Aviation Safety Report

Intelligence, Safety and Risk Analysis Unit

1 January to 31 December 2016

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's Aviation Safety Management System. It primarily covers the period from 1 January 2016 to 31 December 2016.[1]

Key Indicators

- Key measures of industry activity have increased as follows in the above period.
    - Aircraft on CAA records increased slightly by 1.9%
    - Airline Air transport flights increased by2.6%
    - Adventure Aviation flights including parachute descents increased by 29%
    - Total hours flown increased by 3.6% varying by sector from 42% for Adventure Aviation to 21% **decrease** for Private flying
- The number of organisational certificates currently held has increased by 5.5% to 1023.
- The number of accidents in the period was 102, up from 101 in the last period, but the trend is downward relative to the average of the preceding three years (104.7 accidents pa 2012 to 2014).
- There were 10 fatalities, 3 less than in the previous 12 months and the fourth lowest in the last ten years. The average of the last four years was 10.25 fatalities pa and the highest in the last ten years was 22 fatalities in 2012
- The accident statistics are now led by private aeroplane, private sport aircraft and sport transport sectors, but the principal contributors to the fatalities and therefore the social cost statistics are the airline helicopter, private sport and private helicopter sectors.
- The recent surge in the airspace incident rate per 100,000 hours flown continues although at a reduced rate. This period the number of reported airspace occurrences (all types) has increased by 1.8% on the last 12 months while the total flying hours in the same period increased by 3.6%. This is happening in a climate of decreasing aerodrome movements.

Operator Risk Scores.

A major change to this edition has been the replacement of the participant Non Compliance Index with a new presentation of operator risk score. The charts on pages 82 onwards attempt to represent the cumulative and individual risk scores within aviation sectors, and how these are changing with time.

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 December2016 and trend over the preceding 9 years

This section is organised into three parts

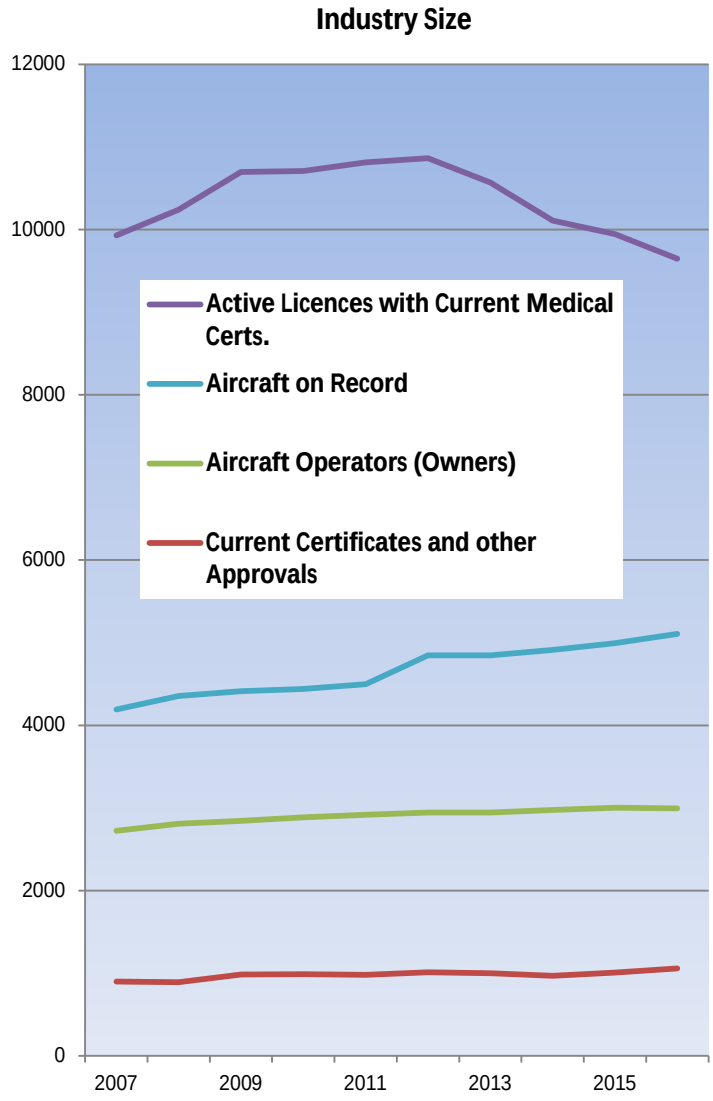
- Industry Size
- Industry Activity
- Safety Outcomes

Industry Size

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

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

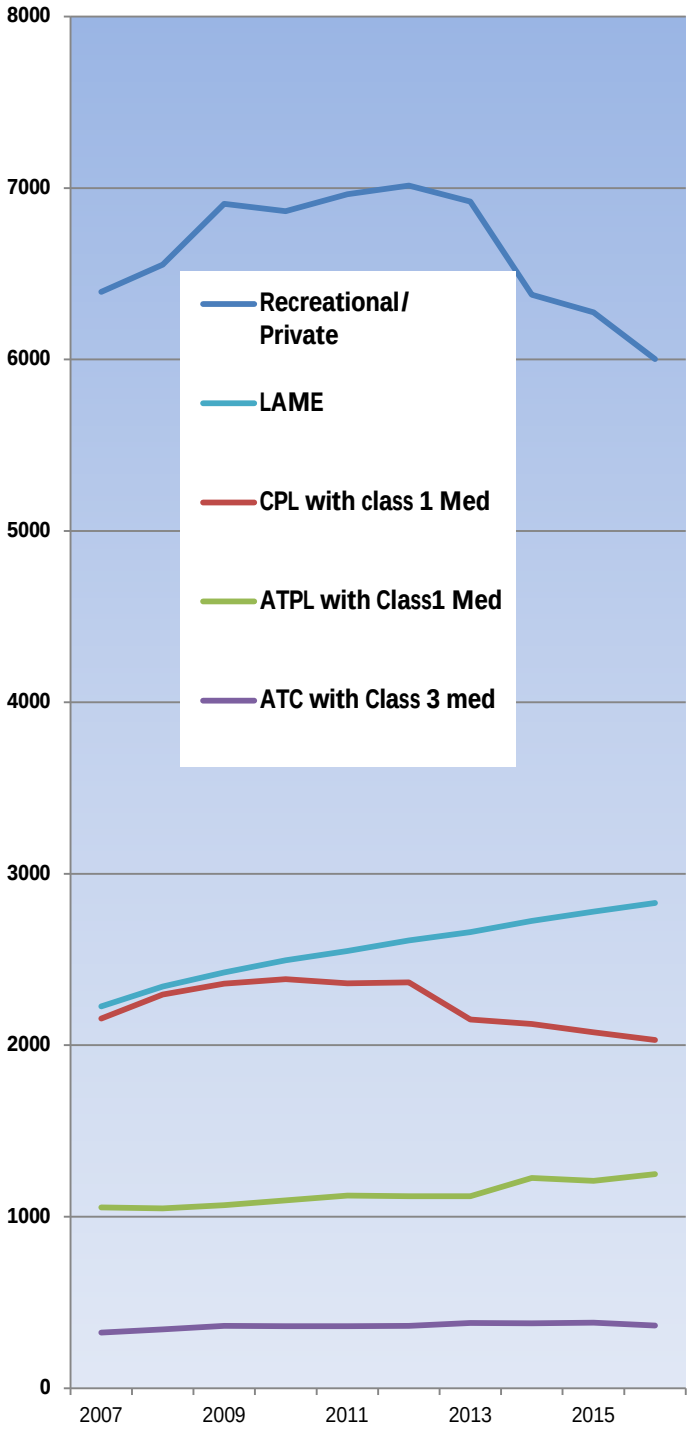
Ten year movements of these measures are summarised in the following graph.



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

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

Licences Held as at 31 December



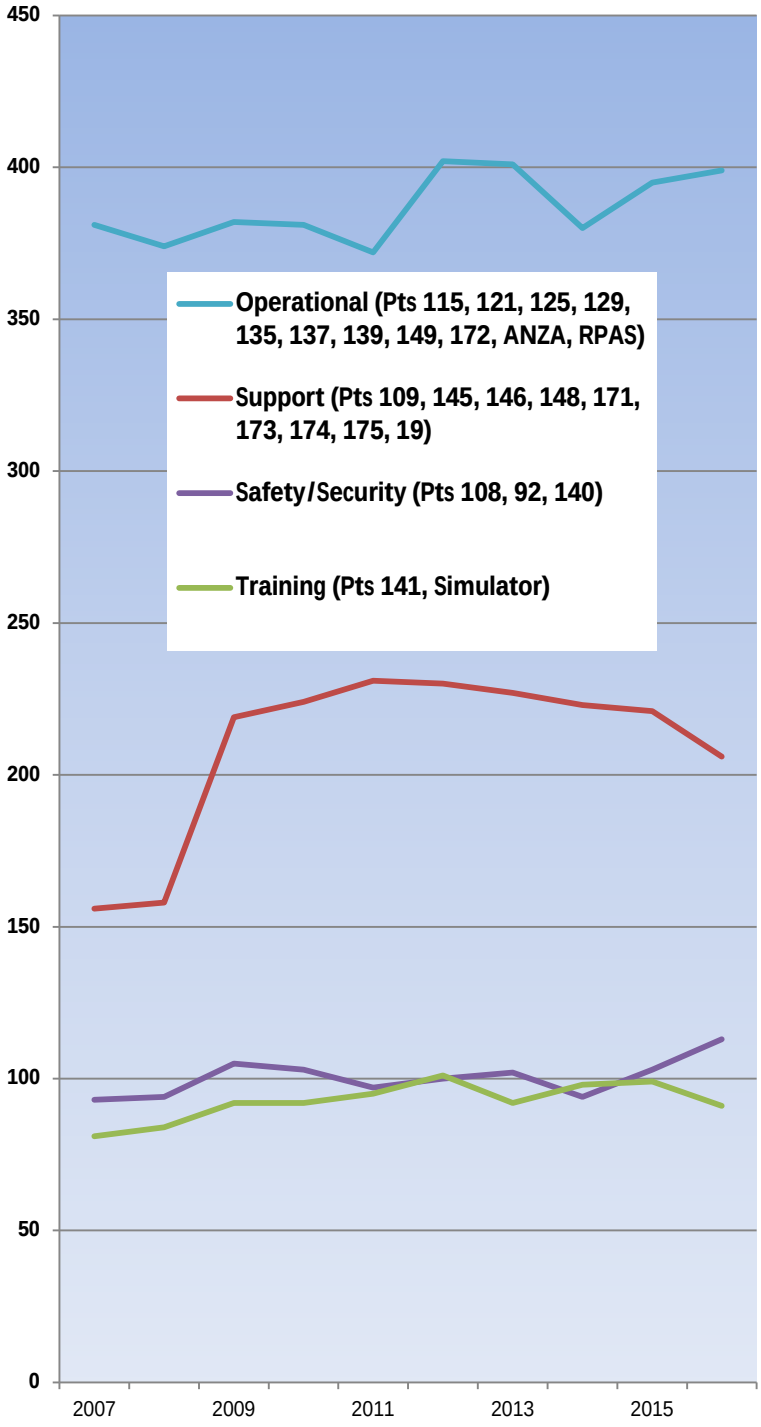
The 'Recreational/Private' group consists of holders of RPL licences who have appropriate current medical certificates plus holders of any pilot licence who have current class 2 medical certificates plus holders of PPL licenses only who hold a current class 1 medical certificate.

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

Both the 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.

For more detail see: Licences

Approvals Held as at 31 December



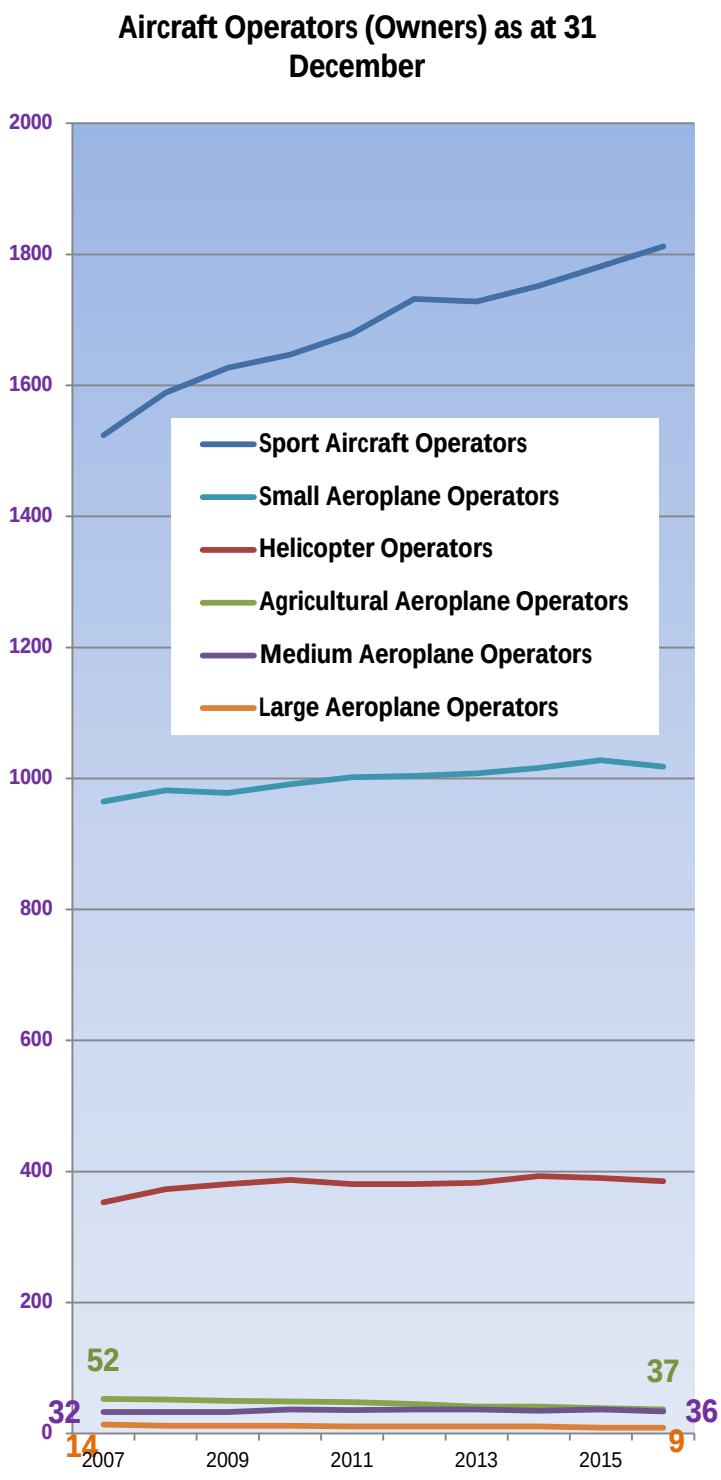
No significant trends are evident.

The number of Part 145 Aircraft Maintenance Organisation approvals peaked 4 years ago at 67 and has since declined to 54. 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 2007 to 7 at the end of 2016. This sector is closely monitored.

The numbers of Part 137 Agricultural Aircraft Operator approvals declined from 114 at the end of 2007 to 99 at the end of 2014 but have levelled out since then. This sector is also closely monitored and the decline does not represent any safety concern.

For more detail see: Approvals



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.

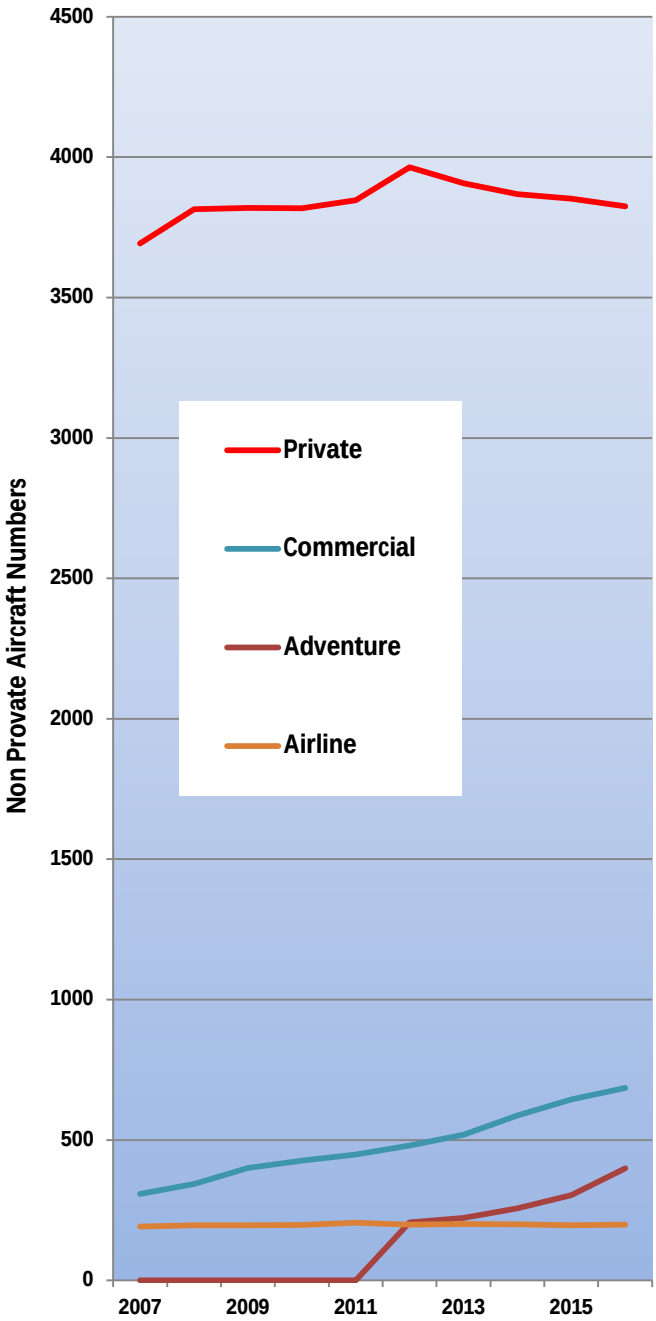
The number of Large Aeroplane operators shows no significant recent trend but has declined by 5 since 2007. The number of Agricultural Aeroplane operators peaked at 53 in 2008 declined until 2014 and has remained steady since then.

The number of Medium Aeroplane operators has been between 34 and 37 since 2010.

All other categories show small increases in the number of operators except for the Sport Aircraft category where there has been significant growth across the whole period covered by this report

For more detail see: Owners

Aircraft on Record as at 31 December



Aircraft have been counted in the Adventure group if there was a current Part 115 approval for the aircraft at the 31 December year end.

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

The most notable trend is in the commercial group where the numbers have increased by 222% since December 2007. Both fixed wing and rotary have contributed to this increase but the rotary component is the major factor having gone from 157 at the end of 2007 to 475 at the end of 2016, an increase of 302%.

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

For more detail see: Aircraft

Industry Activity

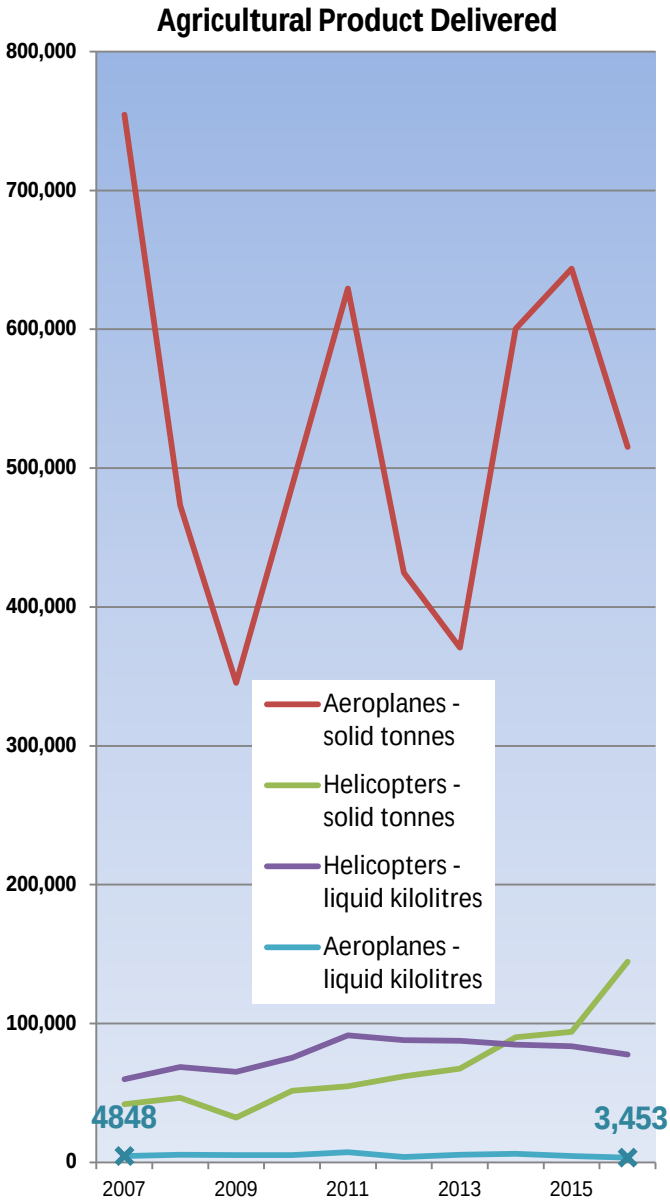
Most activity measures depend on operations statistics returns supplied by operators under the requirements of rule part 12.151 or rule part 19.103 for agricultural aviation statistics.

Compliance with these rules varies widely across the industry and with time. 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 19% of expected agricultural returns and 29% of expected aircraft returns for the year ended 31 December 2016 had not been received.

The following measures of industry activity are available

- Estimate of Agricultural Product delivered during the year
- Estimate of Hours Flown during the year
- Estimate of Air Transport flights conducted 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.

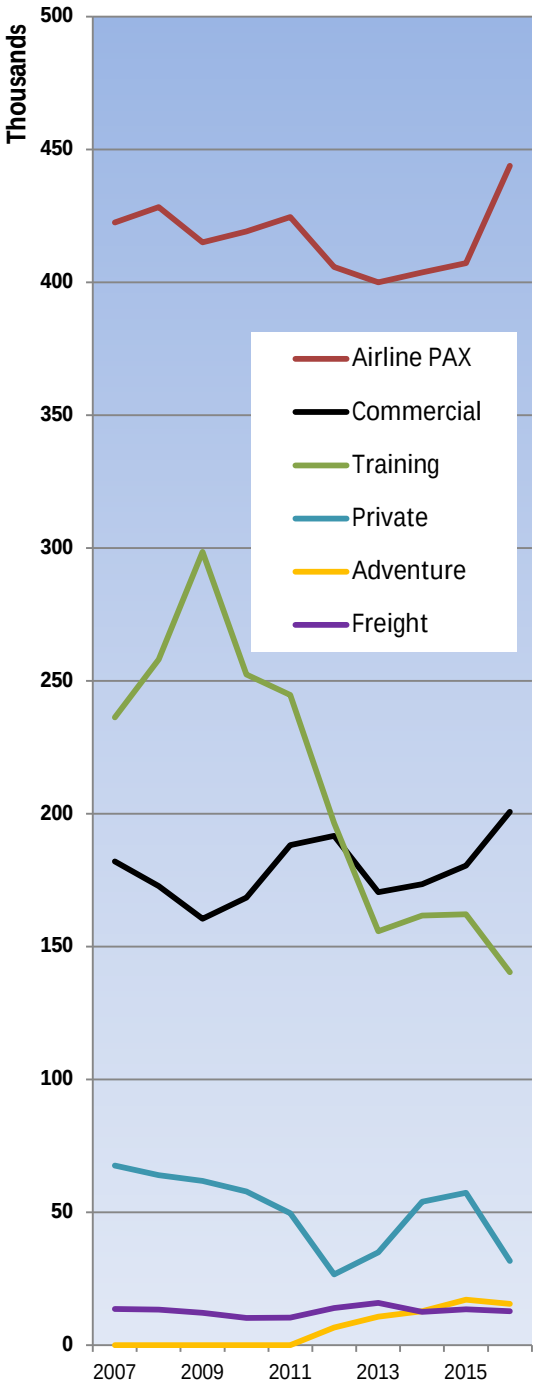


Trends in agricultural product delivery vary by aircraft type.

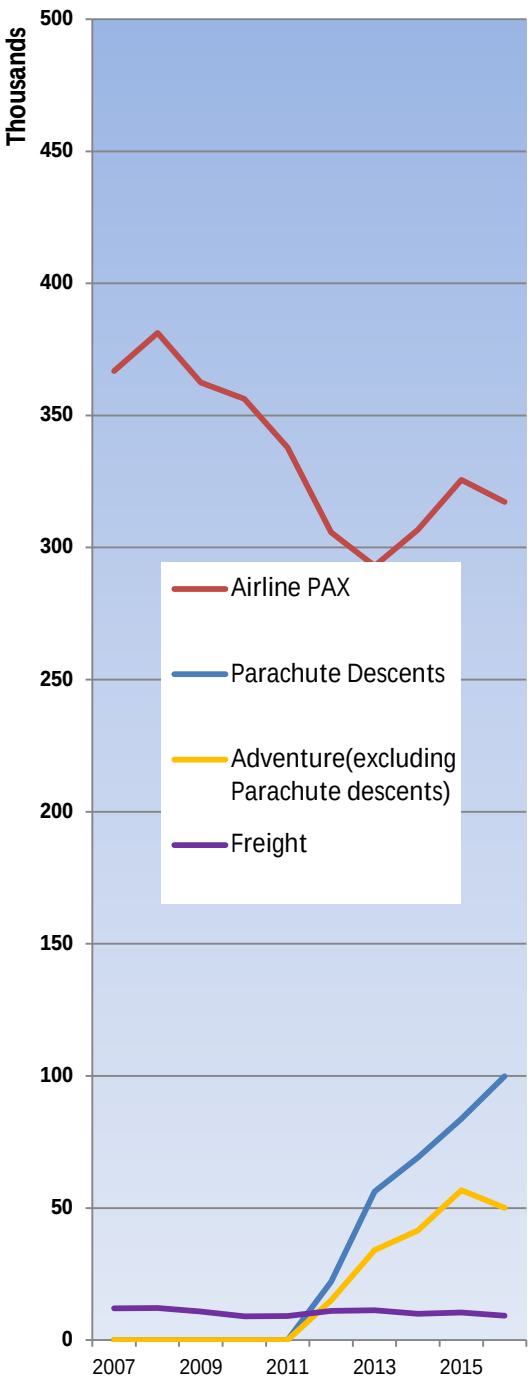
Liquid quantities applied by helicopter have plateaued from 2010 – 2016, while solid tonnage has increased significantly.

Solid tonnage applied by aeroplane has fluctuated significantly from 2007 – 2016

Annual Hours Flown



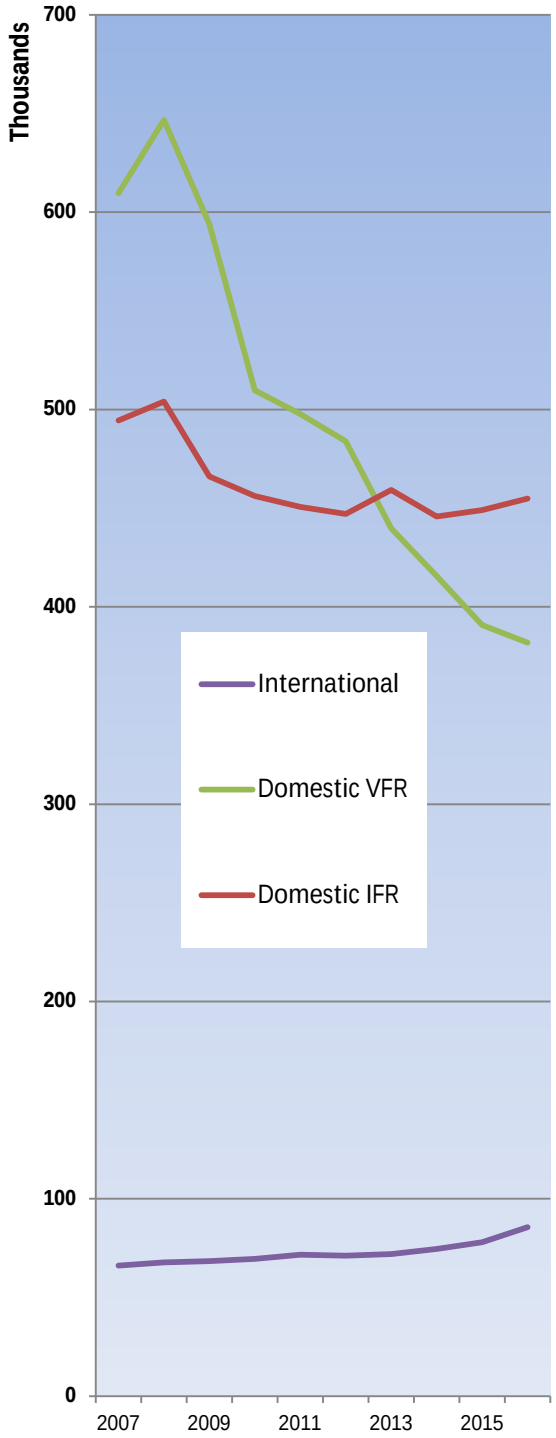
Air Transport Flights



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.

For more detail follow these links: Hours Flown Flights

Aerodrome Movements



This data covers only aerodromes that have an Airways presence either as Air Traffic Control 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 long term data available on the numbers of unscheduled movements at certificated aerodromes that have no Airways presence. Taupo aerodrome's annual movements averaged approximately 27000 over the 10 year period covered by this report and were 20792 during the 2016 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 a consequence of a move of private flying away from busy commercial airports or may be an indication that private flying is declining in New Zealand generally.

For more detail see: Aerodrome Movements

Safety Outcomes

Safety outcome measures covered in this report include

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

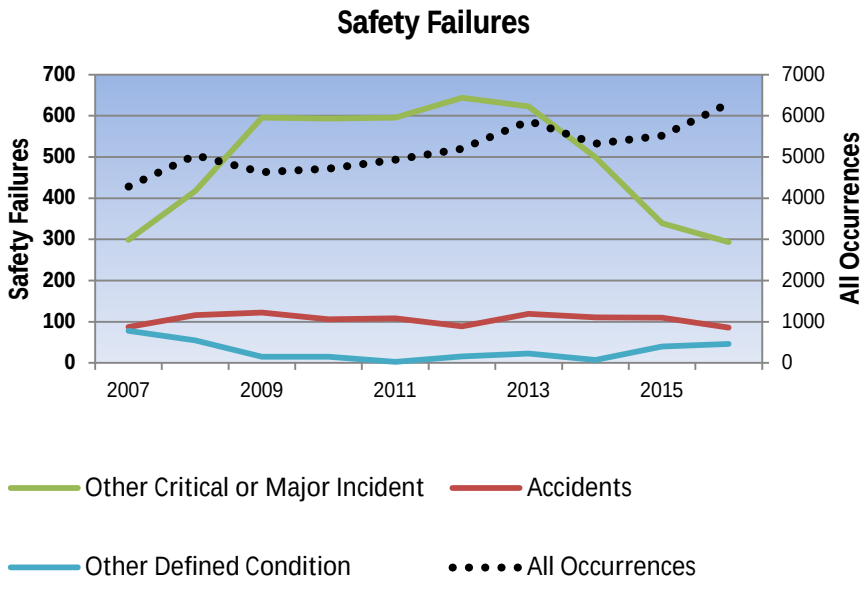
It is not practicable to summarise all of these measures in a concise form so this summary focusses on a concept of Safety Outcomes which classifies all reported occurrences into three groups, Safety Failures, Close Calls and Safety Successes. Aviation-Related Concerns and Risk Assessments are summarised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

The values relate to years ending 31 December

Safety Failures

We have taken a Safety Failure as:

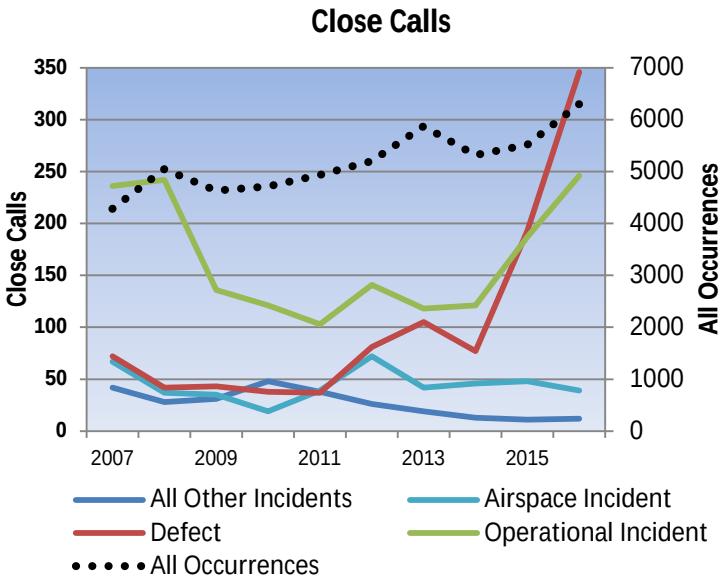
- an accident including hang glider and parachute accidents or
- an incident where the aircraft is written off, destroyed or missing or
- a critical or major incident or
- an incident that has any of 31 selected descriptors (see appendix), most of which relate to collision, serious landing outcomes,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



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

Close Calls

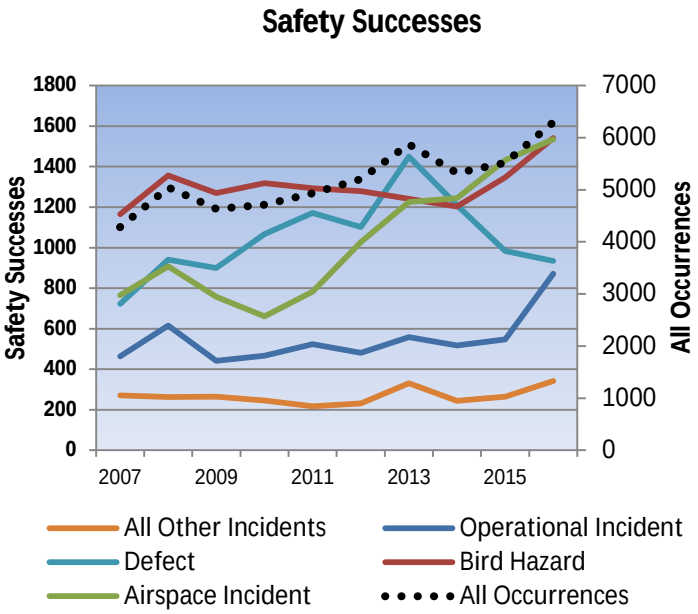
We have defined a Close Call as an incident that is not a safety failure but that has any of 112 selected descriptors (see appendix) that support the assumption that failure would have been the outcome if either the condition had escalated or adequate compensating action had not been taken



The most obvious trend is the recent increase in the number of defect incidents are close calls (269 since 2014). This is accompanied by a decrease in those that are safety failures (184). The total number of reported defect incidents also decreased by 183 from 1547 to 1364.

Safety Successes

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



Precursors to Safety Failure

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

The Client Risk Assessment Process

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

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

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

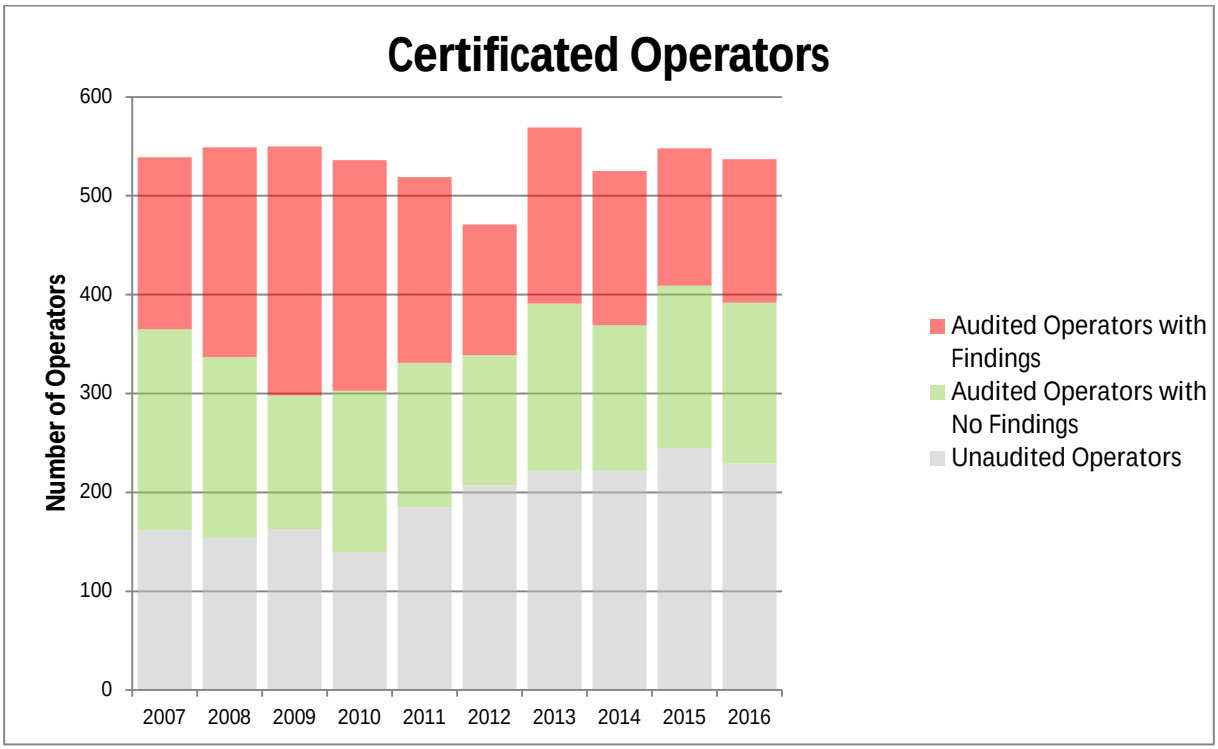
Activity	Year ending 31 December									
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Part 137 Agricultural Aircraft Operator	30.9	21.7	17.5	16.1	16.2	15.2	15.3	14.9	15.0	14.6
Part 135 Air Operator Helicopters and Small Aeroplanes	25.7	18.9	16.7	16.4	15.9	15.2	14.7	14.3	14.7	14.1
Part 125 Air Operator Medium Aeroplanes	21.3	15.0	14.7	15.6	15.0	13.7	13.2	15.1	16.4	13.5
Part 115 Adventure Aviation Operator Certificate						43.6	17.3	12.2	12.9	13.4
Part 149 Aviation Recreation Organisation	9.4		15.8	7.5	14.7	10.8	14.5	16.3	14.4	12.9
Part 172 Air Traffic Service Organisation	38.4	7.3	8.7	9.3	16.9	22.7	15.0	13.8	13.1	12.8
Part 109 Regulated Air Cargo Agent			10.5	12.6	10.3	10.7	11.8	13.1	11.5	10.9
Part 129 Foreign Air Transport Operator	10.7	13.0	9.6	8.6	10.0	8.2	7.8	6.4	8.2	10.4
Part 148 Aircraft Manufacturing Organisation	12.9	13.0	9.0	12.1	11.0	9.5	10.7	11.4	10.8	9.8
Part 92 Dangerous Goods Packaging Approval Holder	2.6		2.6	5.6	13.7	8.7	3.4	8.7	11.6	9.7
Part 140 Aviation Security Service Organisation	23.0	7.7	5.2	5.0	4.6	4.9	5.3	6.4	7.2	9.5
Part 121 Air Operator Large Aeroplanes	12.0	9.4	10.7	9.7	9.5	7.6	7.9	8.2	7.6	9.5
Part 19F Supply Organisation	12.7	12.5	12.4	11.0	10.7	8.8	10.0	11.2	10.2	9.3
Part 145 Maintenance Organisation	13.4	11.1	10.8	9.8	11.7	10.0	9.5	10.0	9.9	8.9
Part 146 Aircraft Design Organisation	12.8	10.0	7.9	9.6	12.7	9.3	8.7	8.3	8.5	8.8
Australia AOC with ANZA Privileges Part 108 Security Programme			6.7	5.6	6.5	6.9	5.8	6.2	8.2	8.3
Part 173 Instrument Flight Procedure			5.4	7.2	11.4	15.8	11.3	11.2	12.0	8.2
Part 139 Aerodrome Operator	8.1	5.5	5.0	5.8	6.4	5.7	6.4	7.0	8.3	7.6
Part 141 Aviation Training Organisation	16.5	12.9	11.1	9.9	10.7	9.5	8.5	9.1	9.5	7.5
Part 108 Security Programme	7.7	7.9	7.0	8.4	7.2	7.1	7.0	6.8	7.0	7.4
Part 171 Telecom Service Organisation	15.1	6.7	5.3	5.0	14.5	16.2	9.2	5.6	5.1	5.0
Part 174 Meteorological Service Organisation	34.6	17.7	6.8	10.6	12.5	13.3	7.3	5.1	6.0	4.9
Part 175 Aeronautical Info Service Organisation	41.4	19.2	6.1	9.2	16.9	18.5	11.2	22.5	14.4	3.6

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

The Routine Audit Process

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

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



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

Industry Size and Activity Data

Registered Aircraft

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

Aircraft Category and Class	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplane	116	121	118	119	127	125	128	128	125	**136**
Medium Aeroplane	76	75	78	78	78	80	79	78	77	**69**
Small Aeroplane	1458	1500	1512	1517	1520	1526	1512	1495	1506	**1508**
Helicopter	698	747	760	761	767	787	795	831	840	**845**
Agricultural Aeroplane	116	113	110	110	109	107	103	97	93	**94**
Sport Aircraft - Aeroplanes	103	114	119	117	126	143	151	165	168	**175**
Sport Aircraft - Amateur Built Aeroplane	226	243	256	258	266	276	282	283	292	**300**
Sport Aircraft - Amateur Built Glider	4	4	4	4	4	3	3	3	3	**3**
Sport Aircraft - Amateur Built Helicopter	16	18	20	20	22	23	24	24	24	**23**
Sport Aircraft - Balloons	64	67	69	69	72	74	61	64	64	**61**
Sport Aircraft - Glider	318	312	304	300	300	296	293	288	289	**287**
Sport Aircraft - Gyroplane	32	36	38	42	36	42	46	53	62	**70**
Sport Aircraft - Hang Glider	0	0	0	0	0	13	17	18	18	**23**
Sport Aircraft - Helicopter	6	5	5	3	5	6	4	5	5	**5**
Sport Aircraft - Microlight Class 1	248	237	233	229	221	225	215	212	206	**206**
Sport Aircraft - Microlight Class 2	666	713	742	767	798	822	820	842	873	**883**
Sport Aircraft - Power Glider	46	49	47	48	48	46	46	46	49	**51**
Sport Aircraft - Parachute	0	0	0	0	0	194	188	210	209	**256**
Sport Aircraft - Para Glider	0	0	0	0	0	61	82	69	89	**105**
Total	**4193**	**4354**	**4415**	**4442**	**4499**	**4849**	**4849**	**4911**	**4992**	**5100**

Statistically significant growth areas are:

- gyroplanes – from 36 in 2011 to 70 in 2016
- sport aeroplanes – from 103 in 2007 to 175 in 2016
- Part 115 hang gliders – from 13 in 2012 to 23 in 2016
- Part 115 parachutes – from 194 in 2012 to 256 in 2016
- Part 115 para gliders – from 61 in 2012 to 105 in 2016

Moderate declines are evident for

- class 1 microlights - from 248 in 2007 to 206 in 2016
- agricultural aeroplanes – from 116 in 2007 to 94 in 2016

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

Licences

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

Licences	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private & Recreational	6394	6553	6907	6865	6964	7014	6921	6377	6275	**6002**
CPL with class 1 Med	2155	2295	2359	2385	2362	2366	2150	2125	2076	**2030**
ATPL with Class1 Med	1055	1048	1068	1096	1124	1119	1120	1226	1210	**1248**
ATC with Class 3 Med	325	342	363	362	362	363	380	379	383	**366**
LAME	2227	2342	2424	2496	2549	2611	2660	2726	2779	**2830**
Total	**12156**	**12580**	**13121**	**13204**	**13361**	**13473**	**13231**	**12833**	**12723**	**12476**

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

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

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

The numbers of 'Private & Recreational' Pilot licence holders have been declining since 2012 and those of Commercial Pilot licence holders have been declining since 2010.

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:	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplanes	14	12	12	12	11	11	11	11	9	**9**
Medium Aeroplanes	33	33	33	37	36	37	37	35	37	**34**
Agricultural Aeroplanes	53	52	50	49	48	45	41	41	39	**37**
Helicopters	353	373	381	387	381	381	383	393	390	**385**
Small Aeroplanes	965	982	978	991	1002	1004	1008	1016	1028	**1018**
Sport Aircraft	1524	1589	1627	1647	1679	1732	1728	1752	1782	**1812**

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 30% drop in the number of agricultural aeroplane operators over the last ten years along with increases of 9%, and 18% in the numbers of helicopter and sport aircraft operators over the same period.

Certificated Operators

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

	Years 20--									
Approval	**07**	**08**	**09**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Part 119 Air Operator	177	174	184	187	185	179	178	175	174	175
Part 135 Helicopters and Small Aeroplanes	164	163	173	175	175	168	166	165	164	164
Part 137 Agricultural Aircraft Operator	114	109	107	108	105	104	99	97	104	102
Part 102 Unmanned Aircraft Operator Certificate	0	0	0	0	0	0	0	0	16	76
Part 109 Regulated Air Cargo Agent	0	0	62	63	63	65	66	65	66	66
Part 92 Dangerous Goods Packaging Approval	40	44	57	57	57	58	59	55	59	62
Part 145 Aircraft Maintenance Organisation	56	55	57	60	63	67	63	56	56	54
Part 141 Aviation Training Organisation	49	49	55	56	57	59	56	55	55	52
Part 19 Supply Organisation Certificate of Approval	58	64	59	57	60	56	56	59	58	50
Part 129 Foreign Air Operator	39	40	38	34	30	32	31	31	33	40
Part 129/108 Security Programme	31	30	28	26	21	23	23	22	25	33
Part 115 Adventure Aviation Operator	0	0	0	0	1	33	34	27	30	29
Synthetic Training Device (General Aviation)	26	28	29	26	29	33	26	30	31	28
Part 139 Aerodromes	24	25	25	26	26	27	27	27	27	27
Part 119/108 Security Programme	21	19	19	19	18	18	19	16	18	17
Part 148 Aircraft Manufacturing Organisation	23	22	21	22	23	20	20	20	20	16
Part 125 Medium Aeroplanes	16	15	15	16	15	15	15	12	15	15
Part 146 Aircraft Design Organisation	12	11	11	14	14	14	14	14	13	12
Synthetic Training Device (Airlines)	6	7	8	10	9	9	10	13	13	11
Part 149 Aviation Recreation Organisation	8	9	9	8	8	7	8	8	8	8
Part 121 Large Aeroplanes	11	9	10	10	9	9	9	8	8	7
Australian AOC Operating with ANZA Privileges	0	0	2	2	1	2	2	1	3	5
Part 171 Aeronautical Telecommunication Service Organisation	3	2	2	2	2	2	2	2	2	2
Part 172 Air Traffic Service	2	2	2	2	2	2	2	2	3	2
Part 173 Instrument Flight Procedure Service Organisation	0	0	3	3	3	3	3	3	2	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	1	1	1	1	2	2	2
Part 140 Aviation Security Service	1	1	1	1	1	1	1	1	1	1
Part 119 Air Operator - Pacific	3	2	1	0	0	0	0	0	0	0
Part 141 Restricted Training Organisation	0	0	0	0	0	0	0	0	0	0
Part 119 Pacific/108 Security Programme	3	2	1	0	0	0	0	0	0	0
Pacific - Part 121 Large Aeroplanes	2	2	1	0	0	0	0	0	0	0
Pacific - Part 125 Medium Aeroplanes	3	2	1	0	0	0	0	0	0	0
Pacific - Part 135 Helicopters and Small Aeroplanes	2	2	1	0	0	0	0	0	0	0
Pilotless Aircraft Authorisation	0	0	0	0	0	3	8	2	0	0
Total	**898**	**892**	**986**	**987**	**980**	**1012**	**1000**	**970**	**1008**	**1060**

* Note:

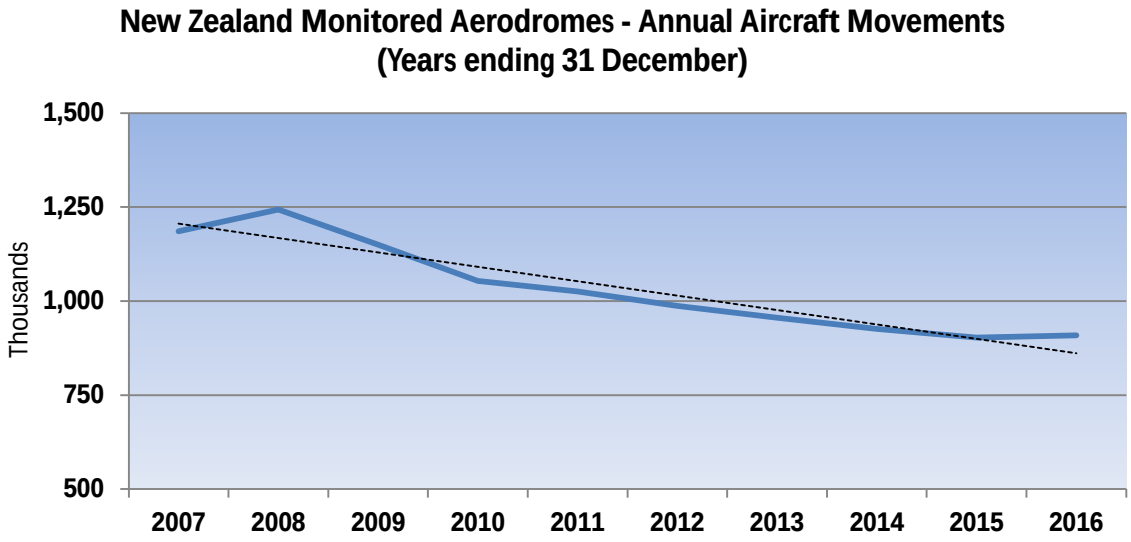
For organisations with Part 92 and for those with Part 172 certificates the figures show the total number of services that are certificated. This does not necessarily equate to the number of organisations that hold the certificate.

Aircraft Movements

Quarterly aircraft movement numbers are supplied to CAA by Airways Corporation for all aerodromes that they service, either by way of a control service or an information service. In addition Taupo airport voluntarily supplies movement information on a regular basis. A movement is defined as a 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 2016. Paraparaumu Airport has been omitted from this long term analysis because the available data is incomplete because there has only been a flight information service available since October 2011.



Breakdown by Aerodrome

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

Annual Aircraft Movements at Aerodromes

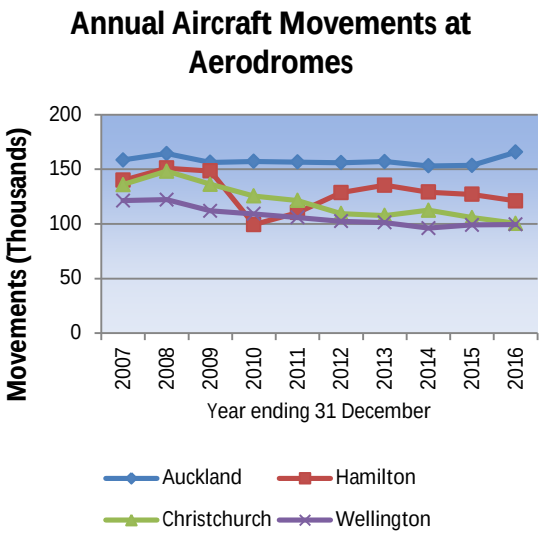
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auckland	158536	164417	156325	157201	156655	156062	157141	153092	153561	**165692**
Hamilton	139939	151109	148380	99308	110419	128744	135404	129050	127044	**121084**
Christchurch	135963	148320	136249	125611	121469	109444	107754	112568	105760	**100548**
Wellington	121308	122206	111969	109193	105988	102488	101279	96084	99053	**99443**
Tauranga	97631	105992	97144	86935	74400	72652	70450	58448	52662	**58340**
Queenstown	49015	50445	45966	42347	41769	43776	43012	45620	49794	**54347**
Palmerston North	88817	82776	58761	56439	65708	67395	55960	52655	49494	**48870**
Nelson	51287	47931	48273	51570	50094	48073	45677	46770	45180	**48469**
Paraparaumu	0	0	6305	0	12832	33702	31241	24279	26115	**27274**
Ohakea	71085	73513	72997	61896	55726	30959	28807	36512	29632	**26264**
Napier	24381	27948	24114	27172	27332	25242	24386	22728	21268	**23090**
Dunedin	40939	55321	53602	44003	29229	25328	22758	22750	23276	**21905**
Taupo	32902	34696	30680	28774	26376	25536	23814	22642	22009	**20792**
Woodbourne	25711	25405	24058	22829	23660	22689	21826	20451	22374	**20372**
New Plymouth	39444	45773	43518	37097	32791	30773	24910	21831	19678	**19684**
Rotorua	26856	29657	20734	23380	22682	22092	22532	20143	19256	**17870**
Milford	17473	15876	14227	14042	13043	12902	13482	13980	16658	**17475**
Invercargill	23427	25332	25805	29279	30840	28491	23058	19960	15910	**16939**
Gisborne	25279	24341	23955	22174	22459	19594	17671	15897	16003	**15331**
Whenuapai	15468	12372	13220	14347	14675	14915	15419	14946	14392	**12188**
Total	**1185461**	**1243430**	**1149977**	**1053597**	**1025315**	**987155**	**955340**	**926127**	**903004**	**908703**

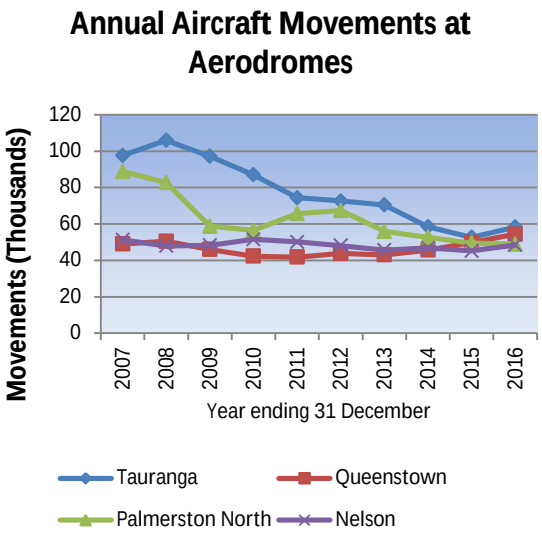
Movements data for individual aerodromes are graphed on the next page.

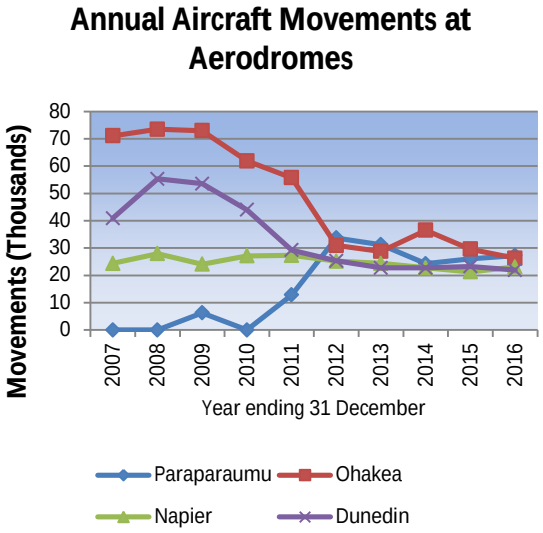
The aerodromes are grouped by the number of movements over the last year covered by this report.

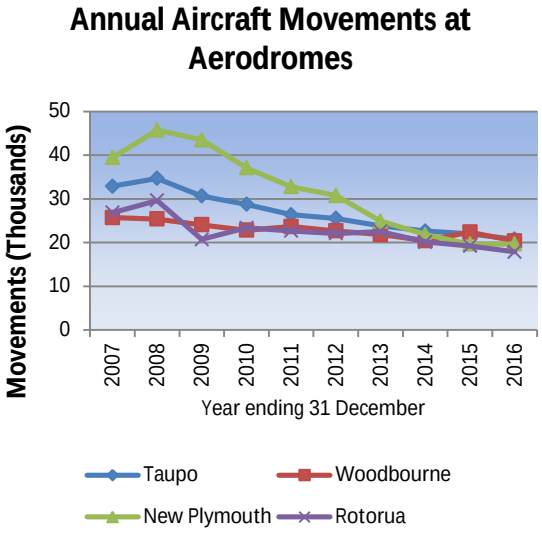
Note that the scales are different for each chart to prevent the smaller aerodromes' graphs from becoming unreadable which would happen if all the charts had the same scales.

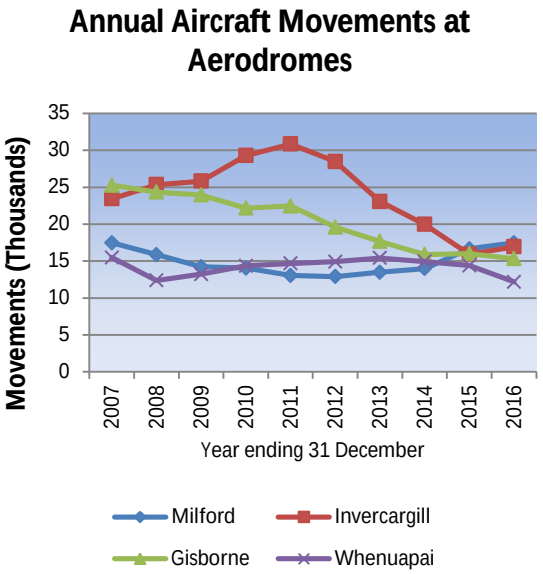
No information is available for Ardmore aerodrome although it is reported in the AIP as NZ's busiest aerodrome. The recent update of Part 139 which requires all aerodromes that are published in the AIP to supply movement data will ensure that a more complete picture of aerodrome movements will be available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


Annual Aircraft Movements at Aerodromes
Movements (Thousands)
200
150
100
50
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Auckland
Hamilton
Christchurch
Wellington


Annual Aircraft Movements at Aerodromes
Movements (Thousands)
120
100
80
60
40
20
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Tauranga
Queenstown
Palmerston North
Nelson


Annual Aircraft Movements at Aerodromes
Movements (Thousands)
80
70
60
50
40
30
20
10
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Paraparaumu
Ohakea
Napier
Dunedin

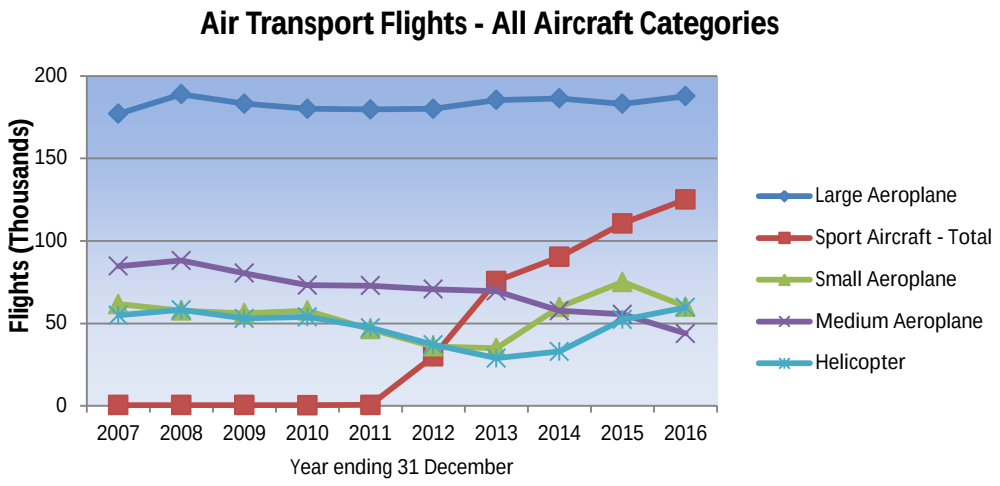

Annual Aircraft Movements at Aerodromes
Movements (Thousands)
50
40
30
20
10
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Taupo
Woodbourne
New Plymouth
Rotorua


Annual Aircraft Movements at Aerodromes
Movements (Thousands)
35
30
25
20
15
10
5
0
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Milford
Invercargill
Gisborne
Whenuapai

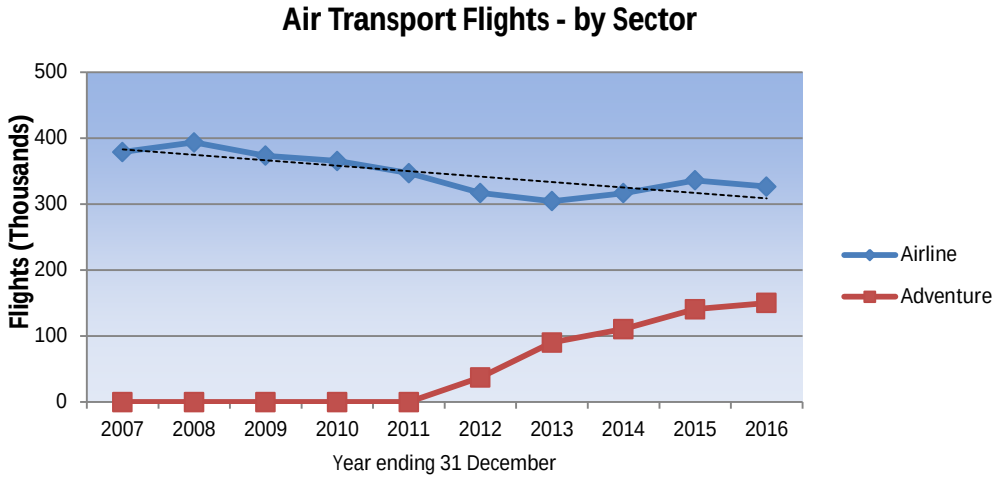
Air Transport Flights

The following graphs show the estimated number of air transport flights for the ten years ending 31 December 2016. 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.

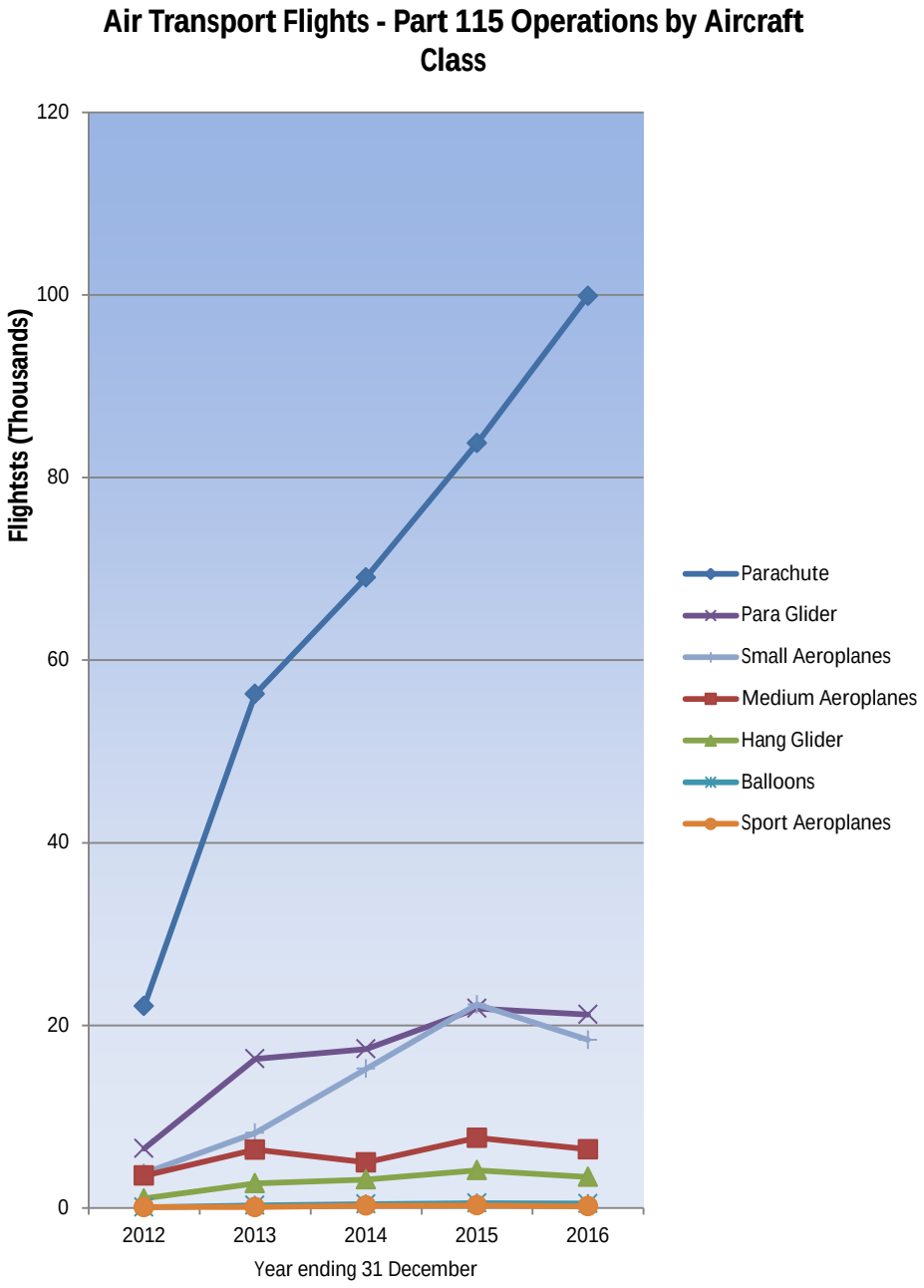


Apart from the expected emergence of adventure aviation flights the only trend that may be worthy of note is that Helicopter Air Transport Flights have reversed the declining trend that existed since 2010 and are now back to 2007 levels. This change is believed to relate in part to the growth in tourism.



The Airline graph shows a decrease of 14% over the ten years. This trend is significantly less than the decrease in the monitored aerodrome movements of 23% over the same period.

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.



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.

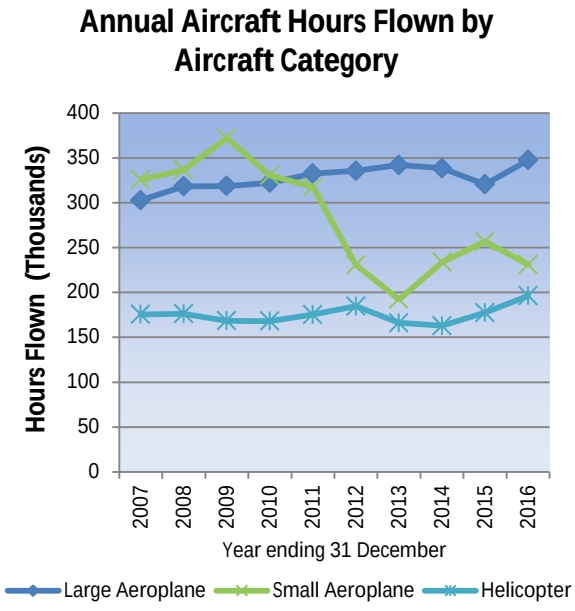
Sport aeroplanes and balloons conduct less than 1000 adventure aviation flights each per year. The reported figures for 2016 (31 December year-end) are 195 and 476 respectively. (The balloon curve is obscured by sport aeroplane curve in the graph above)

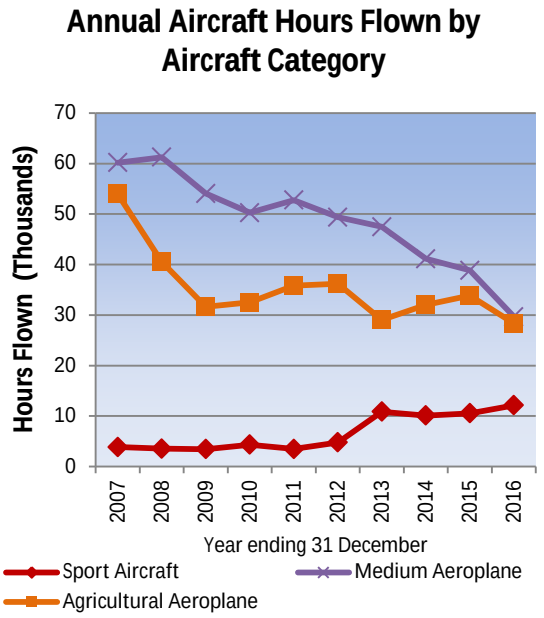
The most obvious trend is the steady growth in the sector particularly in parachute flights.

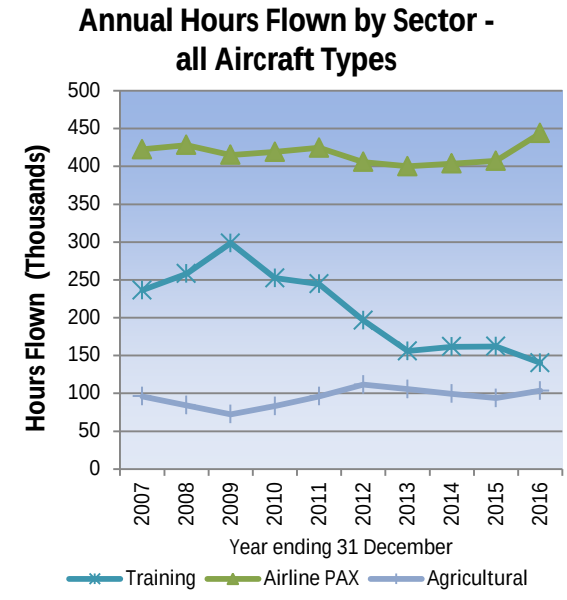
Hours Flown

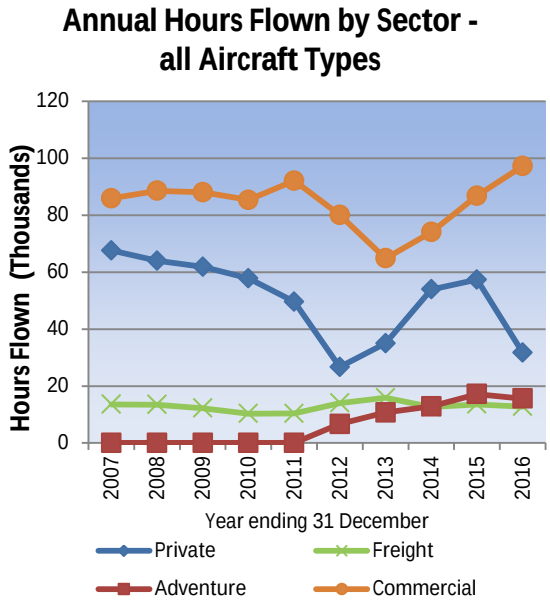
The following graphs show the estimated number of annual hours flown during the ten year period ending 31 December 2016. The estimates are based on the reported hours with an allowance for aircraft for which reports were not received. Recent improvements in the collection procedure for operating statistics data have resulted in improved return rates with a consequent improvement in confidence in the published data.

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









Seat-Hours

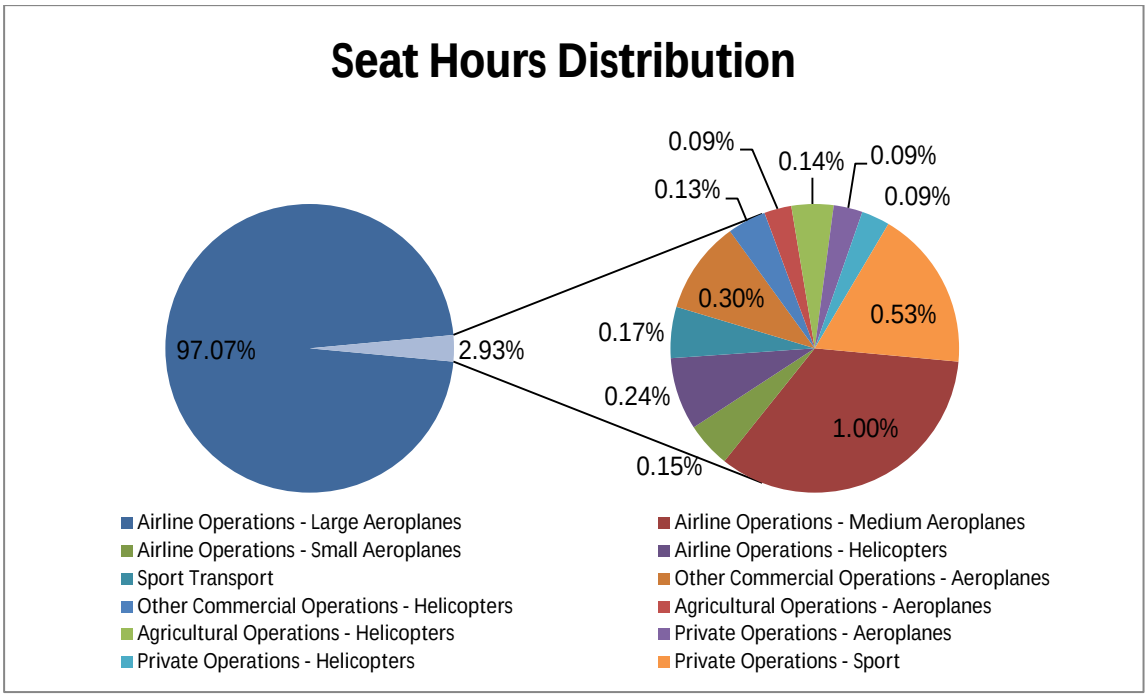
The following table indicates the size of the aviation industry as determined from Aircraft Operating Statistics in the relevant 2010 Safety Target Group categories for years ending 30 June.

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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Airline Operations - Large Aeroplanes	41,044	46,243	46,288	46,811	48,304	48,760	49,695	49,173	46,764	**50,027**
Airline Operations - Medium Aeroplanes	652	796	703	672	712	702	668	508	473	**371**
Airline Operations - Small Aeroplanes	124	108	102	99	111	115	83	75	115	**172**
Airline Operations - Helicopters	144	139	117	124	126	130	119	120	163	**194**
Sport Transport	122	122	122	122	83	79	98	85	104	**121**
Other Commercial Operations - Aeroplanes	231	254	291	250	234	327	239	154	157	**218**
Other Commercial Operations - Helicopters	90	92	109	93	99	102	61	64	71	**64**
Agricultural Operations - Aeroplanes	60	44	34	38	48	52	41	45	49	**46**
Agricultural Operations - Helicopters	95	99	93	108	96	91	92	70	61	**78**
Private Operations - Aeroplanes	62	57	56	54	47	38	42	48	52	**34**
Private Operations - Helicopters	55	55	52	45	40	30	42	47	48	**38**
Private Operations - Sport	206	206	206	206	228	256	272	266	275	**281**

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



This chart shows that for the year ending December 2016 approximately 97.1% of seat hours were offered by the Airline Operations – Large Aeroplanes group, approximately 1.0% by the Airline Operations – Medium Aeroplanes group, with the remaining 1.9% of seat hours offered being split between the other safety target groups.

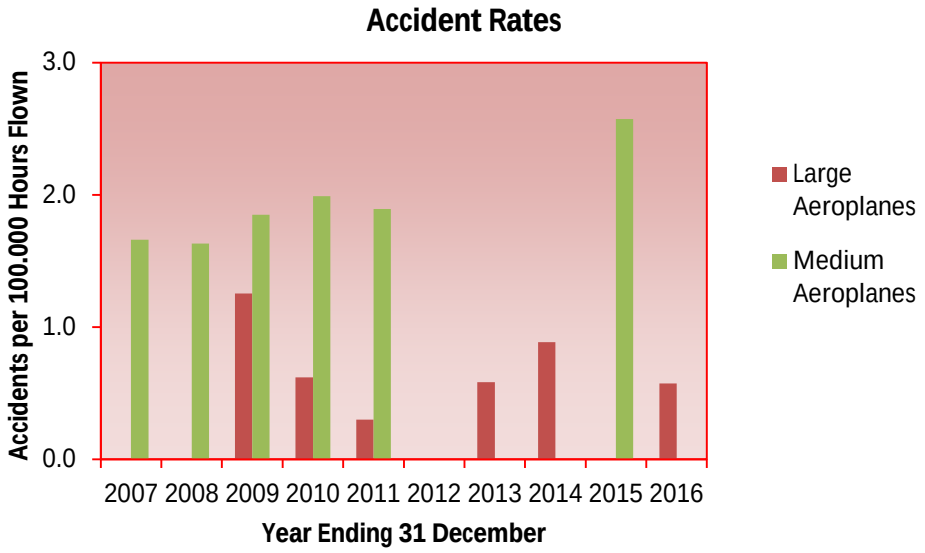
By comparison the 350,000 hours flown by the 136 large aircraft is only approximately 40% more than the 250,000 hours flown by the 1508 small aeroplanes on the register. The difference in passenger exposure is thus largely a function of the seating capacity.

Occurrence Analysis

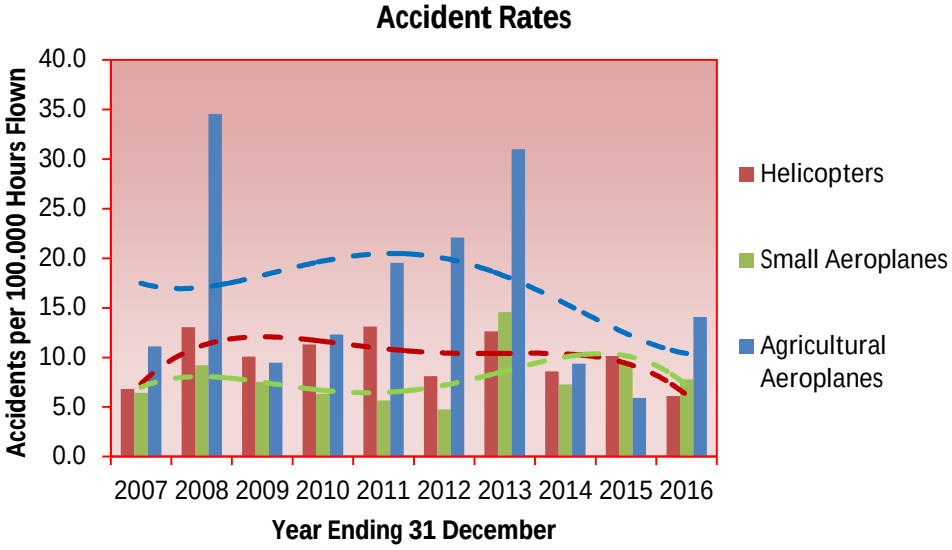
Aircraft Accidents

The following graphs show the annual aircraft accident rates (accidents per estimated 100,000 hours flown) for the ten calendar years up to and including 2016 (excluding the Sport Aircraft statistics category).

Breakdown by Aircraft Category

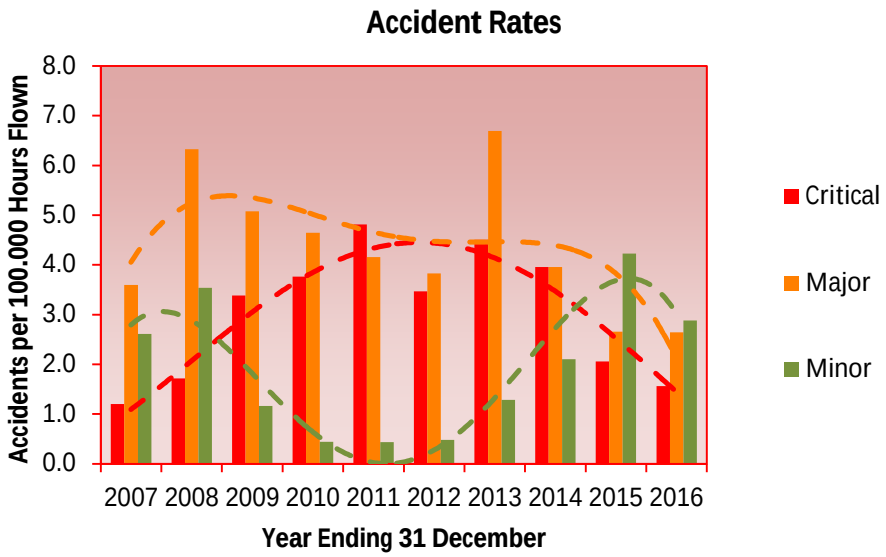


The numbers and rates of accidents in these two aircraft categories are too small for any trend analysis to be useful



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

Breakdown by Severity



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

Yearly Comparisons – counts, not rates

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

The values relate to years ending 31 December

Critical Accidents

Aircraft Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplanes	0	0	0	0	0	0	1	0	0	0
Medium Aeroplanes	1	0	1	0	0	0	0	0	0	0
Small Aeroplanes	4	5	8	8	9	2	8	9	2	1
Helicopters	4	4	5	9	19	9	11	9	10	6
Sport Aircraft excluding Hang Gliders and Parachutes	0	4	17	15	15	15	12	12	5	4
Hang Gliders	3	2	6	3	6	8	9	5	5	3
Parachutes	1	0	1	3	3	5	1	7	2	1
Agricultural Aeroplanes	1	3	1	2	1	3	2	2	0	2
Unknown	1	0	0	0	0	0	1	0	0	0
Total	15	18	39	40	53	42	45	44	24	17

Major Accidents

Aircraft Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplanes	0	0	0	1	1	0	1	1	0	2
Medium Aeroplanes	0	1	0	0	1	0	0	0	1	0
Small Aeroplanes	14	15	16	12	9	7	18	3	8	7
Helicopters	6	17	12	10	4	6	9	5	4	4
Sport Aircraft excluding Hang Gliders and Parachutes	9	21	18	17	17	13	18	21	7	9
Hang Gliders	4	2	10	4	3	2	2	4	5	6
Parachutes	2	0	4	3	4	6	2	2	3	3
Agricultural Aeroplanes	4	5	2	2	4	5	6	0	2	0
Unknown	0	0	0	0	2	1	0	2	0	0
Total	39	61	62	49	45	40	56	38	30	31

Minor Accidents

Aircraft Type	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplanes	0	0	4	1	0	0	0	2	0	0
Medium Aeroplanes	0	0	0	1	0	0	0	0	0	0
Small Aeroplanes	3	11	4	1	0	2	2	5	14	10
Helicopters	2	2	0	0	0	0	1	0	4	2
Sport Aircraft excluding Hang Gliders and Parachutes	18	13	3	1	1	2	5	9	17	9
Hang Gliders	6	2	8	12	2	2	4	9	18	10
Parachutes	3	2	2	1	4	1	4	3	3	4
Agricultural Aeroplanes	1	6	0	0	2	0	1	1	0	2
Unknown	0	1	0	0	1	0	1	0	0	1
Total	33	37	21	17	10	7	18	29	56	38

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.

Private Operations - Sport

- Twizel: A glider went overdue while on a cross country flight from Omarama. The wreckage was found the following day below a ridge line in the Ben Ohau Ranges. The pilot, who did not survive the accident, was found approximately 250 metres further down the terrain below the glider. 1 fatality. Aircraft destroyed. Occurrence Id: 16/437
- Tauranga: A solo pilot on his first flight on type, came in to land too high. The pilot tried to conduct a low level turn at the end of the runway and spun in from approximately 20 metres.1 fatality. Occurrence Id: 16/1970
- Matamata: RCCNZ received a beacon alert from aircraft. Fire and ambulance in attendance. 1 fatality. Occurrence Id: 16/5545

Agricultural Operations - Helicopters

- Glenbervie Forest: A helicopter crashed during forest spray operations.2 fatalities. Aircraft destroyed. Occurrence Id: 16/5811

Agricultural Operations - Aeroplanes

- North of Wairoa: An agricultural aeroplane collided with power lines, crashed and caught fire.2 fatalities. Aircraft destroyed. Occurrence Id: 16/6701

Private Operations - Helicopters

- Near Lindis Pass: A helicopter crashed. Cause of accident not yet known.1 fatality. Aircraft destroyed. Occurrence Id: 16/1973

Safety Target Structure

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

Number of Accidents

The following table shows, for each safety target group, the number of accidents each year for the last ten calendar-years ending with 2016. All aircraft types are included. The table is sorted by the number of accidents in the 2016 year.

Safety Outcome Target Group	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private Operations - Sport	43	45	53	50	46	47	54	61	53	**40**
Sport Transport	5	1	17	10	11	8	3	12	13	**11**
Airline Operations - Large Aeroplanes	0	1	4	2	1	0	2	3	0	**2**
Airline Operations - Small Aeroplanes	2	3	3	2	3	0	3	1	1	**1**
Airline Operations - Medium Aeroplanes	1	0	1	1	1	0	0	0	1	**0**
Airline Operations - Helicopter	0	0	0	0	0	0	0	0	0	**0**
Other Commercial Operations - Aeroplane	0	0	0	0	0	0	0	0	0	**0**
Other Commercial Operations - Helicopter	0	0	0	0	0	0	0	0	0	**0**
Agricultural Operations - Aeroplane	0	0	0	0	0	0	0	0	0	**0**
Agricultural Operations - Helicopter	0	0	0	0	0	0	0	0	0	**0**
Private Operations - Aeroplane	0	0	0	0	0	0	0	0	0	**0**
Private Operations - Helicopter	0	0	0	0	0	0	0	0	0	**0**
Other	0	1	1	0	2	1	2	1	0	**0**
None	0	0	0	0	0	0	0	0	0	**0**
Total	**51**	**51**	**79**	**65**	**64**	**56**	**64**	**78**	**68**	**54**

Not all accidents generate equal consequences and the usefulness of the above data for focussing intervention decisions is limited. The 'Sport Transport' group ranks 2nd in this data but when consequential factors like fatalities, serious injuries and aircraft damage are taken into account the ranking changes to 5th as can be seen from the next section.

Annual Social Cost

Social cost is a measure of the impact of fatal, serious and minor injuries and aircraft destroyed. The measure has been developed and maintained by the Ministry of Transport, and is updated annually. The following table displays the social cost expressed in millions of 2015 dollars for each safety target group for the last ten calendar-years ending with 2016. The table is sorted by the social cost in the 2016 year

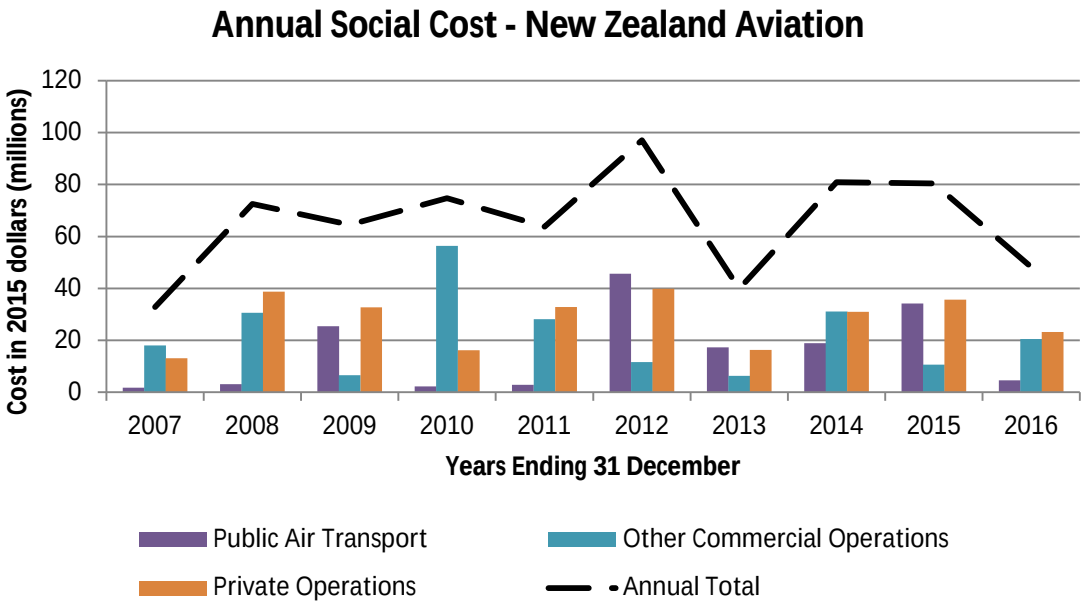
Safety Outcome Target Group	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Private Operations - Sport	12.0	32.6	28.3	7.1	22.3	33.8	15.1	15.7	14.5	**18.0**
Agricultural Operations - Helicopter	0.3	2.4	0.0	0.0	1.6	5.4	4.7	12.1	0.8	**10.4**
Agricultural Operations - Aeroplane	5.7	7.1	1.0	0.8	0.0	5.8	0.0	2.6	0.0	**9.1**
Private Operations - Helicopter	1.0	4.7	0.1	4.7	5.2	4.4	1.0	9.7	4.4	**5.2**
Sport Transport	1.7	0.0	23.3	2.2	1.8	45.5	0.7	2.2	2.0	**2.7**
Airline Operations - Large Aeroplanes	0.0	0.5	0.1	0.0	0.0	0.1	1.0	2.5	0.1	**1.3**
Airline Operations - Helicopter	0.0	2.5	1.3	0.0	0.8	0.0	13.8	9.1	32.1	**0.5**
Other	0.0	8.2	0.0	0.0	0.0	0.0	8.5	0.0	0.4	**0.5**
Other Commercial Operations - Helicopter	6.1	8.5	0.7	8.5	26.4	0.4	0.8	5.2	9.8	**0.4**
Other Commercial Operations - Aeroplane	5.9	12.6	4.8	47.1	0.2	0.0	0.8	11.2	0.0	**0.4**
Private Operations - Aeroplane	0.0	1.5	4.3	4.3	5.3	1.6	0.2	5.5	16.7	**0.0**
Airline Operations - Small Aeroplanes	0.0	0.2	0.6	0.0	0.2	0.0	1.8	5.1	0.0	**0.0**
Airline Operations - Medium Aeroplanes	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
Total	**32.8**	**80.7**	**64.6**	**74.7**	**63.7**	**97.1**	**48.4**	**80.9**	**80.9**	**48.8**

Social Cost Analysis

The extreme value of 97.1 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 2016 has incurred a social cost lower than the average of the previous nine years. The biggest contributing sectors were the Private sectors at 23.2 million dollars but the Agricultural sector at 19.5 million dollars was not far behind.

The following charts show the annual social cost for each Safety Outcome Target Group for the ten calendar years ending with 2016. Note that the Sport groups include hang gliders and parachutes. These charts show the same data as the table above but are intended to give a more visual perspective on the Safety performance of the industry as measured by the Social Cost.

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



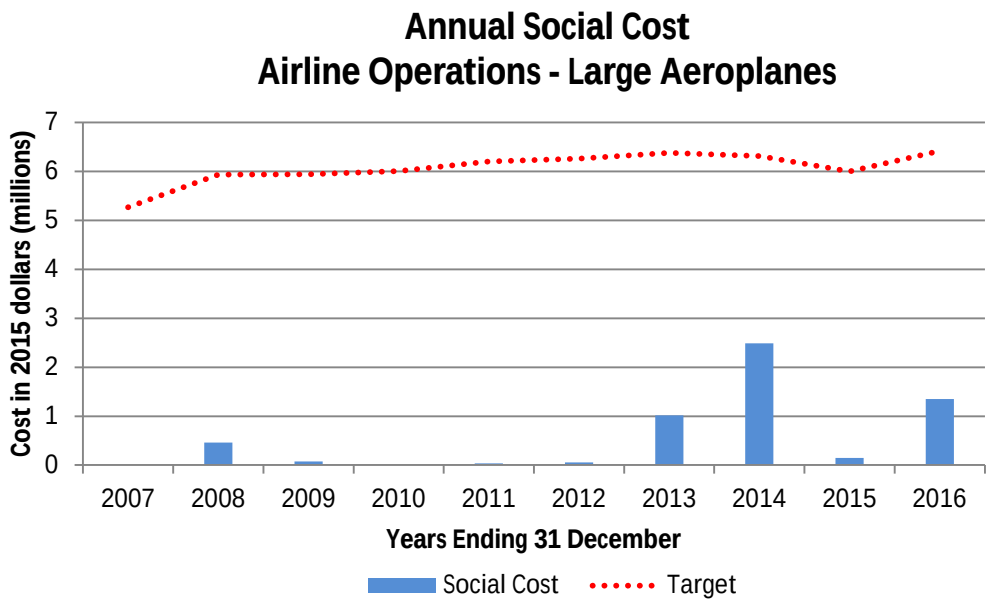
Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	4	23	13	15	11	21	7	12	16	8
Serious Injuries	15	16	17	18	23	17	25	42	19	27
Minor Injuries	17	22	28	26	17	15	44	33	52	39
Aircraft Unusable	18	23	18	16	23	12	19	28	15	6

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.

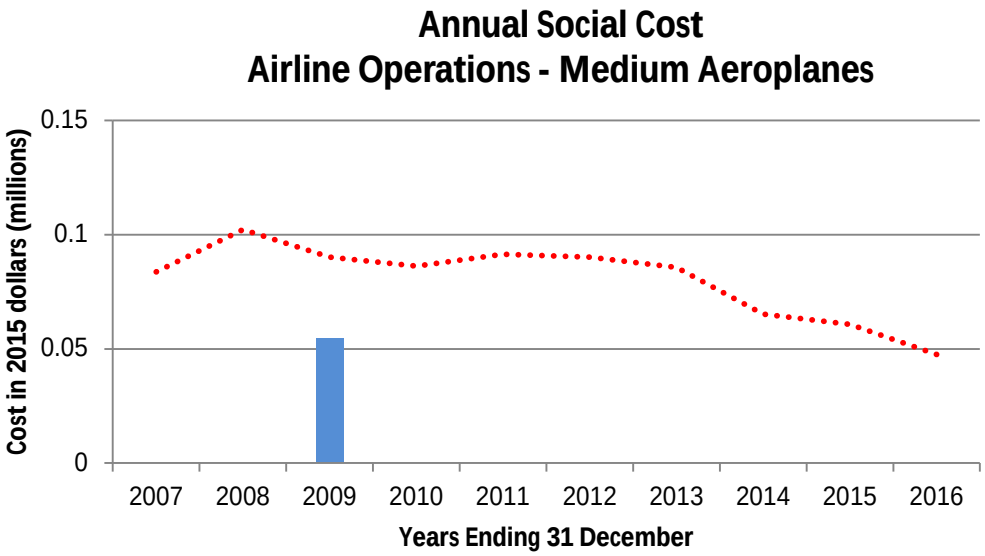


Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	0	0	0	0	0	0	0	**0**
Serious Injuries	0	1	1	0	0	0	2	1	0	**3**
Minor Injuries	0	3	4	0	2	3	9	1	8	**4**
Aircraft Unusable	0	0	0	0	0	0	0	1	0	**0**

The most significant contribution was one aircraft written off in 2014

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



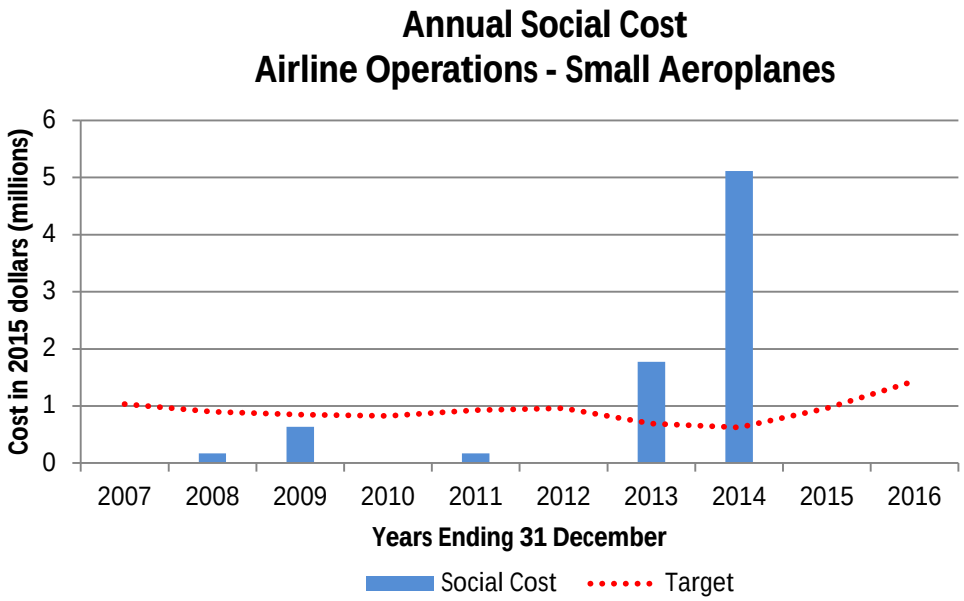
Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
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	0	0	3	0	0	0	0	0	0	**0**
Aircraft Unusable	0	0	0	0	0	0	0	0	0	**0**

The only contribution is three minor injuries in 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 (1.0% of all the seat-hours in the industry) means that a single event has the ability to cause the social cost to exceed the target in the year the event occurred. This is not seen as a problem as long as the target is met on average over an extended period.

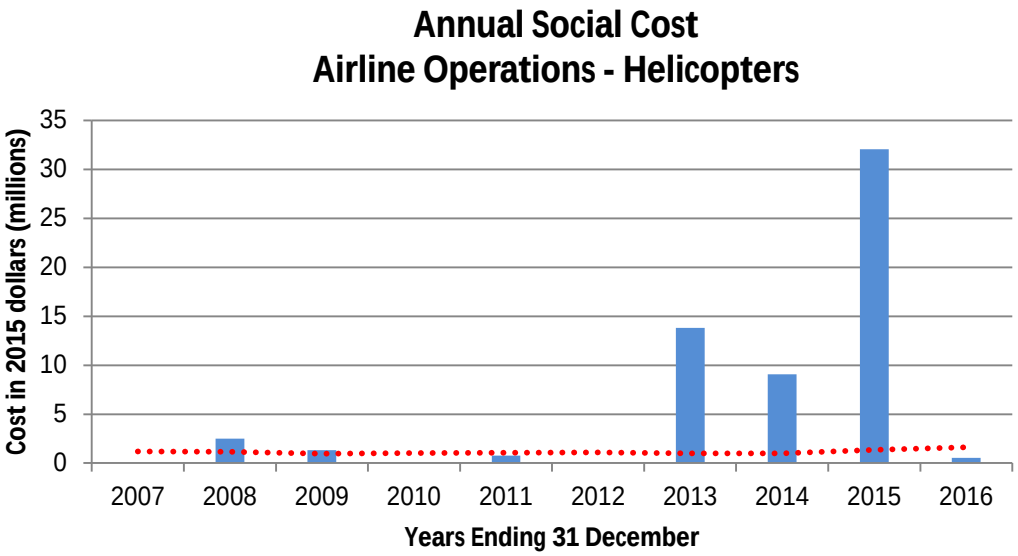


Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	0	0	0	0	0	1	0	**0**
Serious Injuries	0	0	1	0	0	0	3	2	0	**0**
Minor Injuries	1	0	2	0	0	0	0	0	0	**0**
Aircraft Unusable	0	1	1	0	1	0	2	1	0	**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 four years.

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



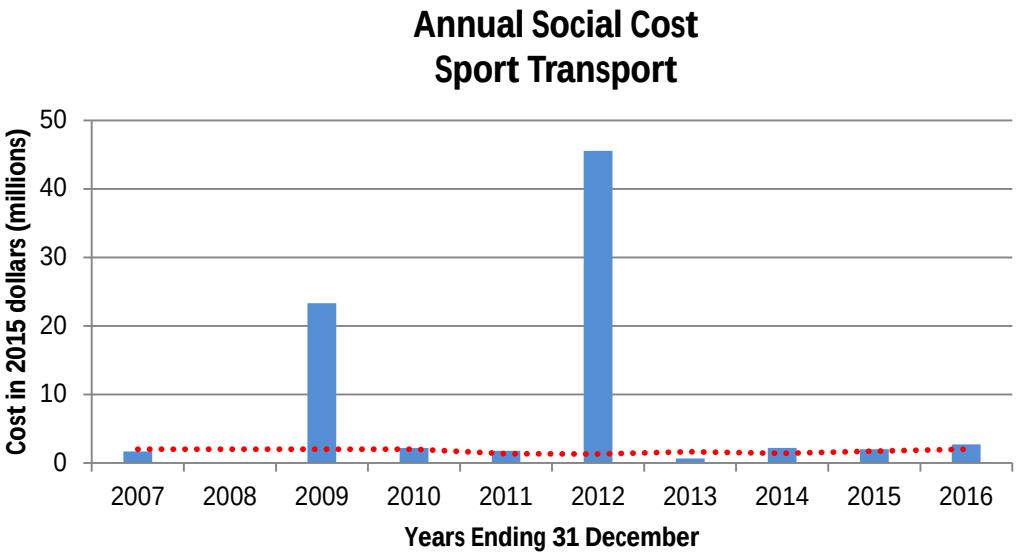
Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	0	0	0	0	2	1	7	**0**
Serious Injuries	0	2	0	0	1	0	1	4	2	**1**
Minor Injuries	0	2	2	0	2	0	5	4	1	**6**
Aircraft Unusable	0	2	1	0	1	0	3	2	2	**0**

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

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

The helicopter sector has been identified as a priority area for the CAA in the 2016/17 strategic safety plan. This sector was also examined by the Part 135 Sector Risk Profile Published November 2015 on the CAA website.

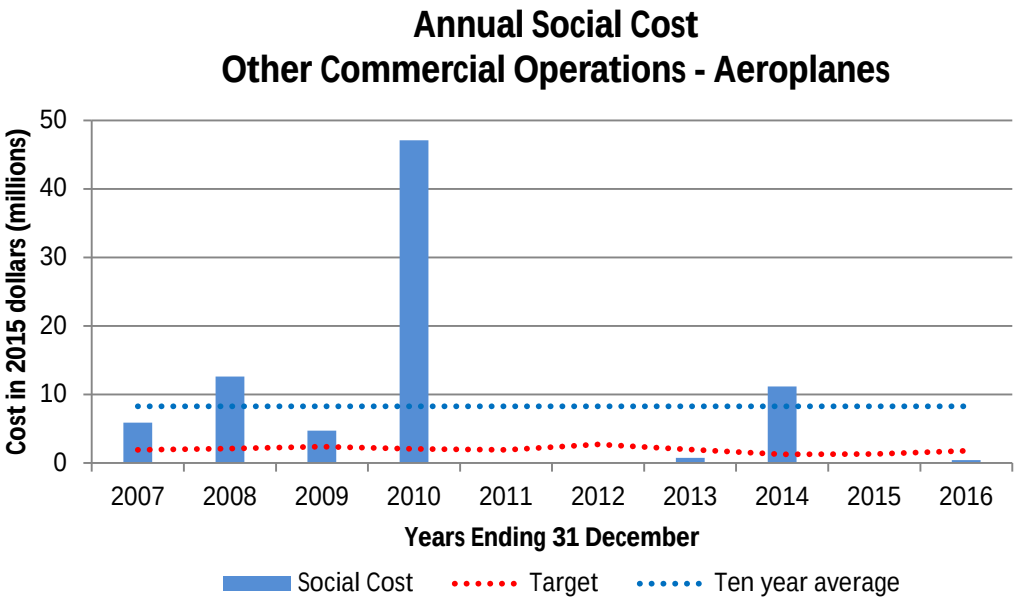


Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	5	0	0	11	0	0	0	**0**
Serious Injuries	4	0	6	5	4	1	1	5	2	**6**
Minor Injuries	0	1	7	4	7	4	4	5	11	**10**
Aircraft Unusable	0	0	4	1	0	1	1	0	1	**0**

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

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



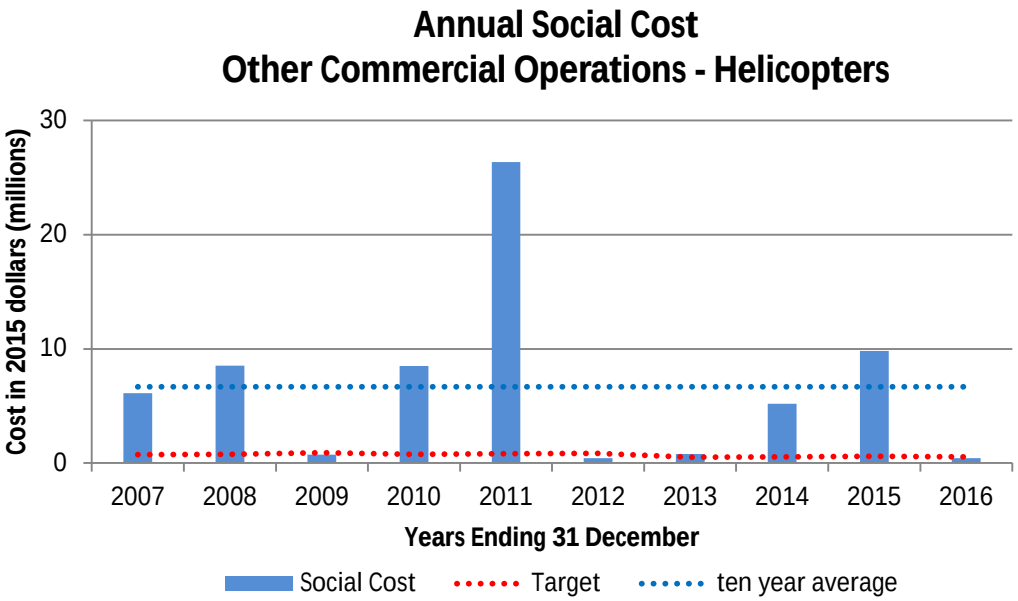
Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	1	3	1	11	0	0	0	2	0	**0**
Serious Injuries	3	0	0	2	0	0	1	5	0	**1**
Minor Injuries	1	1	0	0	0	0	1	0	0	**1**
Aircraft Unusable	3	2	3	5	1	0	2	5	0	**0**

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

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

This is not the case in this group.

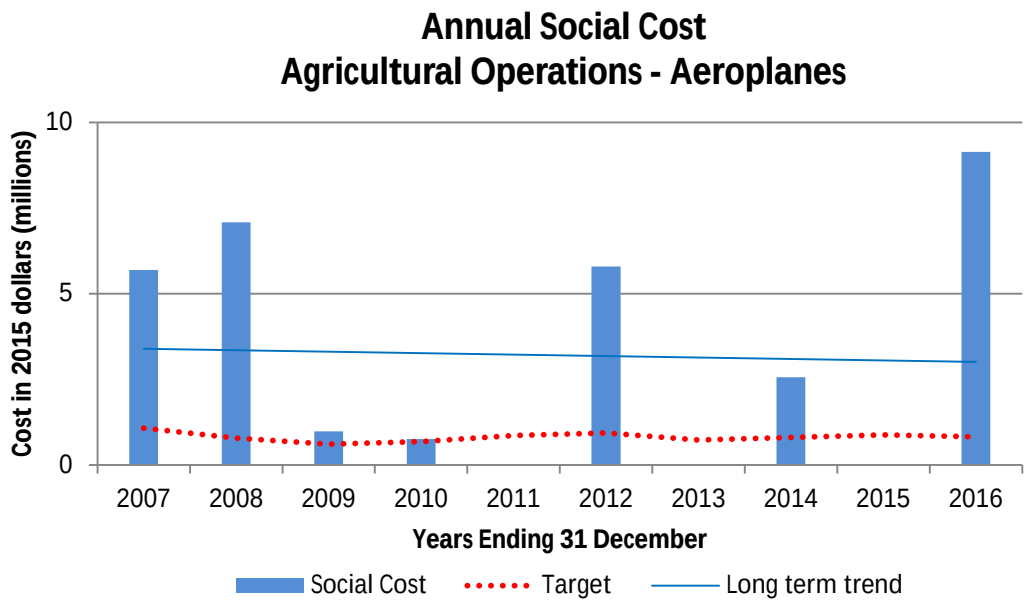


Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	2	0	2	5	0	0	2	2	**0**
Serious Injuries	0	0	1	0	1	1	1	2	0	**1**
Minor Injuries	2	2	0	1	2	0	3	2	2	**1**
Aircraft Unusable	4	1	1	1	6	0	1	3	3	**0**

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

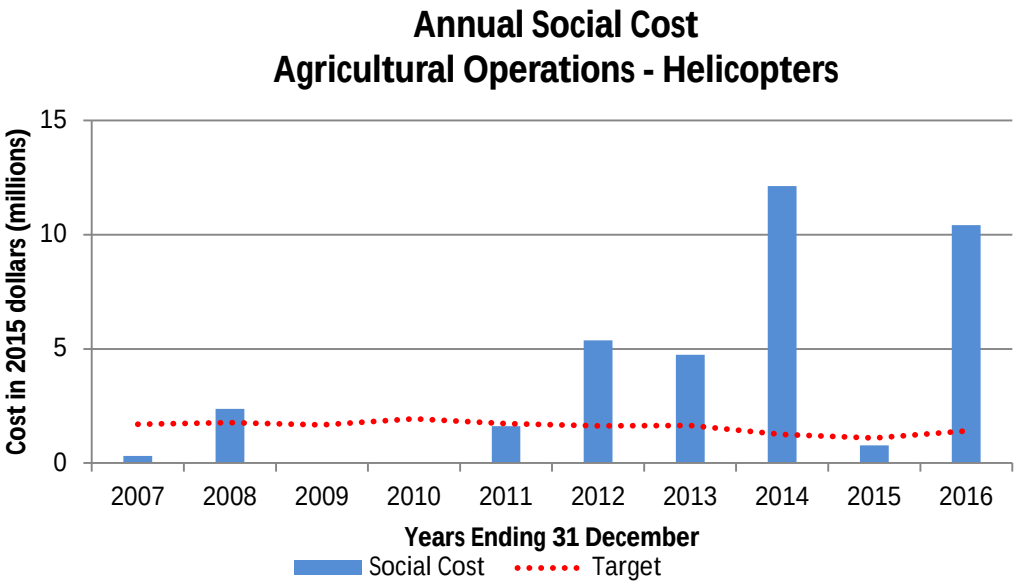
The low level of activity within this sector (0.13% of all the seat-hours in the industry) means that a single event has the ability to cause the social cost to exceed the target in the year the event occurred. While this may not be a problem as long as the target is met on average over an extended period,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



Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	1	1	0	0	0	1	0	0	0	**2**
Serious Injuries	0	1	0	1	0	1	0	3	0	**0**
Minor Injuries	0	0	1	1	0	0	1	0	1	**0**
Aircraft Unusable	3	4	1	1	0	2	0	2	0	**1**

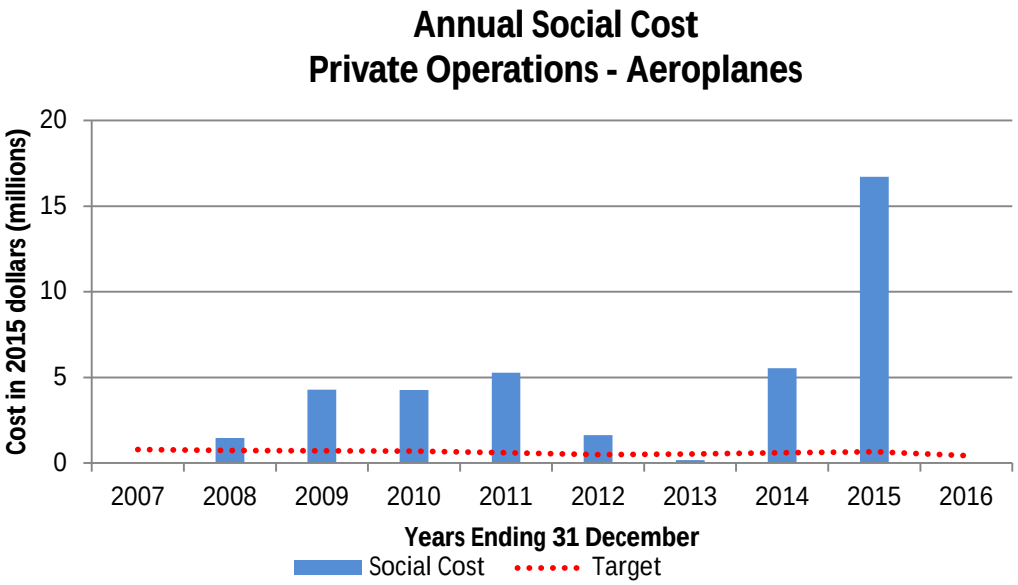
This group's safety performance is closely monitored and following significant safety failures the performance usually improves for a few years before rising again, often with increase in activity as evidenced by tonnage spread (see graph on page 12). The long term linear trend in social cost that was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



Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	0	0	0	1	1	1	0	**2**
Serious Injuries	0	1	0	0	0	0	0	0	1	**0**
Minor Injuries	0	1	1	0	0	0	1	0	2	**0**
Aircraft Unusable	1	3	0	0	1	1	2	2	1	**2**

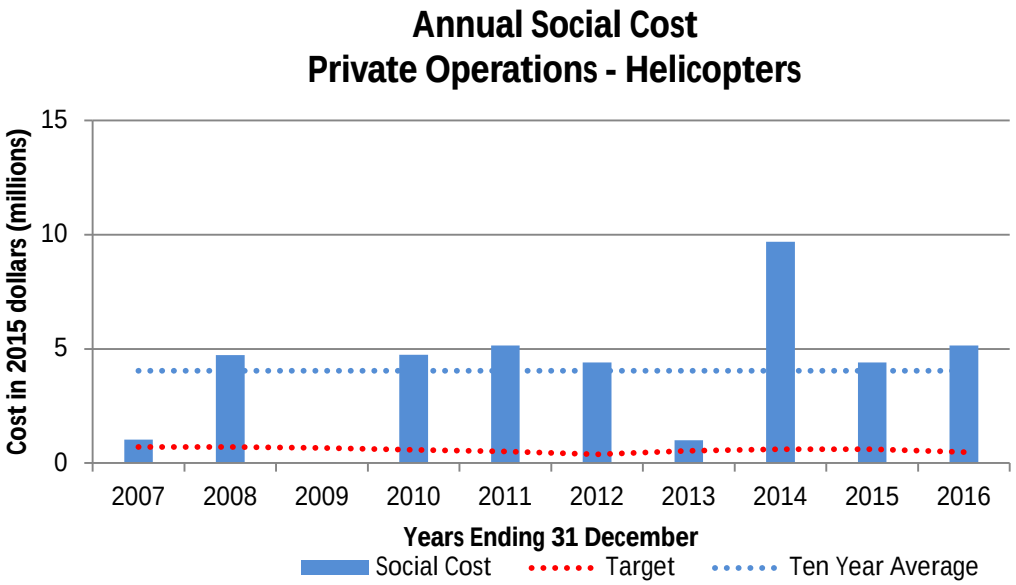
Although the absolute social costs of the safety failures in this group are on a par with those of the agricultural aeroplanes group, it must be remembered that this group operates about twice the number of hours of the aeroplane group, representing a better safety performance per flying hour. Nevertheless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



Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	0	0	1	1	0	0	1	4	**0**
Serious Injuries	0	3	0	0	2	3	0	2	0	**0**
Minor Injuries	2	1	1	0	0	1	0	4	1	**2**
Aircraft Unusable	0	1	1	1	2	2	1	3	2	**0**

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.

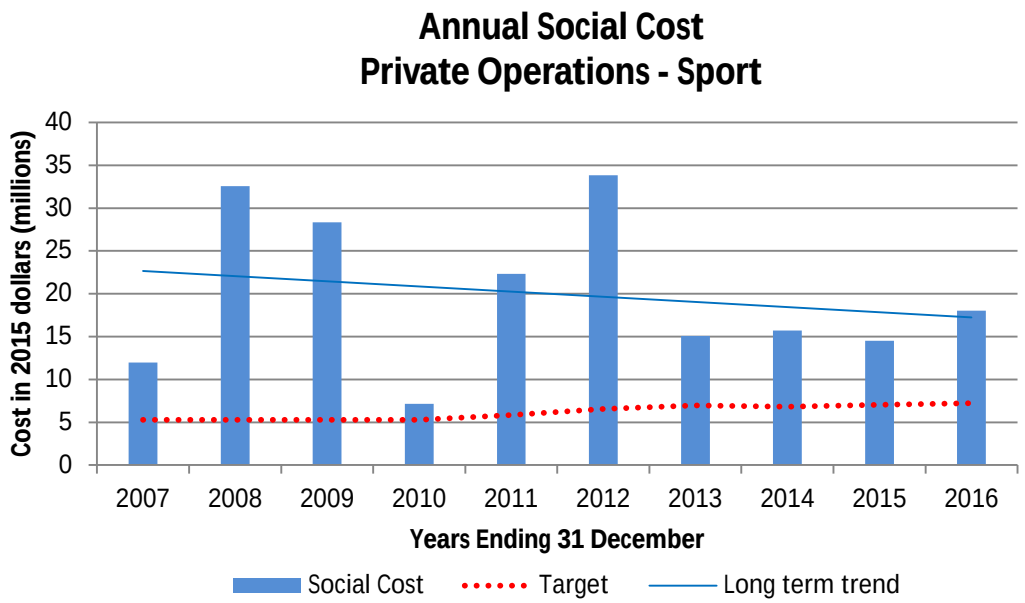


Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	0	1	0	0	1	1	0	2	1	**1**
Serious Injuries	0	0	0	2	1	0	0	2	0	**1**
Minor Injuries	4	0	3	2	1	0	2	1	0	**0**
Aircraft Unusable	3	2	0	4	3	1	3	2	1	**2**

The last three years are trending the wrong way.

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



Arising from:

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Fatalities	2	7	7	1	4	7	2	2	2	**3**
Serious Injuries	8	8	8	8	14	11	15	16	13	**13**
Minor Injuries	7	9	4	17	3	6	17	16	26	**9**
Aircraft Unusable	4	6	6	3	7	5	3	7	5	**1**

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. The long term trend, although not large is at least downward.

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

Flight Phase

The following table shows the flight phase recorded for accidents for the ten one-year periods ending 31 December 2016. The figures include all aircraft types. The table is ordered by the 2016 values.

Flight Phase	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
LANDING	40	46	37	43	37	35	48	42	48	42
TAKEOFF	11	22	30	19	20	11	17	20	16	11
CRUISE	13	17	15	5	14	7	16	13	14	7
UNKNOWN	0	0	1	2	1	2	2	5	3	7
APPROACH	2	5	5	3	8	5	5	9	3	6
CLIMB	6	6	7	8	8	2	6	8	7	3
PARKED	1	6	2	4	2	5	5	0	3	3
DESCENT	3	1	5	6	0	6	4	3	6	2
HOVER	1	3	3	4	4	2	5	1	3	2
AGRICULTURAL MANOEUVRES	2	1	4	3	1	5	2	2	2	1
TAXIING	2	5	5	3	5	3	3	4	5	1
HOVER TAXI	0	0	0	0	0	1	2	0	0	1
CIRCUIT	0	2	0	1	1	0	0	1	0	0
Not Recorded	6	1	8	5	7	4	4	2	0	0
HOLDING	0	1	0	0	0	0	0	0	0	0
AEROBATICS	0	0	0	0	0	1	0	1	0	0

The most common phase of flight during which accidents occurred in the year ending 30 June 2016 was the Landing phase (47%). This proportion of accidents by flight phase is largely unchanged from previous years and reflects the fact that landing is the highest risk phase of flight.

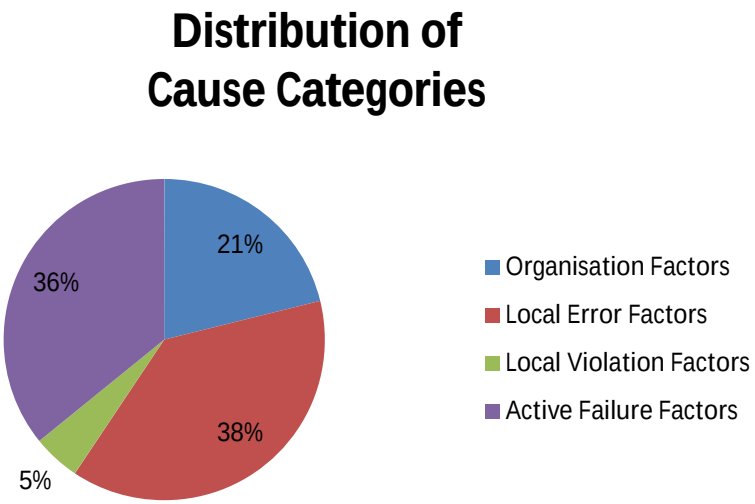
The most common descriptor assigned to Landing Phase accidents during the 2016 year was ‘Damage to aircraft’ at 8%.

The most common causes (at 9%, 8% and 7% respectively) recorded for Landing phase accidents during the year ending 31 December 2016 were ‘Active Failure Factors - POOR PROCEDURE "ACTION", ‘Active Failure Factors - ACTIONS INCONSISTENT WITH PROCEDURES’ and’ Active Failure Factors - PRIMARILY "STRUCTURAL/MECHANICAL".

Accident Causal Factors

796 causal factors have been assigned to 387 (40%) of the 967 accidents that were reported as occurring during the ten years ending 31 December 2016.

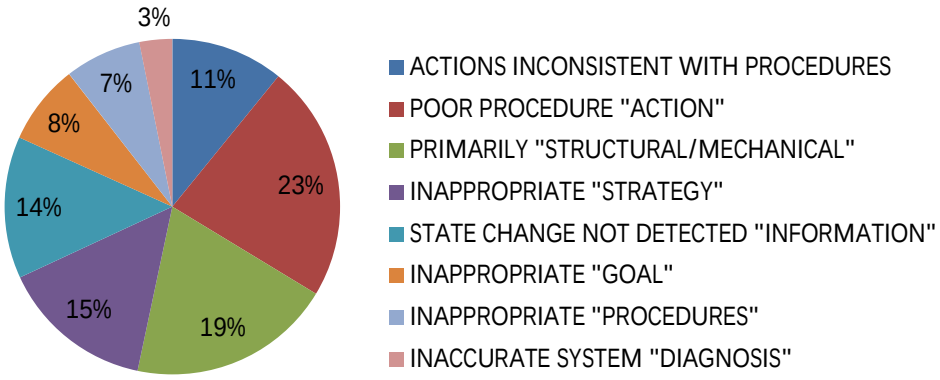
The following chart shows the distribution of cause categories (groupings of causal factors) recorded for those accidents.



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.

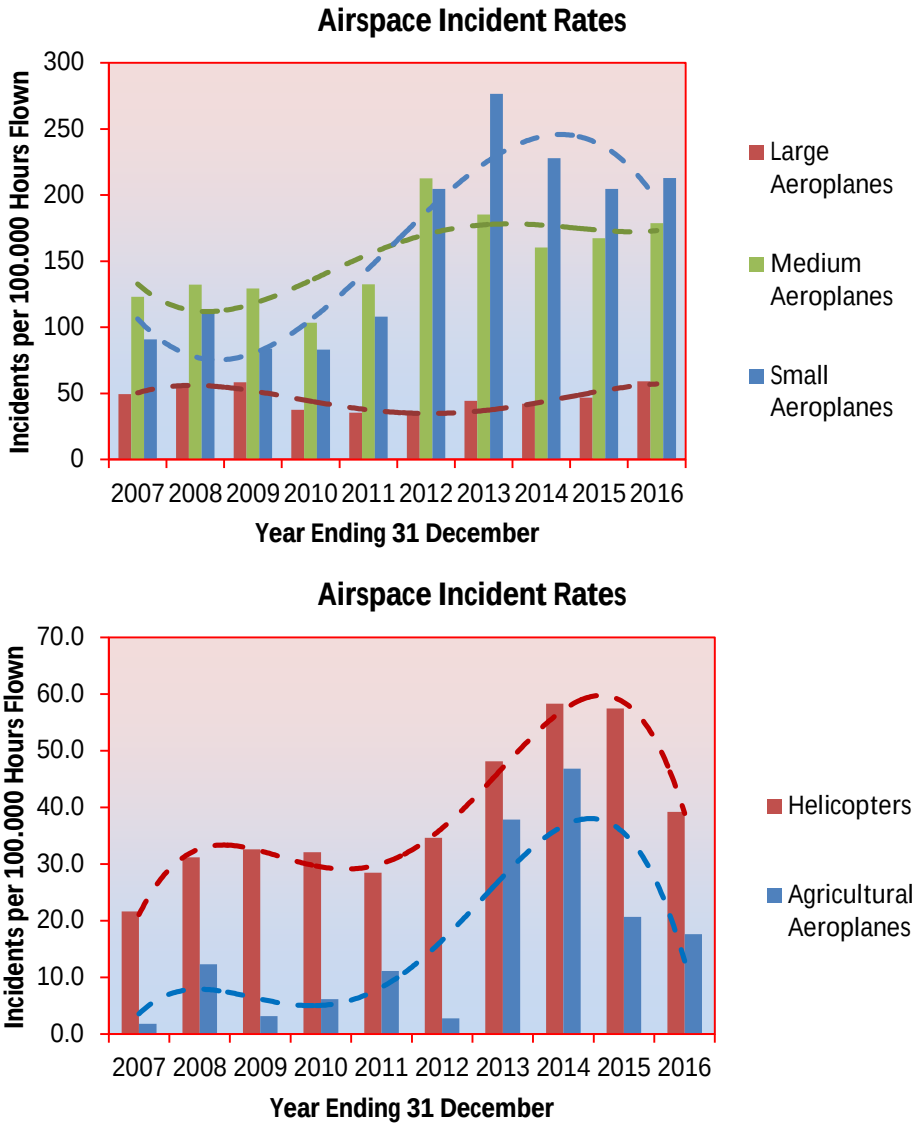
The following chart shows the distribution of Active Failure factors during the same period as above.



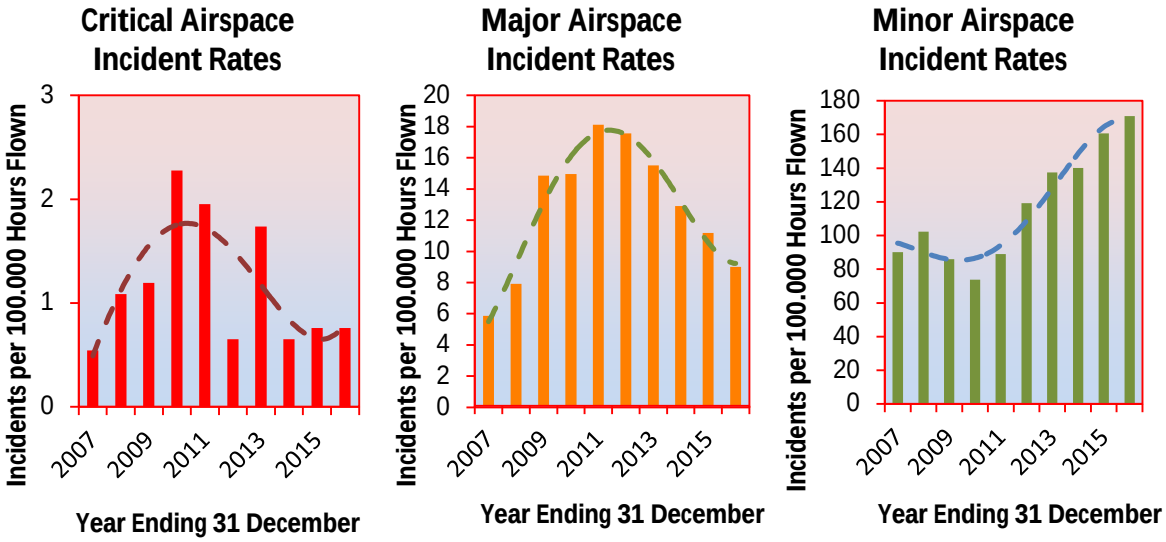
Airspace Incidents

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 2016 (excluding the Sport Aircraft category). The graphs do not differentiate between incidents that are pilot or ATS attributable.

Breakdown by Aircraft Category

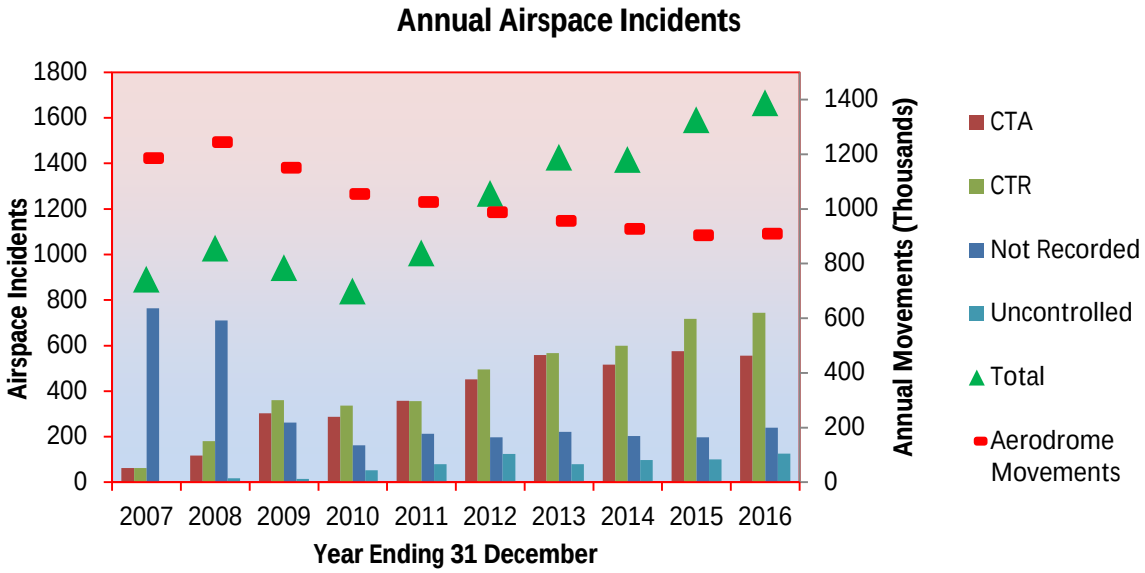


Breakdown by Severity



Breakdown by Airspace Designation

(Counts not Rates)



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

Breakdown of Airspace Incidents in Control Zones by Aerodrome

Aerodrome	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Hamilton	10	35	45	59	54	172	136	125	168	173
Auckland	8	20	39	41	38	39	59	45	73	105
Christchurch	6	18	40	36	33	32	52	53	92	72
Wellington	6	21	47	29	37	34	38	29	42	58
Tauranga	3	9	15	15	38	46	57	66	86	54
Queenstown	0	6	21	23	39	24	34	57	47	45
Nelson	1	5	26	23	28	19	17	26	35	40
Dunedin	2	2	5	20	8	26	31	39	32	40
Palmerston North	4	23	34	22	20	29	37	61	36	37
Rotorua	1	10	15	15	17	14	14	10	14	22
Woodbourne	7	16	31	16	12	10	15	19	24	17
Napier	5	5	7	8	6	13	17	18	17	17
Gisborne	2	0	4	3	5	5	13	10	13	13
Invercargill	0	0	2	6	3	2	3	4	5	10
Whenuapai	0	3	6	3	7	8	12	10	9	8
Ohakea	1	3	10	5	7	8	14	15	11	7
New Plymouth	2	4	6	10	3	3	13	4	8	2

Airspace Incident Attributability

Introduction

Airspace incidents are categorised as

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

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

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

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

Descriptors

Airspace occurrence descriptors have been established for 1588 of the 1665 reported airspace incidents in the year ending 31 December 2016. This means that most but not quite all airspace incidents are accounted for in the following attributability tables and graphs.

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

Descriptor Categories

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

The following table shows the breakdown into these broad categories.

Descriptor is associated with	Number of times descriptor applied
ATS	278
Pilot	1380
Either	323

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 2016
ATS Clearance/Instruction Deficiency	162
ATS Coordination Deficiency	103
ATS Flight Information Deficiency	13
ATS Flight Planning System Deficiency	6

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

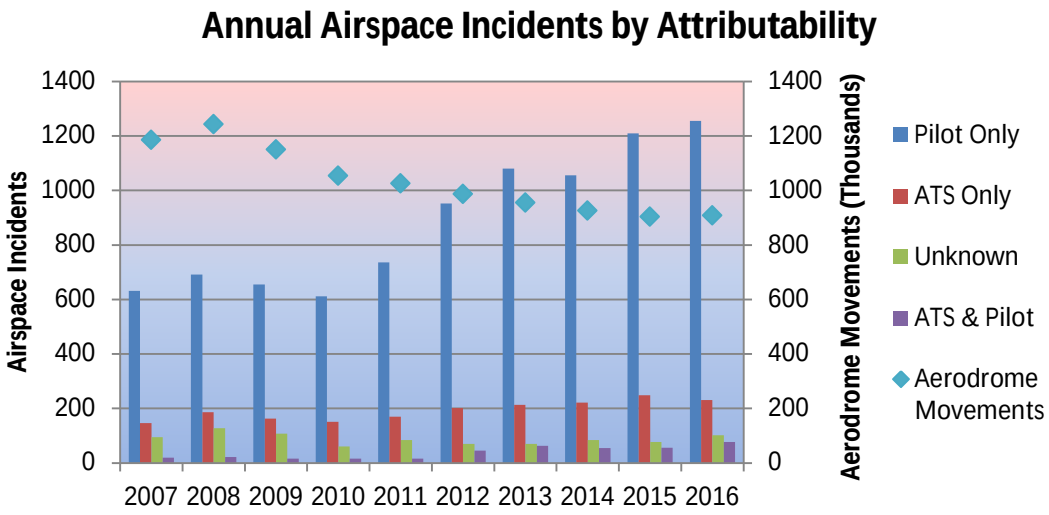
Descriptor	Number assigned in 2016
Breach Of Other Clearance	625
Unauth Airspace Incursion	394
Unauth Altitude Penetration	145
Pilot Position Reporting Deficiency	110
Air Proximity	49
Pilot Flight Planning Deficiency	49
Pilot Readback Deficiency	5
Flight Assist	2
Reduced Navigation Performance	1
Global Positioning System	0
Pilot Breach of Ground Clearance	0

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

Descriptor	Number assigned in 2016
Controller/Pilot Datalink Communications	2
Loss Of Separation	55
Near Collision	10
Other	161
Reduced Vertical Separation Minima	0
Short Term Conflict Alert	7
Traffic Collision Avoidance System	82

Trend

The following graph shows the annual numbers of airspace incident reports and their attributability for the ten year period ending 31 December 2016.



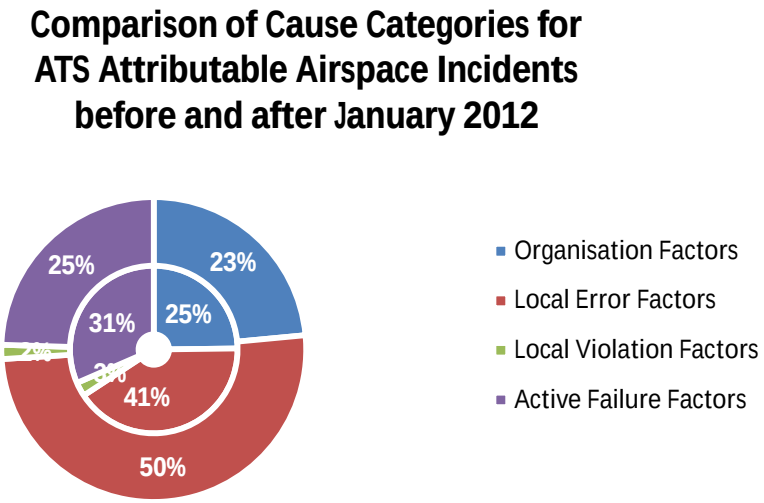
The number of "unknown" attributable airspace incidents reflects difficulties with coding of reports received by the CAA. Note that there is often a time delay between incidents occurring, being investigated, and attributability being assigned to either ATS or Pilot.

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

ATS Attributable ASP Incidents

Causal Categories

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



Local Error Factors

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

The top three causes were:

Jul 2006 to Dec 2011		Jan 2012 to Dec 2016	
INADEQUATE CHECKING	57%	INADEQUATE CHECKING	26%
TASK OVERLOAD	10%	OTHER ERROR ENFORCING CONDITION	21%
OTHER ERROR ENFORCING CONDITION	8%	RISK MISPERCEPTION	16%

Active Failure Factors

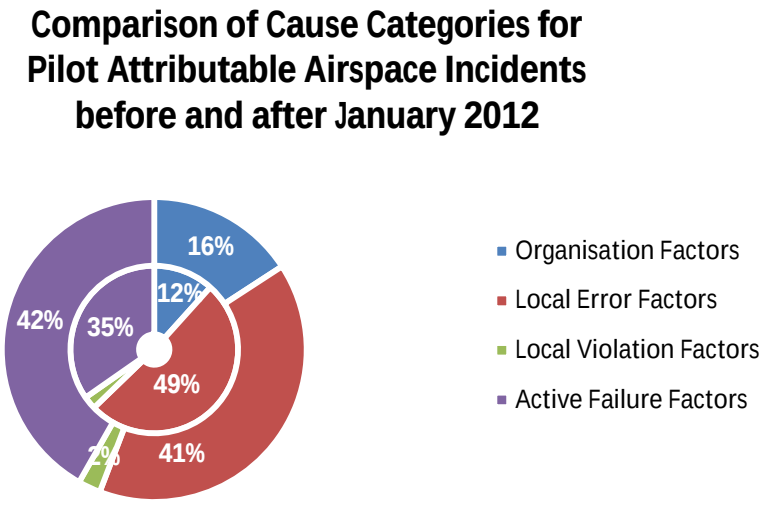
The top three contributing causes were:

Jan 2007 to Dec 2011		Jan 2012 to Dec 2016	
INACCURATE SYSTEM "DIAGNOSIS"	31%	ACTIONS INCONSISTENT WITH PROCEDURES	27%
ACTIONS INCONSISTENT WITH PROCEDURES	19%	INACCURATE SYSTEM "DIAGNOSIS"	20%
INAPPROPRIATE "STRATEGY"	11%	INAPPROPRIATE "STRATEGY"	18%

Pilot Attributable ASP Incidents

Causal Categories

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



Organisation Factors

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

The top four causes were:

Jan 2007 to Dec 2011		Jan 2012 to Dec 2016	
INADEQUATE PROCEDURES	16%	INADEQUATE CONTROL AND MONITORING	29%
INADEQUATE COMMUNICATIONS	14%	INADEQUATE TRAINING	19%
INADEQUATE SPECIFICATIONS/REQUIREMENTS	14%	OTHER ORGANISATION FACTOR	15%
INADEQUATE CONTROL AND MONITORING	14%	INADEQUATE PROCEDURES	6%

Local Error Factors

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

The top three causes were:

Jan 2007 to Dec 2011		Jan 2012 to Dec 2016	
INADEQUATE CHECKING	26%	INADEQUATE CHECKING	25%
POOR INSTRUCTIONS/PROCEDURES	12%	RISK MISPERCEPTION	11%
TASK UNFAMILIARITY	7%	OTHER ERROR ENFORCING CONDITION	10%

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

Significant Incidents

None of the airspace incidents reported as occurring during the last year covered by this report was classified as significant

Serious Incidents

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

ATS Attributable

- Hamilton: Avoiding action taken by a Robin aeroplane following a C172 as number 2 joining the circuit. ATC had instructed the number1 traffic, a C172 to make a left hand orbit and then later cancelled it. The aircraft, however continued in the orbit, creating the head-on conflict with the following traffic. The Robin pilot took avoiding action turning to the right on realising that the C172 was continuing in the orbit. The distance between the 2 aircraft was estimated by the Robin pilot as being less than 1 nm, at the same altitude. Occurrence Id: 16/6637

Pilot Attributable

- Cambridge: While in transit to the aerodrome after completing his first solo cross-country flight, the student was alerted to a TA "TRAFFIC 0 MILES SAME ALTITUDE" by his aircraft. The student was initially confused but started looking for the traffic. Approximately 5-10 seconds later an FU24 (ZK-DZO) passed approximately within 8-12 metres of the C172 from behind and to the right. ATC passed traffic information when the FU24 was 1 nm ahead of the C172 at the same level (both aircraft were entering controlled airspace).

- Spider track information was provided to the CAA safety investigation by both operators, the pilot of the FU24 had also taken (by chance) photos of the C172 as he passed abeam it on its right side. From the photos adequate clearance appeared to exist between the two aircraft. The student's claim of the close proximity of the FU24 to his aircraft could not be verified from the evidence provided. Occurrence Id: 16/1394.

- Paraparaumu: Report of a near collision incident in the PP circuit. A Hughes 300 helicopter was joining from 5nm south, while a Cessna 152 was established in the circuit. Runway, conditions and traffic information were passed. The Hughes 300 continued tracking right-hand down-wind to runway 16. Both aircraft were passed updated mutual traffic information on one another. Airways ATC replay shows at 01:35:40 the aircraft were 0.029NM (176.2ft) apart, the Hughes 300 was at 900ft and the Cessna 152 was at 1000ft. Occurrence Id: 16/5881.

Attributability Undetermined

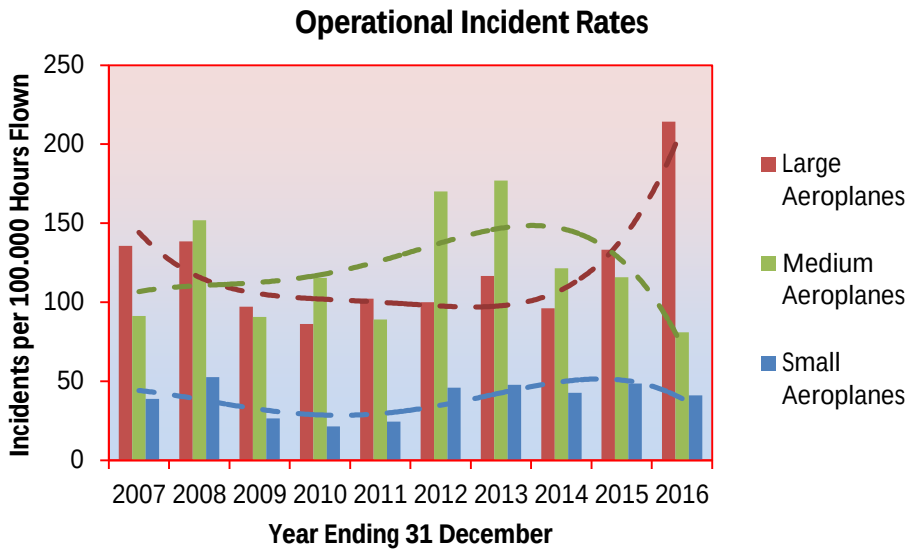
- Motueka: Aircraft joined for runway 02 after mistaking the runway in use to be '02' instead of '20'. The aircraft came into very close proximity with a C172 taking off from runway 20, after a touch and go. The incident occurred as the approaching aircraft was passing 100 ft. on final. The aircraft continued with the landing to increase separation with the climbing departing traffic. Occurrence Id: 16/4232

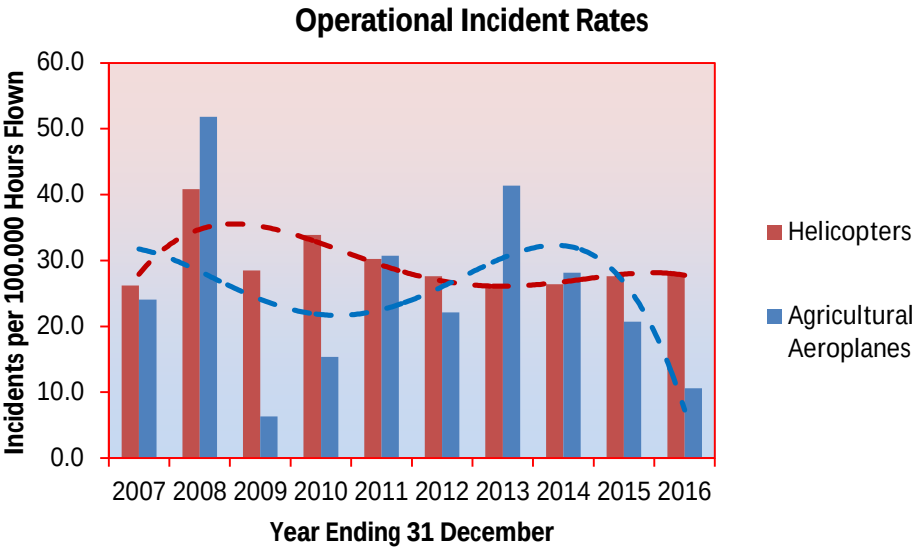
- Waikeria: A helicopter passed within 50m of the submitter's helicopter while he was carrying out pre-spray survey at approx. 300 ft. AGL. The intruder then passed over the nearby prison farm at low level. Occurrence Id: 16/6872

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 2016.

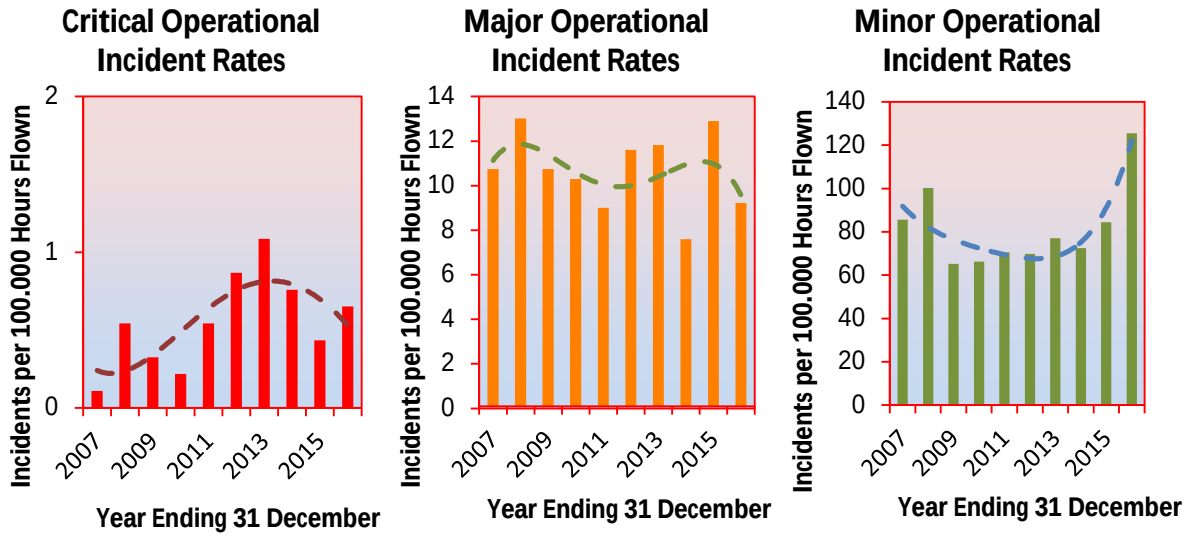
Breakdown by Aircraft Category





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 2016. All aircraft types are included. The table is sorted by the number of incidents in the year ending December 2016.

Safety Outcome Target Group	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Airline Operations - Large Aeroplanes	311	423	291	309	363	359	454	381	497	**811**
Other	8	8	11	45	113	47	25	48	73	**156**
Other Commercial Operations - Aeroplanes	76	144	64	57	57	80	75	73	97	**78**
Other Commercial Operations - Helicopters	23	39	24	27	26	29	20	20	45	**45**
Sport Transport	5	4	5	3	8	21	45	34	21	**42**
Private Operations - Sport	16	22	31	19	19	72	49	62	41	**29**
Private Operations - Aeroplanes	25	12	23	9	19	18	15	19	27	**20**
Other Commercial Operations - Sport	0	0	0	1	0	1	13	7	23	**19**
Airline Operations - Medium Aeroplanes	62	81	47	50	46	82	83	51	46	**17**
Airline Operations - Small Aeroplanes	17	29	8	10	12	4	7	7	14	**11**
None	318	234	172	143	36	14	9	12	6	**9**
Agricultural Operations - Helicopters	13	12	10	13	6	7	9	8	0	**6**
Private Operations - Helicopters	3	2	2	3	7	9	2	3	0	**3**
Agricultural Operations - Aeroplanes	11	21	3	5	11	9	11	8	7	**2**
Airline Operations - Helicopters	1	19	12	14	16	7	13	12	4	**1**
Total	**889**	**1050**	**703**	**708**	**739**	**759**	**830**	**745**	**901**	**1249**

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

- Auckland: A go-around was carried out from a short final due to the landing gear not being selected down by flight crew. Descending through 500ft received a Master Warning illumination with LDG GEAR NOT DOWN red cap. Occurrence Id: 16/1623

- Enroute AA-NS: During cruise at FL200, the cabin pressure warning light came on. An emergency descent to 10,000 ft. was accomplished. After take-off, the first officer had inadvertently turned only one bleed on. This was noted while doing the climb checks, but instead of turning the remaining bleed on, pilot turned the other bleed off, hence a slow decompression resulted. Occurrence Id: 16/4229

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. For each incident the location is stated before the description.

Sport Transport

- Ashburton: An engine failure occurred after take-off. The aircraft landed in paddock 1nm south east of Ashburton. Occurrence Id: 16/4220

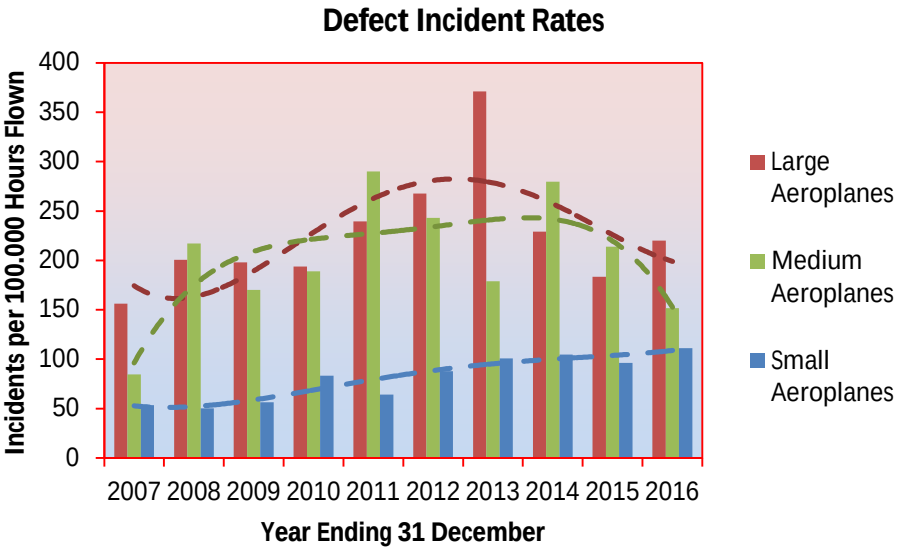
Agricultural Operations - Helicopters

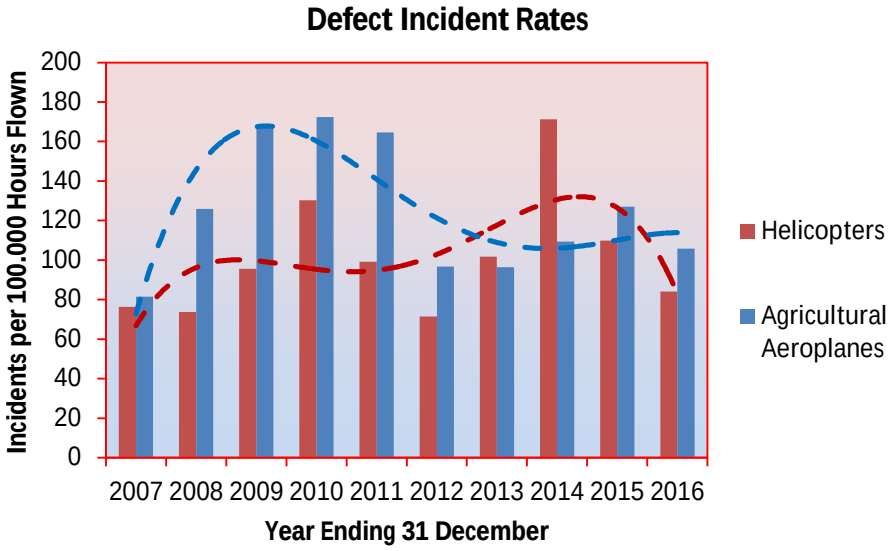
- Haumanga: A helicopter struck wire immediately after taking off from a load site. The wire had been removed during operations, but was re-erected by the farmer before final departure, without telling the pilot. Occurrence Id: 16/6873

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 2016.

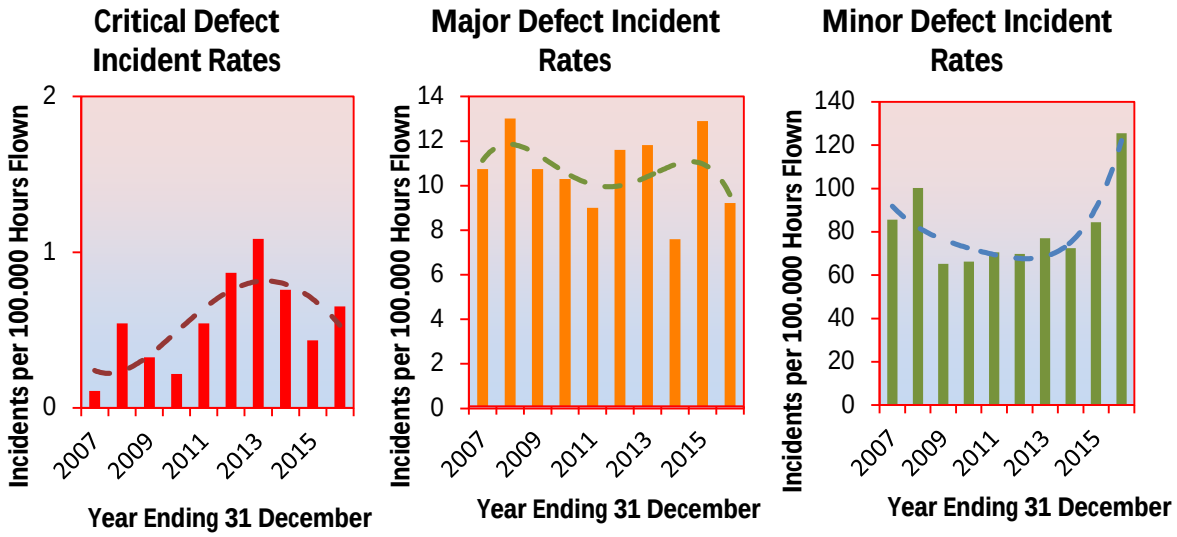
Breakdown by Aircraft Category





Breakdown by Severity

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



Number of Incidents

The following table shows, for each safety target group, the number of defect incidents each year for the last ten one-year periods ending 31 December 2016. All aircraft types are included. The table is sorted by the number of incidents in the year ending December 2016.

Safety Outcome Target Group	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Airline Operations - Large Aeroplanes	377	588	583	619	790	896	1264	789	614	**783**
Other Commercial Operations - Aeroplanes	100	165	171	179	151	141	148	221	232	**243**
Other Commercial Operations -Helicopters	54	72	51	78	94	69	70	233	186	**150**
Other	14	11	7	33	16	19	47	37	11	**37**
Agricultural Operations - Aeroplanes	44	46	43	56	56	37	28	40	46	**32**
Private Operations - Aeroplanes	31	24	40	67	25	29	33	43	31	**30**
Airline Operations - Small Aeroplanes	44	52	49	71	52	45	29	24	27	**24**
Private Operations - Sport	9	8	18	32	29	29	21	13	20	**21**
Airline Operations - Medium Aeroplanes	59	102	73	67	138	111	79	83	53	**16**
Private Operations - Helicopters	4	5	16	30	16	10	18	20	13	**8**
Airline Operations - Helicopters	26	31	71	84	40	36	51	11	1	**7**
None	153	51	89	30	15	14	8	14	9	**7**
Agricultural Operations - Helicopters	9	9	5	27	23	18	32	15	0	**3**
Other Commercial Operations - Sport	0	0	0	0	0	1	3	0	4	**2**
Sport Transport	1	0	0	6	6	7	6	4	1	**1**
Total	**925**	**1164**	**1216**	**1379**	**1451**	**1462**	**1837**	**1547**	**1248**	**1364**

Significant Incidents

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

Airline Operations - Medium Aeroplanes

- Wellington: While retracting the flaps after take-off the selector was noted at 0, but the flaps had failed to retract and remained at 5-10 degrees. An attempt was made to retract the flaps using the standby system. On un-guarding the switches, a cracking noise was heard followed by an arcing sound followed by an electrical burning smell. The ENG FIRE annunciator and alarm sounded along with the Fuel Off annunciator and alarm sounding. The aircraft returned to Wellington. Occurrence Id: 16/5153

Other

- Auckland: During initial climb just after take-off an EICAS message OVERHEAT ENG L was received. As the crew actioned Engine Overheat Checklist an EICAS message FIRE ENG L appeared, a fire warning light and overheat light illuminated and the fire siren sounded. The flight crew executed memory items of the checklist. The fire warning disappeared when the fire extinguishing handle was pulled out, therefore, the flight crew did not release the fire extinguisher bottle. The crew declared PAN and requested return to land. The crew decided on an overweight landing and finished the overweight landing checklist. Occurrence Id: 16/5962

Serious Incidents

None of the defect incidents reported as occurring during the last year covered by this report was classified as serious

ATA Chapters

Defect Incidents reported as occurring during the year ending 30 June 2016 were associated with the following ATA component code chapters.

Large Aeroplanes

The most common chapter was AEROPLANE FLIGHT CONTROL - GENERAL with 182 defects.

The next most common chapter was FLIGHT NAVIGATION SYSTEMS - GENERAL with 92 defects.

Medium Aeroplanes

The most common chapter was LANDING GEAR (LG) - GENERAL with 9 defects.

The next most common chapters were POWERPLANT - GENERAL and ENGINE(TURBINE/TURBOPROP) with 4 defects each.

Small Aeroplanes

The most common chapter was LANDING GEAR (LG) - GENERAL with 34 defects.

The next most common chapter was AEROPLANE FLIGHT CONTROL - GENERAL with 20 defects.

Agricultural Aeroplanes

The most common chapters were LANDING GEAR (LG) - GENERAL and AEROPLANE FLIGHT CONTROL - GENERAL with 5 defects each.

Helicopters

The most common chapter was POWERPLANT FUEL SYSTEM - GENERAL with 20 defects.

The next most common chapter was MAIN ROTOR - GENERAL with 15 defects.

Sport Aircraft

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

The next most common chapter was POWERPLANT INSTALLATION - GENERAL with 2 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.

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

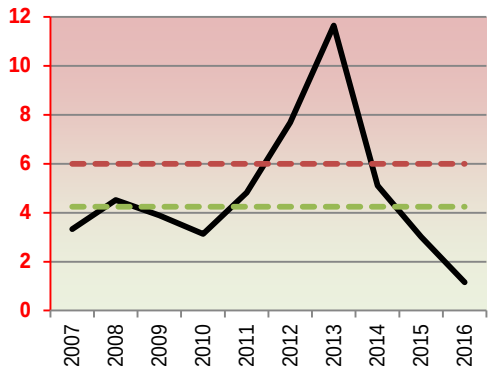
The timing of defect reports is often considerably later than what is mandated by Rule Part 12 and likewise a small number of operators of large and medium aeroplanes are persistently late with their hours and flights data returns. As a result the last two quarters of following defect rate graphs are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

Analysis

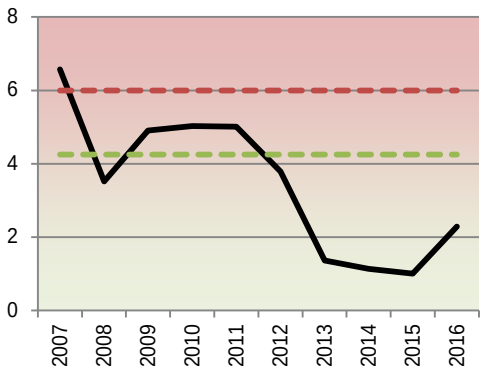
The red line on each graph shows the High defect rate. The green line shows the Alert defect rate. The Manager Airline Maintenance is notified of all high and alert rates on a quarterly basis.

Large Aeroplanes

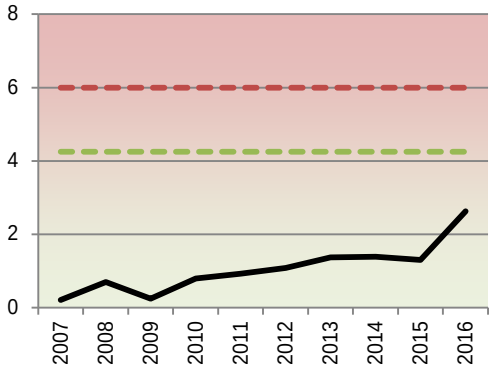
B737-300 Defects per 1000 hours



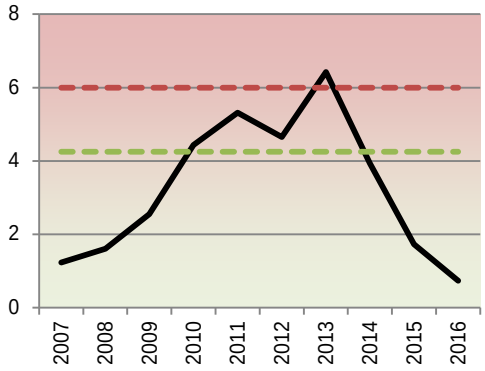
B737-400 Defects per 1000 hours



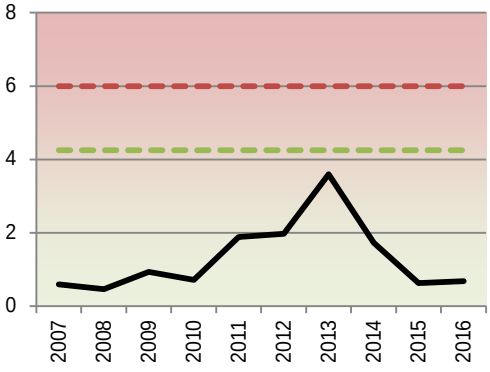
B737-800 Defects per 1000 hours



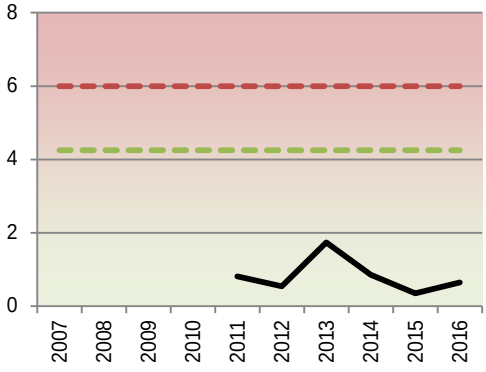
B767-300 Defects per 1000 hours



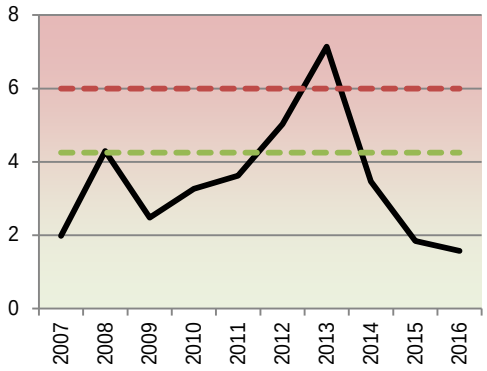
B777-200 Defects per 1000 hours



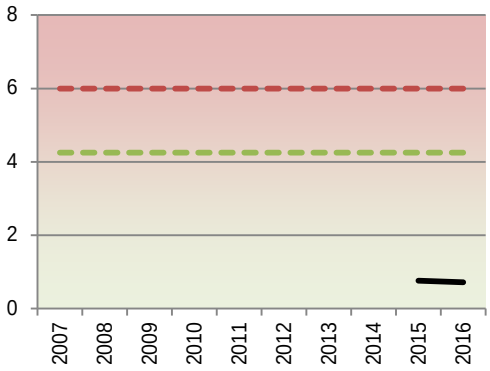
B777-300 Defects per 1000 hours



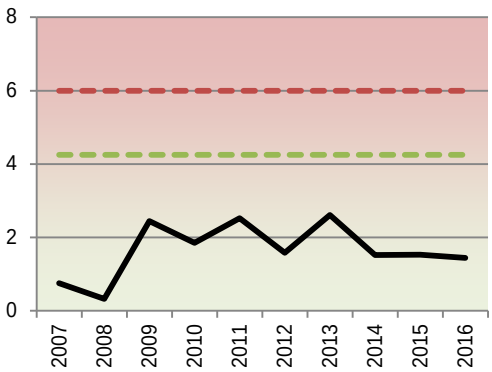
A320 Defects per 1000 hours



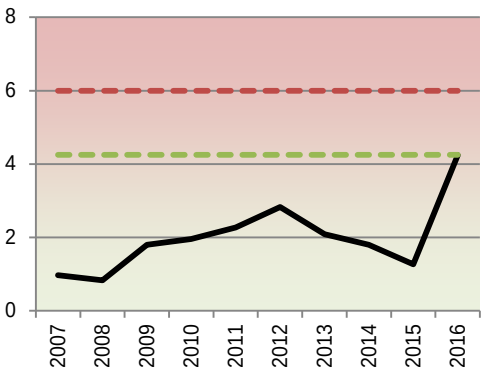
B787-900 Defects per 1000 hours



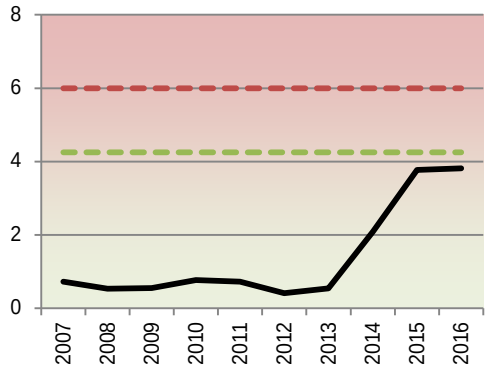
Convair 580 Defects per 1000 hours



ATR 72 Defects per 1000 hours

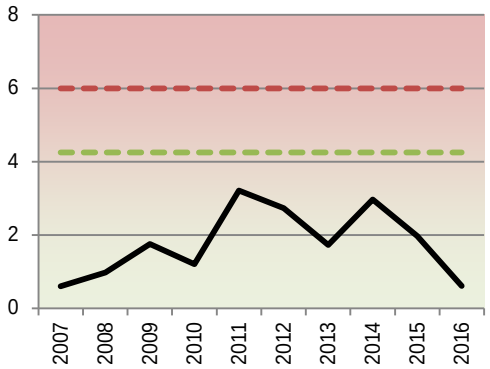


DHC-8 Defects per 1000 hours

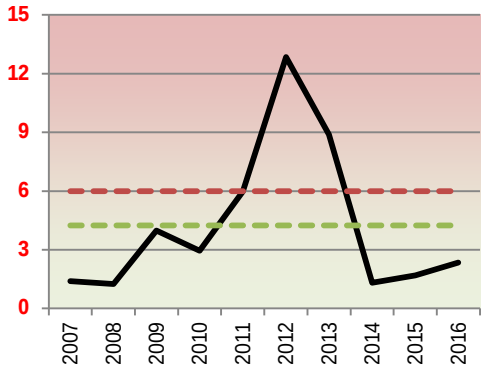


Medium Aeroplanes

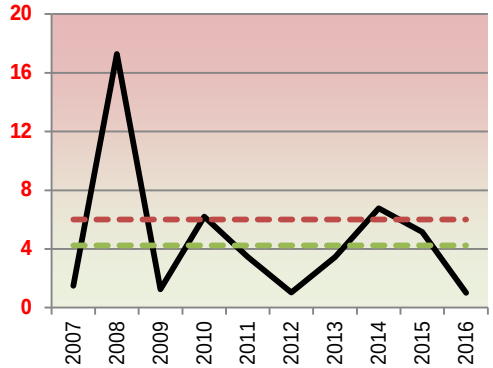
1900D Defects per 1000 hours



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 during each quarter. The results of this query are then divided by the aircraft movements at each aerodrome and multiplied by 10,000 to give incidents per 10,000 aircraft movements. Aircraft movements at aerodromes are obtained from the ACNZ, and, where available, from individual airport companies.

Annual Strike Rate

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

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

Aerodrome	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Manapouri *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	27.8
Napier	3.7	5.4	6.6	7.7	7.3	7.1	8.2	8.4	8.9	9.2
Gisborne	5.5	9.0	4.2	4.1	4.9	5.6	5.7	11.3	3.7	6.9
Nelson	1.4	0.8	1.2	1.9	2.4	1.9	3.3	3.6	4.6	6.6
Dunedin	2.0	2.3	3.4	3.4	4.1	3.6	5.3	4.8	7.3	5.5
Queenstown	2.7	1.4	2.2	1.4	2.2	3.0	1.6	2.2	1.2	5.3
Whenuapai	7.1	8.9	7.6	9.1	8.9	8.0	3.2	5.4	4.9	5.2
Ohakea	1.0	2.2	1.0	2.3	2.2	2.3	1.7	4.7	2.4	4.4
New Plymouth	2.8	2.8	3.4	3.5	2.1	3.2	5.6	3.7	5.6	4.1
Christchurch	2.3	2.0	2.0	2.1	2.1	2.6	2.6	2.2	4.3	4.0
Palmerston North	2.3	1.7	3.6	3.9	1.5	3.0	4.8	3.2	3.6	3.3
Rotorua	4.8	2.7	5.8	4.3	2.6	2.7	5.8	5.0	3.6	3.1
Tauranga	1.3	1.4	0.8	1.4	1.1	1.9	2.3	2.1	1.7	2.1
Wellington	0.7	1.0	1.3	1.4	1.7	2.3	2.3	2.6	3.1	2.0
Invercargill	6.4	7.9	4.7	4.4	5.2	2.1	1.3	8.0	4.4	1.6
Auckland	1.8	1.6	2.0	2.7	2.2	1.9	2.9	2.0	2.8	1.5
Hamilton	1.6	2.1	1.3	1.8	0.9	1.2	0.8	0.9	0.9	1.3
Timaru	7.5	3.8	6.3	2.5	3.8	3.8	5.0	2.5	0.0	1.3
Woodbourne	4.7	2.4	1.7	3.1	3.0	4.4	7.8	5.4	6.3	1.3
Whakatane	0.8	1.7	4.2	4.2	4.2	1.7	5.0	2.5	2.5	0.8
Whangarei	6.0	0.0	6.8	3.0	7.5	2.3	5.3	1.5	0.0	0.8
Wanganui	1.4	0.0	1.4	1.4	2.8	2.1	4.9	2.1	2.8	0.7
Taupo	1.5	1.7	2.3	2.4	3.8	0.8	0.4	0.4	0.5	0.6
Paraparaumu	0.0	0.0	2.4	0.0	0.0	1.8	2.2	1.6	1.5	0.5
Chatham Islands	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.0	0.0	0.0
Hokitika	2.4	2.4	0.0	4.8	0.0	2.4	0.0	0.0	0.0	0.0
Kerikeri	0.0	2.5	8.8	2.5	8.8	8.8	8.8	7.5	2.5	0.0
Westport	33.9	4.8	9.7	14.5	4.8	14.5	4.8	9.7	14.5	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. The CAA understands the “statistical tyranny of small numbers” and does not over react to such outcomes.

For most of the certificated aerodromes that do not have a control or information service, the 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 estimated rate values are indicated by the use of a cream background

Analysis

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

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

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

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

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

Details as at 31 March 2017 for individual aerodromes are shown in the following table.

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

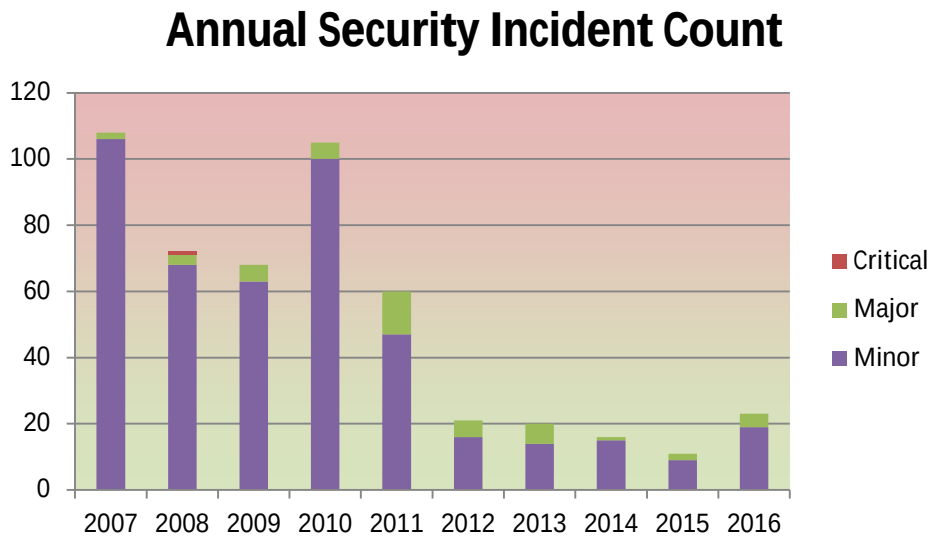
Significant or Serious Incidents

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

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 2016



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	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Auckland	18	8	30	42	28	6	3	3	2	**8**
Nelson	1	0	1	2	2	0	1	2	1	**4**
Christchurch	10	6	7	9	9	0	2	0	2	**3**
Invercargill	1	1	0	0	0	0	0	0	0	**1**
Palmerston North	1	0	0	0	0	0	0	0	0	**1**
Queenstown	1	0	3	3	1	0	0	0	2	**1**
Woodbourne	1	0	0	1	0	0	0	0	0	**1**
Dunedin	1	0	1	2	0	0	0	0	1	**0**
Gisborne	2	0	2	0	0	0	3	0	0	**0**
Hamilton	0	0	2	1	3	0	1	0	0	**0**
Milford Sound	6	1	0	0	0	0	0	0	0	**0**
New Plymouth	0	0	0	0	0	0	0	0	0	**0**
Napier	1	0	0	1	0	0	0	0	0	**0**
Paraparaumu	0	0	2	0	1	0	1	1	0	**0**
Rotorua	3	2	0	0	0	0	0	0	1	**0**
Tauranga	4	0	0	0	0	0	0	0	0	**0**
Wellington	6	3	8	8	4	7	3	1	1	**0**
Off Aerodrome	49	47	9	34	12	5	5	8	1	**4**

Breakdown by Aircraft Category

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

Aircraft Category	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Large Aeroplanes	27	20	11	8	10	8	9	3	3	13
Medium Aeroplanes	2	7	1	2	0	4	1	0	1	0
Small Aeroplanes	0	0	0	0	0	1	1	0	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	79	45	56	95	50	8	9	13	7	10
Total	108	72	68	105	60	21	20	16	11	23

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.

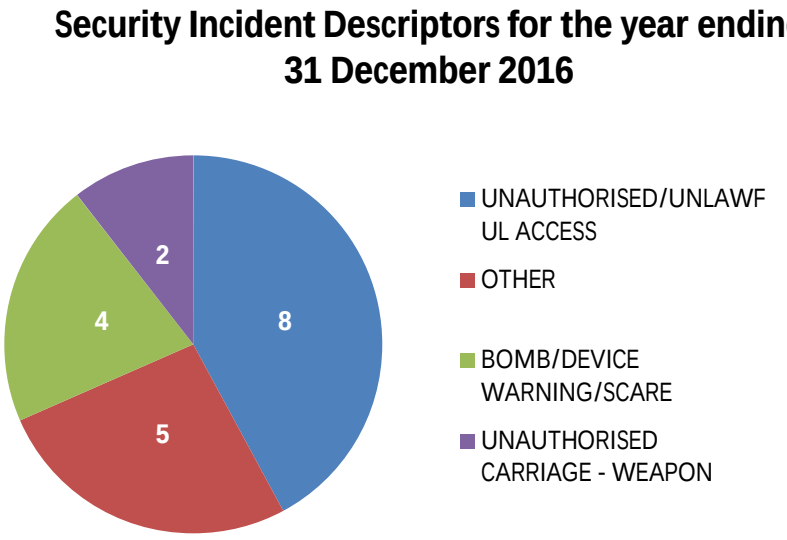
Descriptors and Causal Factors

The most common descriptor (6) recorded for Security Incidents during the year ending 31 December 2016 was 'UNAUTHORISED/UNLAWFUL ACCESS' (8) with 'OTHER' being the second most common (5)

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 30 June 2016.



Aerodrome Incidents

Runway Incursions

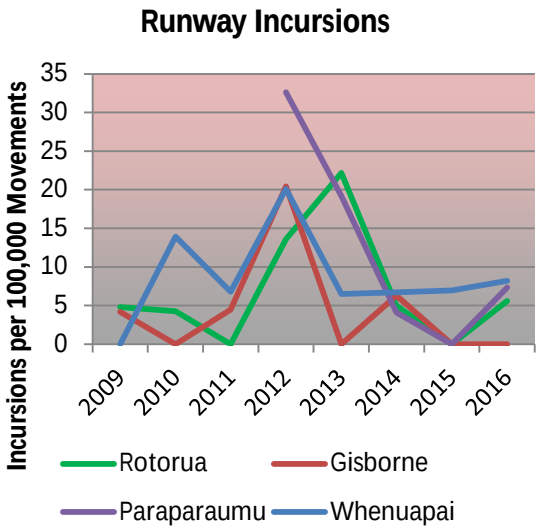
Runway incursion rates are calculated by dividing the total number of reported Aerodrome Incidents that have any of the five runway incursion descriptors by the total number of reported movements for the same aerodrome over the same period. The result is tabulated and graphed as runway incursions per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

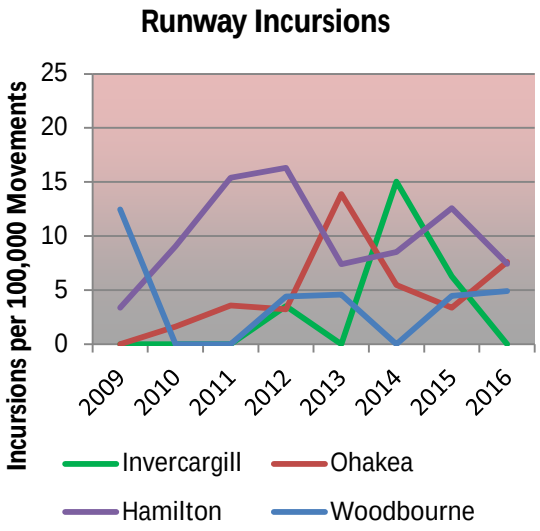
Clearly the number of runway incursions is low with many certificated aerodromes having no such incidents reported at all. With such low numbers caution needs to be exercised in drawing statistical conclusions.

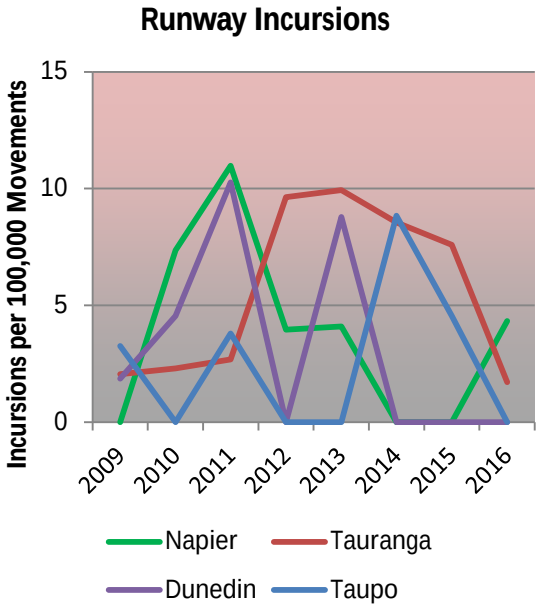
The following table shows annual values of reported runway incursion rates for all certificated aerodromes for which adequate movement data is available. The table is ordered by the maximum rate that has been recorded for any year in the period.

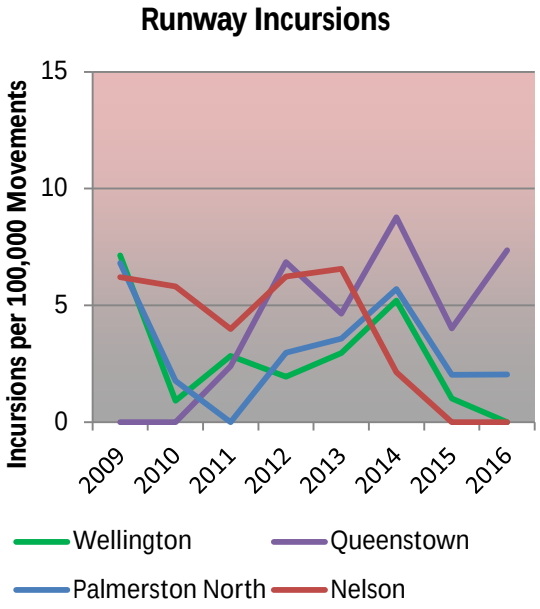
Aerodrome	2009	2010	2011	2012	2013	2014	2015	2016
Paraparaumu	31.7			32.6	19.2	4.1	0.0	**7.3**
Rotorua	4.8	4.3	0.0	13.6	22.2	5.0	0.0	**5.6**
Gisborne	4.2	0.0	4.5	20.4	0.0	6.3	0.0	**0.0**
Whenuapai	0.0	13.9	6.8	20.1	6.5	6.7	6.9	**8.2**
Hamilton	3.4	9.1	15.4	16.3	7.4	8.5	12.6	**7.4**
Invercargill	0.0	0.0	0.0	3.5	0.0	15.0	6.3	**0.0**
Ohakea	0.0	1.6	3.6	3.2	13.9	5.5	3.4	**7.6**
Woodbourne	12.5	0.0	0.0	4.4	4.6	0.0	4.5	**4.9**
Napier	0.0	7.4	11.0	4.0	4.1	0.0	0.0	**4.3**
Dunedin	1.9	4.5	10.3	0.0	8.8	0.0	0.0	**0.0**
Tauranga	2.1	2.3	2.7	9.6	9.9	8.6	7.6	**1.7**
Taupo	3.3	0.0	3.8	0.0	0.0	8.8	4.5	**0.0**
Queenstown	0.0	0.0	2.4	6.9	4.6	8.8	4.0	**7.4**
Wellington	7.1	0.9	2.8	2.0	3.0	5.2	1.0	**0.0**
Palmerston North	6.8	1.8	0.0	3.0	3.6	5.7	2.0	**2.0**
Nelson	6.2	5.8	4.0	6.2	6.6	2.1	0.0	**0.0**
Auckland	3.8	3.8	3.2	0.6	5.7	2.6	1.3	**4.2**
Christchurch	3.7	5.6	1.6	2.7	4.6	0.9	5.7	**2.0**
New Plymouth	0.0	0.0	3.0	3.2	0.0	4.6	0.0	**0.0**

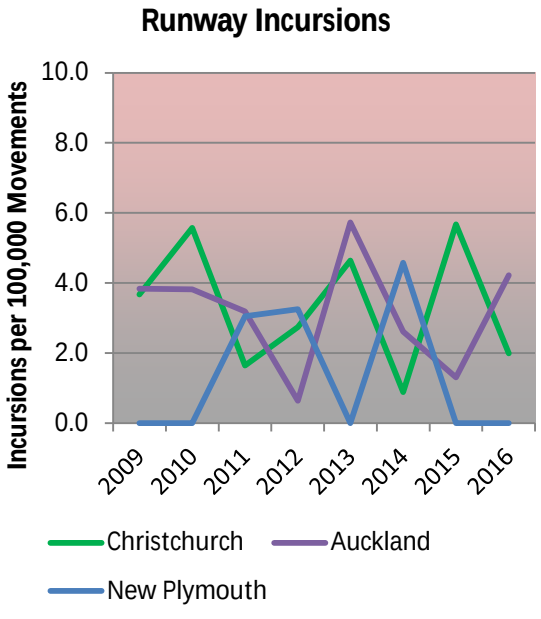
The charts on the next page show the above data in a graphical way. Aerodromes have been grouped in an arbitrary way to keep the number of lines on each chart roughly equal. The grouping is based on the largest value reported over the period covered.


Runway Incursions
Incursions per 100,000 Movements
35
30
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
Rotorua
Gisborne
Paraparaumu
Whenuapai


Runway Incursions
Incursions per 100,000 Movements
25
20
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
Invercargill
Ohakea
Hamilton
Woodbourne


Runway Incursions
Incursions per 100,000 Movements
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
Napier
Tauranga
Dunedin
Taupo


Runway Incursions
Incursions per 100,000 Movements
15
10
5
0
2009
2010
2011
2012
2013
2014
2015
2016
Wellington
Queenstown
Palmerston North
Nelson


Runway Incursions
Incursions per 100,000 Movements
10.0
8.0
6.0
4.0
2.0
0.0
2009
2010
2011
2012
2013
2014
2015
2016
Christchurch
Auckland
New Plymouth

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-2016	11	10	58	134	86	125	5	4	83	3	3	2	1
Feb-2016	4	21	93	184	74	89	2	6	44	3	1	4	1
Mar-2016	7	20	95	162	167	100	6	4	93	3	2	1	4
Apr-2016	3	10	68	117	113	89	6	0	60	1	0	2	1
May-2016	5	25	90	154	171	169	5	1	136	1	0	8	0
Jun-2016	4	23	58	128	189	88	7	0	97	0	0	5	2
Jul-2016	4	20	40	99	101	113	4	0	97	5	0	2	2
Aug-2016	4	14	83	128	208	139	4	2	123	6	0	4	0
Sep-2016	6	24	106	149	88	158	7	2	126	7	0	3	1
Oct-2016	7	18	57	128	128	132	2	0	117	9	1	7	6
Nov-2016	4	22	53	177	139	89	4	1	122	8	1	2	3
Dec-2016	4	16	63	86	54	100	5	2	120	2	3	3	0

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

Causal Factor Summary

Introduction

The following section presents a summary of occurrence causes recorded during the year ending 31 December 2016 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 (Operational) Incident
ASP	Airspace Incident	**NIO**	Facility Malfunction Incident
BRD	Bird Incident	**PAA**	Parachute Accident
CSI	Cargo Security Incident	**PIO**	Promulgated Information Incident
DEF	Defect Incident	**SEC**	Security Incident

Aircraft Flight Operations

The following section summarises causal factors identified from investigation of occurrences that occurred during the year ended 31 December 2016 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	ASP	DEF
Active Failure	PRIMARILY "STRUCTURAL/MECHANICAL"		6
Organisation	DESIGN DEFICIENCIES	1	
	INADEQUATE COMMUNICATIONS	1	

Medium Aeroplanes

Category	Cause	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES			1
	PRIMARILY "STRUCTURAL/MECHANICAL"		2	
Local Error	INADEQUATE CHECKING	1		

Small Aeroplanes

Category	Cause	ACC	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES	1	3		1
	INACCURATE SYSTEM "DIAGNOSIS"		1		
	INAPPROPRIATE "PROCEDURES"	2	1		
	POOR PROCEDURE "ACTION"	1	2		2
	PRIMARILY "STRUCTURAL/MECHANICAL"			4	1
Organisation	INADEQUATE CONTROL AND MONITORING	1			
	UNSUITABLE EQUIPMENT				1
Local Error	INADEQUATE CHECKING		1		
	OTHER ERROR ENFORCING CONDITION	1			
	PHYSIOLOGICAL OTHER		1		
	POOR INSTRUCTIONS/PROCEDURES	2			
	RISK MISPERCEPTION		1		
Local Violation	OTHER VIOLATION ENFORCING CONDITION	1			

Unknown Aircraft Category

Category	Cause	ARC	ASP	DEF
Active Failure	PRIMARILY "STRUCTURAL/MECHANICAL"			1
	STATE CHANGE NOT DETECTED "INFORMATION"		1	
Local Error	INADEQUATE CHECKING		1	
	LACK OF KNOWLEDGE	1		
	PSYCHOLOGICAL OTHER		1	

Other Aeroplanes, Helicopters and Sport Aircraft

Category	Cause	ACC	ARC	ASP	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES					1
	INAPPROPRIATE "STRATEGY"		1			
	POOR PROCEDURE "ACTION"	2				
	PRIMARILY "STRUCTURAL/MECHANICAL"	1			8	1
	STATE CHANGE NOT DETECTED "INFORMATION"	2		1		1
Organisation	INADEQUATE PROCEDURES	1				
Local Error	INADEQUATE CHECKING	1		1		
	LACK OF KNOWLEDGE		1			
	OTHER ERROR ENFORCING CONDITION					1
	POOR INSTRUCTIONS/PROCEDURES		1			
	PSYCHOLOGICAL OTHER			1		
	RISK MISPERCEPTION	2		1		2
Local Violation	HAZARD MISPERCEPTION	1	1			
	OTHER VIOLATION ENFORCING CONDITION	2				
	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 2016 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	DEF	INC
Active Failure	PRIMARILY "STRUCTURAL/MECHANICAL"	3	
	STATE CHANGE NOT DETECTED "INFORMATION"	1	
Organisation	INADEQUATE PROCEDURES	2	
	INADEQUATE SPECIFICATIONS/REQUIREMENTS	1	
	UNSUITABLE MATERIALS		1
Local Error	LACK OF KNOWLEDGE	1	

Medium Aeroplanes

No causes established

Small Aeroplanes

No causes established

Unknown Aircraft Category

Category	Cause	DEF	INC
Active Failure	ACTIONS INCONSISTENT WITH PROCEDURES		1
	INACCURATE SYSTEM "DIAGNOSIS"	1	
Local Error	INADEQUATE CHECKING	1	

Helicopters, Agricultural Aeroplanes and Sport Aircraft

Category	Cause	ARC	DEF	INC
Active Failure	PRIMARILY "STRUCTURAL/MECHANICAL"		2	
	STATE CHANGE NOT DETECTED "INFORMATION"		1	
Organisation	DESIGN DEFICIENCIES		6	1
Local Error	RISK MISPERCEPTION	2		

Air Traffic Services and Personnel

The following tables summarise causal factors identified from investigation of occurrences that occurred during the year ended 31 December 2016 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	ASP	NIO
Organisation	INADEQUATE COMMUNICATIONS	1	
	INADEQUATE DEFENCES	1	
	INADEQUATE PLANNING	1	
	INADEQUATE TRAINING	1	
	OTHER ORGANISATION FACTOR	7	2
	POOR COORDINATION	1	

Air Traffic Service Personnel

Category	Cause	ASP
Active Failure	INAPPROPRIATE "PROCEDURES"	1
	INAPPROPRIATE "STRATEGY"	2
	POOR PROCEDURE "ACTION"	3
Local Error	INADEQUATE CHECKING	3
	INEXPERIENCE (NOT LACK OF TRAINING)	2
	OTHER ENVIRONMENTAL FACTOR (EG WEATHER)	2
	OTHER ERROR ENFORCING CONDITION	4
	PHYSIOLOGICAL OTHER	2
	PSYCHOLOGICAL OTHER	5
	RISK MISPERCEPTION	7
	TASK OVERLOAD	3
	TASK UNFAMILIARITY	2
	TIME SHORTAGE	1
	DISTURBED SLEEP PATTERNS	1
Local Violation	OTHER VIOLATION ENFORCING CONDITION	1

Client Risk Assessment

Introduction

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

The system measures a series of indicators, rated using a scale of 1 to 5 where 1 is an exemplary rating. It is a qualitative rating and relates solely to an official interaction that a 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.

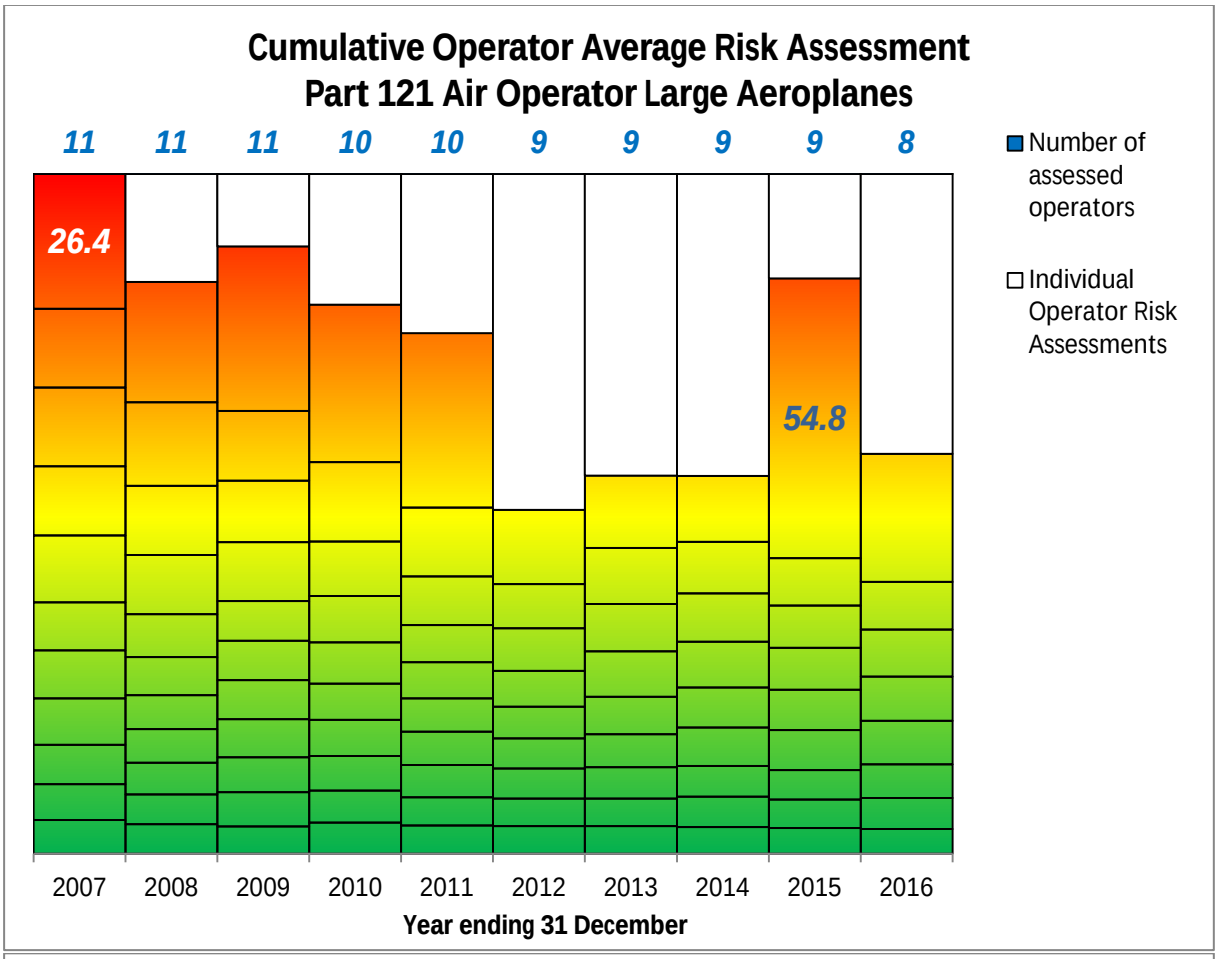
Results are in the form of a percentage of the maximum possible value (if all factors had been rated 5), and thus 100% represents the 'riskiest possible' operator. Clients can have several risk profiles current at one time, one for each activity. Each risk profile is independent of the others, and applies only to the relevant activity, although they may be have common influences, such as aircraft types.

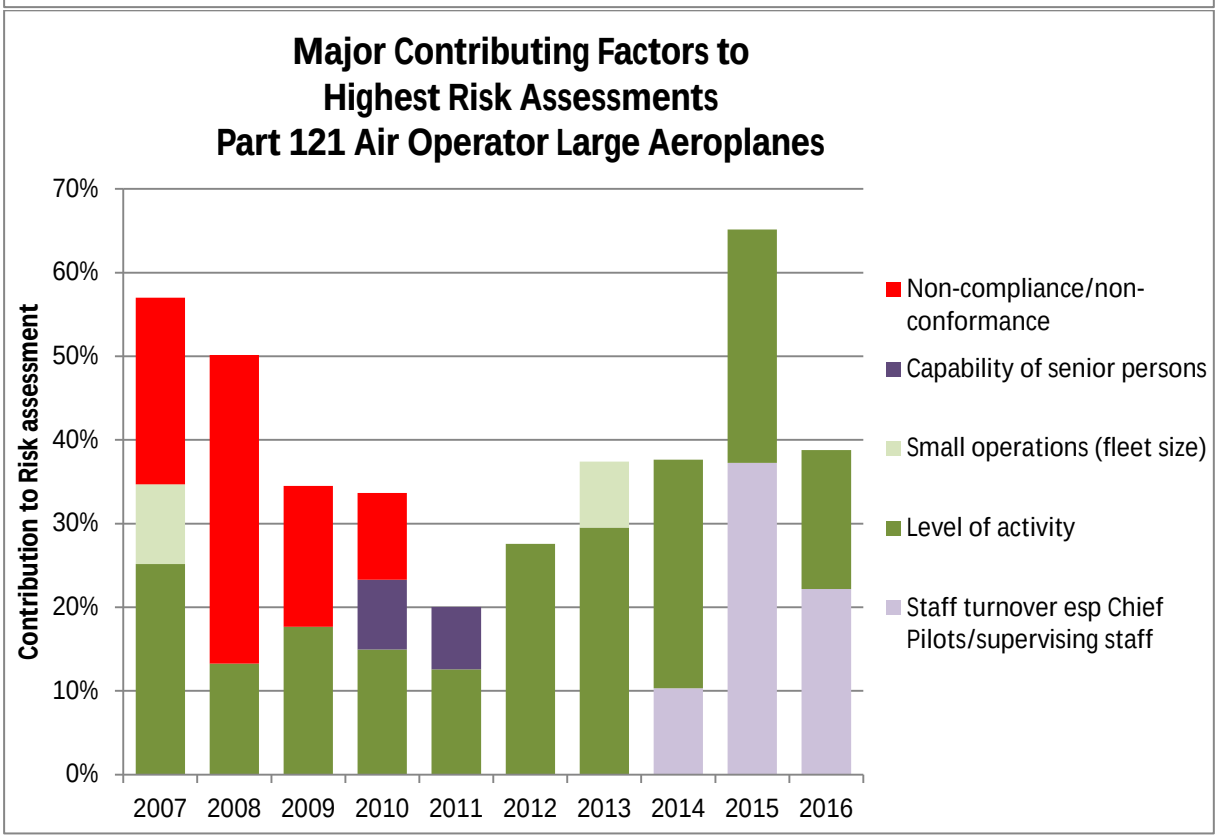
The first chart in each of the following chart pairs depicts the cumulative annual risk assessment for each certificated activity. Each 'cell' represents the annual average risk assessment for one operator with the highest risk operators at the top of the column and the lowest at the bottom. Numbers at the top of each column indicate the total number of operators assessed for the activity in that year. To provide an indication of the scale, the absolute value of the highest risk operator is included as a data label.

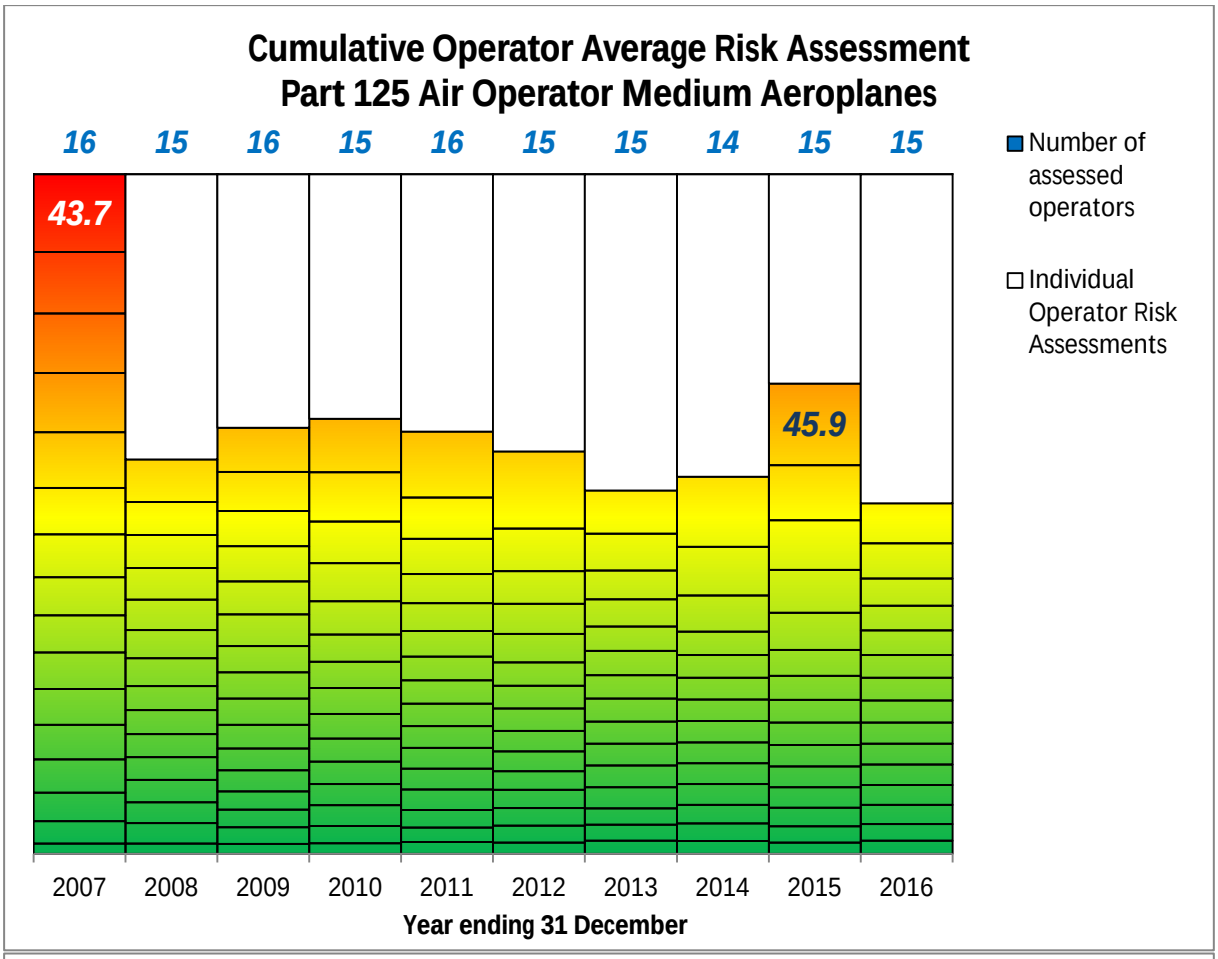
These charts can be used to visualise the overall risk within a particular certificated sector because the height of each 'column' is determined by both the risk assessments and the number of participants. Each yearly column indicates whether risk within the sector is evenly distributed amongst many, or concentrated within a small number of operators. The client risk assessment assigns high risk ratings to new certificate holders, until they accumulate some history, and this is particularly apparent in the part 129 foreign operators chart

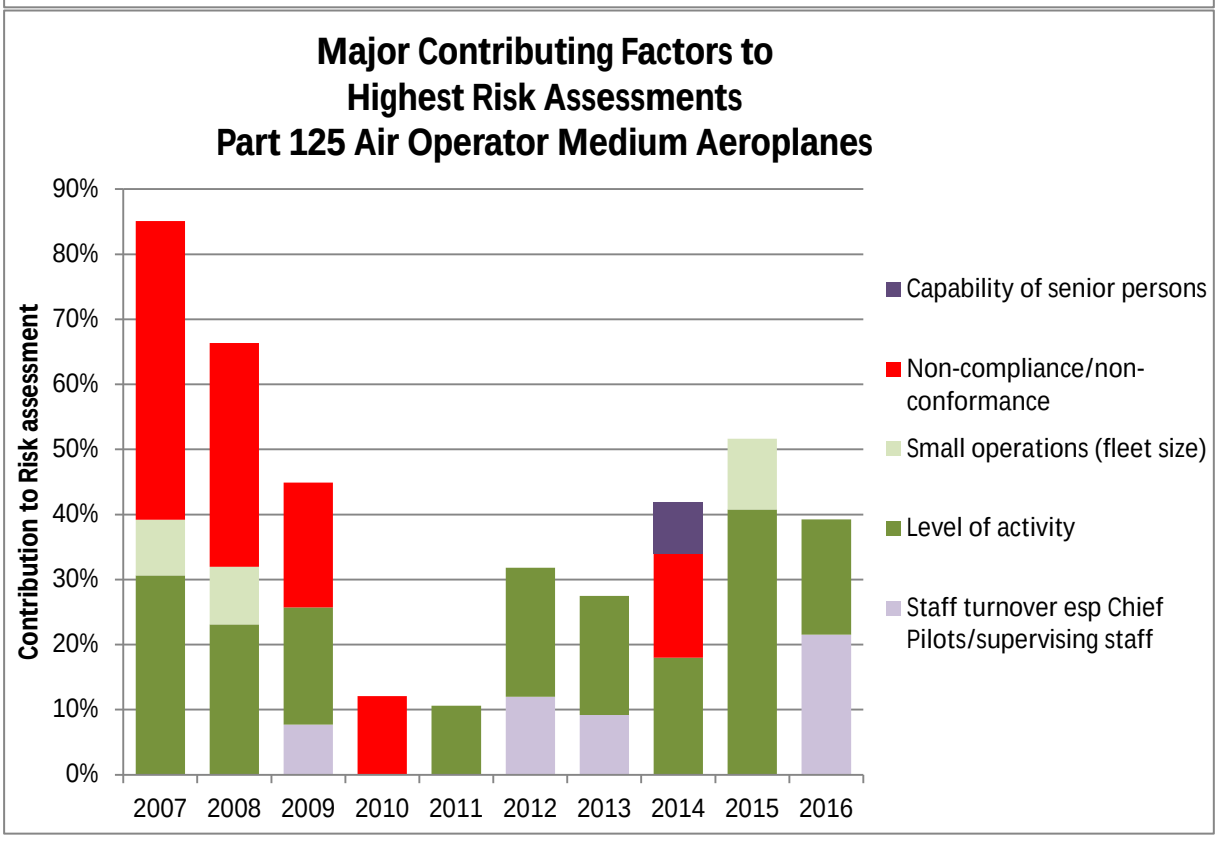
The second chart in each pair shows a more detailed breakdown of the major contributing risk indicators for the worst 10% of the risk assessments in each year. In recent years, turnover of staff has emerged as leading contributor to the highest client risk scores.

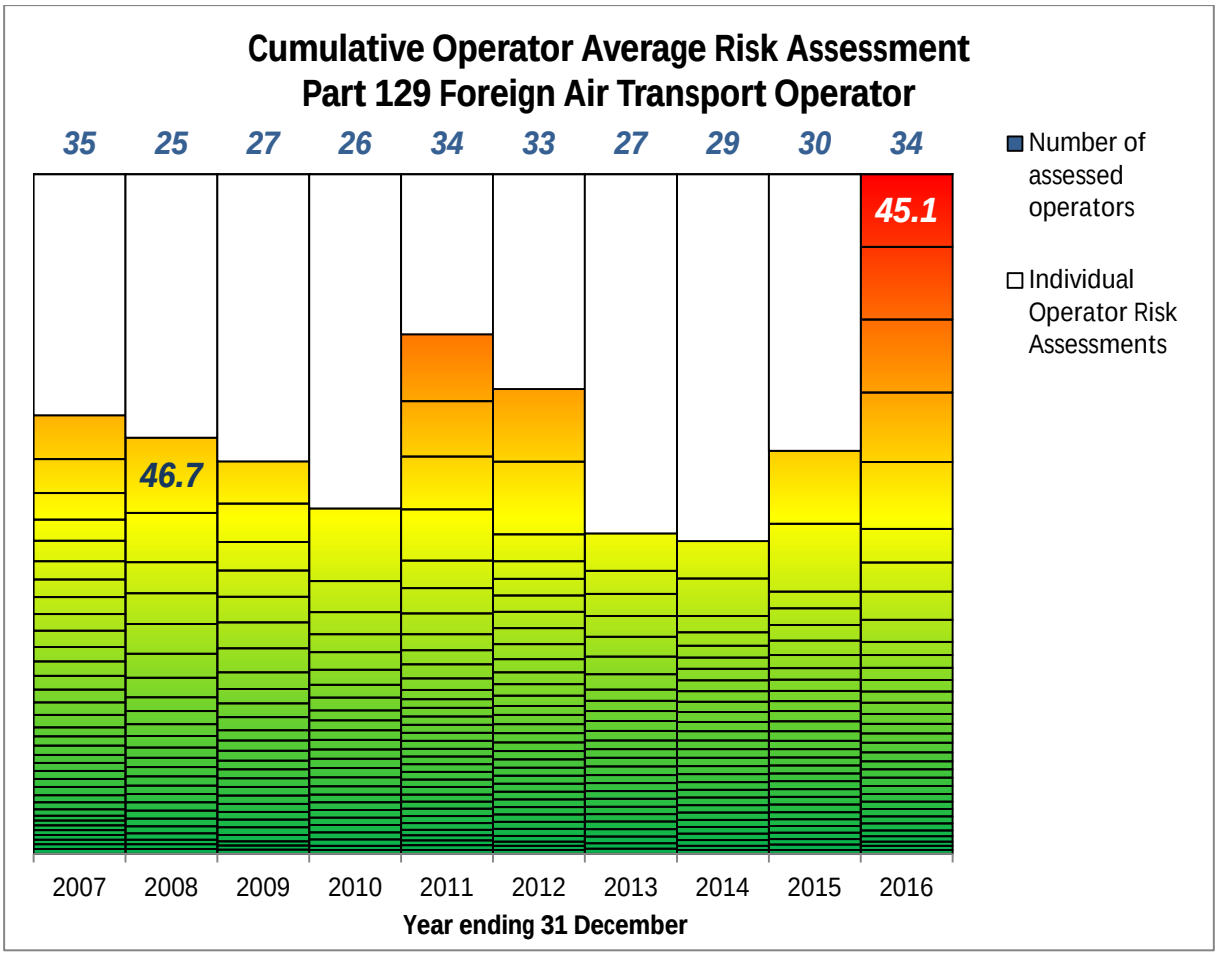
Air Transport Activities

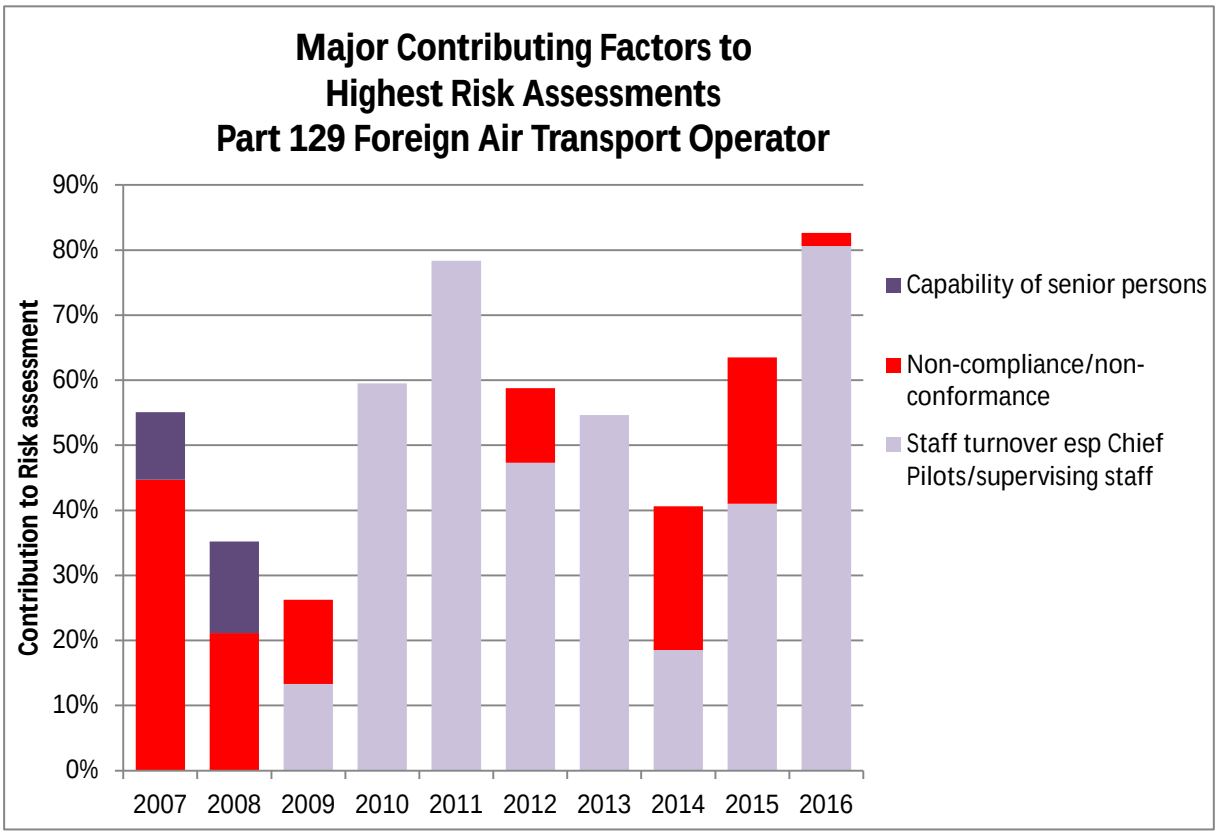


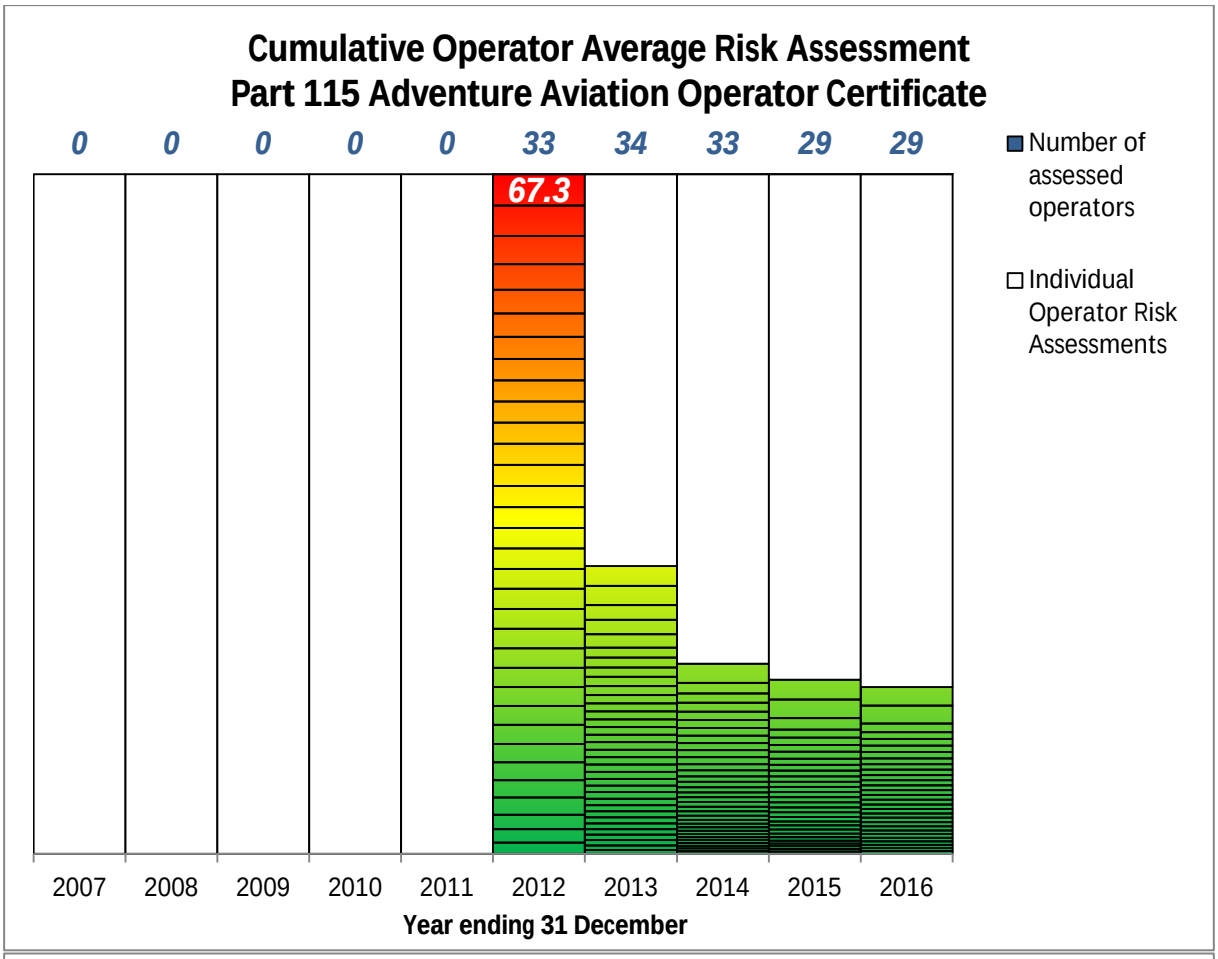


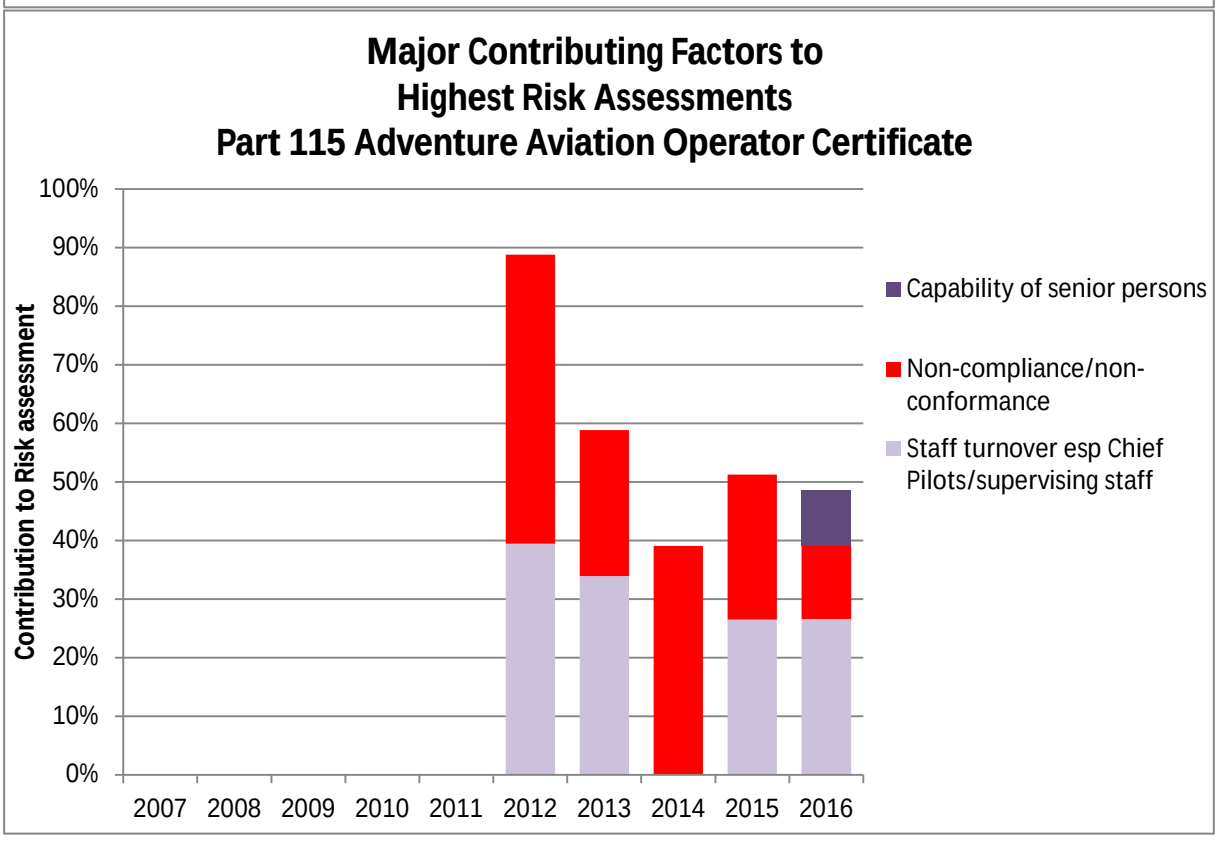




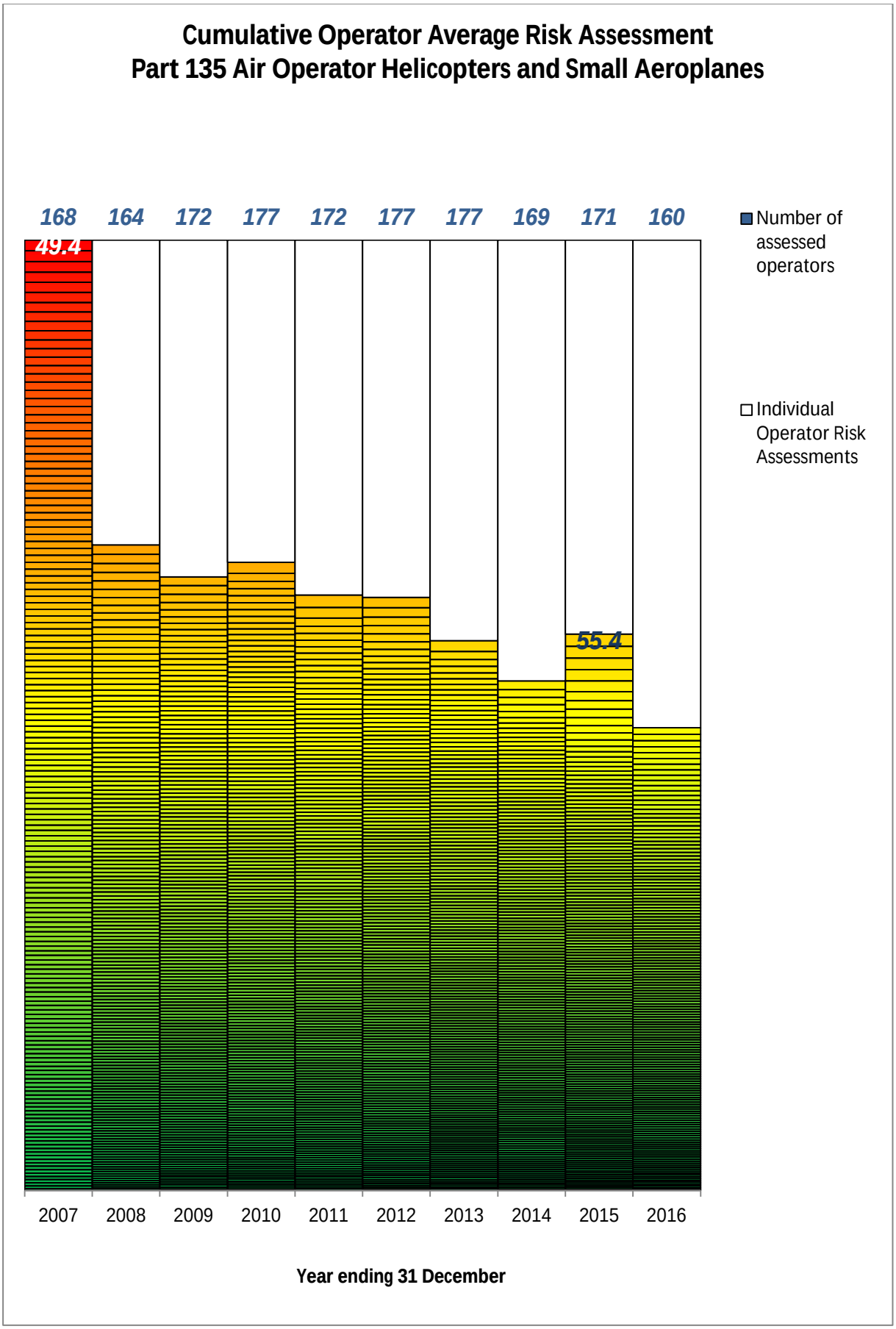

Cumulative Operator Average Risk Assessment
Part 129 Foreign Air Transport Operator
35
25
27
26
34
33
27
29
30
34
46.7
45.1
Number of assessed operators
Individual Operator Risk Assessments
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December

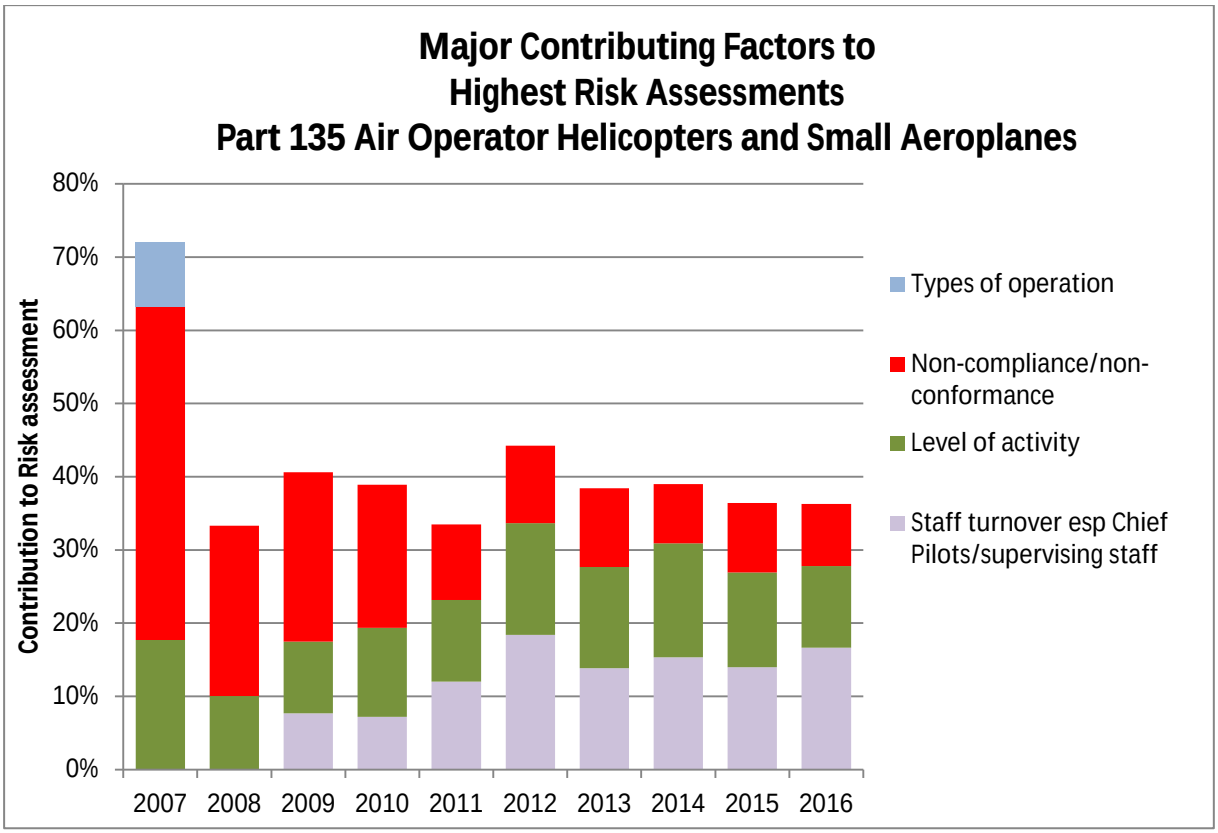

Major Contributing Factors to
Highest Risk Assessments
Part 129 Foreign Air Transport Operator
Contribution to Risk assessment
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Capability of senior persons
Non-compliance/non-conformance
Staff turnover esp Chief Pilots/supervising staff

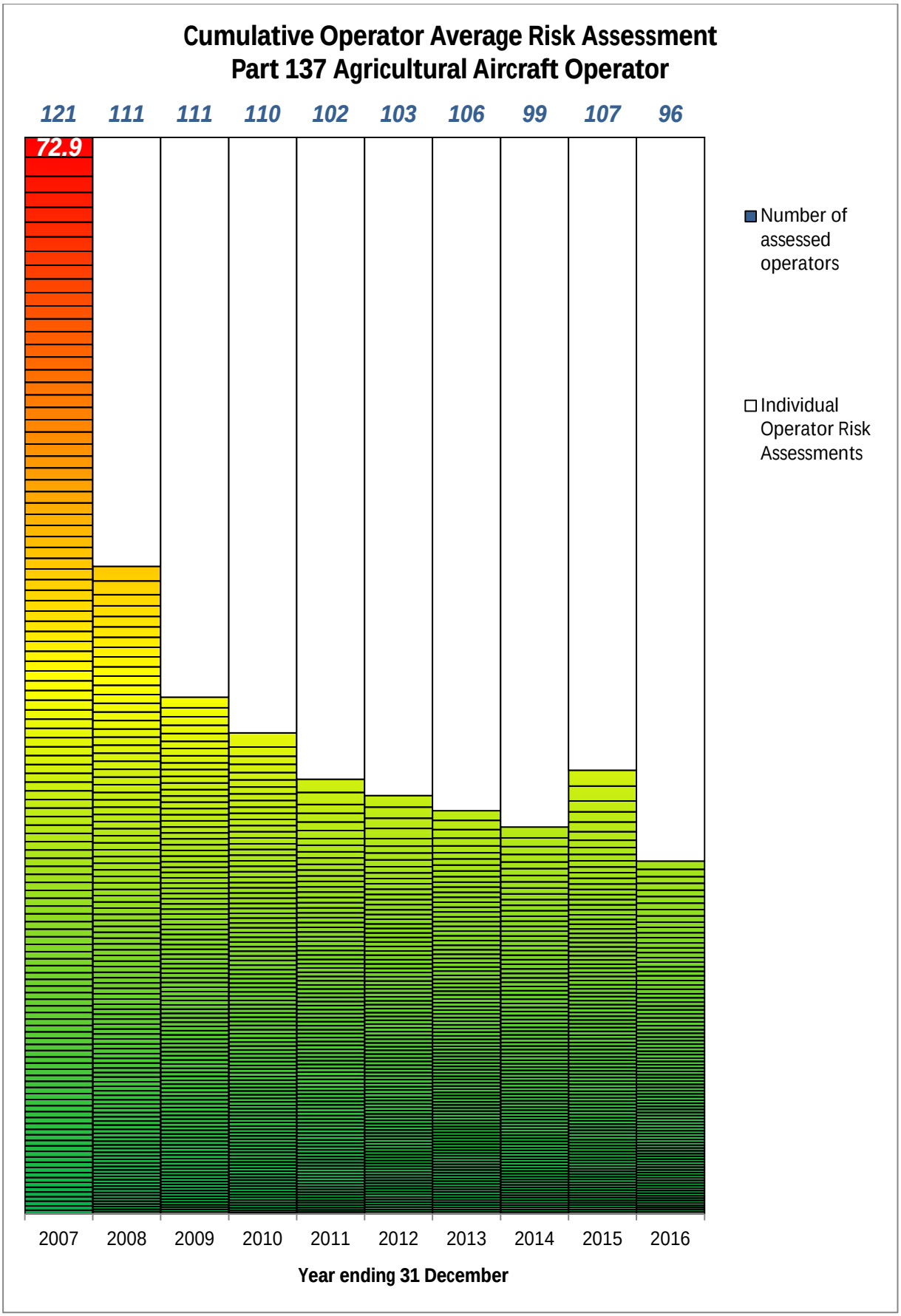


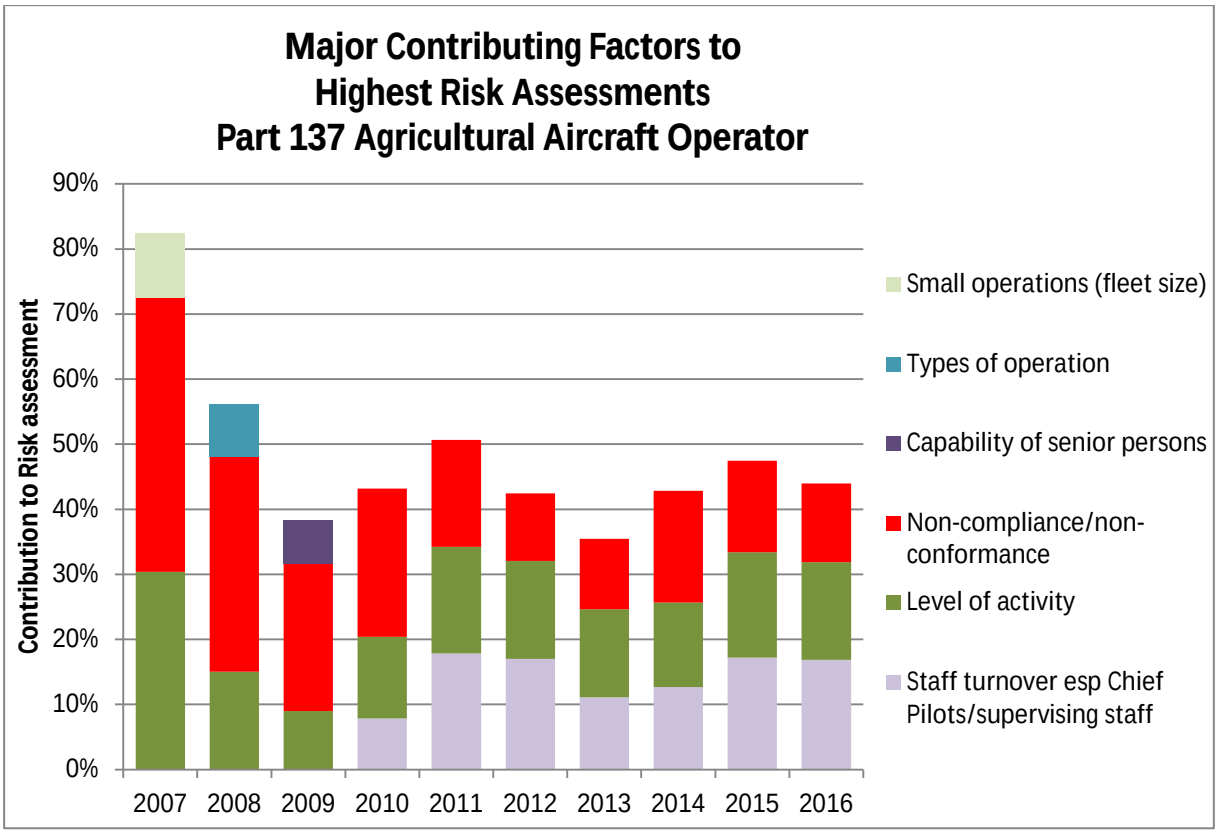


Commercial Activities

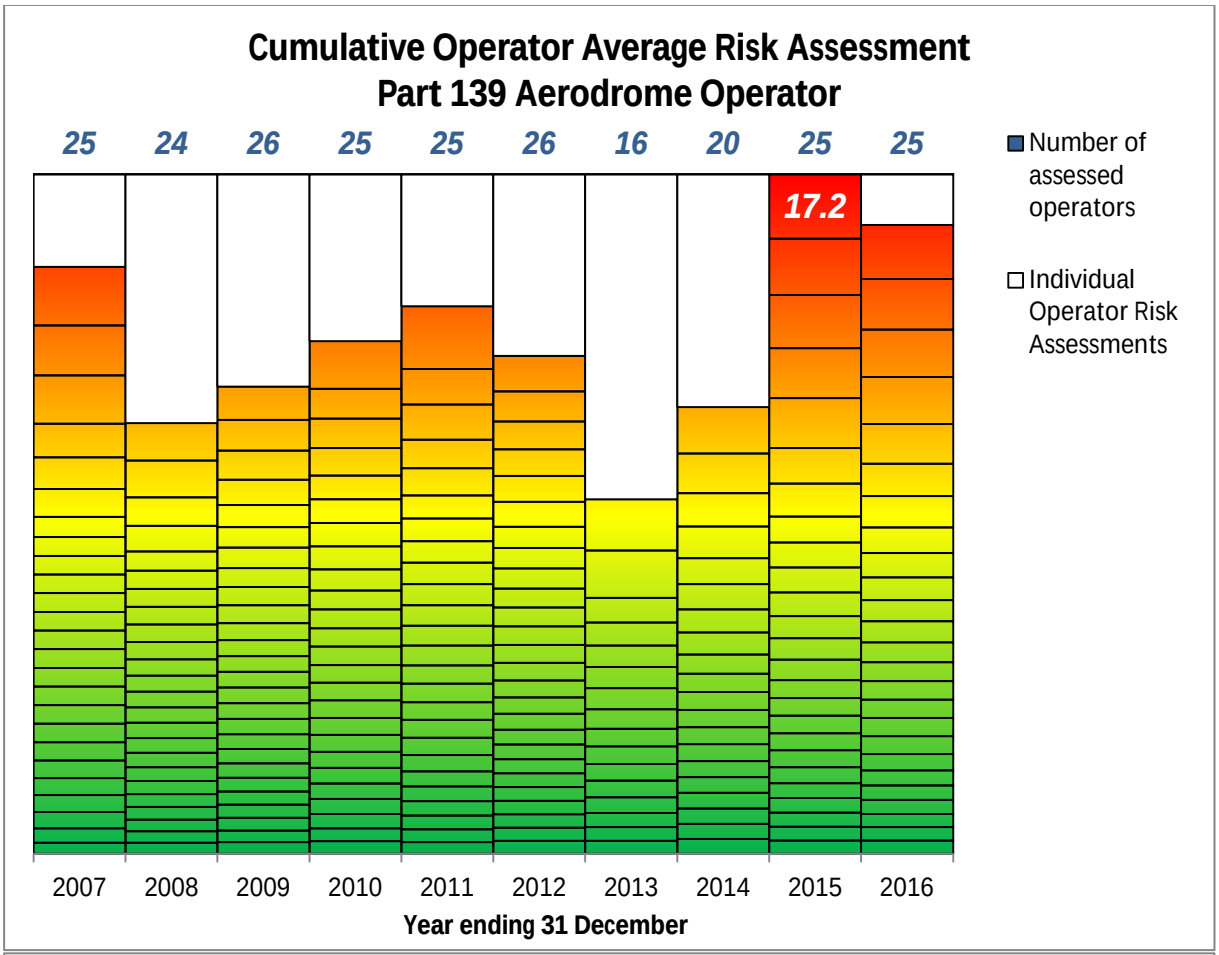


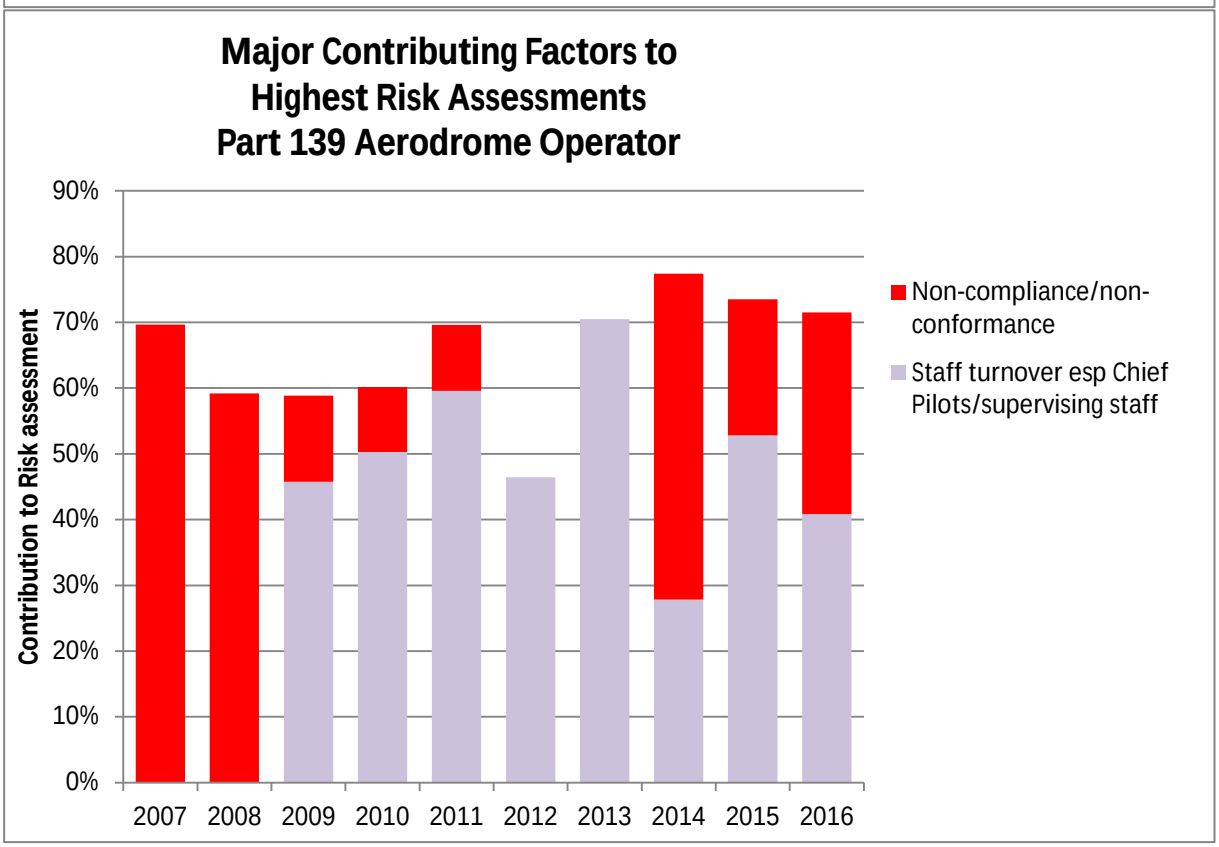


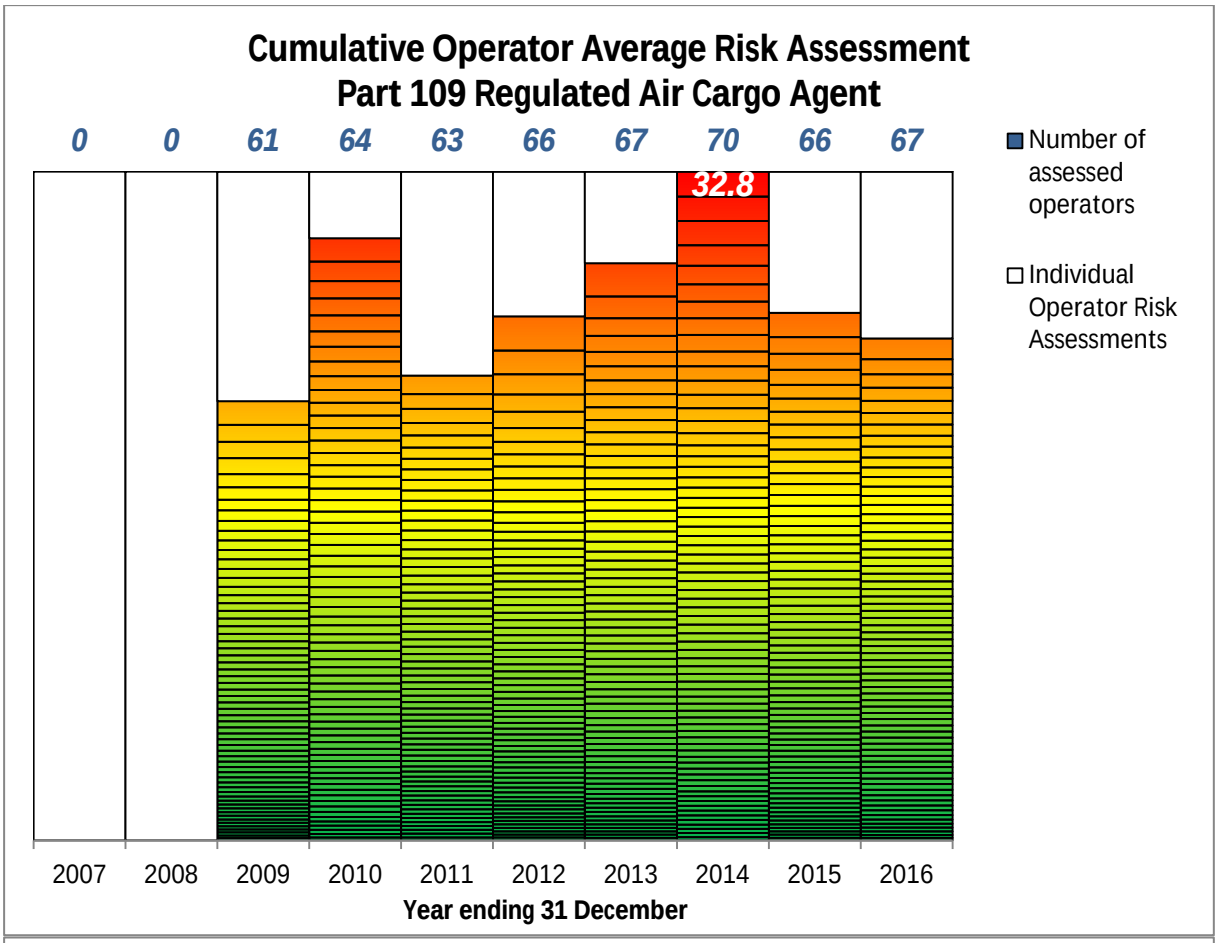

Cumulative Operator Average Risk Assessment
Part 137 Agricultural Aircraft Operator
121
111
111
110
102
103
106
99
107
96
72.9
Number of assessed operators
Individual Operator Risk Assessments
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December

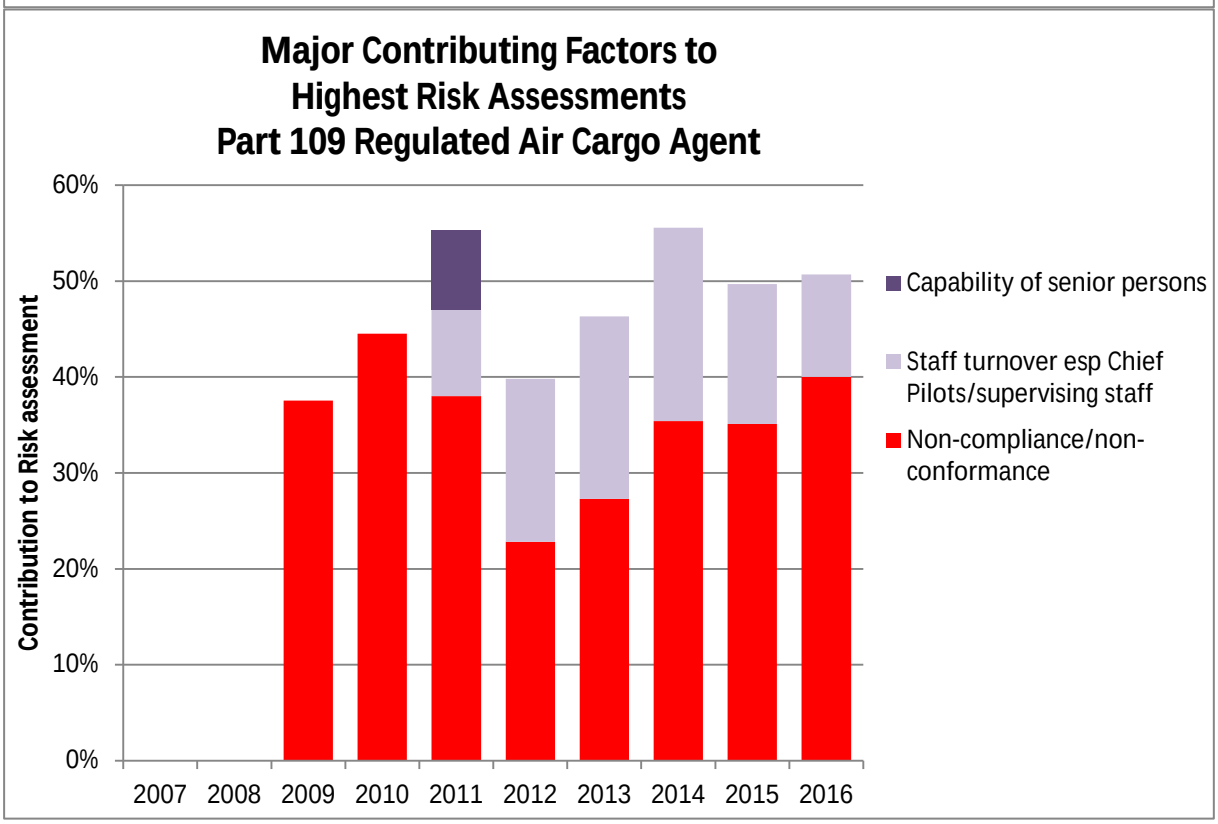


Other Operational Activities

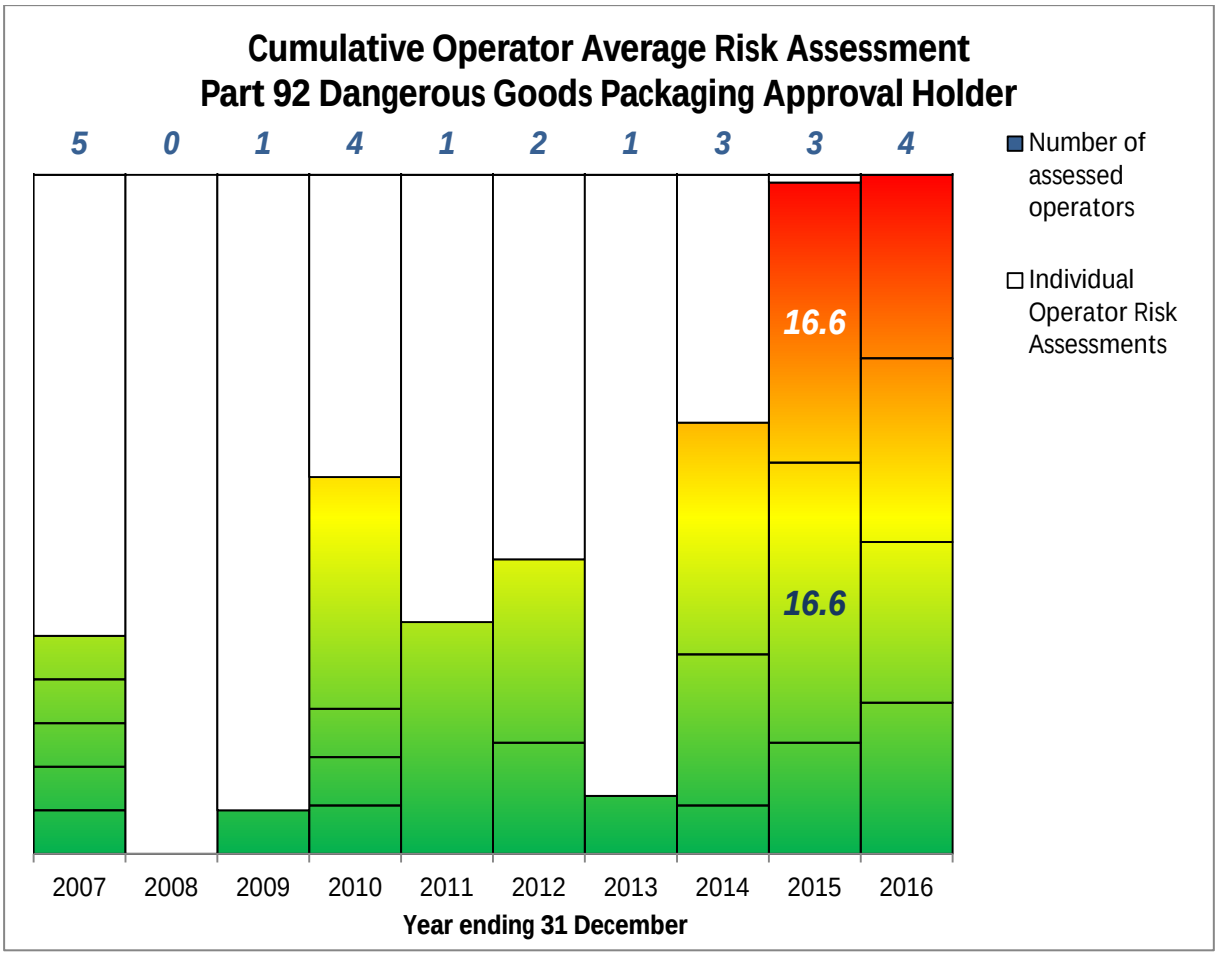








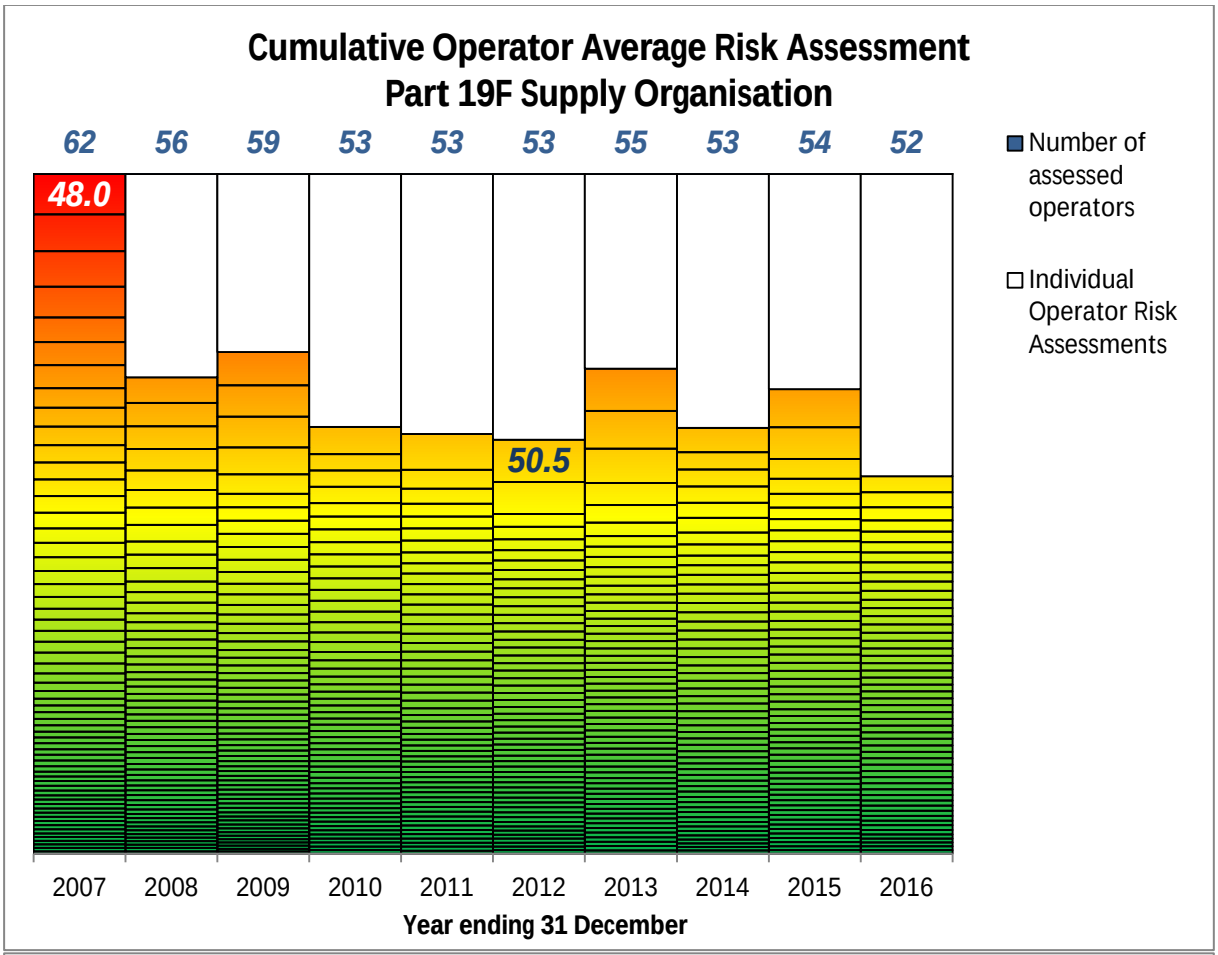
The top contributing indicator to the 10% highest risk band has been 'Non-compliance/non-conformance' for every one of the eight years that this activity has been assessed.

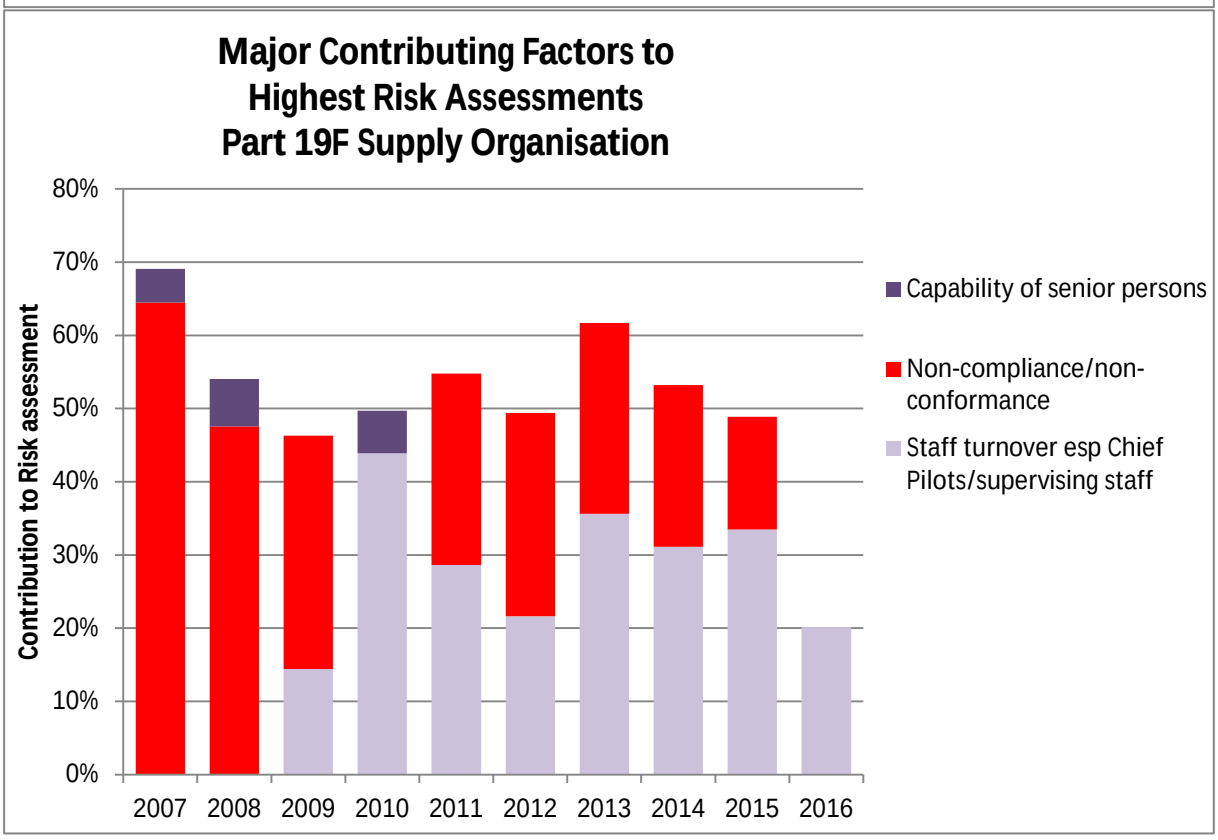


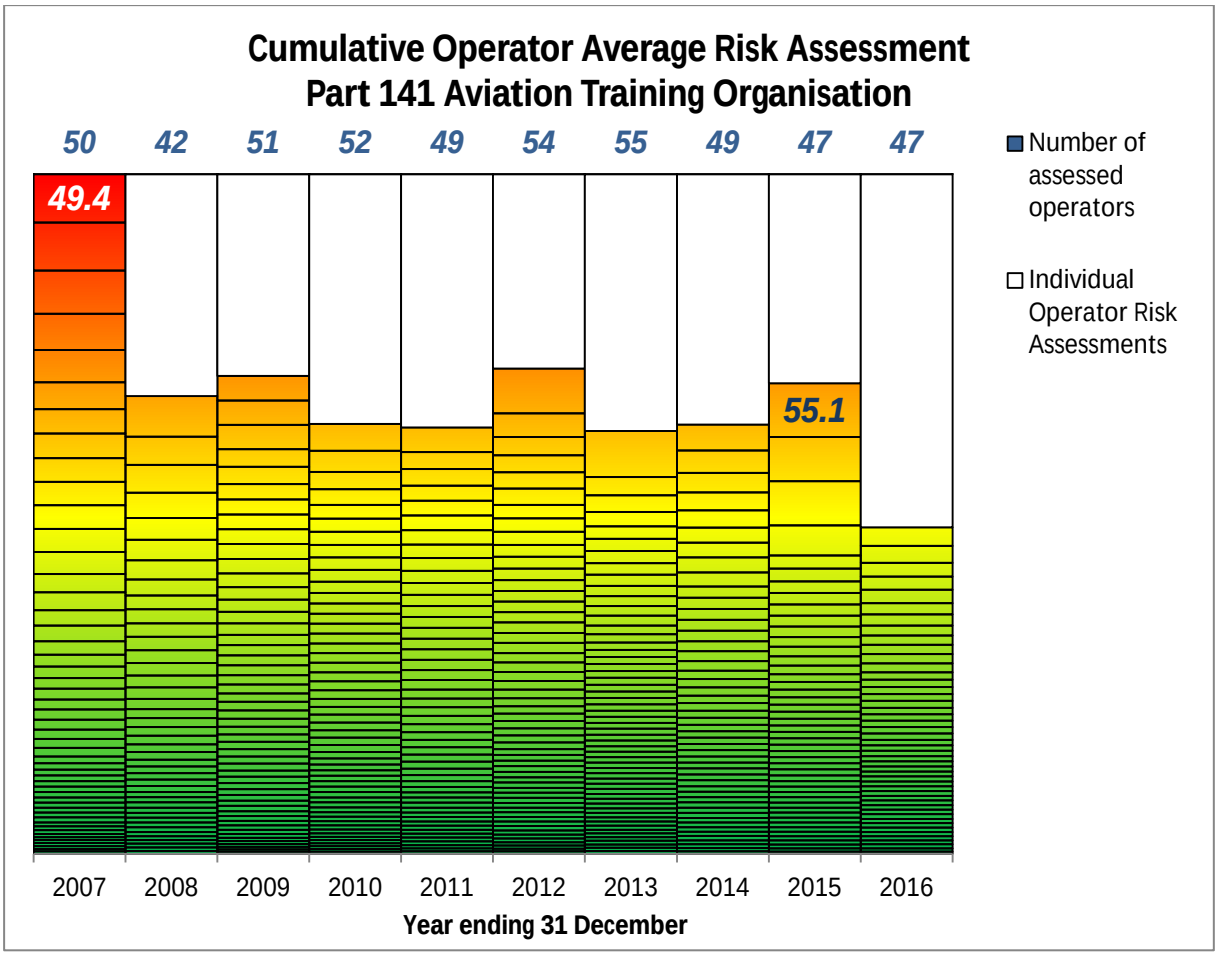
With only four risk-assessed operators the statistical significance of this result is limited but the general increase in the assessment levels may indicate a need for further investigation

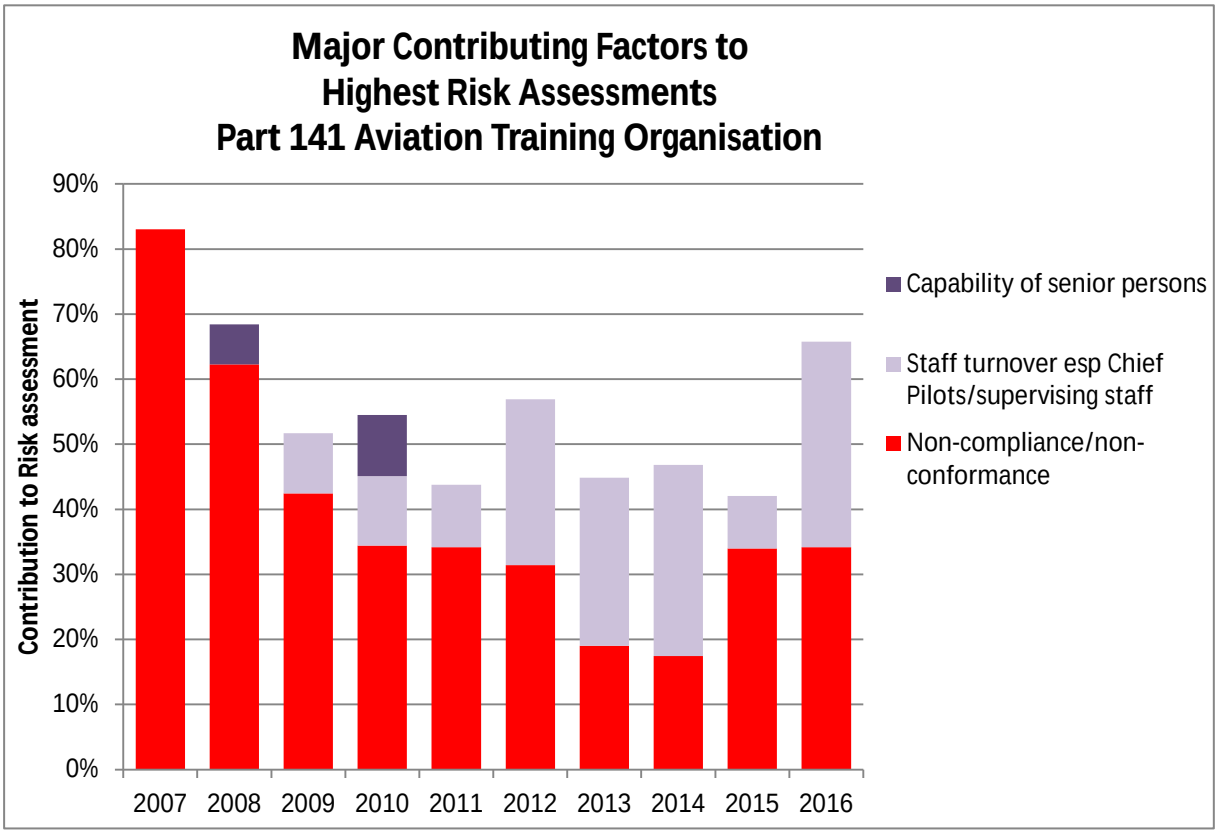
The predominant factor contributing to the year 2016 risk assessments in this group is 'Non-compliance/non-conformance' contributing 26% of the total

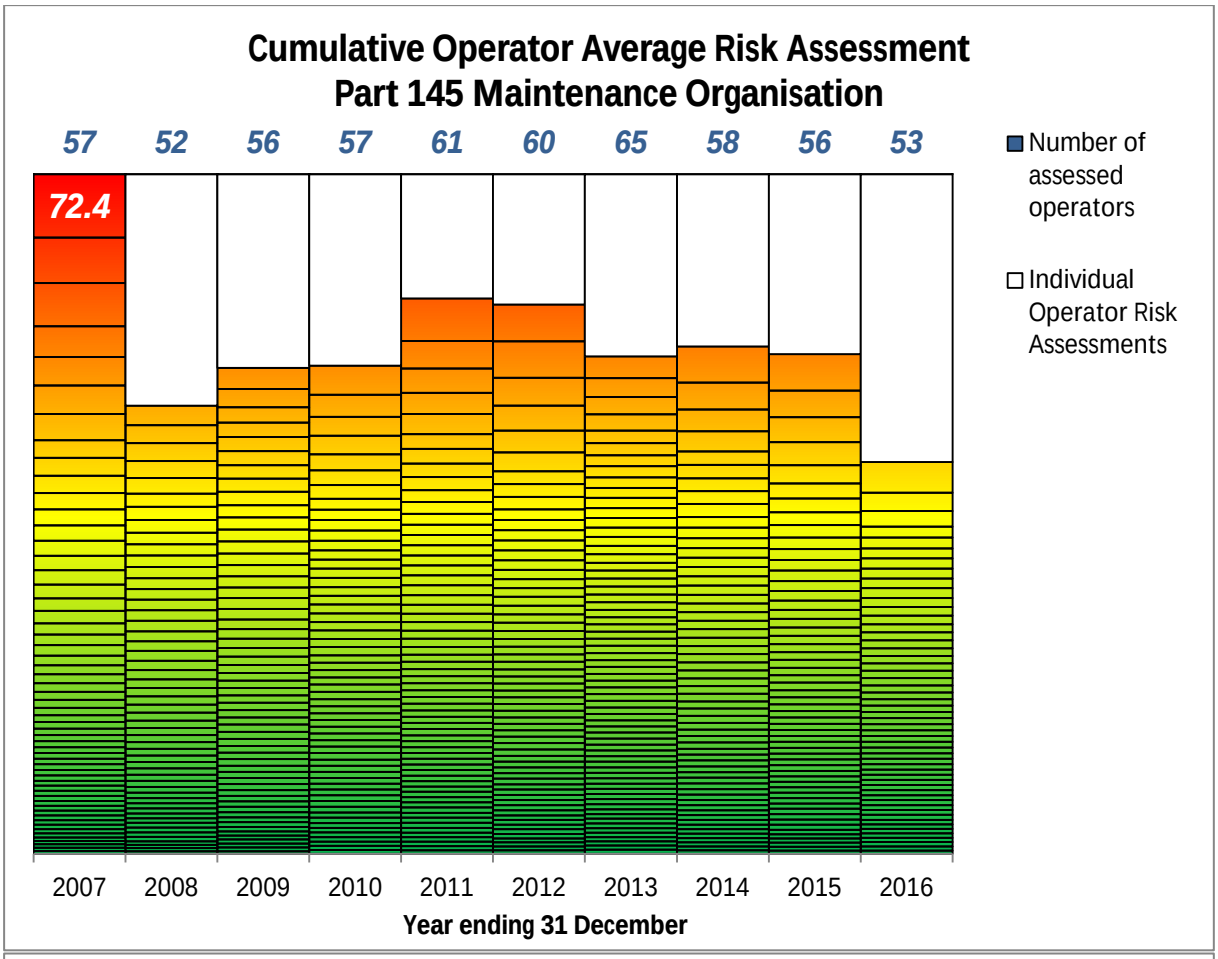
Support Activities

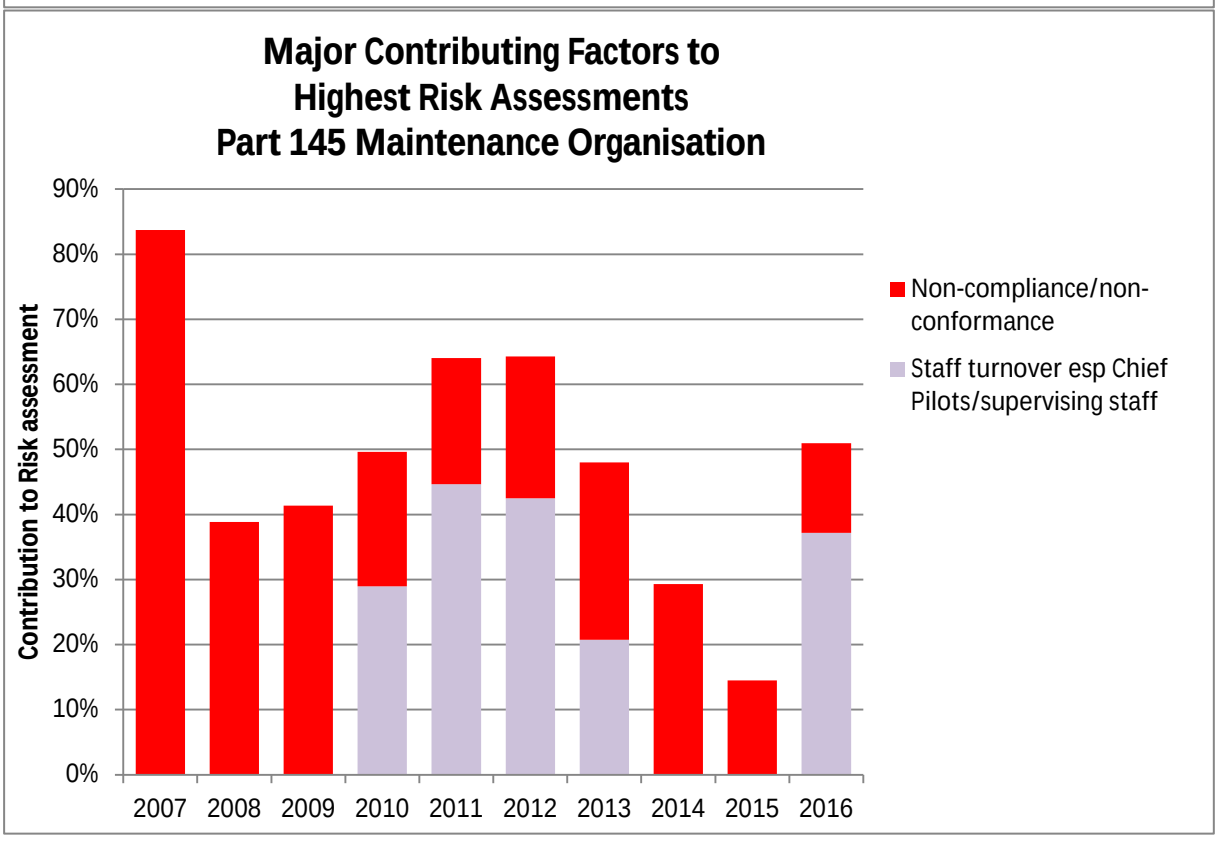


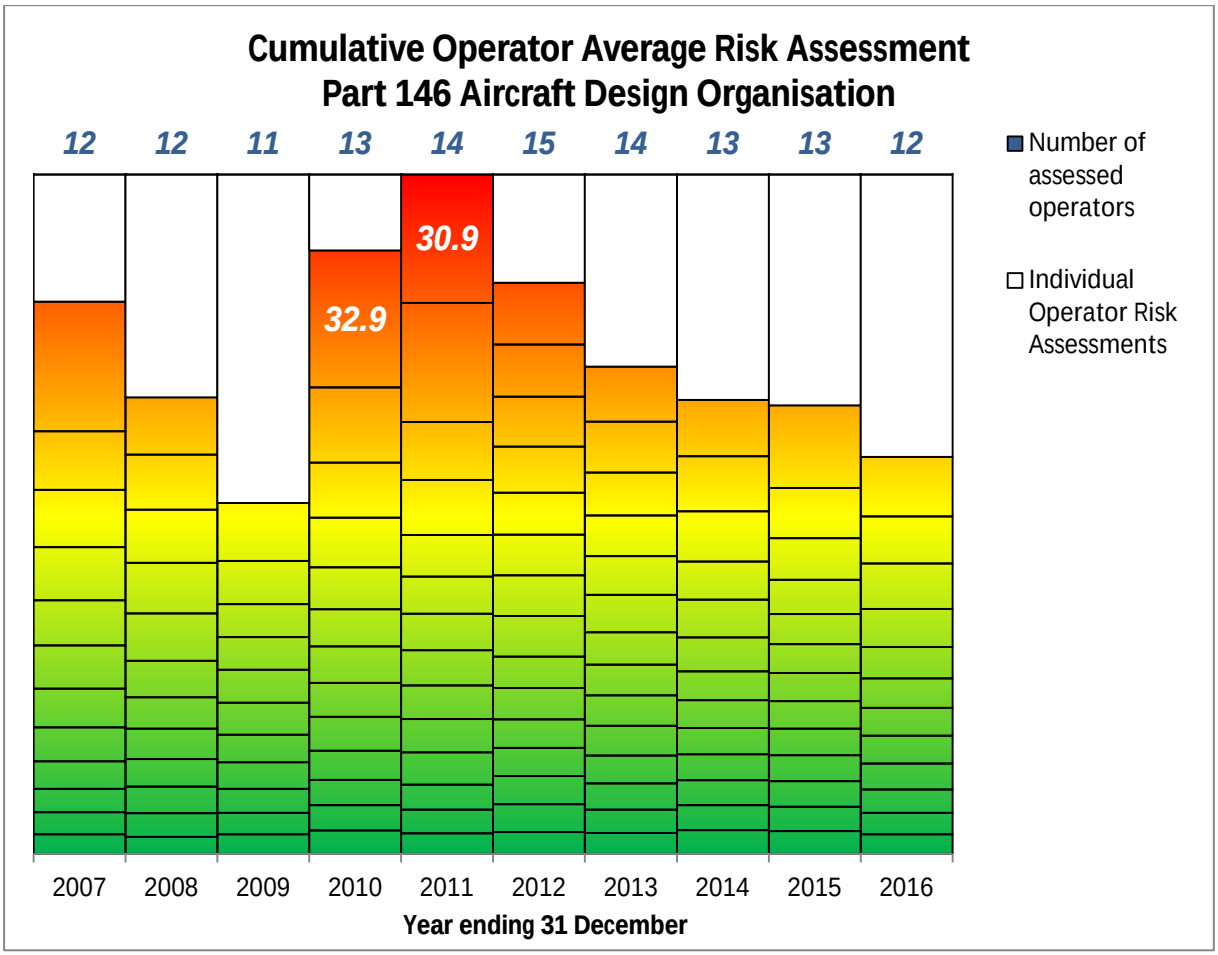


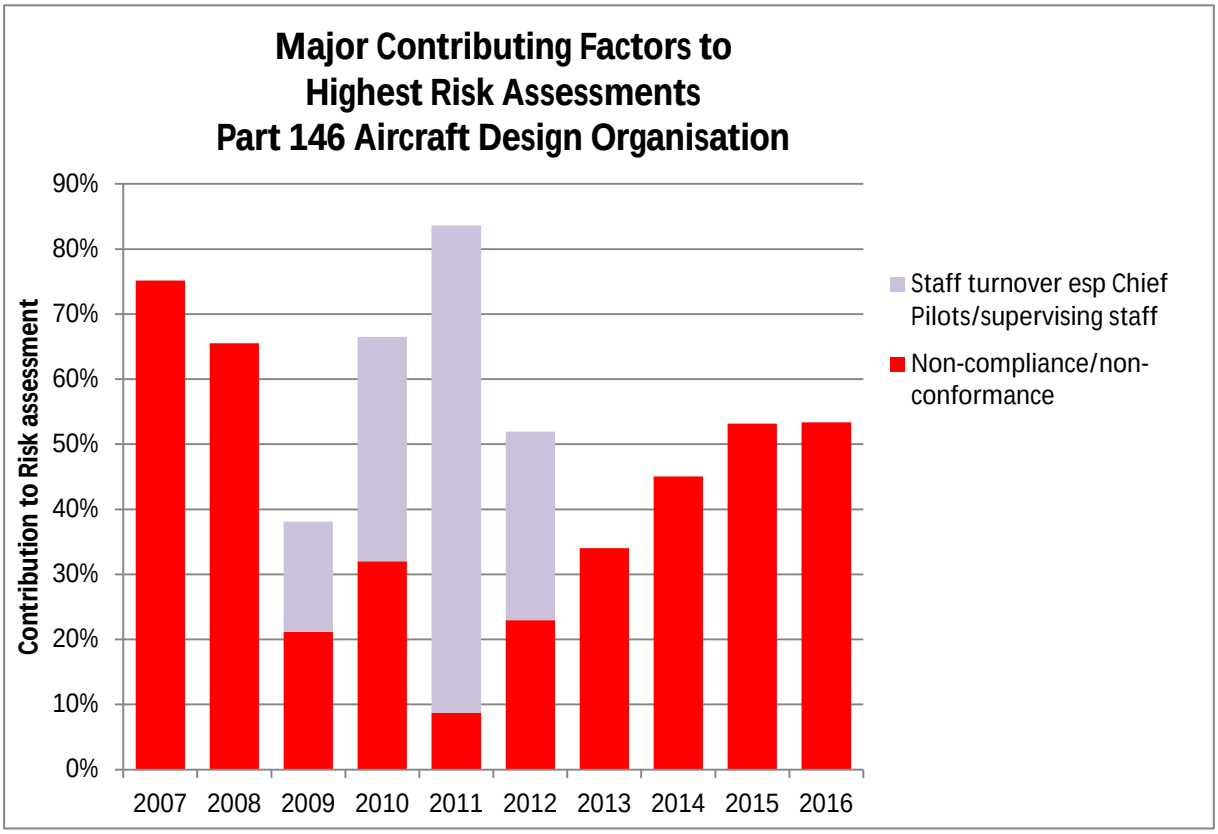

Cumulative Operator Average Risk Assessment
Part 141 Aviation Training Organisation
50
42
51
52
49
54
55
49
47
47
49.4
55.1
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Number of assessed operators
Individual Operator Risk Assessments

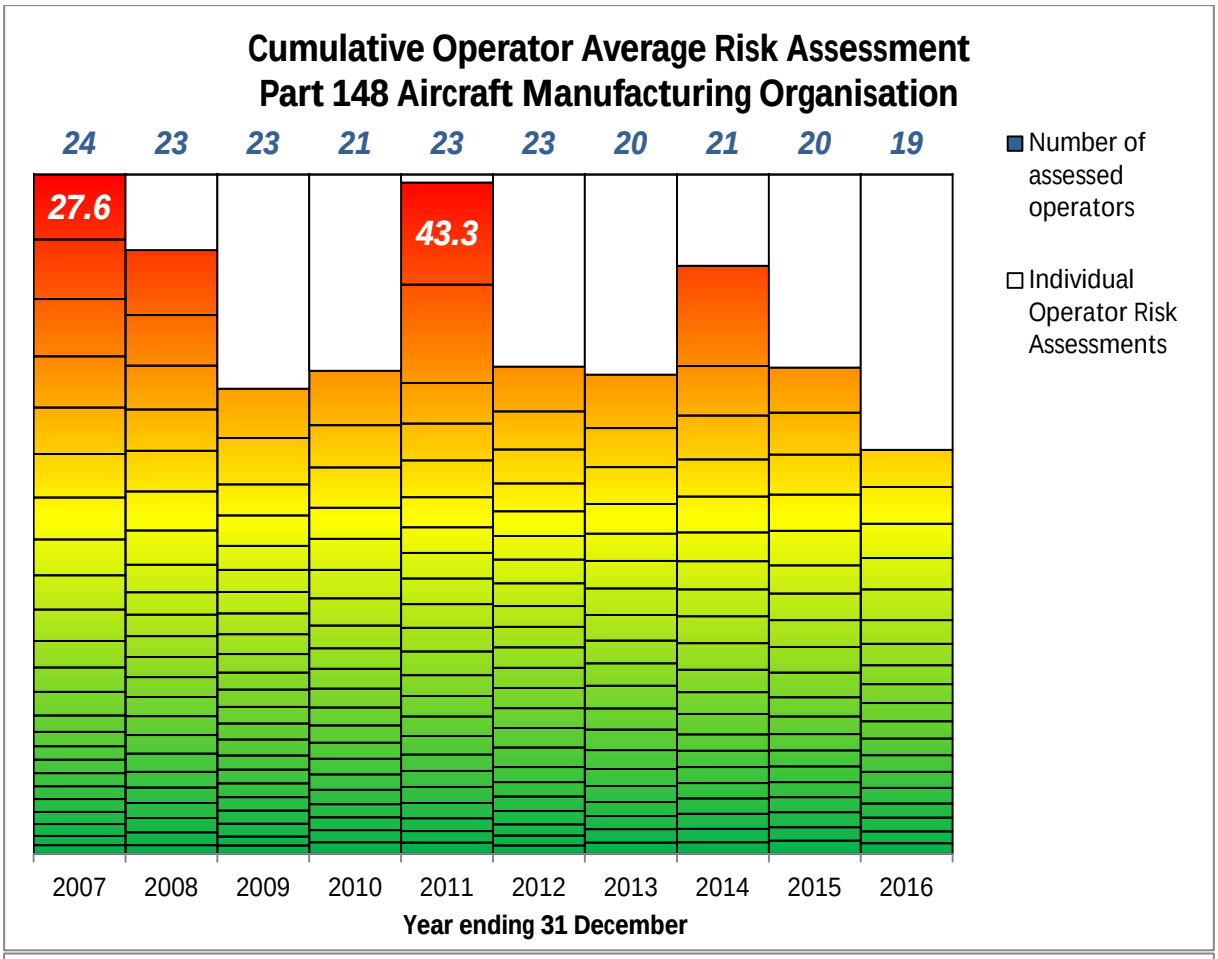

Major Contributing Factors to
Highest Risk Assessments
Part 141 Aviation Training Organisation
Contribution to Risk assessment
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Capability of senior persons
Staff turnover esp Chief Pilots/supervising staff
Non-compliance/non-conformance

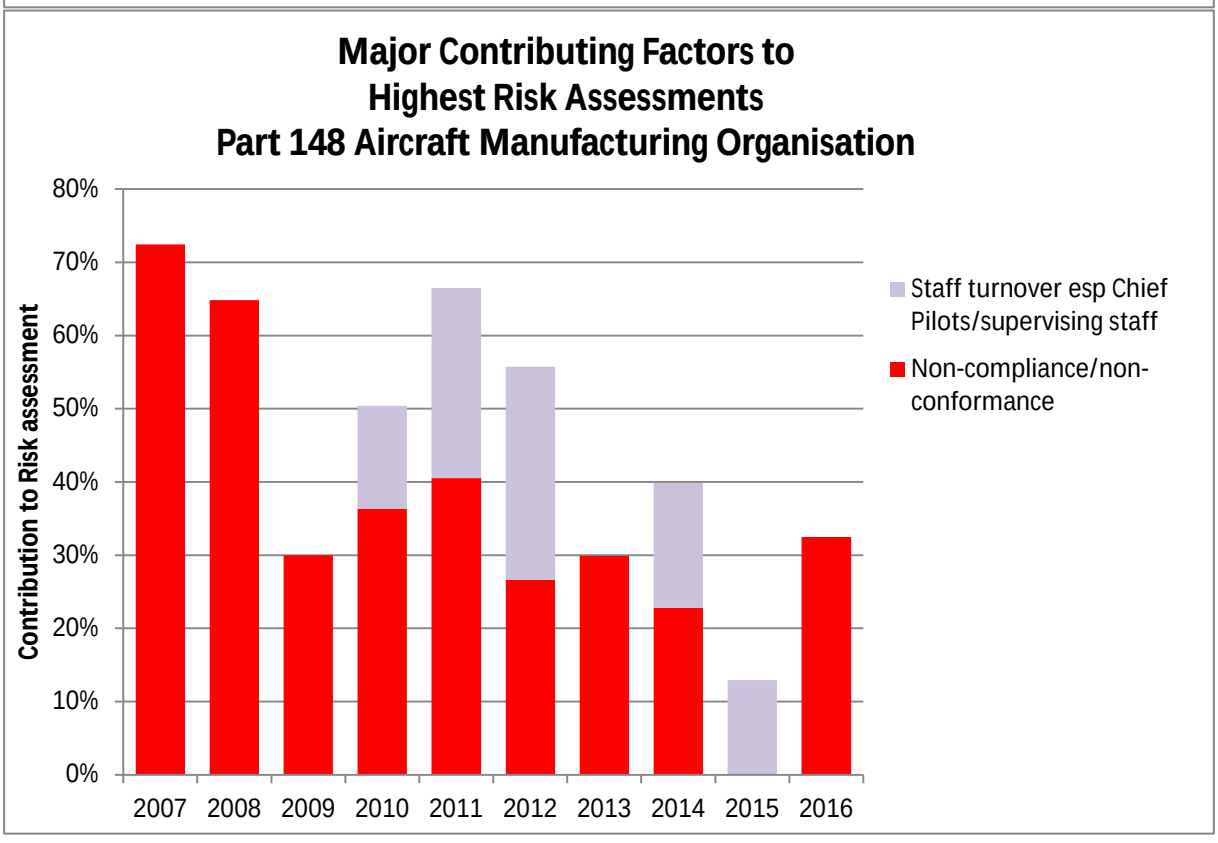




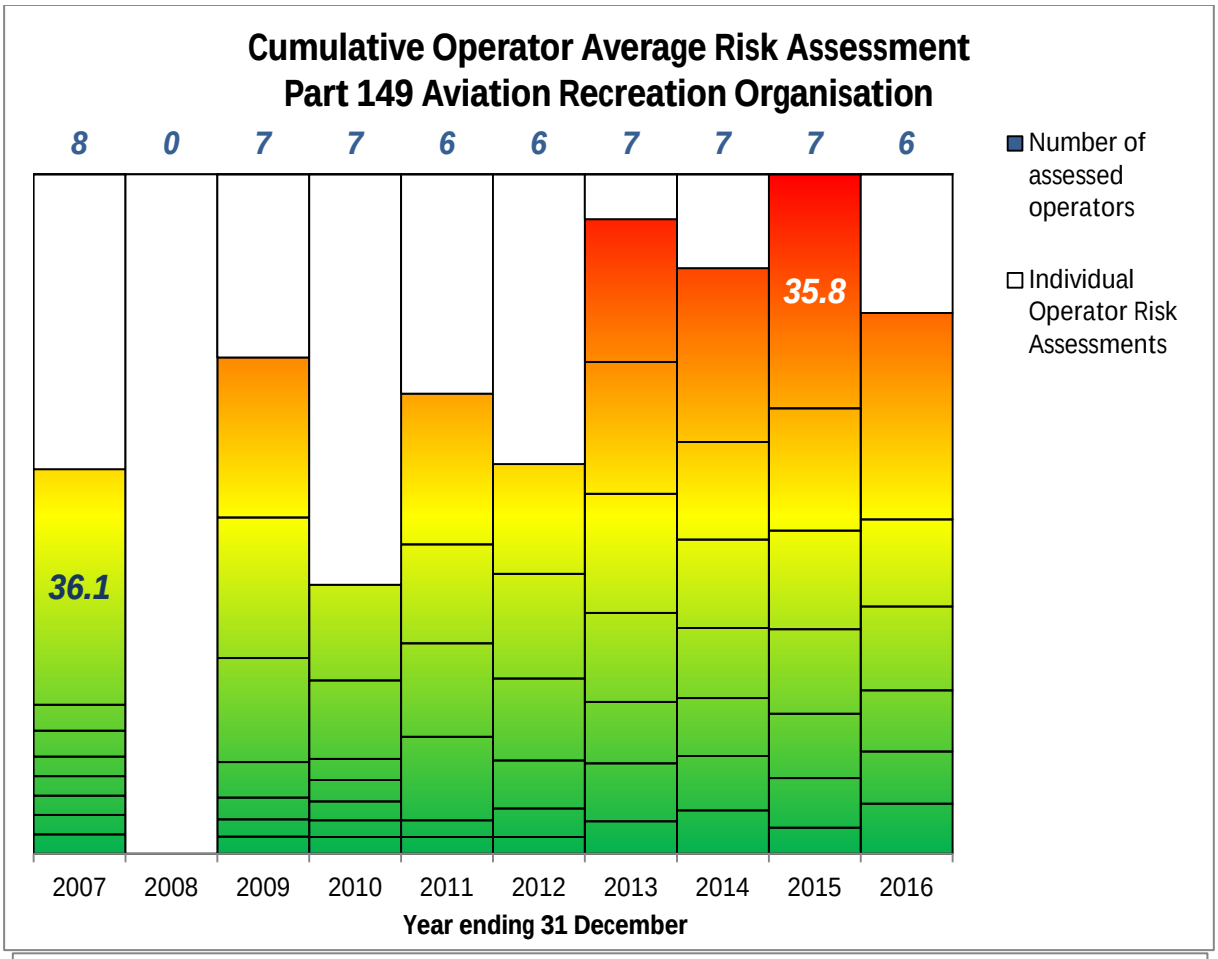

Cumulative Operator Average Risk Assessment
Part 146 Aircraft Design Organisation
12
12
11
13
14
15
14
13
13
12
30.9
32.9
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Year ending 31 December
Number of assessed operators
Individual Operator Risk Assessments

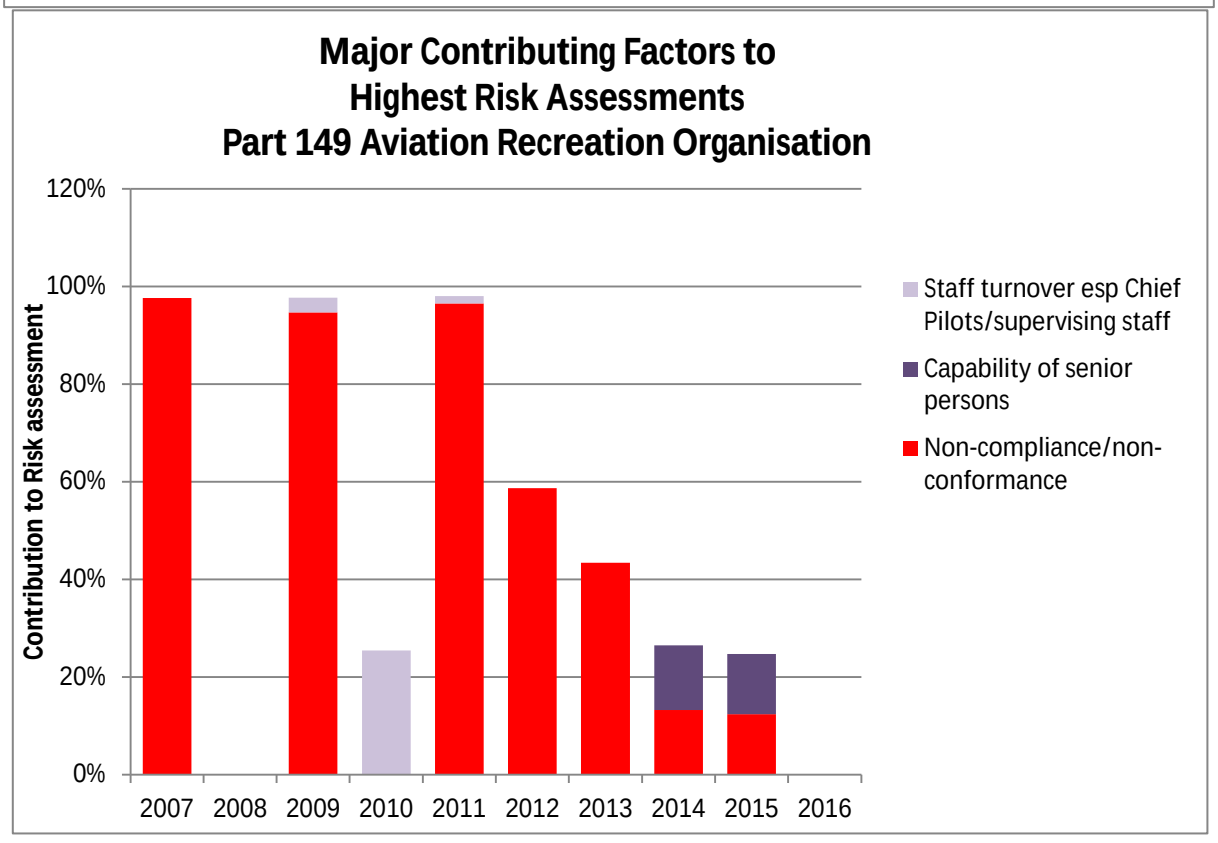

Major Contributing Factors to
Highest Risk Assessments
Part 146 Aircraft Design Organisation
Contribution to Risk assessment
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
Staff turnover esp Chief Pilots/supervising staff
Non-compliance/non-conformance





Recreational Activities





Summary of Responses to Reviewed TAIC Reports

Occurrence Number 13/833 (TAIC?)

Recommendation 025/14

On 10 December 2014 the Commission recommended to the Director of Civil Aviation that he promote the use of quick-donning life jackets for all occupants of single-engine aircraft flying over water.

Response

The CAA advises there is specific reference to quick donning life jackets and their use in Vector publication, September/October 2003. The particular article is titled "The most useless things-keep emergency equipment accessible." To satisfy the intent of the recommendation, the Director is prepared to refresh the article along with the referenced Commission's accident inquiry number in a future Vector publication. An implementation date cannot be provided at this time.

Occurrence Number 10/2867 (TAIC 10-008)

Recommendation 029/12

The Commission recommends that the Director inform flight instructors at all levels of the findings of this report, and in particular that their first responsibility is the safety of the aircraft they are commanding, before attending to the needs of their student pilots. Further, instructors are reminded of their responsibility for ensuring that student pilots are informed and competent to listen for, see and avoid other aircraft before allowing them to fly solo. (Recommendation 029/12)

Response

As provided in our letter of 23 August 2012, the CAA considers the level of its current activity to address the issues is sufficient, given the competing priorities. Accordingly, the CAA considers that both recommendations have been fully addressed.

Recommendation 030/12

The Commission recommends that the Director of Civil Aviation use the lessons from this report to educate pilots at all levels of the aviation industry, and in particular flight training establishments, of:

- how important the concept of see and avoid is for detecting and avoiding other aircraft
- the limitations of the concept of see and avoid
- the importance of making clear and concise radio transmissions to warn other aircraft of your location and intentions, and the importance of listening to radio transmissions from other aircraft to help build an accurate mental picture of the situation around you. (Recommendation 030/12)

Response

As provided in our letter of 23 August 2012, the CAA considers the level of its current activity to address the issues is sufficient, given the competing priorities. Accordingly, the CAA considers that both recommendations have been fully addressed.

Recommendation 031/12

The Commission recommends that the Director of Civil Aviation initiate a review of aircraft anti-collision lighting systems, including the use of high-visibility paints, to determine whether there are systems that can increase the visibility of aircraft; and if such systems are found to exist with demonstrable safety benefits, start action to promote, encourage or mandate their application in the New Zealand civil aviation system. (Recommendation 031/12)

Response

The CAA confirms the recommendation is being implemented. A review of anti-collision lighting systems and high visibility paint use is currently being assessed by the Operations and Airworthiness Group. An implementation date has yet to be finalised.

Appendix — Definitions

General

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

(1) a person is fatally or seriously injured as a result of–

(i) being in the aircraft; or

(ii) direct contact with any part of the aircraft, including any part that has become detached from the aircraft; or

(iii) direct exposure to jet blast–

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

(2) the aircraft sustains damage or structural failure that–

(i) adversely affects the structural strength, performance or flight characteristics of the aircraft; and

(ii) would normally require major repair or replacement of the affected component–

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

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

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

(1) an obstruction either on the aerodrome operational area or protruding into the aerodrome obstacle limitation surfaces; or

(2) a defective visual aid; or

(3) a defective surface of a manoeuvring area; or

(4) any other defective aerodrome facility.

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

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

(1) avoiding a collision between aircraft; or

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

Bird incident [BRD] — means an incident where–

(1) there is a collision between an aircraft and one or more birds; or

(2) when one or more birds pass sufficiently close to an aircraft in flight to cause alarm to the pilot.

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

(1) there is evidence of tampering or suspected tampering with the cargo or mail which could be an act or an attempted act of unlawful interference; or

(2) a weapon, explosive, or other dangerous device, article or substance, that may be used to commit an act of unlawful interference is detected in the cargo or mail.

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

(1) results in injury to a person, property damage, fire, breakage, spillage, leakage of fluid or radiation, or other evidence that the integrity of the packaging has not been maintained; or

(2) involves dangerous goods incorrectly declared, packaged, labelled, marked, or documented.

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

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

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

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

Occurrence — means an accident or incident.

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

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

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

(1) requires hospitalisation for more than 48 hours, commencing within 7 days from the date the injury was received; or

(2) results in a fracture of any bone, except simple fractures of fingers, toes, or nose; or

(3) involves lacerations which cause severe haemorrhage, nerve, muscle, or tendon damage; or

(4) involves injury to an internal organ; or

(5) involves second or third degree burns, or any burns affecting more than 5% of the body surface; or

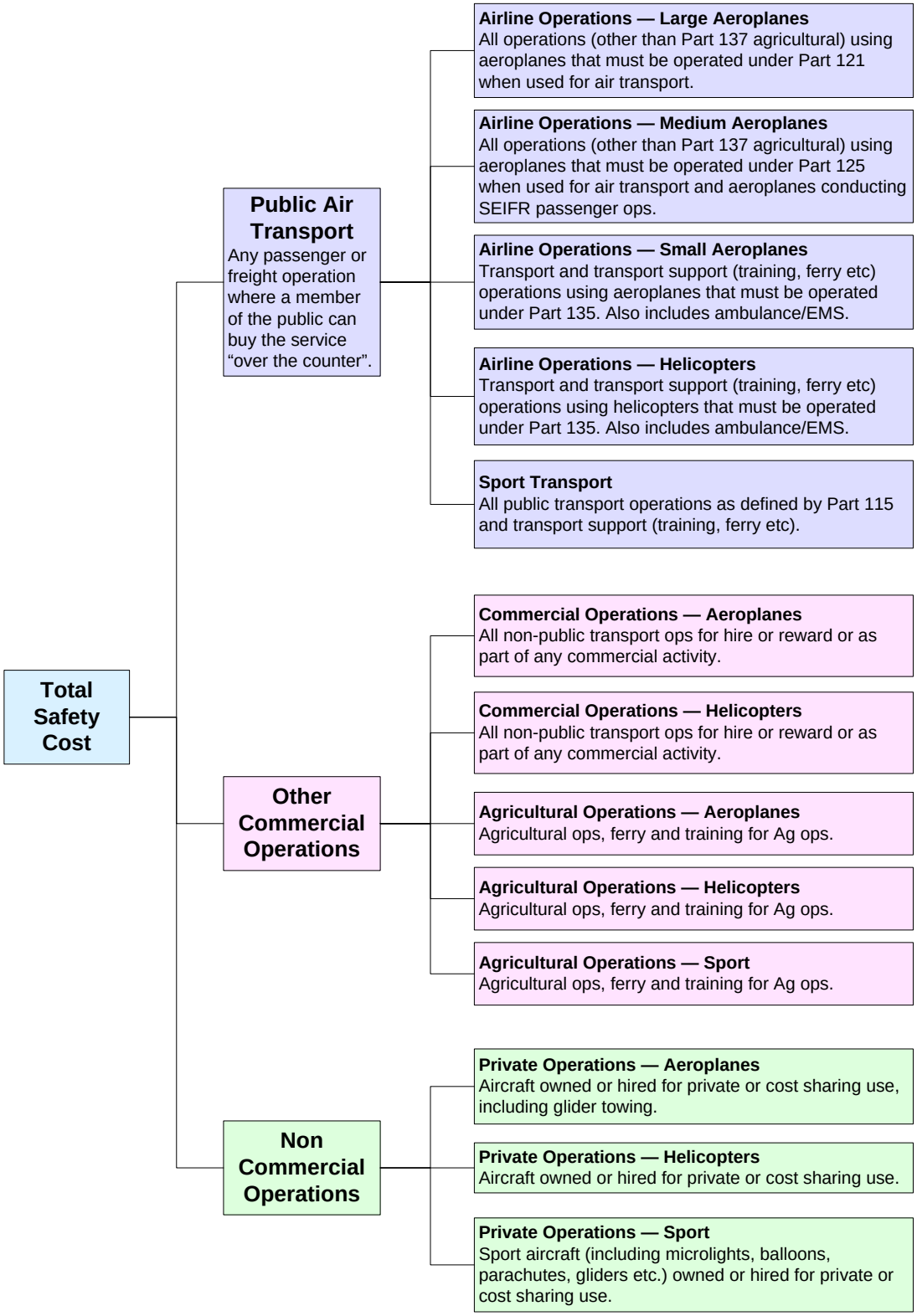
(6) involves verified exposure to infectious substances or injurious radiation.

Severity

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

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

Safety Target Groups



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

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

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

Aircraft Categories

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

Significant Events

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

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

- 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
FUEL/FLUIDS OCCURRENCE
LANDING OVERRUN
RUNWAY EXCURSION
General Breakup/disintegration
COLLISION/STRIKE OBJECT
Collision Level Terrain/water
Collision Hill/mountain
COLLISION WITH AIRCRAFT ON GROUND
DAMAGE TO AIRCRAFT
ENGINE POWER LOSS
Uncontained Failure
Engine Tearaway
PROPELLOR FAILURE
Propellor Separation
Propellor Runaway
FIRE/EXPLOSION/FUMES
Explosion
Struck By Propellor/rotor/jet Blast
TAKE-OFF OR LANDING
Landing Beside Runway
Undershoot
Overrun
Unintentional Wheels Up Landing
Nose Down/overturned
Critically Low Or Exhausted
Contaminated
Incorrect Type
ACT OF VIOLENCE
Aircraft excursion
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
SIGNIFICANT LOSS OF CONTROL/PERFORMANCE
AVOIDING ACTION
OVERWEIGHT LANDING
ABNORMAL LANDING
AIRFRAME FAILURE
Initial Failure Of Control Surface
Initial Failure Of Fuselage
Initial Failure Of Empennage
Initial Failure Of Wing
Initial Failure - Other
Aircraft Standing
Aerodrome Structure
Animal (not Bird)
Bird
Chimney/mast/pole
Ditch
Embankment
Fence/fence Post
Person
Building
Approach Lights
Taxiway/runway Lights
Tree
Vehicle
Wire/cable/powerline
Other
NEAR COLLISION /STRIKE OBJECT
NEAR COLLISION AIRCRAFT ON GROUND
NEAR COLLISION TERRAIN
Both Moving On Ground

COMPONENT/SYSTEM MALFUNCTION
Avionics
Brake
De-icing
Doors/panels
Electrical
Flight Controls
Fuel
Gear
Hydraulic
Instruments
Navigation System
Pneumatic
Pressurisation
Tyre/wheel
Main Rotor
Tail Rotor
Main Rotor Transmissions/gearbox
Maint Rotor Tail Shaft
Tail Rotor Drive Shaft
Struck By Propellor / Rotor / Jet Blast
Sinking Through Surface
Struck By Object
Struck By Stairs / Equipment
GEAR COLLAPSED/RETRACTED
Main Gear
Nose Gear
Complete Gear
Other Gear
LOSS OF CONTROL
Directional Control
Mush/stall
Spin
Spiral
Pitch Control (porpoise)
Other
LOSS OF CONTROL (HELICOPTER)
Dynamic Roll-over (heli)
Inadequate Rotor Rpm (heli)
Settling With Power (heli)
Uncontrolled Rotation (heli)
Other
Fuel Starvation
Mechanical/engine Failure
Non Mechanical Engine Failure
Simulated Engine Failure
Transmission Failure
Driveshaft Failure
Unspecified
Fire
Fumes/smoke
Other
EVACUATION
Insecure Barrier
Scraped Wingtip/cowling/float
Tail Scrape/overrotation
Groundloop/swerve
Hard Landing
Wheels Down Landing On Water
Intentional Wheels-up Landing
Intent Unknown Wheels-up Landing
MISSING AIRCRAFT
Fire/smoke/fumes
Gpws
FAILURE OF EMERGENCY EQUIP/PROCS
EMERGENCY DECLARATION
Incorrect Quantities Loaded
Airspace Incident
NEAR COLLISION
AIR PROXIMITY
Near Miss
Runway Incursion Category A
Runway Incursion Category B
SPILLAGE/LEAKAGE
FUMES/GAS/SMOKE
SABOTAGE
HIJACK/UNLAWFUL SEIZURE
BOMB/DEVICE WARNING/SCARE
Endangering transport
UNLAWFUL INTERFERENCE
Theft

Reason Model – Latent Failure Model

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

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

Diagram 1

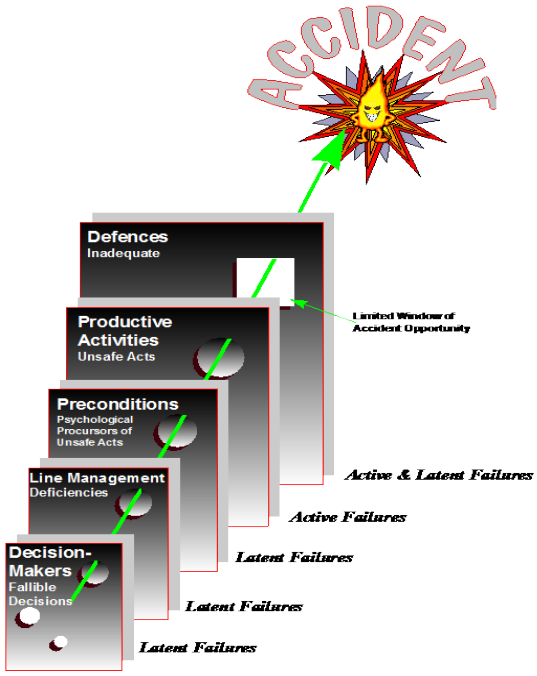


Diagram 1 shows the layers of defences that have been created within the aviation system to prevent accidents and incidents happening. It also shows how these defences have holes in them. When these holes line up there is a window of opportunity for an accident or incident. All that is needed to complete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

Diagram 2

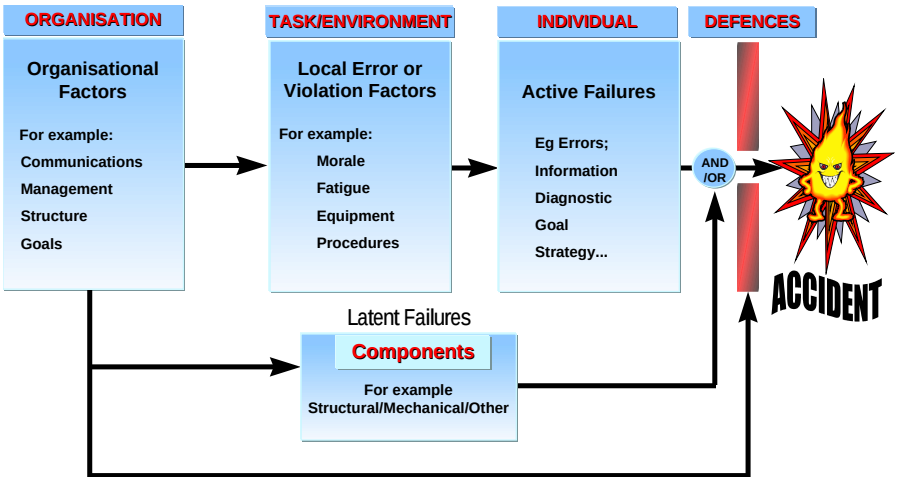


Diagram 2 shows how the latent failures are grouped into 3 areas:

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

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