Aviation Industry
Safety Update

Intelligence, Safety and Risk Analysis Unit

1 January to 31 December 2015

CAA

CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

Te Mana Rererangi Tūmatanui o Aotearoa

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Introduction and Executive Summary

Introduction

This safety report is produced using data from the Civil Aviation Authority Management Information System. It primarily covers the period from 1 January to 31 December 2015.[1]

Key Indicators

- Key measures of industry activity have increased as follows.

  - Aircraft on CAA records increased slightly by 1.7%

  - Airline Air transport flights increased by 7.8%

  - Adventure Aviation flights including parachute descents increased by 19.1%

  - Total hours flown increased by 5.5%

- The number of organisational certificates issued has decreased by 3.9% to 1008.

- The number of aircraft movements at principal aerodromes has decreased by 2.5% in this period and the trend over three years implies a downward trend in the number of air transport flights from principal aerodromes.

- The number of accidents in the period was 109, down from 111 in the last period, but the trend is slightly up relative to the average of the preceding three years (105 accidents pa 2011 to 2013).

- There were 16 fatalities, 4 more than in the previous 12 months and the third highest in the last ten years. The average of the last four years was14 fatalities pa and the highest in the last ten years was 21 fatalities in 2012

- The accident, fatalities and social cost statistics are now led by private aeroplane, private sport aircraft and sport transport sectors, but several accidents, fatal and non-fatal, have seen other commercial helicopters and airline helicopters (part 135), approaching the level of social cost per seat hour associated with agricultural aeroplanes and helicopters.

- The recent surge in the airspace incident rate per 100,000 hours flown continues. This period the number of reported airspace occurrences (all types) has increased by 12.1% on the last 12 months while the total flying hours in the same period increased by 5.5%. This is happening in a climate of decreasing aerodrome movements.

J.D. Stanton
Manager Intelligence Safety and Risk Analysis

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[1] This report uses calendar 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 2015 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 graphs:
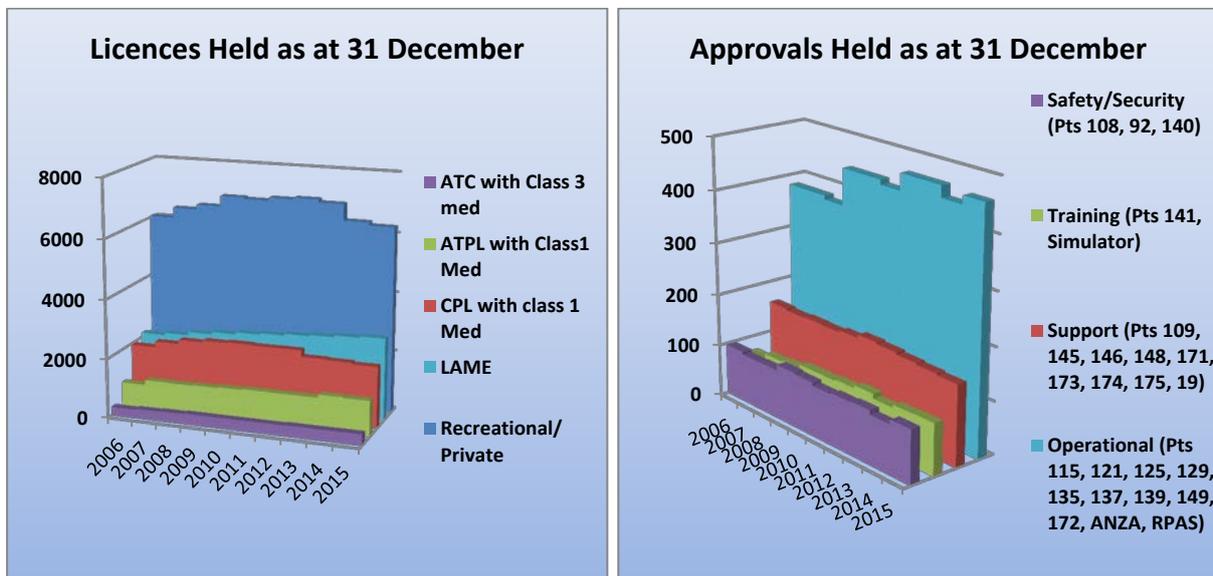
Note the logarithmic scale on the next 2 charts
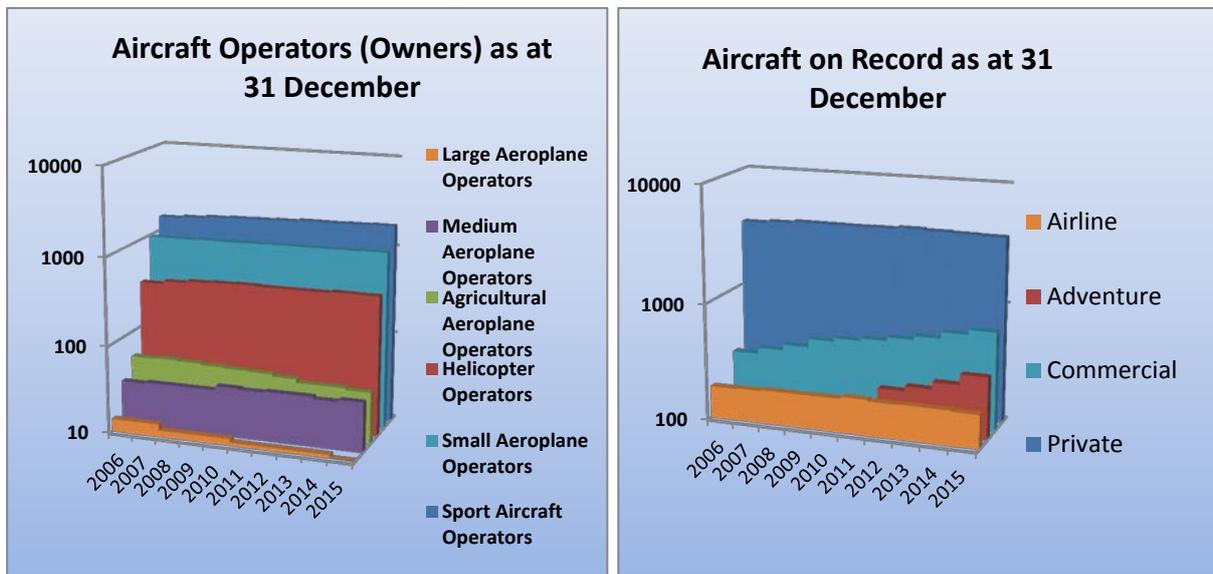
Notes and Comment

Licenses

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 Recreational/Private and the CPL groups have been slowly declining in numbers over the last 3 years and although Microlight certificates issued by Part 149 organisations are not included it has been suggested that PPL and RPL holders might be choosing to operate in the Microlight sector rather than the fully licensed sector.

Approvals

No significant trends are evident.

The number of Part 145 Aircraft Maintenance Organisation approvals peaked 3 years ago at 67 and has since declined to 56. If this is evidence of a continuing trend there might be a case for further assessment.

The number of Part 121 Large Aeroplane Operator approvals has fallen from 11 at the end of December 2006 to 8 at the end of December 2015. This sector is closely monitored.

The numbers of Part 137 Agricultural Aircraft Operator approvals declined from 116 at the end of December 2006 to 97 at the end of December 2014. This decline is not steady and may have begun to reverse. The number was 104 at the end of December 2015. This sector is closely monitored and the decline does not represent any safety concern.

Aircraft Operators (Owners)

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

The number of Large Aeroplane operators is declining and the number of Agricultural Aeroplane operators peaked at 53 in 2007 and has been declining ever since falling to 39 in 2015. The number of Medium Aeroplane operators has been between 35 and 37 since 2010. All other categories show small increases in the number of operators.

Aircraft

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. 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

The vast majority of aircraft recorded in the CAA database are private and their numbers climbed until 2012 and have declined since then. The most notable trend is in the commercial group where the numbers have increased by 244% since December 2006. Both fixed wing and rotary have contributed to this increase but the rotary component is the major factor having gone from 138 at the end of December 2006 to 468 at the end of December 2015.

For more detail follow these links:

Licences   Aircraft   Owners   Approvals

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 with these rules is inconsistent and varies widely across the industry. Activity estimates are carried out to adjust the industry totals for non-compliant operators. These estimates are calculated by assuming each non-compliant operator carries out the same mix of operations as the average of all compliant operators of the same aircraft category and class for the year and quarter being measured. At the time of data extraction 35% of expected returns for the year ended 31 December 2015 had not been received.

The following measures of industry activity are available
- Estimate of Hours Flown during the year
- Estimate of Air Transport flights conducted during the year
- Estimate of Agricultural Product delivered during the year
- Aerodrome Movements conducted during the year at monitored aerodromes

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

Note the logarithmic scale on the first 3 charts
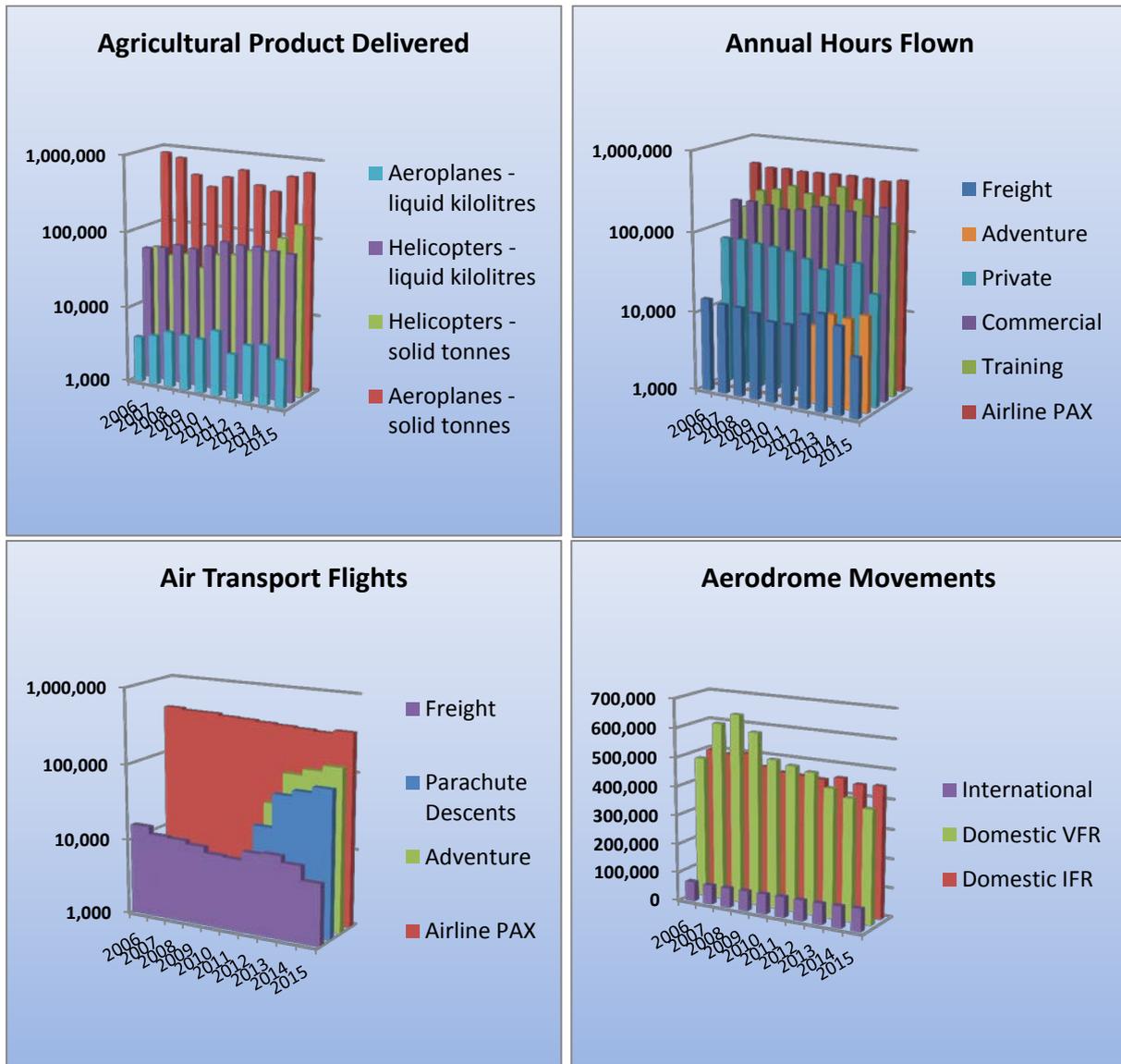
Notes and Comment

Agricultural Product Delivered

There are no obvious trends in this measure but the values display wider variations from year to year than in some other sectors. The tonnage of solids dropped by helicopter has increase markedly in recent years.

Hours Flown

The data presented here includes a 'standard' allowance for those aircraft for which no data had been received at the time of data extraction. This means that more recent data is less reliable than earlier data because there are more missing returns for more recent return periods.

Air Transport Flights

The comment in the previous section about the reliability of recent data applies equally to the air transport flights data.

The Adventure Aviation flights include all parachute descents carried out by Part 115 certificated organisations. Parachute descents make up approximately 55% of all Adventure Aviation flights.

No significant trends are apparent

Aerodrome Movements

This data covers only aerodromes that have an Airways presence either as ATC or Flight Service. An examination of airlines' published schedules suggests that there are between 10 and 20 thousand scheduled movements at certificated aerodromes that are not included in our data. With the exception of Taupo Airport, there is no data available on the numbers of unscheduled movements at certificated aerodromes that have no Airways presence. Taupo aerodrome's annual movements averaged 28219 over the 10 year period covered by this report and were 22009 during the 2015 calendar year.

There has been a steady decline in VFR movements at Airways monitored aerodromes since a peak of 646695 in 2008. This may be no more than 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 follow these links:

Hours Flown   Flights   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, Risk Assessments and Non-Compliance Findings 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 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
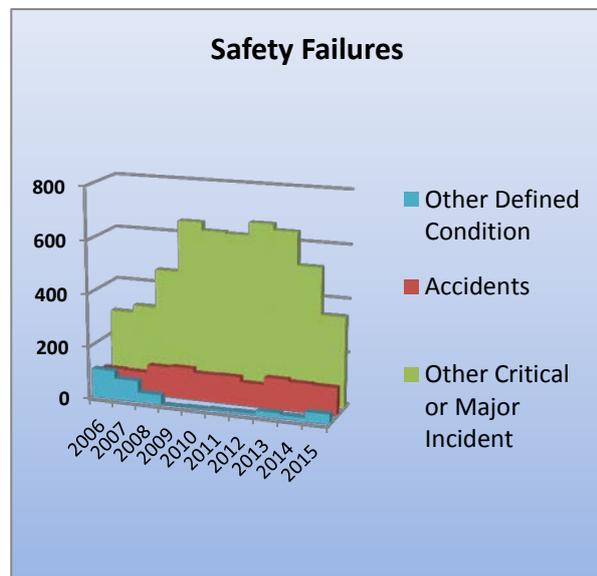
Whilst the goal for Safety Failures must be continuous reduction, it is difficult to identify a clear trend because of the small population. It is worthy of note that the number of 'Other Critical or Major' incidents does seem to be declining in recent years. These 'Other' incidents are mostly (80%) made up of Operational Incidents, Airspace Incidents and Defects in that 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.
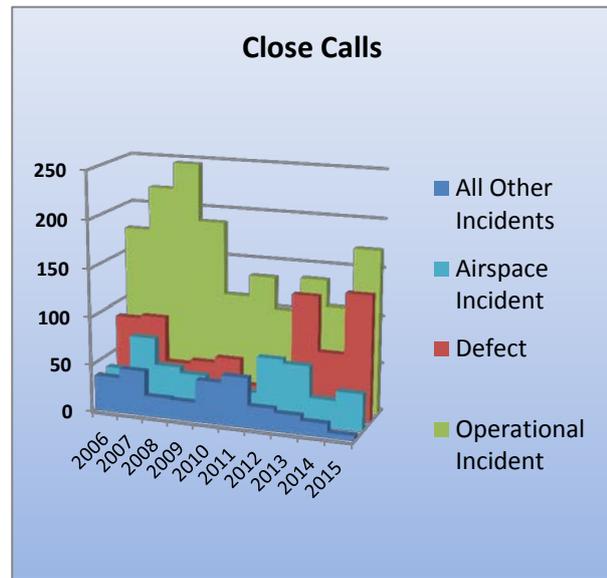
No obvious patterns or trends are evident in the records of close calls and this may be simply a symptom of the part that luck plays in determining whether an incident becomes a safety failure or remains a close call. The apparent predominance of Airspace and Defect incidents is consistent with the overall reporting numbers for these incident types which are equally predominant in the Safety Success outcomes.

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 Client Risk Assessment and Routine Audit 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 and graph show how the Risk Assessments have changed over the last 9 years. The table is ordered by the 2015 average risk score for the activity type.

Activity	Year ending 31 December								
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Australia AOC with ANZA Privileges Part 108 Security Programme				5.5	5.9	7.0	6.1	5.6	7.4	8.3
Part 108 Security Programme	7.8	7.9	7.7	8.3	7.5	7.1	7.0	6.4	6.9	5.6
Part 109 Regulated Air Cargo Agent			7.7	13.9	11.2	10.4	11.7	12.7	12.4	11.8
Part 115 Adventure Aviation Operator Certificate						30.6	13.2	12.2	9.6
Part 121 Air Operator Large Aeroplanes	13.8	10.9	9.5	10.5	10.0	7.8	8.0	8.2	7.6	7.6
Part 125 Air Operator Medium Aeroplanes	24.3	18.3	14.0	15.3	16.1	12.8	14.2	13.8	16.3	13.9
Part 129 Foreign Air Transport Operator	9.2	12.9	10.6	8.2	8.9	9.6	8.3	6.8	6.4	9.3
Part 135 Air Operator Helicopters and Small Aeroplanes	28.7	22.0	17.4	16.7	15.9	15.8	15.3	13.9	14.5	14.5
Part 137 Agricultural Aircraft Operator	33.7	26.5	19.0	16.6	16.3	15.5	15.6	14.6	15.1	14.8
Part 139 Aerodrome Operator	8.5	6.6	5.3	6.3	5.7	5.8	5.9	6.5	7.2	8.6
Part 140 Aviation Security Service Organisation	29.7	11.0	4.7	5.5	4.5	4.8	5.0	6.1	6.1	7.2
Part 141 Aviation Training Organisation	15.1	15.6	11.8	11.4	9.5	10.7	9.3	8.3	9.3	12.2
Part 145 Maintenance Organisation	14.8	12.0	10.7	10.8	10.3	11.1	9.4	9.8	10.3	9.9
Part 146 Aircraft Design Organisation	12.2	12.3	9.0	7.6	11.8	10.2	9.4	8.2	8.8	6.4
Part 148 Aircraft Manufacturing Organisation	14.4	12.2	11.8	10.4	11.2	10.8	9.4	10.9	11.7	8.9
Part 149 Aviation Recreation Organisation	11.8	3.0	5.1	30.7	8.4	16.2	11.4	14.4	16.2	8.7
Part 171 Telecom Service Organisation	21.9	10.8	6.0	4.9	6.8	17.3	12.7	6.6	5.1	5.3
Part 172 Air Traffic Service Organisation	29.2	26.7	7.3	9.7	9.9	22.0	19.1	15.1	12.8	12.6
Part 173 Instrument Flight Procedure				5.9	8.2	15.4	13.0	11.1	13.5	5.4
Part 174 Meteorological Service Organisation	16.3	30.2	7.3	9.6	10.3	15.9	10.7	5.1	5.3	
Part 175 Aeronautical Info Service Organisation	25.1	34.4	6.2	7.6	12.1	21.2	14.6	11.1	43.3	5.6
Part 19F Supply Organisation	13.8	12.1	12.6	11.1	11.2	10.2	9.1	10.8	10.2	12.5
Part 92 Dangerous Goods Packaging Approval Holder	2.6			2.6	5.6	10.9	5.1	8.4	7.4	5.1

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 number of findings and their severity divided by the number of hours spent on the inspection are used to generate a Non-Compliance Index.

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 each year. 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.

The next chart shows how the non-compliance findings have been distributed across those clients that have been audited over the last 10 years. The chart plots a 'Non-Compliance Index' (NCI) which is a weighted measure of the number of non-compliances discovered divided by the number of hours spent on the audit process. The weighting factors used reflect the relative severity of the non-compliance and are 30 for a critical, 2 for a major and 1 for a minor finding. To help with interpreting this chart it may be worth noting that to generate an index of 100 an audit lasting 30 hours would need to discover one critical finding or alternatively 10 Major plus 10 Minor findings.
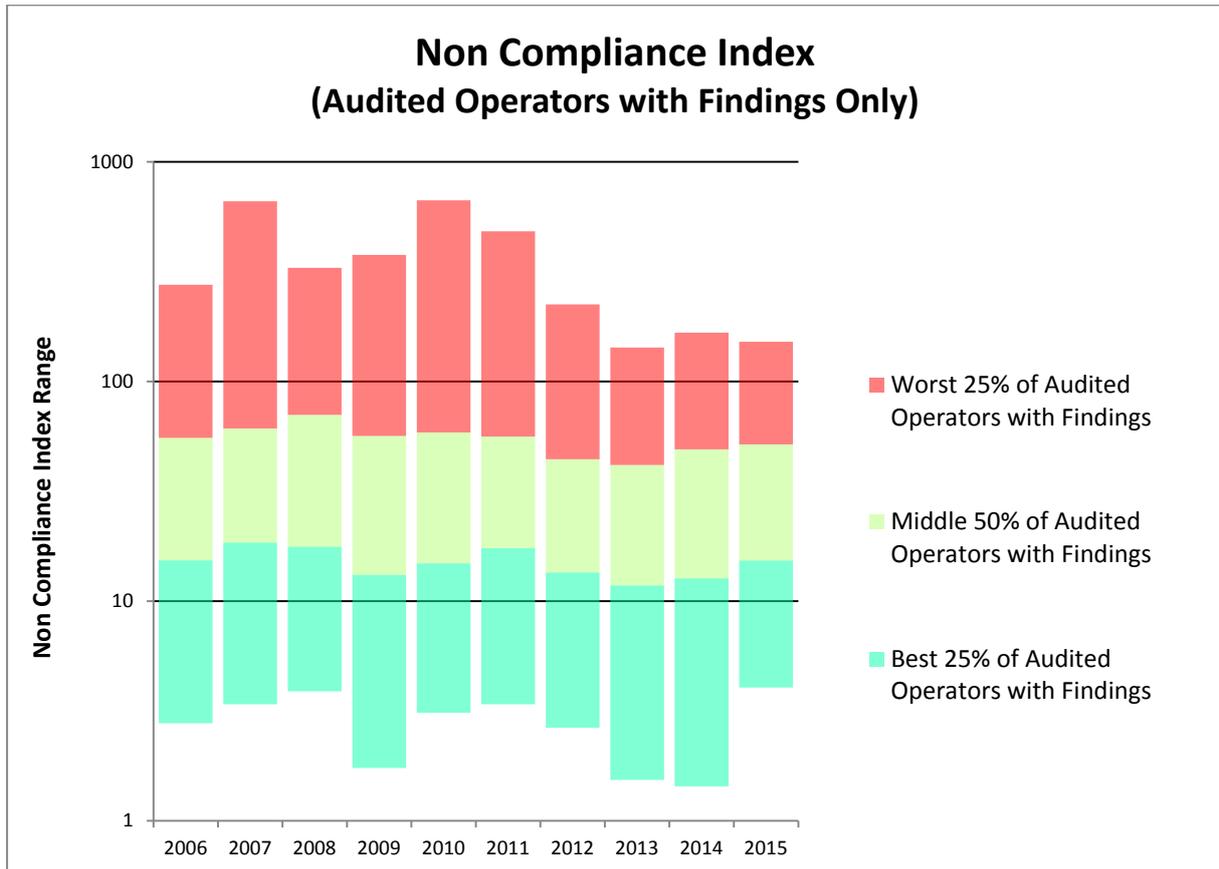
The most noticeable trend is the narrowing of the range of NCI values.

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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplane	117	116	121	118	119	127	125	128	128	**125**
Medium Aeroplane	72	76	75	78	78	78	80	79	78	**77**
Small Aeroplane	1429	1458	1500	1512	1517	1520	1526	1512	1495	**1506**
Helicopter	653	698	747	760	761	767	787	795	831	**840**
Agricultural Aeroplane	119	116	113	110	110	109	107	103	97	**93**
Sport Aircraft - Aeroplanes	97	103	114	119	117	126	143	151	165	**168**
Sport Aircraft - Amateur Built Aeroplane	210	226	243	256	258	266	276	282	283	**292**
Sport Aircraft - Amateur Built Glider	3	4	4	4	4	4	3	3	3	**3**
Sport Aircraft - Amateur Built Helicopter	12	16	18	20	20	22	23	24	24	**24**
Sport Aircraft - Balloons	59	64	67	69	69	72	74	61	64	**64**
Sport Aircraft - Glider	313	318	312	304	300	300	296	293	288	**289**
Sport Aircraft - Gyroplane	25	32	37	39	43	37	43	46	53	**62**
Sport Aircraft - Hang Glider	0	0	0	0	0	0	13	17	18	**18**
Sport Aircraft - Helicopter	8	6	5	5	3	5	6	4	5	**5**
Sport Aircraft - Microlight Class 1	246	248	236	232	228	220	224	215	213	**209**
Sport Aircraft - Microlight Class 2	624	666	713	742	767	798	822	820	842	**873**
Sport Aircraft - Power Glider	46	46	49	47	48	48	46	46	46	**49**
Sport Aircraft - Parachute	0	0	0	0	0	0	194	188	210	**209**
Sport Aircraft - Para Glider	0	0	0	0	0	0	61	82	69	**89**
Total	**4033**	**4193**	**4354**	**4415**	**4442**	**4499**	**4849**	**4849**	**4912**	**4995**

The totals need to be interpreted with care because the figures from 9 years ago did not include Hang Gliders, Parachutes or Para Gliders. Although most of these probably existed at that time they 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.

Significant growth areas are gyroplanes, amateur built helicopters, sport aeroplanes.and class 2 microlights.

Moderate declines are evident in the numbers of sport helicopters, class 1 microlights and agricultural aeroplanes.

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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Recreational (RPL with Med or any Class2 Med only or any PPL only)	6054	6394	6553	6907	6865	6964	7014	6921	6377	6275
CPL with class 1 Med	1960	2155	2295	2359	2385	2362	2366	2150	2125	2076
ATPL with Class1 Med	889	1055	1048	1068	1096	1124	1119	1120	1226	1210
ATC with Class 3 Med	294	325	342	363	362	362	363	380	379	383
LAME	2151	2227	2342	2424	2496	2549	2611	2660	2726	2779
Total	11348	12156	12580	13121	13204	13361	13473	13231	12833	12723

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.

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 and Commercial Pilot licence holders have been declining since 2010 – 2011.

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:	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplanes	14	14	12	12	12	11	11	11	11	9
Medium Aeroplanes	32	33	33	33	37	36	37	37	35	37
Agricultural Aeroplanes	52	53	52	50	49	48	45	41	41	39
Helicopters	326	353	373	381	387	381	381	383	393	390
Small Aeroplanes	962	965	982	978	991	1002	1004	1008	1016	1028
Sport Aircraft	1460	1524	1589	1627	1647	1679	1732	1728	1751	1780

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 36% drop in the number of large aeroplane operators and a 25% drop in the number of agricultural aeroplane operators over the last ten years along with increases of 16%, 20% and 22% in the numbers of medium aeroplane, 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 2015 of each year.

										Years 20--
Approval	06	07	08	09	10	11	12	13	14	15
Part 109 Regulated Air Cargo Agent	0	0	0	62	63	63	65	66	65	66
Part 115 Adventure Aviation Operator	0	0	0	0	0	1	33	34	27	30
Part 119 Air Operator	176	177	174	184	187	185	179	178	175	174
Part 119 Air Operator - Pacific	3	3	2	1	0	0	0	0	0	0
Part 129 Foreign Air Operator	39	39	40	38	34	30	32	31	31	33
Part 137 Agricultural Aircraft Operator	116	114	109	107	108	105	104	99	97	104
Part 139 Aerodromes	25	24	25	25	26	26	27	27	27	27
Part 140 Aviation Security Service	1	1	1	1	1	1	1	1	1	1
Part 141 Aviation Training Organisation	46	49	49	55	56	57	59	56	55	55
Part 141 Restricted Training Organisation	0	0	0	0	0	0	0	0	0	0
Part 145 Aircraft Maintenance Organisation	56	56	55	57	60	63	67	63	56	56
Part 146 Aircraft Design Organisation	13	12	11	11	14	14	14	14	14	13
Part 148 Aircraft Manufacturing Organisation	24	23	22	21	22	23	20	20	20	20
Part 149 Aviation Recreation Organisation	8	8	9	9	8	8	7	8	8	8
Part 171 Aeronautical Telecommunication Service Organisation	3	3	2	2	2	2	2	2	2	2
Part 172 Air Traffic Service	2	2	2	2	2	2	2	2	2	3
Part 173 Instrument Flight Procedure Service Organisation	0	0	0	3	3	3	3	3	3	2
Part 174 Meteorological Service Organisation	2	2	2	2	2	2	2	2	2	2
Part 175 Aeronautical Information Service Organisation	2	2	2	2	1	1	1	1	2	2
Part 19 Supply Organisation Certificate of Approval	59	58	64	59	57	60	56	56	59	58
Part 92 Dangerous Goods Packaging Approval	46	40	44	57	57	57	58	59	55	59
Part 129/108 Security Programme	32	31	30	28	26	21	23	23	22	25
Part 119/108 Security Programme	19	21	19	19	19	18	18	19	16	18
Part 121 Large Aeroplanes	11	11	9	10	10	9	9	9	8	8
Part 125 Medium Aeroplanes	14	16	15	15	16	15	15	15	12	15
Part 135 Helicopters and Small Aeroplanes	163	164	163	173	175	175	168	166	165	164
Part 119 Pacific/108 Security Programme	3	3	2	1	0	0	0	0	0	0
Pacific - Part 121 Large Aeroplanes	2	2	2	1	0	0	0	0	0	0
Pacific - Part 125 Medium Aeroplanes	3	3	2	1	0	0	0	0	0	0
Pacific - Part 135 Helicopters and Small Aeroplanes	3	2	2	1	0	0	0	0	0	0
Australian AOC Operating with ANZA Privileges	0	0	0	2	2	1	2	2	1	3
Synthetic Training Device (Airlines)	6	6	7	8	10	9	9	10	13	13
Synthetic Training Device (General Aviation)	20	26	28	29	26	29	33	26	30	31
Pilotless Aircraft Authorisation	0	0	0	0	0	0	3	8	2	0
Part 102 Unmanned Aircraft Operator Certificate	0	0	0	0	0	0	0	0	0	16
Total	897	898	892	986	987	980	1012	1000	970	1008

* 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 takeoff 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 2015. 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.
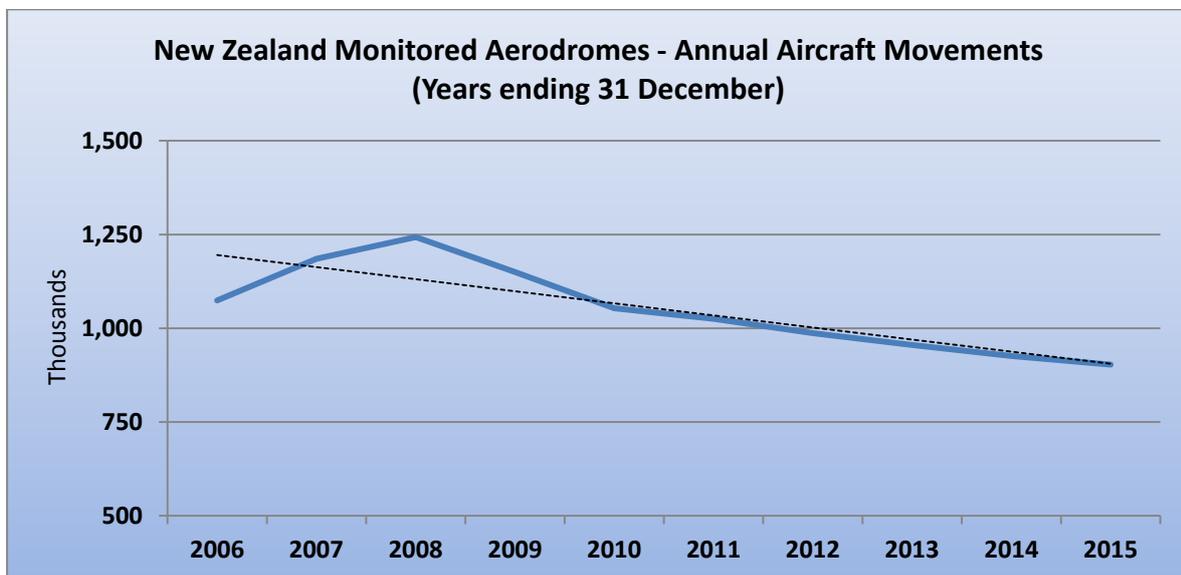
Breakdown by Aerodrome

The following table shows the number of aircraft movements 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.

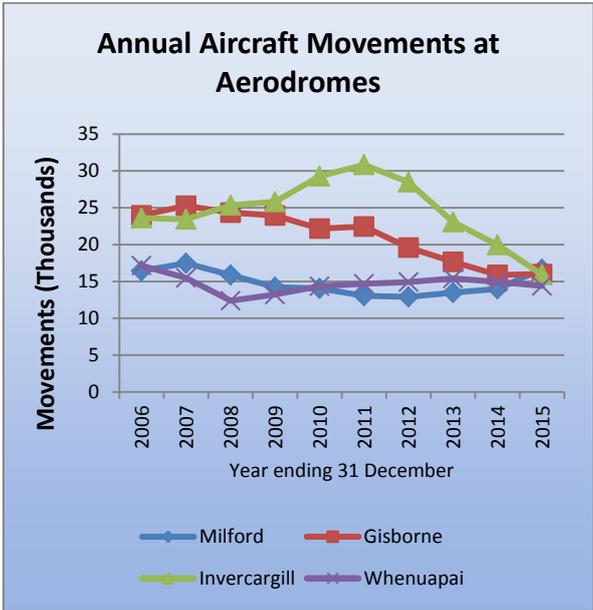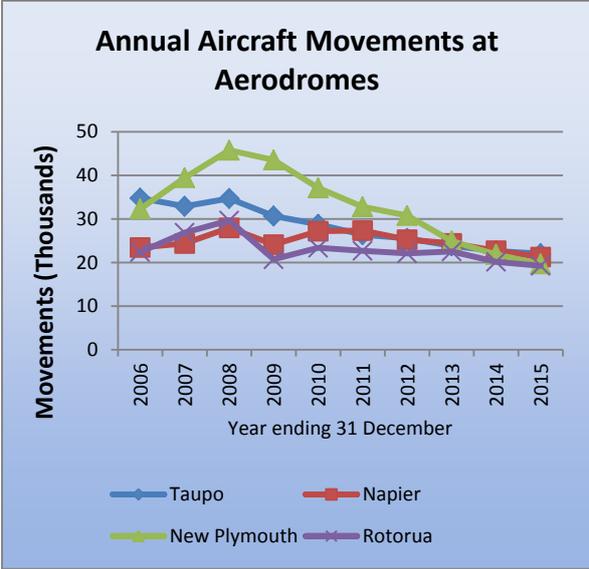| Annual Aircraft Movements at Aerodromes	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Auckland	161219	158536	164417	156325	157201	156655	156062	157141	153092	153561
Hamilton	97165	139939	151109	148380	99308	110419	128744	135404	129050	127044
Christchurch	138233	135963	148320	136249	125611	121469	109444	107754	112568	105760
Wellington	120587	121308	122206	111969	109193	105988	102488	101279	96084	99053
Tauranga	94207	97631	105992	97144	86935	74400	72652	70450	58448	52662
Queenstown	51146	49015	50445	45966	42347	41769	43776	43012	45620	49794
Palmerston North	59074	88817	82776	58761	56439	65708	67395	55960	52655	49494
Nelson	57446	51287	47931	48273	51570	50094	48073	45677	46770	45180
Ohakea	45107	71085	73513	72997	61896	55726	30959	28807	36512	29632
Paraparaumu	0	0	0	6305	0	12832	33702	31241	24279	26115
Dunedin	31903	40939	55321	53602	44003	29229	25328	22758	22750	23276
Woodbourne	23980	25711	25405	24058	22829	23660	22689	21826	20451	22374
Taupo	34760	32902	34696	30680	28774	26376	25536	23814	22642	22009
Napier	23445	24381	27948	24114	27172	27332	25242	24386	22728	21268
New Plymouth	32285	39444	45773	43518	37097	32791	30773	24910	21831	19678
Rotorua	22388	26856	29657	20734	23380	22682	22092	22532	20143	19256
Milford	16440	17473	15876	14227	14042	13043	12902	13482	13980	16658
Gisborne	23970	25279	24341	23955	22174	22459	19594	17671	15897	16003
Invercargill	23615	23427	25332	25805	29279	30840	28491	23058	19960	15910
Whenuapai	17139	15468	12372	13220	14347	14675	14915	15419	14946	14392
Total	1074109	1185461	1243430	1156282	1053597	1038147	1020857	986581	950406	929119

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

The aerodromes are grouped by the largest 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.

No information is available for Ardmore aerodrome although it is reported in the AIP as NZ's busiest aerodrome. The recent update of Part 139 which requires all aerodromes that are published in the AIP to supply movement data will ensure that a more complete picture of aerodrome movements will be available in the future.

Annual Aircraft Movements at Aerodromes — Auckland, Hamilton, Christchurch, Wellington

Annual Aircraft Movements at Aerodromes — Tauranga, Queenstown, Palmerston North, Nelson

Annual Aircraft Movements at Aerodromes — Ohakea, Paraparaumu, Dunedin, Woodbourne

Annual Aircraft Movements at Aerodromes — Taupo, Napier, New Plymouth, Rotorua

Annual Aircraft Movements at Aerodromes — Milford, Gisborne, Invercargill, Whenuapai

Air Transport Flights

The following graphs show the estimated number of air transport flights for the nine years ending 31 December 2015. The estimates are based on the reported numbers of flights with an allowance for aircraft for which reports were not received.

Note that these graphs exclude foreign registered aircraft that are operated in New Zealand.
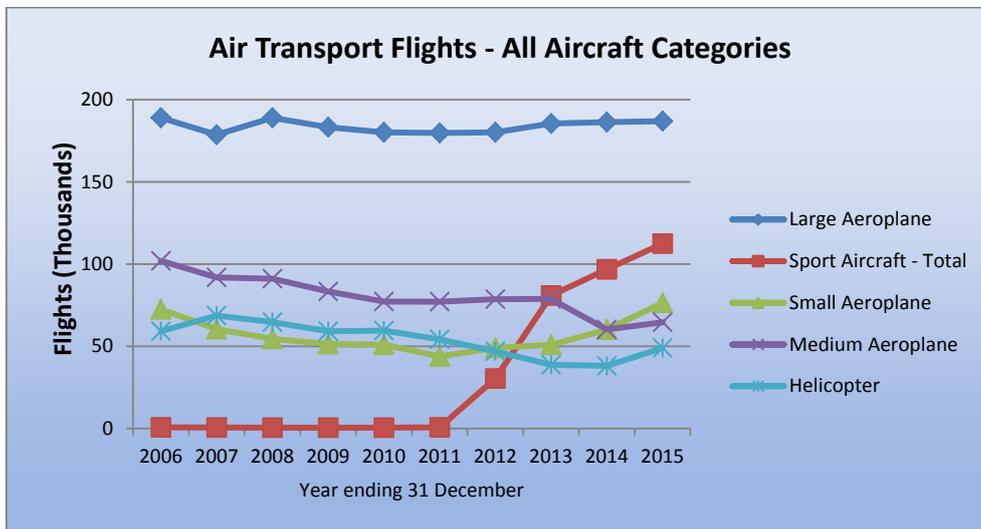
Apart from the expected emergence of adventure aviation flights the only trend that may be worthy of note is that Helicopter Air Transport Flights have reversed the declining trend that has existed since 2006 and are now back to 2012 levels. This change may be worth monitoring but it is important to remember that the reliability of the data for the final year of this report is always less than for the earlier years due to the late submission of data by some operators.

The Airline graph shows a decrease of 16%. This trend is consistent with the decrease in the aerodrome movements of 16% over the last ten years.

While it is expected that the Part 115 operations will not be reflected in the aerodrome movements data, it is interesting to note that the recent increase in airline sector flights is not seen in the aerodrome data. The increase is clearly seen in the small aeroplane and helicopter groups whose operations are less focussed around the monitored aerodromes than are the airlines operations.

Air Transport Flights - Part 115 Operations by Aircraft Class
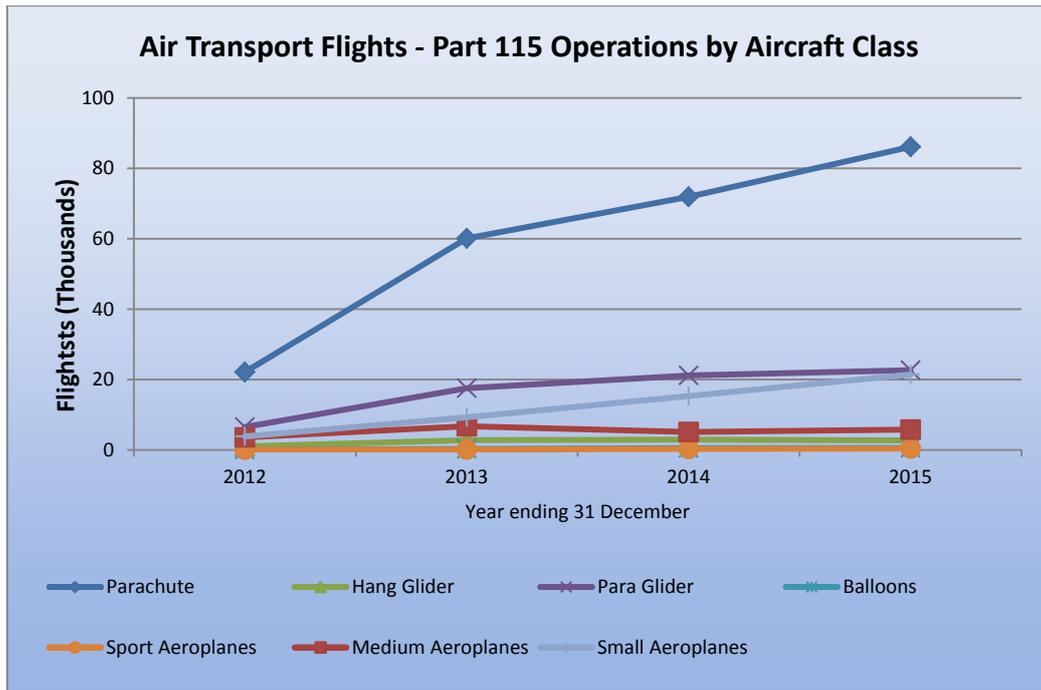
Rule Part 115 didn't come into force until 10 November 2011 so the year ending
31 December 2012 represents a start-up year for most operators. This data therefore should
only be seen as representing industry growth from the 2013 year onwards.

There are no obvious trends in activity levels yet.

Hours Flown

The following graphs show the estimated number of annual hours flown during the nine year period ending 31 December 2015. 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. Parachutes and foreign registered aircraft that are operated in New Zealand are also excluded.
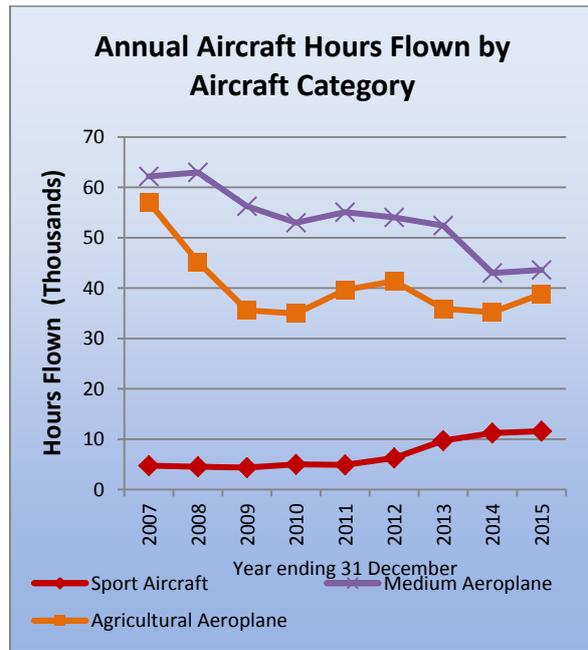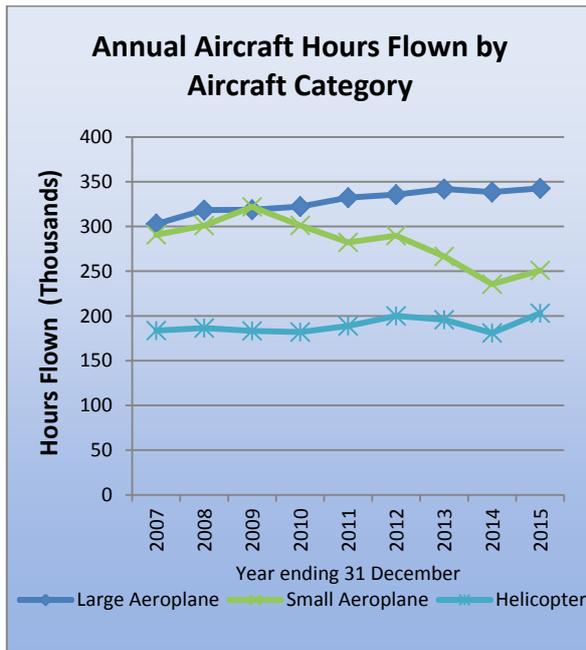
Noteworthy is the decline in hours flown by Agricultural Aeroplanes from 57,000 in the year ending December 2007 to 35,000 three years later. This may have been a consequence of the Global Financial Crisis and didn't trigger any intervention on the part of the CAA.
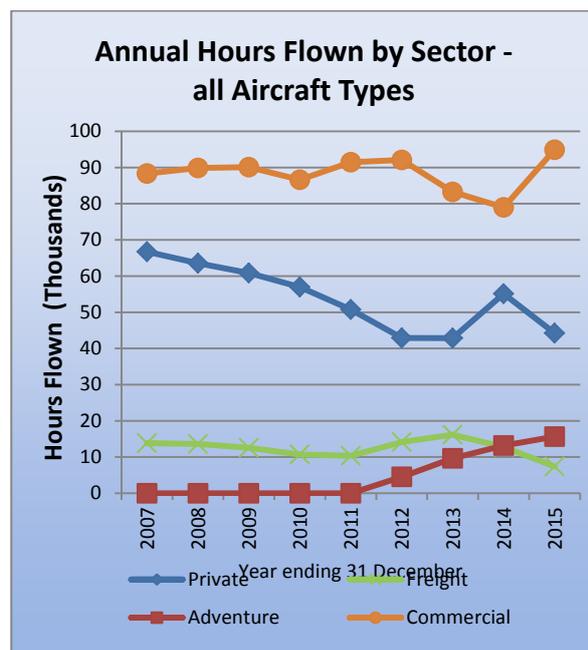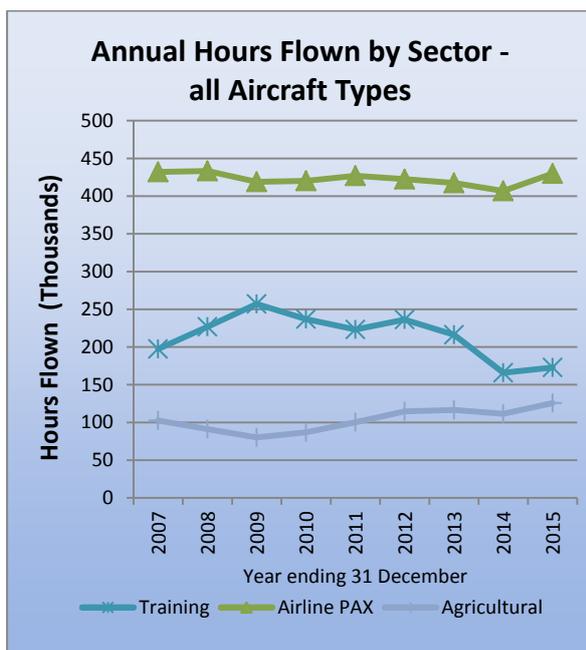
Seat-Hours

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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Airline Operations - Large Aeroplanes	38,901	41,044	46,243	46,288	46,811	48,304	48,760	49,695	49,162	48,778
Airline Operations - Medium Aeroplanes	567	652	796	703	672	712	702	668	508	522
Private Operations - Sport	57	206	206	206	206	228	256	272	266	280
Other Commercial Operations - Aeroplanes	142	231	254	291	250	234	327	239	155	275
Airline Operations - Helicopters	149	144	139	117	124	126	130	119	122	193
Airline Operations - Small Aeroplanes	204	124	108	102	99	111	115	83	76	144
Sport Transport	38	122	122	122	122	83	79	98	85	126
Agricultural Operations - Helicopters	99	95	99	93	108	96	91	92	71	79
Other Commercial Operations - Helicopters	66	90	92	109	93	99	102	61	61	57
Agricultural Operations - Aeroplanes	54	60	44	34	38	48	52	41	46	51
Private Operations - Aeroplanes	66	62	57	56	54	47	38	42	48	35
Private Operations - Helicopters	46	55	55	52	45	40	30	42	48	35

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.

Seat Hours Distribution

96.59% 3.41%

0.08% 0.08%
0.12% 0.18% 0.08%
0.46%
0.19% 0.53%
0.23%
0.16% 1.30%

- Airline Operations - Large Aeroplanes
- Airline Operations - Medium Aeroplanes
- Airline Operations - Small Aeroplanes
- Airline Operations - Helicopters
- Sport Transport
- Other Commercial Operations - Aeroplanes
- Other Commercial Operations - Helicopters
- Agricultural Operations - Aeroplanes
- Agricultural Operations - Helicopters
- Private Operations - Aeroplanes
- Private Operations - Helicopters
- Private Operations - Sport

This chart shows that for the year ending December 2015 approximately 96.6% of seat hours were offered by the Airline Operations – Large Aeroplanes group, approximately 1.3% by the Airline Operations – Medium Aeroplanes group, with the remaining 2.1% of seat hours offered being split between the other safety target groups.

By comparison the 343,000 hours flown by the 125 large aircraft is similar to the 235,000 hours flown by the 1506 small aeroplanes on the register. The difference in passenger exposure is 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 nine-year period ending 31 December 2015 (excluding the Sport Aircraft statistics category).

<u>Breakdown by Aircraft Category</u>
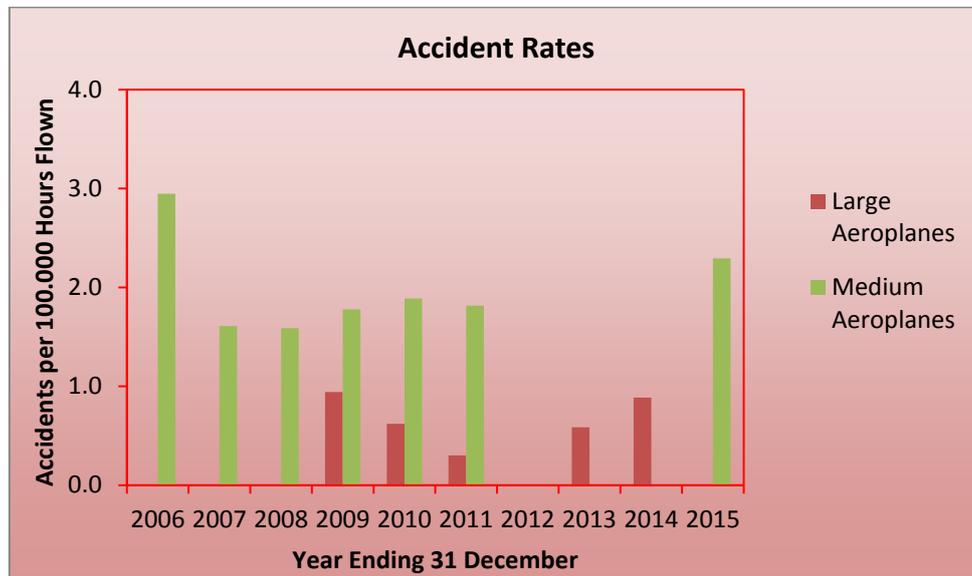
The numbers and rates of accidents in these two aircraft categories are too small for any trend analysis to be useful
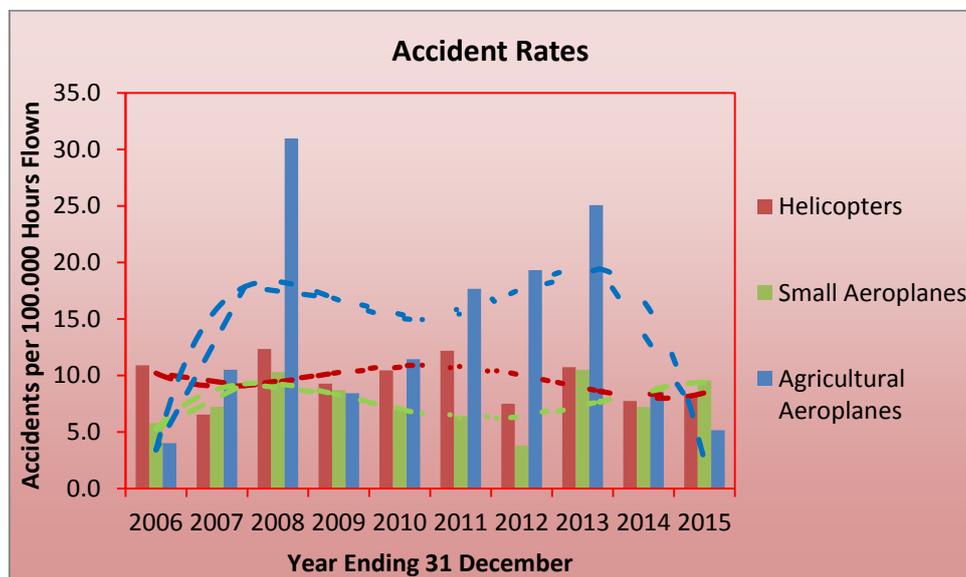
Trends are indicated by dashed lines colour coded the same as the corresponding aircraft categories. Note the cyclic nature of the trend line for the accident rate for Agricultural Aeroplanes.

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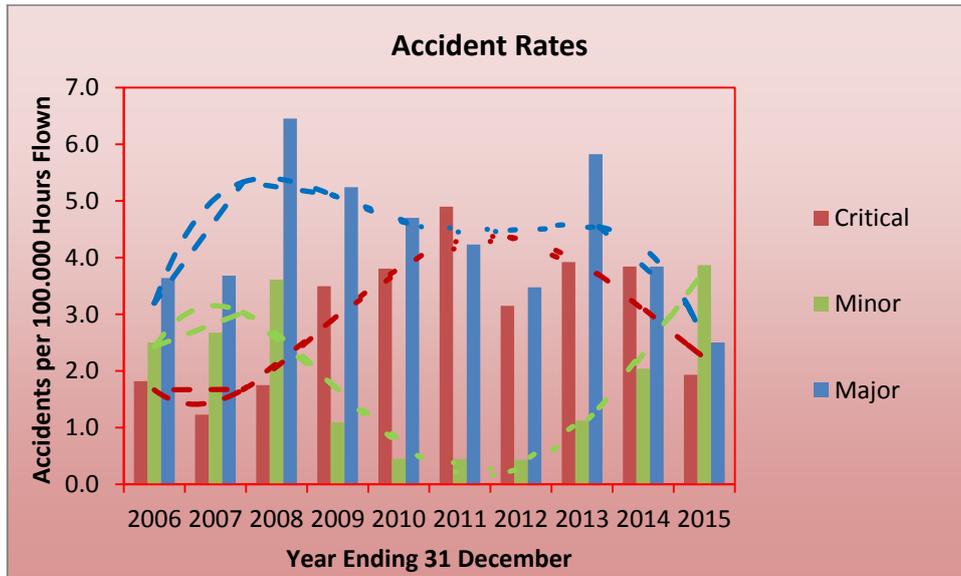
The definitions of Accident and Severity (see Appendix) are such that most accidents fall into the critical or major categories so the recent resurgence in the numbers of minor accidents is noteworthy.

Yearly Comparisons – counts, not rates

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

Critical Accidents

Aircraft Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplanes	0	0	0	0	0	0	0	1	0	0
Medium Aeroplanes	2	1	0	1	0	0	0	0	0	0
Small Aeroplanes	4	4	5	8	8	9	2	8	9	2
Helicopters	6	4	4	5	9	19	9	11	9	10
Sport Aircraft excluding Hang Gliders and Parachutes	2	0	4	17	15	15	15	12	12	5
Hang Gliders	3	3	2	6	3	6	8	9	5	5
Parachutes	2	1	0	1	3	3	5	1	7	2
Agricultural Aeroplanes	1	1	3	1	2	1	3	2	2	0
Unknown	1	1	0	0	0	0	0	1	0	0
Total	21	15	18	39	40	53	42	45	44	24

Major Accidents

Aircraft Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplanes	0	0	0	0	1	1	0	1	1	0
Medium Aeroplanes	0	0	1	0	0	1	0	0	0	1
Small Aeroplanes	8	14	15	16	12	9	7	18	3	8
Helicopters	11	6	17	12	10	4	6	9	5	3
Sport Aircraft excluding Hang Gliders and Parachutes	11	9	21	18	17	17	13	18	21	7
Hang Gliders	6	4	2	10	4	3	2	2	4	5
Parachutes	1	2	0	4	3	4	6	2	2	3
Agricultural Aeroplanes	0	4	5	2	2	4	5	6	0	2
Unknown	2	0	0	0	0	2	1	0	2	0
Total	39	39	61	62	49	45	40	56	38	29

Minor Accidents

Aircraft Type	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplanes	0	0	0	3	1	0	0	0	2	0
Medium Aeroplanes	0	0	0	0	1	0	0	0	0	0
Small Aeroplanes	4	3	11	4	1	0	2	2	5	14
Helicopters	2	2	2	0	0	0	0	1	0	3
Sport Aircraft excluding Hang Gliders and Parachutes	14	18	13	3	1	1	2	5	9	17
Hang Gliders	7	6	2	8	12	2	2	3	9	18
Parachutes	1	3	2	2	1	4	1	4	3	3
Agricultural Aeroplanes	1	1	6	0	0	2	0	1	1	0
Unknown	1	0	1	0	0	1	0	1	0	0
Total	30	33	37	20	17	10	7	17	29	55

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.

Airline Operations - Helicopter

- Fox Glacier: Fatal helicopter accident on Chancellor Shelf, Fox Glacier. 7 Fatalities. Aircraft destroyed. Occurrence ID: 15/5476

Other Commercial Operations - Helicopter

- Lochy River: Helicopter initially reported overdue, wreckage located in the Lochy River basin. 2 Fatalities. Aircraft destroyed. Occurrence ID: 15/631

- Poerua River: Helicopter crashed on takeoff, injuring the pilot and one passenger. 2 Serious injuries. Aircraft destroyed. Occurrence ID: 15/3162

Private Operations - Aeroplane

- Motatapu valley: Notified of an aircraft crash in the East branch of the Motatapu Valley. 4 Fatalities. Aircraft destroyed. Occurrence ID: 15/1129

Private Operations - Helicopter

- French Pass: Helicopter struck power lines which span French Pass and impacted the sea. 1 Fatality. Aircraft destroyed. Occurrence ID: 15/1102

Private Operations - Sport

- Ramarama: Pilot experienced restricted aileron control movement during a gliding flight. The pilot subsequently bailed out. See attached pilot report. 1 Minor injury. Aircraft destroyed. Occurrence ID: 15/541

- Kereta Road: Microlight accident during dual training flight. 2 Fatalities. Aircraft destroyed. Occurrence ID: 15/258

Sport Transport

- Taupo: Engine failure in the climb shortly after take-off. All skydivers and pilot vacated the aircraft via parachute. Aircraft ditched into Lake Taupo. No injury. Aircraft destroyed. Occurrence ID: 15/7

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 one-year periods ending 31 December 2015. All aircraft types are included. The table is sorted by the number of accidents in the year ending December 2015.

Safety Outcome Target Group	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Private Operations - Sport	42	43	45	53	50	46	47	54	61	**53**
Private Operations - Aeroplane	8	6	13	14	4	7	7	15	8	**14**
Sport Transport	8	5	1	17	10	11	8	3	12	**13**
Other Commercial Operations - Aeroplane	10	12	15	9	14	8	3	9	8	**8**
Other Commercial Operations - Helicopter	6	5	5	3	6	10	3	5	4	**5**
Agricultural Operations - Helicopter	7	2	7	5	3	5	7	4	3	**4**
Private Operations - Helicopter	6	5	7	6	9	6	2	6	3	**4**
Airline Operations - Helicopter	0	0	4	3	1	2	3	6	4	**3**
Agricultural Operations - Aeroplane	2	6	14	3	4	6	8	9	3	**2**
Airline Operations - Medium Aeroplanes	1	1	0	1	1	1	0	0	0	**1**
Airline Operations - Small Aeroplanes	0	2	3	3	2	3	0	3	1	**1**
Airline Operations - Large Aeroplanes	0	0	1	3	2	1	0	2	3	**0**
Other	0	0	1	1	0	2	1	2	1	**0**
None	0	0	0	0	0	0	0	0	0	**0**
Total	90	87	116	121	106	108	89	118	111	**108**

Not all accidents generate equal consequences and the usefulness of the above data for focussing intervention decisions is limited. The 'Sport Transport' group ranks 3rd in this data but when consequential factors like fatalities, serious injuries and aircraft damage are taken into account the ranking changes to 8th as can be seen from the next section.

Annual Social Cost

Social cost is a measure of the cost 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 2014 dollars for each safety target group for the last ten one-year periods ending 31 December2015. The table is sorted by the social cost in the year ending December 2015.

Safety Outcome Target Group	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Airline Operations - Helicopter	0.0	0.0	2.5	1.3	0.0	0.8	0.0	13.6	8.9	**29.1**
Private Operations - Aeroplane	9.1	0.0	1.4	4.2	4.1	5.1	1.6	0.2	5.4	**16.3**
Private Operations - Sport	20.8	11.6	31.7	27.6	7.0	21.7	32.9	14.7	15.3	**14.1**
Other Commercial Operations - Helicopter	3.1	6.1	8.3	0.7	8.3	25.8	0.4	0.8	5.1	**11.7**
Private Operations - Helicopter	9.0	1.0	4.6	0.1	4.7	5.0	4.3	1.0	9.4	**4.3**
Sport Transport	2.9	1.7	0.0	22.7	2.1	1.8	44.3	0.7	2.2	**2.4**
Agricultural Operations - Helicopter	4.3	0.3	2.3	0.0	0.0	1.6	5.3	4.6	11.9	**0.8**
Other	0.0	0.0	8.0	0.0	0.0	0.0	0.0	8.3	0.0	**0.4**
Airline Operations - Large Aeroplanes	0.0	0.0	0.5	0.1	0.0	0.0	0.1	1.0	2.5	**0.1**
Airline Operations - Small Aeroplanes	0.0	0.0	0.2	0.6	0.0	0.2	0.0	1.7	5.0	**0.0**
Agricultural Operations - Aeroplane	4.3	5.6	6.9	1.0	0.8	0.0	5.7	0.0	2.5	**0.0**
Other Commercial Operations - Aeroplane	8.5	5.8	12.3	4.6	45.8	0.2	0.0	0.8	10.9	**0.0**
Airline Operations - Medium Aeroplanes	0.7	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**62.7**	**32.1**	**78.7**	**62.9**	**72.8**	**62.2**	**94.5**	**47.3**	**79.0**	**79.2**

Social Cost Analysis

The extreme value of 94.5 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 31 December 2015 has incurred the highest social cost for ten years. The biggest contributing sector was the 'Airline Operations - Helicopter' . It was almost twice as high as the next highest which was the 'Private Aeroplane' sector.

The following charts show the annual social cost for each Safety Outcome Target Group for the ten year period ending 31 December 2015. 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, Other Commercial and Private operational.

Annual Social Cost - New Zealand Aviation
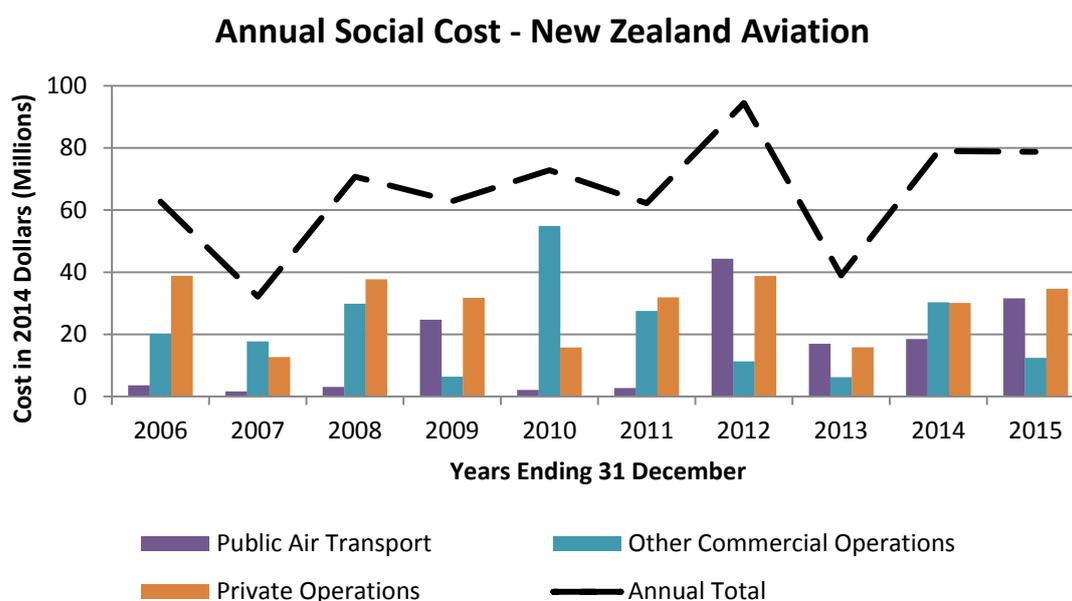
Recent social cost has been greatest in the private sector.

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
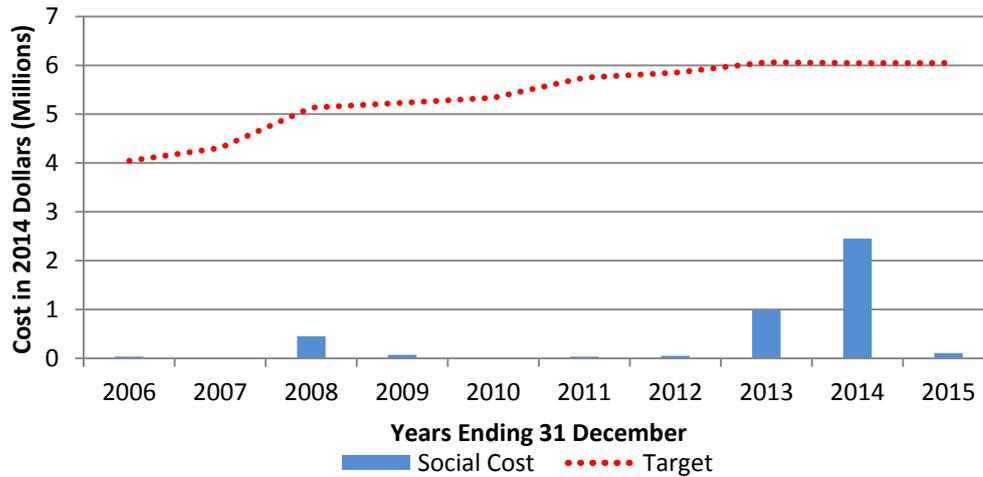
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	0	0	0	0	0	0	0	0
Serious Injuries	0	0	1	0	0	0	0	2	1	0
Minor Injuries	2	0	2	4	0	2	3	9	0	6
Aircraft Unusable	0	0	0	0	0	0	0	0	1	0

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 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.

Annual Social Cost
Airline Operations - Medium Aeroplanes
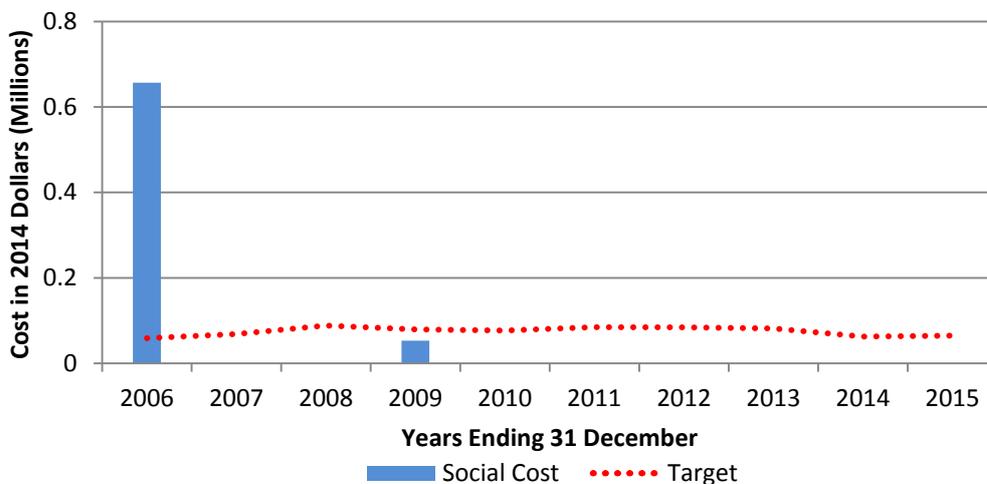
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	0	0	0	0	0	0	0	0
Serious Injuries	0	0	0	0	0	0	0	0	0	0
Minor Injuries	1	0	0	3	0	0	0	0	0	0
Aircraft Unusable	1	0	0	0	0	0	0	0	0	0

The most significant contributions were an aircraft written off in 2006 and three minor injuries in 2010

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 (1.3% 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.

Annual Social Cost
Airline Operations - Small Aeroplanes
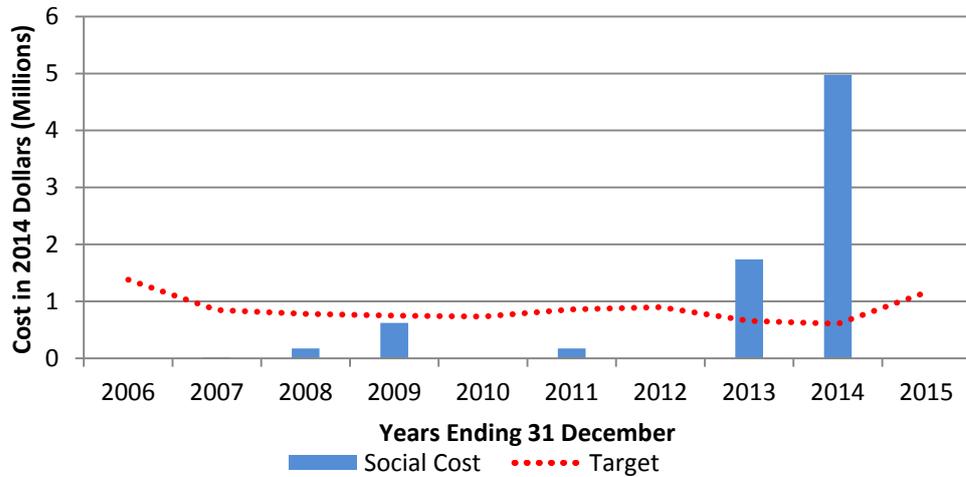
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	0	0	0	0	0	0	1	0
Serious Injuries	0	0	0	1	0	0	0	3	2	0
Minor Injuries	0	1	0	2	0	0	0	0	0	0
Aircraft Unusable	0	0	1	1	0	1	0	2	1	0

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 three years.

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

Also social cost is increasing despite activity levels slowly declining within this group.

Annual Social Cost
Airline Operations - Helicopters

Years Ending 31 December

Social Cost ••••• Target
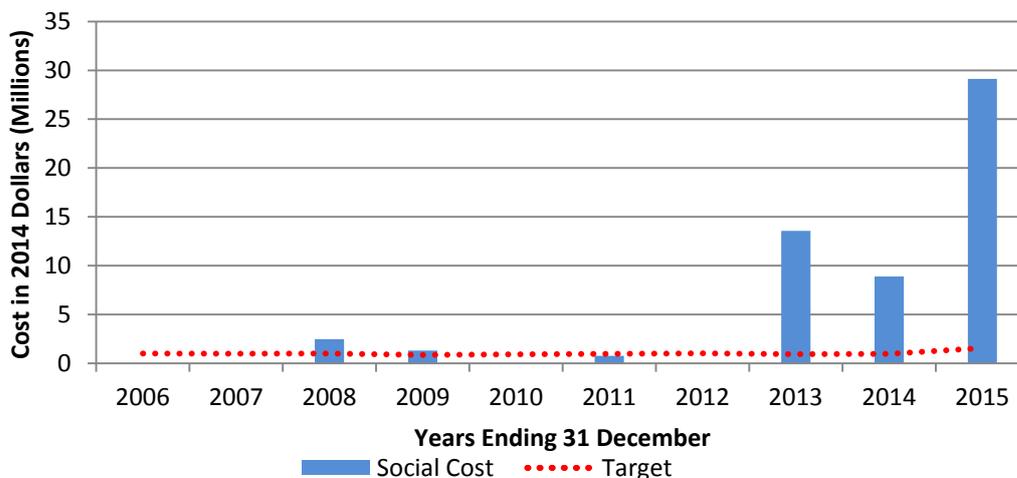
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	0	0	0	0	0	2	1	7
Serious Injuries	0	0	2	0	0	1	0	1	4	0
Minor Injuries	0	0	2	2	0	2	0	5	4	1
Aircraft Unusable	0	0	2	1	0	1	0	3	2	1

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

The social cost target has been met in five of the last ten years but the last time was in the year ending December 2012

The helicopter sector has been identified as a priority area for the CAA in the 2016/17 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
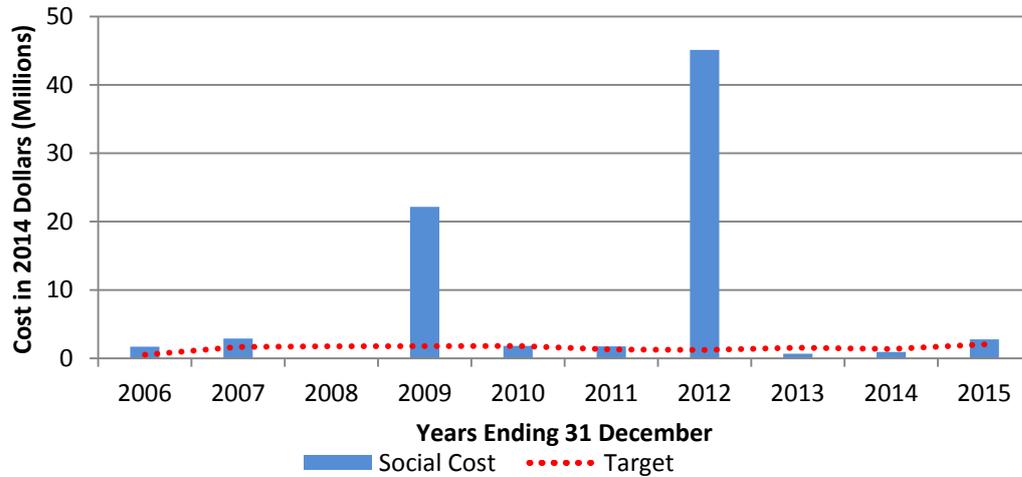
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	0	5	0	0	11	0	0	0
Serious Injuries	7	4	0	6	5	4	1	1	5	3
Minor Injuries	2	0	1	7	4	7	4	4	5	11
Aircraft Unusable	0	0	0	4	1	0	1	1	0	1

Five fatalities in 2009 and eleven in 2012 dominate the safety performance of this group. The nature of the operations within this group is generally viewed as being less safe than in other groups and this is usually understood by customers and is reflected in the targets that are set.

The group has shown the capability of meeting the social cost targets in three of the last ten years and almost meeting them in a further two. The safety failures of 2009 and 2012 were all in different sub-sectors of this group, spanning microlight, glider, hang glider and balloon operations.

No common causal themes have been identified by subsequent investigations leading to the idea that safety procedures in this group may need to be more individually tailored than in other groups.

Annual Social Cost
Other Commercial Operations - Aeroplanes
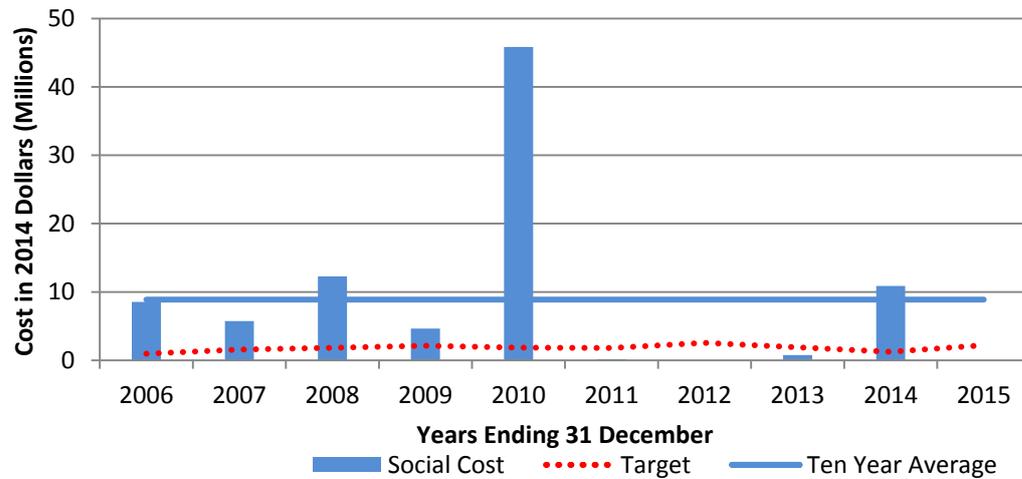
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	2	1	3	1	11	0	0	0	2	0
Serious Injuries	0	3	0	0	2	0	0	1	5	0
Minor Injuries	4	1	1	0	0	0	0	1	0	0
Aircraft Unusable	3	3	2	3	5	1	0	2	5	0

The most noteworthy event in this group is an accident in the year ending 31 December 2010 in which five crew and four passenger fatalities occurred during a parachuting transport flight.

The low level of activity within this sector (0.5% 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
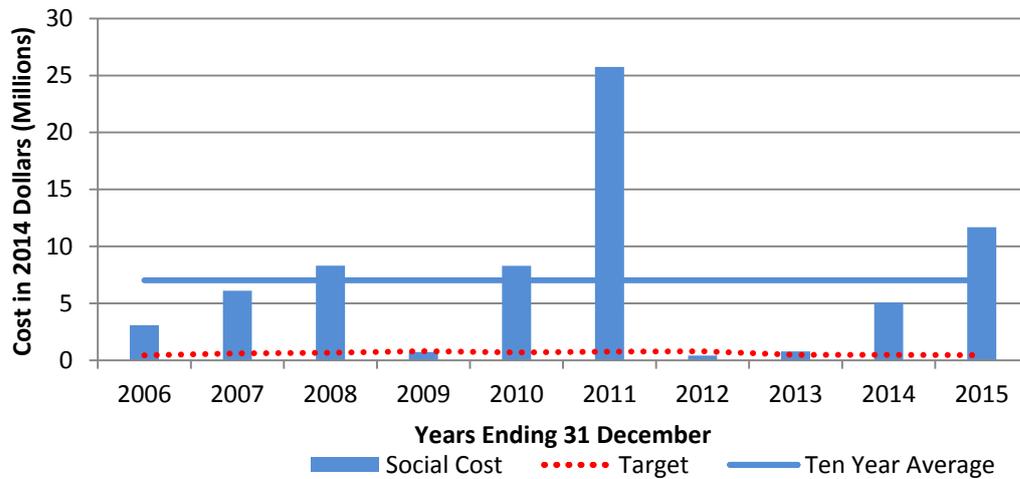
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	0	0	2	0	2	5	0	0	1	2
Serious Injuries	1	0	0	1	0	1	1	1	1	2
Minor Injuries	6	2	2	0	1	2	0	3	2	2
Aircraft Unusable	2	4	1	1	1	6	0	1	2	4

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 (0.12% 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
Agricultural Operations - Aeroplanes
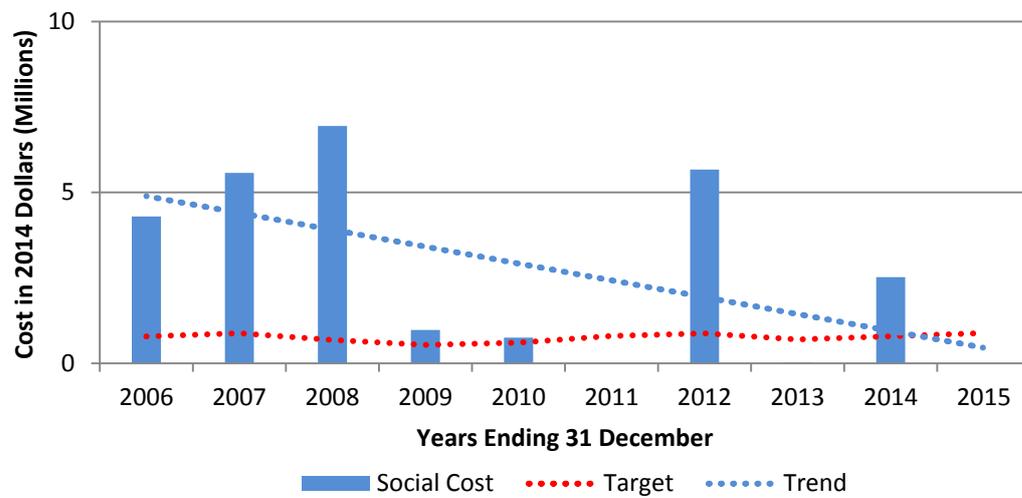
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	1	1	1	0	0	0	1	0	0	0
Serious Injuries	0	0	1	0	1	0	1	0	3	0
Minor Injuries	0	0	0	1	1	0	0	1	0	0
Aircraft Unusable	1	3	4	1	1	0	2	0	2	0

This group's safety performance is closely monitored and following significant safety failures the performance usually improves for a few years.

The long term downward trend in social cost is downward.

Annual Social Cost
Agricultural Operations - Helicopters
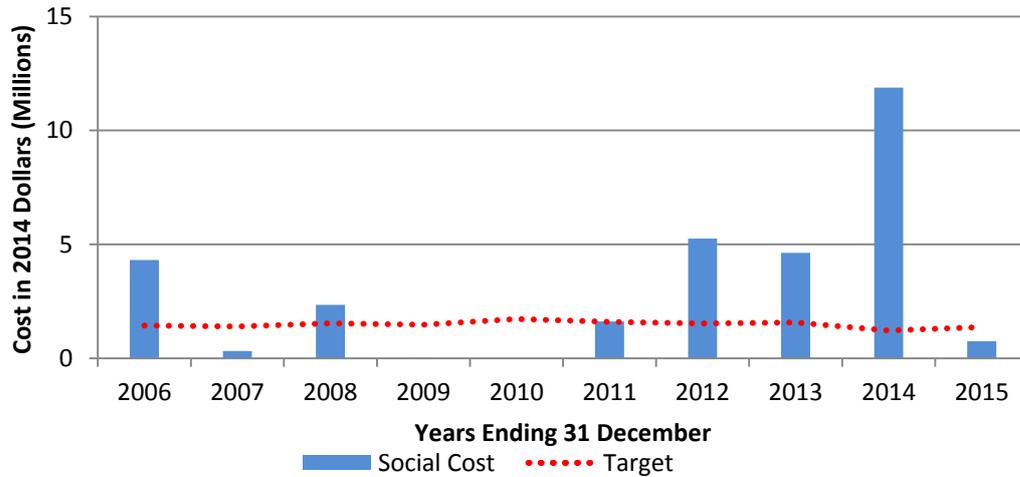
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	1	0	0	0	0	0	1	1	2	0
Serious Injuries	0	0	1	0	0	0	0	0	1	1
Minor Injuries	1	0	1	1	0	0	0	1	0	1
Aircraft Unusable	1	1	3	0	0	1	1	2	3	1

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. Nevertheless social cost increases in two of the last four years are a cause of concern. Significant longer term interventions are in place with the support of the industry.

Annual Social Cost
Private Operations - Aeroplanes

Social Cost   ••••• Target
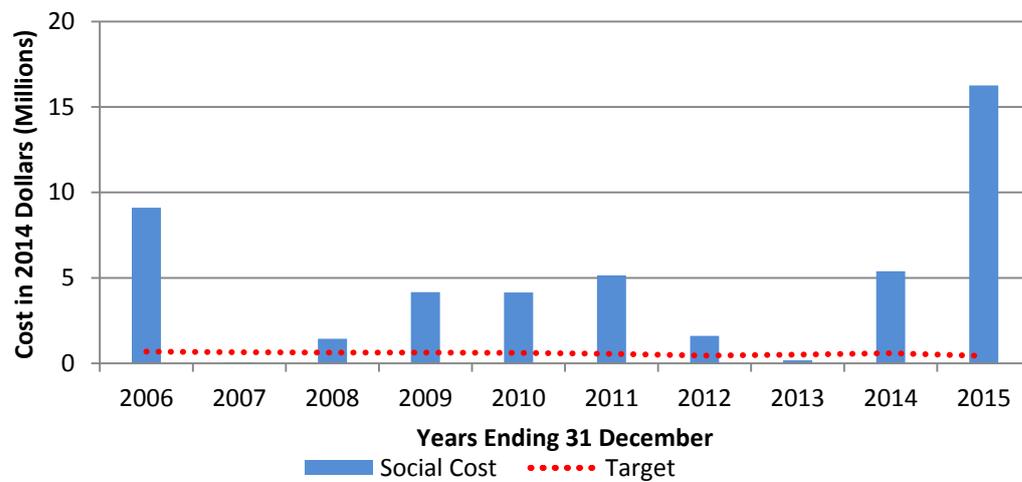
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	2	0	0	0	1	1	0	0	1	4
Serious Injuries	0	0	3	0	0	2	3	0	2	0
Minor Injuries	0	2	1	1	0	0	1	0	4	1
Aircraft Unusable	4	0	1	1	1	2	2	1	3	2

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
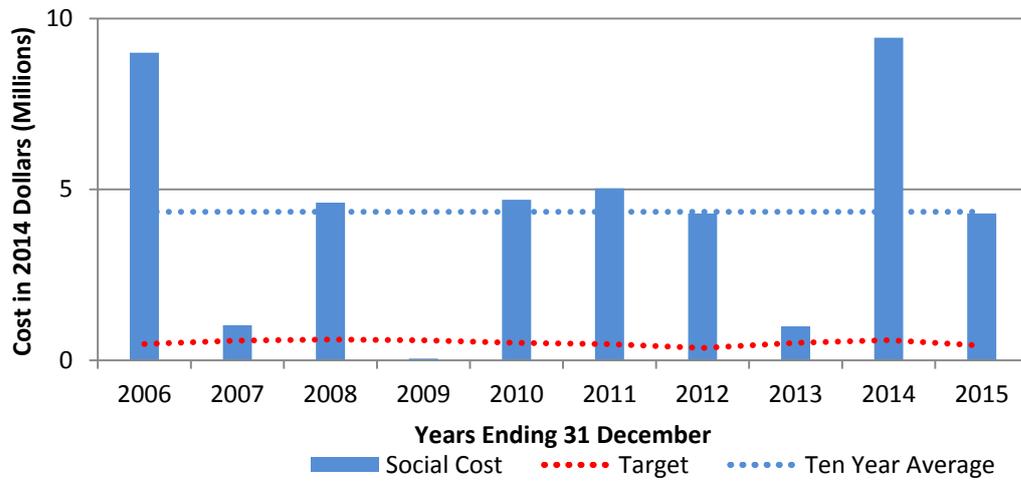
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	2	0	1	0	0	1	1	0	2	1
Serious Injuries	0	0	0	0	2	1	0	0	2	0
Minor Injuries	5	4	0	3	2	1	0	2	1	0
Aircraft Unusable	3	3	2	0	4	3	1	3	2	1

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 average is well above target.

Annual Social Cost
Private Operations - Sport
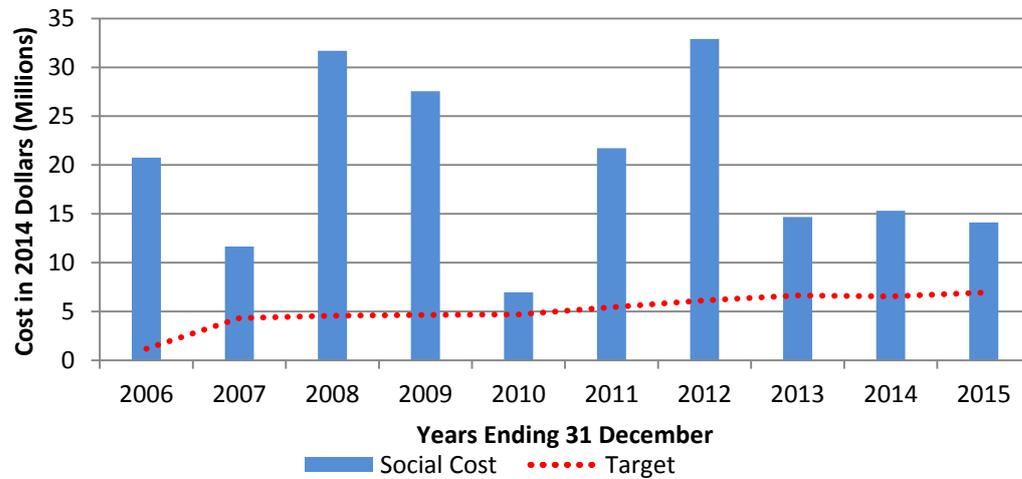
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Fatalities	4	2	7	7	1	4	7	2	2	2
Serious Injuries	11	8	8	8	8	**14**	**11**	**15**	**16**	**13**
Minor Injuries	9	7	9	4	17	3	6	**17**	**16**	**26**
Aircraft Unusable	3	4	6	6	3	7	5	3	7	5

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 steady and is an improvement over the time before that.

Of note are the significant increases in the numbers of minor injuries over the last three years and serious injuries over the last five years.

Flight Phase

The following table shows the flight phase recorded for accidents for the ten one-year periods ending 31 December 2015. The figures include all aircraft types. The table is ordered by the 2015 values.

Flight Phase	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
LANDING	30	40	46	37	43	37	35	48	42	48
TAKEOFF	13	11	21	30	19	20	11	16	20	16
CRUISE	21	13	17	15	5	14	7	16	13	14
CLIMB	5	6	6	6	8	8	2	6	8	7
DESCENT	5	3	1	5	6	0	6	4	3	6
TAXIING	4	2	5	5	3	5	3	3	4	5
UNKNOWN	0	0	0	1	2	1	2	2	5	3
APPROACH	1	2	5	5	3	8	5	5	9	3
AGRICULTURAL MANOEUVRES	1	2	2	4	3	1	5	2	2	2
HOVER	2	1	3	3	4	4	2	5	1	2
PARKED	2	1	6	2	4	2	5	5	0	2
CIRCUIT	1	0	2	0	1	1	0	0	1	0
Not Recorded	2	6	1	8	5	7	4	4	2	0
HOLDING	0	0	1	0	0	0	0	0	0	0
HOVER TAXI	3	0	0	0	0	0	1	2	0	0
AEROBATICS	0	0	0	0	0	0	1	0	1	0

The most common phase of flight during which accidents occurred in the year ending 31 December 2015 was the Landing phase (44%). This proportion of accident 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 causes (at 37%) recorded for Landing phase accidents during the year ending 31 December 2015 were 'Active Failure Factors - ACTIONS INCONSISTENT WITH PROCEDURES' and 'Active Failure Factors - POOR PROCEDURE "ACTION"'.

Accident Causal Factors

501 causal factors have been assigned to 392 (41%) of the 965 accidents that were reported as occurring during the ten years ending 31 December 2015.

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

Distribution of Cause Categories

- Organisation Factors
- Local Error Factors
- Local Violation Factors
- Active Failure Factors
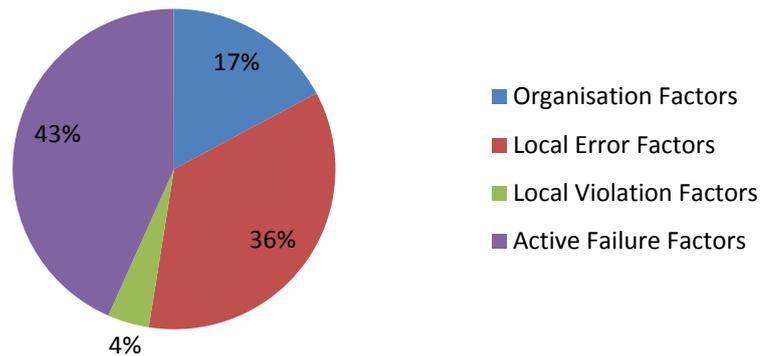
Active Failure Factors

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

- ACTIONS INCONSISTENT WITH PROCEDURES
- POOR PROCEDURE "ACTION"
- PRIMARILY "STRUCTURAL/MECHANICAL"
- INAPPROPRIATE "STRATEGY"
- STATE CHANGE NOT DETECTED "INFORMATION"
- INAPPROPRIATE "GOAL"
- INAPPROPRIATE "PROCEDURES"
- INACCURATE SYSTEM "DIAGNOSIS"
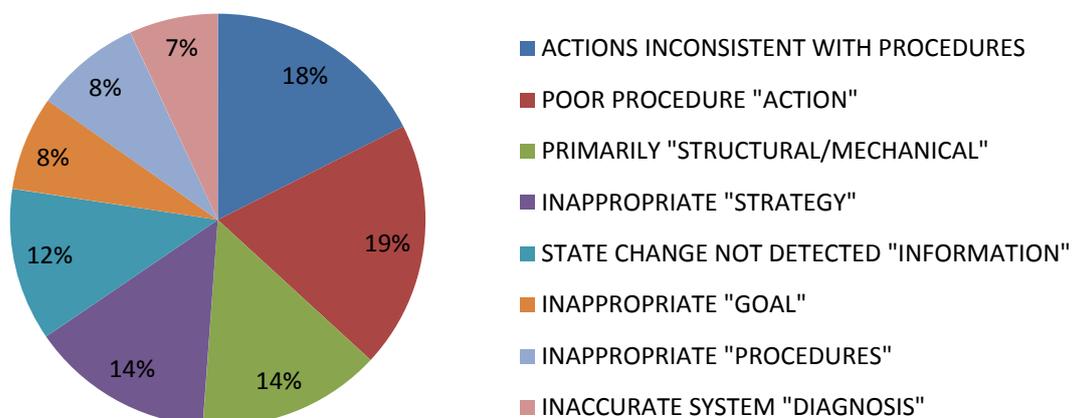
Airspace Incidents

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 2015 (excluding the Sport Aircraft category). The graphs do not differentiate between incidents that are pilot or ATS attributable.

Breakdown by Aircraft Category
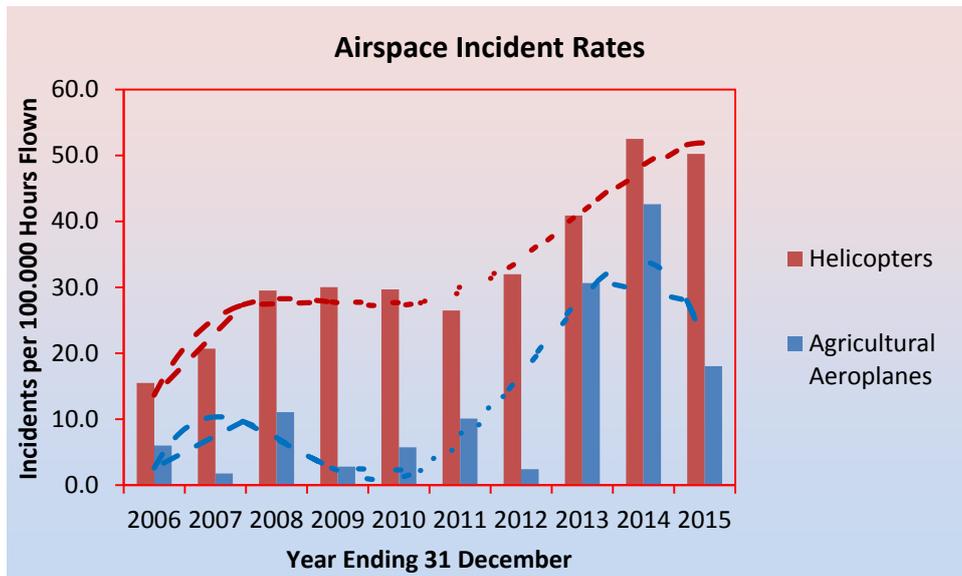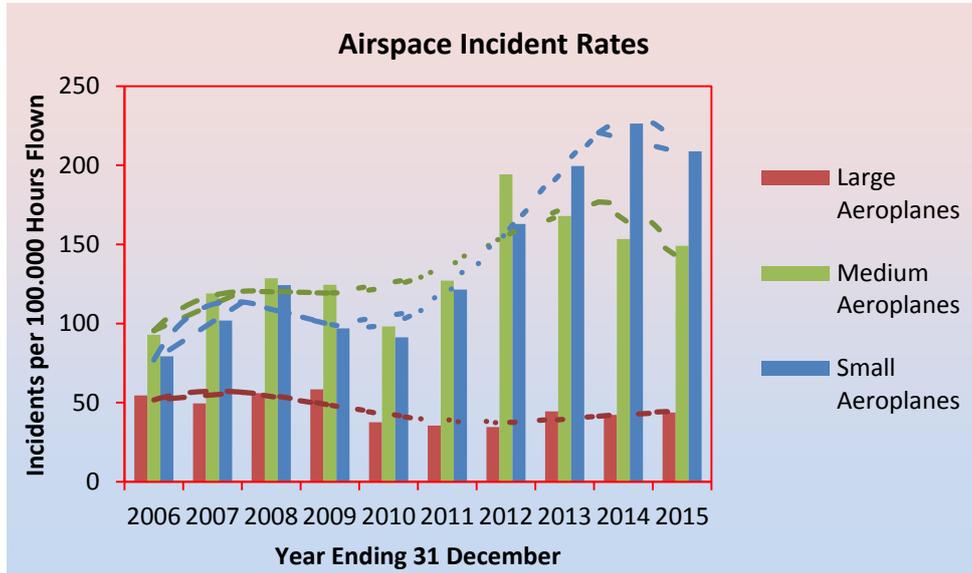
Breakdown by Severity
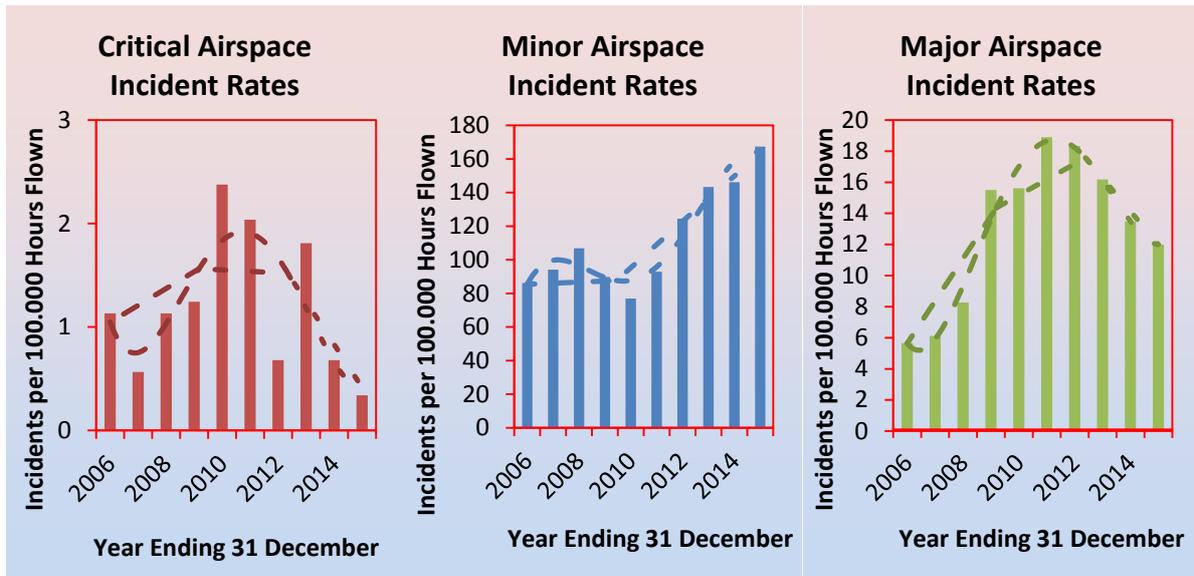
Breakdown by Airspace Designation

(Counts not Rates)
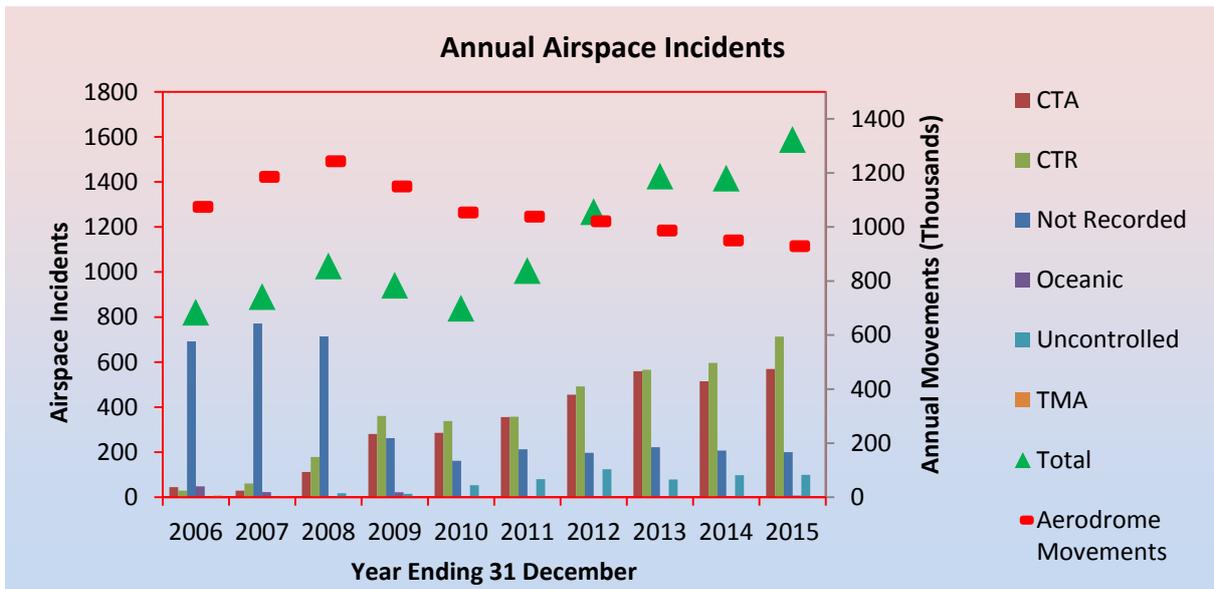
After June 2011 a sudden onset of a steady increase in the total numbers of reported airspace incidents is evident. This was in an environment of a steady but slower decrease in the reported number of aerodrome movements. No single underlying cause for this increase can be identified, although Airways Corporation began several safety enhancement training initiatives around this time.

Breakdown of Airspace Incidents in Control Zones by Aerodrome

Aerodrome	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Hamilton	4	10	35	45	59	54	168	135	125	167
Christchurch	3	5	18	39	34	32	32	51	46	88
Tauranga	1	3	9	15	15	38	46	57	65	85
Auckland	6	8	19	38	41	37	39	59	45	71
Queenstown	1	0	6	21	23	39	24	34	57	47
Wellington	1	5	20	44	27	37	33	38	28	41
Palmerston North	2	2	21	34	22	21	29	37	62	36
Nelson	2	1	5	26	23	27	19	17	26	35
Dunedin	0	1	2	4	19	6	23	31	37	29
Woodbourne	0	5	10	26	16	11	10	14	17	18
Napier	2	5	5	7	8	6	13	17	14	16
Rotorua	1	0	10	15	14	17	13	13	10	14
Gisborne	1	2	0	4	3	5	5	13	10	13
Ohakea	0	1	3	9	5	7	8	13	14	10
Whenuapai	1	0	3	5	3	7	8	12	10	8
New Plymouth	1	2	4	6	10	3	3	13	4	8
Invercargill	0	0	0	2	6	3	2	3	4	5

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 1475 of the 1588 reported airspace incidents in the year ending 31 December 2015. 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 breakdown into these broad categories is shown in this table.

Descriptor is associated with	Number of times descriptor applied
ATS	260
Pilot	1266
Either	211

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 2015
ATS Clearance/Instruction Deficiency	97
ATS Coordination Deficiency	136
ATS Flight Information Deficiency	12
ATS Flight Planning System Deficiency	15

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 2015
Air Proximity	75
Breach Of Other Clearance	541
Flight Assist	1
Pilot Flight Planning Deficiency	19
Pilot Position Reporting Deficiency	90
Pilot Readback Deficiency	3
Unauth Airspace Incursion	382
Unauth Altitude Penetration	155

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

Descriptor	Number assigned in 2015
Controller/Pilot Datalink Communications	1
Loss Of Separation	33
Near Collision	10
Other	108
Reduced Vertical Separation Minima	0
Short Term Conflict Alert	7
Traffic Collision Avoidance System	52

Trend

The following graph shows the annual numbers of airspace incident reports and their attributability for the ten year period ending 31 December 2015.
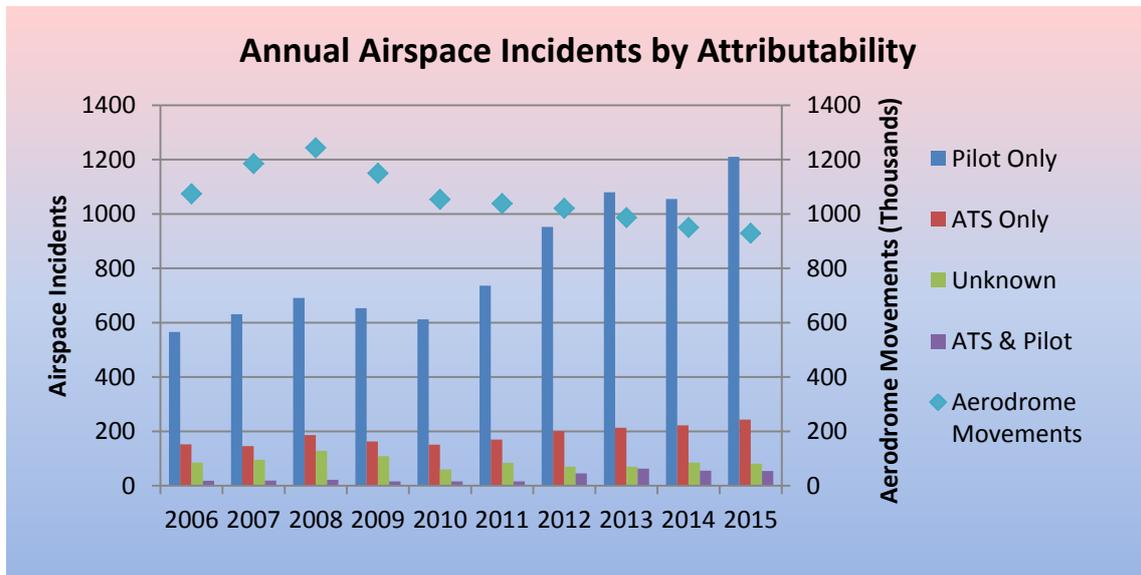
The number of "unknown" attributable airspace incidents reflects difficulties with coding of reports received by the CAA. Note that there is often a time delay between incidents occurring, being investigated, and attributability being assigned to either ATS or Pilot.

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 2006 to December 2011 period and the outer ring the period from January 2012 to December 2015. 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**

- Organisation Factors
- Local Error Factors
- Local Violation Factors
- Active Failure Factors
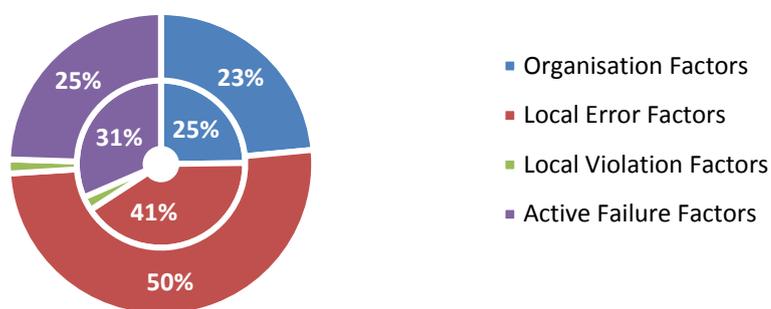
Local Error Factors

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:

Jan 2006 to Dec 2011		Jan 2012 to Dec 2015	
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

A decrease in active failure factors offset most of the shift in local error factors.

The top three contributing causes were:

Jan 2006 to Dec 2011		Jan 2012 to Dec 2015	
ACTIONS INCONSISTENT WITH PROCEDURES	19%	ACTIONS INCONSISTENT WITH PROCEDURES	27%
INACCURATE SYSTEM "DIAGNOSIS"	31%	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 2006 to December 2011 period and the outer ring the period from January 2012 to December 2015. 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
- Local Error Factors
- Local Violation Factors
- Active Failure Factors
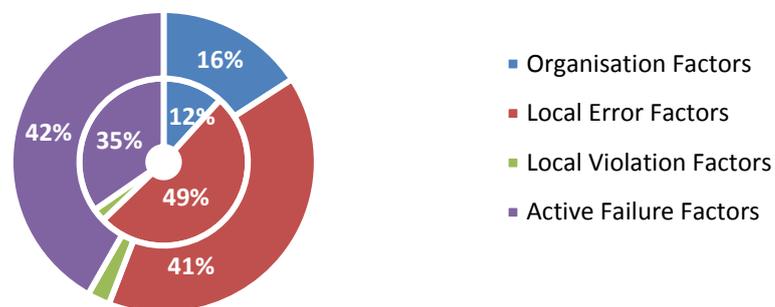
Organisation Factors

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

The top three causes were:

Jan 2006 to Dec 2011		Jan 2012 to Dec 2015	
INADEQUATE PROCEDURES	16%	INADEQUATE CONTROL AND MONITORING	29%
INADEQUATE COMMUNICATIONS	14%	INADEQUATE TRAINING	19%
INADEQUATE SPECIFICATIONS/REQUIREMENTS	14%	OTHER ORGANISATION FACTOR	15%

Local Error Factors

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

The top three causes were:

Jan 2006 to Dec 2011		Jan 2012 to Dec 2015	
INADEQUATE CHECKING	26%	INADEQUATE CHECKING	25%
POOR INSTRUCTIONS/PROCEDURES	12%	POOR INSTRUCTIONS/PROCEDURES	4%
TASK UNFAMILIARITY	7%	TASK UNFAMILIARITY	7%

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

This section describes significant airspace incidents reported as occurring during the last year covered by this report. The section is grouped by attributability. Groups with no significant events have been omitted. For each incident the location is stated before the description.

Pilot Attributable

- Timaru: A departing AT504 made radio call taxiing to runway 29, then another call rolling on runway 29. Crossing the 02/20 intersection at 300ft noted a Beechcraft on final for rwy20, no on final radio call heard from the Beechcraft. Occurrence ID: 15/4661

Serious Incidents

ATS Attributable

- Hamilton: Aircraft converged on final as one was circling off the instrument approach and another was on a 2 nm. final. The aircraft came to within 0.2 nm. of each other, at the same level. Instructions were issued by ATC for aircraft to take avoiding action. Occurrence ID: 15/5919

Pilot Attributable

- Ohakea: Object, suspected to be an RPAS (similar to a Parrot Quadcopter) was operated in close proximity to B200 as it was on the approach to Ohakea at 1200 ft. The RPAS was estimated to have been within 20 ft. laterally and 300 ft. vertically of the B200. Aircraft has descended from 1500 ft. to 1200 ft. AMSL. Occurrence ID: 15/4904

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 2015.

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
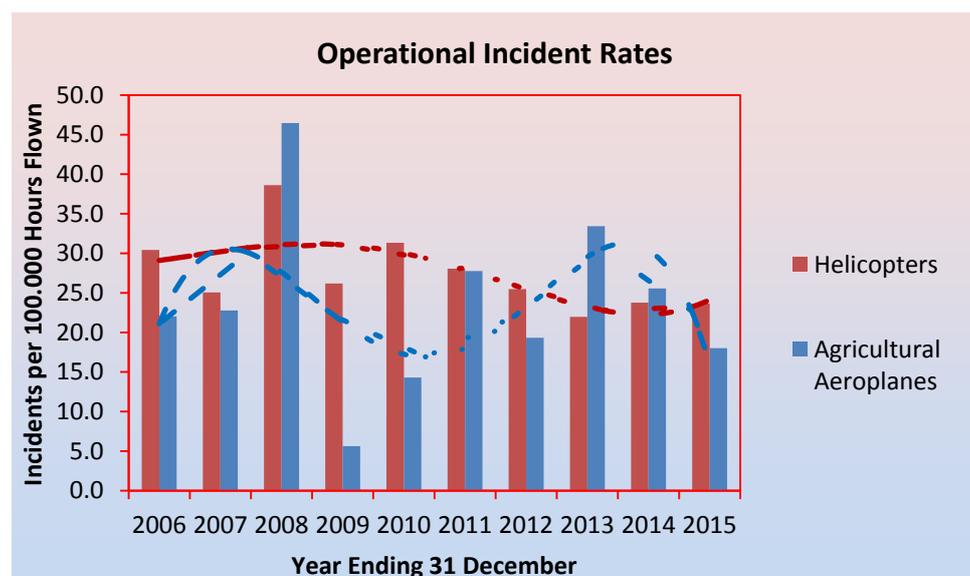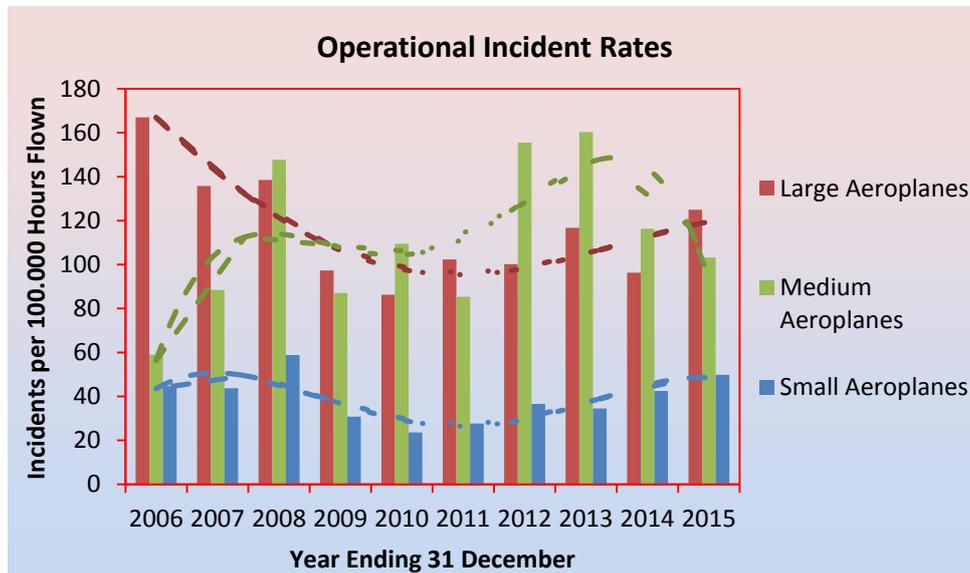
The following table shows, for each safety target group, the number of operational incidents each year for the last ten one-year periods ending 31 December 2015. All aircraft types are included. The table is sorted by the number of incidents in the year ending December 2015.

Safety Outcome Target Group	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Airline Operations - Large Aeroplanes	414	310	423	290	309	363	359	454	381	**498**
Other Commercial Operations - Aeroplane	46	76	144	64	57	57	80	75	73	**97**
Other	7	8	9	11	45	113	47	26	48	**73**
Airline Operations - Medium Aeroplanes	47	62	81	47	50	46	82	83	51	**46**
Other Commercial Operations - Helicopter	32	23	38	24	27	26	29	19	20	**43**
Private Operations - Sport	31	16	22	31	19	19	72	49	62	**41**
Private Operations - Aeroplane	65	25	12	23	9	19	18	15	19	**27**
Other Commercial Operations - Sport	0	0	0	0	1	0	1	9	7	**22**
Sport Transport	1	5	4	5	3	8	21	45	34	**21**
Airline Operations - Small Aeroplanes	20	17	31	8	10	12	4	7	7	**14**
Agricultural Operations - Aeroplane	11	11	21	3	5	11	9	11	8	**7**
None	259	318	234	173	143	36	14	8	12	**6**
Airline Operations - Helicopter	1	1	18	12	14	16	7	13	12	**4**
Agricultural Operations - Helicopter	7	13	11	10	13	6	7	9	8	**0**
Private Operations - Helicopter	8	3	2	2	3	7	9	2	3	**0**
Total	949	888	1050	703	708	739	759	825	745	**899**

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.

Airline Operations - Large Aeroplanes

- Christchurch: Aircraft landed on runway 29. After roll out, on the wet runway, while making a right turn onto E1, nose wheel slid and aircraft moved onto the grass. Aircraft taxied back onto the sealed runway and continued to the apron. Occurrence Id: 15/978

Serious Operational Incidents

- This section describes serious 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 serious events have been omitted. For each incident the location is stated before the description.

Other Commercial Operations - Helicopter

- Clevedon: While following a ridgeline, as student pushed forward on cyclic, helicopter had a mast bump. Instructor attempted to apply aft cyclic but this was overridden by student's input. Violent shudder and mast bumping was felt as helicopter descended. Disc was felt to reload and instructor maintained descent until engine tach was seen coming back to 100%. Collective was then raised and helicopter was flown out of the valley, and returned to Ardmore as there was no suitable landing area in the forest. Occurrence Id: 15/1229

Other Commercial Operations - Aeroplane

- West Melton: A/c clipped top of fence post marker immediately prior touchdown. Pilot used to airfield with runway some distance from fence line and to landing at earliest opportunity there - unfamiliar with new field. Instructed in differences, given alternative strategies and practiced satisfactorily. New fence marker boards to be created to give greater visibility. Occurrence Id: 15/414

Private Operations - Sport

- Kennedy Park: A gust of wind picked up paraglider during ground handling training. Pilot was pulled through tops of trees and suffered minor injuries. Occurrence Id: 15/750

Other

- Christchurch: During the landing roll on runway 29, the aircraft encountered standing water and aqua-planed, resulting in reduced brake efficiency. The aircraft was stopped approximately 5 metres from runway end. Occurrence Id: 15/2368

Sport Transport

- Hamilton: During hot inflation of balloon one of the fuel hoses burst, catching fire which extinguished when the fuel supply was cut. Occurrence Id: 15/1009

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 2015.

<u>Breakdown by Aircraft Category</u>

Defect Incident Rates

Defect Incident Rates

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
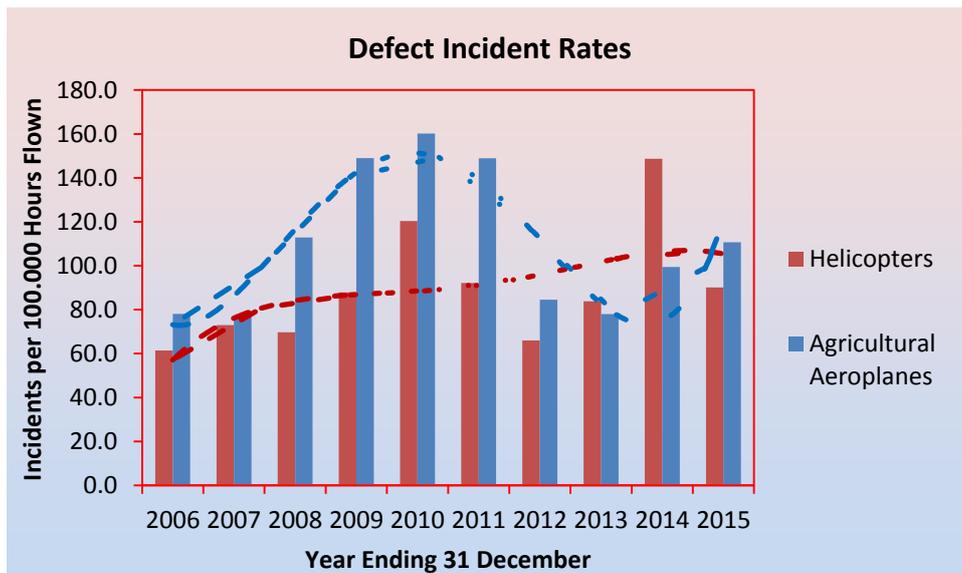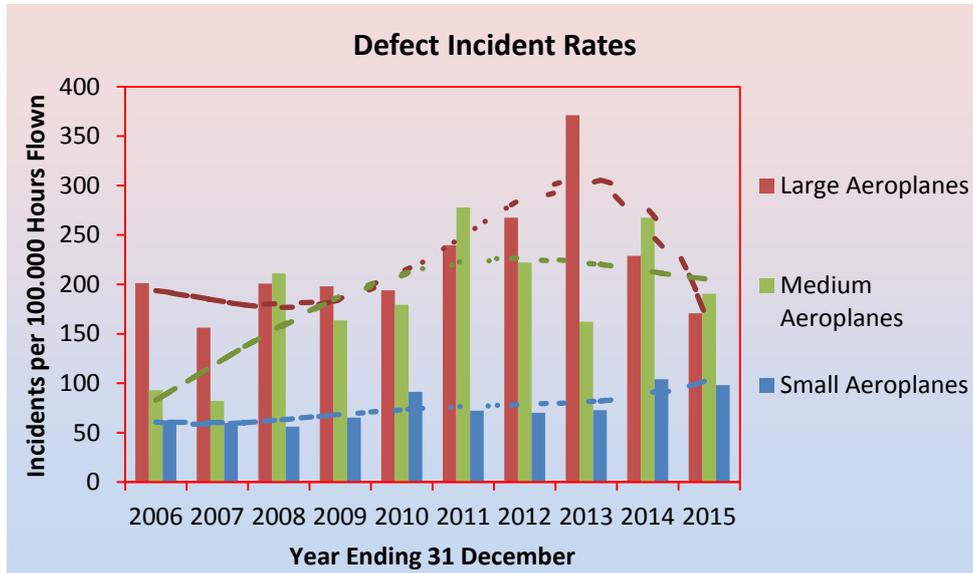
The following table shows, for each safety target group, the number of defect incidents each year for the last ten one-year periods ending 31 December 2015. All aircraft types are included. The table is sorted by the number of incidents in the year ending December 2015.

Safety Outcome Target Group	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Airline Operations - Large Aeroplanes	560	377	588	583	619	790	896	1264	788	**612**
Other Commercial Operations - Aeroplane	94	100	165	171	179	151	141	148	221	**232**
Other Commercial Operations - Helicopter	69	54	72	51	78	94	69	68	233	**183**
Airline Operations - Medium Aeroplanes	56	59	102	73	67	138	111	79	83	**53**
Agricultural Operations - Aeroplane	41	44	46	43	56	56	37	28	40	**46**
Private Operations - Aeroplane	60	31	24	40	67	25	29	33	43	**31**
Airline Operations - Small Aeroplanes	32	44	52	49	71	52	45	29	24	**27**
Private Operations - Sport	12	9	8	18	32	29	29	21	13	**20**
Other	9	14	11	7	33	16	19	47	38	**12**
None	84	153	51	89	30	15	14	8	13	**9**
Private Operations - Helicopter	13	4	5	16	30	16	10	15	11	**5**
Other Commercial Operations - Sport	0	0	0	0	0	0	1	3	0	**4**
Airline Operations - Helicopter	10	26	31	71	84	40	36	51	11	**1**
Sport Transport	1	1	0	0	6	6	7	6	4	**1**
Agricultural Operations - Helicopter	8	9	9	5	27	23	18	32	15	**0**
Total	1049	925	1164	1216	1379	1451	1462	1832	1537	1236

Significant Incidents

None of the defects reported as occurring during the period covered by this report met the requirements to be classed as significant.

Serious Incidents

This section describes serious defects reported as occurring during the period covered by this report. The section is grouped by safety outcome target group. Groups with no serious events have been omitted. For each incident the location is stated before the description.

Private Operations - Aeroplane

- Paraparaumu: During glider towing, just after take-off, there was a strong burning smell in the cockpit, which smelt like a rubbish fire. Moments later, pilot noticed smoke in cockpit, which was thickening. Glider was released at 800ft. Aircraft made a safe landing back at aerodrome. Occurrence ID: 15/318

ATA Chapters

Defect Incidents reported as occurring during the year ending 31 December 2015 were associated with the following ATA component code chapters.

Large Aeroplanes

The most common chapter was Chapter 27 (AEROPLANE FLIGHT CONTROL - GENERAL) with 213 defects

The next most common chapter was Chapter 49 (AUXILIARY POWER - GENERAL) with 28 defects

Medium Aeroplanes

The most common chapter was Chapter 32 (LANDING GEAR (LG) - GENERAL) with 18 defects

The next most common chapter was Chapter 34 (FLIGHT NAVIGATION SYSTEMS - GENERAL) with 8 defects

The next most common chapter was Chapter 27 (AEROPLANE FLIGHT CONTROL - GENERAL) with 8 defects

Small Aeroplanes

The most common chapter was Chapter 73 (POWERPLANT FUEL SYSTEM - GENERAL) with 46 defects

The next most common chapter was Chapter 32 (LANDING GEAR (LG) - GENERAL) with 32 defects

Agricultural Aeroplanes

The most common chapter was Chapter 32 (LANDING GEAR (LG) - GENERAL) with 10 defects

The next most common chapter was Chapter 73 (POWERPLANT FUEL SYSTEM - GENERAL) with 6 defects

Helicopters

The most common chapter was Chapter 73 (POWERPLANT FUEL SYSTEM - GENERAL) with 80 defects

The next most common chapter was Chapter 62 (MAIN ROTOR - GENERAL) with 15 defects

Sport Aircraft

The most common chapter was Chapter 23 (COMMUNICATION SYSTEMS - GENERAL) with 6 defects

The next most common chapter was Chapter 73 (POWERPLANT FUEL SYSTEM - GENERAL) with 4 defects

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 30 June 2002, excluding B747-200 aircraft since that type was removed from service during the quarter 1 July to 30 September 1999.

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

B737-300 Defects per 1000 hours

B737-400 Defects per 1000 hours

B737-800 Defects per 1000 hours

B767-300 Defects per 1000 hours

B777-200 Defects per 1000 hours

B777-300 Defects per 1000 hours

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

1900D Defects per 1000 hours

Jetstream Defects per 1000 hours

SA227 Defects per 1000 hours

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 by 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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Manapouri	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.8	27.8
Westport	14.5	33.9	9.7	24.2	19.4	4.8	14.5	4.8	0.0	9.7
Napier	4.3	2.9	2.1	2.1	4.4	4.8	5.2	7.8	4.4	8.9
Dunedin	2.2	2.2	2.0	3.4	3.4	4.1	4.7	4.4	3.1	6.9
New Plymouth	4.3	2.0	2.4	3.2	4.0	3.0	2.9	4.4	2.3	6.6
Whenuapai	3.5	5.2	8.9	10.6	11.8	8.2	8.7	4.5	9.4	5.6
Palmerston North	3.9	2.0	1.6	5.3	3.2	2.0	3.1	4.8	2.1	5.1
Woodbourne	3.8	3.5	2.0	2.9	5.3	4.2	4.8	8.2	3.4	3.6
Nelson	2.8	1.0	0.8	1.5	1.7	2.0	2.7	2.8	3.2	3.5
Christchurch	2.5	2.1	1.9	0.7	1.7	2.5	2.6	2.8	2.1	3.4
Rotorua	5.8	4.5	2.7	2.4	4.7	2.6	2.7	5.8	5.0	2.6
Gisborne	4.6	4.0	5.8	3.8	3.2	3.1	6.1	4.0	5.0	2.5
Invercargill	4.7	5.1	6.3	4.3	5.8	4.2	1.8	1.3	7.5	2.5
Kerikeri	2.5	0.0	3.8	7.5	6.3	12.5	5.0	10.0	6.3	2.5
Whakatane	3.3	1.7	1.7	7.5	5.8	1.7	2.5	5.0	5.8	2.5
Auckland	1.3	2.0	1.5	1.5	1.8	2.1	1.5	1.5	1.6	2.1
Wellington	0.7	0.8	0.5	0.5	0.8	1.5	2.5	1.8	1.5	2.1
Ohakea	1.1	0.7	1.5	1.2	2.3	2.0	1.3	2.8	2.5	2.0
Queenstown	1.6	2.4	1.6	2.0	1.2	2.2	3.9	2.3	2.6	1.6
Paraparaumu	0.0	0.0	0.0	1.6	0.4	0.0	1.8	1.9	1.2	1.5
Taupo	1.4	1.2	1.4	2.9	2.4	3.8	2.7	1.3	0.9	1.4
Wanganui	2.1	0.7	0.0	0.7	2.1	4.2	3.5	3.5	2.1	1.4
Tauranga	2.1	1.0	1.3	0.8	1.2	0.8	2.5	2.0	2.4	1.3
Hamilton	3.1	1.5	2.2	1.3	2.1	0.9	0.9	0.8	0.6	0.9
Chatham Islands	0.0	0.0	0.0	10.0	0.0	0.0	0.0	10.0	30.0	0.0
Hokitika	7.2	7.2	0.0	2.4	4.8	0.0	2.4	2.4	0.0	0.0
Timaru	5.0	7.5	2.5	5.0	2.5	8.8	2.5	6.3	1.3	0.0
Whangarei	3.8	7.5	0.0	5.3	5.3	8.3	3.8	7.5	1.5	0.0

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, Westport and Chatham Islands. 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 movements 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 values are indicated by the use of a salmon 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 December 2015 for individual aerodromes are shown in the following table.

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

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.

Security Incidents

A security incident is defined as an incident that involves unlawful interference

The following chart shows the annual numbers of reported security incidents over the ten year period ending 31 December 2015
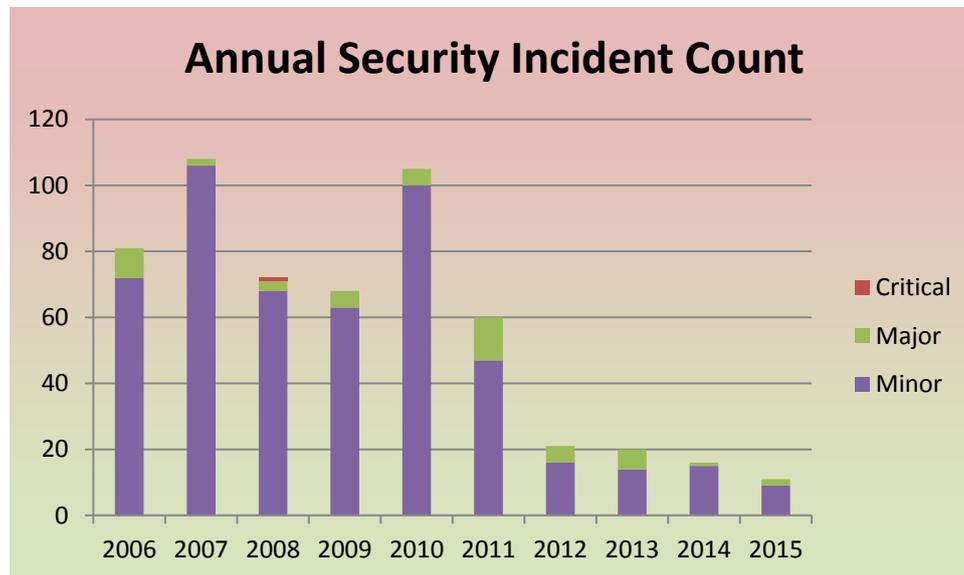
The large drop in the number of recorded security incidents is at least partly due to a correction in the way we interpret the definition of a security incident. No attempt has been made at this time to re-assess historic data.

Breakdown by Nearest Aerodrome

The following table shows a breakdown by location (nearest staffed aerodrome) of the above security incidents

Aerodrome	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Auckland	9	18	8	30	42	28	6	3	3	2
Christchurch	5	10	6	7	9	9	0	2	0	2
Dunedin	1	1	0	1	2	0	0	0	0	1
Gisborne	2	2	0	2	0	0	0	3	0	0
Hamilton	1	0	0	2	1	3	0	1	0	0
Milford Sound	2	6	1	0	0	0	0	0	0	0
New Plymouth	1	0	0	0	0	0	0	0	0	0
Napier	0	1	0	0	1	0	0	0	0	0
Nelson	1	1	0	1	2	2	0	1	2	1
Invercargill	0	1	1	0	0	0	0	0	0	0
Palmerston North	1	1	0	0	0	0	0	0	0	0
Paraparaumu	0	0	0	2	0	1	0	1	1	0
Queenstown	1	1	0	3	3	1	0	0	0	2
Rotorua	0	3	2	0	0	0	0	0	0	1
Tauranga	1	4	0	0	0	0	0	0	0	0
Woodbourne	1	1	0	0	1	0	0	0	0	0
Wellington	4	6	3	8	8	4	7	3	1	1

Breakdown by Aircraft Category

The following table shows a breakdown by Aircraft Statistics Category of the above security incidents.

Aircraft Category	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Large Aeroplanes	24	27	20	11	8	10	8	9	3	3
Medium Aeroplanes	1	2	7	1	2	0	4	1	0	1
Small Aeroplanes	0	0	0	0	0	0	1	1	0	0
Helicopters	0	0	0	0	0	0	0	0	0	0
Agricultural Aeroplanes	0	0	0	0	0	0	0	0	0	0
Unknown	56	79	45	56	95	50	8	9	13	7
Total	81	108	72	68	105	60	21	20	16	11

Significant or Serious Incidents

No security 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.

Descriptors and Causal Factors

The most common descriptor (7) recorded for Security Incidents during the year ending 31 December 2015 was UNAUTHORISED/UNLAWFUL ACCESS'

No causal factors have been recorded for security incidents that occurred during the year ending 31 December 2015.

Descriptors

The following chart shows the numbers of each of the occurrence descriptors that have been recorded for security incidents reported as occurring during the year ending 31 December 2015.

Security Incident Descriptors for the year ending 31 December 2015
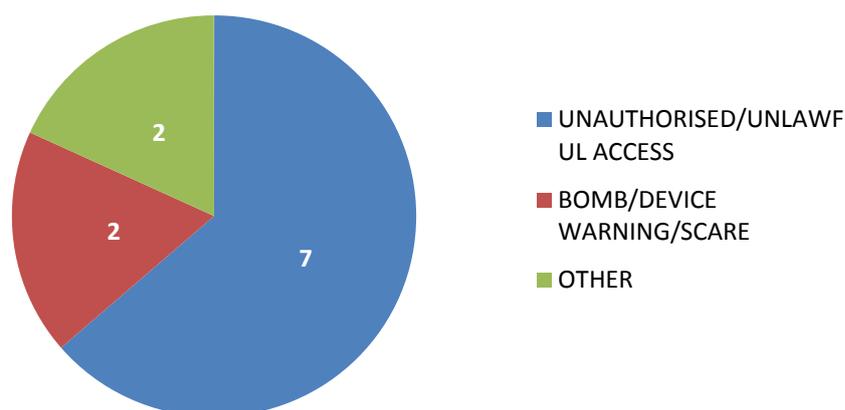
Aerodrome Incidents

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.

Aerodrome	2009	2010	2011	2012	2013	2014	2015
Hamilton	3.4	9.1	15.4	16.3	7.4	8.5	12.6
Tauranga	2.1	2.3	2.7	9.6	9.9	8.6	7.6
Whenuapai	0.0	13.9	6.8	20.1	6.5	6.7	6.9
Invercargill	0.0	0.0	0.0	3.5	0.0	15.0	6.3
Christchurch	3.7	5.6	1.6	2.7	4.6	0.9	5.7
Woodbourne	12.5	0.0	0.0	4.4	4.6	0.0	4.5
Taupo	3.3	0.0	3.8	0.0	0.0	8.8	4.5
Queenstown	0.0	0.0	2.4	6.9	4.6	8.8	4.0
Ohakea	0.0	1.6	3.6	3.2	13.9	5.5	3.4
Palmerston North	6.8	1.8	0.0	3.0	3.6	5.7	2.0
Auckland	3.8	3.8	3.2	0.6	5.7	2.6	1.3
Wellington	7.1	0.9	2.8	2.0	3.0	5.2	1.0
Paraparaumu	31.7		15.6	32.6	19.2	4.1	0.0
Rotorua	4.8	4.3	0.0	13.6	22.2	5.0	0.0
Gisborne	4.2	0.0	4.5	20.4	0.0	6.3	0.0
Napier	0.0	7.4	11.0	4.0	4.1	0.0	0.0
Dunedin	1.9	4.5	10.3	0.0	8.8	0.0	0.0
Nelson	6.2	5.8	4.0	6.2	6.6	2.1	0.0
New Plymouth	0.0	0.0	3.0	3.2	0.0	4.6	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.

Runway Incursions

Runway Incursions


Runway Incursions

Runway Incursions

Runway Incursions
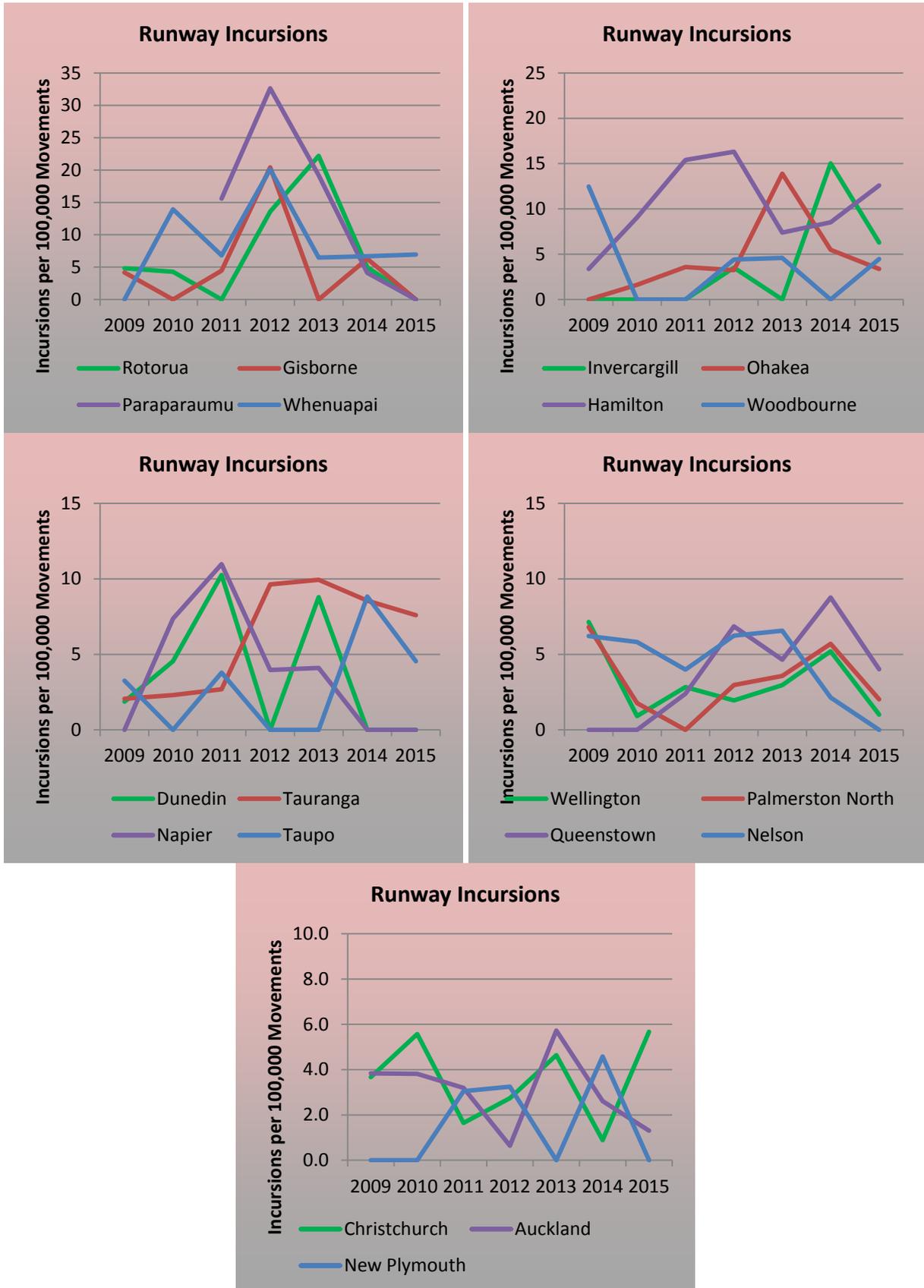
Significant or Serious Incidents

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-2015	11	17	91	108	96	75	2	2	40	1	0	0	1
Feb-2015	8	20	72	178	59	125	4	2	63	1	1	7	0
Mar-2015	9	18	91	164	186	110	3	2	67	3	2	1	2
Apr-2015	4	10	56	145	141	99	1	2	134	3	0	1	0
May-2015	4	11	78	133	167	133	1	3	62	5	0	2	0
Jun-2015	6	15	61	123	114	127	0	2	60	9	1	0	3
Jul-2015	6	10	65	137	104	95	2	2	69	8	0	2	0
Aug-2015	6	15	39	115	119	115	3	0	87	3	0	2	2
Sep-2015	3	12	50	109	75	102	2	3	70	6	4	1	2
Oct-2015	4	22	69	103	109	81	9	3	155	5	4	2	0
Nov-2015	6	21	40	142	47	93	5	2	64	6	0	2	0
Dec-2015	6	20	39	119	111	85	2	3	83	5	1	1	2

ACC	Accident	**DGD**	Dangerous Goods Incident
ADI	Aerodrome Incident	**HGA**	Hang Glider Accident
ARC	Aviation Related Concern	**INC**	Aircraft 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

Causal Factor Summary

Introduction

The following section presents a summary of occurrence causes recorded during the year ending 31 December 2015 as determined by safety investigations.

The causal factor summary is grouped into three parts, each dealing with a unique sector of the aviation industry:

- Aircraft Flight Operations (Aircraft Operator Organisations and Flight Crew);

- Aircraft Maintenance Operations (Aircraft Maintenance/Design Organisations and Maintenance Engineers);

- Air Traffic Services and Personnel (Air Traffic Service Organisations and Air Traffic Service personnel).

The first two sections are further sub-grouped by Aircraft Category, namely:

- Large Aeroplanes;

- Medium Aeroplanes;

- Other Aeroplanes, Helicopters and Sport; and

- "Unknown".

A discussion of the Reason Model – Latent Failure Model used by the CAA for causal factor identification is provided in the appendix.

The following abbreviations apply:

ACC	Accident	**DGD**	Dangerous Goods Incident
ADI	Aerodrome Incident	**HGA**	Hang Glider Accident
ARC	Aviation Related Concern	**INC**	Aircraft 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

Aircraft Flight Operations

The following section summarises causal factors identified from investigation of occurrences that occurred during the year ended 31 December 2015 and which have been attributed to aircraft flight operations (the aircraft operator, organisation or flight crew). The number of times particular causal factors have been identified is reported by occurrence type.

Large Aeroplanes

Category	Cause	ACC	ADI	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES			2		4
	INACCURATE SYSTEM "DIAGNOSIS"	1				2
	POOR PROCEDURE "ACTION"					2
	PRIMARILY "STRUCTURAL/MECHANICAL"		2		7	1
	STATE CHANGE NOT DETECTED "INFORMATION"					1
Organisation	INADEQUATE COMMUNICATIONS	1		1		
	INADEQUATE CONTROL AND MONITORING	1			1	
	INADEQUATE DEFENCES					1
	INADEQUATE PROCEDURES				1	1
	INADEQUATE RESOURCE MANAGEMENT					2
	INADEQUATE TRAINING				1	3
	OTHER ORGANISATION FACTOR		1			1
	UNSUITABLE EQUIPMENT					1
Local Error	FATIGUE - OTHER					1
	HOSTILE ENVIRONMENT			1		
	LACK OF KNOWLEDGE	1				
	POOR SYSTEM FEEDBACK					1
Local Violation	OTHER VIOLATION ENFORCING CONDITION					2

Medium Aeroplanes

Category	Cause	ACC	ASP	DEF	INC
Active Failure	INACCURATE SYSTEM "DIAGNOSIS"				1
	INAPPROPRIATE "STRATEGY"	1			
	PRIMARILY "STRUCTURAL/MECHANICAL"			1	
Organisation	INADEQUATE CONTROL AND MONITORING	1		1	
Local Error	HOSTILE ENVIRONMENT	2			
	INADEQUATE CHECKING				1
	OTHER ERROR ENFORCING CONDITION		1		
	POOR SIGNAL:NOISE		1		
Local Violation	GROUP VIOLATION CONDONING ATTITUDE	1			

Small Aeroplanes

Category	Cause	ACC	ADI	ARC	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES				4		1
	INAPPROPRIATE "PROCEDURES"				1		1
	INAPPROPRIATE "STRATEGY"				1		2
	POOR PROCEDURE "ACTION"	4			2		
	PRIMARILY "STRUCTURAL/MECHANICAL"	3		1		6	1
	STATE CHANGE NOT DETECTED "INFORMATION"	1			1		2
Organisation	INADEQUATE CONTROL AND MONITORING				1		
	INADEQUATE PROCEDURES	3					
	INADEQUATE SPECIFICATIONS/REQUIREMENTS	1					
	INAPPROPRIATE GOALS OR POLICIES	1					
	POOR DECISIONS				1		
Local Error	FATIGUE - OTHER				1		
	INADEQUATE CHECKING	1					1
	INEXPERIENCE (NOT LACK OF TRAINING)	1					
	LACK OF KNOWLEDGE		1				
	OTHER ENVIRONMENTAL FACTOR (EG WEATHER)						1
	OTHER ERROR ENFORCING CONDITION				3		
	POOR HUMAN-SYSTEM INTERFACE	2					
	POOR INSTRUCTIONS/PROCEDURES	1					
	RISK MISPERCEPTION				2		
	TASK OVERLOAD				1		
	TASK UNFAMILIARITY					1	1

Unknown Aircraft Category

Category	Cause	ADI	ARC	ASP	DEF	DGD	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES			1			1
	INACCURATE SYSTEM "DIAGNOSIS"			2			
	INAPPROPRIATE "STRATEGY"					1	
	POOR PROCEDURE "ACTION"		1				
	PRIMARILY "STRUCTURAL/MECHANICAL"			1	2		1
Organisation	OTHER ORGANISATION FACTOR						2
Local Error	HOSTILE ENVIRONMENT			1			1
	LACK OF KNOWLEDGE			1			
	OTHER ERROR ENFORCING CONDITION	1		1			
	POOR ATTENTION SPAN			1			
	POOR SIGNAL:NOISE						1
	POOR SYSTEM FEEDBACK			1			
	TASK UNFAMILIARITY			1			
Local Violation	OTHER VIOLATION ENFORCING CONDITION						1

Other Aeroplanes, Helicopters and Sport Aircraft

Category	Cause	ACC	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES				1
	INACCURATE SYSTEM "DIAGNOSIS"	1			
	INAPPROPRIATE "GOAL"	1	2		
	INAPPROPRIATE "PROCEDURES"		1		
	INAPPROPRIATE "STRATEGY"	2	2		
	POOR PROCEDURE "ACTION"	3	1		
	PRIMARILY "STRUCTURAL/MECHANICAL"	4		1	
	STATE CHANGE NOT DETECTED "INFORMATION"		1		
Organisation	DESIGN DEFICIENCIES				1
	INADEQUATE COMMUNICATIONS	2			
	OTHER ORGANISATION FACTOR	1			
Local Error	DRUGS/ALCOHOL	2			
	ERROR IRREVERSIBILITY	1			
	INADEQUATE CHECKING	1			
	OTHER ERROR ENFORCING CONDITION	5			
	POOR HUMAN-SYSTEM INTERFACE	1			
Local Violation	PERCEIVED LICENSE TO BEND RULES	1			

Aircraft Maintenance Operations

The following section summarises causal factors identified from investigation of occurrences that occurred during the year ended 31 December 2015 and have been attributed to aircraft maintenance operations (the aircraft operator, aircraft maintenance organisation or maintenance engineer). The number of times particular causal factors have been identified is reported by occurrence type.

Large Aeroplanes

Category	Cause	ADI	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES	1		1
	PRIMARILY "STRUCTURAL/MECHANICAL"		1	
Organisation	DESIGN DEFICIENCIES		2	
	INADEQUATE DEFENCES		1	
Local Error	INADEQUATE CHECKING	1		1

Medium Aeroplanes

No causes established

Small Aeroplanes

Category	Cause	ACC	DEF	INC
Active Failure	PRIMARILY "STRUCTURAL/MECHANICAL"		3	
Organisation	DESIGN DEFICIENCIES		1	
	INADEQUATE CONTROL AND MONITORING	1		1
	INADEQUATE SPECIFICATIONS/REQUIREMENTS	1		
	INADEQUATE TRAINING	1		
Local Error	LACK OF KNOWLEDGE	1		
	POOR INSTRUCTIONS/PROCEDURES		1	
	TASK UNFAMILIARITY	1		

Unknown Aircraft Category

No instances

Helicopters, Agricultural Aeroplanes and Sport Aircraft

Category	Cause	ACC	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES		1	
	POOR PROCEDURE "ACTION"			1
	PRIMARILY "STRUCTURAL/MECHANICAL"		2	
Organisation	DESIGN DEFICIENCIES	2	1	
	INADEQUATE COMMUNICATIONS	1		
	INADEQUATE SPECIFICATIONS/REQUIREMENTS		1	
Local Error	ERROR IRREVERSIBILITY	1		

Air Traffic Services and Personnel

The following tables summarise causal factors identified from investigation of occurrences that occurred during the year ended 31 December 2015 and which have been attributed to air traffic services or personnel. The number of times particular causal factors have been identified is reported by occurrence type.

Air Traffic Service Providers

Category	Cause	ADI	ARC	ASP
Organisation	INADEQUATE DEFENCES	1		2
	INADEQUATE TRAINING			3
	OTHER ORGANISATION FACTOR		1	2
Local Error	INADEQUATE CHECKING			1
	INTERPRETATION DIFFICULTIES			1
	RISK MISPERCEPTION			1

Air Traffic Service Personnel

Category	Cause	ADI	ASP	PIO
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES			1
	INAPPROPRIATE "PROCEDURES"	1	2	
	POOR PROCEDURE "ACTION"		1	
Local Error	DESIGNER USER MISMATCH		2	
	INADEQUATE CHECKING	1	1	
	OTHER ERROR ENFORCING CONDITION	1		
	PHYSIOLOGICAL OTHER		1	
	POOR SIGNAL:NOISE		1	
	PSYCHOLOGICAL OTHER	1		
	RISK MISPERCEPTION		1	

Client Risk Assessment

Introduction

The CAA's client risk assessment system came into operation in February 2007.

The system measures a series of factors, rated using a scale of 1 to 5 where 1 is an exemplary rating. It is a qualitative rating and relates solely to the interaction the CAA staff member is having with the client at that time, or to changes in the organisation recorded in the CAA database.

Risk profiles can be generated at any time, including at the end of every audit.

The combined ratings form a risk assessment used to help decide the depth and frequency of inspection and monitoring for each client.

Results are in the form of a percentage of the maximum possible score (if all factors had been rated 5), and are divided into bands of low, moderate, high and very high:

Low: <=16%

Moderate: 16-26%

High: 26-36%

Very High: >36%

Clients can have several risk profiles current at one time, one for each activity. Each risk profile is independent of the others, and applies only to the relevant activity.

The following table refers to risk profiles current on the dates shown and shows the numbers of certificate holders with risk scores in each band.

Comparison of Client Numbers in Risk Score Bands

Activity	As at 31 December 2015				Average at end of each of 4 prior 12 month periods			
	Very High	High	Mode rate	Low	Very High	High	Mode rate	Low
Australia AOC with ANZA Privileges Part 108 Security Programme	0	0	0	2	0.0	0.0	0.0	0.5
Part 108 Security Programme	0	0	0	4	0.0	0.0	0.3	1.3
Part 109 Regulated Air Cargo Agent	0	0	7	54	0.5	0.8	9.0	53.3
Part 115 Adventure Aviation Operator Certificate	2	0	1	25	1.0	1.3	7.0	13.5
Part 121 Air Operator Large Aeroplanes	1	0	0	3	0.0	0.0	0.0	3.8
Part 125 Air Operator Medium Aeroplanes	0	0	0	4	0.5	0.3	0.0	6.0
Part 129 Foreign Air Transport Operator	1	1	0	22	0.5	0.0	1.3	25.3
Part 135 Air Operator Helicopters and Small Aeroplanes	6	4	9	89	1.0	2.0	26.3	88.3
Part 137 Agricultural Aircraft Operator	2	1	20	59	0.3	2.5	17.0	55.3
Part 139 Aerodrome Operator	0	1	0	22	0.0	0.0	0.3	21.5
Part 140 Aviation Security Service Organisation	0	0	0	1	0.0	0.0	0.0	0.5
Part 141 Aviation Training Organisation	1	2	2	17	0.5	0.5	1.8	25.8
Part 145 Maintenance Organisation	1	1	1	16	0.8	0.3	1.0	24.8
Part 146 Aircraft Design Organisation	0	0	1	5	0.0	0.0	0.3	8.8
Part 148 Aircraft Manufacturing Organisation	0	0	2	8	0.3	0.0	1.0	9.3
Part 149 Aviation Recreation Organisation	0	1	0	6	0.3	0.3	0.8	5.5
Part 171 Telecom Service Organisation	0	0	0	0	0.0	0.0	0.0	1.3
Part 172 Air Traffic Service Organisation	0	0	0	0	0.0	0.3	0.0	0.0
Part 173 Instrument Flight Procedure	0	0	0	1	0.0	0.0	0.0	2.0
Part 174 Meteorological Service Organisation	0	0	0	2	0.0	0.0	0.0	1.0
Part 175 Aeronautical Info Service Organisation	0	0	0	1	0.0	0.0	0.0	0.5
Part 19F Supply Organisation	1	0	2	33	0.5	0.3	2.8	36.8
Part 61 Pilot Licence (Aeroplane) Holder	0	0	0	0	0.3	0.0	0.0	0.3
Part 92 Dangerous Goods Packaging Approval Holder	0	0	0	0	0.0	0.0	0.0	2.0

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

Total Safety Cost

Public Air Transport
Any passenger or freight operation where a member of the public can buy the service "over the counter".

Airline Operations — Large Aeroplanes
All operations (other than Part 137 agricultural) using aeroplanes that must be operated under Part 121 when used for air transport.

Airline Operations — Medium Aeroplanes
All operations (other than Part 137 agricultural) using aeroplanes that must be operated under Part 125 when used for air transport and aeroplanes conducting SEIFR passenger ops.

Airline Operations — Small Aeroplanes
Transport and transport support (training, ferry etc) operations using aeroplanes that must be operated under Part 135. Also includes ambulance/EMS.

Airline Operations — Helicopters
Transport and transport support (training, ferry etc) operations using helicopters that must be operated under Part 135. Also includes ambulance/EMS.

Sport Transport
All public transport operations as defined by Part 115 and transport support (training, ferry etc).

Other Commercial Operations

Commercial Operations — Aeroplanes
All non-public transport ops for hire or reward or as part of any commercial activity.

Commercial Operations — Helicopters
All non-public transport ops for hire or reward or as part of any commercial activity.

Agricultural Operations — Aeroplanes
Agricultural ops, ferry and training for Ag ops.

Agricultural Operations — Helicopters
Agricultural ops, ferry and training for Ag ops.

Agricultural Operations — Sport
Agricultural ops, ferry and training for Ag ops.

Non Commercial Operations

Private Operations — Aeroplanes
Aircraft owned or hired for private or cost sharing use, including glider towing.

Private Operations — Helicopters
Aircraft owned or hired for private or cost sharing use.

Private Operations — Sport
Sport aircraft (including microlights, balloons, parachutes, gliders etc.) owned or hired for private or cost sharing use.

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
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
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.

✧ 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.

✧ 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.

✧ Critical air transport occurrences resulting in Loss of Control

✧ Critical air transport occurrences where a Distress or Urgency call was (or should have been) made

✧ Air transport occurrences where the last in a series of "redundant" systems failed in flight or during take off or landing

✧ SEIFR air transport occurrences involving loss of engine power to the extent that an unscheduled landing is required

✧ Fatal accidents

✧ 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.

✧ 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.

✧ 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.

✧ 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	Propellor Runaway
FUEL/FLUIDS OCCURRENCE	FIRE/EXPLOSION/FUMES
LANDING OVERRUN	Explosion
RUNWAY EXCURSION	Struck By Propellor/rotor/jet Blast
General Breakup/disintegration	TAKE-OFF OR LANDING
COLLISION/STRIKE OBJECT	Landing Beside Runway
Collision Level Terrain/water	Undershoot
Collision Hill/mountain	Overrun
COLLISION WITH AIRCRAFT ON	Unintentional Wheels Up Landing
GROUND	Nose Down/overturned
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

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	Embankment
SIGNIFICANT LOSS OF	Fence/fence Post
CONTROL/PERFORMANCE	Person
AVOIDING ACTION	Building
OVERWEIGHT LANDING	Approach Lights
ABNORMAL LANDING	Taxiway/runway Lights
AIRFRAME FAILURE	Tree
Initial Failure Of Control Surface	Vehicle
Initial Failure Of Fuselage	Wire/cable/powerline
Initial Failure Of Empennage	Other
Initial Failure Of Wing	NEAR COLLISION /STRIKE OBJECT
Initial Failure - Other	NEAR COLLISION AIRCRAFT ON
Aircraft Standing	GROUND
Aerodrome Structure	NEAR COLLISION TERRAIN
Animal (not Bird)	Both Moving On Ground
Bird	COMPONENT/SYSTEM
Chimney/mast/pole	MALFUNCTION
Ditch	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:
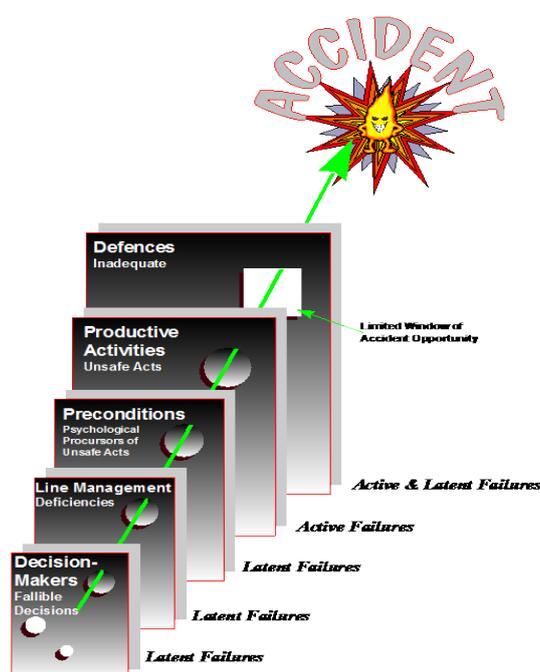
Diagram 1

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

ORGANISATION	TASK/ENVIRONMENT	INDIVIDUAL	DEFENCES
Organisational Factors For example: Communications Management Structure Goals	**Local Error or Violation Factors** For example: Morale Fatigue Equipment Procedures	**Active Failures** Eg Errors; Information Diagnostic Goal Strategy...	AND /OR → ACCIDENT

Latent Failures

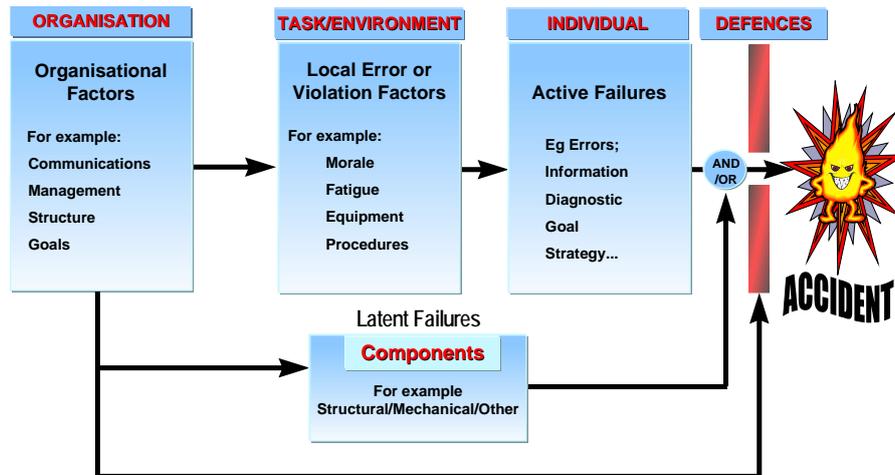**Components**

For example
Structural/Mechanical/Other

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.