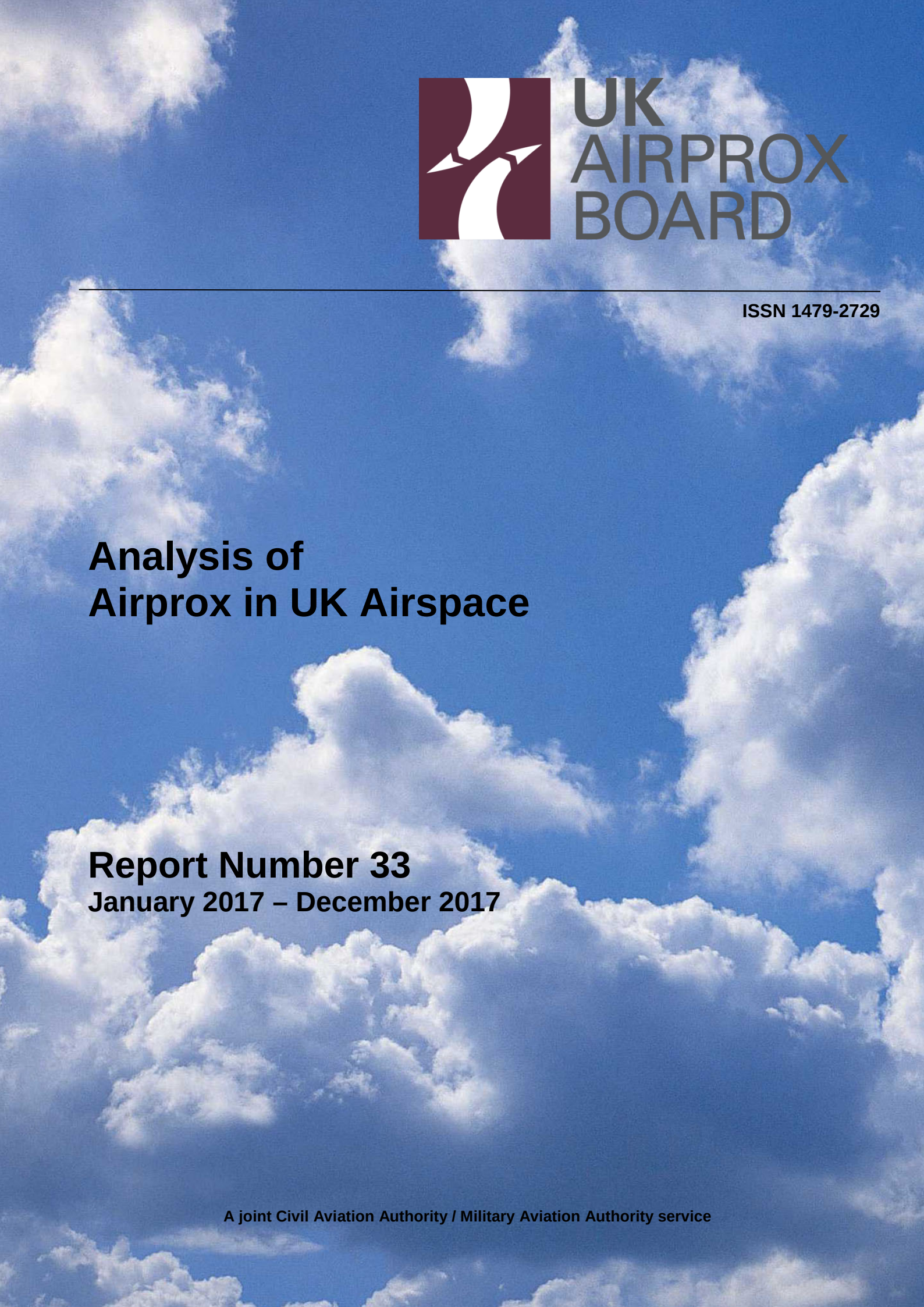

UK AIRPROX BOARD

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Analysis of Airprox in UK Airspace

Report Number 33
January 2017 – December 2017

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Thirty-Third Report by the UK Airprox Board

Analysis of Airprox in UK Airspace

(January 2017 to December 2017)

Compiled by Director UK Airprox Board for

The Chief Executive Officer
UK Civil Aviation Authority

and

The Director
UK Military Aviation Authority

CONTENTS

OVERVIEW

Overall Summary and Trends

The UK Airprox Board (UKAB) assessed 272 Airprox in 2017, of which 159 were aircraft-to-aircraft encounters and 113 involved incidents with small unmanned air systems (SUAS) comprising 93 drones, 1 model aircraft, 6 balloons, and 13 unknown objects.[1] The number of aircraft-to-aircraft encounters was slightly less than in 2016 (when 171 incidents were reported) but the number of SUAS encounters continued the increasing trend of recent years and was significantly more (there were 94 SUAS incidents in 2016). As in previous recent reports, I have provided data for Airprox with and without SUAS involvement for each aircraft category to ensure that only like-for-like comparisons and trend deductions are made over the years.

In preparation for moving away from singular Airprox cause descriptions towards a best-practice 'multiple contributory factor' safety-management perspective, the Board continued to evolve the introduction of last year's mid-air-collision (MAC) safety barrier assessments within the Airprox assessment process during 2017. Although the associated assessment and analysis methodology continues to evolve as we refine its application, I am confident that the outcomes provide a richer understanding of 'why' Airprox occurred compared to the previous simplistic view of 'what' happened in a particular incident. To that end, I have not included the customary analysis of Airprox cause frequencies by sector in this report, which simply served to provide an aggregate view of self-evident causes such as 'did not see'. Instead, the section on safety barriers provides an overview of each barrier's performance over the year that indicates where effort might best be focused to enact systemic improvements.

Focussing on non-SUAS incidents only, Table 1 and Figures 1 & 2 corroborate last year's assessment that 2014's peak in reporting seems to have been a blip, with 2017 continuing to reflect previously expected reporting levels. That being said, of the 159 aircraft-to-aircraft incidents this year, 62 (39%) were assessed as risk-bearing events where safety was not assured (Risk Categories A & B).[2] This represents an increase both in risk-bearing pure numbers and overall percentage. Even taking the 2014 blip into account, the conclusion is that, although Airprox incident numbers are broadly stable in themselves, those that

[1] For Airprox reporting purposes, SUAS are broken down into 4 categories: drones; balloons (including toy balloons and meteorological/research balloons); model aircraft; and unknown objects. SUAS Airprox usually involve only a fleeting encounter wherein the reporting pilot is often only able to give an outline description of the other air vehicle; as a result, the distinction between a drone, model aircraft and object is often down to the choice of wording by the reporting pilot. UKAB policy is to review the associated description and, if the reporting pilot has positively described something with drone-like properties (e.g. '4 rotors') then that is taken at face-value as a drone; if the reporting pilot can only vaguely describe 'an object' then that is classified as an unknown object. The distinction between 'drone' and 'model aircraft' is more difficult given that many fixed-wing drones are not easily distinguishable from model aircraft. Although the UKAB tries to take the context of the sighting into account, it is likely that some reported 'model aircraft' incidents were probably drones.

[2] Risk categories are defined within the Glossary of definitions and abbreviations at the end of this annual report. Note that Category E was only introduced in 2011, and similar events would probably have previously been classified as Category C: the seeming reduction in Category C occurrences since then should be viewed in this light.

are reported have proportionally become riskier in the last 5 years or so as indicated by the dashed line in Figure 2. Hopefully our focus on safety barriers and associated education efforts will bear fruit in this respect in future years; in 2017 we launched the '5 seconds to impact' campaign that emphasised the need not only for robust lookout but also the underpinning importance of gaining situational awareness about other aircraft through ATC; electronic conspicuity and associated on-board collision warning systems; and robust planning.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	10-year Average
Category A	13	11	12	23	18	22	26	27	17	13	18
Category B	38	36	33	36	27	43	65	52	41	49	42
Category C	100	97	116	88	97	72	85	75	79	75	88
Category D	4	3	6	2	5	9	6	5	8	4	5
Category E	-	-	-	12	14	26	33	18	26	18	21
Annual Totals	155	147	167	161	161	172	215	177	171	159	169
Risk Bearing %	33%	32%	27%	37%	28%	38%	42%	45%	34%	39%	36%

Table 1. Non-SUAS Airprox Notifications and Risk Assessment Statistics

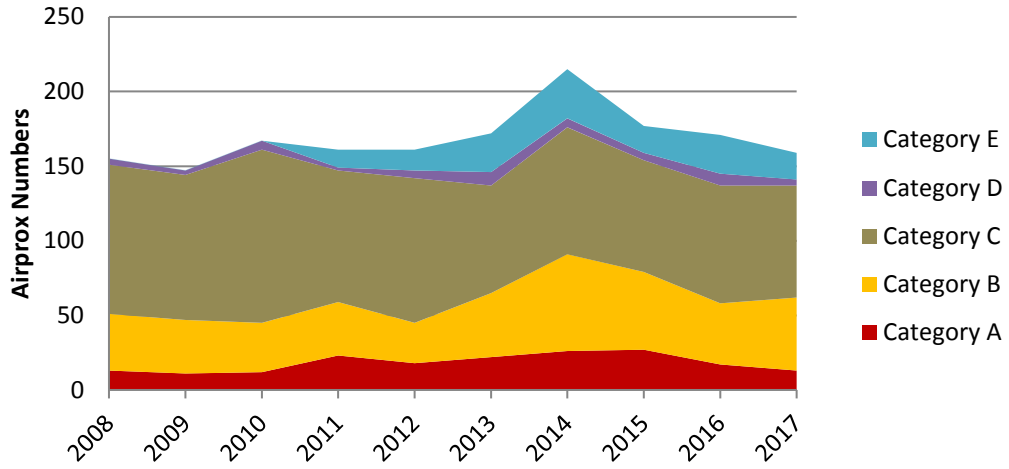


Figure 1. Non-SUAS 10-year Airprox Trend

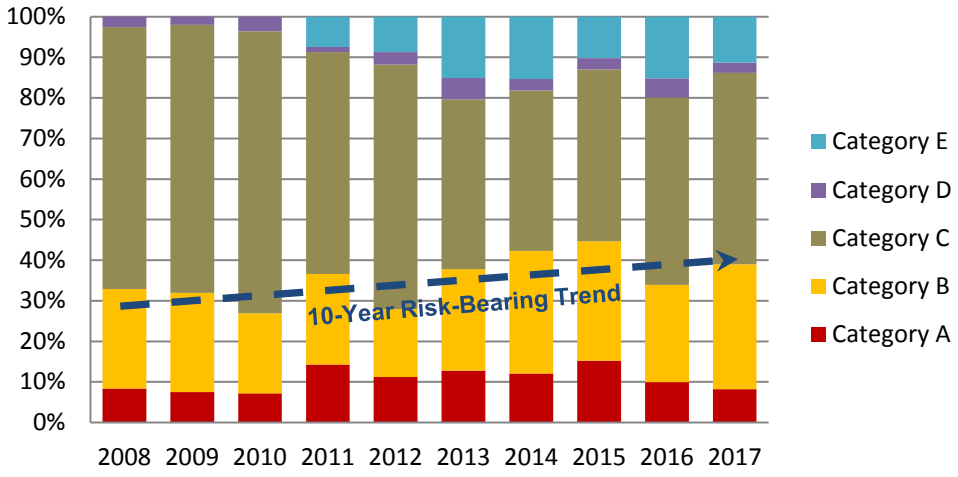


Figure 2. Non-SUAS 10-year Airprox Risk Distribution

When the SUAS figures are included the picture is even worse. Not only are overall reported incident numbers rising rapidly, but the proportion that are risk-bearing is very high. Table 2 and Figures 3 & 4 illustrate this. With respect to SUAS collision risk, it is notable that, of the 113 incidents reported for 2017, 65 (57%) were categorised as risk-bearing. That so many of the SUAS incidents are risk-bearing compared with aircraft-to-aircraft incidents is attributed to the fact that drones, by their small nature, are difficult to see and so it is probably only the closer events that are reported. If we were to assume the same risk-bearing rate as for aircraft-to-aircraft incidents (39% in 2017) then the 65 risk-bearing SUAS incidents would indicate that there would have been 166 SUAS incidents overall in 2017 (i.e. at least 50 or so SUAS incidents were not observed in 2017).

Whilst it may be tempting to discount SUAS Airprox as less important than aircraft events, the fact that they are mostly associated with CAT aircraft raises societal concerns about their perceived level of threat and their associated impact hazard. It is not for the Board to comment on the risk from collision, but simply to address the risk of collision. We will continue to report drone incidents whilst other agencies consider the reality of the collision hazard to the different aircraft types in their various flight regimes.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	10-year Average
Category A	13	11	12	23	18	22	28	41	51	45	26
Category B	38	36	33	36	27	43	68	66	72	82	50
Category C	100	97	116	88	97	72	86	78	104	111	95
Category D	4	3	6	2	5	9	9	12	11	12	7
Category E	-	-	-	12	14	26	33	20	27	22	22
Annual Totals	155	147	167	161	161	172	224	217	265	272	194
Risk Bearing %	33%	32%	27%	37%	28%	38%	43%	49%	46%	47%	39%

Table 2. Total Airprox Notifications and Risk Assessment Statistics

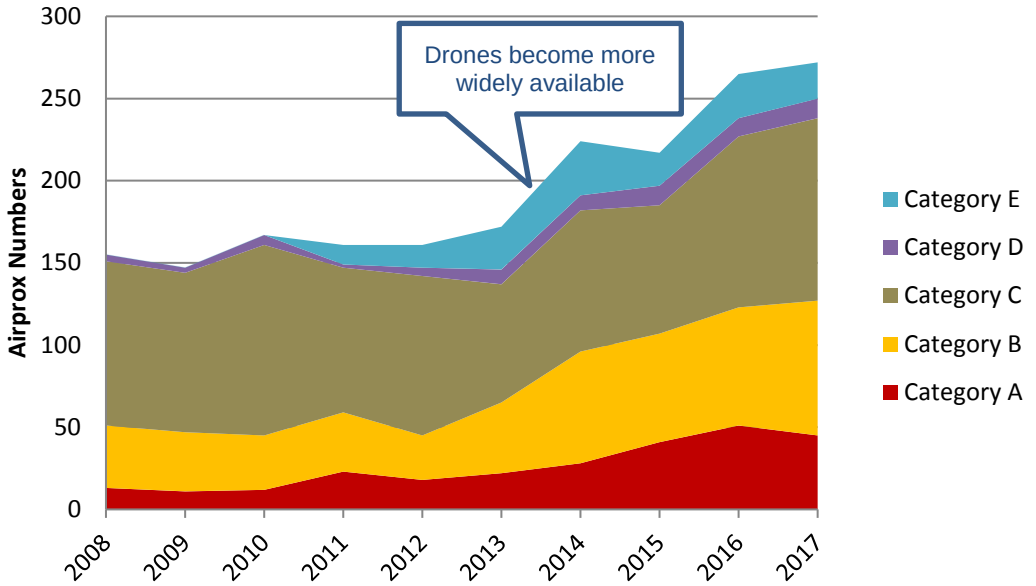


Figure 3. Total 10-year Airprox Trend

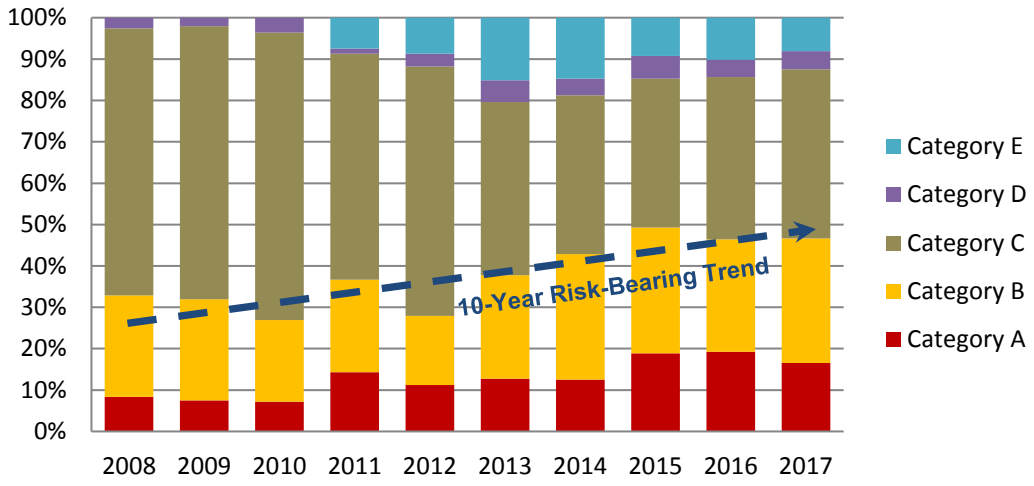


Figure 4. Total 10-year Airprox Risk Distribution

Looking at the longer-term trends since the UKAB was formed, Figures 5 & 6 show the aircraft-to-aircraft incidents from 1995 to 2017. Discounting the 2014 spike, it can be seen that reporting trends for 2015-2017 are returning to post-2005 norms, although the headline number of risk-bearing Airprox is increasing as previously reported: from 2006 to 2012, the baseline risk-bearing trend was about 50 incidents; at 62, 2017's number reflects the increasing trend.

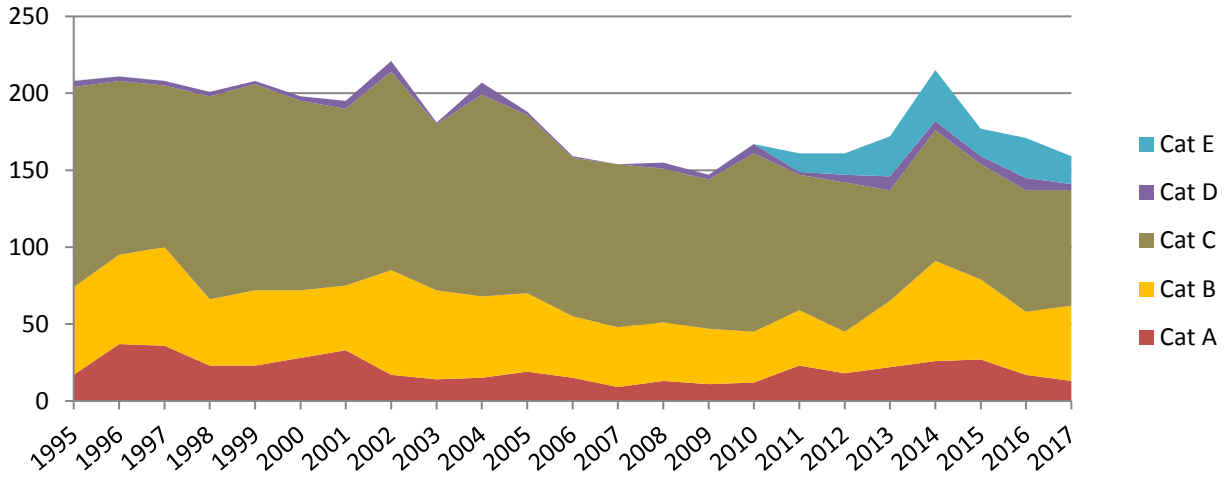


Figure 5. Airprox Numbers – non-SUAS 20-year Trend

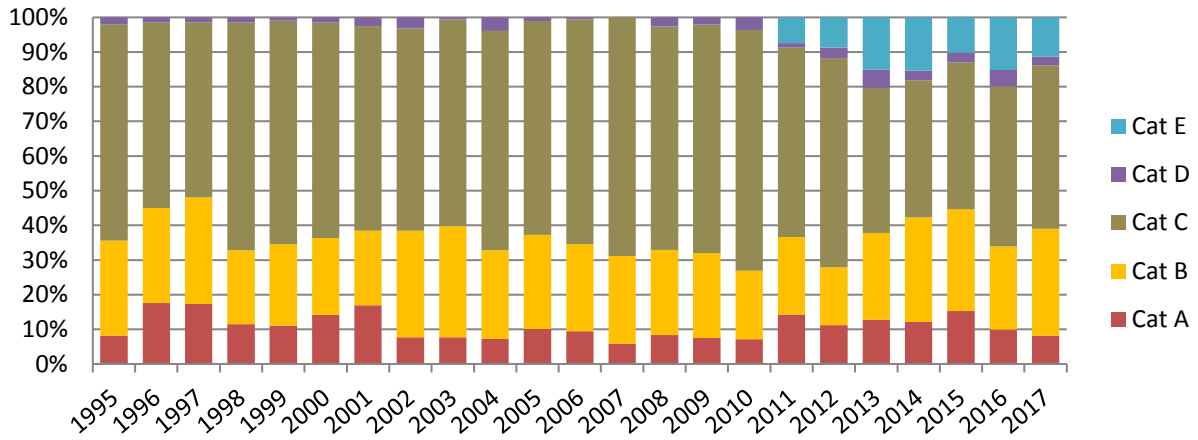


Figure 6. Airprox Risk Distribution – non-SUAS 20-year Trend

Risk-Bearing Trends

Some vagaries in risk classification must be expected because of the subjective nature of both the ICAO Airprox definition and the Board's assessment process (both of which are qualitative in nature rather than quantitative). Even bearing this in mind, there is a clearly increasing trend in riskiness percentage for overall occurrences over the last 10 years as reflected both in Figure 7 (with SUAS) and Figure 8 (without SUAS). What can be said is that in 2008 the non-SUAS risk-bearing percentage was trending near 30%, whereas in 2017 it was almost 40%.

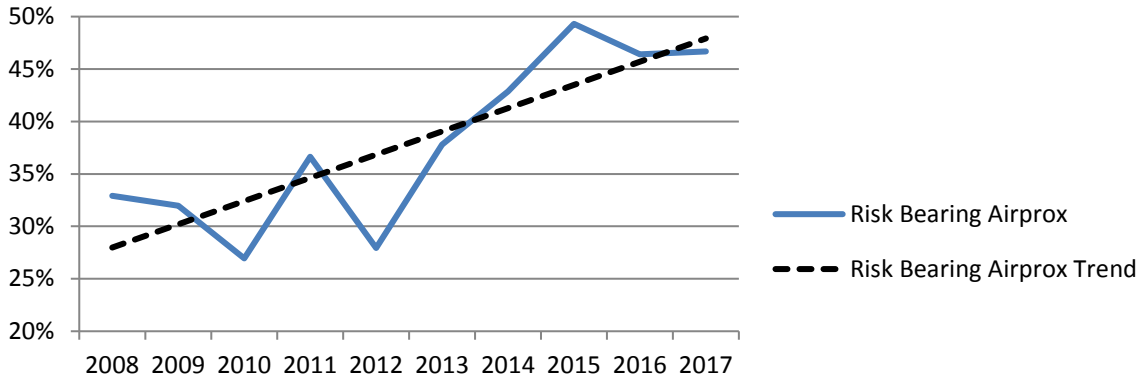


Figure 7. Overall Risk-Bearing Airprox - 10-year Percentage Trend

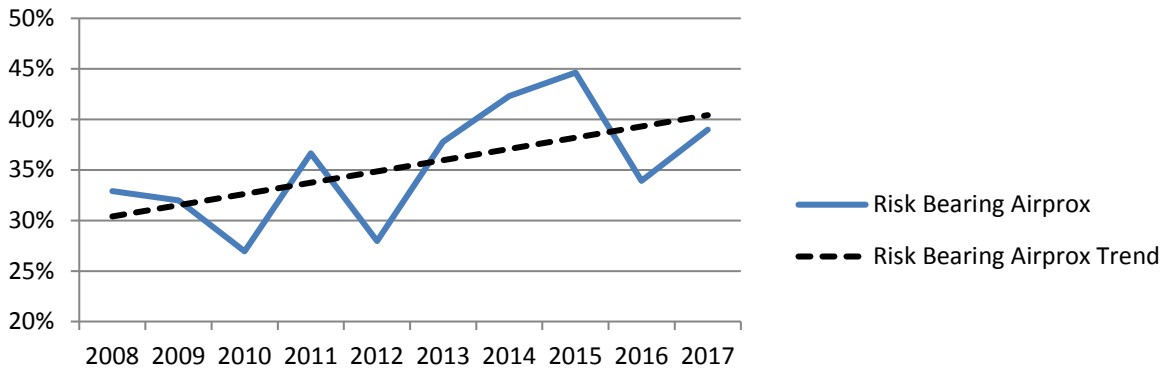


Figure 8. Non-SUAS Risk-Bearing Airprox - 10-year Percentage Trend

Sub-categorising the non-SUAS risk-bearing numbers and percentages into their respective aircraft sectors indicates an increasing overall trend for all categories other than military Airprox as shown in Table 3 and Figures 9 and 10.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GA	39	27	29	46	33	51	78 (1)	64 (6)	46 (10)	52 (18)
Emerg Servs	1	1	1	3	2	3	5	2	2	6 (1)
Mil	22	31	25	30	21	28	31 (2)	29 (3)	22 (6)	17 (7)
CAT	2	1	0	1	1	4	4 (2)	3 (19)	1 (48)	3 (42)

Table 3. Risk-Bearing Airprox by Aircraft Group (SUAS Risk-Bearing figures in brackets)

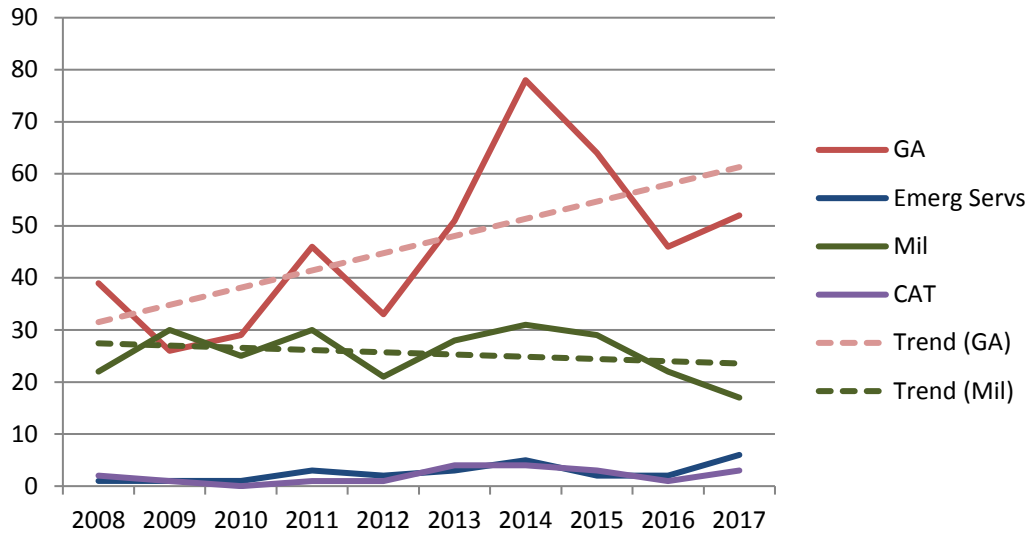


Figure 9. Non-SUAS Risk-Bearing Numerical Trends by Group

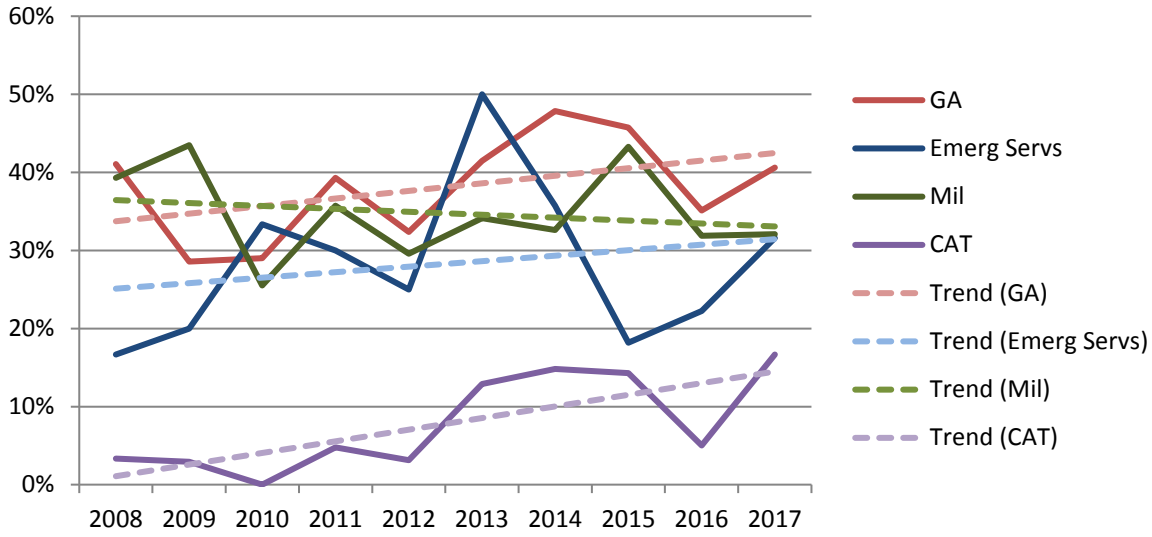


Figure 10. Non-SUAS Risk-Bearing Percentage Trends by Group

Risk-bearing percentage graphs for CAT and Emerg Servs groups should be treated with care given the low numbers of their overall Airprox; even a small change in the number of risk-bearing incidents can translate into a large change in percentage value as indicated by the spiky nature of their respective graphs.

Airprox Trends Normalised for Flying Hours

Analysing Airprox trends using pure numbers of incidents does not always give a reliable understanding of the underlying Airprox rates related to activity levels and flying hours. The following Airprox rates per million flying hours provides an appreciation for year-on-year trends in this respect although caution needs to be exercised when quoting specific yearly values because the collation of reliable flying hour statistics is notoriously difficult due to the fact that much of sports-aviation activity is not logged, and obtaining accurate military flying hours for UK flying is complicated by the fragmented nature of their database systems and the

fact that, for transport aircraft, many flights are a mix of UK and non-UK activity that is not easily apportioned to either. With this in mind, Table 4 shows the best estimate figures I can obtain from CAA and military sources. These indicate that, overall, UK flying hours have been steadily recovering over the last 5 years, although there is some way to go yet before the pre-recession figures are regained. Figure 11 shows these flying hours figures overlain on the 10-year non-SUAS trend graph itself and as trend lines. Notwithstanding reductions since 2014, it can be seen that, over the last 10 years both the total and risk-bearing overall Airprox rates per million flying hours (mfh) are steadily increasing.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CAT Hours x 10K	163.5	149.4	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6
GA Hours x 10K	135.1	131.2	113.0	104.0	96.2	92.3	93.2	88.0	83.9	93.0
Mil hrs x10K	40.1	43.2	31.8	31.1	25.6	24.2	25.0	24.2	25.6	21.1
Total Hrs x10K	338.7	323.7	286.4	282.3	267.2	265.6	269.7	267.1	270.9	281.6
Total Airprox / mfh	46	45	58	57	60	65	80	66	63	56
RB Airprox / mfh	15	15	16	21	17	24	34	30	21	22

Table 4. UK Flying Hours 10-year Statistics

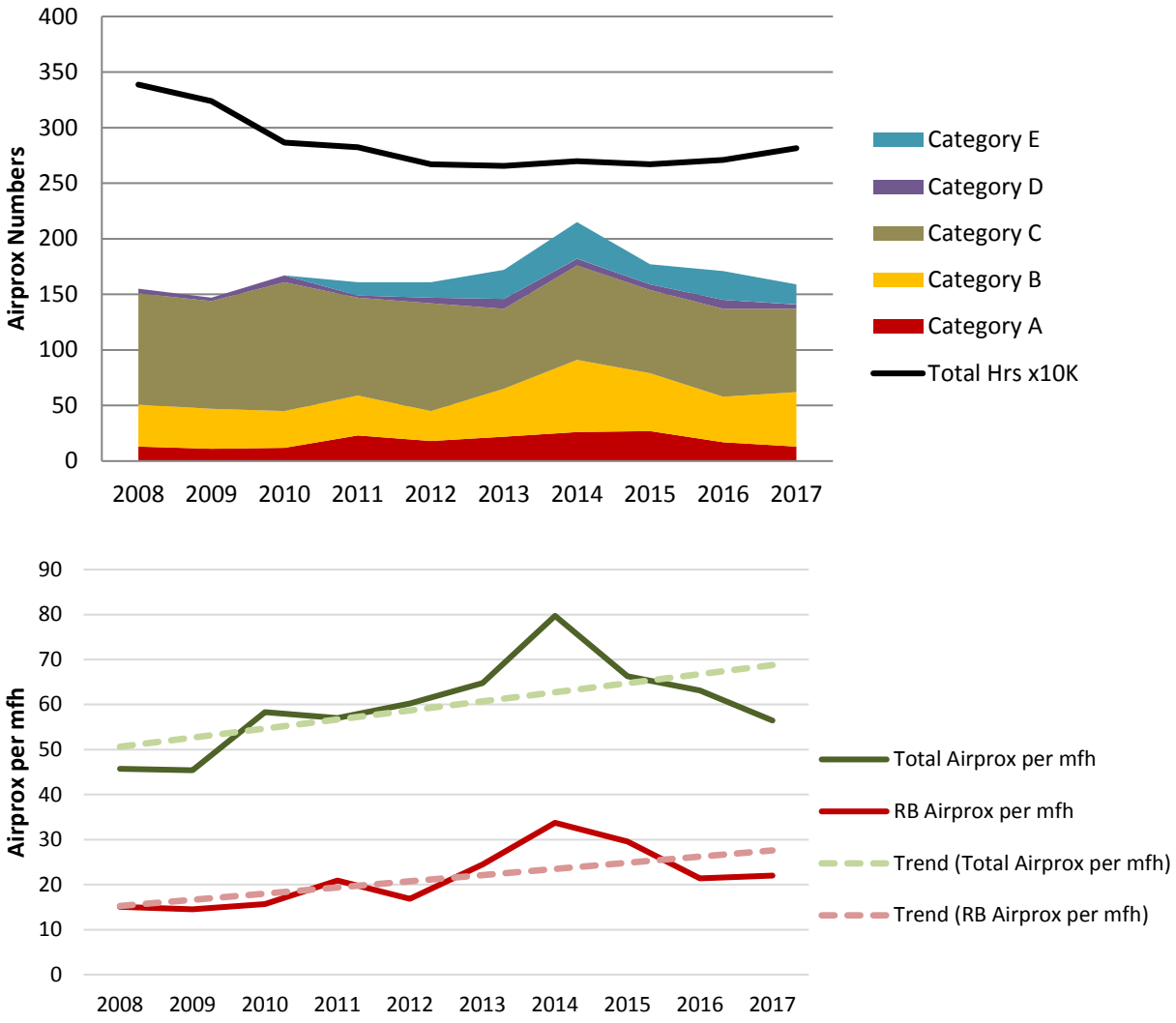
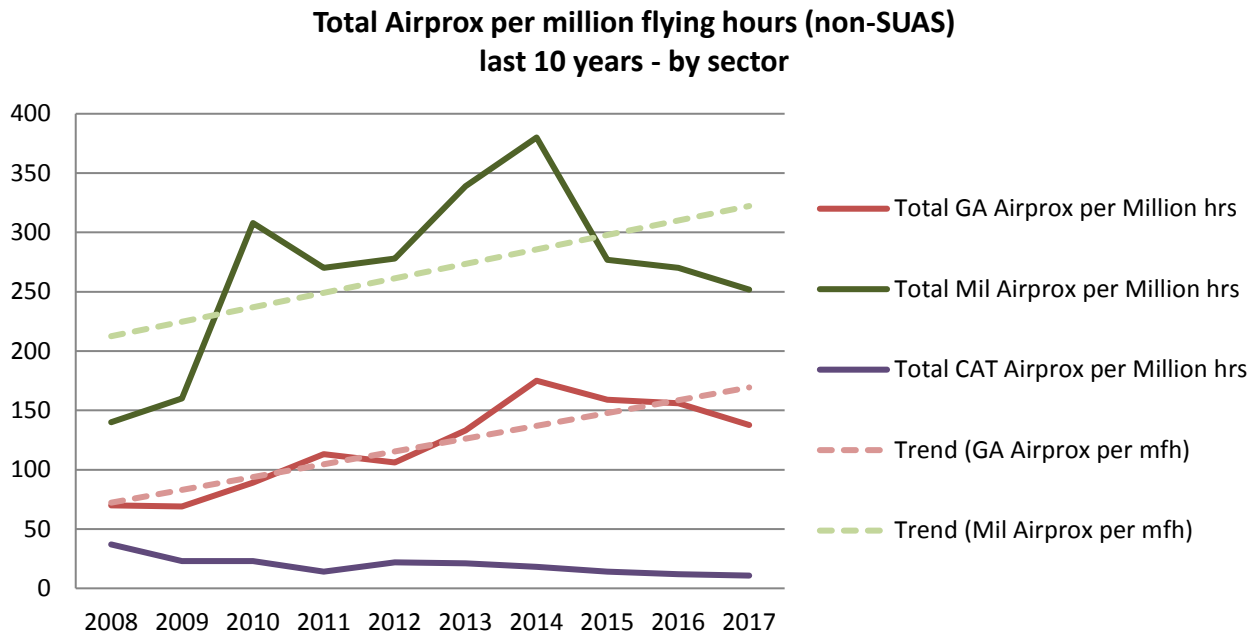


Figure 11. Overall non-SUAS 10-year Trends Compared with Flying Hours

Table 5 and Figure 12 break these Airprox per mfh numbers down by aircraft sectors.[3] There has been a welcome decrease in both GA and military Airprox per mfh since the 2014 peak, although the underlying trends for both total and risk-bearing Airprox per mfh remains upwards for both sectors. Also of note, the military rates for both total and risk-bearing Airprox are consistently about 1½ to twice the GA rate. On the face of it, the conclusion is that, hour-for-hour, military pilots are therefore about twice as likely to experience an Airprox than GA pilots.[4]

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total GA Airprox per mfh	70	69	89	113	106	133	175	159	156	138
GA Risk Bearing Airprox per mfh	29	20	26	44	34	55	84	73	55	56
Total Mil Airprox per mfh	140	160	308	270	278	339	380	277	270	252
Mil Risk Bearing Airprox per mfh	55	69	78	96	82	116	124	120	86	81
Total CAT Airprox per mfh	37	23	23	14	22	21	18	14	12	11
CAT Risk Bearing Airprox per mfh	1	1	0	1	1	3	3	2	1	2

Table 5. Non-SUAS Airprox per mfh by Sector of Aircraft - last 10 years



[3] Currently, I do not have specific flying hours data for Emergency Services and so they are not included within the table or graph.

[4] Moreover, the level of under-reporting of GA hours (unknown microlight, paraglider, paramotor etc hours) is likely to be much more than any errors in the estimate of military flying and so the GA Airprox rates per mfh may be even lower thereby increasing this differential.

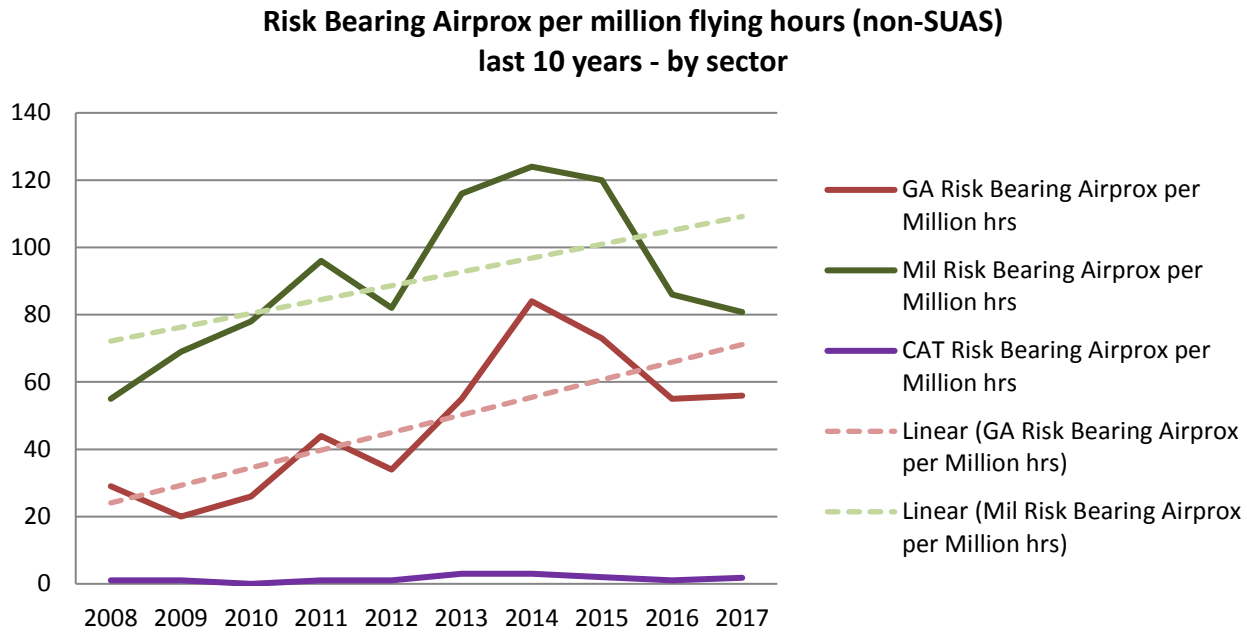


Figure 12. Airprox per mfh by Sector of Aircraft – last 10 years

Airprox by Sector Involvement

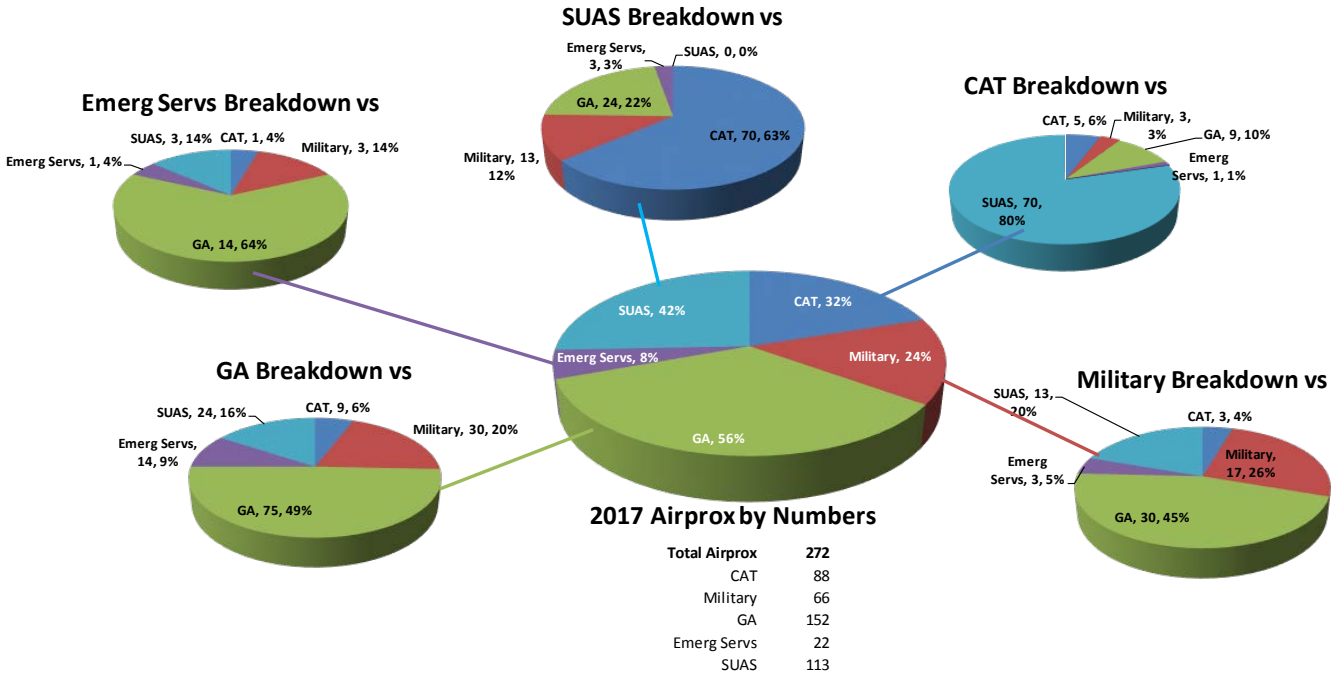
Table 6 and Figure 13 illustrate the 2017 Airprox-by-numbers breakdown by sector involvement. Note that the figures do not add up to the total number of Airprox in the year (272) because each Airprox may involve 2 classes of aircraft. Thus, a GA-GA Airprox will count as one GA involvement, whilst a GA-Mil Airprox would count as both a GA and a Mil involvement. Similarly, the total percentages do not add up to 100 for the same reason. The headline figures for all Airprox in 2017 are: 56% involved GA; 24% involved military; 8% involved Emerg Servs; 32% involved CAT (mostly vs SUAS); and 42% involved SUAS (mostly vs CAT). For aircraft-to-aircraft-only Airprox (i.e. no SUAS) the corresponding figures are: 81% involved GA; 33% involved military; 12% involved Emerg Servs; and 11% involved CAT.

	CAT	Military	GA	Emerg Servs	SUAS	Unknown	Total	Total as % of Airprox
CAT	5	3	9	1	70	0	88 (18)	32% (11%)
Military	3	17	30	3	13	0	66 (53)	24% (33%)
GA	9	30	75	14	24	0	152 (128)	56% (81%)
Emerg Servs	1	3	14	1	3	0	22 (19)	8% (12%)
SUAS	70	13	24	3	0	3	113 (0)	42% (0%)
Unknown	0	0	0	0	3	1	4 (1)	1% (1%)

Table 6. 2017 Total Airprox by Sector Involvement (non-SUAS totals in brackets)

In the 2 pie charts of Figure 13, the large central pie shows the division of all Airprox by sector involvement, with and without SUAS respectively, The smaller satellite pies show the sub-division of involvements within each of the sectors

(i.e. for the 152 Airprox involving GA in the first chart: 49% were with other GA aircraft; 20% were with military aircraft; 6% were with CAT; 16% were with SUAS; and 9% were with Emerg Servs aircraft.



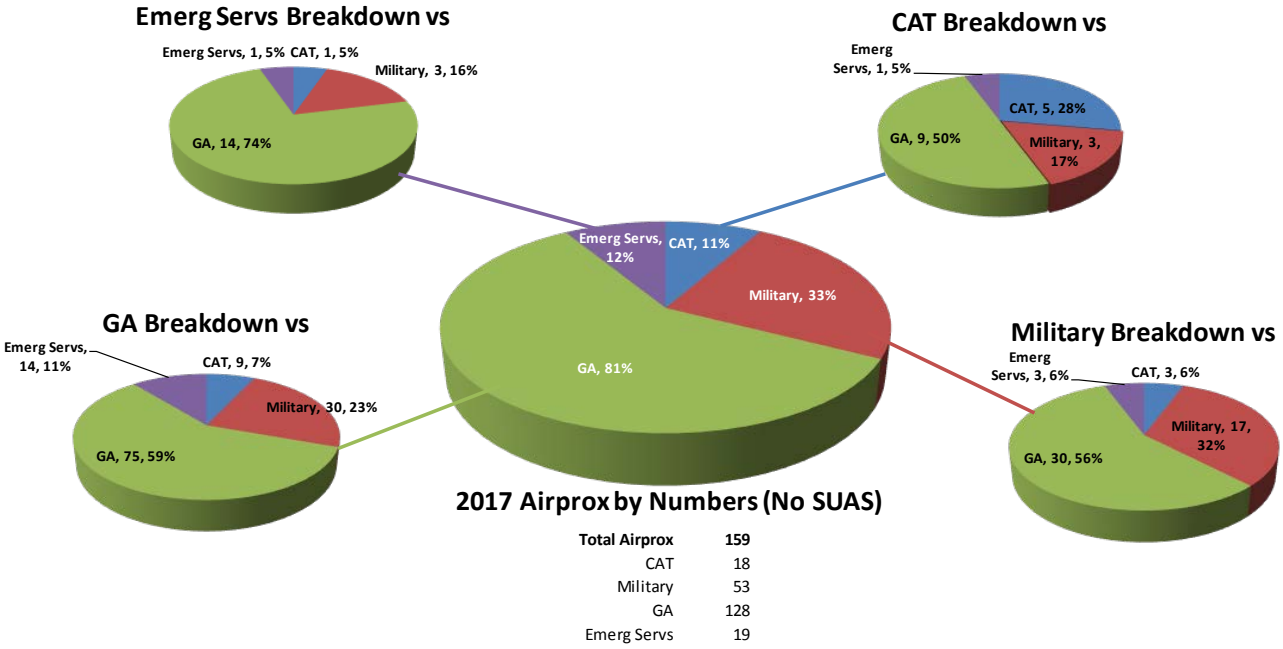


Figure 13. 2017 Total Airprox by Sector Involvement

In headline terms, the first chart shows that the greatest collision risk for GA remains other GA; for military it is GA; for CAT it is SUAS; for Emerg Servs it is GA; and for SUAS it is CAT. If SUAS are discounted (as in the second chart), the only change is that the biggest risk for CAT becomes GA. In other words, for aircraft-to-aircraft incidents, the biggest threat for all sectors is GA.

Safety Barriers

As previously mentioned, 2017 saw us evolve the concept of Airprox analysis by safety barriers as introduced in 2016. Intended to develop a more systematic approach to incident analysis, the barriers were based on those in common use within mid-air collision (MAC) bow-tie analysis, modified slightly from the 2016 versions to incorporate experience gained through use. Each barrier was attributed a weighting depending on the airspace type (i.e. in controlled airspace see-and-avoid has less importance as a safety barrier compared to Class G airspace). Barriers were then graded for each incident for their effectiveness in terms of their availability and functionality. The 9 barriers used in 2017 were: ATM regulations and procedures; ATM manning and equipment; ATM situational awareness and action; ATM warning systems; Flight-crew regulations and procedures; Flight-crew tactical planning; Flight-crew situational awareness and action; Onboard warning systems; and See & avoid. Airprox assessments were presented on a chart for each incident that showed the weighting as the length of each barrier and the effectiveness as the colour. Figure 14 shows examples for hypothetical incidents both outside and within controlled airspace.

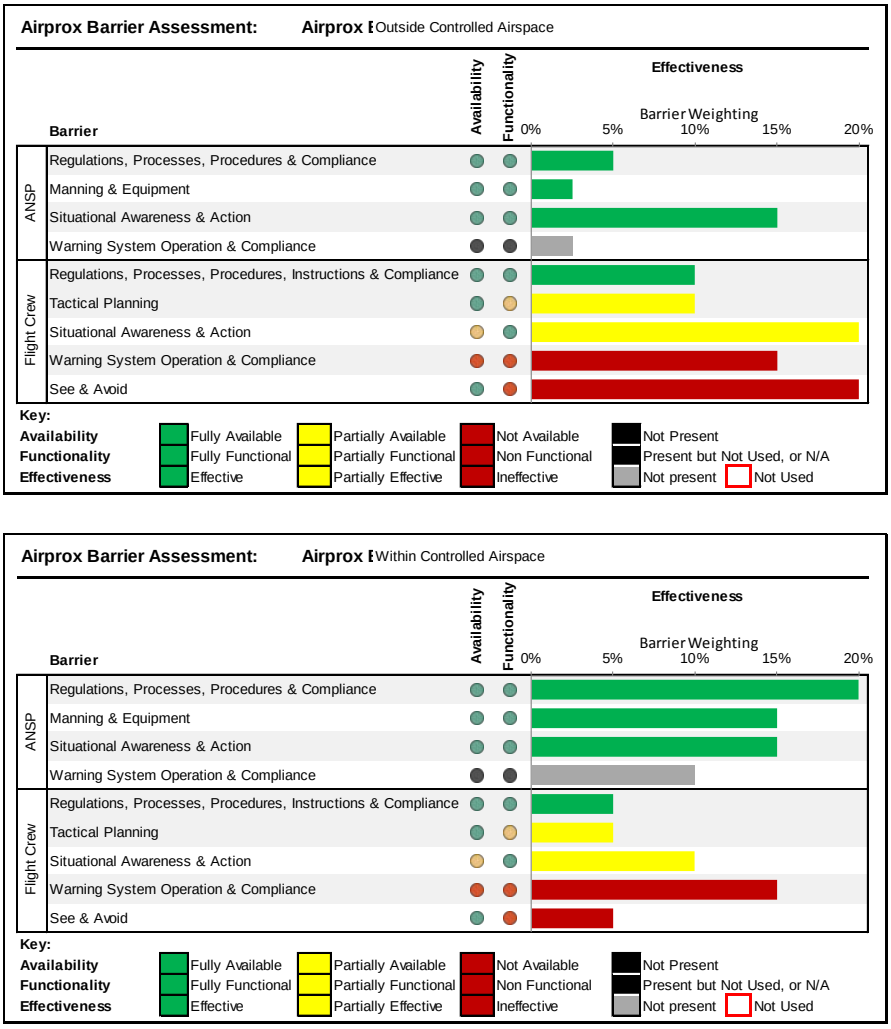


Figure 14. Examples of 2017 Airprox Barrier Assessment Outcomes

A word-picture chart for each barrier ensures consistency in assessment (see the glossary of definitions and abbreviations at the end of this report). Even so, not every incident fitted into these word-pictures and so individual assessments required a degree of subjective judgement. Although the outcome for each incident is of interest, the real strength of the process comes from analysing the aggregate outcomes over the year to develop a measure of overall effectiveness and associated insights. For 2017, Table 7 and Figure 15 show the combined outcomes as a percentage of the 162 Airprox assessed in this manner.[5]

Barrier Assessment:	Effectiveness Percentage Count					Effectiveness Numerical Count					Check Sum Total Incidents
	Absent	Ineff	Partly Eff	Fully Eff	Not Used	Absent	Ineff	Partly Eff	Fully Eff	Not Used	
ATC Regs, Processes, Procedures & Compliance	17%	6%	11%	66%	0%	27	10	18	107	0	162
ATC Manning & Equipment	22%	2%	5%	72%	0%	35	3	8	116	0	162
ATC Situational Awareness & Action	26%	21%	17%	25%	12%	42	34	27	40	19	162
ATC Warning System & Compliance	90%	3%	1%	5%	1%	146	5	1	8	2	162
Pilot Regs, Processes, Procedures & Compliance	1%	19%	17%	64%	0%	1	30	27	104	0	162
Pilot Tactical Planning	0%	12%	35%	52%	0%	0	20	57	85	0	162
Pilot Situational Awareness & Action	0%	41%	38%	21%	0%	0	66	62	34	0	162
Warning System Operation & Compliance	33%	28%	12%	25%	2%	53	45	20	41	3	162
See & Avoid	0%	14%	42%	39%	6%	0	22	68	63	9	162

Table 7. 2017 Aggregate Barrier Performance (162 Assessed Incidents)

Barrier assessments of 'Ineffective', 'Partially Effective', and 'Fully Effective' are self-explanatory from their respective word-pictures. 'Absent' refers to situations where the barrier was not present (e.g. in much of Class G airspace ATC is not present and therefore the barrier is absent), whilst 'Not Used' refers to incidents where the barrier was available but not used by the pilots (e.g. ATC may have been available but an appropriate Air Traffic Service (ATS) was not requested).

Some pertinent deductions from the raw figures are:

- See-and-avoid was only fully effective as a barrier in 39% of incidents.
- Onboard collision warning/avoidance equipment was absent or ineffective (mostly due to incompatibilities between aircraft) in 61% of incidents.
- Pilot situational awareness was either ineffective or only partially effective in 79% of incidents. The lack of situational awareness regarding other aircraft is a key area for focus – if they know the other aircraft is there, most pilots will do something about it. Engagement with ATC; electronic conspicuity/collision warning systems; and thorough pre-flight planning are all key channels for improving pilot situational awareness.
- Pilot tactical planning was effective in 52% of incidents but only partially so in 35% (often due to pilots not modifying their plan in flight to account for changing circumstances).
- Pilot compliance with procedures was fully effective in 64% of incidents but more can be done to improve the 36% of incidents when it was not. Many of these latter incidents involved poorly flown overhead joins and flying too close to glider/microlight/paradropping sites for example.

[5] Most SUAS incidents were not assessed using the barrier methodology because of the lack of sufficient information given that the SUAS operator was not known and could therefore not contribute their perspective. Incidents that were reported by SUAS operators were included in the analysis.

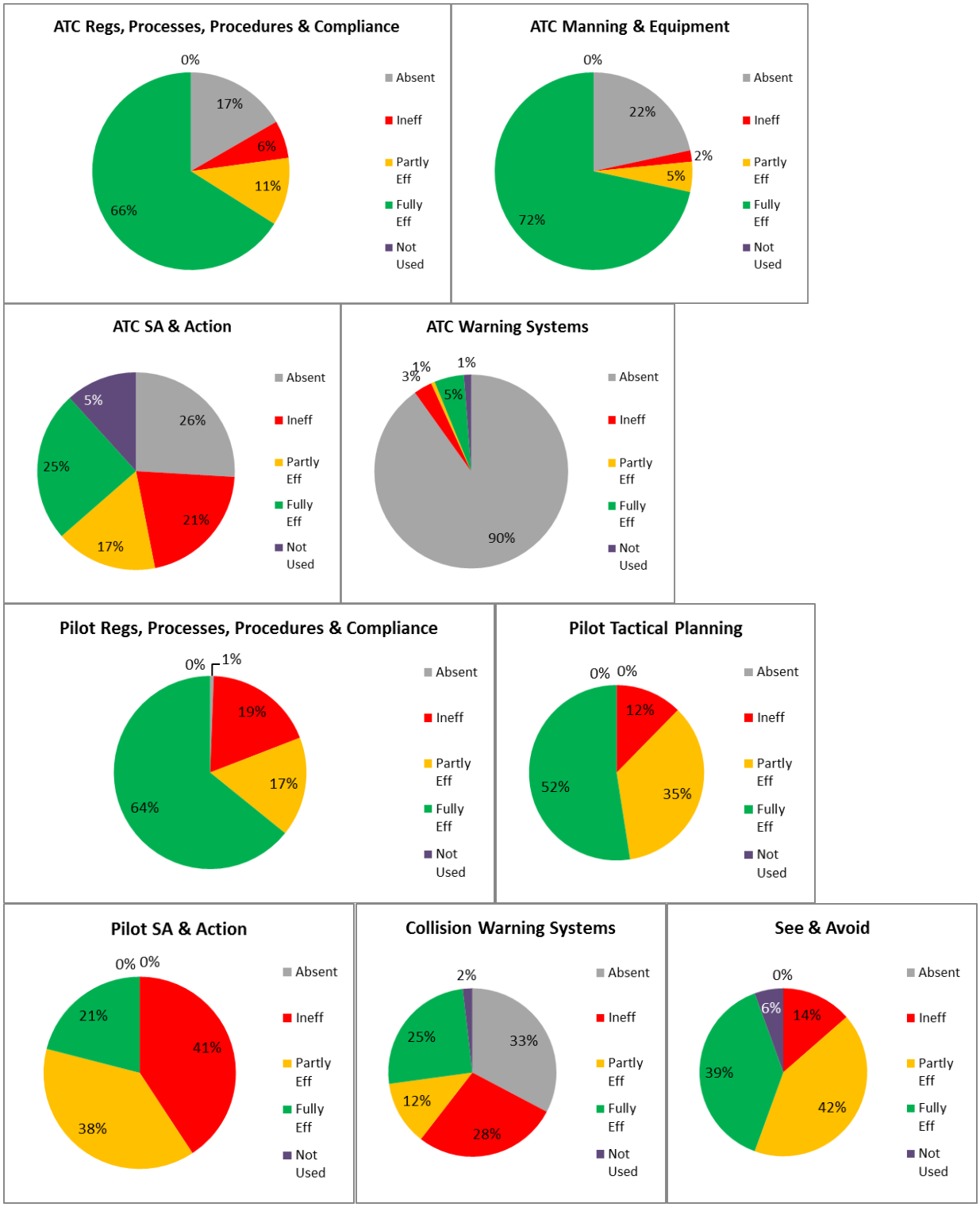


Figure 15. 2017 Airprox Barrier Dashboard (162 Assessed Incidents)

Airprox Education Themes

Based on the above barrier analysis and overall causal outcomes, educational messages were developed for a 2017 campaign titled '5 seconds to impact'. This campaign employed 6 easily understood themes as indicated in Figure 16. This messaging was deployed to the GA community from Spring 2017, including a

short video and annual magazine. Both of these products are available on the UK Airprox Board website at www.airproxboard.org.uk within the 'Director's Topical Issues and Themes' area.

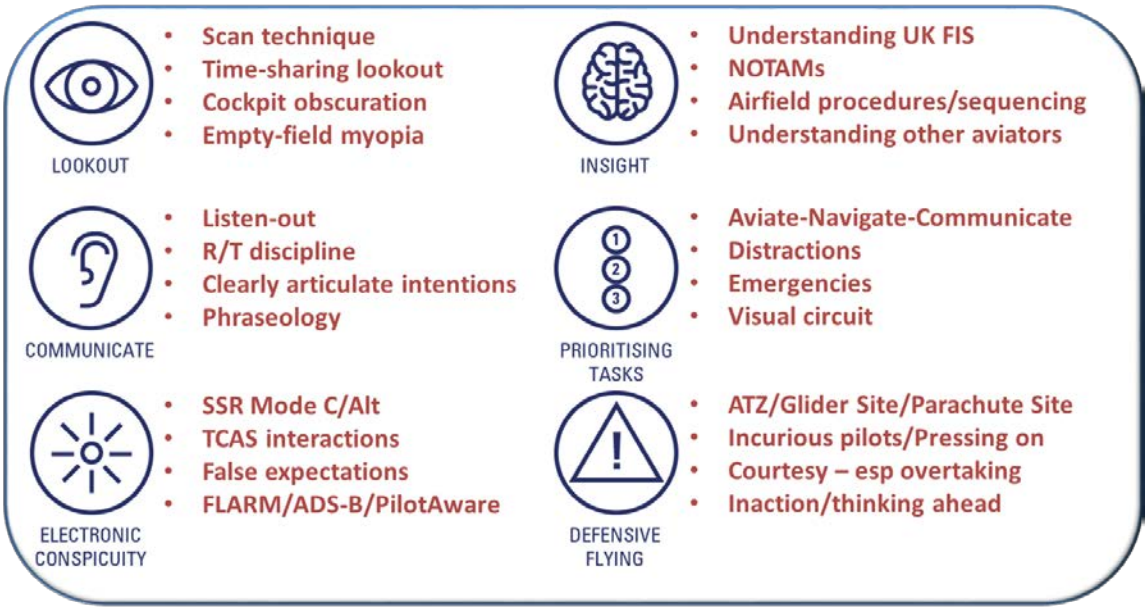


Figure 16. 2017 Airprox Education Themes

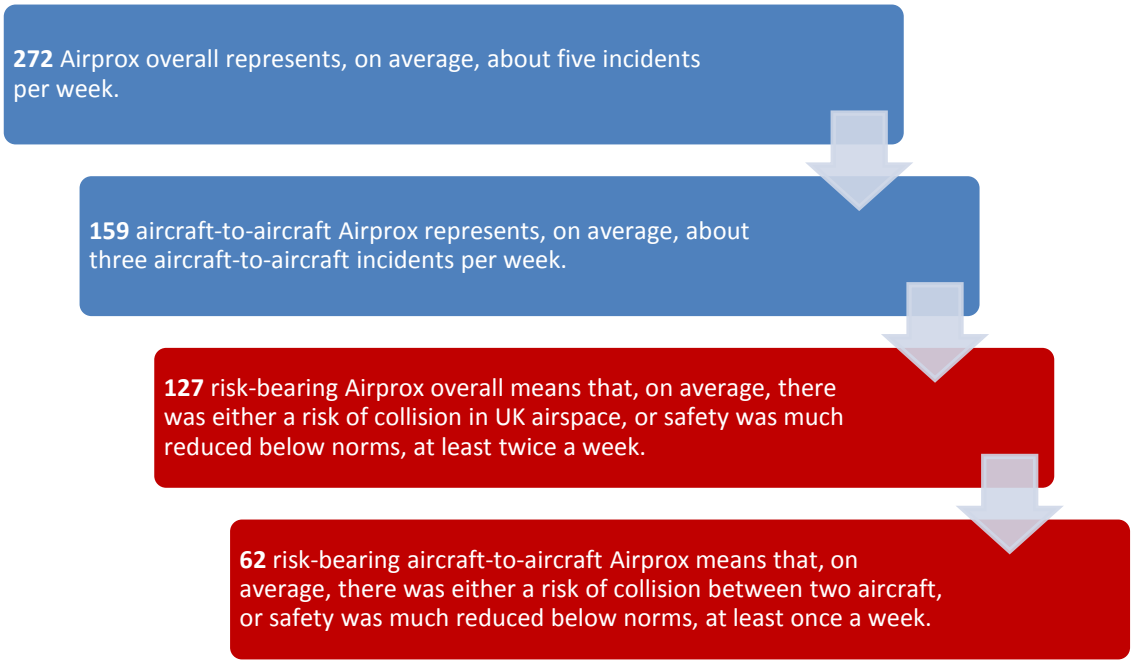
The following report sections provide more detailed overviews of Airprox statistics and trends by sector, intended to provide analysis on how things are progressing year-on-year. The subjective nature of Airprox reporting and assessment, and the small number of incidents compared to the overwhelming number of flights where Airprox were not encountered, means that care should be taken in drawing too many definitive conclusions. Notwithstanding, and as highlighted in the safety barrier analysis, there are areas that appear to offer key opportunities for improvements.

Principally, situational awareness is the key to avoiding Airprox. Whether this is derived from ATC, onboard systems or thorough pre- and in-flight planning, most pilots will act on information if they are aware of the other aircraft; that being said, we also see some disappointing incidents where pilots do not act, often based on the false assumption that the other pilot has seen them and will give way.

Electronic conspicuity (and the counterpart collision warning systems) are becoming increasingly affordable and I have often extoled their virtue when presenting to GA audiences. It is not for me to recommend particular systems, but it is clear that effort is required to ensure compatibility between them and I note that the CAA views ADS-B as the most likely route to achieving this. Market forces will no doubt come into play, and low-power peer-to-peer capability appears to be gaining support as a method for achieving this in an affordable manner. Care needs to be taken to ensure however that the emergent system is the best-of-market rather than the best-marketed.

Statistics and trends can sometimes mask the overall meaning of the analysis. In short, Airprox are near-accidents, and risk-bearing Airprox reflect incidents

where aircraft very nearly collided, or safety was at least much reduced below the norm. That being said, as for every other Airprox annual report, I stress that caution should be exercised when trying to identify trends and lessons from what is a statistically small sample size compared to the many thousands of flights that are conducted without incident within the UK's airspace. Nevertheless, in purely numeric terms, 272 overall incidents in 2017 represents, on average, an Airprox occurring in UK about every working day. Of these, 127 risk-bearing incidents indicates that, on average, a collision very nearly occurred in UK airspace (or safety margins were at least much reduced) more than twice a week. Even when looking at only the aircraft-to-aircraft Airprox, 159 incidents represents about 3 Airprox a week on average, and with 62 risk-bearing aircraft-to-aircraft incidents in 2017, on average 2 aircraft nearly collided every week. In assessing the relevance of these statements, it is worth noting that, although annual correlations vary over the last 20 years, on average, there is one MAC event in UK airspace for every 20 risk-bearing Airprox (and one for every 60 Airprox overall).



This report and associated individual Airprox reports are available online at www.airproxboard.org.uk (or by email on request). An annual Airprox magazine is also published online which focuses on GA Airprox incidents and issues in a more digestible and relevant format for the wider aviation community, along with other relevant information and collision avoidance educative material.

Steve Forward
Director UK Airprox Board

AIRPROX REPORTING STATISTICS

Airprox Analysis and Trends - Overview

In common with normal Airprox annual trends, 2017 saw proportionally more incidents in the summer months (when GA are more active), than the rest of the year. Figure 17 shows the breakdown of 2017's flow of occurrences overlain on bars representing the 5-year rolling average for each of the months. The blue bars and blue line represent the aircraft-to-aircraft incidents, whilst the black line shows the total number of Airprox each month (the difference between the blue and black lines being the SUAS incidents). As can be seen, aircraft-to-aircraft incidents were fairly consistent with predictions, other than in September when there were far fewer reports than expected. We have yet to establish a robust pattern for the SUAS incidents although, being also weather dependent, they appear to follow an overall increase in late Spring, Summer and Autumn. The SUAS '5-year' predictions are shown as green bars but are as yet unreliable given that we have only really seen SUAS incidents as they have built over the previous 3 years, and so the numbers have yet to stabilise.

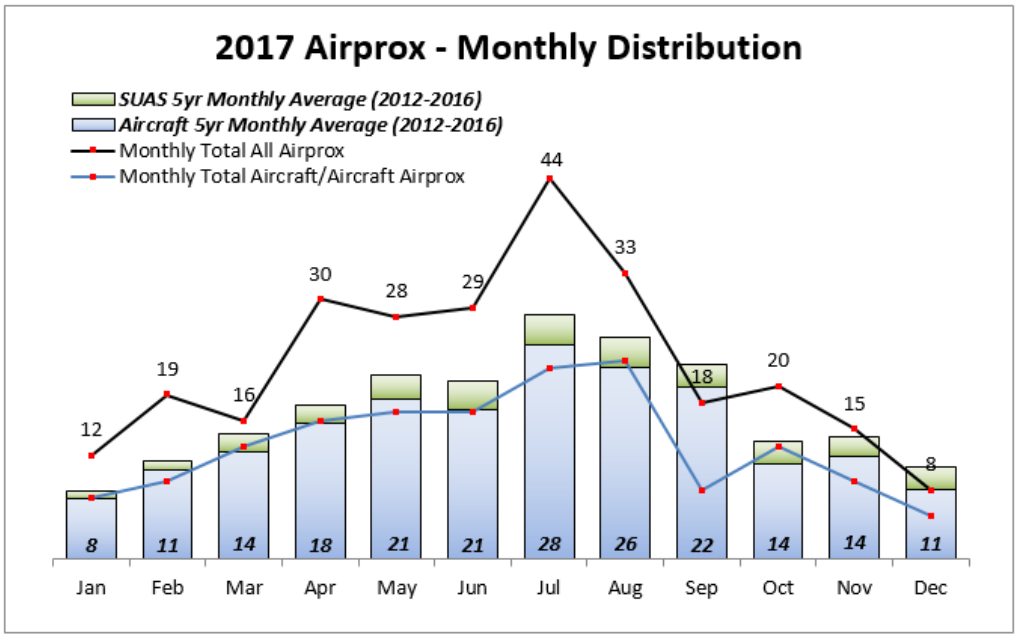


Figure 17. 2017 Airprox Monthly Distribution

Although the reasons for the peaks and troughs above will be many and varied, they are often associated with weather conditions, which naturally affect GA flying rates. Although only one aspect of aviation weather considerations, Figure 18 shows the Met Office rainfall anomaly charts[6] for 2017 compared to the 30-year averages from1981-2010. These reveal a generally drier than average January to May, with a particularly dry April (brown shading); a wet June in the north (blue shading); a fairly average summer (although a moderately wet July in the south); and a drier than average start to the winter in the south.

[6] Available at: http://www.metoffice.gov.uk/climate/uk/summaries/anomacts.

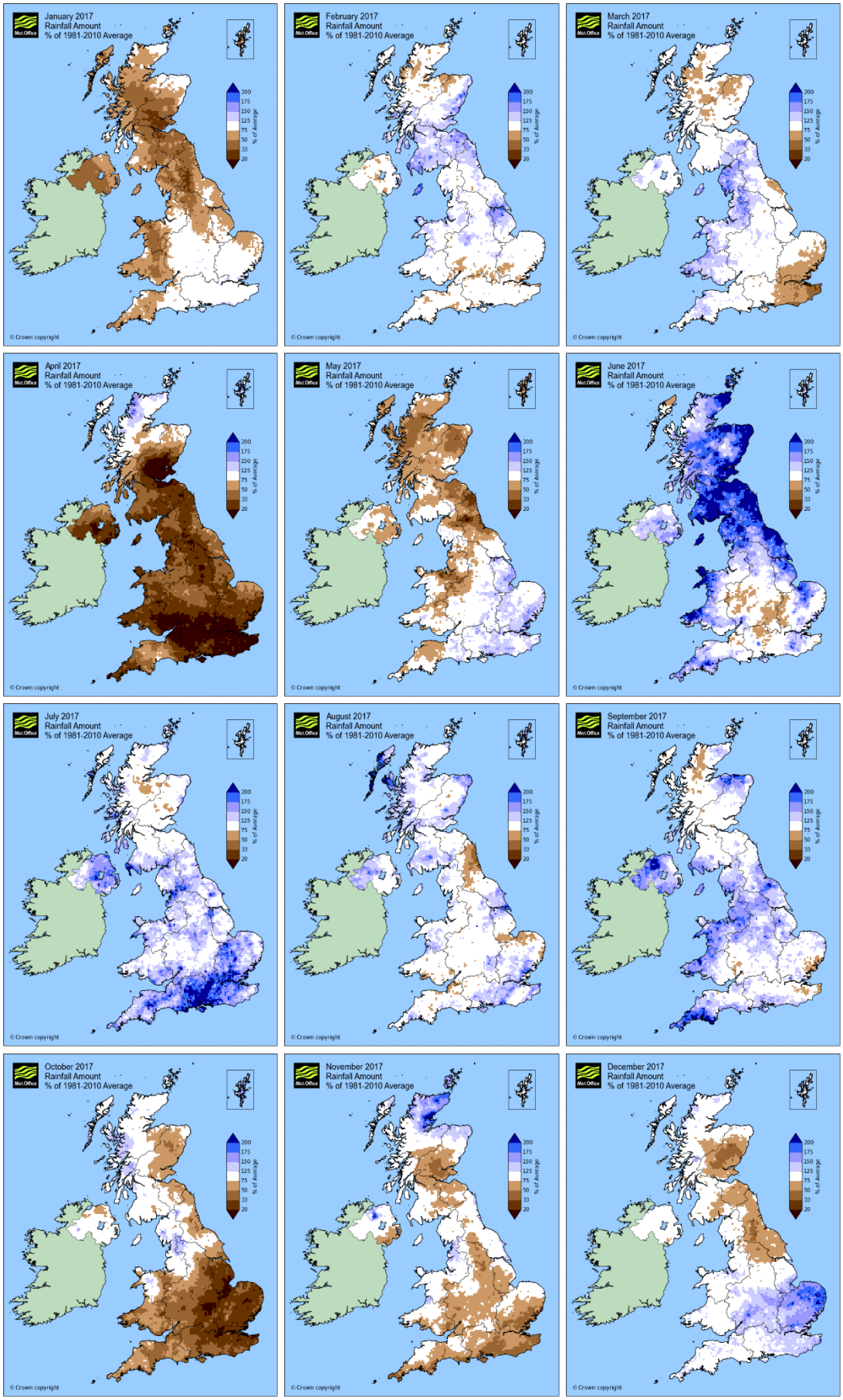


Figure 18. 2017 Seasonal Rainfall Anomaly Charts

These weather charts correlate reasonably well with the Airprox peaks for April, May, August, October and November, although June and July still showed high incidences of Airprox even though the overall weather was somewhat worse than average for these months. Figure 19 shows the corresponding monthly breakdown of aircraft-to-aircraft Airprox incidents by risk, whilst Figure 20 shows the same data but overlain with the percentage of incidents that were risk-bearing (Category A & B).

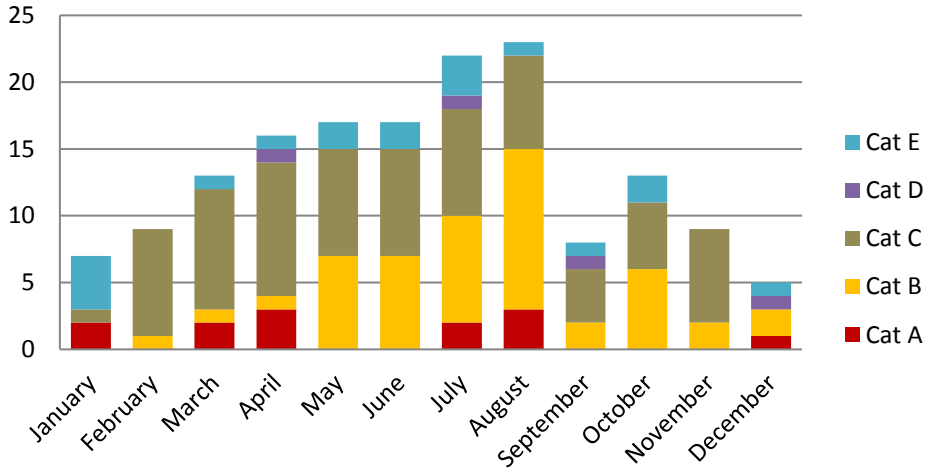


Figure 19. 2017 Airprox Risk Distribution by Month (non-SUAS)

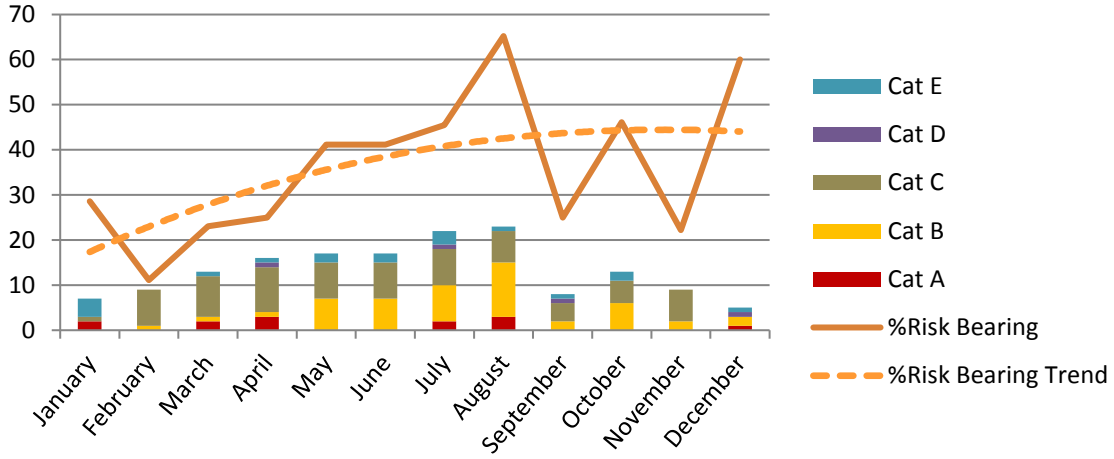


Figure 20. 2017 Airprox Risk-Bearing Trend by Month (non-SUAS)

As in previous years, the trend is for Airprox to initially be quite 'risky' at the start of the year, decline in risk in February, and then steadily rise in risk again in Spring/Summer before tailing off again towards the end of the year (albeit, for some reason, December 2017's Airprox were much riskier than the preceding few months). This is a repeatable pattern over the years and gives credence to the hypothesis that, as the GA flying community came out of 'hibernation' in January (a better than average weather-month in 2017), pilots were perhaps a little rusty and may have inadvertently prioritised their focus on refreshing pure flying skills at the expense of lookout and situational awareness. As the year progresses, the Spring and Summer increases in flying result in an associated increased Airprox exposure overall, and with more aircraft airborne there are therefore more chances of a 'riskier' encounter. There is also a tendency for

those who do not fly regularly, or who are *ab initio* pilots, to focus on the good-weather summer season: because they may be less practiced in lookout, or may have less well-honed flying skills that are absorbing their capacity, they may not see other aircraft either at all, or until the latter stages of an occurrence.

Analysis by User Groups

Table 8 and Figure 21 show the overall total Airprox trends by user group interactions over the last 10 years. As can be seen, the numbers of Military-to-Military incidents have shown a broadly reducing trend in recent years (albeit a minor increase in 2017); Civil-to-Military incidents seem to have stabilised at about 40 incidents per year (although the underlying linear trend is also gradually decreasing over the last few years); and the underlying Civil-to-Civil trend remains firmly upwards even discounting the peaks of 2014 and 2015. 'Other' in previous years refers to unknown aircraft, which can also probably be assumed to be civil.

As previously reported, massively increased numbers of SUAS Airprox remain the stand-out item due to their soaring popularity in the last few years. Incidents have rapidly risen in recent years from only 9 in 2014 to 113 in 2017.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Civil~Civil	97	71	67	75	85	90	120	111	105	103
Civil~Mil	38	35	54	50	39	54	57	41	41	39
Mil~Mil	17	30	31	26	28	19	25	23	15	17
SUAS			6	0	3	0	9	40	94	113
Other/Unknown	3	11	9	10	6	9	13	2	10	0
Totals:	155	147	167	161	161	172	224	217	265	272

Table 8. 10-year Total Airprox Statistics by User Group

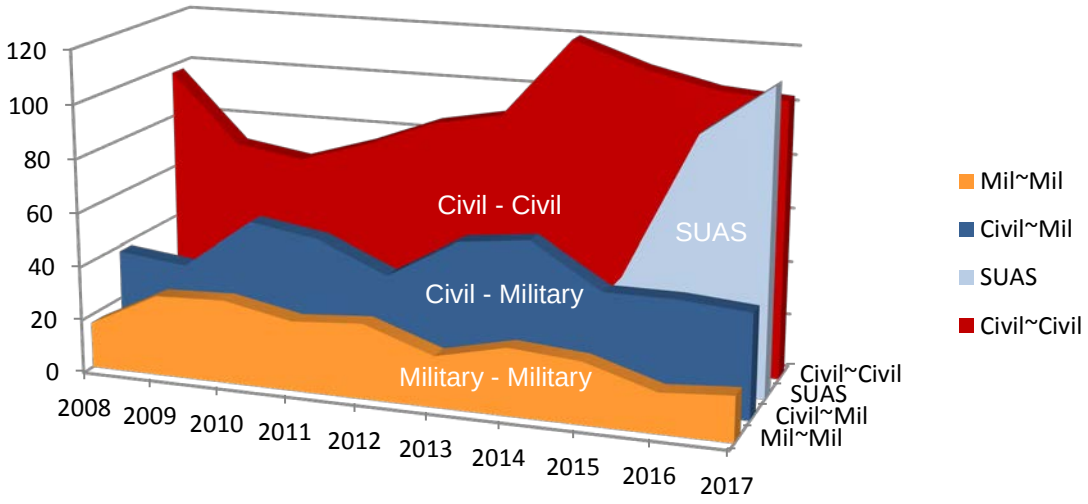


Figure 21. 10-year Total Airprox Trends by User Groups

Analysis by Sector

In order to gain greater granularity of civil Airprox trends, Table 9 and Figure 22 further break down the above user-group statistics into categories that distinguish CAT from GA and Emergency Services.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GA~Mil	24	29	50	52	35	55	54	35	44	31
GA~GA	46	42	43	50	54	59	89	82	76	75
CAT~CAT	24	11	5	4	11	9	5	3	5	5
CAT~GA	22	15	15	12	14	17	17	18	18	9
CAT~Mil	14	7	13	4	6	6	5	4	3	3
Mil~Mil	17	30	31	26	28	19	25	23	15	17
SUAS	0	0	6	0	3	0	9	40	94	113
Emerg Servs~GA	5	2	3	8	4	4	10	9	8	14
Emerg Servs~Mil	1	2	1	1	2	1	4	1	2	3
Emerg~Emerg	0	0	0	0	0	0	0	0	0	1
Emerg Servs~CAT	0	1	0	1	2	1	0	1	0	1
Unknown Ac	2	8	0	3	2	1	6	1	0	0
Total	155	147	167	161	161	172	224	217	265	272

Table 9. 10-year Total Airprox Statistics by Sector

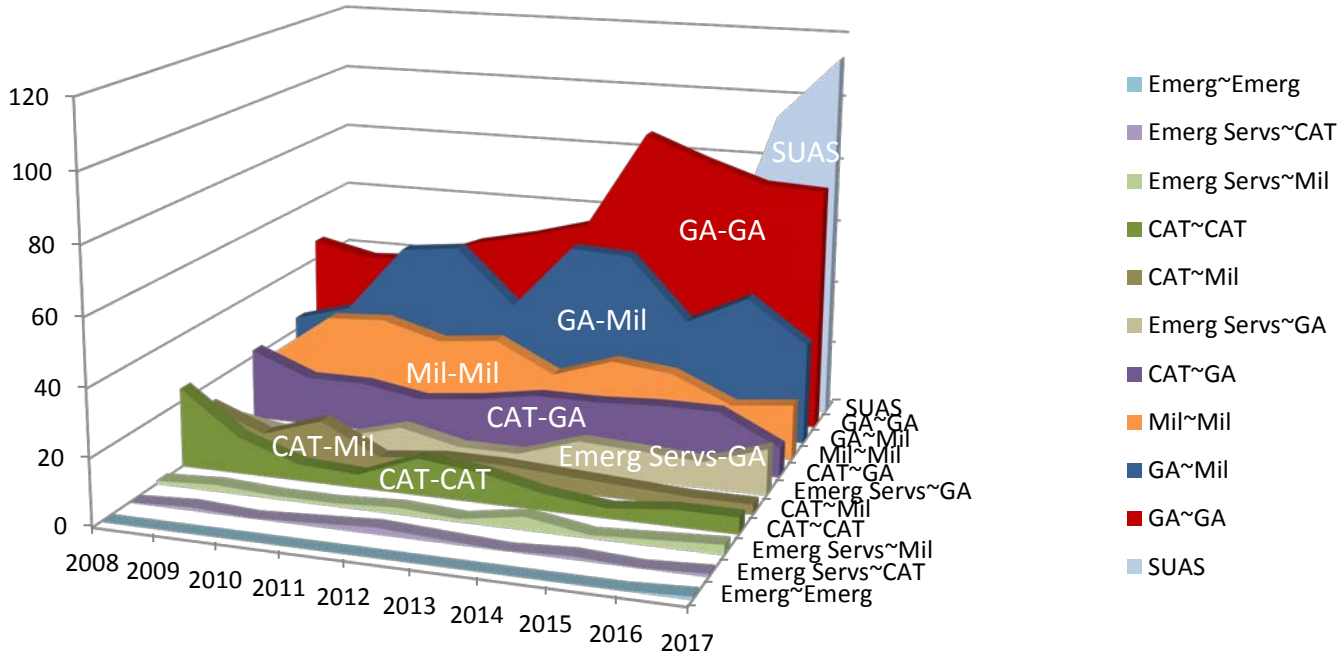


Figure 22. 10-year Total Airprox Trends by Sector

The following observations are pertinent:

- **CAT**: CAT-CAT incidents are few and have been broadly level at 5 a year since 2014; CAT-Mil incidents are also few (3) and in a steady decline; whilst CAT-GA incidents were halved in 2017 compared to recent years (but were still more than double the CAT-CAT/CAT-Mil rates).

- **Mil**: Mil-Mil incidents continue to show an overall gradual decreasing trend over the last 10 years and, although somewhat spikier in data terms, this is also reflected in Mil-GA incidents. Reductions in military incidents possibly reflect overall reduced numbers of military aircraft; high overseas operational tempo; the introduction of CADS[7] (a flight notification and conflict awareness tool used by the military and selected others); transfer of the SAR role to the civil sector (see also the Emergency Services bullet); and the introduction of TCAS to the Tornado fleet. The step-increase and subsequent overall higher reporting rates for military Airprox since 2010 can probably be attributed to the introduction at that time of mandatory military Airprox reporting, the adoption of ASIMS[8], and an associated strong reporting culture within their safety management system.

- **GA**: GA-GA incidents have continued their welcome downward trend since their high point in 2014. However, this needs to be tempered by the knowledge that the overall reporting trend over the last 10 years remains noticeably upward. The 75 GA-GA incidents reported in 2017 represents about 47% of the overall 159 aircraft-to-aircraft Airprox total, which is significantly more than any other sector (GA-Mil being the next largest sector with 31 incidents in 2017 - about 19% of the aircraft-to-aircraft total). Whichever way the statistics are represented, GA has the largest involvement in Airprox overall, with 81% of aircraft-to-aircraft incidents having some form of GA involvement: hence our educational material is targeted mostly at this sector.

- **Emergency Services**: Police, Ambulance and SAR Airprox have been steadily increasing over the last 5 years or so, with 19 incidents in 2017. This reflects the increasing number of Emergency Services aircraft in operation, and especially the fact that the SAR role has now been taken over by the Coastguard vice the military (there were 6 Coastguard incidents in 2017, in previous years these would have been attributed to the military sector).

Analysis by Airspace

Figure 23 shows the distribution of all 2017's Airprox occurrences by airspace involvement. The large numbers of Class A and Class D incidents are almost exclusively the result of SUAS Airprox which have mostly been reported against CAT aircraft either on the approach to major airports or within controlled airspace. Figure 24 shows the corresponding distribution without SUAS, and Figure 25 shows the SUAS distribution. As in all previous annual reports, the most prevalent airspace for aircraft-to-aircraft Airprox is Class G airspace/military low-level areas below 3000ft (78 incidents); this reflects the fact that most GA aircraft operate in that flight regime.

Aircraft-to-aircraft Airprox within ATZ/MATZ remained disappointingly high at 22 incidents this year (about 14% of the total) despite our efforts to educate pilots to

[7] CADS – Centralised Aviation Data Service.
[8] ASIMS – Air Safety Information Management System.

'lookout, listenout and follow procedures'. In this respect, 2017 again saw too many Airprox caused by pilots either not understanding or not conducting overhead joins properly, and similarly frustrating numbers of incidents where pilots failed to integrate with others already established in the visual circuit. There remains a clear case for more education on joins and circuit procedures, and perhaps as a specific topic during periodic instructor flights.

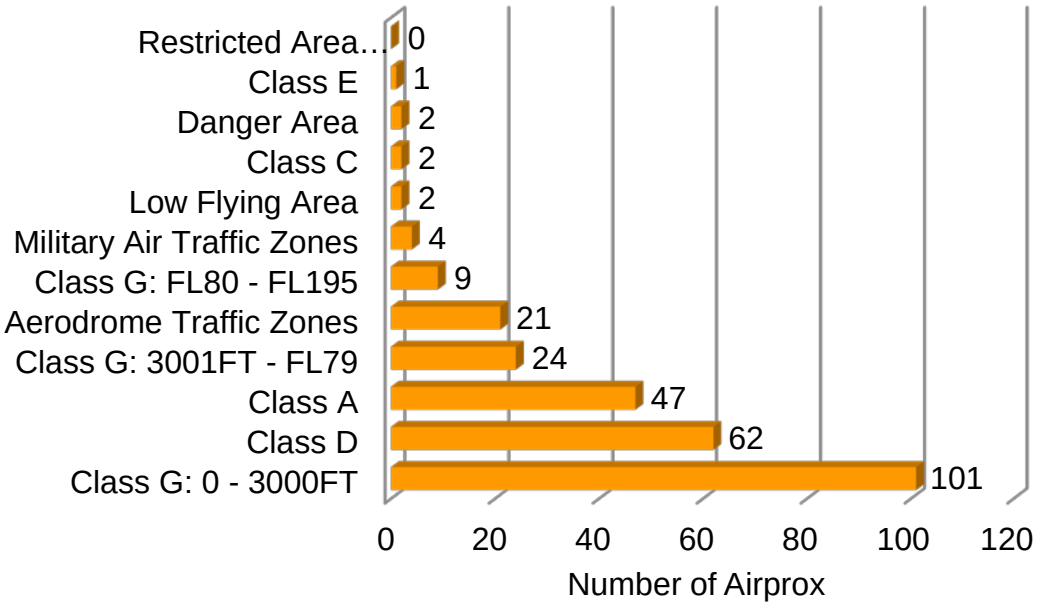


Figure 23. 2017 All Airprox by Airspace Involvement

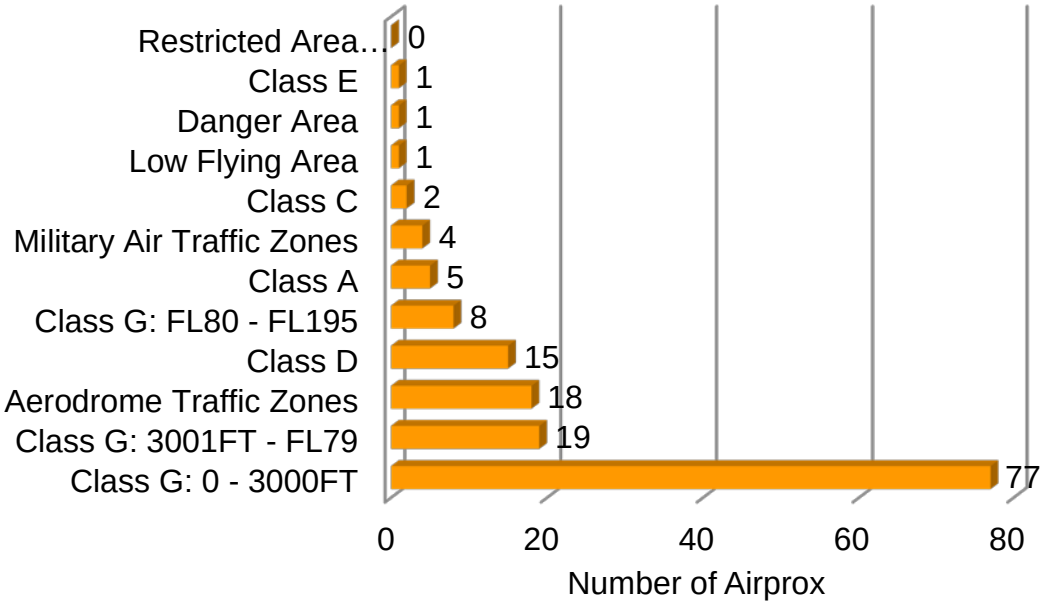


Figure 24. 2017 non-SUAS Airprox by Airspace Involvement

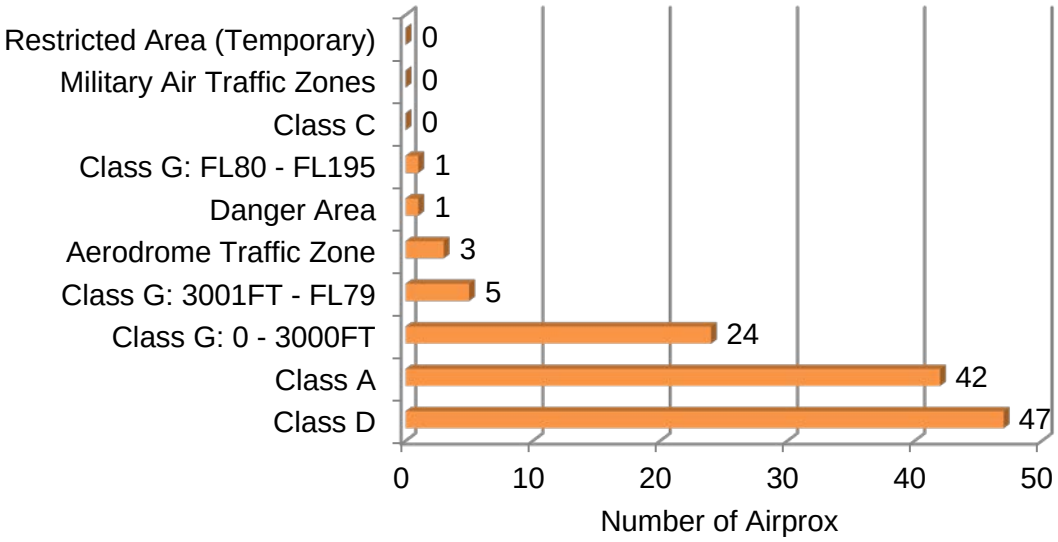


Figure 25. 2017 SUAS Airprox by Airspace Involvement

Airprox Themes

Most Airprox stem from multiple contributory factors with each having a greater or lesser bearing on the outcome depending on the circumstances. As previously commented, this year we have moved away from attributing individual causes to incidents in favour of a safety-barrier approach. As such, a formal breakdown of causes is now not included in this report but, to give a flavour of what lies behind these safety-barrier performance assessments, the following themes were specifically commented upon over the year in my monthly reports. Although such an analysis of comments would not bear detailed statistical scrutiny, it gives a sense of what concerned the Board most over the year (ranked in order of times the comment was made).

- Poor, or at least questionable, airmanship decisions were commented upon 78 times.
- Late- or non-sighting was specifically mentioned as a factor 36 times.
- Sub-optimal controller decisions, ineffective ATC coordination or lack of Traffic Information was mentioned 32 times.
- Ineffective integration in the visual circuit was discussed 21 times.
- Flawed, or lack of, situational awareness was mentioned 20 times.
- Not following procedures (either pilots or controllers) was highlighted 13 times.

Reflecting the causes above, the themes below represent a distillation of the Board's discussions and are based on a qualitative, subjective review of the underlying incidents. Encompassing all of these themes, Board debates consistently returned to the need for pilots to fly defensively and with consideration for others; prioritise lookout above in-cockpit tasks (lookout being a prime component in the 'Aviate' part of the 'Aviate, Navigate, Communicate' mantra); and to properly understand the applicability and limitations of each of the air traffic services that are available under UK FIS.

- **Airmanship.** The Board considered that poor, or at least questionable, airmanship decisions were contributory at least 78 times. In this context, 'Airmanship' as a quality is intended to convey the notion of aviation wisdom, experience and 'common-sense' gained from: learning from the experiences and sage advice of other aviators; thinking ahead and understanding the application of rules, procedures and airspace; courtesy to other aviators; and applying a huge dose of self-preservation through defensive flying at all times. Anecdotally at least, there were complaints that 'airmanship' was on the decrease, but I have no hard evidence to underpin that belief. Particular issues were: poor decision-making in respect of not thinking ahead or not deviating from a plan when conditions had changed (aka 'pressing on regardless'); inaction when detecting a conflict (including an assumption that the other pilot would have seen them and would therefore give way); unclear communication of intentions; flying too close to other aircraft (on the assumption that if they themselves were comfortable with the separation then so would be the other pilot); sub-optimal ATS selection (including not talking to ATC when it was available); and flying too close to, or overhead airfields, glider or parachuting sites.

- **Lookout**. Late- or non-sighting was mentioned in discussions many times. The well-known failings of the human eye have to be compensated for by pro-active and robust lookout (especially in detecting objects with little relative movement), and this again highlighted the point that, even in good VMC, great attention and appropriate prioritisation needs to be given to visual lookout over other in-cockpit tasks. Anecdotally, there are concerns about pilots focussing more on internal avionics and navigation displays (including iPads etc) at the expense of lookout; I have no specific evidence of this either but there are ever increasing App-based aids to navigation that are welcome in their own right but need to be used with foresight - we have seen a number of incidents where pilots have reported Airprox as they have turned their attention again to lookout having conducted in-cockpit tasks described as radio frequency changes, map/system-checking or SSR re-coding, all of which are nothing new.

- **Visual Circuit.** Poor or ineffective integration in the visual circuit (or when near to ATZs, airfields, parachuting and glider sites) was specifically discussed as a factor at least 21 times. Flying in the circuit should be one of the most regimented and predictable of activities that a pilot conducts, yet we saw many *ad hoc* profiles and much 'pressing-on' when situational awareness had not been achieved. There is a recurring problem with the conduct of overhead joins, with many pilots either appearing not to understand them or being unable to perform them correctly. Particular problems were: poor situational awareness when joining, operating within, or departing the visual circuit; failing to follow standard joining procedures; joining the circuit downwind, crosswind or base leg rather than from an overhead join when the circuit was busy; failing to clearly pass intentions; poor integration, sequencing or separation with other aircraft already in the circuit; a general lack of consideration/awareness of those already within the visual and instrument patterns; becoming task-focussed to the

detriment of lookout; assumption of 'protection' when within an ATZ; and lack of awareness of the nuances/limitations of the various levels of control at airfields (ATC vs AFISO vs AGCS). Based on a growing impression that some pilots seem not to fly defensively in this environment, are prone to pressing on without proper situational awareness, or think that they have priority when they do not, I have emphasised again that conduct in the visual circuit is certainly something that could be usefully underlined in flying training, competence flights and general education activities.

- **ATS Provision.** Sub-optimal or ineffective ATC coordination, provision of TI, or simple controller errors were discussed 32 times. In mitigation, there were numerous instances where pilots had flawed expectations of ATC, and some where they simply did not communicate their intentions effectively or early enough to allow ATC enough time to fully assimilate the situation. That being said, there are hot-spots of uncertain LARS coverage where pilots complain that they are unlikely to gain access to their ATS of choice due to controller workload in busy airspace, the very time an ATS is of most use. There were also a disappointing number of Airprox demonstrating poor pilot understanding of UK FIS (especially foreign pilots). Other problems that recurred in Board discussions included: insufficient or incomplete Traffic Information; poor adherence to procedures (see the visual circuit theme above); and limited awareness by VFR pilots about IFR procedures and associated holds/routing.

More generally, poor knowledge/appreciation of others (specifically, gliders, parachuting, microlights, hang-gliders etc) was evident in a number of incidents. In particular, the number of incidents where aircraft have flown through glider/microlight/parachuting sites indicates either poor GA awareness, or a lack of consideration for winch-launching, glider towing and other associated sport-aviation activities.

We also saw a number of incidents where pilots were not squawking, thereby reducing the situational awareness of ATC and other pilots who might be equipped with collision warning systems (CWS). With that in mind, the Board welcomed the introduction of SERA 13001/13005/13010/13015 on 12 October 2017 which mandated that if a transponder is fitted to an aircraft and serviceable then it is to be switched on, with all available modes selected, irrespective of whether the pilot is in communication with ATC or not. Notwithstanding, even a year on, a straw-poll of GA Board members indicated that many of the GA community were unaware of this requirement.

In order to counter some of these elements, we deployed the '5 Seconds to Impact' educational campaign in Spring 2017 based on the 6 themes below. This material is available on the UKAB website at www.airproxboard.org.uk and from our App which was also introduced in 2017.

- **Lookout.** Specifically: the limitations of the human eye; developing a scan technique; the problems of cockpit obscurations; and the need to spend at least 80% of the time looking out compared to 20% looking in.

- **Communicate.** Specifically: the need to listen carefully to other pilots and controllers; RT discipline and the use of correct phraseology; and the need to clearly articulate intentions.

- **Electronic Conspicuity.** Specifically: the requirement to use a transponder when fitted; the value of collision warning systems, but also the need to avoid false expectations of their performance; and awareness of TCAS envelopes when flying near other aircraft.

- **Insight.** Specifically: the need to understand UK FIS and select an appropriate ATS for an activity; awareness of NOTAMs; the need to understand and follow airfield procedures (especially joining and integrating); and the need to understand other aviators, what they are trying to achieve, and what their aircraft are capable of or limited to.

- **Prioritising Tasks.** Specifically: the need to maintain lookout even when distracted by emergencies or other flying tasks; focusing on the visual circuit when in or around airfields; and the old Aviate-Navigate-Communicate mantra for ensuring proper prioritisation of capacity.

- **Defensive Flying.** Specifically: thinking ahead; assuming that everyone is ‘out to kill you’; not pressing on when things change from the plan; flying with courtesy for others; and avoiding glider sites and parachuting sites by as much separation as possible.

COMMERCIAL AIR TRANSPORT

As previously mentioned in this report, 2017 saw the continued sharp rise in SUAS Airprox, with most of these being recorded against CAT aircraft. On the face of it, CAT Airprox numbers therefore rose significantly but, in order to compare like with like, I have separated out the SUAS incidents so that year-on-year comparisons with historic data can be made. That being said, SUAS Airprox are still incidents in their own right, and should not be discounted merely because the risk from collision is as yet not fully quantified. I have therefore included a short analysis of SUAS incidents at the end of this CAT section given that most involved CAT aircraft.

CAT Airprox by Airspace

Figure 26 shows the breakdown of all CAT Airprox by airspace type. Of the 88 Airprox involving CAT: 40 occurred in Class A; 43 in Class D; 4 in Class G; and 1 in Class E. The large number of incidents is predominantly due to SUAS events (there were 70 CAT Airprox involving SUAS in 2017); Figure 27 shows the corresponding breakdown of the 18 non-SUAS CAT Airprox by Airspace type.

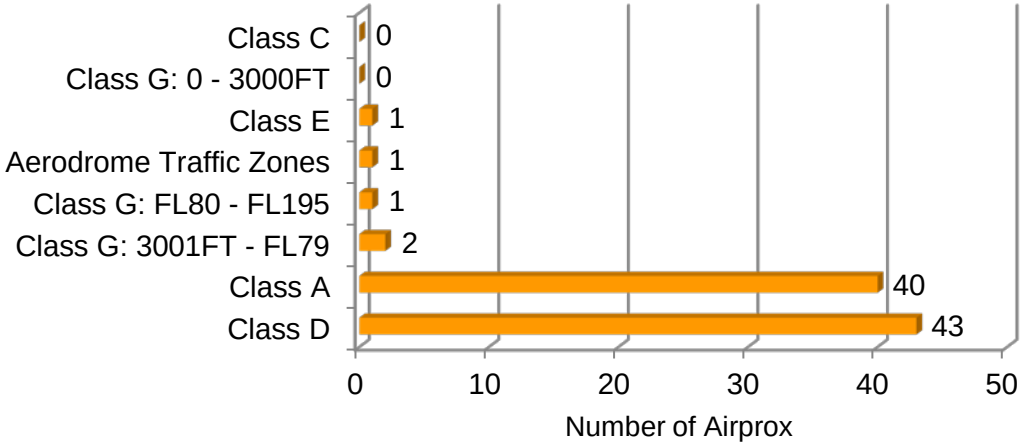


Figure 26. 2017 All CAT Airprox by Airspace Involvement

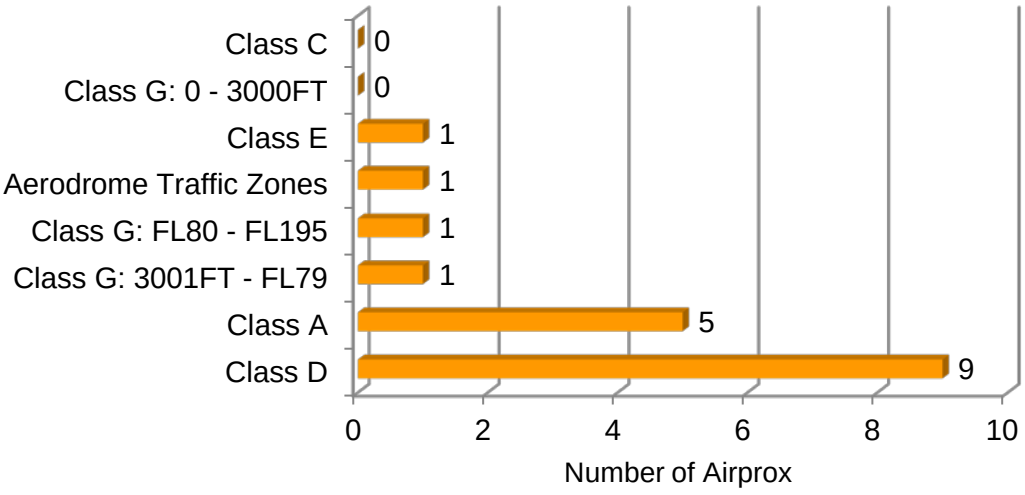


Figure 27. 2017 non-SUAS CAT Airprox by Airspace Involvement

A significant number of aircraft-to-aircraft CAT incidents result from TCAS interactions were the flight vector of the other aircraft causes a TCAS TA (Traffic Alert) or RA (Resolution Advisory) if the aircraft come close enough together for the predicted track of the non-CAT aircraft to impinge on the CAT aircraft TCAS safety envelope. TCAS was principally designed for IFR operations in controlled airspace where separation standards are well defined. In mixed VFR/IFR or VFR/VFR environments there are no defined separation requirements for VFR aircraft other than to avoid a collision and so TCAS can be triggered even though both aircraft are operating in accordance with airspace requirements. Furthermore, aircraft operating near to the boundary of controlled airspace can also interact with aircraft within, thereby also generating 'spurious' TCAS warnings. CAT crews must always obey the commands generated under a TCAS RA, and this often results in the declaration of an Airprox. As a result, VFR pilots should be aware that CAT crews are mandated to respond to TCAS RAs, and they should therefore try to give CAT aircraft as wide a berth as possible to avoid their own flight-vector triggering TCAS manoeuvres in the CAT aircraft.

CAT Risk Distribution

Table 10 and Figures 28 & 29 show the 10-year CAT Airprox totals and associated risk distributions. Discounting the SUAS data, the underlying aircraft-to-aircraft CAT Airprox trend continues to show a steady decline since 2012, stabilising at about 20 Airprox per year since 2015 (Figure 28). There were 3 risk-bearing aircraft-to-aircraft incidents in 2017, which is about normal in recent years. The picture is very much different if SUAS Airprox are included in the statistics, where increasing trends are evident in both overall numbers of incidents and the proportion that are risk-bearing (Figure 29). The SUAS risk-bearing trend is skewed by the fact that most SUAS incidents are reported at close quarters due to the difficulty in seeing drones etc at range; as a result, most SUAS Airprox are classified as risk-bearing. Other than SUAS incidents, the CAT Airprox classified as risk-bearing in 2017 were:

- **Airprox 2017083 – Category B: A319 vs unknown hang-glider.**
- **Airprox 2017117 – Category B: Jetstream 41 vs Typhoon**
- **Airprox 2017210 – Category B: Saab 2000 vs Typhoon**

Details of these incidents can be found in the 2017 Airprox catalogue at the end of this report, and on the UKAB website at www.airproxboard.org.uk.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
CAT Risk A	0	0	0	0	1	1	1(2)	0(9)	0(29)	0(20)
CAT Risk B	2	1	0	1	0	3	3(4)	3(13)	1(20)	3(25)
CAT Risk C	58	33	32	17	23	14	14(15)	11(13)	11(24)	11(32)
CAT Risk D	0	1	2	0	4	3	1(2)	1(7)	1(3)	0(6)
CAT Risk E	0	0	0	3	7	12	8(8)	6(7)	7(7)	4(5)
CAT Total	**60**	**35**	**34**	**21**	**35**	**33**	**27(31)**	**21(49)**	**20(83)**	**18(88)**

Table 10. 10-year CAT Airprox by Risk Classification (figures in brackets include SUAS Airprox)

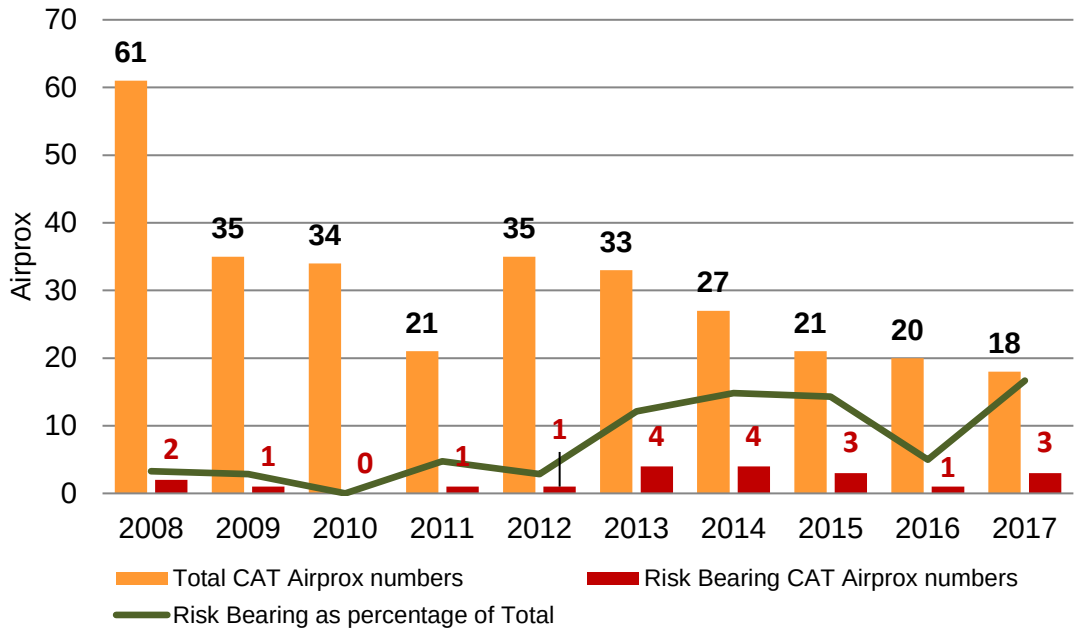


Figure 28. 2017 CAT Airprox Risk Bearing Distribution - no SUAS

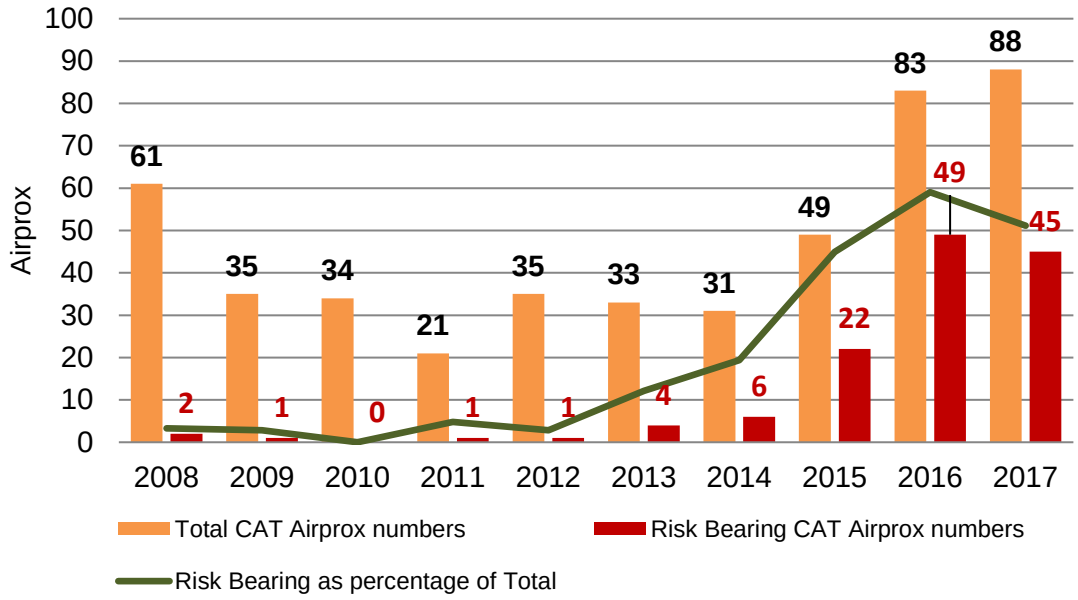


Figure 29. 2017 CAT Airprox Risk Bearing Distribution - including SUAS

CAT Airprox Rates

Table 11, along with Figures 30-33, further illustrate the CAT Airprox risk distributions and rates normalised for hours flown (both with, and without, SUAS incidents) over the last 10 years. The underlying aircraft-to-aircraft trend shows a steadily reducing overall rate of CAT Airprox per million flying hours (mfh) in the last few years. If SUAS incidents are included in the statistics then, as before, the picture is very different with commensurately sharply increased trends for both overall and risk-bearing incidents per mfh.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total CAT Airprox	61	35	34	21	35	33	27(31)	21(49)	20(83)	18(88)
Risk Bearing CAT Airprox	2	1	0	1	1	4	4(6)	3(22)	1(49)	3(45)
CAT Hours x 10K	163.5	149.4	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6
Total per Million hrs	37	23	24	14	24	22	18(20)	14(32)	12(51)	11(53)
Risk Bearing per Million hrs	1	1	0	1	1	3	3(4)	2(14)	1(30)	2(27)

Table 11. 10-year CAT Airprox versus hours flown (figures in brackets include drone/SUAS Airprox)

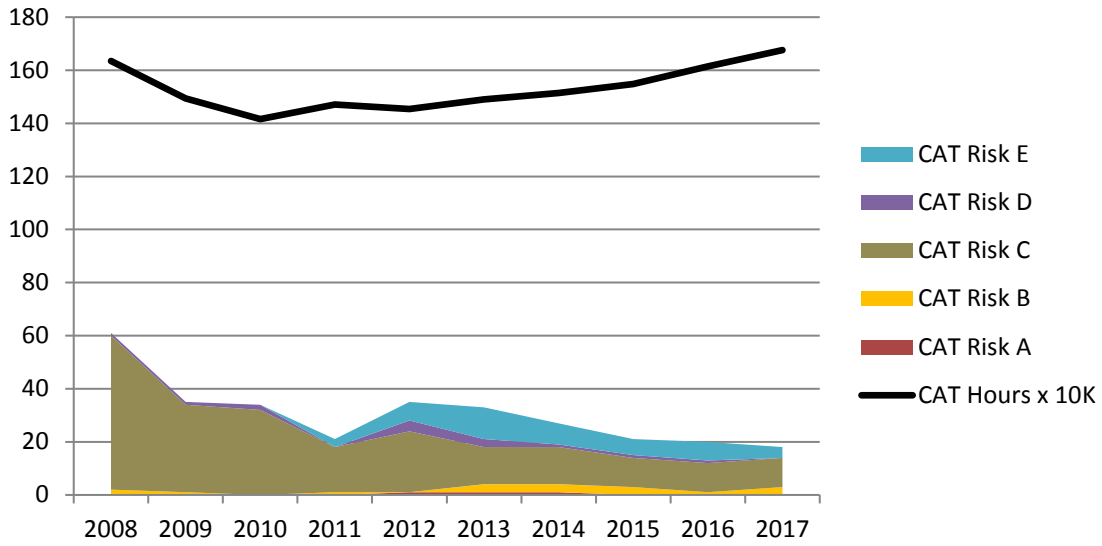


Figure 30. 10-year CAT Airprox Risk Distribution vs CAT hrs – no SUAS

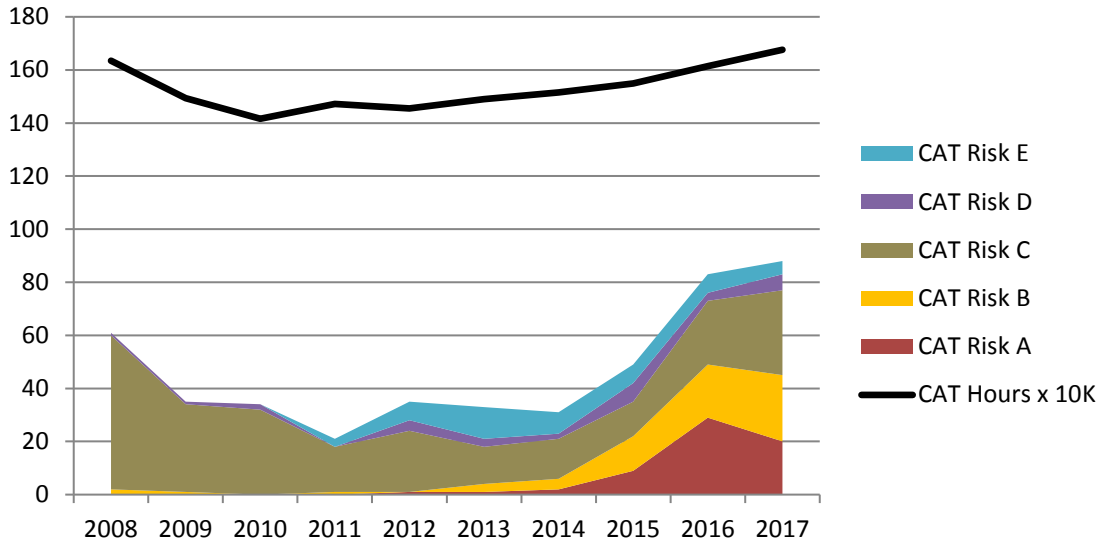


Figure 31. 10-year CAT Airprox Risk Distribution vs CAT hrs – inc SUAS

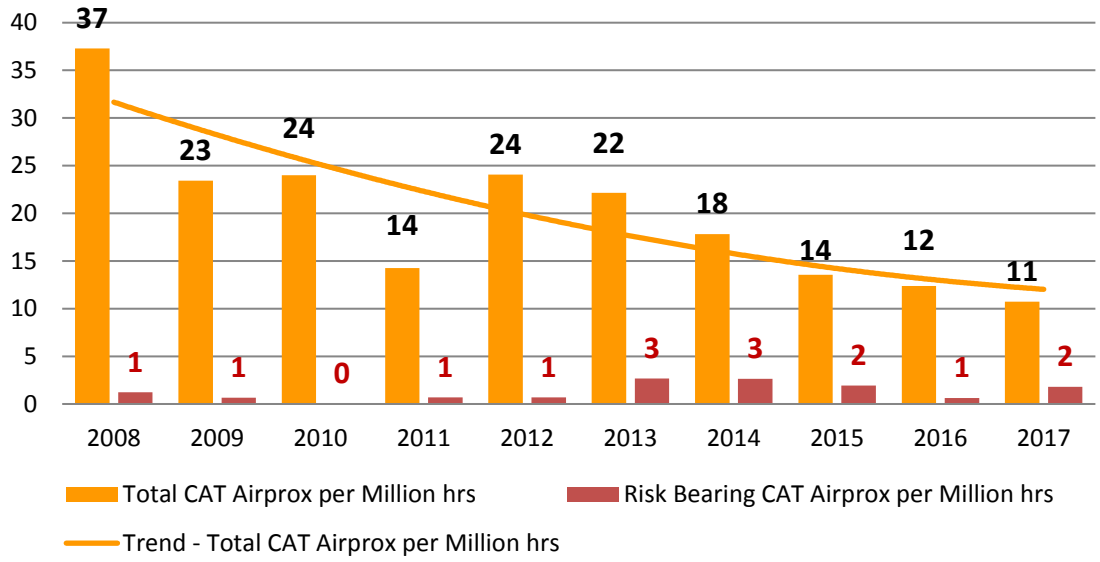


Figure 32. 10-year CAT Airprox Rates per Million Flying hrs – no SUAS

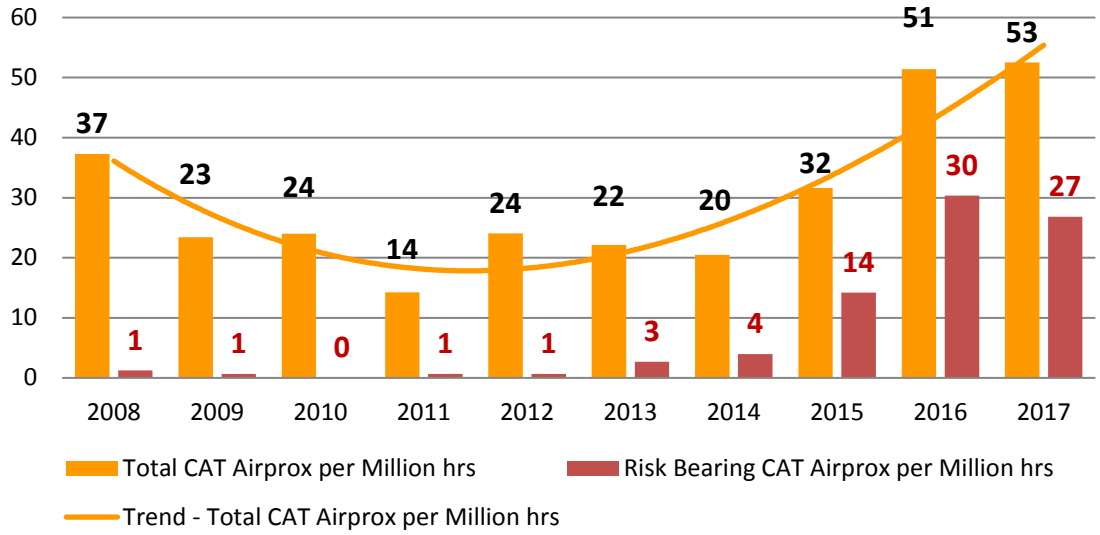


Figure 33. 10-year CAT Airprox Rates per Million Flying hrs – inc SUAS

Putting all this into perspective, the following headline statistics for 2017 are pertinent in framing the risk to CAT aircraft:

- **18** aircraft-to-aircraft CAT incidents represents, on average, about 1-2 Airprox per month.
- **3** aircraft-to-aircraft risk-bearing CAT incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, once every 4 months.

- **70** SUAS CAT Airprox represents, on average, more than one a week.
- **45** risk-bearing SUAS CAT Airprox means that, on average, there was either a real risk of a collision between a SUAS and a CAT aircraft, or safety was much reduced below norms, almost every week.

SUAS (Drones / Unknown Objects / Model Aircraft / Balloons)

SUAS Airprox have again increased markedly in 2017 as a result of their growing popularity across all sectors of consumer, hobbyist and commercial operator communities. Table 12 and Figure 34 illustrate the figures since 2010, when drone/SUAS incidents first began to be consistently reported.

For Airprox reporting purposes, SUAS are broken down into 4 categories: drones; balloons (including toy balloons and meteorological/research balloons); model aircraft; and unknown objects. SUAS Airprox usually involve only a fleeting encounter wherein the reporting pilot is often only able to give an outline description of the other air vehicle; as a result, the distinction between a drone, model aircraft and object is often down to the choice of wording by the reporting pilot. UKAB policy is to review the associated description and, if the reporting pilot has positively described something with drone-like properties (e.g. '4 rotors') then that is taken at face-value as a drone; if the reporting pilot can only vaguely describe 'an object' then that is classified as an unknown object. The distinction between 'drone' and 'model aircraft' is more difficult given that many fixed-wing drones are not easily distinguishable from model aircraft. Although the UKAB tries to take the context of the sighting into account, it is likely that some reported 'model aircraft' incidents were probably drones.

Year	Drone	Model Aircraft	Balloon	Unknown	Total
2010	4	1	0	1	6
2011	0	0	0	0	0
2012	0	2	1	2	5
2013	0	0	0	0	0
2014	6	2	0	1	9
2015	29	3	3	5	40
2016	71	12	5	6	94
2017	93	1	6	13	113

Table 12. Airprox involving SUAS since 2010

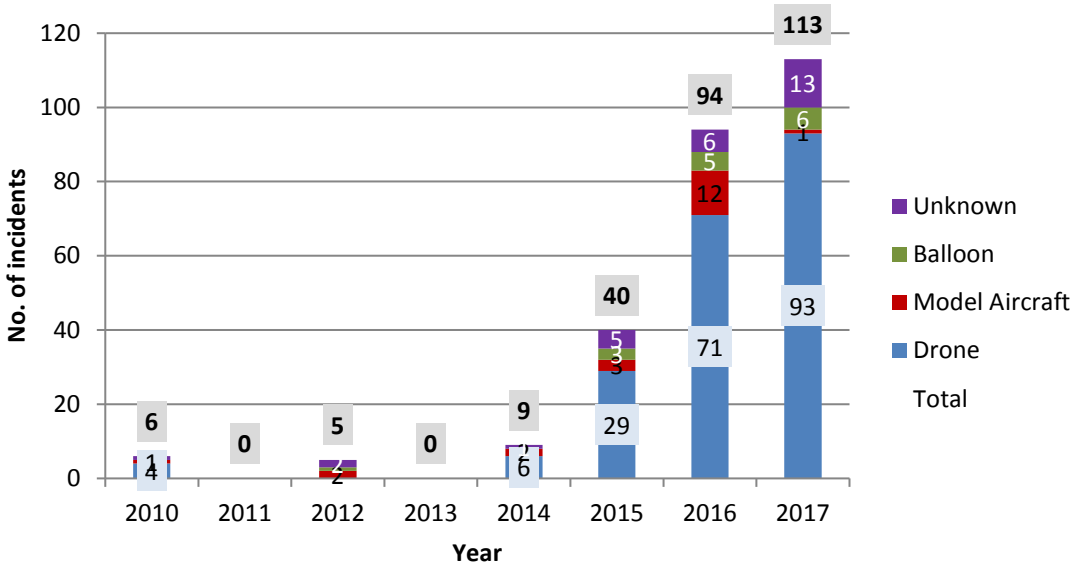


Figure 34. Airprox involving SUAS since 2010

GENERAL AVIATION

GA Airprox by Airspace

In 2017 there were 162 Airprox where at least one aircraft was GA; of these, 34 involved SUAS. The corresponding 128 aircraft-to-aircraft GA Airprox represent 81% of the overall number of aircraft-to-aircraft incidents in 2017 (159 Airprox), which is slightly above the norm (the average percentage of incidents involving GA over the last 5 years was 77%). That 81% of Airprox in 2017 involved GA, reflects the fact that GA represents the majority of flying activity in Class G see-and-avoid airspace, which is where most incidents occur. As in previous years, most of 2017's GA incidents (nearly 62%) occurred below 3000ft in Class G/Low-Flying airspace as indicated in Figure 35. However, the second most common airspace for GA Airprox was within combined Aerodrome Traffic Zones/Military Air Traffic Zones (15%) which should provide a highly structured and known environment but still accounts for a significant number of events largely resulting from poor procedures, poor situational awareness or lack of consideration for other airspace users, especially when integrating into the visual circuit.

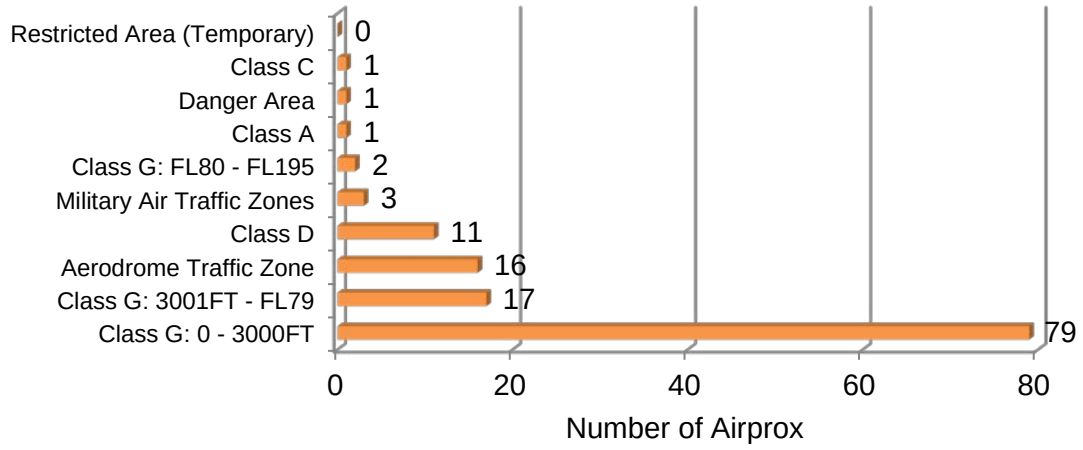


Figure 35. All 2017 GA Airprox by Airspace Involvement – no SUAS

GA Risk Distribution

Although the GA Airprox trend has been downwards in the years since 2014, the overall 10-year trend remains firmly upwards both for total and risk-bearing absolute numbers as shown in Table 13 and Figure 36. There are two ways of looking at this: either there is much more that can be done to raise awareness within the GA community to reduce incidents, or our education efforts to raise the profile of Airprox reporting in the last few years are bearing fruit through more reporting of incidents that were previously not raised. Notwithstanding, the 2017 GA Airprox risk distribution figures at Table 13 show a welcome slight decrease in overall GA aircraft-to-aircraft Airprox numbers this year compared to 2016, but a less welcome increase in risk-bearing incidents. This is also reflected in the risk-bearing percentage line in Figure 37, which has increased from 35% in 2016 to 41% in 2017. Although this indicates that GA incidents were overall more 'risky' in 2017, the percentage has been fluctuating around 40% in recent years and so the short-term trend is relatively steady. That being said, as can be seen

over the last 10 years, the percentage of risk-bearing incidents has gradually been trending upwards from about 30% to 40%. Without extensive Human Factors information, it is hard to explain these trends other than to speculate about the levels of situational awareness/airmanship; individuals' lookout performance/prioritisation; or simply hope that the increase is down to more Airprox reporting as the GA community embraces safety processes.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GA Risk A	8	8	5	19	12	18	23(23)	23(26)	16(19)	10(19)
GA Risk B	31	19	24	27	21	33	55(56)	41(44)	30(37)	42(51)
GA Risk C	54	64	70	61	61	53	59	57(58)	64(68)	59(70)
GA Risk D	2	1	2	2	1	2	3	4(5)	6(7)	4(6)
GA Risk E	0	0	0	8	9	17	23	15(16)	15(16)	13(16)
GA Totals	**95**	**92**	**101**	**117**	**104**	**123**	**163(164)**	**140(149)**	**131(147)**	**128(162)**

Table 13. 10-year GA Airprox by Risk Classification (figures in brackets include SUAS Airprox)

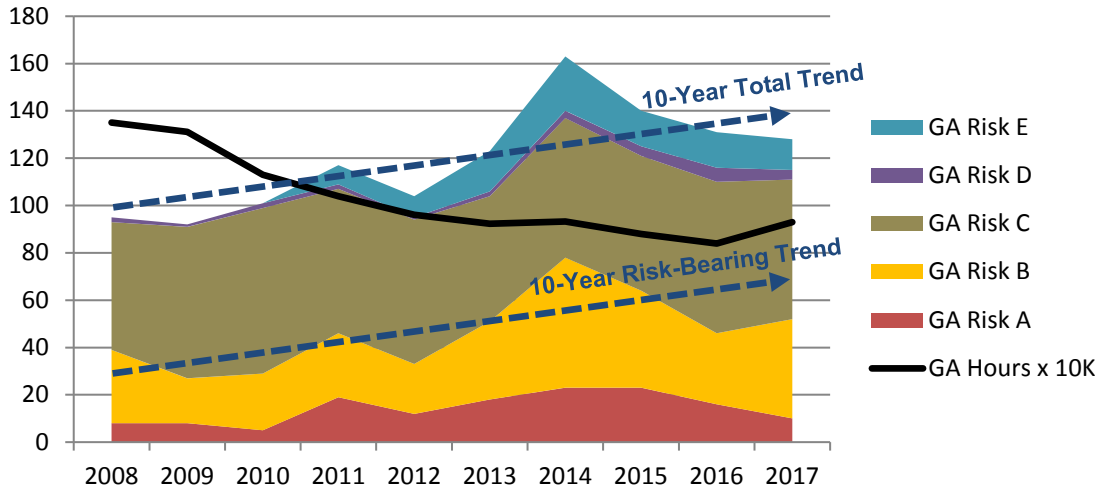


Figure 36. 10-year GA Airprox Risk Distribution and GA hours – no SUAS

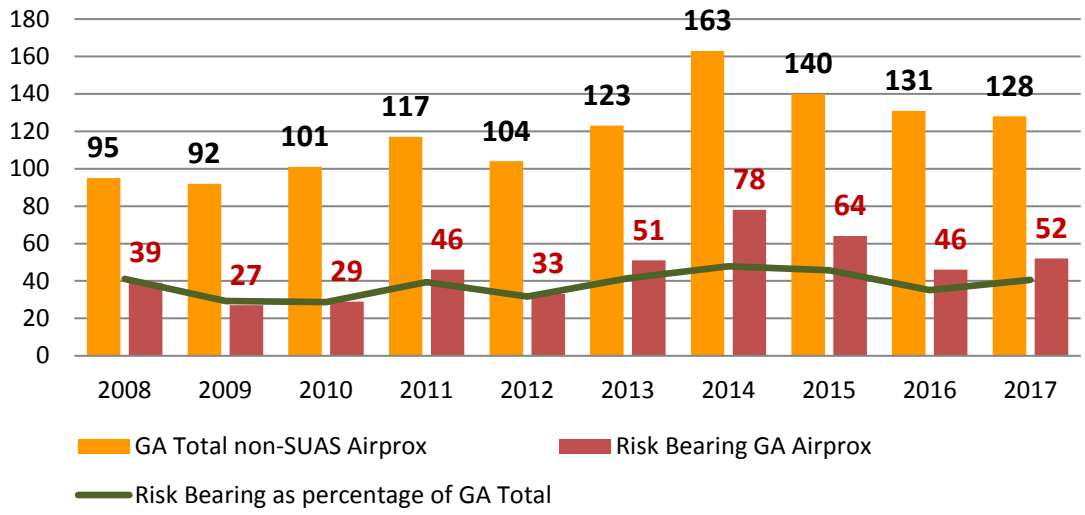


Figure 37. 10-year GA Airprox Risk Bearing Distribution – no SUAS

GA Airprox Rates

Normalising GA non-SUAS Airprox for hours flown shows a welcome reduction in the overall total rate per mfh since the 2014 peak. In contrast, the risk-bearing rate per mfh appears to have plateaued, which indicates that although there are fewer incidents overall, the risk of collision has not reduced. Moreover, both figures remain higher than the 10-year historic norms. I stress that GA flying hours statistics are notoriously hard to estimate given that a significant portion of hours are not formally recorded (especially hang-glider, paraglider and paramotor hours). Notwithstanding, light-aircraft and glider hours have been reported fairly consistently over the years and, given that these represent the majority of Airprox participants, headline rates can be used as an indicative measure.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total non-SUAS Airprox	155	147	161	161	158	172	215	177	171	159
GA non-SUAS Airprox	95	92	101	117	104	123	163	140	131	128
Risk Bearing GA Airprox	39	27	29	46	33	51	78	64	46	52
Risk Bearing as % of GA Total	41	29	29	39	32	41	48	46	35	41
GA Hours x 10K	135.1	131.2	113.0	104.0	96.2	92.3	93.2	88.0	83.9	93.0
GA non-SUAS per Million hrs	70	70	89	113	108	133	175	159	156	138
GA Risk Bearing per Million hrs	29	21	26	44	34	55	84	73	55	56

Table 14. 10-year GA Airprox versus hours flown – no SUAS

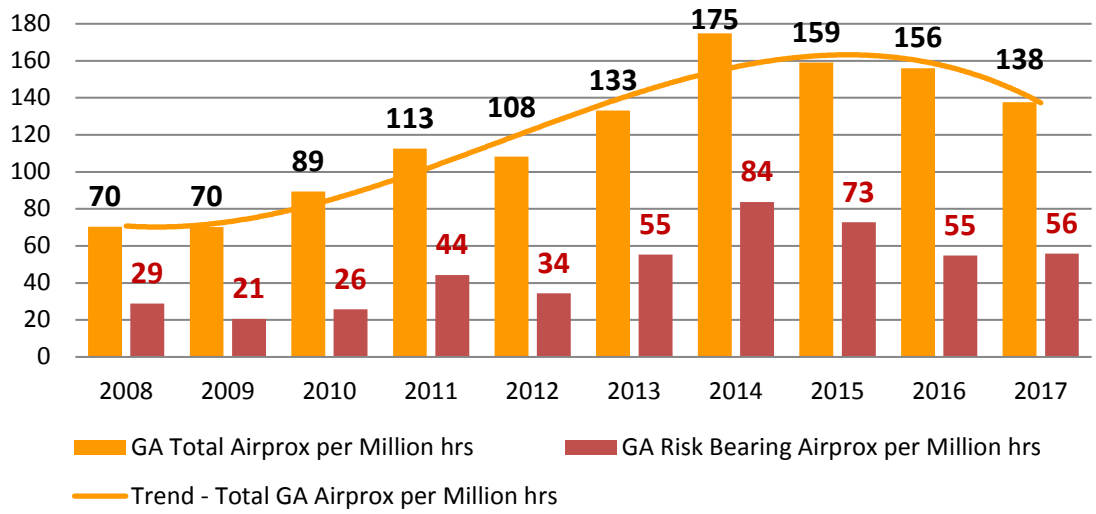


Figure 38. 10-year GA Airprox Rates per Million Flying Hours – no SUAS

As for the previous section, putting all this into perspective, the following headline statistics for 2017 are pertinent in framing the risk to GA aircraft:

- **128** aircraft-to-aircraft GA incidents represents, on average, about 2-3 GA Airprox per week.
- **52** aircraft-to-aircraft risk-bearing GA incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, once a week.

MILITARY AVIATION

Military Airprox by Airspace

Overall, there were 66 Airprox involving Mil in 2017; of these, 13 involved SUAS. The 53 aircraft-to-aircraft Mil Airprox represents 33% of the overall total of 159 aircraft-to-aircraft incidents in 2017, which is about the normal historic rate, and down from 40% in 2016). In airspace terms, the majority of Mil Airprox again occurred in Class G/Low-Flying Area airspace below 3000ft, although numbers were much reduced compared to 2016 (when there were 50 incidents below 3000ft); this probably reflects reducing amounts of military low-flying in the UK. Overall, there were 39 Civ-Mil incidents in 2017, and 17 Mil-Mil incidents. These figures not only re-emphasise that civil aircraft remain the key MAC risk to military aircraft, but also that the success of CADS (and to a lesser extent TCAS in GR4) is evident in mitigating Mil-Mil Airprox in the low-level regime. On the other hand, although Mil Class G incidents above 3000ft were also slightly reduced this year (there were 16 in 2017 compared to 19 in 2016), the lack of any overall mil-mil medium-level coordinating system or TCAS in Typhoon means that there are few MAC mitigations available for this fleet in particular other than ATC and see-and-avoid.[9] Figure 39 shows the distribution of Mil Airprox in 2017 by airspace type.

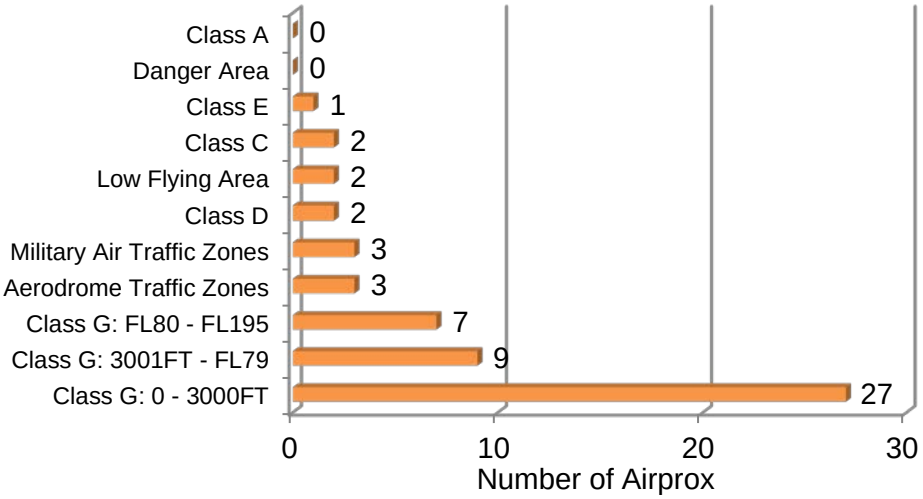


Figure 39. 2017 Military Airprox by Airspace Involvement – no SUAS

Military Risk Distribution

Table 15 and Figures 40 & 42 illustrate the military Airprox statistics and risk distribution for the last 10 years, wherein the recent peaks and troughs merit some explanation. The step increase in Airprox reporting rates in 2010 is likely to be accounted for by the introduction of formalised Air Safety Management processes and mandatory Airprox reporting when the MAA was formed. The trough in 2012/2013 was likely attributable both to reduced flying by the Tutor and Glider fleets as a result of their respective groundings due to maintenance issues, and to the Tornado fleet being employed on concurrent operations in 2

[9] Typhoon is due to receive a collision warning system in the near future although dates for introduction are not yet finalised.

overseas areas (Libya and Afghanistan) which will have reduced their UK flying rates. Note also that the SAR role was transferred to the civil sector as of 2015-2016, and this will also have influenced military Airprox numbers (there were 6 civil SAR incidents in 2017 that might otherwise have been attributed to the military thus further positively influencing the military statistics (see Table 18 in the Emergency Services report after this section).

Nevertheless, there is cause for optimism in that the overall number of Mil aircraft-to-aircraft Airprox reduced markedly in 2017 (53 incidents compared to 69 in 2016), and the risk-bearing component similarly reduced (17 incidents compared to 22 in 2016). Although the aircraft-to-aircraft risk-bearing percentage rate remained steady at 32%, (having been at a high of 43% in 2015), the overall 10-year downward trends of incidents and their risk-bearing component is welcome.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Mil Risk A	7	8	7	9	8	8	7	9(11)	5(6)	4(7)
Mil Risk B	15	23	18	21	13	20	24(26)	20(21)	17(22)	13(17)
Mil Risk C	34	38	70	45	43	38	41	27	33(39)	29(34)
Mil Risk D	0	1	3	1	0	4	6	2	2	0
Mil Risk E	0	0	0	8	7	12	17	9	12	7(8)
Mil Totals	56	70	98	84	71	82	95(97)	67(70)	69(81)	53(66)

Table 15. 10-year Military Airprox by Risk Classification (figures in brackets include SUAS Airprox)

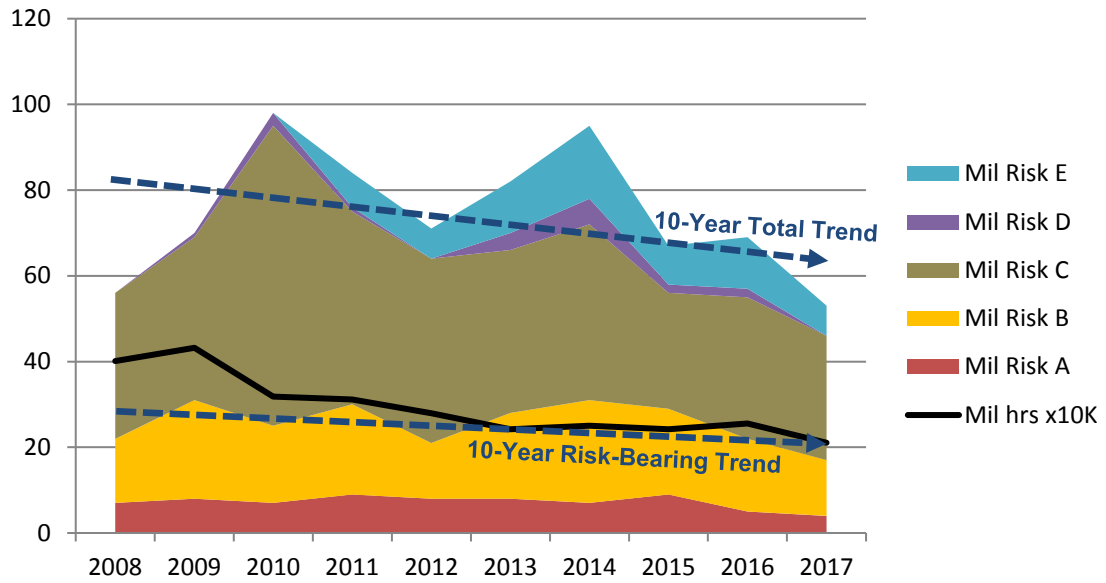


Figure 40. 10-year Military Airprox Risk Distribution and hours – no SUAS

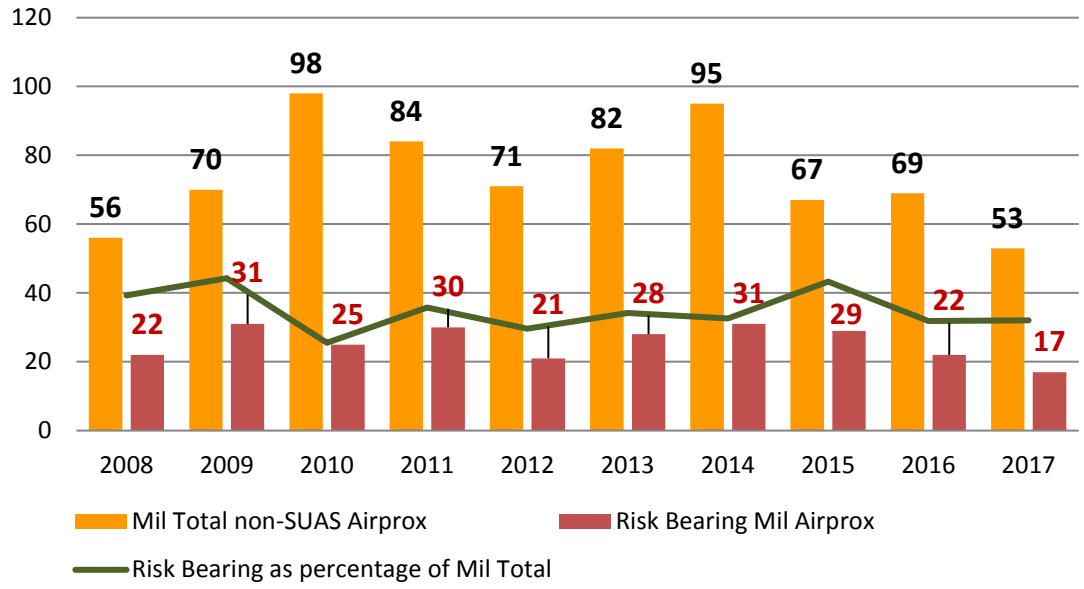


Figure 41. 10-year Military Airprox Risk Bearing Distribution – no SUAS

Military Airprox Rates

Overall, UK military flying hours appeared to have gradually declined in the last 10 years, although my confidence in the absolute figures is not high because there is currently no single source for military hours (the MAA do not have the information) and so the figures are a collation from the Front-Line Commands with varying levels of confidence and granularity about which hours were flown in UK and which were contractor flown.

Table 16 and Figure 42 show the normalised military Airprox rate per mfh. Overall, in 2017, there were 252 Airprox per mfh, slightly down from 270 in 2016, and nicely below the annual average of about 292 per mfh since 2010. Similarly, the 2017 risk-bearing rate per mfh also showed a decrease to 81 per mfh (from 86 in 2016), also below the annual average of about 97 per mfh since 2010. Although these reduced rates per mfh are cause for celebration in isolation, compared to GA the military still experienced about twice the overall GA rates per mfh in 2017 (GA: 128/mfh overall and 52/mfh risk-bearing; Mil: 252/mfh overall and 81/mfh risk-bearing). Superficially, it might be tempting to conclude that, hour for hour, military flying is therefore almost twice as risky as GA flying. However, care should be exercised when making direct comparisons of Airprox rates between sectors of aircraft given that military crews have a mandatory requirement to report incidents, whereas the GA community reports on a voluntary basis so there are likely to be a significant number of unreported GA events as a result. Also, paradoxically, the military's focus on lookout training techniques may well also mean that they simply see and report more aircraft than their hobbyist GA counterparts who probably have relatively less proficiency in pro-active scanning techniques. That being said, the routinely higher speeds at which some elements of the military fly may well also pre-dispose them to encounters brought on by reduced detection and reaction times in the see-and-avoid environment, and the effects of terrain screening at low-level (electronic and visual) will also undoubtedly be a factor.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total non-SUAS Airprox	155	147	161	161	158	172	215	177	171	159
Total Mil non-SUAS Airprox	56	70	98	84	71	82	95	67	69	53
Risk Bearing Mil Airprox	22	31	25	30	21	28	31	29	22	17
Risk Bearing as % of Mil Total	39	44	26	36	30	34	33	43	32	32
Mil hrs x 10K	40.1	43.2	31.8	31.1	28.0	24.2	25.0	24.2	25.6	21.1
Total Mil per Million hrs	140	162	308	270	254	339	380	277	270	252
Risk Bearing Mil per Million hrs	55	72	78	96	75	116	124	120	86	81

Table 16. 10-year Military Airprox versus hours flown – no SUAS

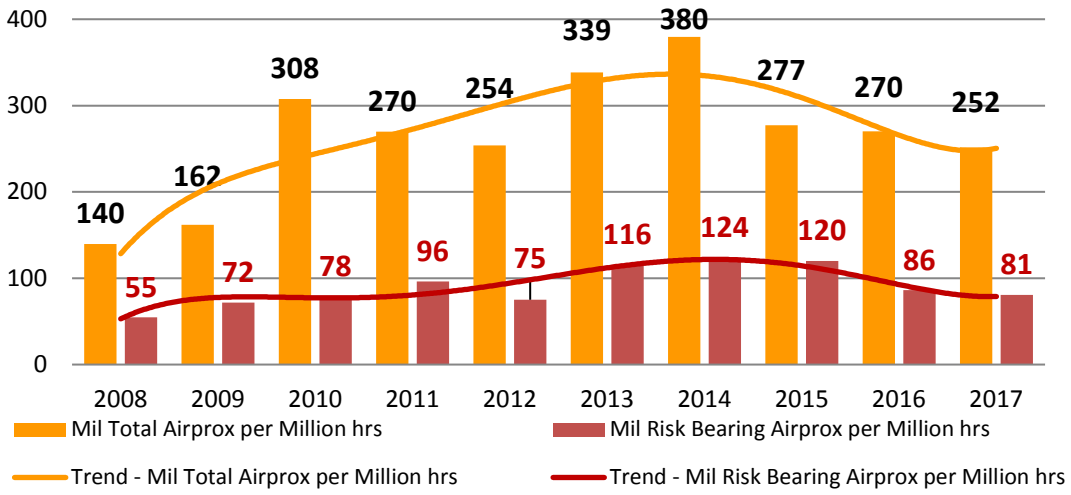


Figure 42. 10-year Military Airprox Rates per Million Flying Hours – no SUAS

A welcome initiative in 2014 was the introduction of a VHF low-level common frequency in Scotland.[10] There have been some anecdotal reports of its benefit, and a number of comments have been made to me during my visits to Regional Airspace User Working Groups (RAUWG) in England and Wales where GA pilots commented that they wished the frequency was available for use outside Scotland because they could have communicated with military aircraft to prevent a reported incident. As shown in Figure 43, historically, most Mil-GA low-level (below 3000ft) Airprox over the last

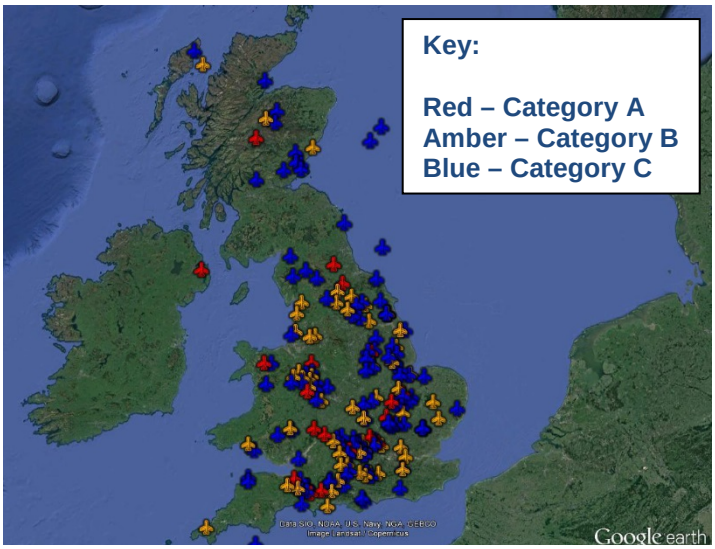


Figure 43. Mil-GA Airprox at or below 3000ft (2010 to 2016)

[10] Previously, military aircraft used only UHF at low-level so that they could communicate with other military aircraft; unfortunately, these UHF frequencies were not accessible to civilian VHF-only equipped aircraft. The intention is to provide a common VHF means for civil aircraft to gain situational awareness as military aircraft broadcast their intentions, and also to enable direct communications, if time permits, to resolve conflictions.

few years have occurred in England and Wales, and so it may be that we have yet to see the full potential benefits of this scheme realised; its extension to cover the whole of the UK is wholeheartedly supported by the Airprox Board.

Finally, 2015 saw the phased introduction of TCAS to the Tornado fleet. Although there have annually been sharply reducing numbers of Tornado aircraft since 2010 as the type goes out of service, of interest, Figure 44 shows a notable reduction in Tornado Airprox in 2016 and 2017 that probably also reflects the efficacy of the 2015 TCAS fit.[11]

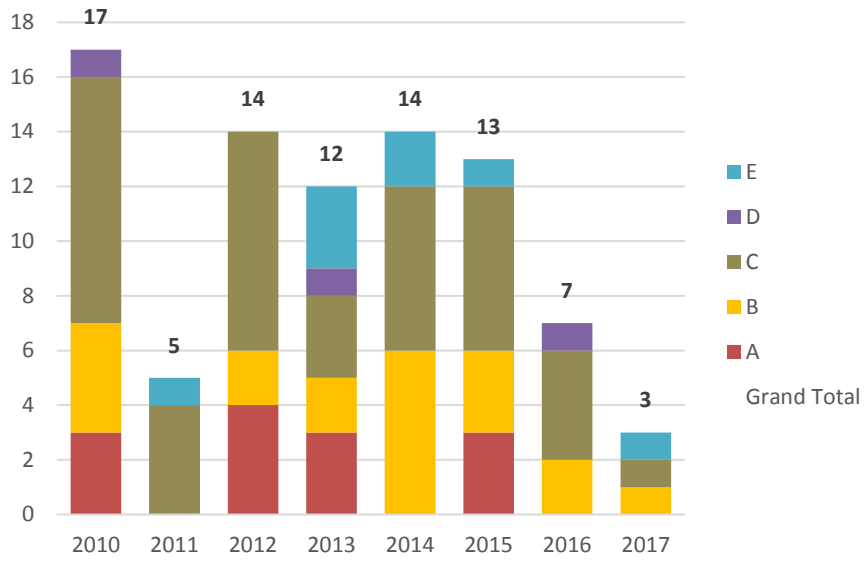


Figure 44. Tornado Airprox Distribution since 2010

As for the previous sections, putting all this into perspective, the following headline statistics for 2017 are pertinent in framing the risk to Military aircraft:

- **53** aircraft-to-aircraft Mil incidents represents, on average, about 1 Military Airprox per week.
- **17** aircraft-to-aircraft risk-bearing Mil incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, once every 3 weeks (i.e. just over 1 per month).

[11] The low number of incidents in 2011 is likely due to high overseas operational tempo following the commencement of the Libya campaign concurrent with operations in Afghanistan, both of which will have seen a concomitant reduction in UK Tornado flying.

EMERGENCY SERVICES

Emergency Services Airprox by Airspace

There were 22 overall Airprox involving Emergency Services aircraft in 2017; of which 3 involved SUAS. The 19 aircraft-to-aircraft Airprox represent about 12% of the overall number of aircraft-to-aircraft incidents in 2017 (159 Airprox). This is about double what we have seen in previous years and reflects both the increased numbers of Police and HEMS aircraft and the fact that the Coastguard has now taken over the SAR role from the military. In airspace terms, and reflecting the nature of their tasking, the majority of Emerg Servs Airprox occurred in Class G/Low-Flying Area airspace below 3000ft as shown at Figure 45. I have yet to identify a reliable source of hours data for all elements of Emergency Services and so I have no statistics for Airprox per mfh as yet.

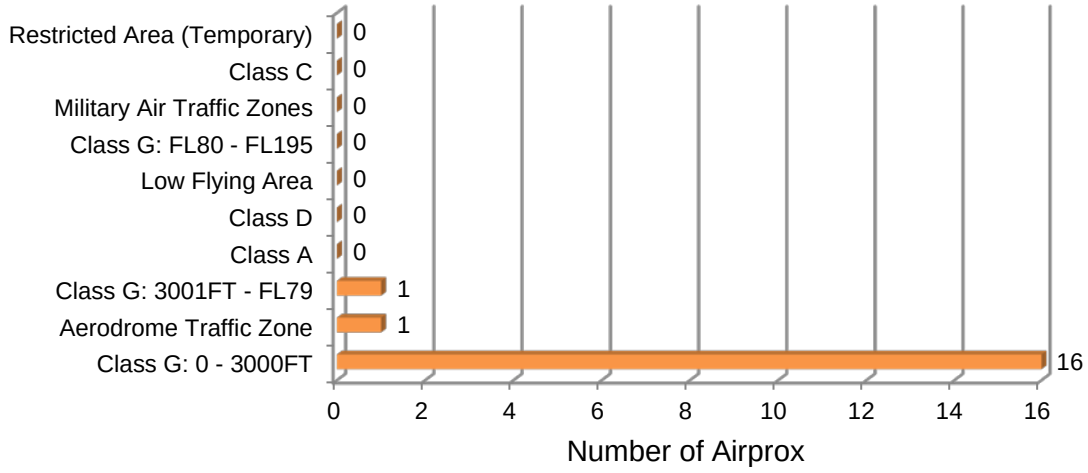


Figure 45. 2017 Emerg Servs Airprox by Airspace Involvement

Emergency Services Risk Distribution

Table 17 and Figures 46 & 47, illustrate the Emerg Servs Airprox statistics and risk distribution for the last 10 years. Although a little spiky due to the small numbers involved, a clearly increasing trend of overall and risk-bearing Airprox can be seen over the last 10 years. In 2017, 32% of Emerg Servs Airprox were risk-bearing, which is close to the 10-year average of 30%.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Emerg Servs Risk A	0	0	0	1	2	1	1	1	2	1
Emerg Servs Risk B	1	1	2	2	0	2	4	1	1	5(6)
Emerg Servs Risk C	4	4	2	5	4	1	6	9	4	7(9)
Emerg Servs Risk D	1	0	0	0	0	0	0	0	0	0
Emerg Servs Risk E	0	0	0	2	2	2	3	0	3	6
Emerg Servs Total	6	5	4	10	8	6	14	11	10	19(22)

Table 17. 10-year Emerg Servs Airprox by Risk Classification (figures in brackets include SUAS Airprox)

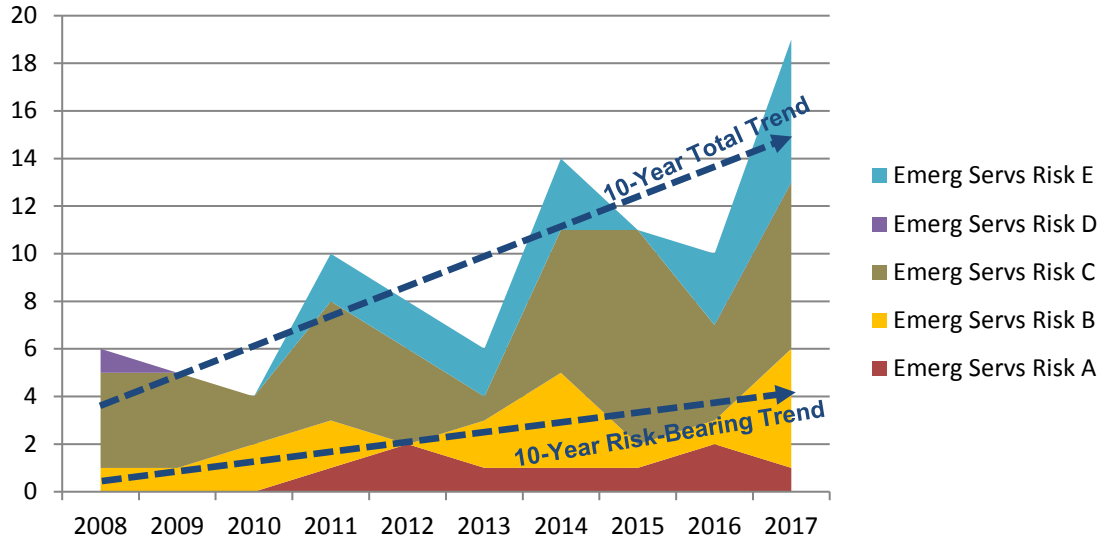


Figure 46. 10-year Emerg Servs Airprox Risk Distribution – no SUAS

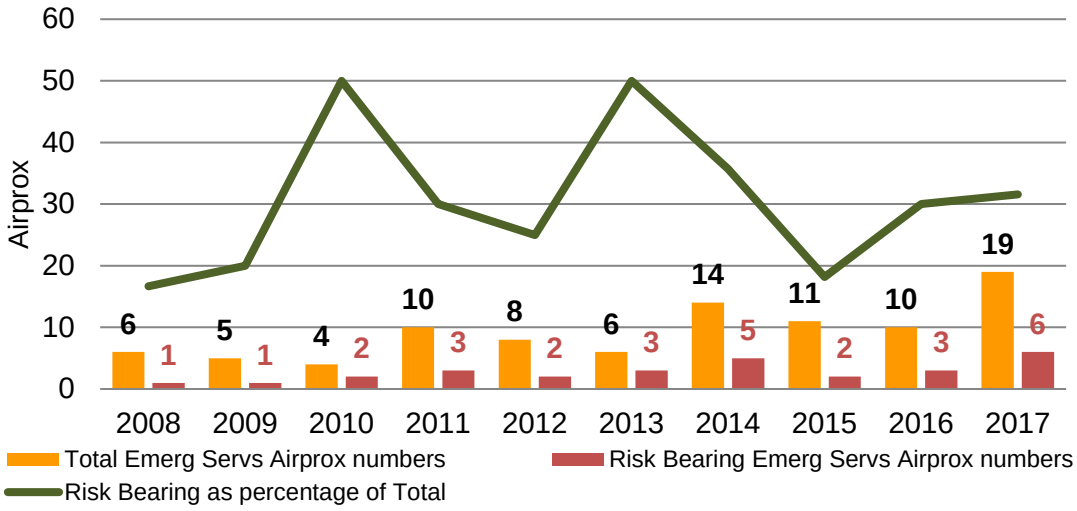


Figure 47. 10-year Emerg Servs Risk Bearing Distribution – no SUAS

Emerg Servs Airprox Rates

Table 18 shows the Emerg Servs Airprox rates over the last 10 years, and Figure 48 illustrates the breakdown by involvement. Although it's too early to come to many conclusions on an annual basis, I suspect that the formation of NPAS as an homogenous police aircraft operating authority (that became fully operational in October 2012), will have positively influenced reporting processes and overall safety culture as they collectively standardised safety management systems; this may help account for the reducing police incidents in the last few years. The same cannot be said for the air ambulance sector, which shows an increasing trend that may be the result both of more Helicopter Emergency Medical Services (HEMS) helicopters and the fact that they are independently organised and so may not benefit as much from mutual learning of lessons. As previously mentioned, this is the first year following the establishment of the Coastguard SAR role and so trends for this sector are not yet available.

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Airprox	155	147	167	161	161	172	224	217	265	272
Total Emerg Servs Airprox	6	5	4	10	8	6	14	11	10	19
Risk Bearing Emerg Servs Airprox	1	1	2	3	2	3	5	2	3	6
Risk Bearing as % of Total	17	20	50	30	25	50	36	18	30	32
Police	4	2	1	5	6	6	6	5	4	2
Ambulance	2	3	3	5	2	0	8	6	6	11(14)
Coastguard	0	0	0	0	0	0	0	0	0	6

Table 18. 10-year Emerg Servs Airprox Rates – no SUAS (sector figures in brackets include SUAS Airprox)

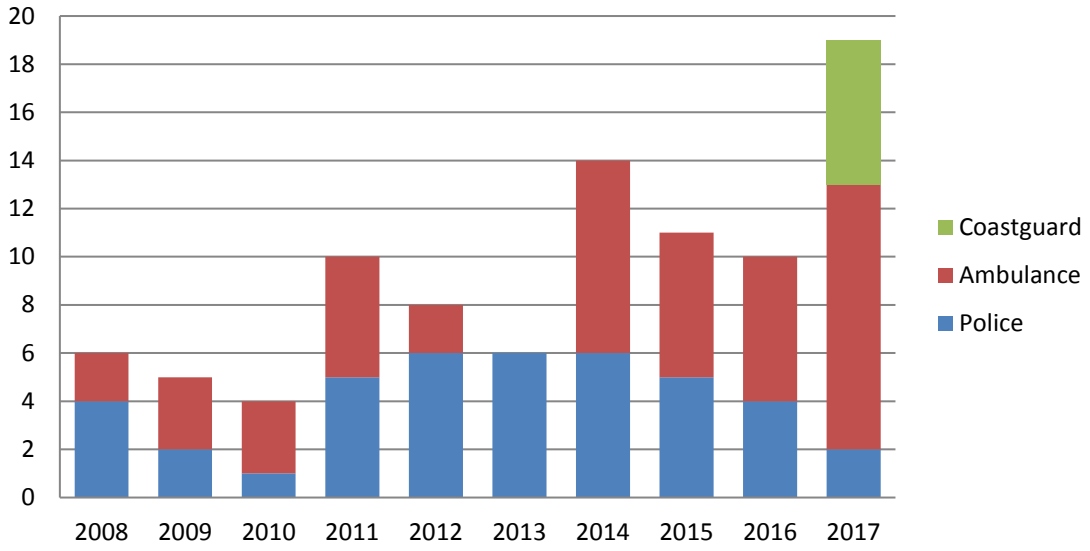


Figure 48. Emerg Servs Airprox by Involvement over the last 10 years – no SUAS

The Emerg Servs primary operating environment in see-and-avoid Class G/Low-level airspace means that incidents were usually from interactions with the GA and, to a lesser extent, the Mil sectors. This often resulted from other pilots not giving Emerg Servs aircraft a wide-enough berth when they were carrying out their tasks. This is a theme that I regularly offer during presentations at RAUWGs; a hovering helicopter is highly likely to be conducting an emergency task, and therefore unpredictable, so avoid by a wide margin.

- **19** aircraft-to-aircraft Emerg Servs incidents represents, on average, about 1-2 Airprox per month.
- **6** aircraft-to-aircraft risk-bearing Emerg Servs incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, once every couple of months.

UKAB 2017 SAFETY RECOMMENDATIONS

Accepted Recommendations

Airprox	Recommendation	Comments
2017029	HQ Air Command reviews ATC tasking with regard to current manning at Brize Norton.	HQ Air Cmd noted that the ATC manning issue was widespread across Defence, therefore a full review of BM manning was undertaken. It was a complex issue that is not easily resolved, but a number of workstrands were being pursued to improve the situation. In the interim, all ODHs are aware of the capability limitations within military ATC and activity will be curtailed where necessary to ensure continued safe operations. Additionally, manning levels have improved since the date of the Airprox.
2017065	The BHPA publicises the greater mid-air collision risk associated with transiting close to busy airfields, especially within climb-out lanes.	The BHPA agreed to publicise the text of the recommendation in the next issue of the BHPA Club Bulletin and under Safety Matters in the BHPA magazine, SkyWings.
2017109	HQ Air Command and Netheravon agree a robust LoA with respect to parachuting operations from Netheravon and the implications for Boscombe Down operations.	A new LoA was issued in which Netheravon pilots were advised that they were to contact BDN zone before climbing above 1000ft and were to remain on the BDN Zone frequency throughout operations.
2017111	That Halton and Luton include additional considerations within the LoA regarding approaches to Luton RW08.	NATS conducted a review of their procedures and felt that the current guidance and regulations for controllers with respect to the LOA was satisfactory. However, noting that the controller could have done better in this instance, they have used the incident as a basis for discussion in all competence assessments.
2017142	ACAS review the wording of the regulation covering use of LFS airspace in the vicinity of the MFTA.	ACAS and DAATM reviewed the wording of the restrictions covering low-flying in the vicinity of the Snowdonia MFTA. Following consultation with the RAF Safety Centre, the entry in the Low Flying Handbook was updated as follows: - FW ac are not to enter the Llanberis Pass at any height unless, in avoiding the Pass, the safety of the ac is likely to be compromised. - FW ac are not permitted to fly in the MFTA except in the Nant Ffrancon (A5) Pass and the Caernarfon/Beddgelert (A4085) Pass where they may fly down to 250ft MSD. Overflight of the MFTA by FW ac is not to be below 1000ft AGL. This information was published in line with the AIRAC cycle on 4 January 2018.
2017160	HQ Air Command considers mandating that the RAFGSA only use transponder-equipped tug aircraft.	The RAFGSA no longer operates out of Halton, for daily operation at their home base, only transponder equipped tugs are now used. However, for competitions this is not practicable and other mitigations are therefore put in place.

Airprox	Recommendation	Comments
2017182	DAATM review the AIP wording regarding transit of the Valley ATA.	DAATM-Airspace SO1 confirmed that the recommendation had been enacted and was to be reflected in the AIP in the next AIRAC cycle 24 May 18. Reference to London Info was removed from ENR 5.2.13 and ENR 6.5.1.2 as below. It has also been removed from several other entries on the same basis. The team are also now scrutinising the document for anomalies regarding the Swanwick Mil/London Radar callsign. ENR 5.2.13 3. VALLEY □□0800-1800 Mon-Thu and 0800-1700 Fri. RAF Valley ATC or Swanwick Mil. ENR 6.5.1.2 Advisory Measures: Pilots crossing the area are advised to maintain constant vigilance and to request a radar service from Valley ATC or London Radar.
2017201	HQ Air Command examine current Military regulations with regard to the status of aircraft operating under IFR in Class D CTRs who's pilots declare 'visual' with the airfield.	An assessment of MAA regulations was conducted and in the light of this, changes were made to various regulations. Furthermore, liaison was conducted with HQ 22 Gp ADFT to understand what crews were being taught. Procedures and orders were updated at Brize Norton and for the future, reminders will be sent out, through Air Safety Matters, of the recent changes to RAs and the wider implications of operating in different classes of airspace.
2017205	Farnborough ATSU publish in the UK AIP the minimum altitude at which a surveillance-based service will be provided.	Change was incorporated into UK AIP EGLF AD 2.18
2017272	USAFE-UK consider promulgation of North Sea helicopter activity to F15 crews.	USAFE-UK were in agreement with the comments regarding low altitude training in those areas beneath the 323 complex. They commented that the helicopter routes were briefed to new aircrews during their Theatre Indoctrination academics and periodic Instrument Refresher Courses. Finally, during any sortie where low altitude flying would occur in these areas, aircrew were briefed on the expected altitude of the helicopter routes and encouraged to contact Norwich control for further information on potential traffic.
2017278	USAFE-UK review the rate of climb once above safety altitude after a low-level abort.	USAFE-UK responded that aircrew were continually briefed of their own responsibility for terrain and flight path clearance when climbing out of the low fly structure but not that they should limit their climb rate. The presented situation highlighted that fast-jet aircrew must be ready for dangers coming from above as well as below. This includes climbing to "Route Abort Altitudes" without climb rate limitation to avoid the ground and then either levelling off or slowing their climb in order to contact ATC to receive a service. Continued emphasis on safety in and out of the low fly structure will help support the layered defence against mid-air collision avoidance.

Partially Accepted Recommendations

Airprox	Recommendation	Comments
2017265	The BGA consider recommending the fitment of transponders to tug aircraft.	BGA do not intend to recommend that all tug operators install a transponder. However, they will write to all clubs reminding themselves of the BGA guidance, to note the airprox, and to remind tug operators that a transponder may be appropriate for their particular towing operation.

Rejected Recommendations

Airprox	Recommendation	Comments
2017047	That Halfpenny Green review their AIP entry to ensure it contains pertinent information with regard to turn direction when departing the visual circuit.	Halfpenny Green responded that given that circuit discipline is generally good and no similar incidents have occurred over the past ten years, during which time the aerodrome dealt with almost half a million movements, no amendment to the current AIP entry was considered to be necessary.

Recommendations Remaining Unresolved

Airprox	Recommendation	Comments

Nil

AIRPROX CATALOGUE 2017

The table below is an abbreviated form of the 2017 Airprox Index that is available on the UKAB Website at 2017 Website Catalogue. Individual reports can be accessed using the hyperlinks within the table or at the appropriate tab for 2017 on the website. Note that report numbers do not always run congruently because incidents that were initially reported and then subsequently withdrawn (either because the reporter had second thoughts, or the event did not meet investigation criteria), are not listed.

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017001	05/01/2017	C	MD HELICOPTER - 902	OTHER - (Light Aircraft)
2017002	05/01/2017	A	OTHER - Military (Voyager)	OTHER - Military (F15)
2017003	05/01/2017	E	PIPER - PA34	VERTOL - CH47
2017004	05/01/2017	E	Unknown - (RPAS)	CESSNA - 152
2017005	09/01/2017	E	AIRBUS - A319	AIRBUS - A319
2017006	06/01/2017	E	SIKORSKY - S92	EUROCOPTER - EC175
2017007	02/01/2017	C	AIRBUS - A319	Unknown - (RPAS)
2017008	21/01/2017	C	SIKORSKY - S92	Unknown - (RPAS)
2017009	22/01/2017	B	BELL - 206	Unknown - (RPAS)
2017011	26/01/2017	B	AIRBUS - A321	Unknown - (Balloon)
2017012	19/01/2017	A	CESSNA - 152	AEROSPATIALE - AS350
2017013	03/02/2017	A	AEROSPATIALE - AS350	Unknown - (RPAS)
2017014	24/01/2017	E	GROB - G115	OTHER - Military (Tucano)
2017015	07/02/2017	C	SIKORSKY - S92	OTHER - Military (Hawk)
2017016	05/02/2017	C	AGUSTA BELL - AB139	SCHEMPP HIRTH - DUO DISCUS
2017017	13/02/2017	B	DE HAVILLAND - DHC8 400	Unknown - (RPAS)
2017018	12/02/2017	A	AIRBUS - A319	Unknown - (RPAS)
2017020	19/02/2017	C	VANS - RV8	CIRRUS - SR20
2017021	20/02/2017	C	Unknown - (RPAS)	OTHER - Military (Apache)
2017022	22/02/2017	C	SIKORSKY - S92	SIKORSKY - S92
2017023	22/02/2017	C	AEROSPATIALE - AS350	AEROSPATIALE - AS350
2017024	24/02/2017	C	BOMBARDIER - CL600 2B19	SOCATA - TBM700
2017025	24/02/2017	B	OTHER - Military (Chinook)	Unknown - (RPAS)
2017026	28/02/2017	B	OTHER - Military (Typhoon)	OTHER - Military (Typhoon)
2017027	28/02/2017	A	OTHER - Military (King Air)	Unknown - (Balloon)
2017028	01/03/2017	C	OTHER - Military (Typhoon)	BOEING - KC135
2017029	01/03/2017	C	AIRBUS - A400M	AIRBUS - A400M
2017030	01/03/2017	C	OTHER - Military (Hawk)	TECNAM P2008
2017031	21/02/2017	C	DIAMOND - DA20	OTHER - Military (Hawk)
2017032	16/02/2017	C	DORNIER - DO28A	DE HAVILLAND - DHC8
2017033	06/03/2017	D	DE HAVILLAND - DHC8	Unknown - (Object)
2017034	07/03/2017	C	EVEKTOR AEROTECHNIK - EV97	Unknown - (RPAS)
2017035	02/02/2017	B	AIRBUS - A319	Unknown - (Object)
2017036	07/03/2017	A	COMCO IKARUS - IKARUS C42	CESSNA - 525

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017037	07/03/2017	C	ACES HIGH - CUBY	ROBINSON - R44
2017038	08/03/2017	A	PIPER - PA38	PIPER - PA38
2017039	05/02/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017040	16/03/2017	E	OTHER - Military (Osprey)	DIAMOND - DA42
2017041	24/02/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017042	25/03/2017	B	EUROCOPTER - EC135	OTHER - (Motorglider)
2017043	24/03/2017	C	AGUSTA BELL - AB139	THRUSTER - T600
2017044	01/03/2017	E	AIRBUS - A319	Unknown - (Object)
2017045	25/03/2017	C	BOEING - 737	OTHER - (Unknown)
2017046	26/03/2017	C	CESSNA - 152	PIPER - PA28
2017047	02/04/2017	D	DIAMOND - DA40	PIPER - PA38
2017048	28/03/2017	C	EMBRAER - ERJ190	AIRBUS - A319
2017049	04/04/2017	C	PIPER - PA28	PIPER - PA28
2017050	06/04/2017	C	GROB - G115	GLASFLUGEL - H201
2017051	05/04/2017	C	BEECH - 200	OTHER - Military (Typhoon)
2017053	06/04/2017	C	CESSNA - 150	OTHER - Military (Typhoon)
2017054	07/04/2017	C	EUROCOPTER - EC135	PIPER - PA28
2017055	08/04/2017	C	BOEING - 737	Unknown - (RPAS)
2017056	10/04/2017	A	AEROSPATIALE - AS350	Unknown - (RPAS)
2017057	09/04/2017	A	EUROCOPTER - EC135	CESSNA - 208
2017058	06/04/2017	C	OTHER - Military (Hawk)	Unknown - (RPAS)
2017059	08/04/2017	A	AEROPRAKT - A22 FOXBAT	PIPER - PA28
2017060	09/04/2017	C	BOEING - 737	PIPER - PA28
2017061	11/04/2017	A	DE HAVILLAND - DHC8	Unknown - (Balloon)
2017062	06/04/2017	B	BOEING - 777	Unknown - (RPAS)
2017063	10/04/2017	B	Unknown - (RPAS)	AEROSPATIALE - SA330
2017064	12/04/2017	A	AGUSTA - A109	SIKORSKY - S76
2017065	11/04/2017	B	LEARJET - 40	OTHER - (Paraglider)
2017067	12/04/2017	D	AIRBUS - A320	Unknown - (RPAS)
2017068	22/04/2017	A	AIRBUS - A319	Unknown - (RPAS)
2017069	18/04/2017	A	OTHER - Military (Wildcat)	Unknown - (RPAS)
2017070	15/04/2017	B	AIRBUS - A320	Unknown - (RPAS)
2017071	22/04/2017	B	PIPER - PA34	Unknown - (RPAS)
2017072	22/04/2017	E	EMBRAER - ERJ190	ROBINSON - R44
2017073	26/04/2017	C	SCHLEICHER - ASK13	OTHER - Military (F15)
2017074	02/05/2017	B	BEECH - 200	GROB - G115
2017075	06/03/2017	C	OTHER - Military (Wildcat)	OTHER - (Light Aircraft)
2017076	30/04/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017077	17/02/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017078	27/04/2017	C	DASSAULT - MYSTERE FALCON20	DIAMOND - DA40
2017079	21/04/2017	B	CESSNA - 402	Unknown - (RPAS)
2017080	29/04/2017	C	CESSNA - 560	PIPER - PA28
2017081	07/04/2017	C	CESSNA - 150	CIRRUS - SR20

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017082	05/05/2017	A	CESSNA - 550	Unknown - (RPAS)
2017083	06/05/2017	B	AIRBUS - A319	OTHER - (Unknown)
2017084	08/05/2017	B	PIPER - PA28	CESSNA - 152
2017085	13/04/2017	C	AIRBUS - A319	Unknown - (Object)
2017086	10/05/2017	E	EUROCOPTER - EC135	PIPER - PA28
2017087	10/05/2017	C	DASSAULT - MYSTERE FALCON20	OTHER - (Paraglider)
2017088	11/05/2017	C	OTHER - Military (Tornado)	CESSNA - 150
2017089	10/05/2017	C	DE HAVILLAND - DHC1	OTHER - (Gyrocopter)
2017090	13/05/2017	C	AEROSPATIALE - AS365	AEROSPATIALE - AS350
2017091	14/05/2017	B	SCHLEICHER - ASW15	HORNET MICROLIGHTS - HORNET
2017092	22/05/2017	B	AEROSPATIALE - AS350	Unknown - (RPAS)
2017093	23/05/2017	E	AEROSPATIALE - AS365	ROBINSON - R44
2017094	19/05/2017	A	SAAB - 340	Unknown - (RPAS)
2017095	22/05/2017	B	CESSNA - 152	OTHER - (Unknown)
2017096	25/05/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017097	25/05/2017	C	BOEING - 777	Unknown - (RPAS)
2017098	31/05/2017	B	FLY BUY ULTRALIGHTS - IKARUS C42	PIPER - PA28
2017099	25/05/2017	B	CZAW - SPORTCRUISER	PIPER - PA28
2017100	31/05/2017	C	Unknown - (RPAS)	AGUSTA - AW189
2017101	25/05/2017	B	AIRBUS - A320	Unknown - (RPAS)
2017102	26/05/2017	D	AIRBUS - A320	Unknown - (Object)
2017103	31/05/2017	B	SIKORSKY - S92	Unknown - (Balloon)
2017104	30/05/2017	C	AGUSTA BELL - AB139	Unknown - (RPAS)
2017105	24/05/2017	C	AEROSPATIALE - AS365	EUROCOPTER - EC135
2017106	02/06/2017	C	VERTOL - CH47	AEROSPOOL - WT9 DYNAMIC
2017107	03/06/2017	B	SCHLEICHER - ASK21	DIAMOND - DA40
2017108	03/06/2017	C	CESSNA - 152	OTHER - (Glider)
2017109	31/05/2017	C	BAE - BAE146	CESSNA - 208
2017110	03/06/2017	E	AUGUSTA - AW189	PIPER - PA28
2017111	25/05/2017	C	SCHLEICHER - ASK21	BOMBARDIER - CL600 2B19
2017112	25/05/2017	C	AIRBUS - A321	CESSNA - 210
2017113	14/06/2017	B	PIPER - PA28	CABRI - G2
2017114	07/06/2017	E	BAE - JETSTREAM4100	EUROCOPTER - EC135
2017115	14/06/2017	C	AEROSPATIALE - AS350	CESSNA - 172
2017116	15/06/2017	A	DASSAULT - FALCON900	Unknown - (RPAS)
2017117	14/06/2017	B	BAE - JETSTREAM4100	OTHER - Military (Typhoon)
2017118	17/06/2017	C	AIRBUS - A319	Unknown - (RPAS)
2017119	14/06/2017	D	BOEING - 787	Unknown - (RPAS)
2017120	20/06/2017	B	OTHER - Military (Tucano)	OTHER - (Gyrocopter)
2017121	14/06/2017	C	OTHER - Military (Hawk)	Unknown - (Object)
2017122	06/06/2017	B	BOEING - 757	Unknown - (RPAS)
2017123	20/06/2017	B	DIAMOND - DA20	Unknown - (RPAS)
2017124	15/06/2017	A	AIRBUS - A320	Unknown - (RPAS)

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017125	15/06/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017126	22/06/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017127	25/06/2017	B	CHAMPION - 8KCAB	ROBINSON - R44
2017128	18/06/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017129	14/06/2017	A	AIRBUS - A321	Unknown - (RPAS)
2017130	21/06/2017	C	AVIONS ROBIN - DR400	CESSNA - 172
2017131	26/06/2017	B	SCHEMP HIRTH - Arcus	CESSNA - 310
2017132	14/06/2017	C	OTHER - Military (Wildcat)	SOCATA - TB10
2017134	22/06/2017	C	OTHER - Military (Merlin)	MCDONNELL DOUGLAS - 500
2017135	29/06/2017	B	OTHER - Military (Merlin)	EH INDUSTRIES - EH101
2017136	26/06/2017	C	LEARJET - 40	OTHER - Military (Alpha Jet)
2017137	02/07/2017	C	SLINGSBY - T67	Unknown - (RPAS)
2017138	02/07/2017	B	AIRBUS - A320	Unknown - (RPAS)
2017139	30/06/2017	C	CESSNA - 172	CESSNA - 152
2017140	03/07/2017	E	EVEKTOR AEROTECHNIK - EV97	CESSNA - 152
2017141	02/07/2017	A	BOEING - 777	Unknown - (RPAS)
2017142	05/07/2017	B	OTHER - Military (Griffin)	OTHER - Military (F15)
2017143	05/07/2017	A	AEROSPATIALE - AS350	AEROSPATIALE - AS350
2017144	05/07/2017	B	OTHER - Military (Hawk)	OTHER - Military (Tornado)
2017146	09/07/2017	A	AIRBUS - A319	Unknown - (RPAS)
2017147	05/07/2017	C	AGUSTA - A109	OTHER - (Glider)
2017148	08/07/2017	E	GLASER DIRKS - DG300	BOEING - C17
2017149	07/07/2017	C	PIPER - PA28	Unknown - (RPAS)
2017150	05/07/2017	A	CESSNA - 177	Unknown - (RPAS)
2017151	21/06/2017	A	GULFSTREAM - GV	Unknown - (RPAS)
2017152	08/07/2017	A	BOEING - 787	Unknown - (RPAS)
2017153	10/07/2017	C	EMBRAER - ERJ170	Unknown - (RPAS)
2017154	12/07/2017	C	OTHER - Military (Apache AH1)	CAARP - CAP10
2017155	06/07/2017	D	CESSNA - 152	CHILTON - DW1
2017156	15/07/2017	B	GROB - G109	PIPER - PA28
2017157	16/07/2017	B	EUROCOPTER - EC135	PIPER - PA28
2017158	14/07/2017	C	COMCO IKARUS - IKARUS C42	PIPER - PA28
2017159	12/07/2017	C	OTHER - Military (Typhoon)	CYCLONE AIRSPORTS - PEGASUS QUIK
2017160	13/07/2017	A	SCHLEICHER - ASK21	AEROSPATIALE - AS365
2017161	14/07/2017	C	PILATUS - PC12	OTHER - Military (F16)
2017162	13/07/2017	B	CESSNA - 510	AEROSPATIALE - SA330
2017163	16/07/2017	B	EMBRAER - ERJ190	Unknown - (Object)
2017164	12/07/2017	B	SAAB - 340	Unknown - (RPAS)
2017165	19/07/2017	C	COMMANDER - 114	DE HAVILLAND - DH89
2017166	12/07/2017	E	AIRBUS - A319	EVEKTOR AEROTECHNIK - EV97
2017167	18/07/2017	A	CESSNA - 404	Unknown - (RPAS)
2017168	01/05/2017	A	PIPER - PA28	Unknown - (RPAS)
2017169	22/07/2017	C	DASSAULT - MYSTERE FALCON20	PIPER - PA28

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017170	24/07/2017	C	PIPER - PA28	Unknown - (RPAS)
2017171	22/07/2017	C	BOEING - 737	Unknown - (Object)
2017172	22/07/2017	C	ATR - ATR42	Unknown - (Object)
2017173	26/07/2017	A	BOEING - 787	Unknown - (RPAS)
2017174	24/07/2017	A	BOEING - 757	Unknown - (RPAS)
2017175	30/07/2017	C	AIRBUS - A319	Unknown - (RPAS)
2017176	27/07/2017	C	BOEING - 757	Unknown - (RPAS)
2017177	29/07/2017	E	Unknown - (RPAS)	OTHER - (Helicopter)
2017178	31/07/2017	A	BOEING - 777	Unknown - (RPAS)
2017179	29/07/2017	B	BOEING - 737	OTHER - (Unknown)
2017180	31/07/2017	B	AVIONS ROBIN - HR100	AEROSPATIALE - AS365
2017181	29/07/2017	B	DIAMOND - DA40	CESSNA - 172
2017182	31/07/2017	C	OTHER - Military (Hawk)	PIPER - PA28
2017183	02/08/2017	E	SIKORSKY - S92	OTHER - Military (Tucano)
2017184	02/07/2017	C	AIRBUS - A319	Unknown - (RPAS)
2017185	06/08/2017	B	EUROCOPTER - EC120	AEROSPATIALE - AS355
2017186	06/08/2017	A	AVIONS ROBIN - DR400	OTHER - (Glider)
2017187	06/08/2017	A	BOEING - 757	Unknown - (RPAS)
2017188	10/08/2017	A	EUROCOPTER - EC130	DENNEY - KITFOX
2017189	13/08/2017	B	AGUSTA BELL - AB139	Unknown - (Object)
2017190	10/08/2017	C	CESSNA - 182	CESSNA - 152
2017192	08/08/2017	C	SAAB - 340	OTHER - Military (F18)
2017193	16/08/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017194	15/08/2017	B	PIPER - PA28	CESSNA - 172
2017195	14/08/2017	C	AIRBUS - A319	Unknown - (Object)
2017196	20/08/2017	B	PIPER - PA28	CESSNA - 152
2017197	18/08/2017	B	AGUSTA - A109	PIPER - PA28
2017198	04/08/2017	B	CESSNA - 208	OTHER - Military (Hawk)
2017199	12/08/2017	B	AIRBUS - A320	Unknown - (Object)
2017200	20/08/2017	C	SCHLEICHER - ASW27	COMCO IKARUS - IKARUS C42
2017201	21/08/2017	C	AIRBUS - A400M	AIRBUS - A400M
2017202	18/08/2017	C	BOEING - 737	AEROSPATIALE - AS350
2017203	23/08/2017	B	OTHER - Military (Juno)	SCHEMPP HIRTH - DUO DISCUS
2017204	22/08/2017	A	SAAB - 2000	Unknown - (RPAS)
2017205	23/08/2017	A	PIPER - PA28	PIPER - PA28
2017206	25/08/2017	B	EUROCOPTER - EC145	AEROSPATIALE - AS350
2017207	26/08/2017	B	CESSNA - 152	Unknown - (RPAS)
2017208	25/08/2017	B	AVIONS ROBIN - DR400	OTHER - (Microlight)
2017209	28/08/2017	C	OTHER - Generic (Helton Lark)	GIPPSLAND - GA8
2017210	25/08/2017	B	SAAB - 2000	OTHER - Military (Typhoon)
2017211	28/08/2017	B	AIRBUS - A319	Unknown - (RPAS)
2017212	29/08/2017	B	LUSCOMBE - 8	AVIONS ROBIN - DR400
2017213	27/08/2017	B	BOEING - 787	Unknown - (RPAS)

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017214	23/08/2017	B	AIRBUS - A320	Unknown - (RPAS)
2017216	06/09/2017	B	EMBRAER - ERJ170	Unknown - (RPAS)
2017217	06/09/2017	B	EMBRAER - ERJ190	Unknown - (RPAS)
2017218	27/08/2017	B	PIPER - PA28	PIPER - PA38
2017219	08/09/2017	B	DE HAVILLAND - DH80	Unknown - (RPAS)
2017220	10/09/2017	B	SCHLEICHER - ASK21	PIPER - PA28
2017221	08/09/2017	E	EUROCOPTER - EC135	OTHER - (Microlight)
2017222	06/09/2017	C	DE HAVILLAND - DHC8	Unknown - (RPAS)
2017223	11/09/2017	C	DASSAULT - MYSTERE FALCON20	Unknown - (RPAS)
2017224	02/09/2017	D	PIPER - PA28	MAINAIR - GEMINI FLASH
2017226	26/08/2017	B	PIPER - PA27	CYCLONE AIRSPORTS - PEGASUS QUIK
2017227	19/09/2017	A	AIRBUS - A321	Unknown - (RPAS)
2017228	17/09/2017	D	AIRBUS - A321	Unknown - (Object)
2017229	20/08/2017	D	AIRBUS - A319	Unknown - (RPAS)
2017230	19/09/2017	C	COMCO IKARUS - IKARUS C42	COMCO IKARUS - IKARUS C42
2017231	22/09/2017	C	CESSNA - 152	CESSNA - 172
2017232	21/09/2017	C	OTHER - Military (Hawk)	Unknown - (Balloon)
2017233	28/09/2017	C	VANS - RV7	Unknown - (Model Aircraft)
2017234	17/09/2017	C	AIRBUS - A319	CIRRUS - SR22
2017235	28/09/2017	C	AIRBUS - A320	AIRBUS - A320
2017236	23/09/2017	C	DASSAULT - MYSTERE FALCON20	Unknown - (RPAS)
2017237	03/10/2017	B	CESSNA - 152	STODDARD HAMILTON - GLASAIR
2017238	20/08/2017	C	OTHER - Military (Hawk)	CESSNA - 172
2017239	05/10/2017	B	OTHER - Military (Voyager)	Unknown - (RPAS)
2017240	01/10/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017241	06/10/2017	C	AEROSPATIALE - SA330	OTHER - Military (Apache)
2017242	08/10/2017	B	AGUSTA - AW139	OTHER - (Light Aircraft)
2017243	06/10/2017	A	CESSNA - 560	Unknown - (Balloon)
2017244	08/10/2017	E	EUROCOPTER - EC135	CESSNA - 152
2017245	12/10/2017	B	SIKORSKY - S92	OTHER - (Light Aircraft)
2017246	14/10/2017	C	OTHER - Generic (Murphy Renegade)	AGUSTA - A109
2017247	12/10/2017	C	BOEING - 787	ATR - ATR72
2017249	16/10/2017	C	AIRBUS - A320	Unknown - (RPAS)
2017250	21/09/2017	B	AEROSPATIALE - AS350	OTHER - (Light Aircraft)
2017251	20/10/2017	B	AUGUSTA - AW169	AGUSTA - A109
2017252	20/10/2017	C	GROB - G115	OTHER - Military (Hawk)
2017253	24/10/2017	C	DE HAVILLAND - DHC8	SCHLEICHER - ASK13
2017254	25/10/2017	A	AIRBUS - A321	Unknown - (RPAS)
2017256	29/10/2017	B	CENTRAIR - 101	CESSNA - 172
2017257	27/10/2017	B	OTHER - Military (Wildcat)	OTHER - (Paramotor)
2017258	30/10/2017	C	VERTOL - CH47	Unknown - (RPAS)
2017259	30/10/2017	E	SIKORSKY - S92	OTHER - Military (Typhoon)
2017260	01/11/2017	B	OTHER - Military (Wildcat)	AEROMOT - AMT200

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2017261	01/11/2017	C	DE HAVILLAND - DHC8	COMCO IKARUS - IKARUS C42
2017262	02/11/2017	E	Unknown - (RPAS)	OTHER - Military (Tornado)
2017263	06/11/2017	C	BEECH - 350	OTHER - Military (F15)
2017264	04/11/2017	A	AIRBUS - A320	Unknown - (RPAS)
2017265	15/11/2017	C	AEROPRO - EUROFOX	OTHER - Military (Typhoon)
2017266	19/11/2017	C	AGUSTA - AB139	CAARP - CAP10
2017267	17/11/2017	A	DORNIER - 328	Unknown - (RPAS)
2017268	19/11/2017	D	Unknown - (RPAS)	OTHER - (Light Aircraft)
2017269	24/11/2017	B	PIPER - PA28	CIRRUS - SR22
2017270	24/11/2017	A	PIPER - PA31	Unknown - (RPAS)
2017271	01/12/2017	C	BOEING - 787	Unknown - (RPAS)
2017272	01/12/2017	E	AGUSTA - AW189	OTHER - Military (F15)
2017273	10/12/2017	D	BRITTEN NORMAN - BN2	Unknown - (RPAS)
2017274	29/11/2017	C	EUROCOPTER - EC135	ROBINSON - R44
2017275	28/11/2017	C	SCHEMPP HIRTH - DISCUS BT	VULCAN - P68
2017276	16/12/2017	D	DE HAVILLAND - DH82	OTHER - (Unknown)
2017277	14/12/2017	B	EUROCOPTER - EC135	ROBINSON - R44
2017278	14/12/2017	A	OTHER - Military (Tucano)	OTHER - Military (F15)
2017279	08/10/2017	A	AIRBUS - A319	Unknown - (RPAS)
2017280	28/12/2017	B	DE HAVILLAND - DHC1	CESSNA - 172
2017281	19/11/2017	C	AIRBUS - A319	Unknown - (RPAS)
2017282	27/11/2017	C	OTHER - Military (RC135)	OTHER - Military (F15)
2017283	20/12/2017	A	BOEING - 787	Unknown - (RPAS)

GLOSSARY OF DEFINITIONS AND ABBREVIATIONS

Risk Categories

Risk Category	ICAO 4444 PANS-ATM AIRPROX risk classification	Eurocontrol severity classification scheme (ESARR 2)[12]	Current UKAB Board Guidelines word picture	UKAB collision risk descriptor and word picture
A	Risk of Collision: ...aircraft proximity in which serious risk of collision has existed.	Serious incident.	Situations that stop short of an actual collision, where separation is reduced to the minimum and / or where chance played a major part in events and nothing more could have been done to improve matters. Late sightings frequently attach to these cases.	**Providence – serious risk of collision**. Situations where separation was reduced to the bare minimum and/or which only stopped short of an actual collision because chance played a major part in events: the pilots were either unaware of the other aircraft or did not/could not make any inputs in time to materially improve matters.
B	Safety not assured: ...aircraft proximity in which the safety of the aircraft may have been compromised.	Major incident.	Those cases, often involving late sightings, where avoiding action may have been taken to prevent a collision, but still resulted in safety margins much reduced below the normal.	**Safety much reduced/not assured**. Situations where aircraft proximity resulted in safety margins being much reduced below the norm either due to serendipity, misjudgement, inaction, or where emergency avoiding action was taken at the last minute that materially increased separation and averted a likely collision.
C	No risk of collision: ...aircraft proximity in which no risk of collision has existed.	Significant incident	By far the most common outcome where effective and timely actions were taken to prevent aircraft colliding.	**Safety degraded – no risk of collision**. Situations where safety was degraded but either fortuitous circumstances or early enough sighting, information or action allowed one or both of the pilots to either simply monitor the situation or take timely and effective avoiding action to prevent the aircraft from coming into close proximity.
D	Risk not determined: aircraft proximity in which insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.	Not determined.	Reserved for those cases where a dearth of information renders impossible any meaningful finding.	**Non-assessable – insufficient, inconclusive or irresolvable information**. Situations where insufficient information was available to determine the risk involved, or inconclusive/conflicting evidence precluded such determination.
E	No ICAO risk classification	No safety effect: occurrences which have no safety significance.	Met the criteria for reporting but, by analysis, it was determined that the occurrence was so benign that it would be misleading to consider it an Airprox event. Normal procedures, safety standards and parameters pertained.	**Non-proximate - benign**. Situations that met the criteria for reporting but where the occurrence was in fact benign and normal procedures, safety standards and parameters were considered to have pertained.

[12] ESARR - **E**UROCONTROL **Sa**fety **R**egulatory **R**equirement.

AIRPROX BARRIER DEFINITIONS (2017 VERSION)

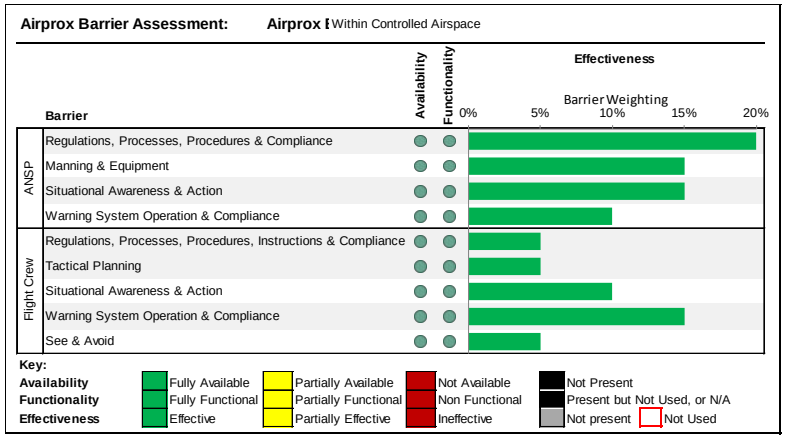
Availability and Functionality Word-pictures

Entity	Barrier	Availability				Functionality			
		Fully (3)	Partially (2)	Not Available (1)	Not Present	Fully (3)	Partially (2)	Non Functional (1)	Not Used
ANSP	**Regulations, Processes, Procedures and Compliance**	Appropriate regulations, processes & procedures were available	Regulations, processes & procedures were available but were lacking in some respects	Regulations, processes & procedures were either not available or were not appropriate	The Barrier was not present in this incident (e.g. no electronic warning system present. Note: U/S equipment is Not Available)	Regulations, processes & procedures were fully complied with	Regulations, processes & procedures were only partially complied with	Regulations, processes & procedures were not complied with	The Barrier was present but not used in this incident (e.g. Class G airspace radar service available but not used by the pilots)
	Manning & Equipment	Manning & equipment resources were appropriate	Manning and/or equipment resources were lacking in some respects	Manning and/or equipment resources were not appropriate		Shift manning was optimum and the equipment was fully functional	Shift manning was sub-optimal and/or the relevant equipment was partially serviceable (e.g. SSR only)	Shift manning was inadequate/ overtasked and/or the relevant equipment was unserviceable	
	Situational Awareness & Action	Specific situational awareness was available	Only generic situational awareness was available	Situational awareness relevant to the scenario was not available		The conflict was recognised and dealt with in a timely and effective manner	The conflict was recognised but only partially resolved or resolved late	The conflict was not identified or the actions did not resolve the incident	
	Warning System Operation and Compliance	Appropriate warning systems were available	Warning systems were available but not optimally configured	Warning systems were unserviceable		Warning system operated correctly and actions were appropriate	Warning system alerted late/ambiguously or was not acted upon until closer than desirable, or only partially acted upon	Warning system did not alert as expected, or was not acted upon	
Flight Crew	**Regulations, Processes, Instructions, Procedures and Compliance**	Appropriate regulations, processes, instructions & procedures were available	Regulations, processes, instructions or procedures were lacking in some respects	Regulations, processes, instructions or procedures were either not available or were not appropriate		Regulations, processes, instructions & procedures were fully complied with	Regulations, processes, instructions or procedures were only partially complied with	Regulations, processes, instructions or procedures were not complied with	
	Tactical Planning	Relevant information was available	Limited information was available (e.g. site not marked on maps)	Relevant information was not available or was not appropriate		Execution was fully effective	Execution was partially effective	Execution was not effective	
	Situational Awareness & Action	Specific SA/TI from either external or onboard systems was available	Only generic SA/TI was available	Flight crew had no SA/TI relevant to the scenario		Flight Crew acted accordingly with the available SA/TI	Flight Crew only partially acted or did not fully use the available SA/TI	Flight Crew did not use the available SA/TI	
	Warning System Operation and Compliance	Both aircraft were equipped with electronic warning systems that were compatible, selected and serviceable	One aircraft was equipped with an electronic warning system that was compatible, selected, serviceable and able to detect the other aircraft	At least one aircraft was equipped with an electronic warning system that was selected and serviceable but incompatible or unable to detect the other aircraft (e.g. other aircraft not transponding)		Warning system operated correctly and instructions were followed	Warning system alerted late/ambiguously or was not acted upon until closer than desirable, or only partially acted upon	Warning system did not alert or was not acted upon	
	See & Avoid	Both pilots were able to see the other aircraft (e.g. both were clear of cloud)	One pilot's visibility was uninhibited, one pilot's visibility was impaired (e.g. one in cloud one clear of cloud)	Both pilots were unable to see the other aircraft (e.g. both in cloud)		At least one pilot takes timely and appropriate action/ inaction	Both pilots or one pilot sees the other late and one or both are only able to take emergency avoiding action	Neither pilot sees the other in time to take effective avoiding action (i.e. the non-sighting scenario)	

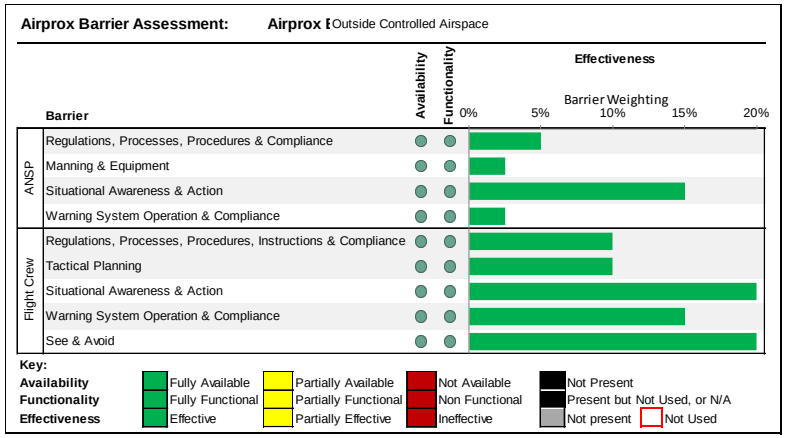
Note that these barrier definitions were only applicable to the 2017 Airprox. They were further modified in 2018 and beyond in light of experience gained as the safety barrier methodology evolved.

Barrier Effectiveness and Weighting

The 9 safety barriers used in 2017 were: ATM regulations and procedures; ATM manning and equipment; ATM situational awareness and action; ATM warning systems; Flight-crew regulations and procedures; Flight-crew tactical planning; Flight-crew situational awareness and action; Onboard warning systems; and See & avoid. These barriers were attributed an airspace weighting depending on the airspace type to reflect their relative importance as a factor of 100% contribution for all 9 (i.e. in controlled airspace see-and-avoid has less importance as a safety barrier compared to in Class G airspace, whereas ANSP regulations and procedures have more importance in controlled airspace than in Class G).



Barrier Weighting Within Controlled Airspace



Barrier Weighting Outside Controlled Airspace

Within this weighting, barriers were then graded for each incident for their effectiveness in terms of their availability and functionality using the word-picture matrix. These availability and functionality assessments were then combined to produce an overall 'effectiveness' rating in accordance with the matrix below. Barrier assessments of 'Ineffective', 'Partially Effective', and 'Fully Effective' are self-explanatory in relation to their respective word-pictures. 'Absent' refers to situations where the barrier was not present (e.g. in much of Class G airspace ATC is not present and therefore the barrier is absent), whilst 'Not Used' refers to incidents where the barrier was available but not used by the pilots (e.g. ATC may have been available but an appropriate Air Traffic Service (ATS) was not requested or the requested service did not require the controller to monitor the aircraft (e.g. Basic Service)). Airprox assessments were then presented on a chart for each incident showing the weighting and the effectiveness colour.

Availability \ Functionality	Not Functional	Partially Functional	Fully Functional
Not Available	Not Effective	Not Effective	Not Effective
Partially Available	Not Effective	Partially Effective	Fully Effective
Fully Available	Not Effective	Partially Effective	Fully Effective

Barrier Effectiveness Matrix

Abbreviations

aal	**above aerodrome level**
ac	aircraft
ACAS	Airborne Collision Avoidance System
ACC	Area Control Centre
ACN	Airspace Co-ordination Notice
ACR	Approach Control Room
A/D	aerodrome
ADC	Aerodrome Control(ler)
ADR	Advisory Route
AEF	Air Experience Flight
AEW	Airborne Early Warning
AFIS(O)	Aerodrome Flight Information Service (Officer)
A/F	Airfield
AGCS	Air-Ground Communication Service
agl	above ground level
AIAA	Area of Intense Aerial Activity
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIS	Aeronautical Information Services
alt	altitude
amsl	above mean sea level
ANSP	Air Navigation Service Provider
AOB	Angle of Bank
A/P	Autopilot
APP	Approach Control(ler)
APR	Approach Radar Control(ler)
ARP	Aerodrome Reference Point
ASR	Airfield Surveillance Radar
ATC	Air Traffic Control
ATCC	Air Traffic Control Centre
ATCO	Air Traffic Control Officer
ATCRU	Air Traffic Control Radar Unit
ATIS	Automatic Terminal Information Service
ATM	Aerodrome Traffic Monitor
ATS	Air Traffic Service
ATSA	Air Traffic Service Assistant
ATSI	Air Traffic Services Investigations
ATSU	Air Traffic Service Unit
ATZ	Aerodrome Traffic Zone
AWACS	Airborne Warning and Control System
AWR	Air Weapons Range
AWY	Airway
BGA	**British Gliding Association**
BHPA	British Hang Gliding and Paragliding Association
BMAA	British Microlight Aircraft Association
BMFA	British Model Flying Association
BS	Basic Service
CANP	**Civil Air Notification Procedure**
CAS	Controlled Airspace
CAT	Commercial Air Transport
CAVOK	Visibility and cloud above prescribed values
cct	Circuit
CFI	Chief Flying Instructor
CLAC	Clear Above Cloud
CLAH	Clear Above Haze
CLBC	Clear Below Cloud
CLBL	Clear Between Layers
CLNC	Clear No Cloud
CLOC	Clear of Cloud
CMATZ	Combined MATZ
CPA	Closest Point of Approach
C/S	Callsign
CTA	Control Area
CTR/CTZ	Control Zone
CWS	Collision Warning System

DA	**Decision Altitude**
DAP	Directorate of Airspace Policy CAA
DF	Direction Finding (Finder)
DH	Decision Height
DME	Distance Measuring Equipment
DS	Deconfliction Service
DW	Downwind
E	**East**
EAT	Expected Approach Time
elev	elevation
ERS	En Route Supplement
est	estimated
FAT	**Final Approach Track**
FIR	Flight Information Region
FIS	Flight Information Service
FISO	Flight Information Service Officer
FMS	Flight Management System
FO	First Officer
FOB	Flying Order Book
FPL	Filed Flight Plan
fpm	Feet per Minute
FPS	Flight Progress Strip
FW	Fixed Wing
GAT	**General Air Traffic**
GCA	Ground Controlled Approach
GH	General Handling
GMC	Ground Movement Controller
GP	Glide Path
GS	Groundspeed
G/S	Glider Site
H	**Horizontal**
hdg	Heading
HISL	High Intensity Strobe Light
HLS	Helicopter Landing Site
HMR	Helicopter Main Route
hPa	Hectopascals (previously millibars)
HPZ	Helicopter Protected Zone
HQ Air	HQ Air Command
HUD	Head-Up Display
IAS	**Indicated Air Speed**
iaw	In accordance with
ICF	Initial Contact Frequency
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
ivo	In the vicinity of
KHz	**Kilohertz**
km	Kilometres
kt	Knots
L	**Left**
LACC	London Area Control Centre (Swanwick)
LARS	Lower Airspace Radar Service
LATCC(Mil)	London Air Traffic Control Centre (Military)
LFA	Low Flying Area
LFC	Low Flying Chart
LH	Left Hand
LJAO	London Joint Area Organisation
LoA	Letter of Agreement
LOC	Localizer
LTMA	London TMA

MATS	**Manual of Air Traffic Services**
MATZ	Military Aerodrome Traffic Zone
METAR	Aviation routine weather report
MHz	Megahertz
M/L	Microlight
MOD	Ministry of Defence
MRP	Military Regulatory Publication
MSD	Minimum Separation Distance
N	**North**
NATS	National Air Traffic Services
NDB	Non-Directional Beacon
NK	Not Known
nm	Nautical Miles
NMC	No Mode C
NR	Not Recorded
NVD	Night Vision Devices
NVG	Night Vision Goggles
OACC	**Oceanic Area Control Centre**
OAT	Operational Air Traffic
O/H	Overhead
OJTI	On-the-Job Training Instructor
Oo	Out of
OOS	Out of Service
PAR	**Precision Approach Radar**
PCAS	Portable Collision Avoidance System
PD	Practice Diversion
PF	Pilot Flying
PFL	Practice Forced Landing
PI	Practice Interception
PIC	Pilot-in-Command
PINS	Pipeline Inspection Notification System
PNF	Pilot Non-flying
PS	Procedural Service
QFE	**Atmospheric pressure at aerodrome elevation**
QFI	Qualified Flying Instructor
QHI	Qualified Helicopter Instructor
QNH	Atmospheric pressure altimeter setting to obtain elevation when on the ground
R	**Right**
RA	Resolution Advisory (TCAS)
RA(T)	Restricted Area (Temporary)
RCO	Range Control Officer
RCS	Radar Control Service
RH	Right Hand
ROC	Rate of Climb
ROD	Rate of Descent
RMZ	Radio Mandatory Zone
RP	Reporting Point
RPAR	Replacement PAR
RPAS	Remotely Piloted Air Vehicle
RPS	Regional Pressure Setting
RT	Radio Telephony
RTB	Return to base
RTF	Radio Telephony Frequency
RVR	Runway Visual Range
RVSM	Reduced Vertical Separation Minimum
RW	Rotary Wing
RWxx	Runway xx, e.g. RW09
S	**South**
SA	Situational Awareness
SAP	Simulated Attack Profile
SAS	Standard Altimeter Setting
ScACC	Scottish Area Control Centre (Prestwick)
ScATCC(Mil)	Scottish Air Traffic Control Centre (Military)
SERA	Standardised European Rules of the Air
SFL	Selected Flight Level [Mode S]
SID	Standard Instrument Departure
SMF	Separation Monitoring Function
SOPs	Standard Operating Procedures
SRA	Surveillance Radar Approach
SSR	Secondary Surveillance Radar
STAR	Standard Instrument Arrival Route
STCA	Short Term Conflict Alert
SUAS	Small Unmanned Air System
SUAV	Small Unmanned Air Vehicle
SUP	Supervisor
SVFR	Special VFR
TA	**Traffic Advisory (TCAS)**
TAS	True Air Speed
TC	Terminal Control
TCAS	Traffic Alert & Collision Avoidance System
TDN	Talkdown Control(ler)
TFR	Terrain Following Radar
TI	Traffic Information
TMA	Terminal Control Area
TMZ	Transponder Mandatory Zone
TP	Turn Point
TRA	Temporary Restricted Area
TRUCE	Training in Unusual Circumstances and Emergencies
TS	Traffic Service
TWR	ATC Tower
UAR	**Upper Air Route**
UAS	Unmanned Air System
UAV	Unmanned Air Vehicle
UHF	Ultra High Frequency
UIR	Upper Flight Information Region
UKDLFS	United Kingdom Day Low Flying System
UK FIS	UK Flight Information Services
UKNLFS	United Kingdom Night Low Flying System
unk	unknown
unltd	unlimited
USAF(E)	United States Air Force (Europe)
U/S	Unserviceable
UT	Under Training
UTC	Co-ordinated Universal Time
UW	Upwind
V	**Vertical**
VCR	Visual Control Room
VDF	Very High Frequency Direction Finder
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omni Range
VRP	Visual Reporting Point
W	**West**
Wx	Weather
XXXX	**Unknown or deliberately dis-identified**