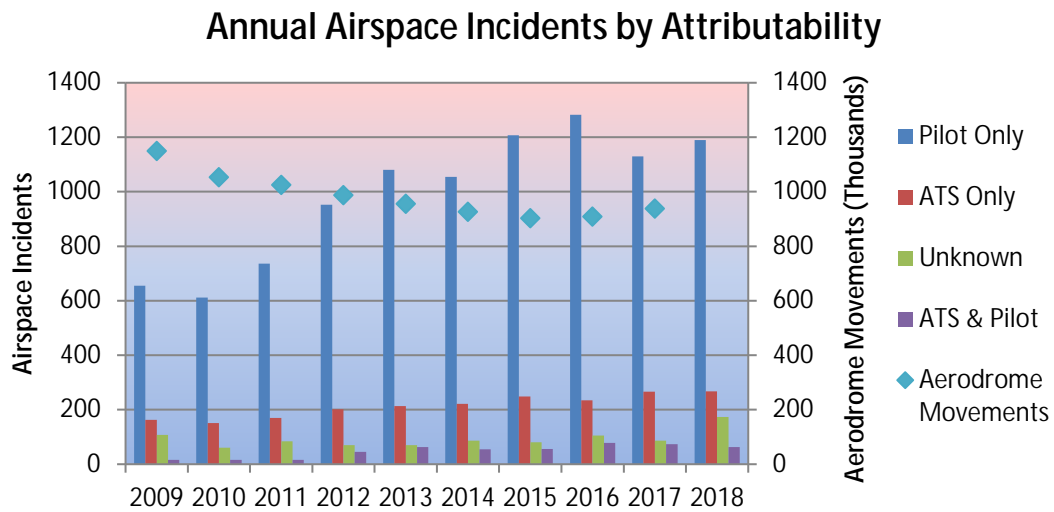
Descriptor	Number assigned in 2018
Air Proximity	68
Breach Of Other Clearance	573
Flight Assist	8
Global Positioning System	0
Pilot Breach of Ground Clearance	0
Pilot Flight Planning Deficiency	34
Pilot Position Reporting Deficiency	92
Pilot Readback Deficiency	31
Reduced Navigation Performance	0
Unauth Airspace Incursion	408
Unauth Altitude Penetration	99

The following table shows the assignment of airspace occurrence descriptors that could be associated with any airspace incident.

Descriptor	Number assigned in 2018
Controller/Pilot Datalink Communications	3
Loss Of Separation	88
Near Collision	35
Other	122
Reduced Vertical Separation Minima	1
Short Term Conflict Alert	2
Traffic Collision Avoidance System	74

Trend

The following graph shows the annual numbers of airspace incident reports and their attributability for the ten year period ending 31 December 2018.



The number of “unknown” attributable airspace incidents reflects difficulties with coding of reports received by the CAA. Note that there is often a time delay between incidents occurring, being investigated, and attributability being assigned to either ATS or Pilot.

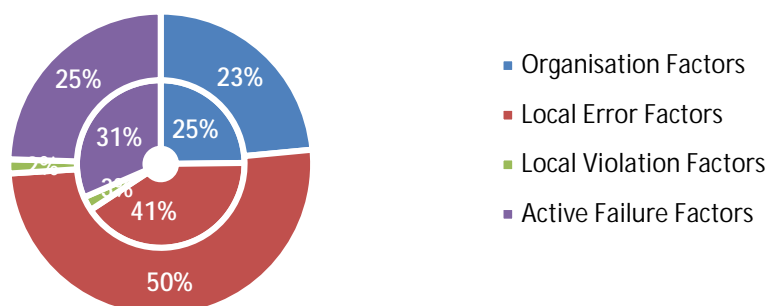
The ratio of Pilot Attributable to ATS Attributable incidents was relatively stable until the 2011 year that saw the total numbers begin a sharp upward trend. The data suggest that pilot attributable incidents are a disproportionate component of this trend.

ATS Attributable ASP Incidents

Causal Categories

The following chart shows the distribution of cause categories (groupings of causal factors) recorded for ATS-attributable airspace incidents that occurred before and after 1 January 2012. The inner ring represents the January 2007 to December 2011 period and the outer ring the period from January 2012 to December 2018. This date boundary has been chosen as it aligns approximately with the beginning of the observed sharp ongoing increase in the overall airspace incident rate.

Comparison of Cause Categories for ATS Attributable Airspace Incidents before and after January 2012



Local Error Factors

The increase in local error factors from 41% to 50% while perhaps not major is the result of a major shift in causes after January 2012.

The top three causes were:

Jul 2006 to Dec 2011		Jan 2012 to Jun 2018	
INADEQUATE CHECKING	57%	INADEQUATE CHECKING	26%
TASK OVERLOAD	10%	OTHER ERROR ENFORCING CONDITION	21%
OTHER ERROR ENFORCING CONDITION	8%	RISK MISPERCEPTION	16%

Active Failure Factors

The top three contributing causes were:

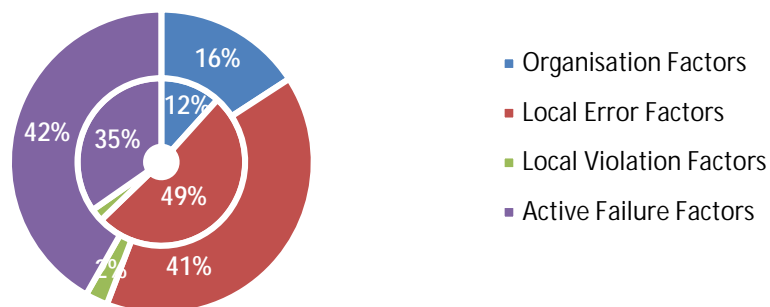
Jan 2007 to Dec 2011		Jan 2012 to Jun 2018	
INACCURATE SYSTEM "DIAGNOSIS"	31%	ACTIONS INCONSISTENT WITH PROCEDURES	27%
ACTIONS INCONSISTENT WITH PROCEDURES	19%	INACCURATE SYSTEM "DIAGNOSIS"	20%
INAPPROPRIATE "STRATEGY"	11%	INAPPROPRIATE "STRATEGY"	18%

Pilot Attributable ASP Incidents

Causal Categories

The following chart shows the distribution of cause categories (groupings of causal factors) recorded for Pilot-attributable airspace incidents that occurred before and after 1 January 2012. The inner ring represents the January 2007 to December 2011 period and the outer ring the period from January 2012 to December 2016. This date boundary has been chosen as it aligns approximately with the beginning of the observed sharp ongoing increase in the overall airspace incident rate.

Comparison of Cause Categories for Pilot Attributable Airspace Incidents before and after January 2012



Organisation Factors

Organisation factors increased from 12% to 16 % of all causal factors.

The top four causes were:

Jan 2007 to Dec 2011		Jan 2012 to Dec 2018	
INADEQUATE PROCEDURES	16%	INADEQUATE CONTROL AND MONITORING	29%
INADEQUATE COMMUNICATIONS	14%	INADEQUATE TRAINING	19%
INADEQUATE SPECIFICATIONS/REQUIREMENTS	14%	OTHER ORGANISATION FACTOR	15%
INADEQUATE CONTROL AND MONITORING	14%	INADEQUATE PROCEDURES	6%

Local Error Factors

A reduction in the incidence of local error factors offset the increase in organisation factors.

The top three causes were:

Jan 2007 to Dec 2011		Jan 2012 to Dec 2018	
INADEQUATE CHECKING	26%	INADEQUATE CHECKING	25%
POOR INSTRUCTIONS/PROCEDURES	12%	RISK MISPERCEPTION	11%
TASK UNFAMILIARITY	7%	OTHER ERROR ENFORCING CONDITION	10%

In early 2011 a system of follow-up letters was introduced by CAA for operators of aircraft who didn't report Airspace incidents that were reported by the ATS provider. Since the introduction of this system there has been a noticeable increase in the number of Airspace Incidents that are reported by both parties.

Significant Incidents

None of the airspace incidents reported as occurring during the last year covered by this report was classified as [significant](#)

Serious Incidents

This section describes [serious](#) airspace incidents reported as occurring during the last year covered by this report. The section is grouped by attributability. For each incident the location is stated before the description.

Pilot and ATS Attributable

- Gisborne: The pilot reported near miss with UAV at 400 ft. when returning to the airfield. The UAV was operating near the airport with 2nd person as contact/spotter. The operator was asked to land when the helicopter requested a return to the airfield. The controller thought they saw the UAV descending but may have seen a gull instead. The traffic information was not passed to the helicopter pilot because the controller thought the UAV had landed. The UAV operator later advised that they had been operating on pre-planned route and were unable to quickly resume control. | ~ Occurrence Id: 18/5

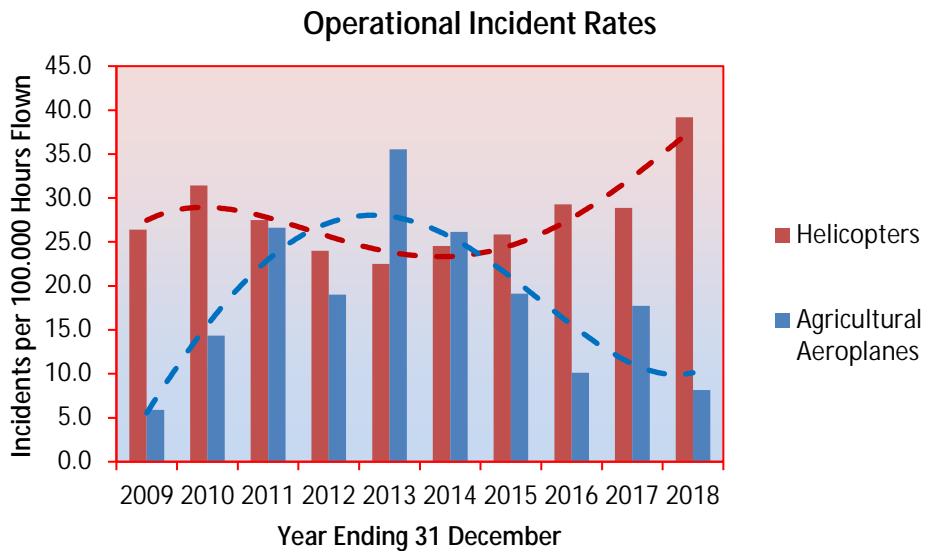
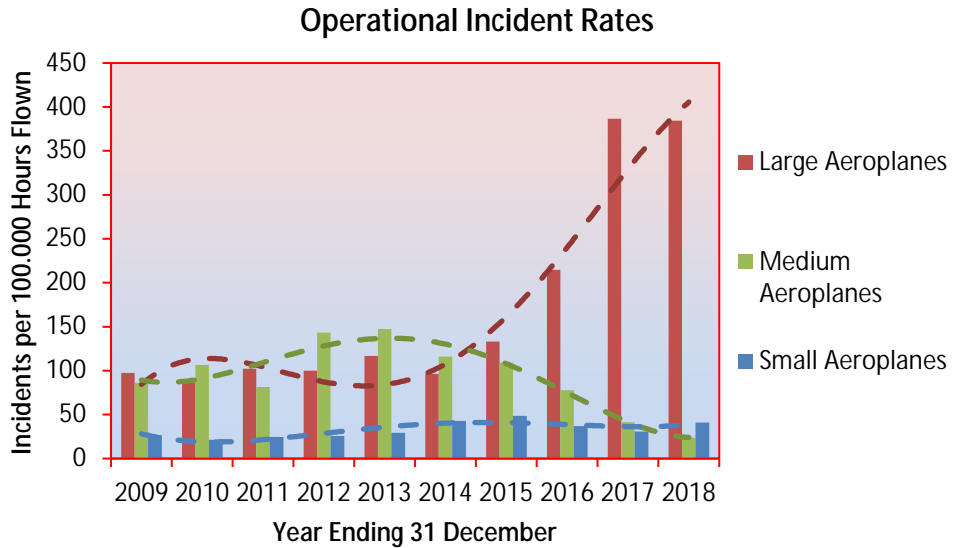
Pilot Attributable

- Franz Josef Aerodrome: Helicopter took off from the Franz Josef Airport and then orbited above the Skydive Franz PLA while three tandem parachutes were open and descending to land on the PLA. Causing a near miss situation with the helicopter and at least one of the tandem parachutes being only 100 metres apart. ~ Occurrence Id: 18/57

Operational (Aircraft) Incidents

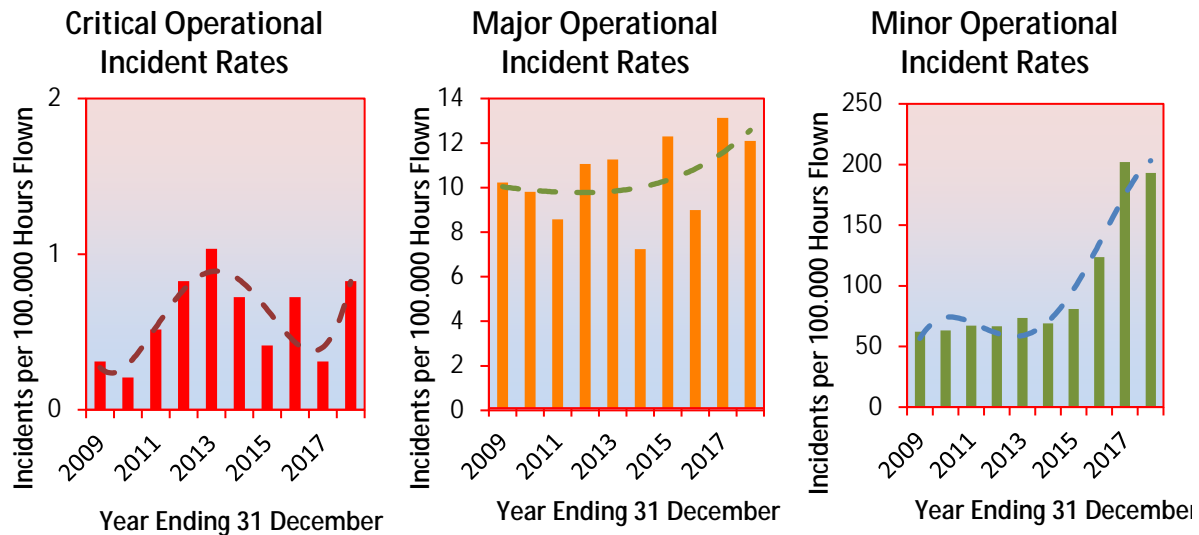
The following graphs show the reported annual operational incident rates (incidents per 100,000 hours flown) for the ten-year period ending 31 December 2018.

Breakdown by Aircraft Category



Breakdown by Severity

These charts cover all operational incidents regardless of the category of the aircraft involved. The previous section omitted incidents where the aircraft were sport aircraft or the category was not recorded.



Number of Incidents

The following table shows, for each safety target group, the number of operational incidents each year for the last ten one-year periods ending 31 December 2018. All aircraft types are included. The table is sorted by the number of incidents in the year ending June 2018.

Safety Outcome Target Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Airline Operations - Large Aeroplanes	291	308	363	359	454	381	497	817	1464	1460
Airline Operations - Medium Aeroplanes	47	50	46	82	83	51	46	18	12	24
Airline Operations - Small Aeroplanes	8	10	12	4	7	7	14	11	19	19
Airline Operations - Helicopters	12	14	16	7	13	12	4	2	13	5
Sport Transport	5	3	8	21	46	35	26	49	141	141
Other Commercial Operations - Aeroplanes	64	58	57	80	75	73	97	87	94	69
Other Commercial Operations - Helicopters	24	27	26	29	20	20	45	46	28	61
Other Commercial Operations - Sport	0	1	0	1	12	7	23	19	0	1
Agricultural Operations - Aeroplanes	3	5	11	9	11	8	7	2	7	2
Agricultural Operations - Helicopters	10	13	6	7	9	8	0	6	15	11
Private Operations - Aeroplanes	23	9	19	18	15	19	27	20	12	16
Private Operations - Helicopters	2	3	7	9	2	3	0	3	6	0
Private Operations - Sport	31	19	19	72	49	62	41	33	31	11
Other	11	45	113	47	25	48	73	169	228	46
None	172	143	36	14	9	12	6	9	12	102
Total	703	708	739	759	830	746	906	1291	2082	1968

Significant Operational Incidents

This section describes [significant](#) operational incidents reported as occurring during the last year covered by this report. The section is grouped by safety outcome target group. Groups with no significant events have been omitted. For each incident the location is stated before the description.

Private Operations - Sport

- Kariotahi Beach: ~During paragliding training a drone was flown into one of the paragliding students. It got stuck in the paraglider's lines and caused difficulty steering and landing. On landing, the drone was still going. The operator apparently could not turn it off even once the collision had happened. ~~The pilot landed safely, but very shaken. --The area is a marked paragliding / hang gliding area. Occurrence Id: 18/1531

Sport Transport

- Jardines: Normal canopy flight, TM said he hit some turbulence on landing pushing him to the left once TMs ankle touched down his ankle gripped on the grass and rolled, no problem to the customer. | ~Suspected Cause: Tandem masters final turn for landing was too high, which resulted in him losing all speed for landing. Possible slight directional wind change with no canopy speed resulting in the canopy to turn to the left on landing. Occurrence Id: 18/3114

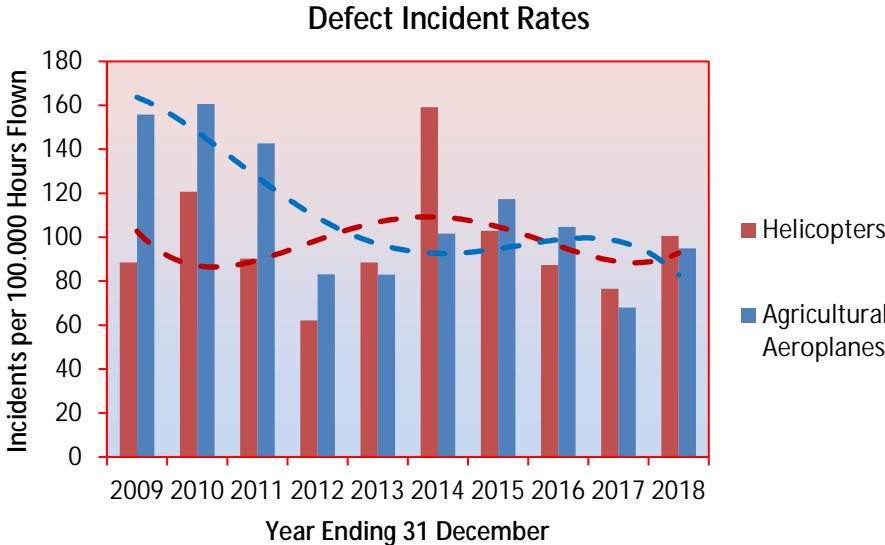
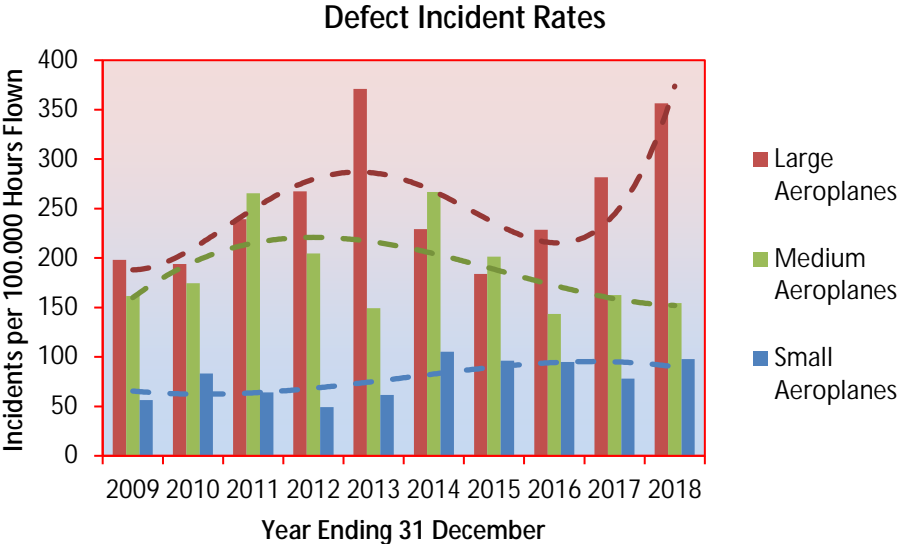
Pilot Training – Aeroplanes

- Nelson: MTC departing control zone had near collision with inbound a/c. Inbound a/c had not made radio contact before entering control zone. Evaded due to TAS, estimated separation of 50m Occurrence Id: 18/3230

Defect Incidents

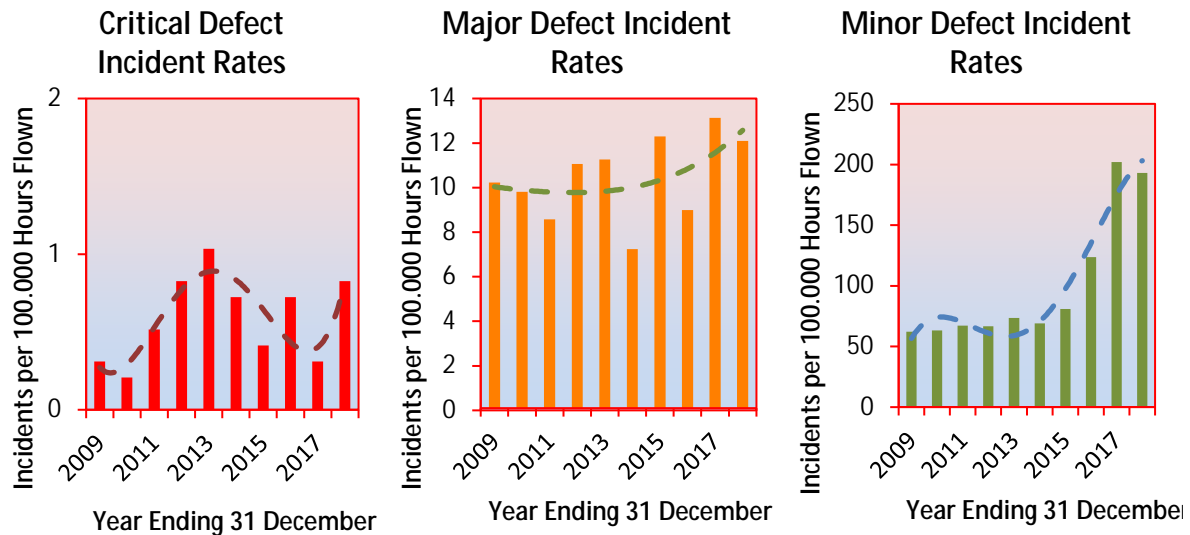
The following graphs show the aircraft defect incident reporting rates (incidents reported per 100,000 hours flown) for the ten-year period ending 31 December 2018.

Breakdown by Aircraft Category



Breakdown by Severity

These charts cover all operational incidents regardless of the category of the aircraft involved. The previous section omitted incidents where the aircraft were sport aircraft or the category was not recorded.



Number of Incidents

The following table shows, for each safety target group, the number of defect incidents each year for the last ten one-year periods ending 31 December 2018. All aircraft types are included. The table is sorted by the number of incidents in the year ending June 2018.

Safety Outcome Target Group	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Airline Operations - Large Aeroplanes	583	619	790	896	1264	789	615	815	1041	1274
Airline Operations - Medium Aeroplanes	73	67	138	111	79	83	53	17	22	29
Airline Operations - Small Aeroplanes	49	71	52	45	29	24	27	24	34	44
Airline Operations - Helicopters	71	84	40	36	51	11	1	7	18	6
Sport Transport	0	6	6	7	6	4	1	1	13	7
Other Commercial Operations - Aeroplanes	171	179	151	141	148	221	232	252	294	187
Other Commercial Operations - Helicopters	51	78	94	69	70	233	186	154	126	167
Other Commercial Operations - Sport	0	0	0	1	3	0	4	2	3	2
Agricultural Operations - Aeroplanes	43	56	56	37	28	40	46	33	27	43
Agricultural Operations - Helicopters	5	27	23	18	32	15	0	4	20	20
Private Operations - Aeroplanes	40	67	25	29	33	44	31	30	30	39
Private Operations - Helicopters	16	30	16	10	18	20	13	8	6	5
Private Operations - Sport	18	32	29	29	21	13	20	20	20	21
Other	7	33	16	19	47	37	11	37	39	25
None	89	30	15	14	8	14	9	9	11	28
Total	1216	1379	1451	1462	1837	1548	1249	1413	1704	1897

Significant Incidents

This section describes [significant](#) defect incidents reported as occurring during the last year covered by this report. The section is grouped by safety outcome target group. Groups with no significant events have been omitted. For each incident the location is stated before the description.

Airline Operations - Large Aeroplanes

- Auckland: When the landing gear was extended for landing 3 greens were indicated, however, the left main gear unsafe light was illuminated. The gear was cycled but the indications remained the same. Alternate method for checking the gear position showed that the gear was down and locked. Maintenance advice was sought with the advice to follow the QRH actions which were carried out. The aircraft then landed safely at NZAA. Occurrence Id: 18/395

Serious Incidents

None of the defect incidents reported as occurring during the last year covered by this report was classified as [serious](#)

Other Commercial Operations -Helicopters

- Wanaka: While in the hover the engine started to fluctuate in RPM which also affected Rotor RPM, collective lowered to regain Rotor RPM, the engine RPM reduced to idle. Opening the throttle the engine coughed then stopped. Helicopter was then dived towards the ground to gain forward speed, at 50kts helicopter was flared and run on into a cultivated paddock. Occurrence Id: 18/7714

Private Operations - Helicopters

- Taupo: While conducting a private flight south of Taupo the occupants of the R22 heard a loud bang coming from the rear of the helicopter. | ~The passenger, an experienced instructor, took control of the helicopter and carried out an emergency landing. On inspection it was discovered that the v-belts had failed in flight. | ~ Occurrence Id: 18/6301

ATA Chapters

Defect Incidents reported as occurring during the year ending 31 December 2016 were associated with the following ATA component code chapters.

Large Aeroplanes

The most common chapter was AEROPLANE FLIGHT CONTROL - GENERAL with 174 defects.

The next most common chapter was AEROPLANE FLIGHT CONTROL - GENERAL with 131 defects.

Medium Aeroplanes

The most common chapter was LANDING GEAR (LG) - GENERAL with 13 defects.

The next most common chapters were AEROPLANE FLIGHT CONTROL - GENERAL and FLIGHT NAVIGATION SYSTEMS with 4 defects each.

Small Aeroplanes

The most common chapter was LANDING GEAR (LG) - GENERAL with 40 defects.

The next most common chapter was AEROPLANE FLIGHT CONTROL - GENERAL with 30 defects.

Agricultural Aeroplanes

The most common chapters were LANDING GEAR (LG) - GENERAL with 4 defects

The next most common were AEROPLANE FLIGHT CONTROL - GENERAL and FUSELAGE – GENERAL with 3 defects each.

Helicopters

The most common chapter was MAIN ROTOR DRIVE - GENERAL with 14 defects.

The next most common chapter were MAIN ROTOR – GENERAL; ENGINE (TURBINE/TURBOPROP) – GENERAL and MAIN ROTOR – GENERAL with 13 defects each.

Sport Aircraft

The most common chapter was LANDING GEAR (LG) - GENERAL with 4 defects.

The next most common chapter were PROPELLER – GENERAL and FUEL SYSTEM - GENERAL with 3 defects each.

Defect Incident Rates

Summary of Defect Rate Standard

Three levels have been defined for categorising quarterly defect rates. The current levels are:

Normal – less than 4.25 defect incidents per 1,000 hours flown.

Alert – between 4.25 and 6 defect incidents per 1,000 hours flown.

High – above 6 defect incidents per 1,000 hours flown.

The current levels were set in July 2002. They are based on data from the three years to 31 December 2002.

CAA Actions

The following table shows how the current values of defect rates will be used to determine CAA action.

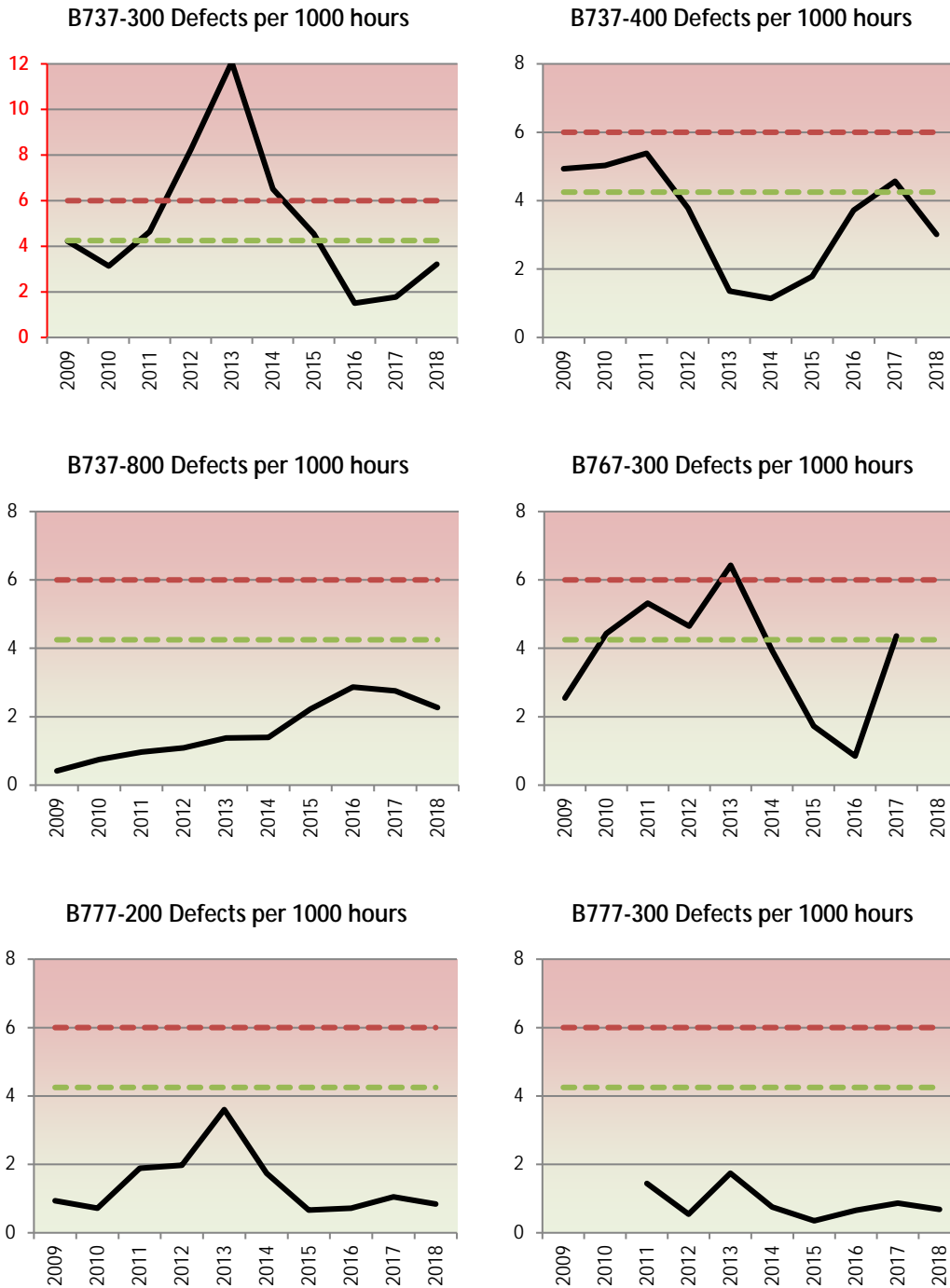
Defect Rate	CAA Action
Normal	Monitor
Alert	Notify appropriate General Manager
High	Notify appropriate General Manager

The timing of defect reports is often considerably later than what is mandated by Rule Part 12 and likewise a small number of operators of large and medium aeroplanes are persistently late with their hours and flights data returns. As a result the last two quarters of following defect rate graphs are based on forecasts of hours flown and must be interpreted with caution.

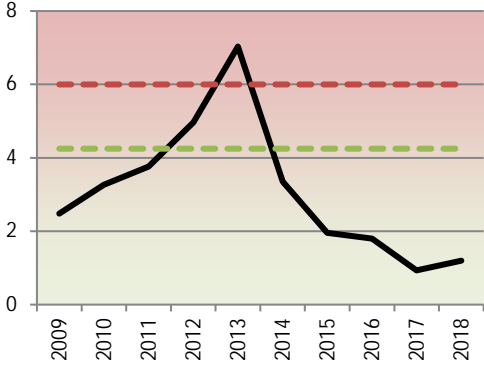
Analysis

The red line on each graph shows the High defect rate. The green line shows the Alert defect rate. The Manager Airline Maintenance is notified of all high and alert rates on a quarterly basis.

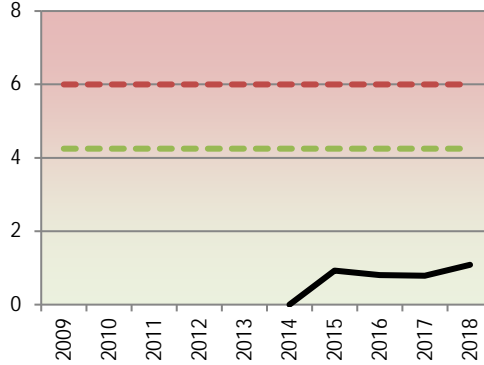
Large Aeroplanes



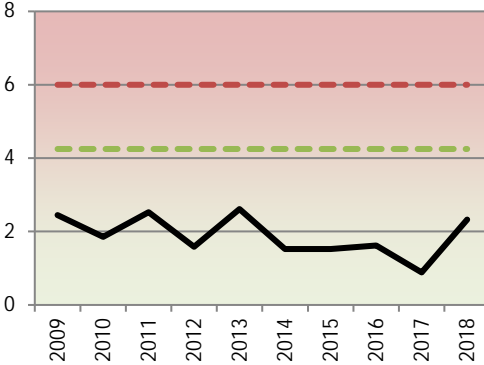
A320 Defects per 1000 hours



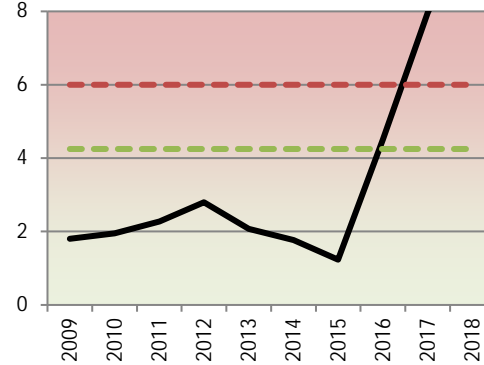
B787-900 Defects per 1000 hours



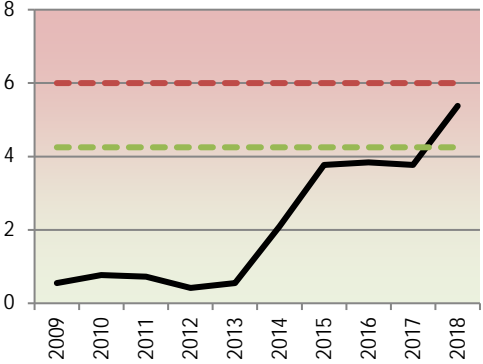
Convair 580 Defects per 1000 hours



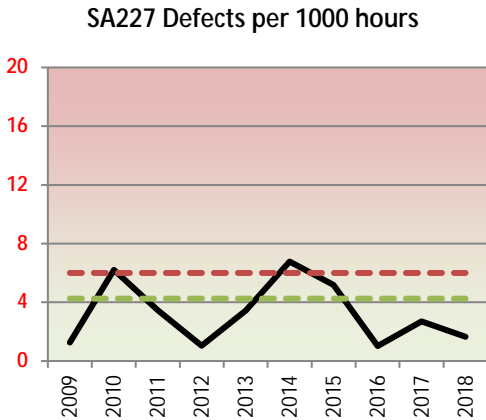
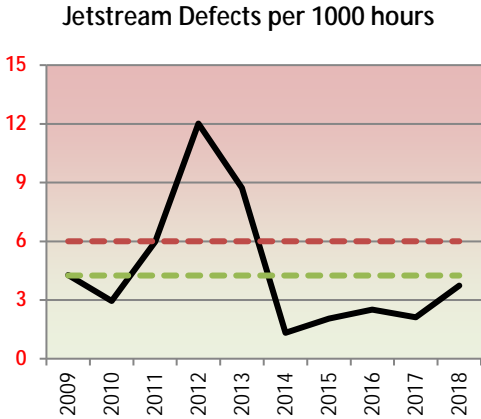
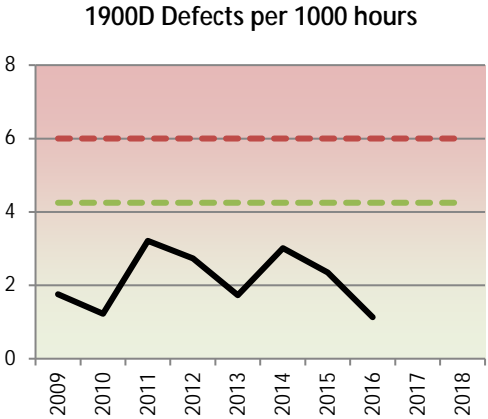
ATR 72 Defects per 1000 hours



DHC-8 Defects per 1000 hours



Medium Aeroplanes



Bird Incident Rates

Bird occurrence reporting rates are measured quarterly by aerodrome. This is achieved by querying the database for the number of bird hazard incidents reported at aerodromes during each quarter. The results of this query are then divided by the aircraft movements at each aerodrome and multiplied by 10,000 to give incidents per 10,000 aircraft movements. Aircraft movements at aerodromes are obtained from the ACNZ, and, where available, from individual airport companies.

Annual Strike Rate

Incidents are categorised as strikes or near-strikes depending on whether or not actual contact occurred between the aircraft and one or more birds.

The following table shows the annual **on-airport strike** rates for identified aerodromes for each year ending 31 December.

Aerodrome	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Rotorua	6.3	6.4	3.1	3.2	7.5	6.0	5.2	5.0	8.3	8.4
Gisborne	5.8	4.1	5.8	7.1	6.8	12.0	5.6	7.8	10.9	7.8
Whenuapai	10.6	13.2	10.9	12.7	5.2	12.0	6.9	9.0	10.3	18.8
Hamilton	1.6	2.7	1.4	1.5	1.3	1.1	1.5	1.9	2.0	2.7
Invercargill	5.8	7.2	6.8	2.5	2.6	12.5	6.3	8.3	3.9	3.7
Ohakea	1.5	2.7	3.1	2.6	3.8	5.8	3.4	8.4	2.4	2.4
Woodbourne	3.3	6.1	4.6	5.3	8.7	5.9	6.7	3.4	7.9	8.8
Napier	7.9	11.0	9.1	9.1	9.4	10.6	13.6	20.8	22.1	22.5
Dunedin	4.5	4.1	6.5	5.1	6.2	4.8	7.7	10.0	5.3	8.1
Tauranga	1.0	2.0	1.3	2.5	3.0	2.7	2.5	4.1	3.4	4.9
Taupo	2.6	3.1	4.5	2.7	1.3	0.9	1.4	1.0	1.9	2.9
Queenstown	2.4	1.4	2.4	5.7	2.8	3.1	1.8	6.3	2.4	3.5
Wellington	1.4	1.8	2.3	3.4	3.1	3.6	4.4	3.6	5.7	5.4
Palmerston North	6.0	4.3	2.1	4.3	5.7	3.8	5.9	5.9	5.4	3.9
Nelson	1.7	2.7	2.6	3.1	4.2	4.5	6.2	9.9	6.0	4.9
Auckland	2.6	3.2	3.4	2.5	3.8	2.4	3.7	2.8	2.3	2.9
Christchurch	2.4	3.0	3.3	3.9	3.4	3.3	5.2	5.5	6.9	7.7
New Plymouth	4.8	5.7	3.7	4.2	6.4	4.6	8.1	7.6	6.7	9.0
Paraparaumu	7.9	-	0.0	2.1	2.6	1.6	1.9	0.7	1.2	0.5

* For some of the smaller aerodromes that have limited numbers of movements a single birdstrike incident can translate into an apparently serious strike rate. Examples of this can be seen in some of the rates for Manapouri. The CAA understands the “statistical tyranny of small numbers” and does not over react to such outcomes.

For most of the certificated aerodromes that do not have a control or information service, the movement data currently available to the CAA is limited. In these cases an estimate of the movements has been used to calculate the above rates. These estimated rate values are indicated by the use of a cream background

Analysis

Each aerodrome is assigned a risk category based on the most recent 12 month average bird strike rate per 10,000 aircraft movements. These categories are:

- Low where the rate is less than 5 strikes per 10,000 movements
- Medium where the rate is not less than 5 strikes per 10,000 movements but less than 10 strikes per 10,000 movements
- High where the rate is not less than 10 strikes per 10,000 movements.

Each aerodrome is also assigned a trend category based on a straight line approximation to the 3 year history of bird strike rates. These categories are:

- Trending down where the 3 year decrease exceeds 20% of the average
- Constant where the 3 year change is between + and – 20% of the average
- Trending up where the 3 year increase exceeds 20% of the average

The CAA then determines what if any actions are required based on the combination of the above categories

Details as at 31 March 2018 for individual aerodromes are shown in the following table.

Aerodrome	Incident Rate	Trend
Auckland	Low	Constant
Chatham Islands	Low	Constant
Christchurch	Medium	Upward
Dunedin	Medium	Constant
Gisborne	Medium	Upward
Hamilton	Low	Upward
Hokitika	Low	Upward
Invercargill	Low	Downward
Kerikeri	Low	Upward
Manapouri	Low	Downward
Napier	High	Upward
Nelson	Low	Downward
New Plymouth	Medium	Constant
Ohakea	Low	Downward
Palmerston North	Low	Downward
Paraparaumu	Low	Constant
Queenstown	Low	Downward
Rotorua	Medium	Upward
Taupo	Low	Upward
Tauranga	Low	Upward
Timaru	Low	Upward
Wanganui	Low	Constant
Wellington	Low	Upward
Westport	Low	Constant
Whakatane	Medium	Upward
Whangarei	Low	Constant
Whenuapai	High	Upward
Woodbourne	Medium	Upward
Overall	Low	Constant

Significant or Serious Incidents

No bird hazard incidents reported as occurring since the end of the period covered by the previous report met the criteria that define either a significant or a serious incident.

Aerodrome Incidents

Runway Incursions

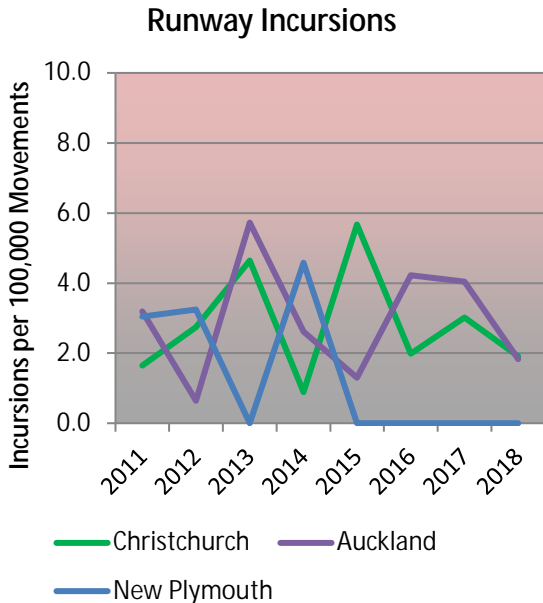
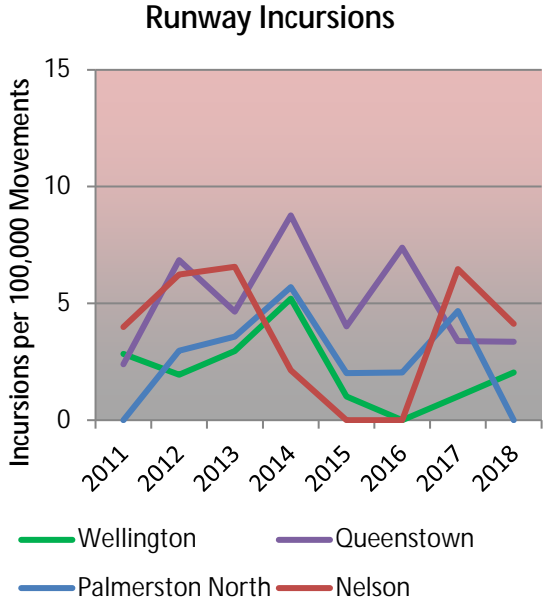
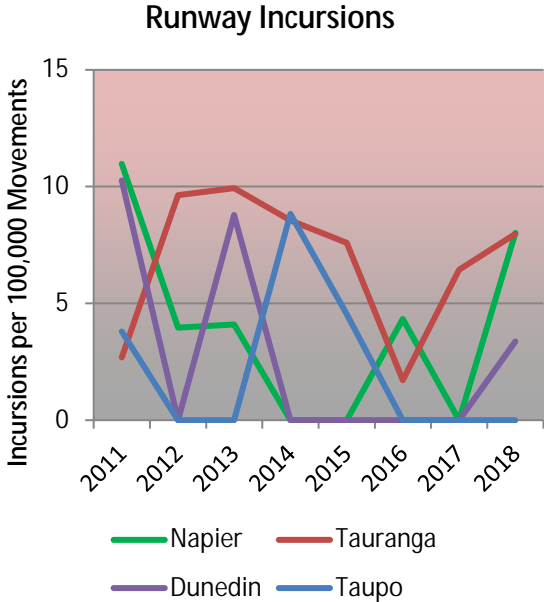
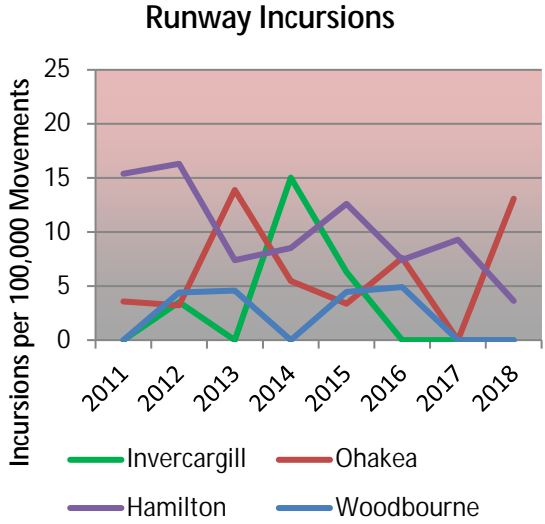
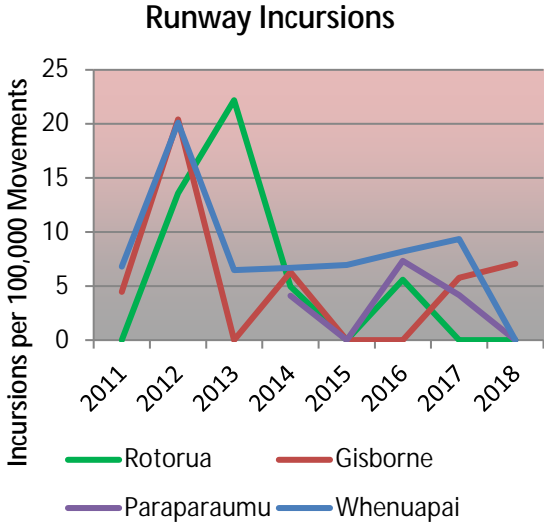
Runway incursion rates are calculated by dividing the total number of reported Aerodrome Incidents that have any of the five runway incursion descriptors by the total number of reported movements for the same aerodrome over the same period. The result is tabulated and graphed as runway incursions per 100,000 movements.

Clearly the number of runway incursions is low with many certificated aerodromes having no such incidents reported at all. With such low numbers caution needs to be exercised in drawing statistical conclusions.

The following table shows annual values of reported runway incursion rates for all certificated aerodromes for which adequate movement data is available. The table is ordered by the maximum rate that has been recorded for any year in the period.

Aerodrome	2011	2012	2013	2014	2015	2016	2017	2018
Paraparaumu	15.6			4.1	0.0	7.3	4.2	0.0
Rotorua	0.0	13.6	22.2	5.0	0.0	5.6	0.0	0.0
Gisborne	4.5	20.4	0.0	6.3	0.0	0.0	5.8	7.1
Whenuapai	6.8	20.1	6.5	6.7	6.9	8.2	9.4	0.0
Hamilton	15.4	16.3	7.4	8.5	12.6	7.4	9.3	3.6
Invercargill	0.0	3.5	0.0	15.0	6.3	0.0	0.0	0.0
Ohakea	3.6	3.2	13.9	5.5	3.4	7.6	0.0	13.1
Woodbourne	0.0	4.4	4.6	0.0	4.5	4.9	0.0	0.0
Napier	11.0	4.0	4.1	0.0	0.0	4.3	0.0	8.0
Dunedin	10.3	0.0	8.8	0.0	0.0	0.0	0.0	3.4
Tauranga	2.7	9.6	9.9	8.6	7.6	1.7	6.4	8.0
Taupo	3.8	0.0	0.0	8.8	4.5	0.0	0.0	0.0
Queenstown	2.4	6.9	4.6	8.8	4.0	7.4	3.4	3.4
Wellington	2.8	2.0	3.0	5.2	1.0	0.0	1.0	2.0
Palmerston North	0.0	3.0	3.6	5.7	2.0	2.0	4.7	0.0
Nelson	4.0	6.2	6.6	2.1	0.0	0.0	6.5	4.1
Auckland	3.2	0.6	5.7	2.6	1.3	4.2	4.0	1.8
Christchurch	1.6	2.7	4.6	0.9	5.7	2.0	3.0	1.9
New Plymouth	3.0	3.2	0.0	4.6	0.0	0.0	0.0	0.0

The charts on the next page show the above data in a graphical way. Aerodromes have been grouped in an arbitrary way to keep the number of lines on each chart roughly equal. The grouping is based on the largest value reported over the period covered.



Significant or Serious Incidents

No Aerodrome Incidents reported as occurring since the end of the period covered by the previous report met the criteria that define a significant or a serious incident.

Occurrences — General

The following table shows the number of occurrences (excluding Non-Reportable Occurrences) that were registered on the CAA database during each of the 12 months of the reporting period.

Month	ACC	ADI	ARC	ASP	BRD	DEF	DGD	HGA	INC	NIO	PAA	PIO	SEC
Jan-2018	10	17	76	144	47	142	0	1	148	11	3	2	6
Feb-2018	7	8	33	114	0	108	4	2	100	3	0	1	3
Mar-2018	5	8	85	146	331	140	4	3	129	1	1	2	0
Apr-2018	5	27	195	191	306	291	6	1	273	14	2	6	3
May-2018	4	31	261	212	190	233	6	1	280	5	2	4	3
Jun-2018	5	22	89	130	149	190	2	1	114	4	0	2	0
Jul-2018	5	25	100	127	122	180	10	1	171	2	0	2	3
Aug-2018	3	21	100	114	124	172	5	1	138	8	1	5	6
Sep-2018	6	22	131	111	111	127	4	0	113	4	2	2	2
Oct-2018	8	9	134	159	123	177	4	3	150	1	1	4	1
Nov-2018	3	12	113	149	130	111	3	1	196	6	2	0	1
Dec-2018	4	17	72	117	100	103	4	1	144	7	1	0	1

ACC	Accident	DGD	Dangerous Goods Incident
ADI	Aerodrome Incident	HGA	Hang Glider Accident
ARC	Aviation Related Concern	INC	Aircraft (Operational) Incident
ASP	Airspace Incident	NIO	Facility Malfunction Incident
BRD	Bird Incident	PAA	Parachute Accident
CSI	Cargo Security Incident	PIO	Promulgated Information Incident
DEF	Defect Incident	SEC	Security Incident

Appendix — Definitions

General

Accident [ACC] — means an occurrence that is associated with the operation of an aircraft and takes place between the time any person boards the aircraft with the intention of flight and such time as all such persons have disembarked and the engine or any propellers or rotors come to rest, being an occurrence in which—

- (1) a person is fatally or seriously injured as a result of—
 - (i) being in the aircraft; or
 - (ii) direct contact with any part of the aircraft, including any part that has become detached from the aircraft; or
 - (iii) direct exposure to jet blast—

except when the injuries are self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to passengers and crew; or

- (2) the aircraft sustains damage or structural failure that—
 - (i) adversely affects the structural strength, performance or flight characteristics of the aircraft; and
 - (ii) would normally require major repair or replacement of the affected component—

except engine failure or damage that is limited to the engine, its cowlings, or accessories, or damage limited to propellers, wing tips, antennas, tyres, brakes, fairings, small dents, or puncture holes in the aircraft skin; or

- (3) the aircraft is missing or is completely inaccessible.

Aerodrome incident [ADI] — means an incident involving an aircraft operation and—

- (1) an obstruction either on the aerodrome operational area or protruding into the aerodrome obstacle limitation surfaces; or
- (2) a defective visual aid; or
- (3) a defective surface of a manoeuvring area; or
- (4) any other defective aerodrome facility.

Aircraft incident [INC] — means any incident, not otherwise classified, associated with the operation of an aircraft.

Airspace incident [ASP] — means an incident involving deviation from, or shortcomings of, the procedures or rules for—

- (1) avoiding a collision between aircraft; or
- (2) avoiding a collision between aircraft and other obstacles when an aircraft is being provided with an Air Traffic Service.

Bird incident [BRD] — means an incident where—

- (1) there is a collision between an aircraft and one or more birds; or
- (2) when one or more birds pass sufficiently close to an aircraft in flight to cause alarm to the pilot.

Cargo security incident [CSI] — means an incident involving cargo or mail that is carried, or has been accepted by a regulated air cargo agent or an air operator for carriage, by air on an aircraft conducting an international regular air transport operation passenger service, and—

- (1) there is evidence of tampering or suspected tampering with the cargo or mail which could be an act or an attempted act of unlawful interference; or
- (2) a weapon, explosive, or other dangerous device, article or substance, that may be used to commit an act of unlawful interference is detected in the cargo or mail.

Dangerous goods incident [DGD] — means an incident associated with and related to the carriage of dangerous goods by air after acceptance by the operator, that—

- (1) results in injury to a person, property damage, fire, breakage, spillage, leakage of fluid or radiation, or other evidence that the integrity of the packaging has not been maintained; or
- (2) involves dangerous goods incorrectly declared, packaged, labelled, marked, or documented.

Defect incident [DEF] — means an incident that involves failure or malfunction of an aircraft or aircraft component, whether found in flight or on the ground.

Facility malfunction incident [NIO] — means an incident that involves an aeronautical facility.

Fatal Injury — means any injury which results in death within 30 days of the accident.

Incident — means any occurrence, other than an accident, that is associated with the operation of an aircraft and affects or could affect the safety of operation. Note: Incident has many sub-categories.

Occurrence — means an accident or incident.

Promulgated information incident [PIO] — means an incident that involves significantly incorrect, inadequate, or misleading information or aeronautical data promulgated in an aeronautical information publication, map, chart, or otherwise provided for the operation of an aircraft.

Security incident [SEC] — means an incident that involves unlawful interference.

Serious Injury — means any injury that is sustained by a person in an accident and that—

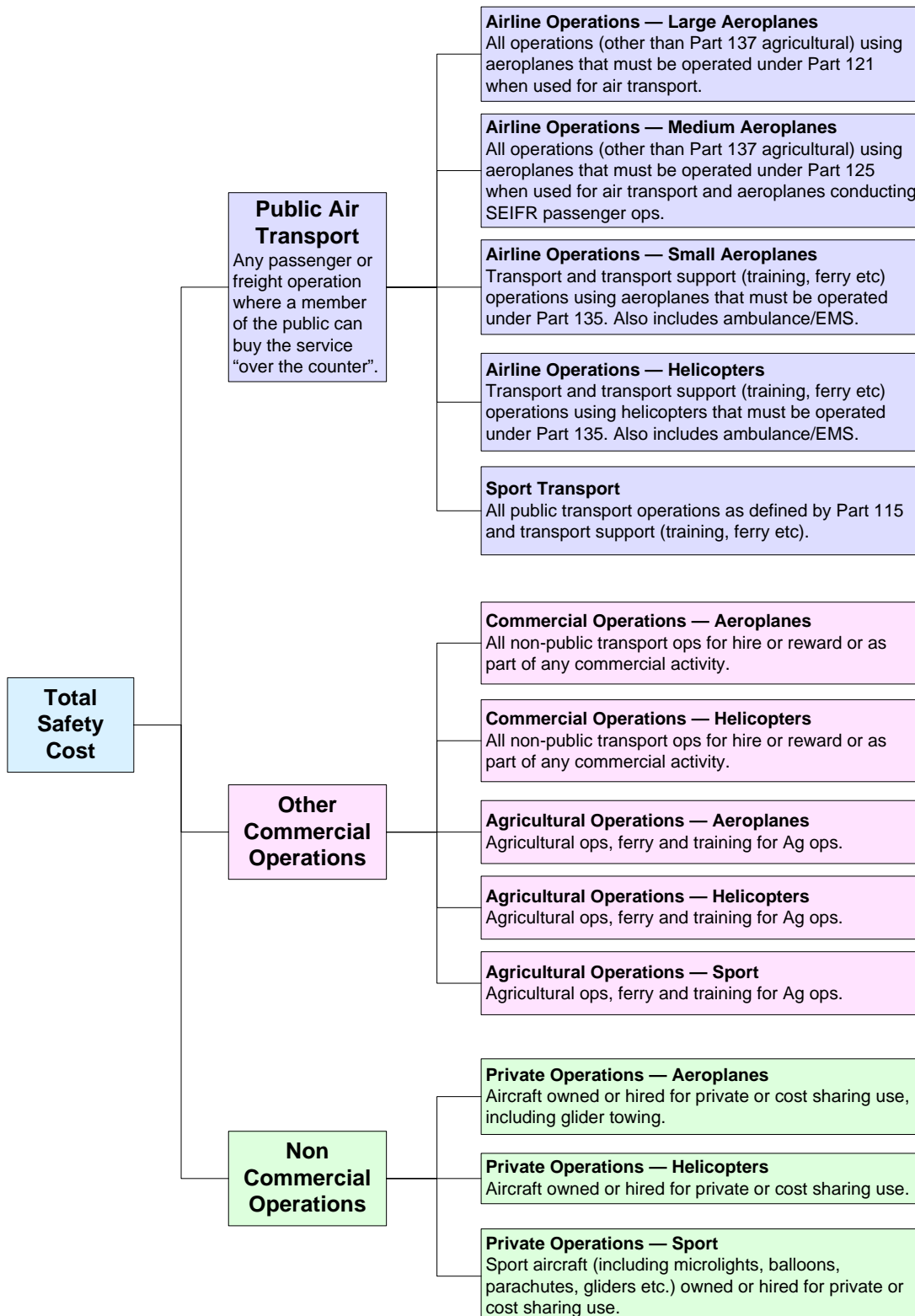
- (1) requires hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received; or
- (2) results in a fracture of any bone, except simple fractures of fingers, toes, or nose; or
- (3) involves lacerations which cause severe haemorrhage, nerve, muscle, or tendon damage; or
- (4) involves injury to an internal organ; or
- (5) involves second or third degree burns, or any burns affecting more than 5% of the body surface; or
- (6) involves verified exposure to infectious substances or injurious radiation.

Severity

The following definitions apply to the severity accorded to occurrences and to findings as the result of investigation of occurrences.

Severity Factor	Definition
CR Critical	An occurrence or deficiency that caused, or on its own had the potential to cause, loss of life or limb;
MA Major	An occurrence or deficiency involving a major system that caused, or had the potential to cause, significant problems to the function or effectiveness of that system;
MI Minor	An isolated occurrence or deficiency not indicative of a significant system problem.

Safety Target Groups



Target group name	General description	Includes	Excludes
Airline Operation - Large Aeroplanes	All operations using large passenger and freight aeroplanes that are operated under part 121	Ferry, test, training, passenger and freight, domestic and international, Part 91 operations, and commercial operations other than Part 137 agricultural operations. Includes all aeroplanes that have a passenger seating configuration of 30 seats or more, or a payload capacity of more than 3410kg.	Part 137 agricultural operations
Airline Operation - Medium aeroplanes	All operations using medium passenger and freight aeroplanes that are operated under part 125.	Ferry, test, training, passenger and freight, domestic and international, Part 91 operations, and commercial operations other than Part 137 agricultural operations. Aeroplanes that have a seating configuration of 10 to 30 seats, excluding any required crew member seats, or a payload capacity of 3410 kg or less and a MCTOW of greater than 5700 kg, and any aeroplanes conducting SEIFR passenger operations.	Part 137 agricultural operations
Airline Operation - Small aeroplanes	All operations by 119 certificate holders using other aeroplanes.	Ferry, test, passenger and freight, domestic and international, training in support of Part 135 operations, Ambulance/EMS	Part 137 agricultural operations, Part 91 operations, and commercial operations. SEIFR under Part 125
Airline Operation - Helicopters	All operations by 119 certificate holders using helicopters	Ferry, test, passenger and freight, domestic and international, training in support of Part 135 operations, Ambulance/EMS	Part 137 agricultural operations, Part 91 operations, and commercial operations. SEIFR under Part 125

Target group name	General description	Includes	Excludes
Commercial Operations - Aeroplane	Other commercial operations Aeroplane (all non-public transport ops for hire or reward or as part of any commercial activity)	Positioning, ferrying flights, training (dual and solo), "Commercial non-certified", Business and Executive	Public transport ops, Agricultural ops & training for Agricultural ops, non-commercial ops
Commercial Operations - Helicopter	Other commercial operations Helicopter (all non-public transport ops for hire or reward or as part of any commercial activity)	Positioning, ferrying flights, training (dual and solo), "Commercial non-certified", Business and Executive	Agricultural ops & training for Agricultural ops, public transport, non-commercial ops.
Agricultural Operations - Aeroplane	Agricultural operations using aeroplanes	Agricultural ops, ferry & training for Ag ops.	Everything else.
Agricultural Operations - Helicopters	Agricultural operations using helicopters	Agricultural ops, ferry & training for Ag ops.	Everything else
Agricultural Operations - Sport Aircraft	Agricultural operations using sport aircraft	Agricultural ops, ferry & training for Ag ops.	Everything else
Private Aeroplane	Private operations in aeroplanes	Cost sharing, aircraft hired from schools and clubs for private or cost sharing use, glider towing	Airline, commercial, agricultural operations, sport aircraft, balloons, training (dual and solo)
Private Helicopter	Private operations in helicopters	Cost sharing, aircraft hired from schools and clubs for private or cost sharing use	Airline, commercial, agricultural operations, sport aircraft, balloons, training, ferry/positioning flights by commercial operators

Target group name	General description	Includes	Excludes
Sport Transport	All public transport ops by sport aircraft	Ferry, test, passenger and freight, domestic and international, training for such ops. And balloons	Agricultural operations.
Sport Private	Private operations using sport aircraft	Cost sharing, aircraft hired from schools and clubs for private or cost sharing use, training, gliders, power gliders, hang gliders, parachutes and all forms of inflatable wing, balloons	Airline, commercial, agricultural operations, and training for these activities

Aircraft Categories

Aircraft Statistics Category	Definition	Aircraft Class
Large Aeroplanes	Aeroplanes that must be operated under Part 121 when used for air transport	Aeroplane
Medium Aeroplanes	Aeroplanes that must be operated under Part 125 when used for air transport, except for those required to operate under Part 125 solely due to operating SEIFR	Aeroplane
Small Aeroplanes	Other Aeroplanes with Standard Category Certificates of Airworthiness	Aeroplane
Agricultural Aeroplanes	Aeroplanes with Restricted Category Certificates of Airworthiness limited to agricultural operations	Aeroplane
Helicopters	Helicopters with Standard or Restricted Category Certificates of Airworthiness	Helicopter
Sport Aircraft	All aircraft not included in the groups above	Aeroplane, Amateur Built Aeroplane, Amateur Built Glider, Amateur Built Helicopter, Balloon, Glider, Gyroplane, Helicopter, Microlight Class 1, Microlight Class 2, Power Glider

Significant Events

The following text is taken from the procedure SI - 0.0 Occurrence Management, 0.08 - Occurrence completion:

To facilitate in deciding whether or not your investigation file should be "tagged" as a "Significant Event" here are some occurrences that substantially meet the criteria.

- 2 Occurrences that are investigated by TAIC unless it is known that the TAIC are using the event for their own training purposes and would not otherwise be investigating.
- 2 Critical air transport occurrences resulting in Near Collision (provided one of the aircraft involved is airborne, nearly airborne, or has just landed). In cases where an aircraft is landing or taking off the event would not be significant unless the aircraft's speed was in excess of 10 kts.
- 2 Critical air transport occurrences resulting in Loss of Control
- 2 Critical air transport occurrences where a Distress or Urgency call was (or should have been) made
- 2 Air transport occurrences where the last in a series of "redundant" systems failed in flight or during take off or landing
- 2 SEIFR air transport occurrences involving loss of engine power to the extent that an unscheduled landing is required
- 2 Fatal accidents
- 2 Occurrences that are relevant to a current (group) of safety concerns. For example in 1999/2000 aircraft electrical wiring was a significant international concern therefore occurrences in the New Zealand fleet of electrical wiring problems may warrant them being tagged as significant.
- 2 Occurrences that are relevant to the current CAA (Business) Safety Plan. For the 1999/2000-year collision with terrain, obstacles, and water; controlled flight into terrain and loss of control in flight were relevant for aircraft with a MCTOW of 5,670 kg and above.
- 2 Engine failure in 2-plus engined air transport aircraft at critical phases of flight or failures of a nature that may have a fleet impact or significantly affect safe operations or are subject to media scrutiny.
- 2 Significant structural or engine failure of a private GA aircraft/helicopter that may have implications for the fleet type, particularly where that type is used for air transport operations.

Serious Events

The following text is taken from the procedure SI - 2.0 Safety Investigation - Appendices, 2.02 Appendix B - Aviation Occurrence Notification Checklist:

“Serious incident” means an incident involving circumstances indicating that an accident nearly occurred. The difference between an accident and serious incident lies only in the result (ICAO Annex 13 definition). The serious incidents listed below are extracted from ICAO Annex 13 attachment D. The list is not exhaustive and only serves as guidance to the definition of serious incident.

- (a) Near collisions requiring an avoidance manoeuvre to avoid a collision or an unsafe situation or when an avoidance action would have been appropriate.
- (b) Controlled flight into terrain only marginally avoided.
- (c) Aborted take-off on a closed or engaged runway.
- (d) Take-off from a closed or engaged runway with marginal separation from obstacle(s).
- (e) Landings or attempted landings on a closed or engaged runway.
- (f) Gross failures to achieve predicated performance during take-off or initial climb.
- (g) Fires and smoke in the passenger compartment, in cargo compartments or engine fires, even though such fires were extinguished by the use of extinguishing agents.
- (h) Events requiring the emergency use of oxygen by the flight crew.
- (i) Aircraft structural failures or engine disintegration's not classified as an accident.
- (j) Multiple malfunctions of one or more aircraft systems seriously affecting the operation of the aircraft.
- (k) Flight crew incapacitation in flight.
- (l) Fuel quantity requiring the declaration of an emergency by the pilot.
- (m) Take-off or landing incidents. Incidents such as undershooting, overrunning or running off the side of runways.
- (n) System failures, weather phenomena, operations outside the approved flight envelope or other occurrences, which could have caused difficulties controlling the aircraft.
- (o) Failures of more than one system in a redundancy system mandatory for flight guidance and navigation.

Safety Failure

We have taken a Safety Failure as:

- an accident including hang glider and parachute or
- an incident where the aircraft is written off, destroyed or missing or
- a critical or major incident or
- an incident that has any of the following 31 selected descriptors, most of which relate to collision, serious landing outcomes, serious aircraft technical or operational failures or acts of violence

INJURIES TO PERSONS	FIRE/EXPLOSION/FUMES
FUEL/FLUIDS OCCURRENCE	Explosion
LANDING OVERRUN	Struck By Propellor/rotor/jet Blast
RUNWAY EXCURSION	TAKE-OFF OR LANDING
General Breakup/disintegration	Landing Beside Runway
COLLISION/STRIKE OBJECT	Undershoot
Collision Level Terrain/water	Overrun
Collision Hill/mountain	Unintentional Wheels Up Landing
COLLISION WITH AIRCRAFT ON GROUND	Nose Down/overtuned
DAMAGE TO AIRCRAFT	Critically Low Or Exhausted
ENGINE POWER LOSS	Contaminated
Uncontained Failure	Incorrect Type
Engine Tearaway	ACT OF VIOLENCE
PROPELLOR FAILURE	Aircraft excursion
Propellor Separation	Collision
Propellor Runaway	

Close Call

We have defined a Close Call as an incident that is not a safety failure but that has any of the following 112 selected descriptors that support the assumption that failure would have been the outcome if either the condition had escalated or adequate compensating action had not been taken.

ENGINE(S) SHUTDOWN	Chimney/mast/pole
SIGNIFICANT LOSS OF	Ditch
CONTROL/PERFORMANCE	Embankment
AVOIDING ACTION	Fence/fence Post
OVERWEIGHT LANDING	Person
ABNORMAL LANDING	Building
AIRFRAME FAILURE	Approach Lights
Initial Failure Of Control Surface	Taxiway/runway Lights
Initial Failure Of Fuselage	Tree
Initial Failure Of Empennage	Vehicle
Initial Failure Of Wing	Wire/cable/powerline
Initial Failure - Other	Other
Aircraft Standing	NEAR COLLISION /STRIKE OBJECT
Aerodrome Structure	NEAR COLLISION AIRCRAFT ON GROUND
Animal (not Bird)	NEAR COLLISION TERRAIN
Bird	Both Moving On Ground

COMPONENT/SYSTEM MALFUNCTION

Avionics
Brake
De-icing
Doors/panels
Electrical
Flight Controls
Fuel
Gear
Hydraulic
Instruments
Navigation System
Pneumatic
Pressurisation
Tyre/wheel
Main Rotor
Tail Rotor
Main Rotor Transmissions/gearbox
Maint Rotor Tail Shaft
Tail Rotor Drive Shaft
Struck By Propellor / Rotor / Jet Blast
Sinking Through Surface
Struck By Object
Struck By Stairs / Equipment
GEAR COLLAPSED/RETRACTED
Main Gear
Nose Gear
Complete Gear
Other Gear
LOSS OF CONTROL
Directional Control
Mush/stall
Spin
Spiral
Pitch Control (porpoise)
Other
LOSS OF CONTROL (HELICOPTER)
Dynamic Roll-over (heli)
Inadequate Rotor Rpm (heli)
Settling With Power (heli)
Uncontrolled Rotation (heli)

Other
Fuel Starvation
Mechanical/engine Failure
Non Mechanical Engine Failure
Simulated Engine Failure
Transmission Failure
Driveshaft Failure
Unspecified
Fire
Fumes/smoke
Other
EVACUATION
Insecure Barrier
Scraped Wingtip/cowling/float
Tail Scrape/overrotation
Groundloop/swerve
Hard Landing
Wheels Down Landing On Water
Intentional Wheels-up Landing
Intent Unknown Wheels-up Landing
MISSING AIRCRAFT
Fire/smoke/fumes
Gpws
FAILURE OF EMERGENCY EQUIP/PROCS
EMERGENCY DECLARATION
Incorrect Quantities Loaded
Airspace Incident
NEAR COLLISION
AIR PROXIMITY
Near Miss
Runway Incursion Category A
Runway Incursion Category B
SPILLAGE/LEAKAGE
FUMES/GAS/SMOKE
SABOTAGE
HIJACK/UNLAWFUL SEIZURE
BOMB/DEVICE WARNING/SCARE
Endangering transport
UNLAWFUL INTERFERENCE
Theft

Reason Model – Latent Failure Model

CAA identification of occurrence causal factors is based on the Reason Model (latent failure model). Occurrence investigations attempt to assign attributable cause by identifying the generic type of organisation or person involved and the contributing active failures, local factors, and/or organisation factors. The analysis contained in the Causal Factor Analysis section of this report summarises the results from investigation by reporting the different types of causal factors identified versus occurrence type. It should be noted that occurrence types (e.g. Accident, Defect etc.) are not mutually exclusive (e.g. an accident and a defect may be associated) and hence any causal factor recorded during the investigation will be recorded for all associated occurrence types.

The following two diagrams are designed to show the basic principles of the latent failure model:

Diagram 1

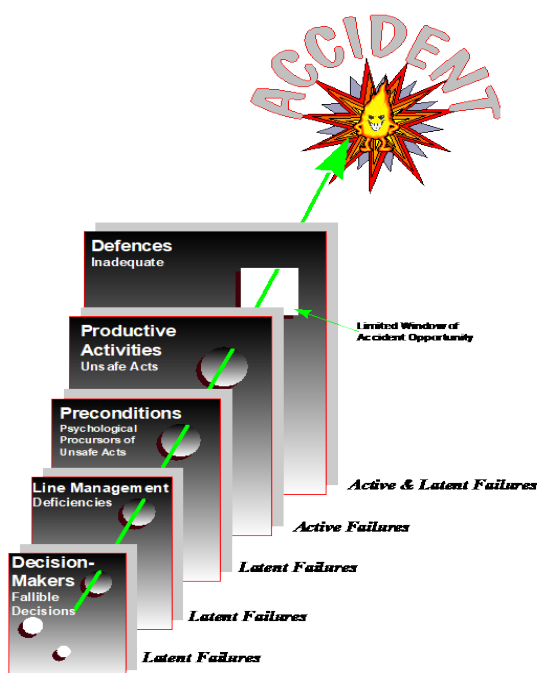


Diagram 1 shows the layers of defences that have been created within the aviation system to prevent accidents and incidents happening. It also shows how these defences have holes in them. When these holes line up there is a window of opportunity for an accident or incident. All that is needed to complete the breach in the defence is an active failure at the operational level. When this happens an accident occurs. When the defences in the system work properly and are only partially breached the end result may be an incident. Incidents are free lessons that should be investigated to show where the holes (latent failures) in the system are. Holes in the system are there all the time and a good pro-active audit program should also help in detecting them.

Diagram 2

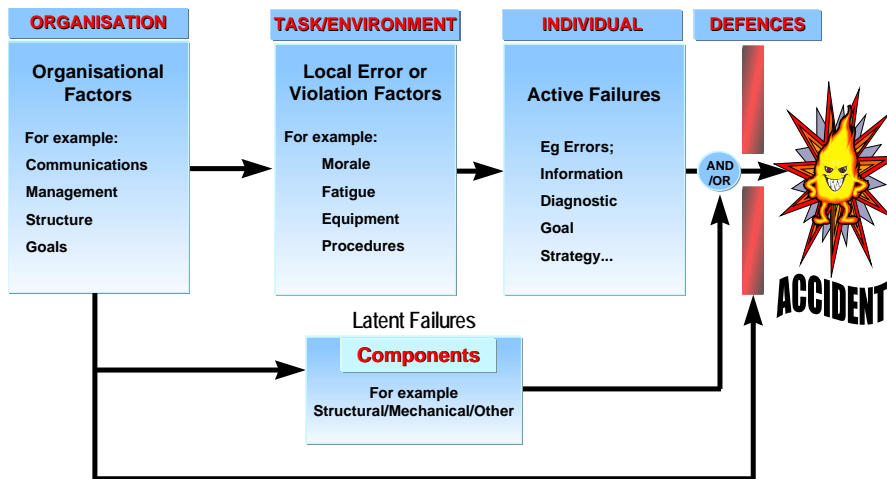


Diagram 2 shows how the latent failures are grouped into 3 areas:

1. The active failures.
2. Task/environment or local factors.
3. Organisational factors.

In basic terms the latent failure model states that an accident is predicated by deficiencies in the management and physical systems responsible for and supporting the particular operation. Management system deficiencies in the responsible organisation(s) can lead to error or violation inducing conditions in the local working environment. The existence of these conditions increases the likelihood of actual errors or violations by personnel which can place an over-reliance on, or expose deficiencies in, final defences.