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Analysis of Airprox in UK Airspace

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Thirty-Fourth Report by the UK Airprox Board

Analysis of Airprox in UK Airspace

(January 2018 to December 2018)

Compiled by Director UK Airprox Board for

The Chief Executive Officer
UK Civil Aviation Authority

and

The Director
UK Military Aviation Authority

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OVERVIEW

Overall Summary and Trends

The UK Airprox Board (UKAB) assessed 319 Airprox in 2018, of which 180 were manned aircraft-to-aircraft encounters and 139 involved incidents with small unmanned air systems (SUAS)[1]. This represents an increase both in aircraft-to-aircraft and aircraft-to-SUAS reports compared to 2017 (when there were 159 aircraft-to-aircraft and 113 aircraft-to-SUAS incidents). 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.

This year the Board continued to evolve the introduction of the mid-air-collision (MAC) safety barrier assessment methodology within the Airprox process. Whilst the resultant grading of safety barriers for each incident is illuminating in its own right as an indicator of where the normal safety processes broke down in those specific circumstances, the real value comes from looking at the aggregated view over the year. Doing so highlights which barriers were the weakest overall and therefore where there is potentially most to gain from the attentions both of regulators' and operators' in enacting systemic improvements.

With that in mind, this report's later 'Safety Barriers' section shows that one of the key areas of weakness is that of airborne collision warning systems (CWS) or, more pointedly, lack thereof, to which electronic conspicuity (EC) is a vital component. As a result, I have been promoting the value of CWS/EC in all the forums to which I present, and also within the CAA's MAC Programme Board and separate MAC Challenge Group; the CAA's focus on EC is a welcome initiative in this respect. Other topics that I also regularly highlight using the safety barrier analysis are the ever-important need for robust lookout; the importance of gaining situational awareness about other aircraft (through EC, radio and ATC Traffic Information when available); and robust planning (and execution of the plan). Although the associated assessment and analysis methodology continues to evolve as we refine its application, I am confident that the safety-barrier outcomes provide a far richer understanding of 'why' Airprox occurred compared to the previous simplistic view of 'what' happened to cause a particular incident. The next step in the evolution is to introduce 'contributory factor analysis' for each barrier assessment in 2019, which, as I write, is already providing welcome additional granularity and focus to our assessments.

[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. In 2018, there were 125 drones, 1 model aircraft, 2 balloons, and 11 unknown objects reported. However, 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 positively describes 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 therefore likely that some reported 'Model Aircraft' or 'Unknown Object' incidents might be drones, and vice versa.

Focussing initially on the non-SUAS incidents, the 10-year data at Table 1 and Figures 1 & 2 shows that the increase in 2018 reinforces an overall gradually increasing underlying trend in Airprox reporting levels (even after discounting the 2014 peak blip). Whilst increases in reporting might simply be something to celebrate within a more engaged aviation community, it might also indicate an underlying worsening safety situation. It is not possible to determine easily which of these paradigms represents reality but one worrying trend is that, as shown in Figure 2, the percentage of reported Airprox that are assessed as 'Risk-Bearing' (risk categories A or B)[2] is also trending upwards. In other words, accepting that the annual variances in report numbers might be subject to the vagaries of reporting cultures, those incidents that are reported are becoming proportionally riskier; ten years ago, about 30% of Airprox were assessed as Risk-Bearing, in recent years this has increased to about 40%.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	10-year Average
Category A	11	12	23	18	22	26	27	17	13	**20**	19
Category B	36	33	36	27	43	65	52	41	49	**49**	43
Category C	97	116	88	97	72	85	75	79	75	**80**	86
Category D	3	6	2	5	9	6	5	8	4	**2**	5
Category E	-	-	12	14	26	33	18	26	18	**29**	22
Annual Totals	147	167	161	161	172	215	177	171	159	**180**	171
Risk Bearing %	32%	27%	37%	28%	38%	42%	45%	34%	39%	**38%**	36%

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

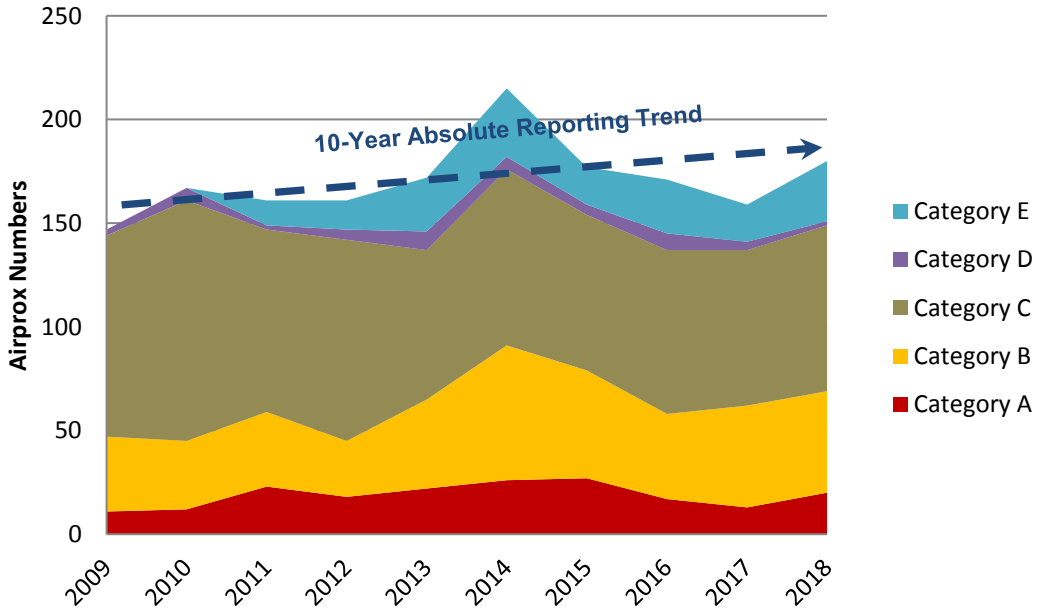


Figure 1. Non-SUAS 10-year Airprox Trend

[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.

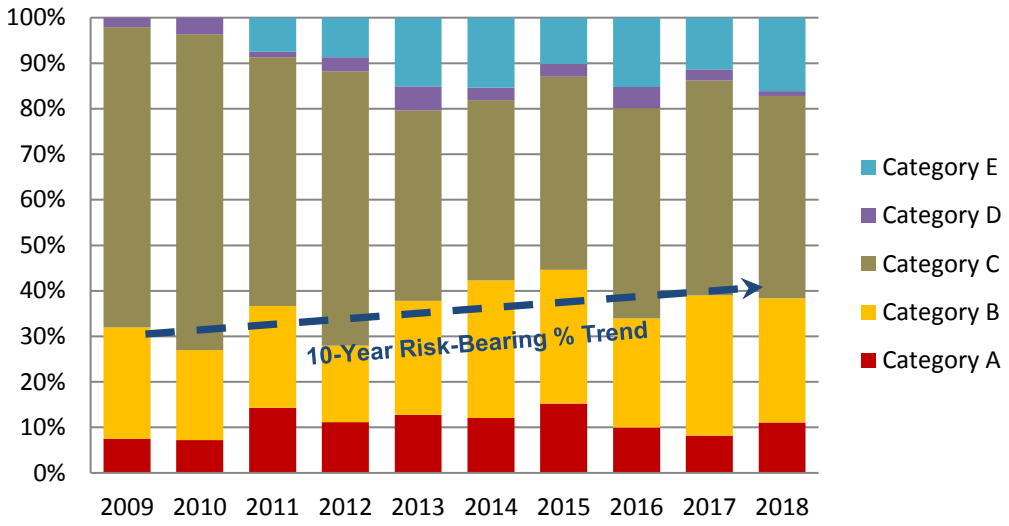


Figure 2. Non-SUAS 10-year Airprox Risk Distribution

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 continues to be very high. Table 2 and Figures 3 & 4 illustrate this. With respect to SUAS collision risk, it is notable that, of the 139 SUAS incidents reported for 2018, 92 (66%) 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 objects, 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 (38% in 2018) then 92 risk-bearing SUAS incidents would equate to 242 SUAS incidents overall in 2018 (i.e. at least 150 or so SUAS events might not have been observed in 2018).

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.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**	10-year Average
Category A	11	12	23	18	22	28	41	51	45	**65**	32
Category B	36	33	36	27	43	68	66	72	82	**96**	56
Category C	97	116	88	97	72	86	78	104	111	**120**	97
Category D	3	6	2	5	9	9	12	11	12	**5**	7
Category E	-	-	12	14	26	33	20	27	22	**33**	23
Annual Totals	147	167	161	161	172	224	217	265	272	**319**	211
Risk Bearing %	32%	27%	37%	28%	38%	43%	49%	46%	47%	**50%**	42%

Table 2. Total Airprox Notifications and Risk Assessment Statistics

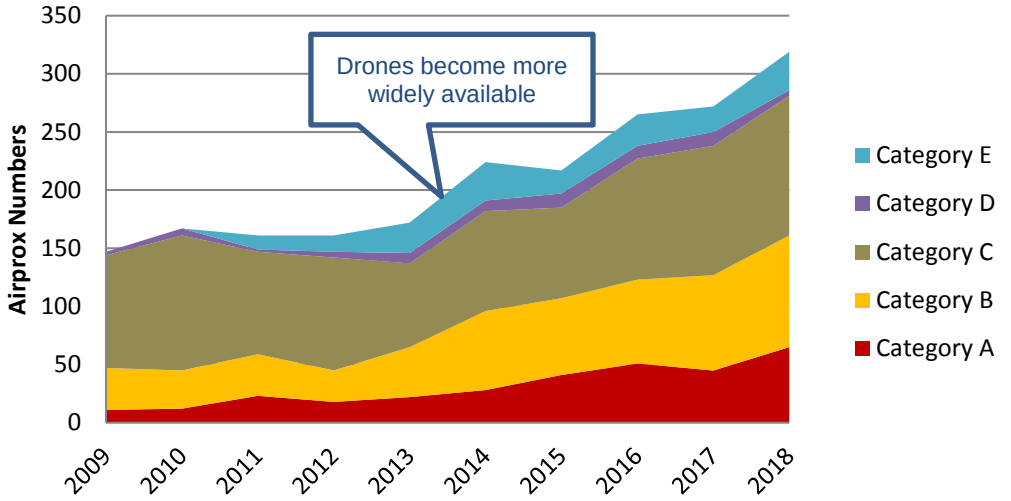


Figure 3. Total 10-year Airprox Trend

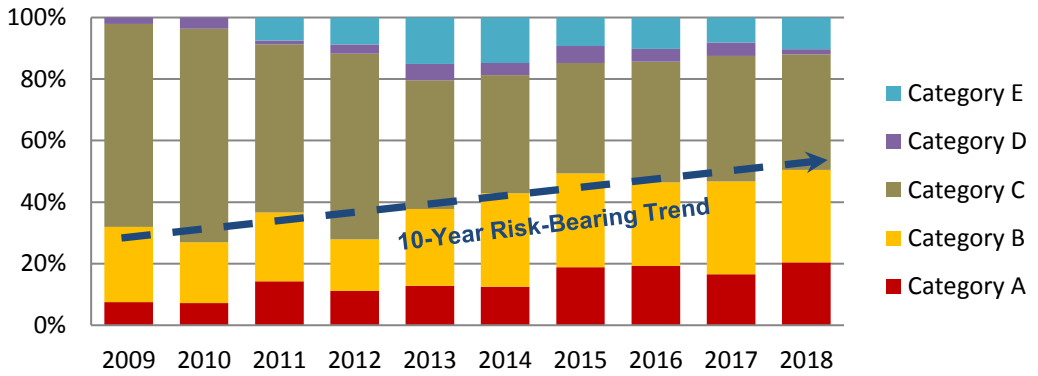


Figure 4. Total 10-year Airprox Risk Distribution

Looking at the longer-term trends for non-SUAS Airprox since the UKAB was formed, Figures 5 & 6 show the aircraft-to-aircraft incidents from 1995 to 2018. Even discounting the 2014 spike, it can be seen that reporting and risk-bearing trends are both increasing again from their 2009/2010 lows. As previously mentioned, it is not easily possible to determine whether these rises are the result of an invigorated reporting culture or whether numbers of incidents are actually rising due to underlying safety issues.

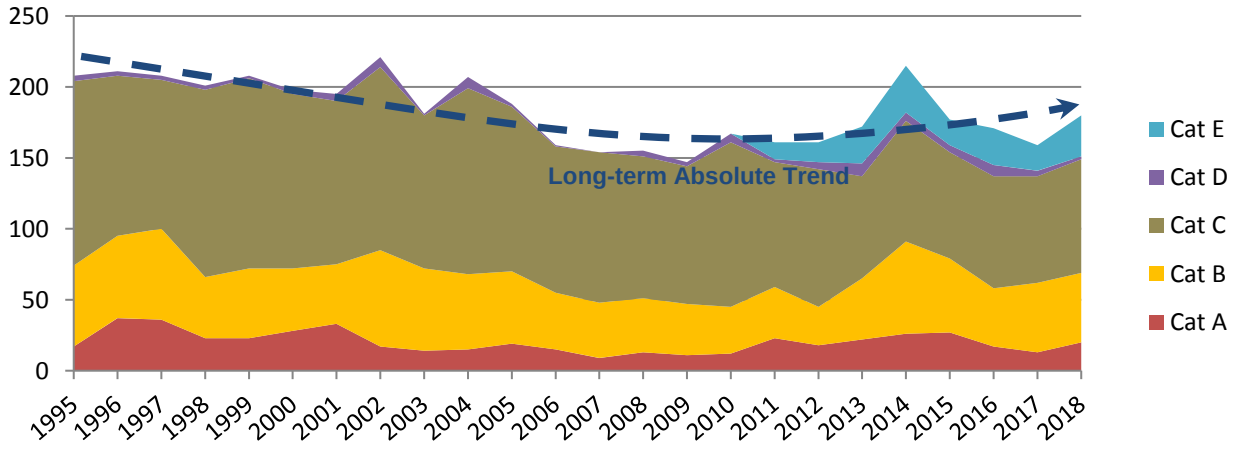


Figure 5. Airprox Numbers – non-SUAS Long-term Trend

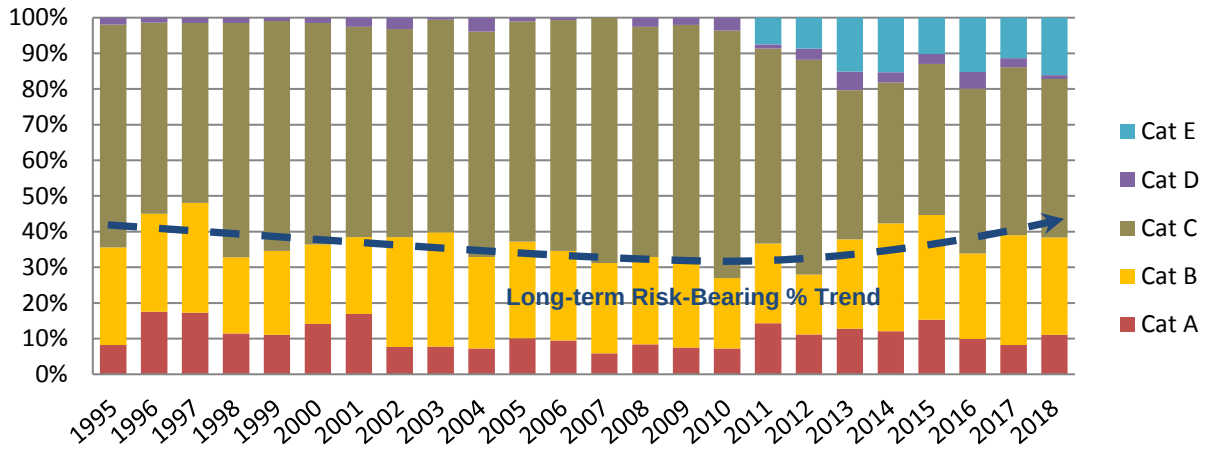


Figure 6. Airprox Risk Distribution – non-SUAS Long-term Trend

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 percentage riskiness 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 2009/2010 the non-SUAS risk-bearing percentage was near 30%, whereas in 2017/2018 it had risen by almost 10% over the decade to nearly 40%.

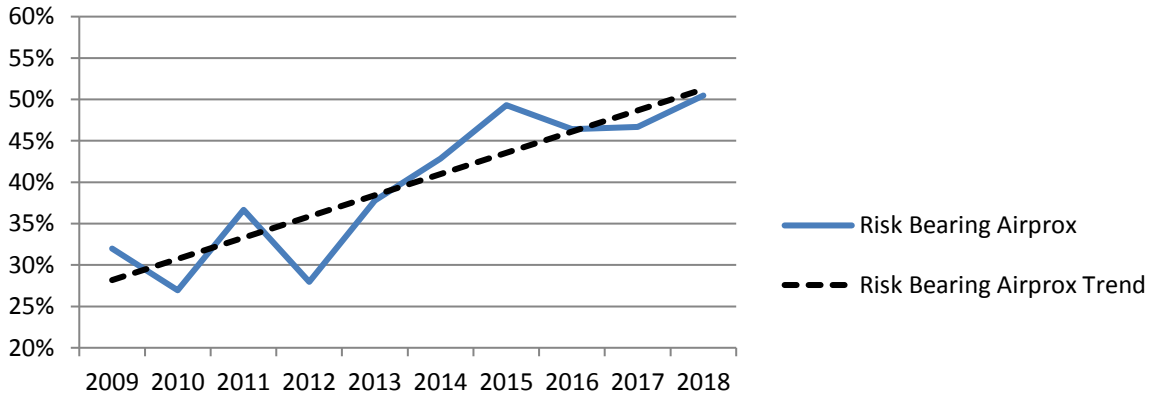


Figure 7. Overall Risk-Bearing Airprox - 10-year Percentage Trend

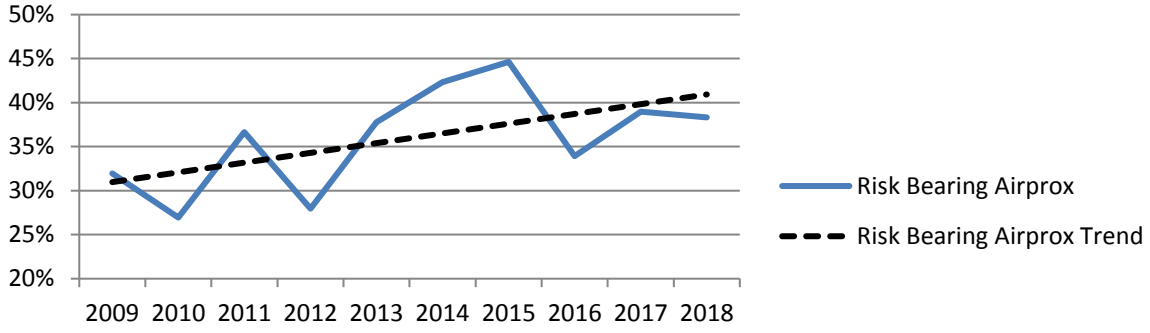


Figure 8. Non-SUAS Risk-Bearing Airprox - 10-year Percentage Trend

As can be seen in Table 3 and Figures 9 & 10, sub-categorising the non-SUAS risk-bearing numbers and percentages into their respective aircraft sectors provides further granularity which highlights that the increasing trend is almost exclusively within the GA sector.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**
GA	26	29	46	33	51	78 (1)	64 (6)	46 (10)	52 (18)	**63 (15)**
Emerg Servs	1	1	3	2	3	5	2	2	6 (1)	**2 (3)**
Mil	30	25	30	21	28	31 (2)	29 (3)	22 (6)	17 (7)	**21 (5)**
CAT	1	0	1	1	4	4 (2)	3 (19)	1 (48)	3 (42)	**1 (70)**

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

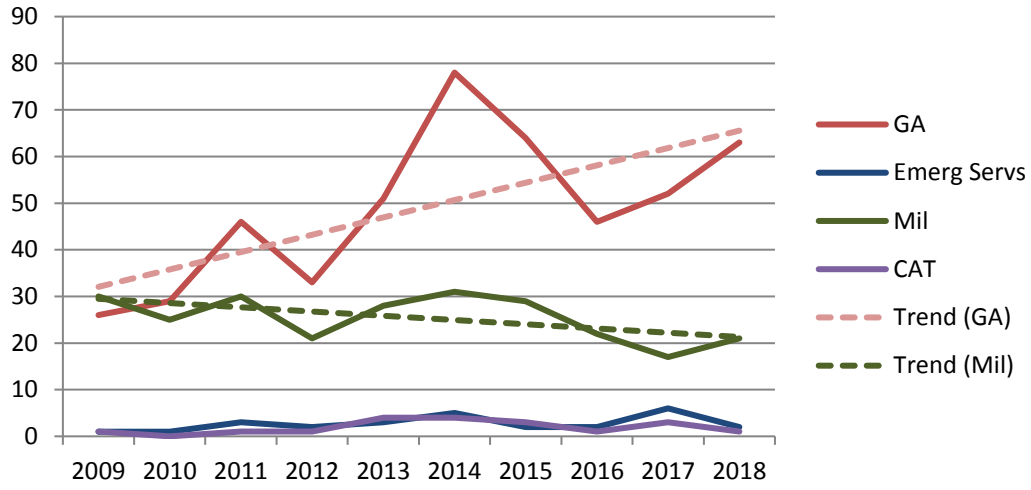


Figure 9. Non-SUAS Risk-Bearing Numerical Trends by Group

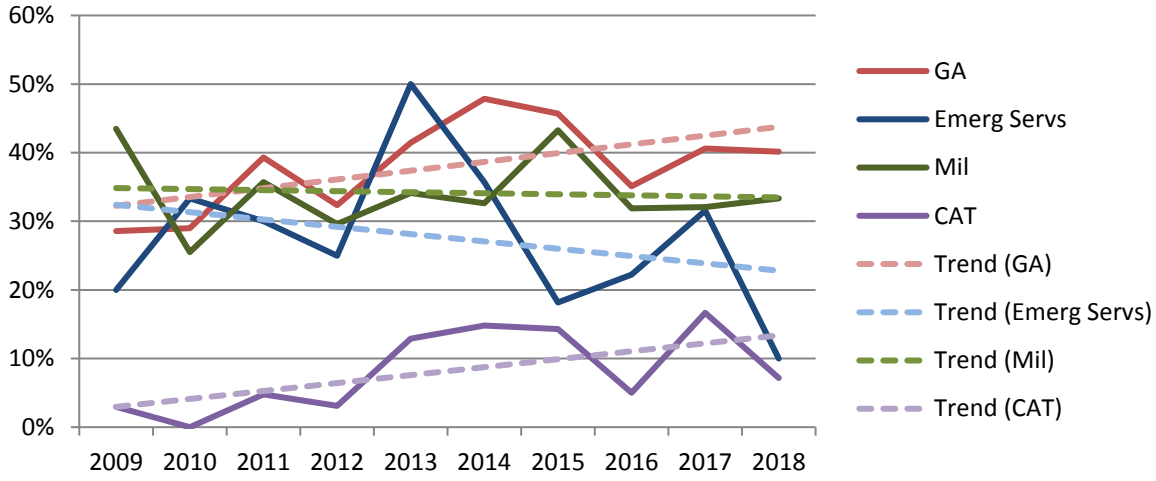


Figure 10. Non-SUAS Risk-Bearing Percentage Trends by Group

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

The following Airprox rates per million flying hours (mfh) provides an appreciation for year-on-year trends normalised for flying hours. However, caution needs to be exercised when quoting specific values because the collation of reliable flying-hour statistics is notoriously difficult: 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, for transport aircraft, that 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 estimates I can obtain from CAA and military sources, which indicate that, overall, UK flying hours have been gradually trending upwards over the last 5 years. Figure 11 shows these flying hours overlain on the 10-year non-SUAS risk graph and as trend lines in the second graph. Even discounting the 2014 peak, it can be seen that over the last 10 years both the total and risk-bearing Airprox trends per mfh are steadily increasing.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CAT Hours x 10K	149.4	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6	167.3
GA Hours x 10K	131.2	113.0	104.0	96.2	92.3	93.2	88.0	83.9	93.0	92.5
Mil hrs x10K	43.2	31.8	31.1	25.6	24.2	25.0	24.2	25.6	21.1	17.7
Total Hrs x10K	323.7	286.4	282.3	267.2	265.6	269.7	267.1	270.9	281.6	277.6
Total Airprox / mfh	45	58	57	60	65	80	66	63	56	65
RB Airprox / mfh	15	16	21	17	24	34	30	21	22	25

Table 4. UK Flying Hours 10-year Statistics (no SUAS Airprox)

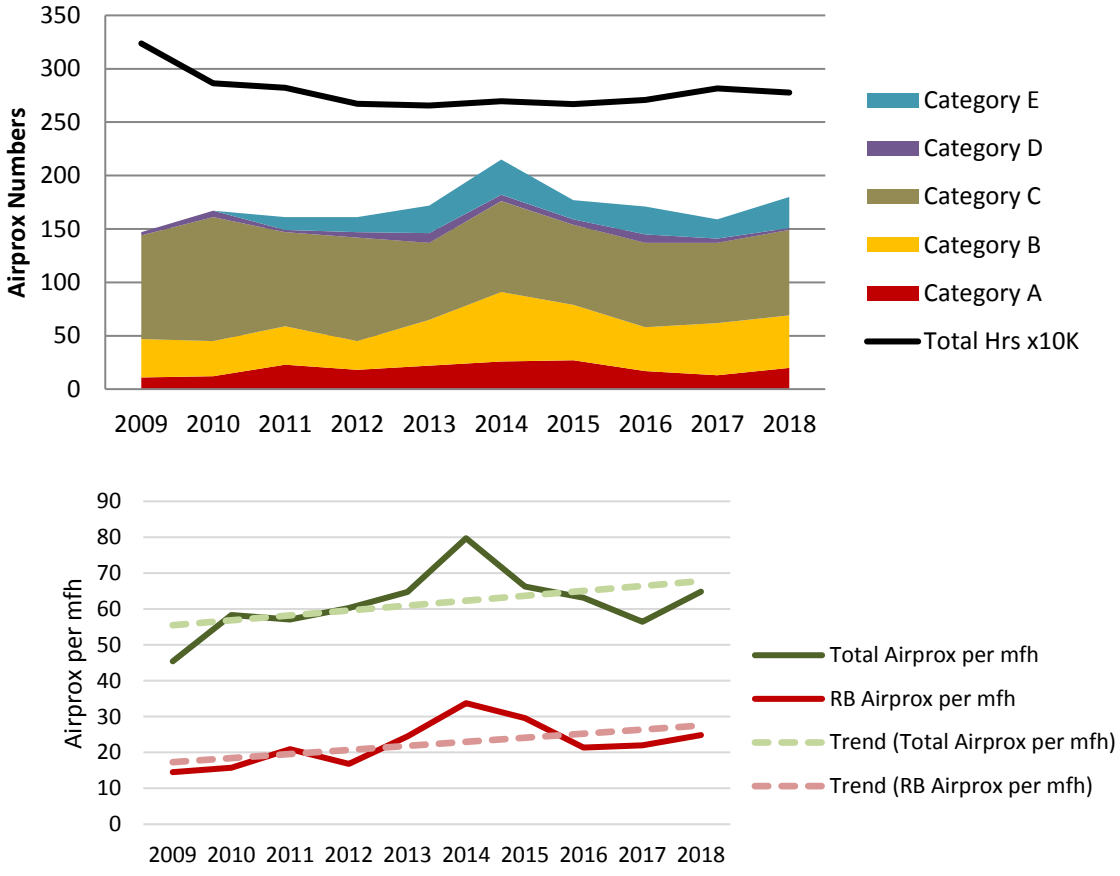


Figure 11. Overall non-SUAS 10-year Trends Compared with Flying Hours

Table 5 and Figure 12 show Airprox per mfh by aircraft sectors.[3] After a welcome decrease in both GA and Military Airprox per mfh in 2017, 2018 shows a return to previous levels that perpetuate the underlying upward trends for both total and risk-bearing Airprox per mfh for both sectors. Also of note, the military rates for both total and risk-bearing Airprox are consistently about 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]

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total GA Airprox per mfh	69	89	113	106	133	175	159	156	137	170
GA Risk Bearing Airprox per mfh	20	26	44	34	55	84	73	55	56	68
Total Mil Airprox per mfh	160	308	270	278	339	380	277	270	252	355
Mil Risk Bearing Airprox per mfh	69	78	96	82	116	124	120	86	81	118
Total CAT Airprox per mfh	23	23	14	22	21	18	14	12	11	8
CAT Risk Bearing Airprox per mfh	1	0	1	1	3	3	2	1	2	1

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

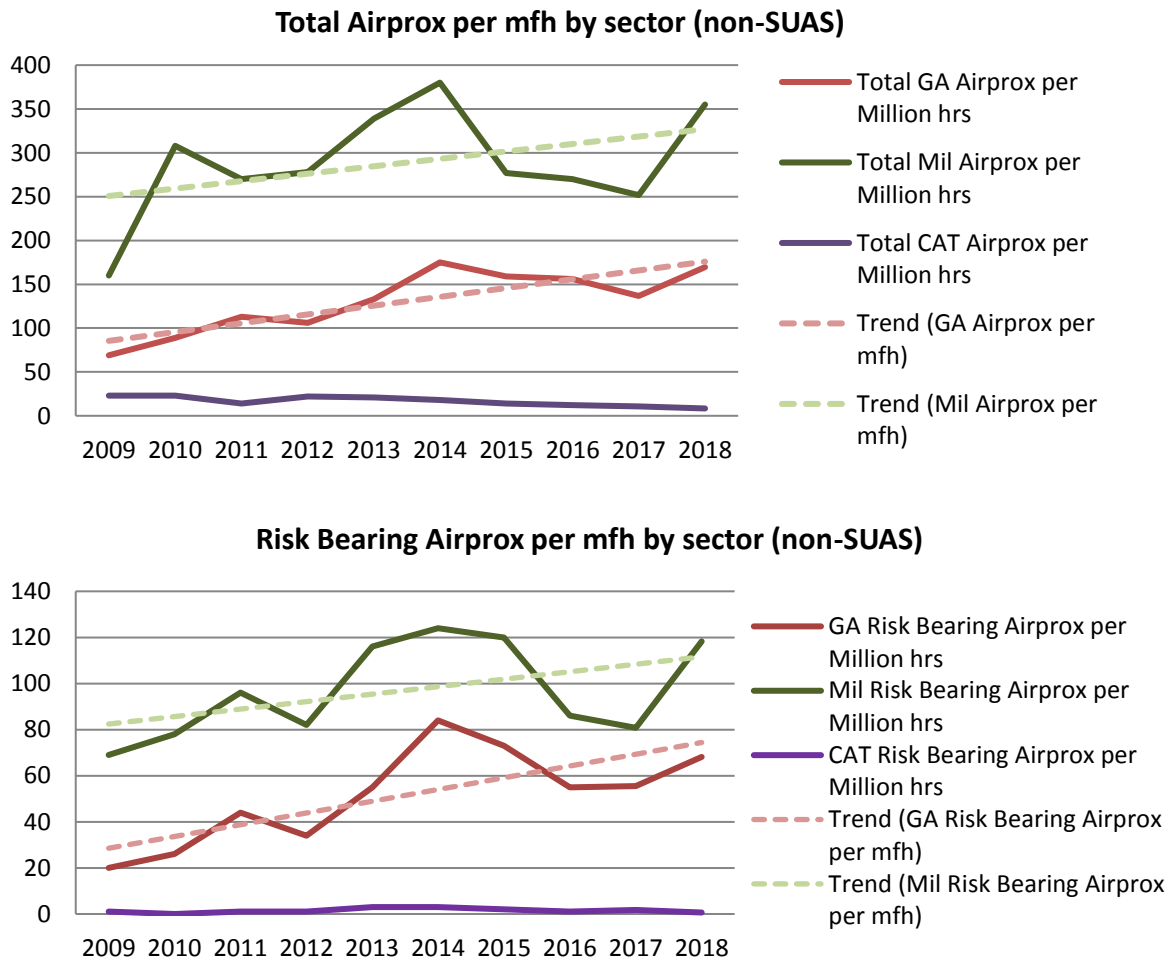


Figure 12. Airprox per mfh by Sector of Aircraft – last 10 years

[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.

Airprox by Sector Involvement

Table 6 and Figure 13 illustrate the 2018 Airprox-by-numbers breakdown by sector involvement. Note that the sum of the sector figures in each chart will not add up to the total number of Airprox in the year (319 for all Airprox and 180 for non-SUAS Airprox) because an Airprox may involve 2 classes of aircraft and therefore appear twice in the figures. Thus, in these graphs, 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 2018 are:

- 59% involved GA
- 24% involved Military
- 7% involved Emerg Servs
- 33% involved CAT (mostly vs SUAS)
- 44% involved SUAS (mostly vs CAT)

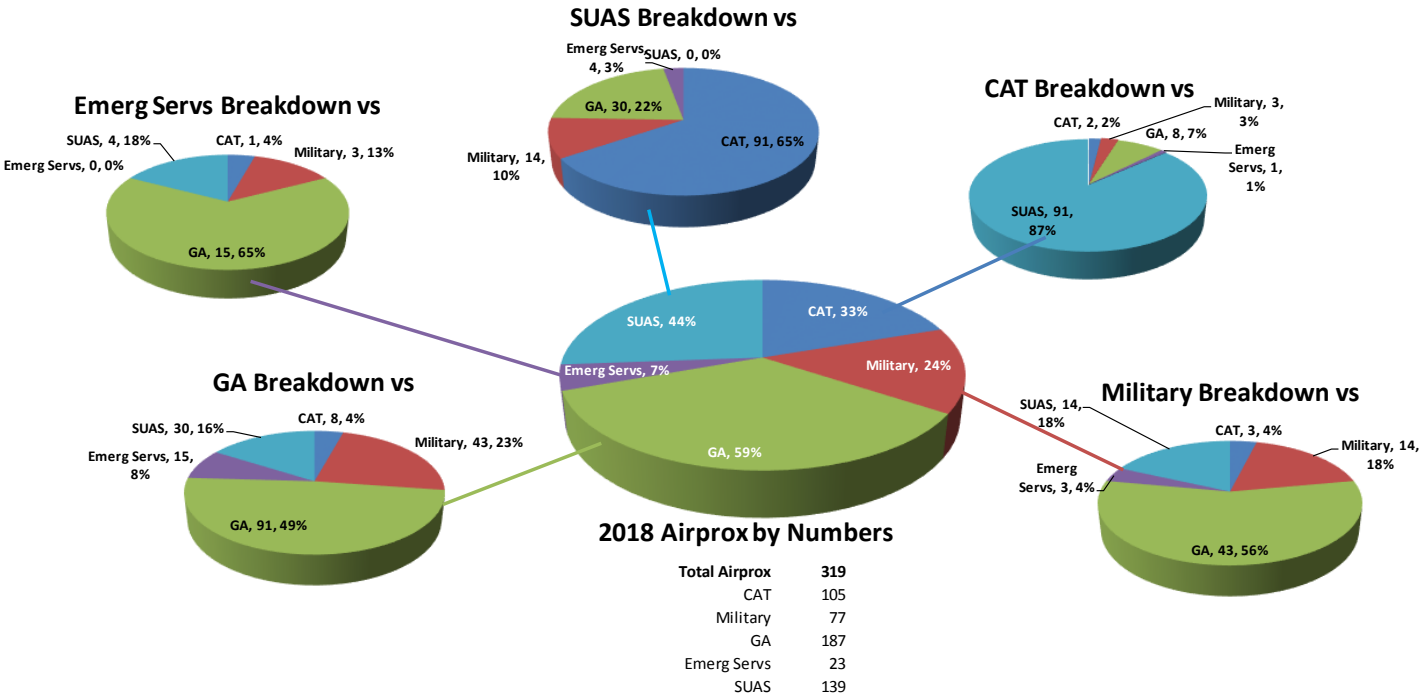
For non-SUAS Airprox, the corresponding Airprox headline figures are:

- 87% involved GA
- 35% involved Military
- 11% involved Emerg Servs
- 8% involved CAT

	CAT	Military	GA	Emerg Servs	SUAS	Unknown	Total	Total as % of Airprox
CAT	2	3	8	1	91	0	105 (14)	33% (8%)
Military	3	14	43	3	14	0	77 (63)	24% (35%)
GA	8	43	91	15	30	0	187 (157)	59% (87%)
Emerg Servs	1	3	15	0	4	0	23 (19)	7% (11%)
SUAS	91	14	30	4	0	0	139 (0)	44% (0%)
Unknown	0	0	0	0	0	0	0 (0)	0% (0%)

Table 6. 2018 Total Airprox by Sector Involvement (non-SUAS totals in brackets)

The 2 pie charts of Figure 13 show these figures graphically both for all Airprox (1st chart) and the non-SUAS Airprox (2nd chart). In each chart, the large central pie shows the division of Airprox by sector involvement. The smaller 'satellite' pies show the sub-division of involvements within each of the sectors (i.e. for the 187 Airprox involving GA in the first chart: 49% were with other GA aircraft; 23% were with Military aircraft; 4% were with CAT; 16% were with SUAS; and 8% were with Emerg Servs aircraft).



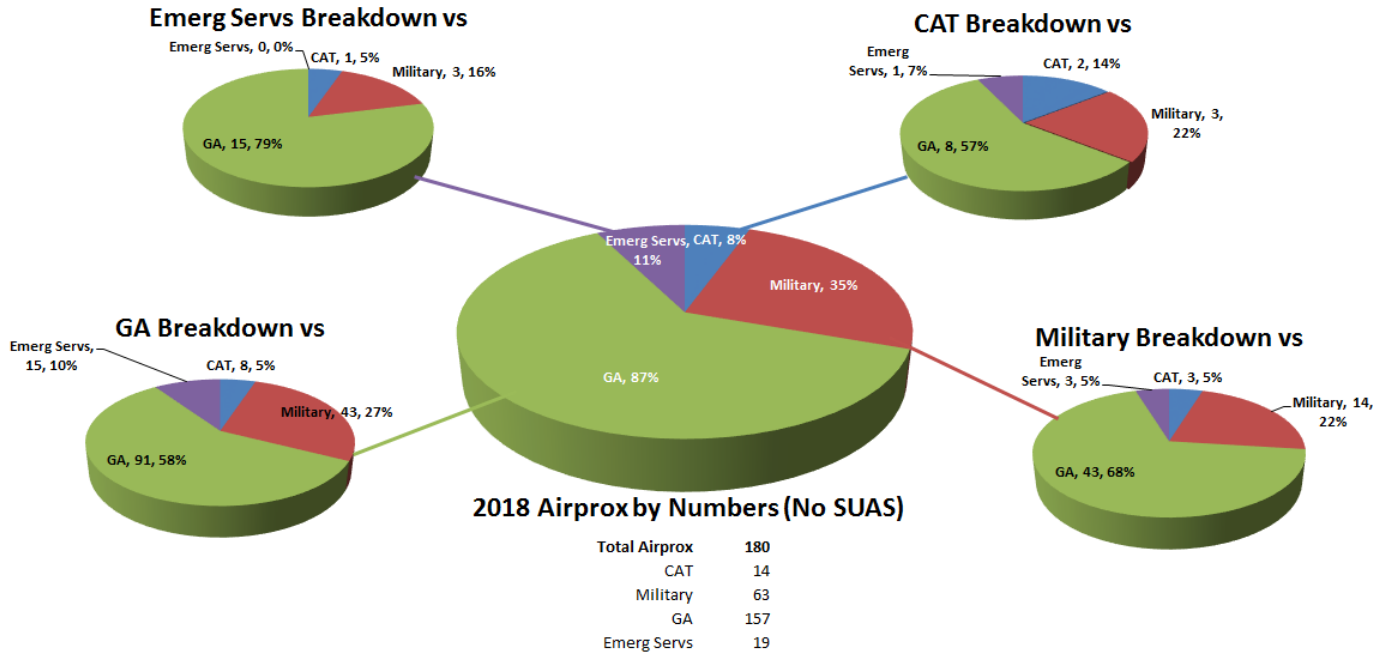


Figure 13. 2018 Total Airprox by Sector Involvement

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

Safety Barriers

The UKAB safety barrier analysis methodology continues to evolve and the relevant 2018 word-picture chart for each barrier is shown within the associated Appendix at the end of this report. These word-pictures are intended to ensure consistency in assessment although not every incident fitted neatly into these word-pictures and so individual assessments required a degree of subjective judgement. Although each incident's assessments are included in the associated Airprox report to highlight specific safety issues and insights, the real strength of the process comes from analysing the aggregate outcomes over the year to develop a measure of overall safety-barrier effectiveness within UK airspace. For 2018, Table 7 and Figures 14 & 15 show the combined outcomes as a percentage of the 190 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	19%	4%	13%	64%	0%	37	8	24	121	0	190
ATC Manning & Equipment	21%	0%	3%	75%	2%	39	0	5	143	3	190
ATC Situational Awareness & Action	21%	13%	7%	29%	29%	40	25	14	56	55	190
ATC Warning System & Compliance	95%	0%	0%	3%	2%	181	0	0	5	4	190
Pilot Regs, Processes, Procedures & Compliance	0%	28%	12%	60%	0%	0	54	22	114	0	190
Pilot Tactical Planning	0%	11%	44%	45%	0%	0	21	84	85	0	190
Pilot Situational Awareness & Action	0%	48%	22%	29%	0%	0	92	42	56	0	190
Warning System Operation & Compliance	37%	32%	3%	28%	0%	70	60	6	54	0	190
See & Avoid	0%	17%	39%	41%	3%	0	33	74	77	6	190

Table 7. 2018 Aggregate Barrier Performance (190 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 apt 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 41% of incidents.
- Onboard collision warning/avoidance equipment was absent or ineffective (mostly due to incompatibilities between equipment) in 69% of incidents.
- Pilot situational awareness was either ineffective or only partially effective in 70% of incidents. The lack of situational awareness regarding other aircraft is a key area for focus – if pilots know the other aircraft is there, most 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.

[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.

- Pilot tactical planning and execution of the plan was fully effective in 45% of incidents but only partially so in 44% (often due to pilots not modifying their plan in flight to account for changing circumstances).
- Pilot compliance with procedures was fully effective in 60% of incidents but more can be done to improve the 40% of incidents when it was not. Many of these latter incidents involved poorly flown overhead joins, poor circuit procedures or flying too close to glider/microlight/paradropping sites for example.
- ATC was absent and therefore unable to provide any assistance in about 20% of incidents, and when it was available, pilots did not fully use its capabilities (such as requesting a surveillance-based service where available) in 29% of incidents.

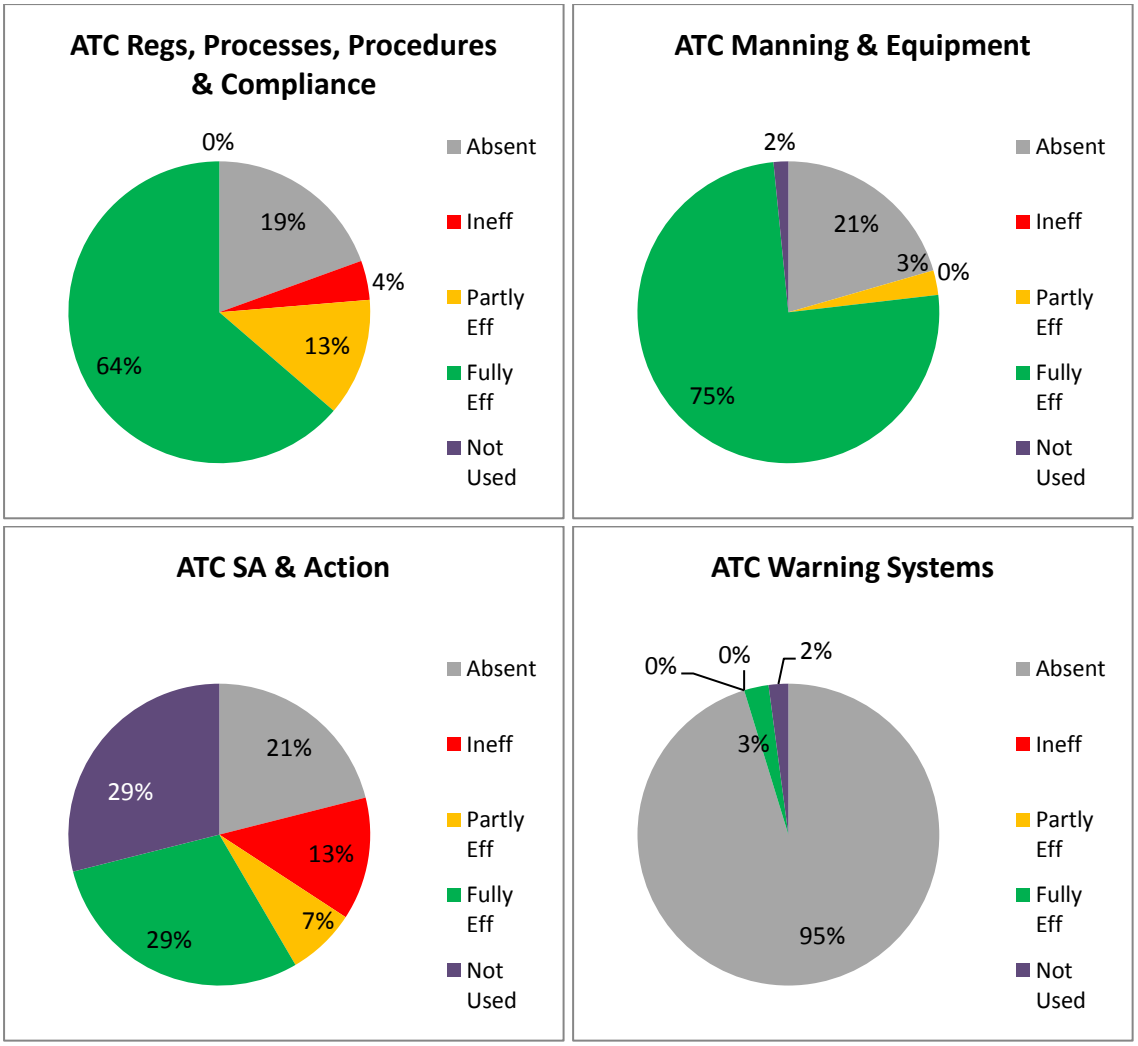


Figure 14. 2018 ATC Barrier Dashboard (190 Assessed Incidents)

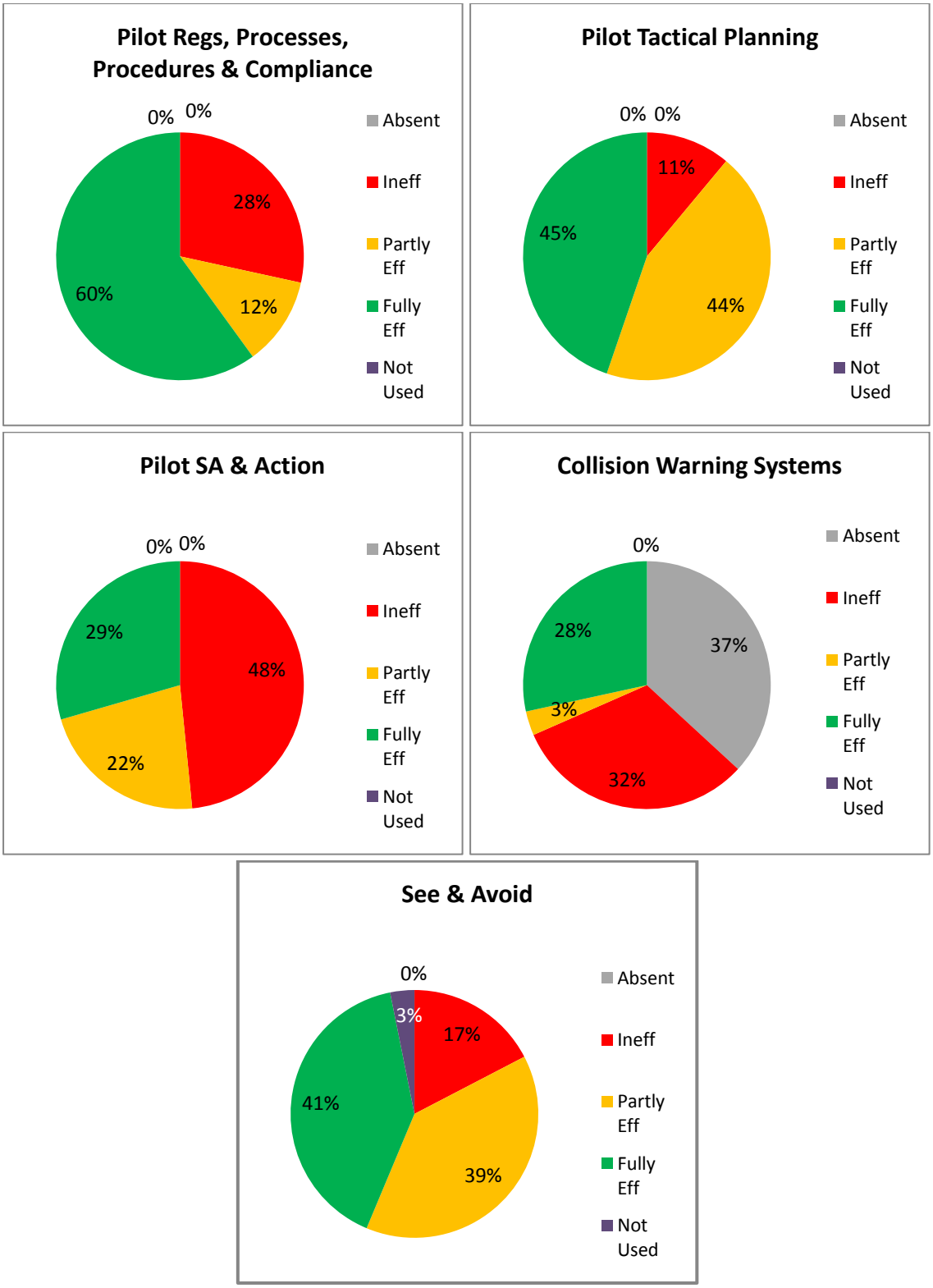


Figure 15. 2018 Flight Crew Barrier Dashboard (190 Assessed Incidents)

Airprox Education Themes

The above barrier analysis and overall causal outcomes were very similar to the 2017 assessments and so the 2017 educational messages were re-employed in 2018 in an effort to maintain pilots' focus on a few familiar key messages. The associated '5 seconds to impact' campaign employed 6 easily understood themes as indicated in Figure 16. This messaging was deployed to the GA community in numerous presentations, a short video and monthly 'Airprox Insight' newsletters that were highlighted to the various stakeholders using the CAA's SkyWise notification system and through the UKAB App. The 2018 annual Airprox magazine also focused on lookout (and specifically the well-known limitations of the human eye) along with a review of the 2017 safety barriers. All of these products are available on the UKAB website at www.airproxboard.org.uk within the 'Director's Topical Issues and Themes' area.

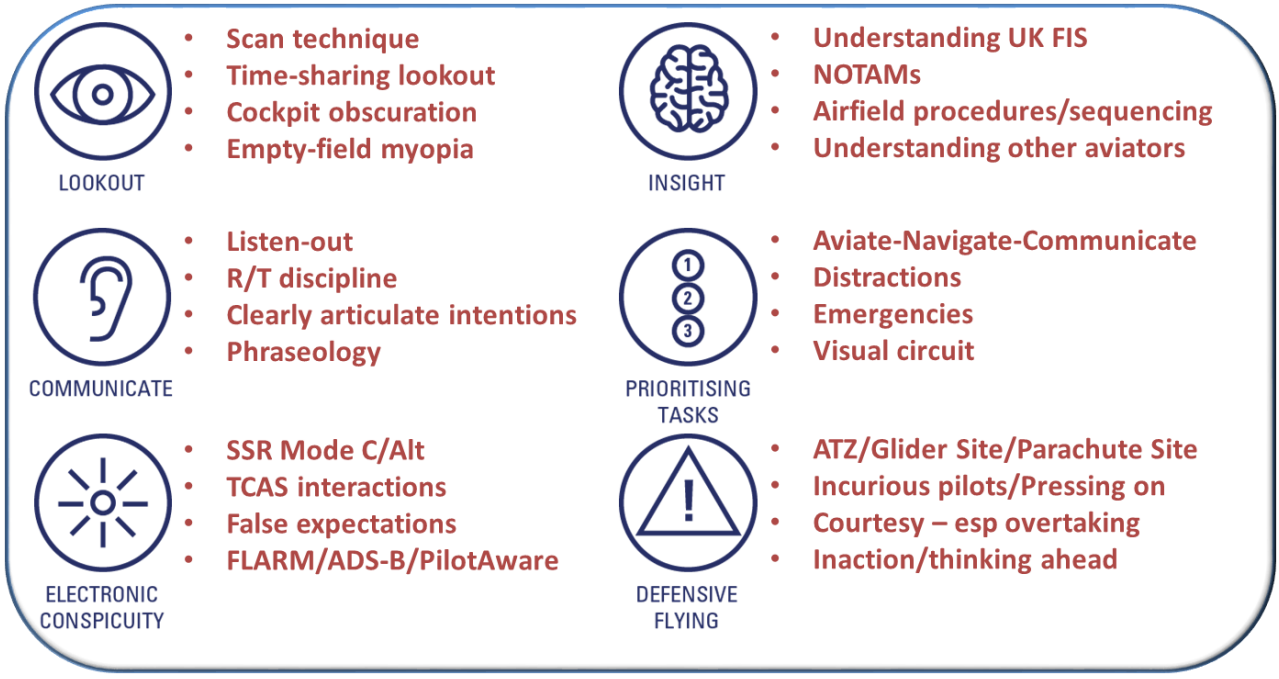


Figure 16. 2018 Airprox Education Themes

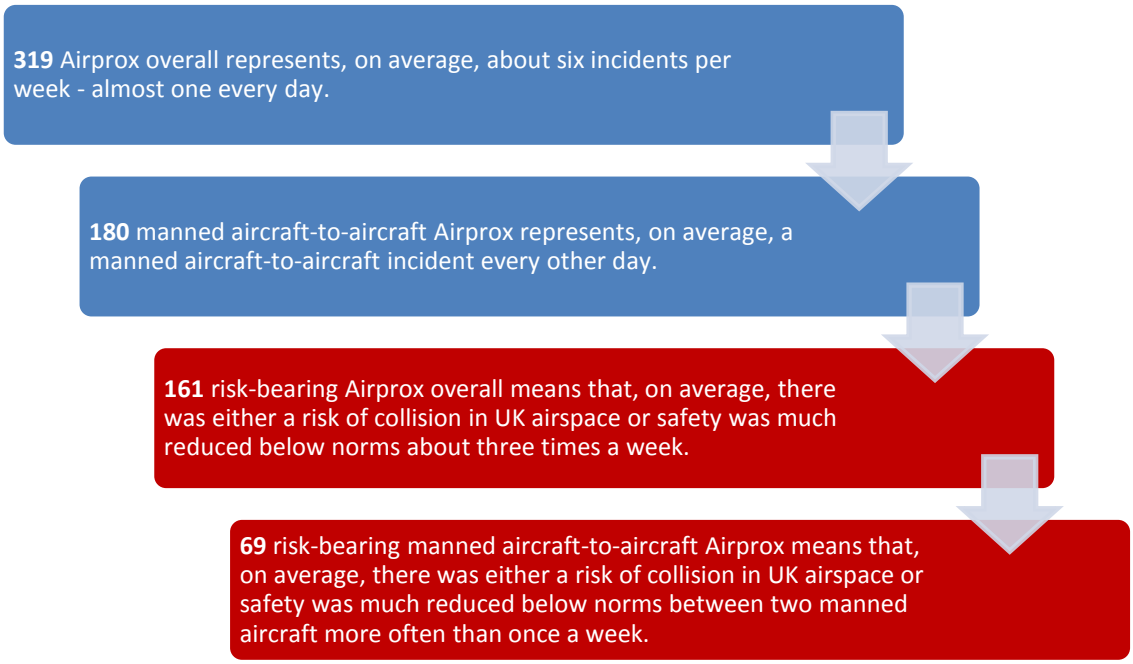
This report's following sections provide more detailed overviews of Airprox statistics and trends by sector, and this is intended to provide analysis on how things are progressing year-on-year. However, the subjective nature of Airprox reporting and assessment, and the small number of incidents compared 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.

Situational awareness is the fundamental 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 too many disappointing incidents where pilots do not act,

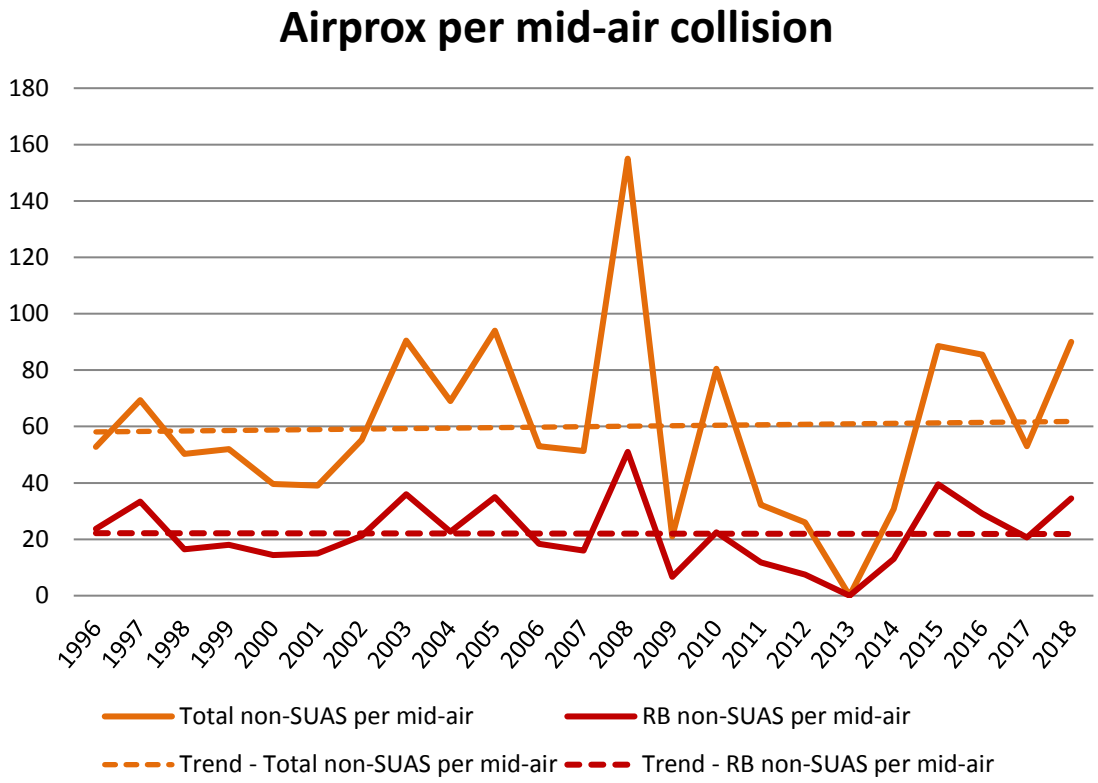
often based on the false assumption that the other pilot will have seen them and will therefore give way.

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 equipment, but it is clear that effort is required to ensure compatibility between the current systems and I note the CAA's focus in this area as we move towards potential universal equipage in all air vehicles. In a rapidly evolving environment, 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. However, all will hinge on ensuring compatibility between systems such that we resolve the current 'VHS versus BetaMax' situation whereby some systems are not able to interact with each other.

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, and 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, 319 overall incidents in 2018 represents, on average, an Airprox occurring in UK almost every day. Of these, 161 risk-bearing incidents indicates that, on average, a collision very nearly occurred in UK airspace (or safety margins were at least much reduced) about 3 times a week. Even when looking at only the manned aircraft-to-aircraft Airprox, 180 incidents represents an Airprox occurring between 2 manned aircraft about every other day, and with 69 risk-bearing manned aircraft-to-aircraft incidents in 2018, on average, two aircraft nearly collided more often than once a week.



In assessing the relevance of these statements, it is also worth noting that, although annual correlations vary over the last 20 years or so, on average the trend is that there is one MAC event in UK airspace for every 20 risk-bearing non-SUAS Airprox (and one for every 60 non-SUAS Airprox overall) as shown below.



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

Steve Forward
Director UK Airprox Board

AIRPROX REPORTING STATISTICS

Airprox Analysis and Trends - Overview

In common with normal Airprox annual trends, 2018 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 2018'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 manned 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, manned aircraft-to-aircraft incidents were fairly consistent with predictions, (other than in May and June when there were many more reports than expected and July 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 early-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 4 years, and so the numbers have yet to stabilise.

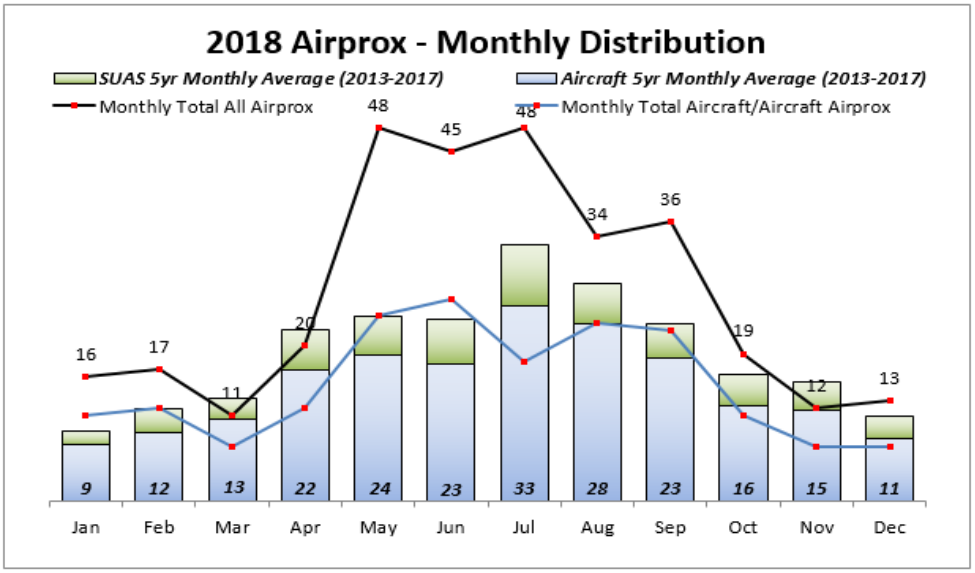


Figure 17. 2018 Airprox Monthly Distribution

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 2018 compared to the 30-year averages from1981-2010. These provide an indicator of overall conditions that reveal a generally wetter than average start to Spring, (with March being particularly poor), but with the remainder of the year largely being average or drier than average (and especially dry in June in the south). It is interesting to correlate the wetter March with a reduction in Airprox that month (presumably from reduced flying by GA) and the increased numbers of Airprox in May/June reflecting the likely increased GA flying during those very good weather months.

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

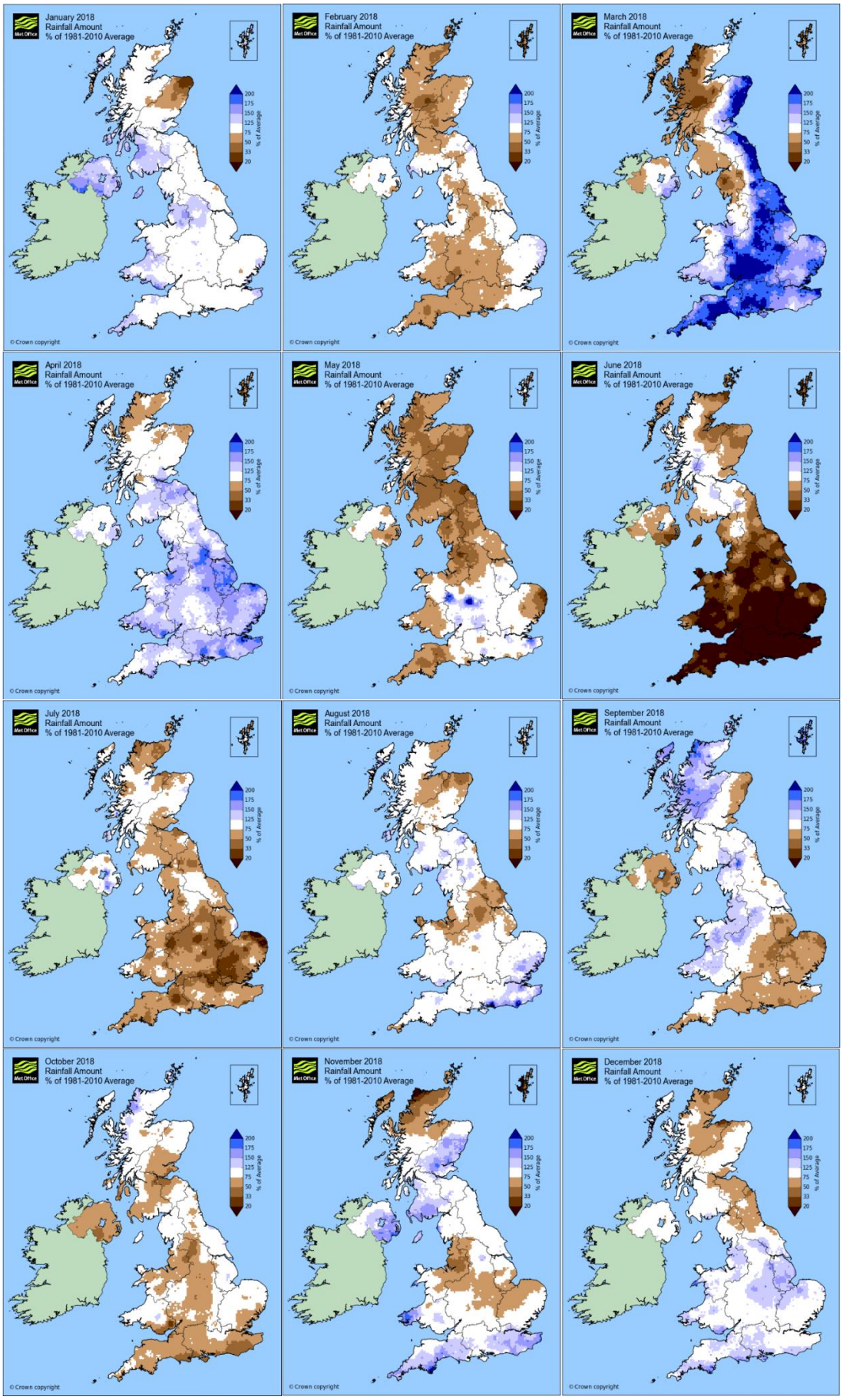


Figure 18. 2018 Monthly Rainfall Anomaly Charts

Figure 19 shows the corresponding monthly breakdown of manned 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).

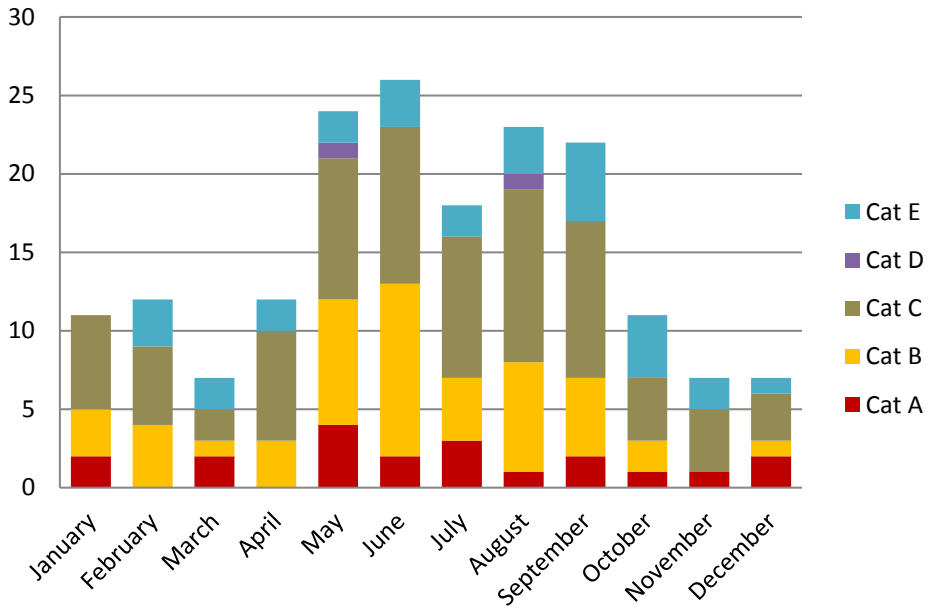


Figure 19. 2018 Airprox Risk Distribution by Month (non-SUAS)

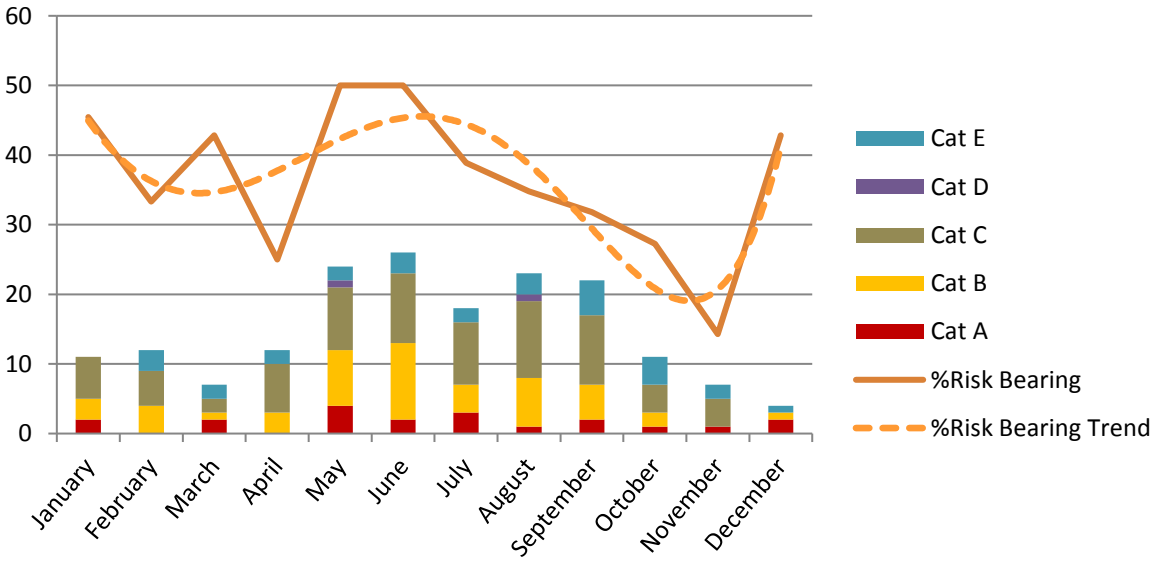


Figure 20. 2018 Airprox Risk-Bearing Trend by Month (non-SUAS)

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 2018'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, 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/Summer increases in flying result in an associated increased Airprox exposure overall, and with more aircraft airborne there are 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-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 40-50 incidents per year (notwithstanding 2018's increase, the underlying linear trend is broadly level 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, greatly increased numbers of SUAS Airprox remain a stand-out item. As their popularity and accessibility increases, incidents have rapidly risen in recent years from only 9 in 2014 to 139 in 2018.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**
Civil~Civil	71	67	75	85	90	120	111	105	103	**117**
Civil~Mil	35	54	50	39	54	57	41	41	39	**49**
Mil~Mil	30	31	26	28	19	25	23	15	17	**14**
SUAS	0	6	0	5	0	9	40	94	113	**139**
Other/Unknown	11	9	10	4	9	13	2	10	0	**0**
Totals:	147	167	161	161	172	224	217	265	272	**319**

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

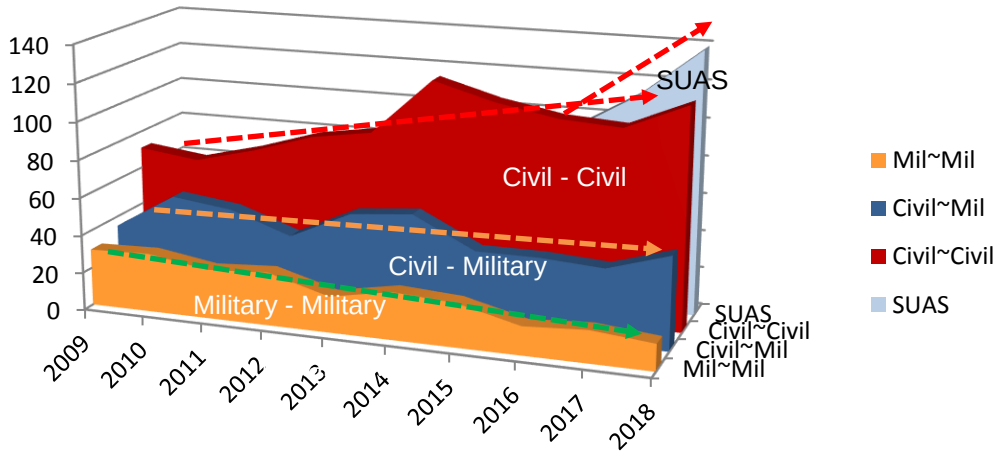


Figure 21. 10-year Total Airprox Trends by User Groups

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.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GA~Mil	29	50	52	35	55	54	35	44	31	**43**
GA~GA	42	43	50	54	59	89	82	76	75	**91**
CAT~CAT	11	5	4	11	9	5	3	5	5	**2**
CAT~GA	15	15	12	14	17	17	18	18	9	**8**
CAT~Mil	7	13	4	6	6	5	4	3	3	**3**
Mil~Mil	30	31	26	28	19	25	23	15	17	**14**
SUAS	0	6	0	3	0	9	40	94	113	**139**
Emerg Servs~GA	2	3	8	4	4	10	9	8	14	**15**
Emerg Servs~Mil	2	1	1	2	1	4	1	2	3	**3**
Emerg~Emerg	0	0	0	0	0	0	0	0	1	**0**
Emerg Servs~CAT	1	0	1	2	1	0	1	0	1	**1**
Unknown Ac	8	0	3	2	1	6	1	0	0	**0**
Total	147	167	161	161	172	224	217	265	272	**319**

Table 9. 10-year Total Airprox Statistics by Sector

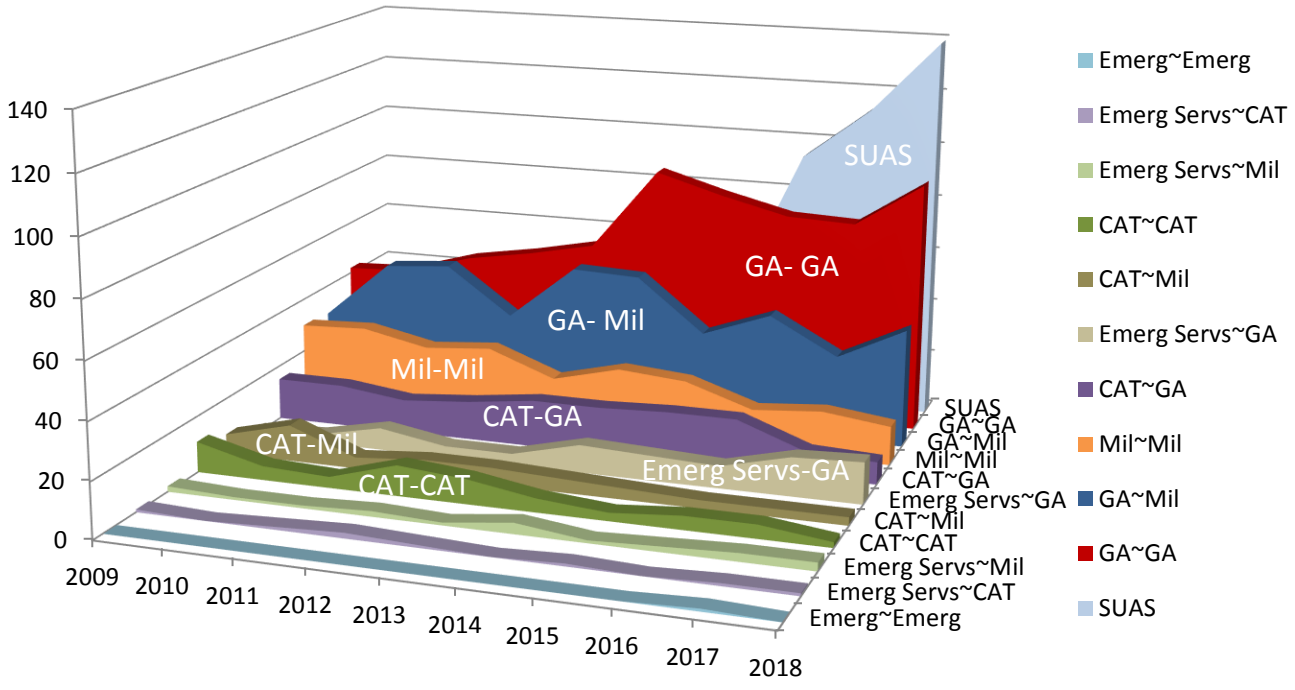


Figure 22. 10-year Total Airprox Trends by Sector

The following observations are pertinent:

- **CAT**: CAT-CAT incidents were few (2018 saw only 2 incidents) and have been broadly level at an average of 4 a year since 2014; CAT-Mil incidents were also few (3 in 2018) and in a steady decline in the last 10 years; and

CAT-GA incidents remained at 2017's lower levels (8 incidents in 2018) which was half that of previous years. Although the reduced CAT-GA rate is welcome, it was 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 reflect reduced numbers of military fast-jet aircraft overall; high overseas operational tempo meaning that less flying was conducted in UK; a shift away from extensive fast-jet low-flying (and thus away from the GA height bands); 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 (although Tornado is now out of Service as of Spring 2018).

- **GA**: GA-GA incidents increased in 2018 compared to 2017 and this reinforced the overall upward reporting trend over the last 10 years. The 91 GA-GA incidents reported in 2018 represents about 50% of the overall 180 manned aircraft-to-aircraft Airprox total, which is significantly more than any other sector (GA-Mil being the next largest sector with 43 incidents in 2018 - about 24% of the manned aircraft-to-aircraft total). Whichever way the statistics are represented, GA has the largest involvement in Airprox overall, with 87% of manned 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 10 years, with 19 incidents in 2018; most of these were with GA aircraft (15). This reflects the increasing number of Emergency Services aircraft in operation, (and the fact that the SAR role has now been taken over by the Coastguard vice the Military so in previous years SAR incidents would have been attributed to the military sector).

Analysis by Airspace

Figure 23 shows the distribution of all 2018's Airprox occurrences by known 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 manned aircraft-to-aircraft Airprox is Class G airspace below 3000ft (214 aircraft involved in 2018, about 59% of the total 365 aircraft involved in non-SUAS Airprox); this reflects the fact that most GA aircraft operate in that height band.

[7] CADS – Centralised Aviation Data Service.

Manned aircraft-to-aircraft Airprox within ATZ/MATZ remained disappointingly high again with 67 aircraft involved in incidents this year (about 18% of aircraft involved in non-SUAS Airprox). 2018 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 or pressed-on under the notion that they would have 'right of way' on the assumption that the other pilot knew they were there. There still remains a clear case for more education on joins and circuit procedures, perhaps as a specific topic during periodic instructor flights.

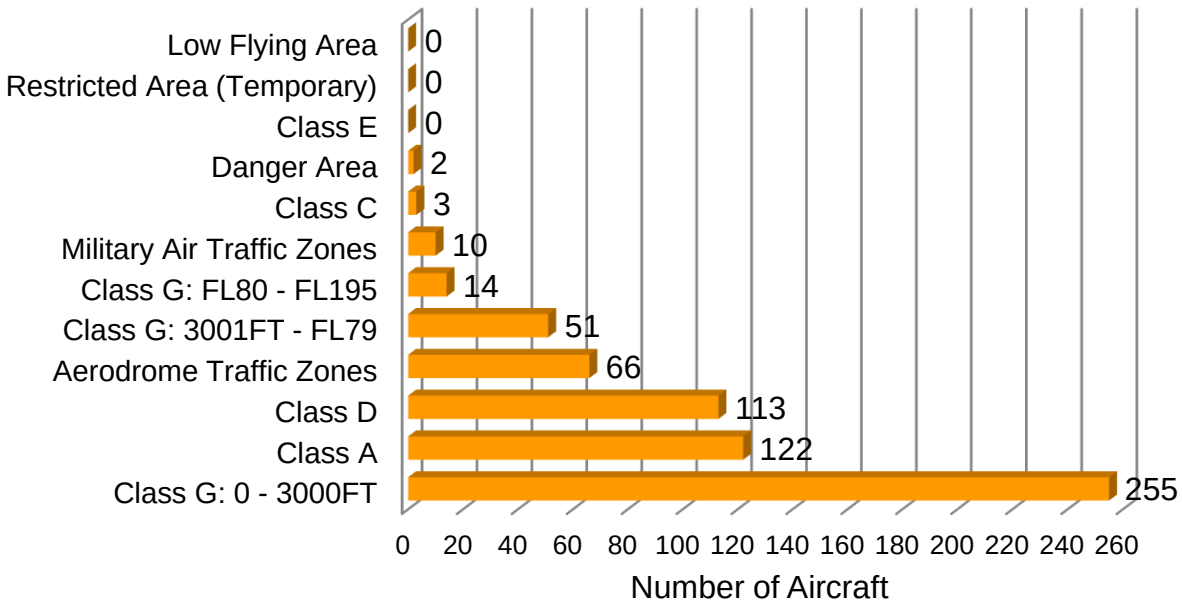


Figure 23. 2018 All Airprox by Airspace Involvement

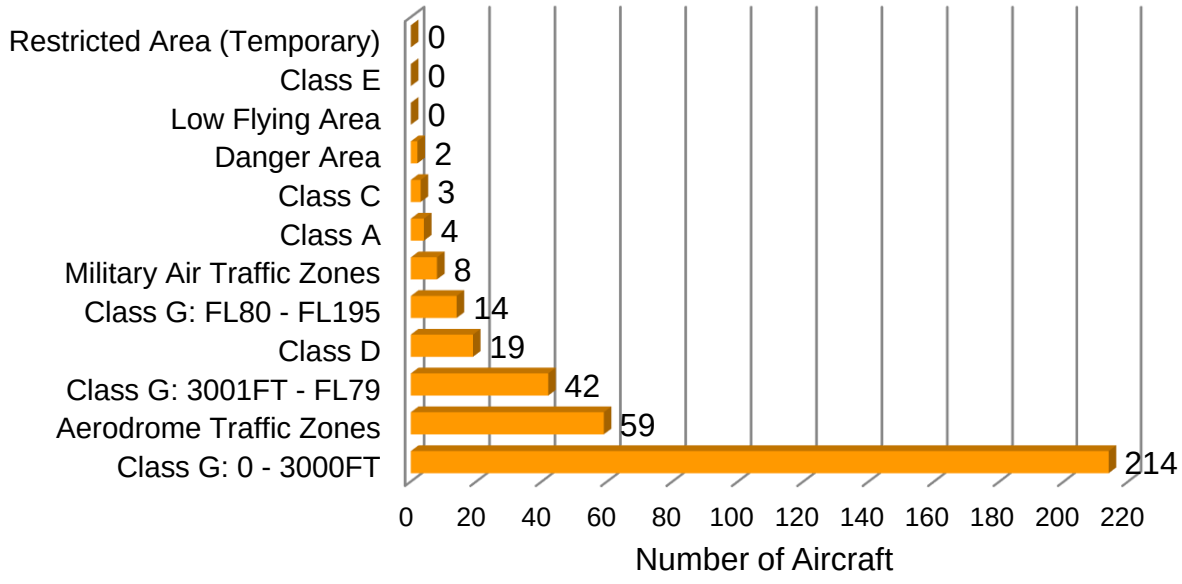


Figure 24. 2018 non-SUAS Airprox by Airspace Involvement

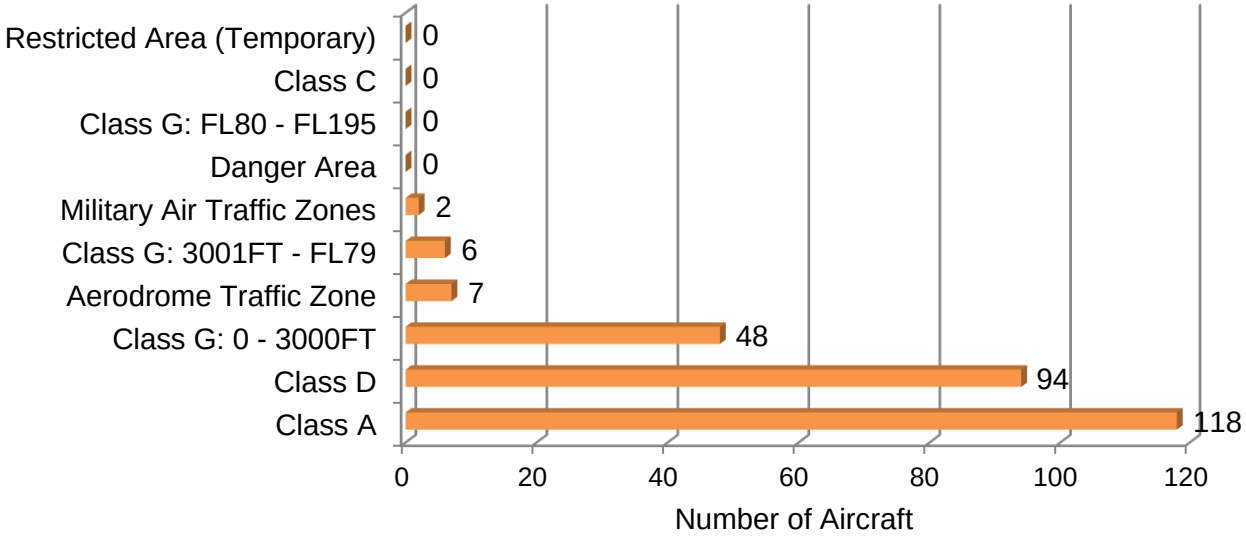


Figure 25. 2018 SUAS Airprox by Airspace Involvement

Airprox Themes

As ever, the analysis of Airprox shows that most incidents stem from multiple contributory factors with each having a greater or lesser bearing on the outcome depending on the circumstances. Reflecting contemporary thinking in safety management, since 2017 we have moved away from attributing individual causes to incidents because they often only reflect what happened rather than why. Instead, we have adopted a safety-barrier approach that considers the underlying issues behind how the available collision avoidance measures performed as an overall complex system that allowed the aircraft to come into proximity. As such, a formal breakdown of causes is no longer included in Airprox analysis but, to give a flavour of what lies behind these safety-barrier performance assessments, the following top-ten 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).

1. **Late-/non-sighting** or flawed/no SA about the other aircraft.
2. **Poor planning** or execution/modification of the plan.
3. **Inaction** on sighting or gaining SA on the other aircraft.
4. **Poor integration** in or near the visual circuit.
5. **Not following procedures** (especially in, or joining, the visual circuit).
6. **Sub-optimal ATS** (when a surveillance-based service was available)**.**
7. **Sub-optimal or lack of Traffic Information** from controllers.
8. **Ineffective communication of intent** by pilots.
9. **Flew too close to**, or through a promulgated and active glider site, parachuting site, microlight site or minor airfield.
10. **Distraction or task-focus**.

Reflecting some of the themes above, the comments below represent a distillation of the Board's discussions and are based on a qualitative, subjective review of the underlying incidents.

- **Lookout**. The top theme of 'late-/non-sighting' is almost implicit in the definition of an Airprox and probably largely reflects the well-documented physiological limitations of the human eye in the aviation environment (with the associated need therefore to adopt a robust scan). 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.

- **Situational Awareness**. 'Flawed/no SA' is also fundamental to the Airprox debate; most pilots will do something about an impending conflict if they are given timely information (but see 'inaction' below). The accumulation of good SA through sound planning, ATC Traffic Information or onboard Collision Warning Systems is the root to avoiding many Airprox and, in the latter respect, the CAA's focus on Electronic Conspicuity (EC) is welcome - at the moment, the plethora of different EC solutions has resulted in a mix of incompatible systems that leaves the GA pilot wondering which to adopt.

- **Planning**. Sub-optimal planning or execution included: not properly reviewing airfield data/procedures; lack of awareness or consideration for NOTAMS/RA(T); overflight of minor airfields and sport aviation sites (or needlessly close to them) at visual circuit height or below the maximum winch-launch height at glider sites; flying through an airfield's approach path 'feathers' without talking to ATC; not adapting the plan to suit changed circumstances (aka 'pressing-on regardless'); not having a Plan B (i.e. not considering 'eventualities'); and seemingly not thinking through 'threat and error management' (TEM) before flight. Another quick-win would be for pilots to avoid the 1000-1500ft transit block whenever possible; it seems to be a feature of helicopter operations in particular that pilots (air taxi, HEMS, NPAS etc) chose to transit at about 1000ft by default when off-task. Transiting at 1000ft means that pilots risk passing unknowingly through or near the circuit patterns of small strips (where aircraft might be getting airborne and climbing) or encountering other GA aircraft either routing to or from airfields or conducting training activities such as PFLs. Pilots could also help themselves by seeking a more appropriate ATS other than a Basic Service (or no ATS). The value of a surveillance-based Traffic Service has been emphasised many times before, but the message still appears to fail to register with some who either anticipate they will not get such a service and so don't even ask, or who think that they will receive Traffic Information when under a Basic Service (which they might, but which is not the intention or expectation with that level of ATS).

- **Inaction**. Having commented that most pilots will react positively when they become aware of a conflict, it was disappointing to see that some do not. We saw a number of cases where pilots assumed that the other pilot had seen them and would therefore give way in accordance with the Rules of the Air; this is a flawed assumption given the vagaries of the human eye as mentioned in the late-/non-sighting comments. Although pilots are required to maintain course and speed in converging situations so that the other 'giving-way' pilot is able to meet his responsibilities, there comes a point when avoiding action must be taken even when it is the other pilot who should give way. We saw many comments such as '[they] failed to give way as required' which implied an obvious assumption that the other pilot had seen the reporter. But more worrying were the few reports where pilots deliberately continued their track in the circuit to 'make the point' that they had 'right of way'. These have often involved aircraft that were joining the circuit straight-in and were therefore required to integrate with others already on base-leg/final but weren't aware of them. That those on base-leg/final would continue to fly into conflict with the joining aircraft in full knowledge that it was there (presumably on the assumption that if they themselves were comfortable with the resulting reduced separation then so would be the other pilot) was very disappointing.

- **Integration**. Poor or ineffective integration in the visual circuit (or when near to ATZs, airfields, parachuting and glider sites) was a recurring issue. 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. Many pilots appear either not to understand overhead joins or are unable to perform them correctly. Particular integration 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 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; 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 emphasise again that conduct in the visual circuit is certainly something that could be usefully underlined in flying training, competence flights and general education activities. Key lessons are: the need to follow procedures; be clear to others about one's intentions; and, above all, maintain a robust lookout at all times even when conducting visual circuits in case others might lose (or have flawed) situational awareness or ineffective lookout.

Encompassing all of these themes, Board debates consistently returned to the need for pilots to fly defensively (with the 3C's of **caution**, **consideration** and **courtesy** to the fore); prioritise lookout above in-cockpit tasks (lookout being a

prime component in the 'Aviate' part of the 'Aviate, Navigate, Communicate' mantra); plan properly and modify plans to adapt to the circumstances pertaining; and to properly understand the applicability and limitations of each of the air traffic services that are available under UK FIS.

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.

In order to counter some of these elements, we continue to deploy the '5 Seconds to Impact' educational campaign that was introduced in Spring 2017 based on the 6 themes below. Associated material is available on the UKAB website at www.airproxboard.org.uk and from our App which is available by searching for 'UKAB' or 'Airprox' on the Apple App Store or Google Play.

- **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 beware having 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 Aviate-Navigate-Communicate mantra for ensuring proper prioritisation of capacity.

- **Defensive Flying.** Specifically: thinking ahead; expect the unexpected; not assuming others are aware of you or have seen you; not pressing on when things change from the plan; making allowances and flying with courtesy for others; and avoiding minor airfields, glider sites, microlight sites and parachuting sites with as much separation as possible.

COMMERCIAL AIR TRANSPORT

As in recent years, 2018 saw a large rise in SUAS Airprox, with most of these being recorded against CAT aircraft. As a result, overall CAT Airprox numbers again increased significantly (there were 105 CAT Airprox in 2018 compared to 88 in 2017) but, because most are with SUAS, this skews the underlying CAT trends. Therefore, in order that year-on-year comparisons can be made, I have provided figures for all CAT Airprox (i.e. including SUAS) and just those involving manned aircraft (of which there were 14 incidents). 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 also included a short analysis of SUAS Airprox at the end of this section.

CAT Airprox by Airspace

Figure 26 shows the breakdown of all CAT Airprox by airspace type. Of the 105 Airprox involving CAT: 55 involved aircraft in Class A; 46 in Class D; and 5 in Class G. Figure 27 shows the corresponding breakdown of the 14 non-SUAS CAT Airprox: unsurprisingly, there were only 3 which involved aircraft not in controlled airspace, and most incidents involved aircraft in Class D airspace (8).

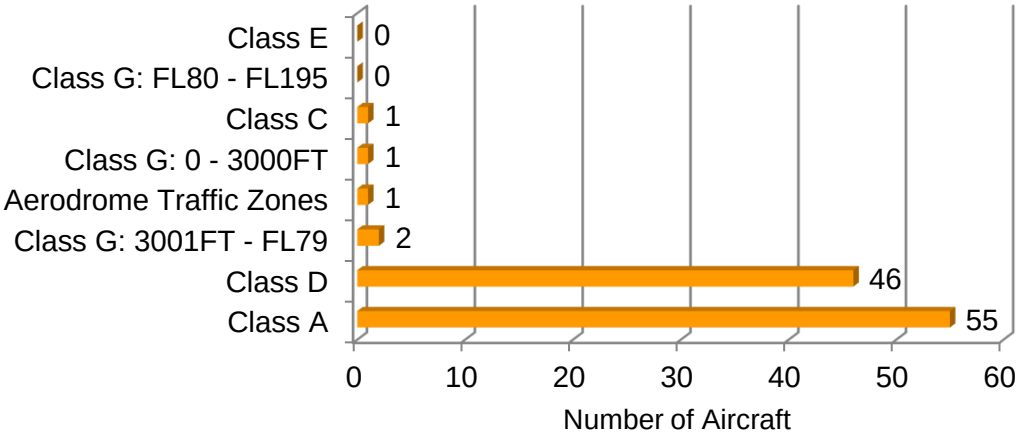


Figure 26. 2018 All CAT Airprox by Airspace Involvement

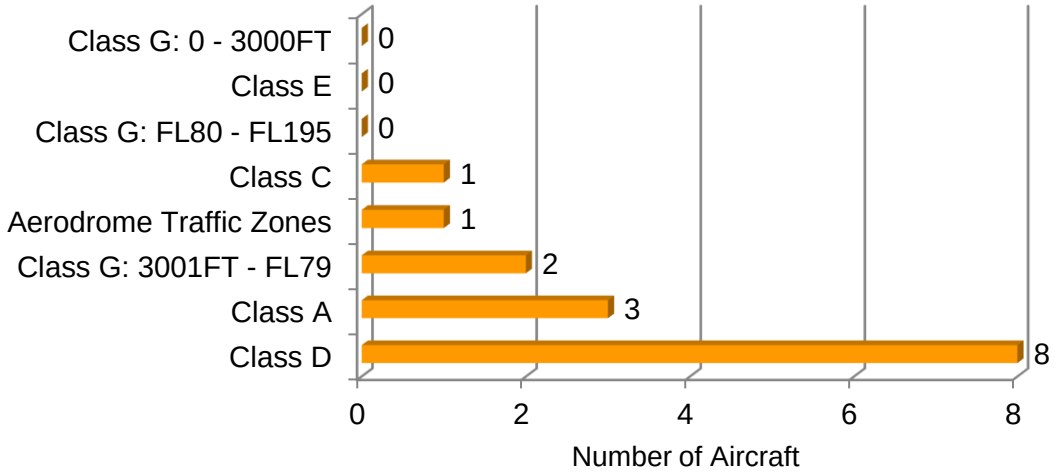


Figure 27. 2018 non-SUAS CAT Airprox by Airspace Involvement

A number of non-SUAS CAT incidents resulted from TCAS interactions were the flight vector of the other aircraft caused a TCAS TA (Traffic Alert) or RA (Resolution Advisory) as the aircraft came close enough together for the predicted track of the non-CAT aircraft to impinge on the CAT aircraft's TCAS safety envelope. This issue was specifically evident with GA aircraft transiting or holding close to the approach path (often on base leg, as instructed by ATC) as CAT aircraft made their approach. Even though the CAT pilots could often see that there was no conflict, because their TCAS generated an RA they were often obliged to go-around and hence declare an Airprox. 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. In UK, CAT crews must always obey the commands generated under a TCAS RA. As a result, VFR pilots 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, Figure 28 shows that the underlying aircraft-to-aircraft CAT Airprox trend continues to show a steady decline since 2012. There was 1 risk-bearing aircraft-to-aircraft incident in 2018, which is below the normal 3-4 of recent years (albeit the small numbers of risk-bearing Airprox make any trend analysis unpredictable). 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. The sole non-SUAS CAT Airprox classified as risk-bearing in 2018 was:

- **Airprox 2018216 – Category B: EMB170 vs unknown paramotor.**

Details of this incident can be found in the 2018 Airprox catalogue at the end of this report, and on the UKAB website at www.airproxboard.org.uk.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
CAT Risk A	0	0	0	1	1	1(2)	0(9)	0(29)	0(20)	**0(34)**
CAT Risk B	1	0	1	0	3	3(4)	3(13)	1(20)	3(25)	**1(37)**
CAT Risk C	33	32	17	23	14	14(15)	11(13)	11(24)	11(32)	**9(28)**
CAT Risk D	1	2	0	4	3	1(2)	1(7)	1(3)	0(6)	**0(2)**
CAT Risk E	0	0	3	7	12	8(8)	6(7)	7(7)	4(5)	**4(4)**
CAT Total	**35**	**34**	**21**	**35**	**33**	**27(31)**	**21(49)**	**20(83)**	**18(88)**	**14(105)**

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

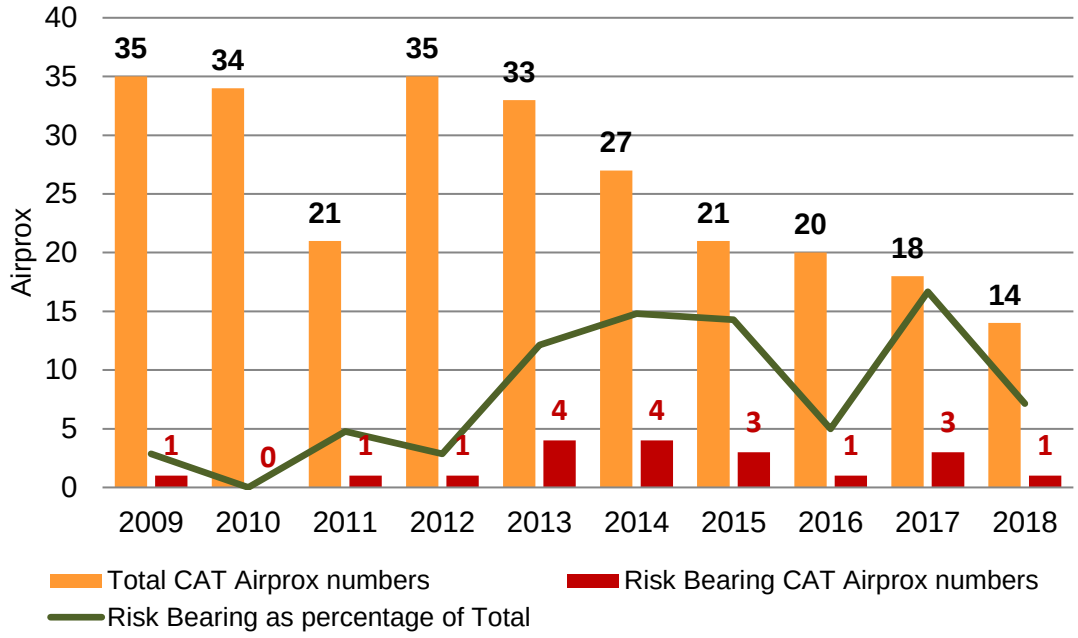


Figure 28. 2018 CAT Airprox Risk Bearing Distribution - no SUAS

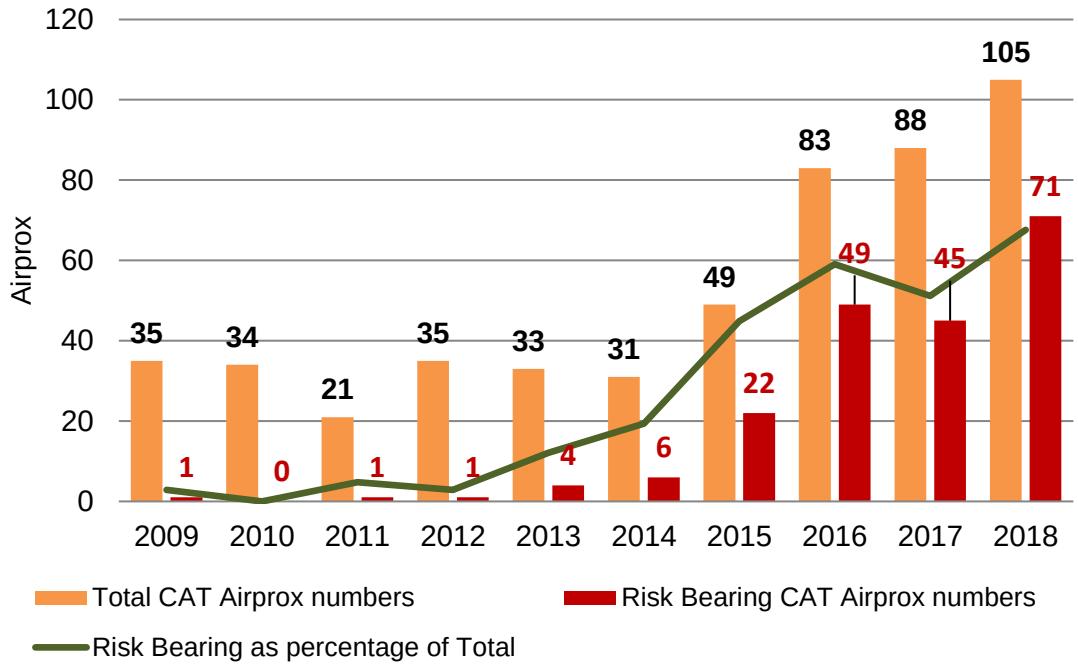


Figure 29. 2018 CAT Airprox Risk Bearing Distribution - including SUAS

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.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total CAT Airprox	35	34	21	35	33	27(31)	21(49)	20(83)	18(88)	**14(105)**
Risk Bearing CAT Airprox	1	0	1	1	4	4(6)	3(22)	1(49)	3(45)	**1(71)**
CAT Hours x 10K	149.4	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6	**167.3**
Total per Million hrs	23	24	14	24	22	18(20)	14(32)	12(51)	11(53)	**8(63)**
Risk Bearing per Million hrs	1	0	1	1	3	3(4)	2(14)	1(30)	2(27)	**1(42)**

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

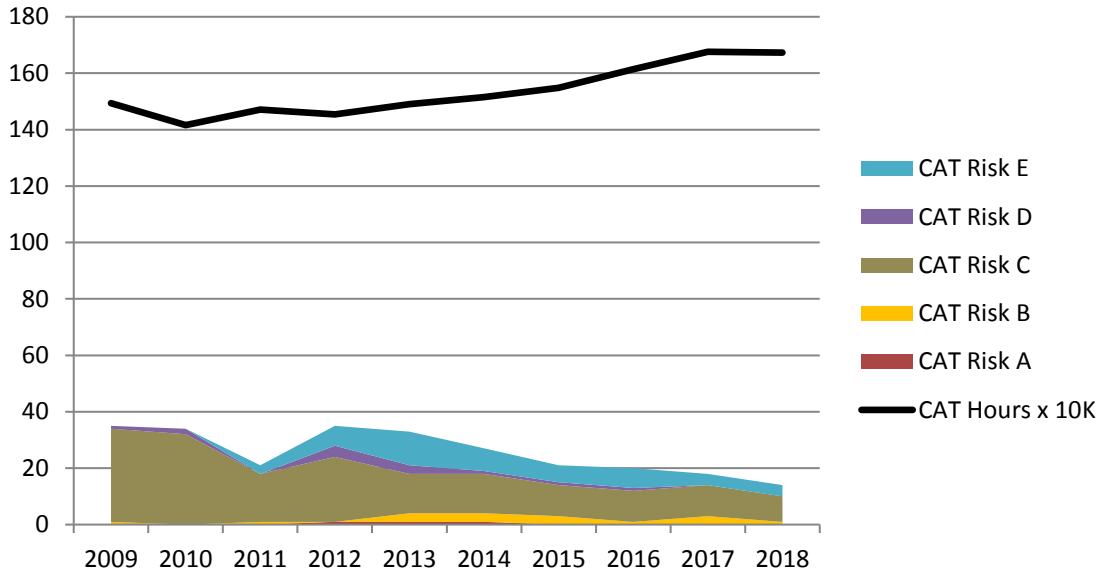


Figure 30. 10-year CAT Airprox Risk Distribution vs CAT hrs – no SUAS

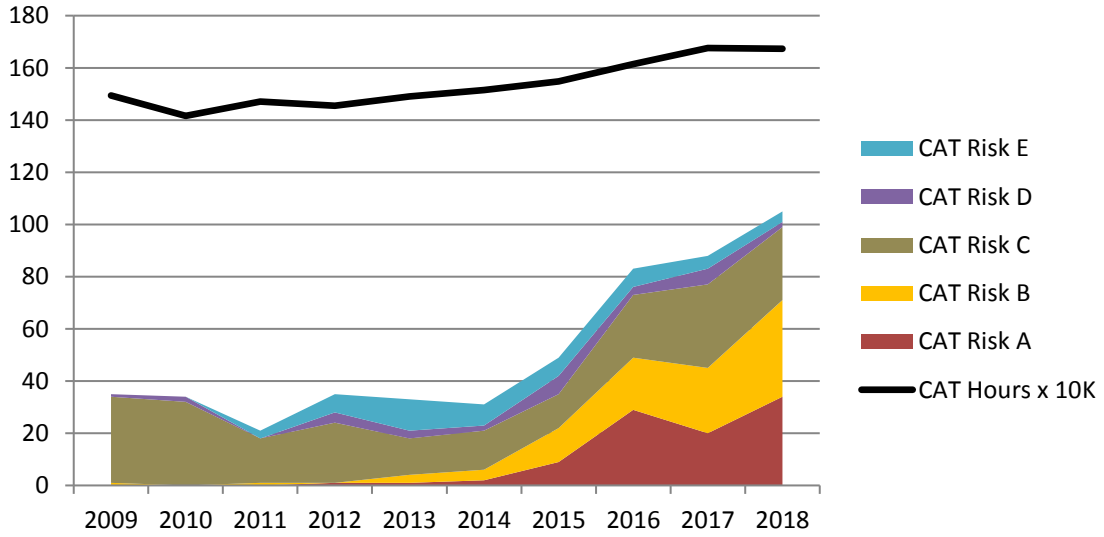


Figure 31. 10-year CAT Airprox Risk Distribution vs CAT hrs – inc SUAS

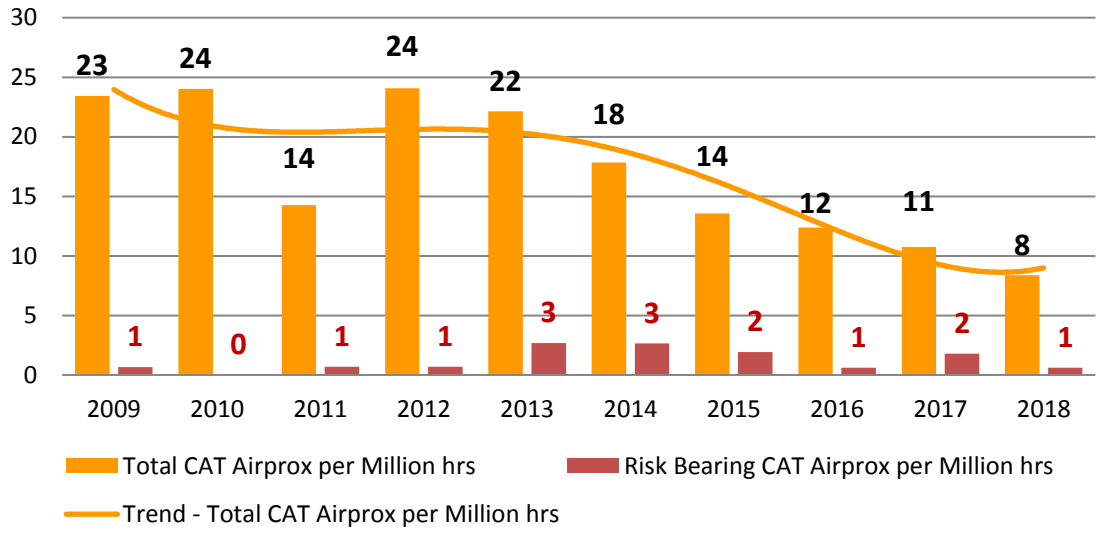


Figure 32. 10-year CAT Airprox Rates per Million Flying hrs – no SUAS

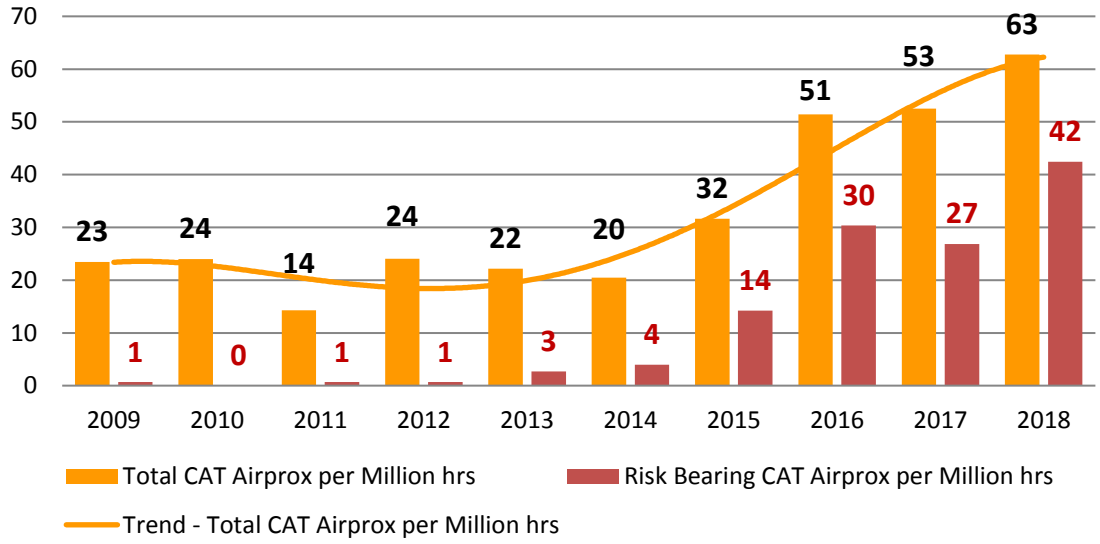


Figure 33. 10-year CAT Airprox Rates per Million Flying hrs – inc SUAS

Putting all this into perspective, the following headline statistics for 2018 are pertinent in framing the risk to CAT aircraft:

- **14** aircraft-to-aircraft CAT incidents represents, on average, about 1 Airprox per month.
- **1** aircraft-to-aircraft risk-bearing CAT incident reflects the strong barriers that exist for the prevention of MAC in controlled airspace.
- **91** SUAS CAT Airprox represents, on average, a SUAS incident almost twice a week.
- **70** 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, once or twice week.

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

SUAS Airprox have again increased in 2018. 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 therefore likely that some reported 'Model Aircraft', 'Balloon' or 'Unknown Object' incidents were probably drones, and vice versa.

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
2018	125	1	2	11	139

Table 12. Airprox involving SUAS since 2010

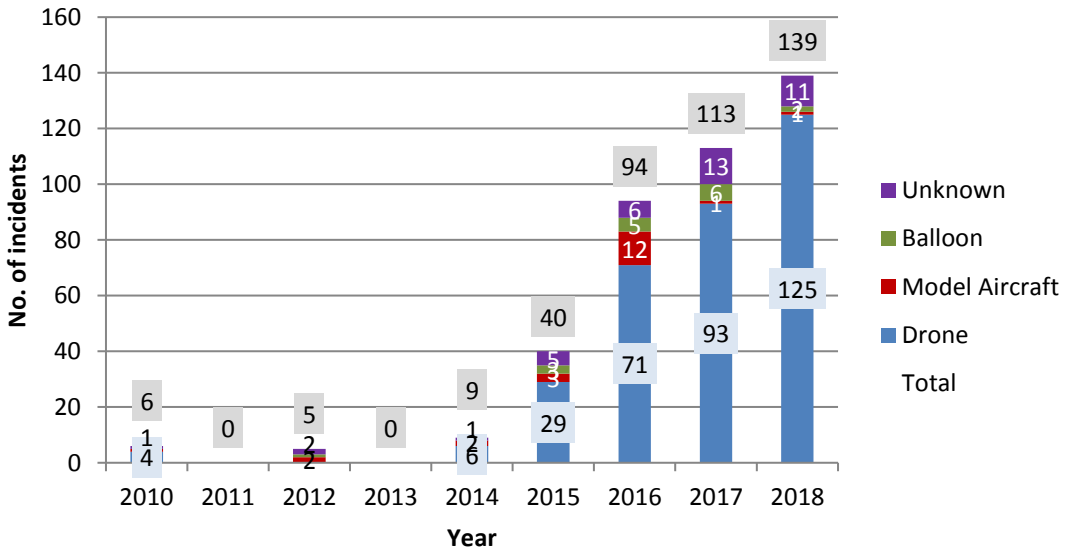


Figure 34. Airprox involving SUAS since 2010

GENERAL AVIATION

GA Airprox by Airspace

There were 187 Airprox in 2018 where at least one aircraft was GA; of these, 30 involved SUAS. The corresponding 157 manned aircraft-to-aircraft GA Airprox represent 87% of the overall number of aircraft-to-aircraft incidents in 2018 (180 Airprox), which is an increase since 2017 (when 81% of manned aircraft-to-aircraft incidents involved GA) and well above the norm (the average percentage of incidents involving GA over the previous 5 years to 2017 was 77%). The conclusion is that GA are becoming increasingly predominant in their share of Airprox incidents and this is reflected in the graphs earlier in this report that show GA-to-GA incidents rapidly rising in particular. As in previous years, most of 2018's GA non-SUAS incidents (nearly 64%) occurred below 3000ft in open Class G airspace as indicated in Figure 35 which shows GA Airprox involvement by airspace type. However, the second most common airspace for GA Airprox was within combined Aerodrome Traffic Zones/Military Air Traffic Zones (almost 20%) 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.

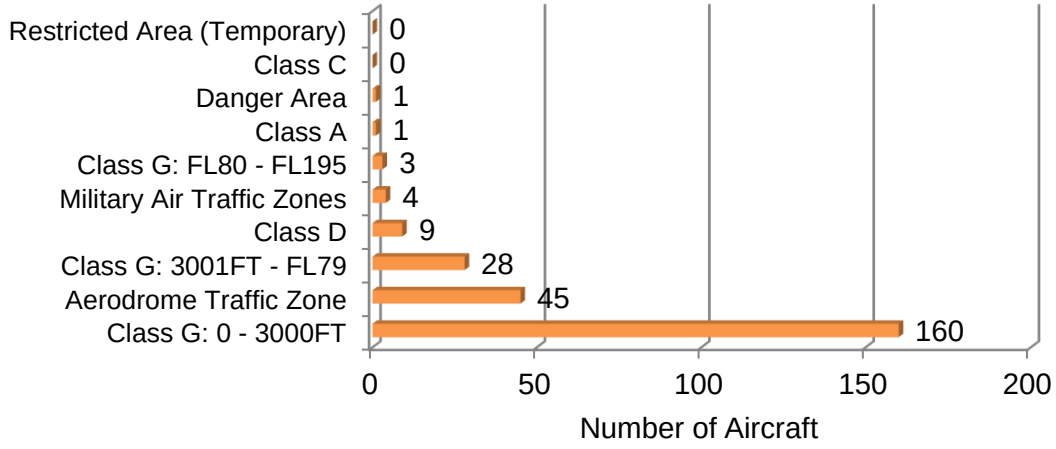


Figure 35. 2018 GA Airprox by Airspace Involvement – no SUAS

GA Risk Distribution

Up to 2017, the GA Airprox reporting trend had been downwards since 2014, but this was sharply reversed in 2018 which showed a return to 2014 levels. Moreover, 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. Either way, what is of most concern is that the 2018 GA Airprox risk distribution figures at Figures 36 and 37 show a continued unwelcome trend of an increasing number of incidents that were risk-bearing. In percentage terms, the number of incidents

that were risk bearing has been fluctuating around the 40% level over recent years and, as can be seen in Figure 37, 2018 continued this trend. Although this indicates that the short-term trend is relatively steady, 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 or individuals' lookout performance/prioritisation.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
GA Risk A	8	5	19	12	18	23(23)	23(26)	16(19)	10(19)	18(29)
GA Risk B	19	24	27	21	33	55(56)	41(44)	30(37)	42(51)	45(49)
GA Risk C	64	70	61	61	53	59	57(58)	64(68)	59(70)	71(84)
GA Risk D	1	2	2	1	2	3	4(5)	6(7)	4(6)	2(3)
GA Risk E	0	0	8	9	17	23	15(16)	15(16)	13(16)	21(22)
GA Totals	**92**	**101**	**117**	**104**	**123**	**163(164)**	**140(149)**	**131(147)**	**128(162)**	**157(187)**

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

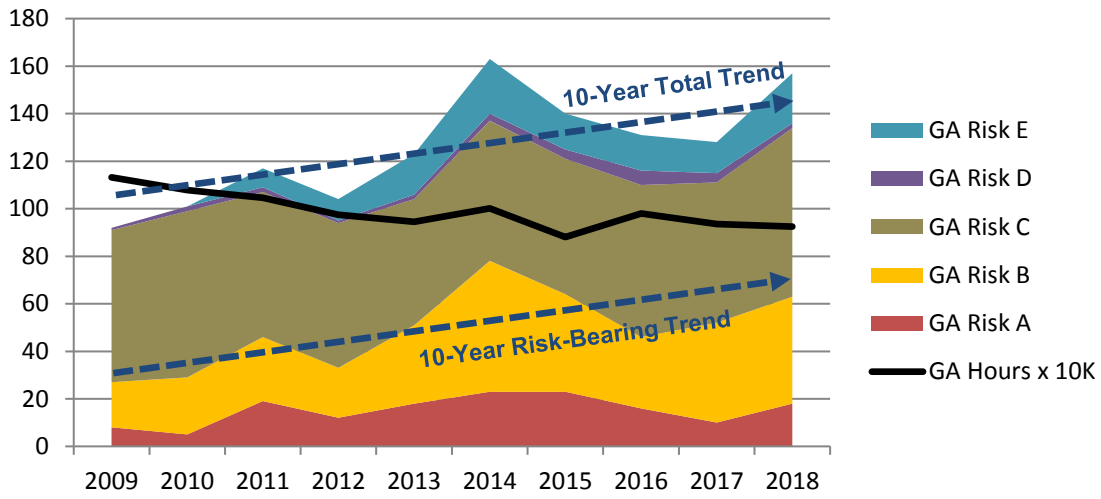


Figure 36. 10-year GA Airprox Risk Distribution and GA hours – no SUAS

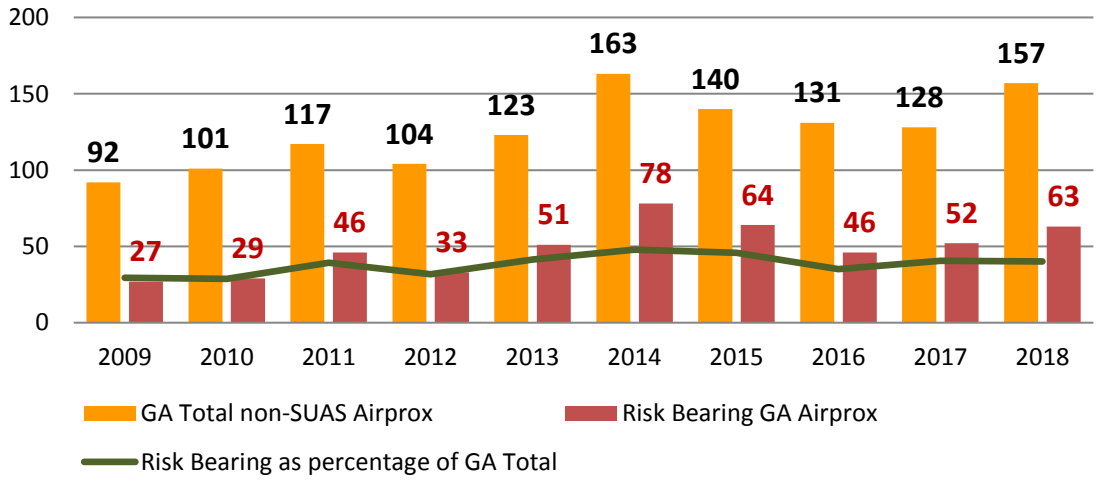


Figure 37. 10-year GA Airprox Risk Bearing Distribution – no SUAS

GA Airprox Rates

Normalising GA non-SUAS Airprox for hours flown in 2018 shows that with flying hours reportedly being similar to 2017, the increased number of Airprox in 2018 has driven a return to the 2014 peak in the overall total rate per mfh. Similarly, the risk-bearing rate per mfh has been steadily rising over the last few years but has not quite returned to the 2014 level. That being said, both rates show a considerably rising trend over the last 10 years. 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). As a result, the actual figures provided by CAA may not stand up to much scrutiny but, on the assumption that the errors are consistent over the years, they give an idea of what the headline normalised trends might be.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total non-SUAS Airprox	147	161	161	158	172	215	177	171	159	180
GA non-SUAS Airprox	92	101	117	104	123	163	140	131	128	157
Risk Bearing GA Airprox	27	29	46	33	51	78	64	46	52	63
Risk Bearing as % of GA Total	29	29	39	32	41	48	46	35	41	40
GA Hours x 10K	113.2	107.8	104.6	97.5	94.5	100.1	88.1	98.0	93.6	92.5
GA All non-SUAS per Million hrs	81	94	112	107	130	163	159	134	137	170
GA Risk Bearing per Million hrs	24	27	44	34	54	78	73	47	56	68

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

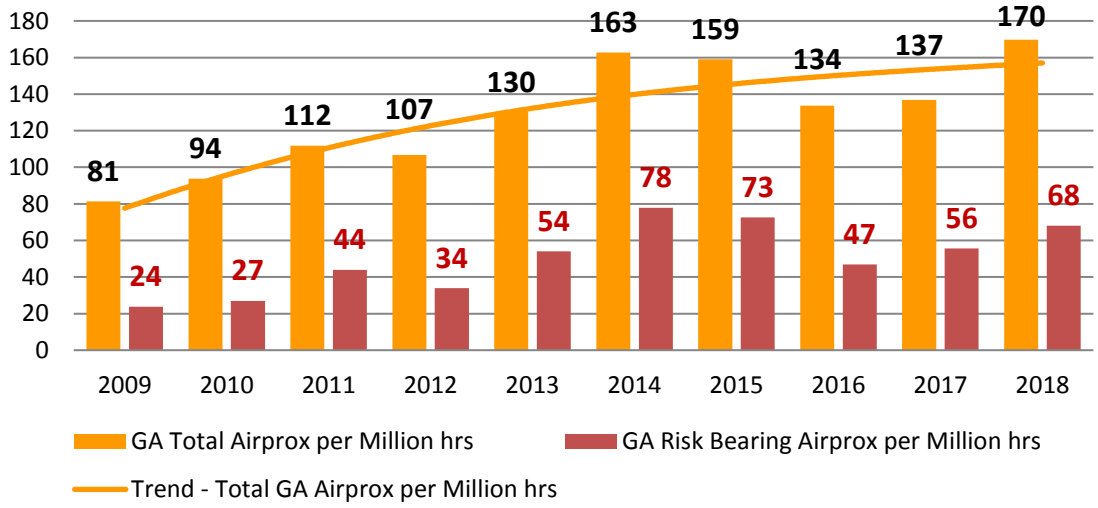


Figure 38. 10-year GA Airprox Rates per Million Flying Hours – no SUAS

As for the previous section, putting all this into perspective, the following headline statistics for 2018 are pertinent in framing the risk to GA aircraft:

- **157** non-SUAS GA incidents represents, on average, about 3 GA Airprox per week.
- **63** non-SUAS risk-bearing GA incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, more than once a week.

MILITARY AVIATION

Military Airprox by Airspace

Overall, there were 77 Airprox involving Mil in 2018; of these, 14 involved SUAS. The 63 manned aircraft-to-aircraft Mil Airprox represents 33% of the overall total of 180 aircraft-to-aircraft incidents in 2018, which is about the normal historic rate. In airspace terms, the majority of Mil Airprox again occurred in open Class G/Low-Flying Area airspace below 3000ft (46%): given that 68% of Mil incidents involved GA (43 incidents), this probably accounts for the predominance of military Airprox below 3000ft, where GA mostly operate. The next largest threat to Mil aircraft was other Mil aircraft (22% of Mil incidents were Mil-to-Mil (14 incidents)), whilst CAT and Emerg Servs aircraft accounted for 5% each (3 incidents each).

These figures not only re-emphasise that civil aircraft remain the key MAC risk to military aircraft, but also that the success of measures such as CADS (and to a lesser extent TCAS in GR4) have been evident in mitigating Mil-Mil Airprox (since 2014, Mil-Mil Airprox have steadily reduced from 25 incidents to 14 in 2018, the lowest number in the last 10 years). On the other hand, Figure 39 also shows that 28% of military involvements occurred in Class G airspace above 3000ft, which may reflect the lack of any overall Mil-Mil medium-level coordinating system (CADS is only employed for flights below 2000ft) and the lack of a collision warning system in Typhoon which means that there are few MAC mitigations available for this fleet other than ATC and see-and-avoid.[8]

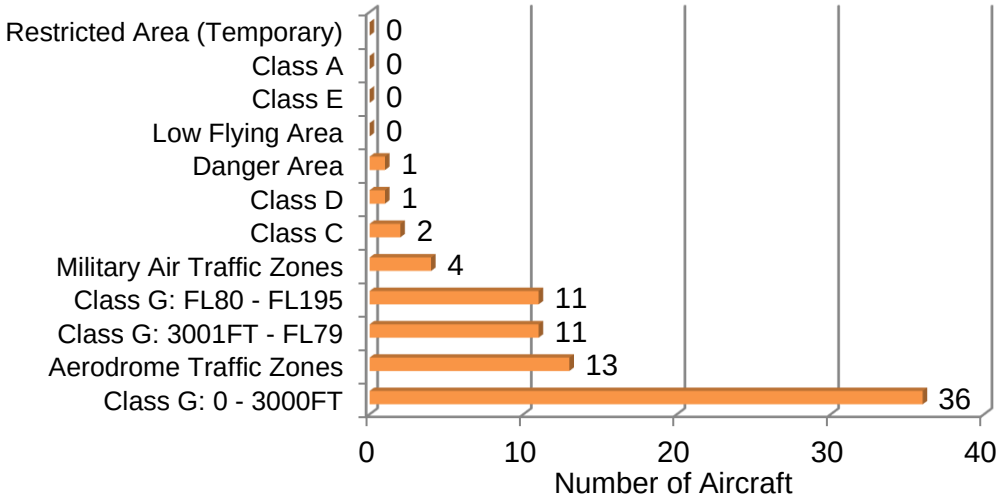


Figure 39. 2018 Military Airprox by Airspace Involvement – no SUAS

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

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

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 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, although 2018 shows an increase compared to 2017, there is cause for optimism in that the overall number of Mil non-SUAS Airprox has been steadily trending downwards over the last 10 years, with the risk-bearing component similarly reducing. Although the manned aircraft-to-aircraft risk-bearing percentage rate remained steady at 33%, (having been at a high of 43% in 2015), the overall 10-year downward trends of incidents and their risk-bearing component is welcome.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Mil Risk A	8	7	9	8	8	7	9(11)	5(6)	4(7)	**4(4)**
Mil Risk B	22	18	21	13	20	24(26)	20(21)	17(22)	13(17)	**17(22)**
Mil Risk C	38	70	45	43	38	41	27	33(39)	29(34)	**28(36)**
Mil Risk D	1	3	1	0	4	6	2	2	0	**1(1)**
Mil Risk E	0	0	8	7	12	17	9	12	7(8)	**13(14)**
Mil Totals	69	98	84	71	82	95(97)	67(70)	69(81)	53(66)	**63(77)**

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

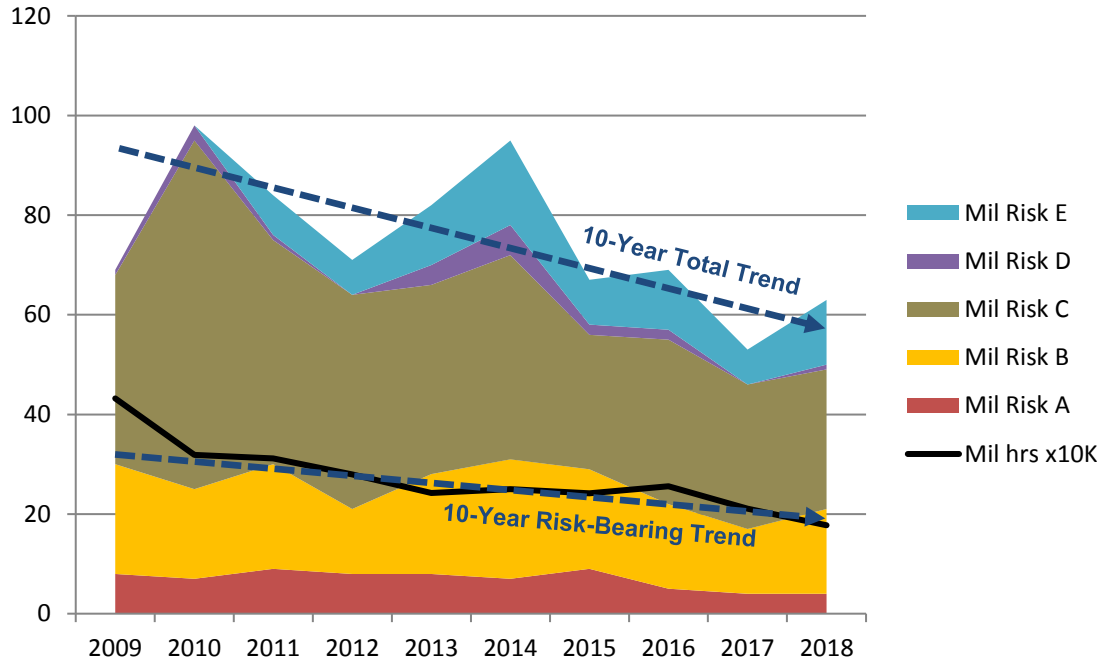


Figure 40. 10-year Military Airprox Risk Distribution and hours – no SUAS

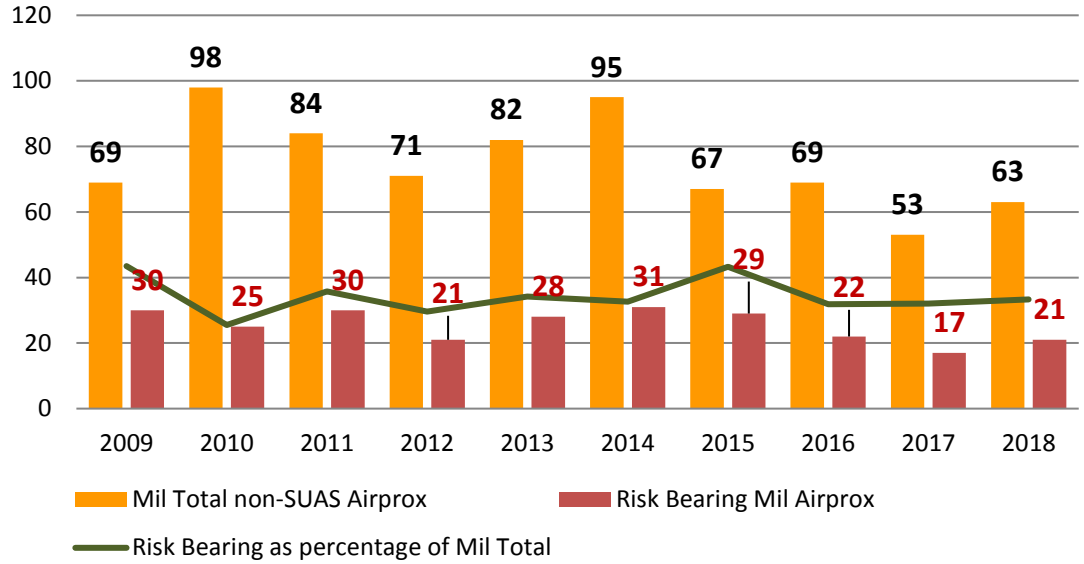


Figure 41. 10-year Military Airprox Risk Bearing Distribution – no SUAS

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.

In contrast to the encouraging news that pure numbers of military Airprox have been reducing, the also reducing number of military hours flown means that the normalised rates per flying hour paint a different picture. Table 16 and Figure 42 show this normalised military Airprox rate per mfh. Wherein it can be seen that, overall, in 2018 there were 355 Airprox per mfh. This is much higher than in the last few years and represents a return to pre-2014 levels. Similarly, the 2018 risk-bearing rate per mfh also showed an increase to 2014 levels at 118 risk-bearing incidents per mfh (from 81 in 2017). Comparing across sectors, in 2018 the military experienced about twice the overall GA Airprox rates per mfh (GA: 170/mfh overall and 68/mfh risk-bearing; Mil: 355/mfh overall and 118/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 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 be a factor.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total non-SUAS Airprox	147	167	161	161	172	215	177	171	159	180
Total Mil non-SUAS Airprox	69	98	84	71	82	95	67	69	53	63
Risk Bearing Mil Airprox	30	25	30	21	28	31	29	22	17	21
Risk Bearing as % of Mil Total	43	26	36	30	34	33	43	32	32	33
Mil hrs x 10K	43.2	31.8	31.1	28.0	24.2	25.0	24.2	25.6	21.1	17.7
Total Mil per Million hrs	160	308	270	254	339	380	277	270	252	355
Risk Bearing Mil per Million hrs	69	78	96	75	116	124	120	86	81	118

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

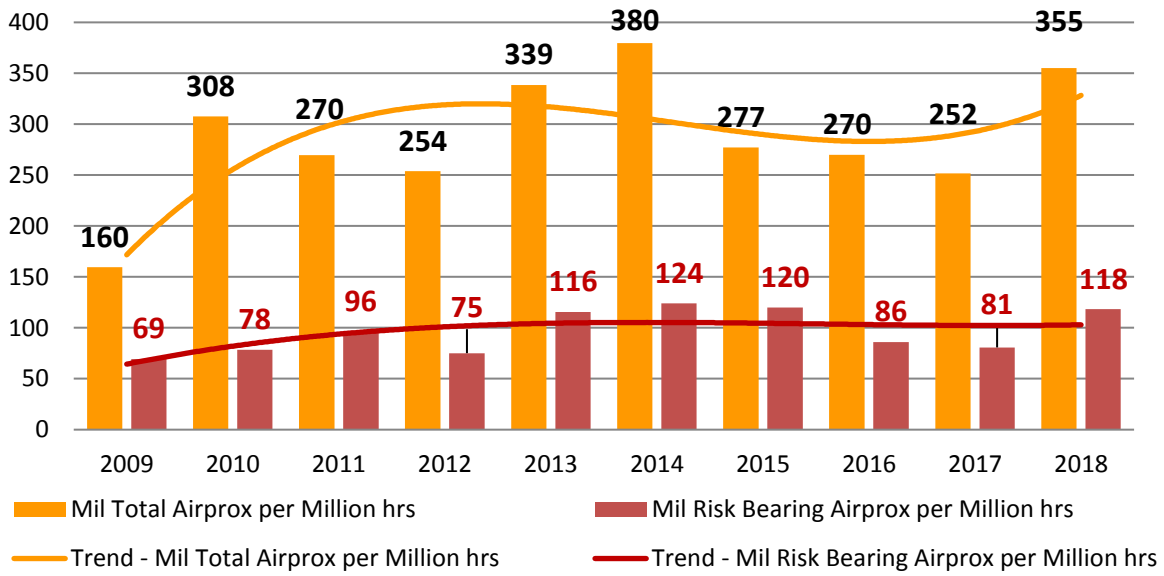


Figure 42. 10-year Military Airprox Rates per Million Flying Hours – no SUAS

Since 2014, the Board have been monitoring the success of the VHF low-level common frequency in Scotland.[9] 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, most Mil Airprox over the last 3 years have historically 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.

[9] 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.

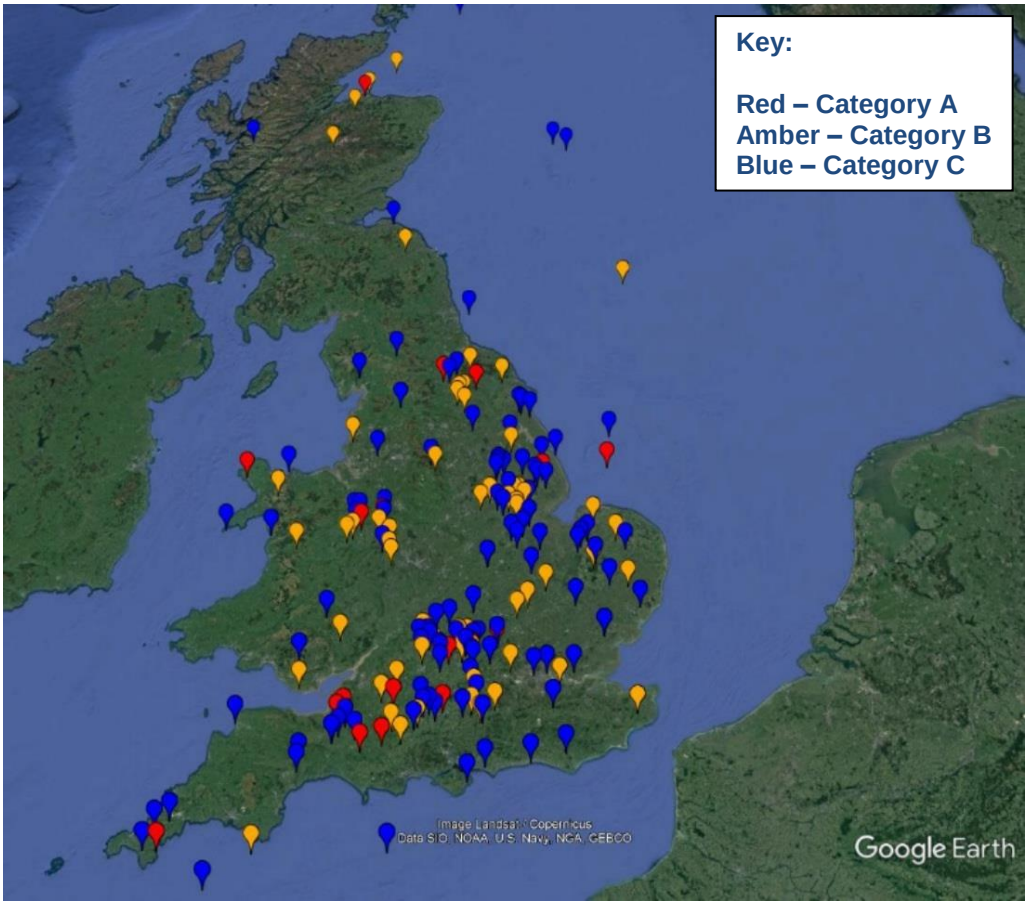


Figure 43. Mil Airprox Locations 2016 to 2018

Finally, breaking down the Mil Airprox by type provides some idea of which fleets experience the greatest MAC risk. Figure 44 shows the spread across all Mil aircraft. Care must be taken in drawing conclusions from small numbers of incidents, but the following headlines are perhaps worthy of note:

- Hawk aircraft had most Airprox (10), although only 30% were risk bearing.
- The next highest in incidence was F15E (8), but only 13% were risk bearing (mostly a spate of TCAS alerts on other aircraft).
- Chinook and Typhoon both had 7 incidents, with similar risk-bearing exposure from about half the incidents (43% for Chinook and 57% for Typhoon).
- Of the 5 incidents each for Apache, Prefect and Tutor, Prefect was notable in that 60% of incidents were risk-bearing.

Accepting again that small numbers can quickly skew statistics, the following risk-bearing percentages are offered for those aircraft with 3 or more incidents:

1. Tucano – 100% (of 3)
2. C130/Merlin – 67% (of 3)
3. Prefect – 60% (of 5)
4. Typhoon – 57% (of 7)
5. Chinook – 43% (of 7)
6. Tornado – 33% (of 6)
7. Hawk – 30% (of 10)
8. Tutor – 20% (of 5)
9. Apache – 20% (of 5)
10. F15 – 13% (of 8)

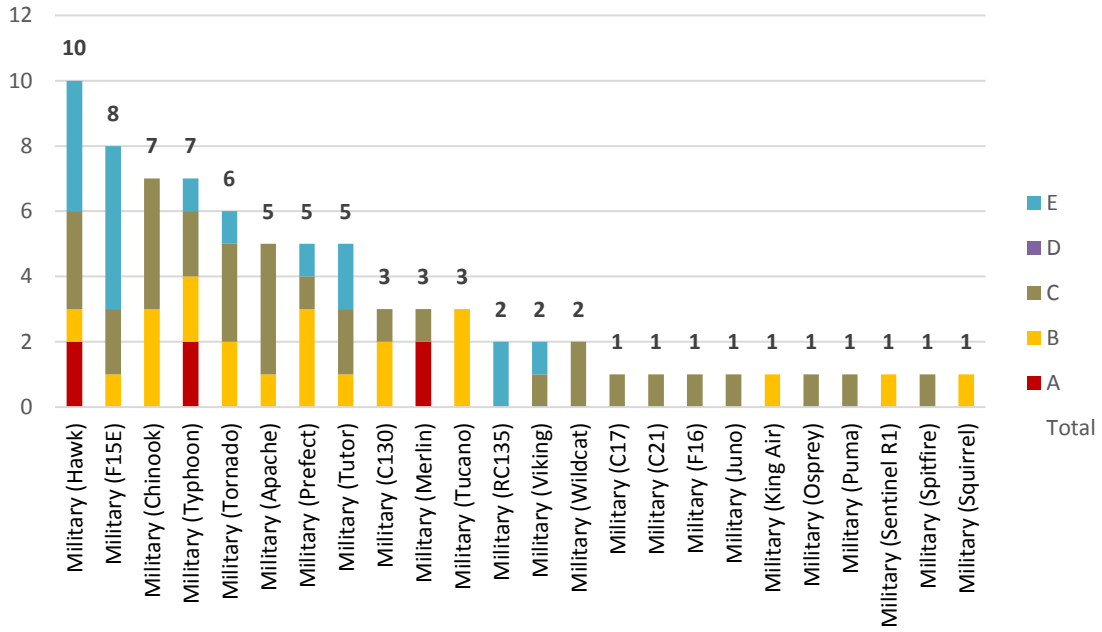


Figure 44. 2018 Military Involvement by Aircraft Type and Risk

As for the previous sections, putting all this into perspective, the following headline statistics for 2018 are pertinent in framing the risk to Military aircraft:

- **63** non-SUAS Mil incidents represents, on average, just over one Military Airprox per week.
- **21** non-SUAS risk-bearing Mil incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, almost once a fortnight.

EMERGENCY SERVICES

Emergency Services Airprox by Airspace

There were 24 overall Airprox involving Emergency Services aircraft in 2018; of which 5 involved SUAS. The 19 manned aircraft-to-aircraft Airprox represent about 10% of the overall number of aircraft-to-aircraft incidents in 2018 (180 Airprox). This is similar to 2017, and perhaps reflects the new norm following the increased numbers of Police and HEMS aircraft in recent years 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.

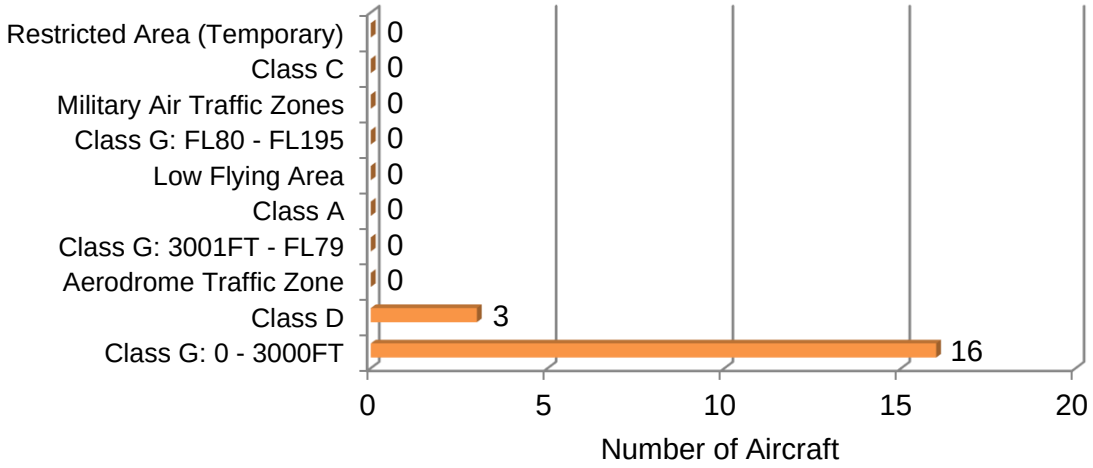


Figure 45. 2018 Emerg Servs Airprox by Airspace Involvement

Emergency Services Risk Distribution

Table 17 and Figures 46 & 47, illustrate the Emerg Servs Airprox statistics and risk distribution over the last 10 years. Although a little spiky due to the small numbers involved, a clearly increasing underlying trend of overall and risk-bearing Airprox can be seen. That being said, in 2018, about 10% of Emerg Servs Airprox were risk-bearing, which is well down on the 10-year average of 30%. The statistics over the last 10 years seem to indicate increasing overall Airprox numbers and risk-bearing trends as shown in Figure 46.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	**2018**
Emerg Servs Risk A	0	0	1	2	1	1	1	2	1	**0**
Emerg Servs Risk B	1	2	2	0	2	4	1	1	5(6)	**2(4)**
Emerg Servs Risk C	4	2	5	4	1	6	9	4	7(9)	**9(9)**
Emerg Servs Risk D	0	0	0	0	0	0	0	0	0	**0**
Emerg Servs Risk E	0	0	2	2	2	3	0	3	6	**8(11)**
Emerg Servs Total	5	4	10	8	6	14	11	10	19(22)	**19(24)**

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

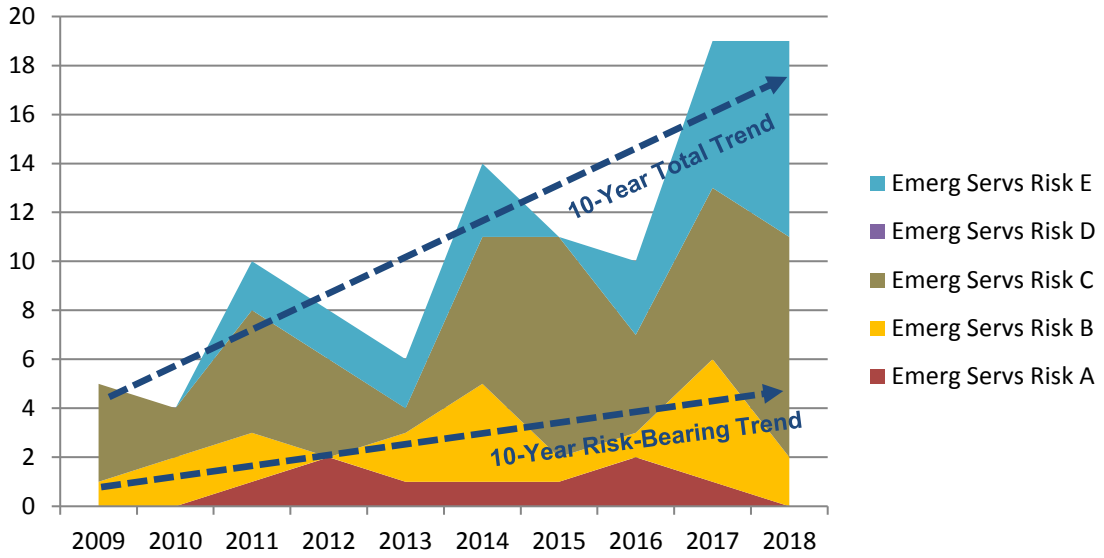


Figure 46. 10-year Emerg Servs Airprox Risk Distribution – no SUAS

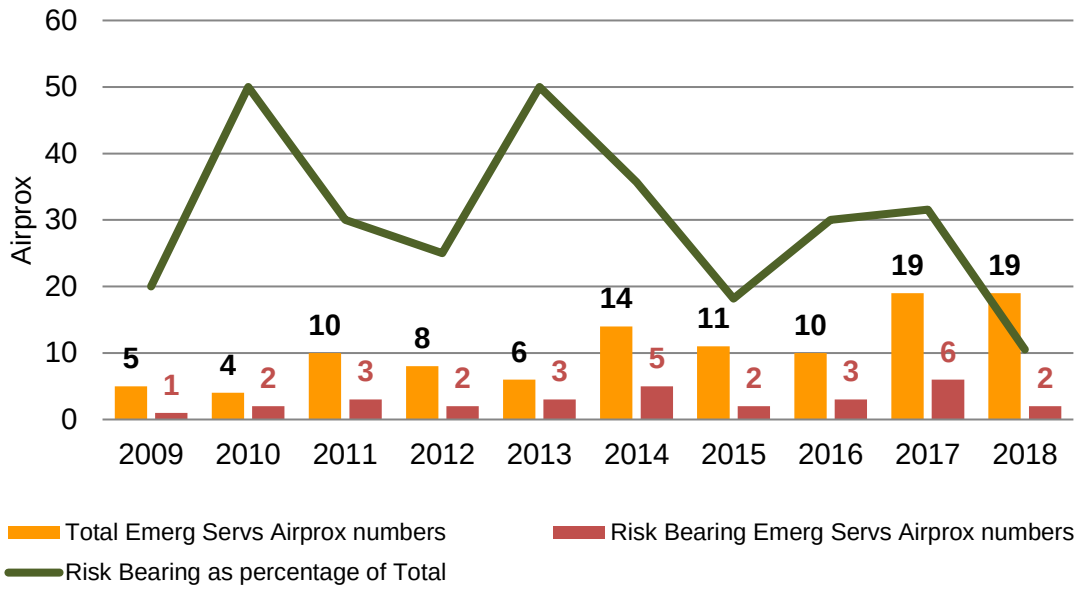


Figure 47. 10-year Emerg Servs Risk Bearing Distribution – no SUAS

Emerg Servs Airprox Rates

Table 18 shows the overall Emerg Servs Airprox rates over the last 10 years, and Figure 48 illustrates the incident breakdown by involvement. Noting the perils of drawing statistical conclusions from small numbers, it is disappointing that the previously reducing trend of NPAS incidents was reversed sharply in 2018; I have no evidence to account for this increase other than to note that most incidents involved GA (15 incidents), and which might therefore be influenced by the increased GA Airprox rates overall. For their part, HEMS Airprox numbers were at a similar level to 2017, whilst SAR incidents were much reduced. For the latter, this is only the second year following the establishment of the Coastguard SAR role and so reliable trends for this sector are still yet to emerge.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Airprox	147	167	161	161	172	224	217	171 (265)	159 (272)	180 (319)
Total Emerg Servs Airprox	5	4	10	8	6	14	11	10	19 (22)	19 (24)
Risk Bearing Emerg Servs Airprox	1	2	3	2	3	5	2	3	6 (7)	2 (4)
Risk Bearing as % of Total	20	50	30	25	50	36	18	30	32	11 (17)
Police	2	1	5	6	6	6	5	4	2	**8 (9)**
Ambulance	3	3	5	2	0	8	6	6	11 (14)	**9 (11)**
Coastguard	0	0	0	0	0	0	0	0	6	**2 (4)**

Table 18. 10-year Emerg Servs Airprox Rates (sector figures in brackets include SUAS Airprox)

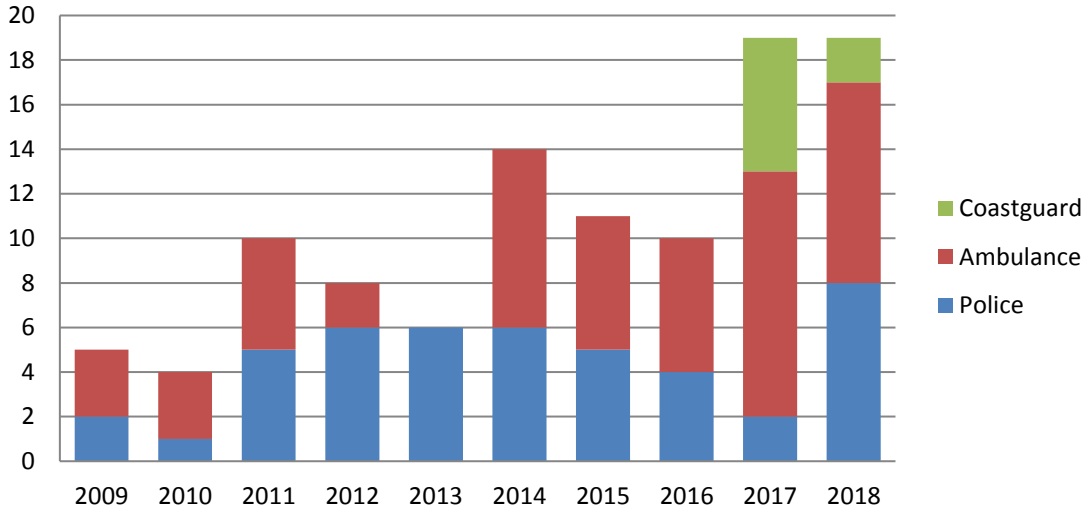


Figure 48. Emerg Servs Airprox by Involvement over the last 10 years – no SUAS

The Emerg Servs main operating environment is in see-and-avoid Class G/Low-level airspace and this means that incidents were usually from interactions with 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 be unpredictable, so avoid by a wide margin.

As for the previous sections, the following headline statistics for 2018 are pertinent in framing the risk to Emerg Servs aircraft:

- **19** non-SUAS Emerg Servs incidents represents, on average, about 1-2 Airprox per month.
- **2** non-SUAS risk-bearing Emerg Servs incidents indicates that most Emerg Servs Airprox were detected sufficiently early such that timely and effective manoeuvres could be employed to avoid conflict.

UKAB 2018 SAFETY RECOMMENDATIONS

Accepted Recommendations

Airprox	Recommendation	Comments
2018005	HQ Air Command reviews the education of military pilots with respect to the avoidance of minor airfields.	An article for Air Clues was written and published.
2018005	MAA reviews the wording of RA2307 to reflect The Rules of the Air Regulations 2015 and SERA wording.	MAA agreed to undertake a review of the wording of RA2307 and a wider gap analysis to compare SERA to the 2000 series: flying regulations.
2018020	A NOTAM is issued to remind airspace users of the advantage of contacting Waddington LARS when operating in the vicinity of EG R313.	It was decided that a NOTAM was not the best option but the UK AIP EG R313 entry was changed to highlight that a surveillance-based ATS was strongly recommended when operating in the vicinity.
2018022	HQ Air Command review the radio procedures for CGS operations from Syerston.	CGS Syerston engaged with East Midlands Airport and proposed measures to improve the co-ordination of activities in the area. Other mitigations were also identified and were in the process of being staffed.
2018023	MAA reviews the wording of RA2307 to reflect The Rules of the Air Regulations 2015 and SERA wording.	MAA agreed to undertake a review of the wording of RA2307 and a wider gap analysis to compare SERA to the 2000 series: flying regulations.
2018025	The CAA consider further publicising the SERA Part C transponder requirements.	The CAA agreed with the Board that broader and more targeted information regarding the new transponder carriage and operation requirements was required, and that such messaging would help to reinforce the safety aspects of their mid-air collision programme.
2018027	Benson and local airfields engage in liaison to improve coordination of activities.	Benson Safety Cell instigated a number of Local Airspace Working Groups to both raise any concerns and enhance understanding of the different operational requirements. A meeting took place between Benson and White Waltham and this included a discussion regarding White Waltham's Aerobatic Boxes.
2018031	USAFE(UK) re-brief their aircrew and controllers on the need to anticipate the effect of aircraft flight vector on other aircraft's TCAS.	Lakenheath crews and controllers were reminded, via the Flight Crew Information Folder (the USAF equivalent of an Order Book) of the need not to vector unnecessarily close to TCAS equipped aircraft

Airprox	Recommendation	Comments
2018064	The CAA re-emphasise the provisions of a Basic Service.	The General Aviation Unit agreed to facilitate a GA press release to support this recommendation. They also published an appropriate article in the 'Clued Up' magazine.
2018090	That North Weald provide advice to pilots concerning the potential for confliction with the Stapleford visual circuit.	North Weald held one of their regular pilots' operational briefing sessions in November 2018 during which the potential for Airprox with Stapleford circuit traffic was one of the items specifically raised to heighten local pilots' situational awareness. They also amended their Airfield Operating Manual to highlight the potential for Airprox specifically, and local flying orders were also updated along with their online operational briefing available for download to include a specific section about Stapleford traffic because visitors may not be aware of the proximity of the two circuits.
2018092	Tatenhill update their AIP entry to remove ambiguity from the join procedure.	AIRAC 08/2019 EGBM AD 2.22 reflected a Tatenhill change of: 'Aircraft to make standard overhead join. Circuits are left hand for Runways 08 and 26.'
2018101	HQ Air Command investigate whether D&D should transmit on all transmitters and on 121.5MHz	The restriction on transmitting on all frequencies and transmitters was put in place after complaints from civil airline companies but the decision was now reversed and D&D once again transmits appropriate safety messages on both Guard frequencies and all available transmitters.
2018140	Dunkeswell review their AIP entry regarding pilots notifying a straight-in join.	Dunkeswell AIP entry was amended to: 1 CIRCUITS a. Circuit directions: Runway 04 - RH; Runway 22 - LH. Circuit height: 800 ft. b. No overhead joins due to parachuting. c. No straight in approaches. d. No orbits in the circuit or on final approach, ie extend downwind or go around.
2018151	1. That Lasham Gliding Society ensure that their powered aircraft departure procedures are promulgated to all pilots using the airfield. 2. The PA31 operating company ensure that their pilots are aware of the Lasham powered aircraft departure procedures.	Lasham procedures for all twin-engine aircraft operating into Lasham were revised and pilots with the PA31's operating company were required to sign to ensure authorisation to fly in and out of Lasham.

Airprox	Recommendation	Comments
2018160	HQ Air Command pursue the use of a system for notification of commercial drone operations to pilots operating in the UK Low Flying System.	HQ Air Command commented that the Government proposed mandating the use of a Flight Information Notification System (FINS) for drone users in their most recent consultation (Sep 18), the ambition being to provide digital, interactive and real-time information on drone flights. In a response co-ordinated by the RAF Safety Centre, the MOD urged the government to push this proposal into legislation, citing the risk of MAC in the UKLFS. On 7th Jan 19 the Government took the decision not to mandate FINS, but instead to continue to develop the policy as part of a future Unmanned Traffic Management system. In the absence of any legislation or regulation to mitigate the risk of collision in the UKLFS, the RAF Safety Centre continues to address the issue using its 3E strategy. As part of this strategy, a Freephone hotline is advertised to drone users to have their flights published on CADS and be informed of military low flying activity in their area of operation. Until such time as notification of commercial drone activity is mandatory, the MOD (through the use of CADS or a successor capability) will continue to apply 'best effort' to informing crews of military low flying aircraft about notified drone operations.
2018162	Lasham and Farnborough liaise to discuss mutual operations.	Farnborough will implement airspace changes on 27th Feb 2020 and Lasham are in discussion with them about closer cooperation and a future LoA for airspace sharing.
2018182	The CAA and MAA remind FDDs of their responsibility to proactively direct activities in the display to ensure deconfliction.	The CAA agreed to: brief the recommendation at the pre-display season symposium and the next FDD course (Jan), email all FDD with the CAP 403 change and encourage them to read the Airprox report, update CAP 403 to include 'pro-active display item deconfliction' in the responsibilities of the FDD. The MOD agreed to: circulate the DASOR and UKAB report to all military FDDs; highlight the incident to all candidates of the joint CAA/MAA FDD trainnig course; highlight the incident to all attendees of the CAA/MAA pre-season display symposium in March 19; a copy was also circulated to all military event committees encouraging dissemination to all military flying display participants and display organisers; review MAA Reg article 2335.

Airprox	Recommendation	Comments
2018205	The CAA consider expanding GNSS theoretical knowledge and flying training syllabi.	CAA commented that this recommendation raised several important safety issues affecting the UK GA sector and they have carefully considered how they should respond to achieve the best possible proportionate and risk-based outcome. The CAA will therefore: 1. Via the CAA Aircrew TeB Member, contact EASA and ask the Agency to consider an EASA initiative to review and if deemed appropriate expand GNSS theoretical knowledge and pilot training syllabi for EU Part-FCL PPL and LAPL GA pilot licences. The purpose of this is to help ensure GA pilots are proficient in the use of a GPS based devices for navigation. 2. Liaise with The General Aviation Safety Council (GASCo) to determine if there are any new opportunities for CAA / GASCo engagement on education and awareness on GNSS technology use in the UK GA sector. 3. Review of the UK's Alt MoC PPL and LAPL syllabus knowledge and flying training syllabi with regard to opportunities to enhance GNSS theoretical knowledge and pilot training elements."
2018235	1. Sywell revise the use of 'Sloane procedures' during the LAA Rally. 2. Sywell review the AIC to emphasise the importance of going-around if in conflict with other traffic. 3. Sywell review the AIC to emphasise that pilots will not be in receipt of an Aerodrome Control Service.	Sywell have implemented procedures and amendments to the AIC to fully accept all these recommendations.

Partially Accepted Recommendations

Airprox	Recommendation	Comments
2018069	Drone Assist should display all minor airfields more obviously.	NATS accepted that there was an issue with displaying minor airfields, many of which were not in the AIP and were only displayed on VFR charts, but as yet no solution was available due to the difficulties with displaying all the information on any zoom level without causing so much clutter that meaningful insight was lost. However, NATS were constantly looking at enhancements and were currently reviewing how airspace was displayed, including the FRZ alongside the ATZ/ground hazard.

Airprox	Recommendation	Comments
2018069	The CAA re-emphasise that drone operators are required to have access to a current VFR chart before commencing operations.	CAA commented that drone operators that do not already hold an acceptable aviation qualification were required to undertake an assessment process with a CAA-approved NQE. Part of this assessment was use and understanding VFR charts. However, this was only for those operators that the CAA is required to authorise, there remained a large numbers of recreational and private drone operators within the UK for which the primary link is through dronesafe.uk and apps such as Drone Assist.
2018232	Boscombe and Thruxton to review their LoA.	A revised LOA was agreed although Boscombe still had reservations about its veracity regarding some Thruxton departures.
2018252	That Wickenby and Waddington consider the use of the 7010 squawk for Wickenby circuit traffic.	SATCO Waddington engaged with Wickenby to encourage them to look at adopting a 7010 squawk when in the circuit. Despite repeated attempts, they haven't been able to secure an undertaking that a change request to the UKAIP will take place.
2018266	The CAA and MAA review the regulations and procedures pertaining to ATC use of 'unassured data' such as FLARM for the provision of Traffic Information.	MAA commented that scrutiny of individual Unit orders by Air Command had highlighted subtle differences in the employment of FLARM by MoD ATS providers. They intended to conduct an holistic review which will examine the current restrictions on its use and, if appropriate, seek to make recommendations which might enhance exploitation of the available data for situational awareness. CAA commented that whilst the technical specifications of currently existing equipment do not meet the standard necessary to achieve certification for the full provision of an ATS, they recognised the value of such data and that there were ongoing efforts to review and, if possible maximise the benefits available to both civilian and military controllers from the use of all Electronic Conspicuity mechanisms in operation in the UK today.

Rejected Recommendations

Airprox	Recommendation	Comments
2018010	Merryfield controllers are equipped to detect the position of traffic in the visual circuit at night.	The UKAB recommendation was investigated fully however, because of the unsuitability of ATM or NVD, it was not implemented. Additional work to ensure the distances between 'T's and the runway meet regulatory compliance was nearing completion. This would remove any legacy procedures and increase separation between an air system flying to a 'T' and a second air system flying to the runway. In addition, the pattern of lighting designating the runway in use was being investigated and a rectangular configuration to denote the available landing area was likely to be implemented. These actions would

Airprox	Recommendation	Comments
		mitigate any possible reduction in a controller's ability to detect the position of aircraft in the visual circuit and address the factors which have been identified as additionally contributing to the cause.
2018012	The Avon Hang Gliding & Paragliding Club and SPTA Ops refresh their LoA to cover usage of the Bratton launch site and how that information is conveyed.	Both SPTA Ops and the Avon HGPG Club stated that notification of usage at Bratton was too unreliable to make such a system useful.
2018216	The CAA review licensing requirements for paramotor activities.	The CAA reviewed licensing requirements for paramotor activities and decided to reject the recommendation and tolerate the associated risk based on an estimate of 1.1 paramotor occurrences per 100,000 estimated flying hours, compared to 15.9 for the overall GA fleet. They noted that introducing any form of regulation including pilot licensing or mandatory training requirements for paramotors would constitute a fundamental change to the currently unregulated status of this category of aircraft. This would require an extensive and detailed review of the issues to generate policy options in cooperation with the stakeholders, which would then be subject to public consultation followed by amendments to the Air Navigation Order. Given the significance of the changes they would need to propose, they do not believe there to be sufficient evidence at this time to warrant any immediate or urgent action with regards to introducing licensing for paramotors.
2018237	That Sywell consider specifying that parallel approaches are not to be conducted.	The recommendation to stop parallel approaches was not applied. Sywell stated that aircraft position onto final from a single stream and then split onto hard/grass runway. They opined that a parallel approach would only occur if aircraft speeds differed once established on final.

Recommendations Remaining Unresolved

Airprox	Recommendation	Comments at time of writing report
2018185	The CAA review current regulation concerning RLLCs.	The CAA were still reviewing current RLLC regulations, particularly with reference to civilian pilot responsibility. The CAA had been engaged with the DfT, Royal Household and TQHF to provide improvement in this area since March 2018. Due to several factors including BREXIT and additional requests from the Royal Household this had resulted in a lengthy process to ensure correct measures were taken moving forward. The CAA was committed to undertaking this review correctly and ensuring any future change, if agreed, is implemented appropriately and without any ambiguity.

Airprox	Recommendation	Comments at time of writing report
2018239	North Weald consider promulgating specific helicopter procedures.	North Weald were still in the process of updating their procedures and were waiting for the agreement of NPAS and Air Ambulance prior to the police helicopter operations starting in August 2018.
2018312	The CAA develop guidance for aerodrome operators regarding complexity of operations versus the level of ATS provision.	No progress at time of writing report.
2018319	The CAA investigate options for the cost-effective and straightforward means to afford additional protection of traffic operating in the immediate vicinity of busy minor aerodromes.	No progress at time of writing report.

AIRPROX CATALOGUE 2018

The table below is an abbreviated form of the 2017 Airprox Index that is available on the UKAB Website at 2018 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
2018001	01/01/2018	A	SCHLEICHER - ASK21	UNKNOWN (RPAS)
2018002	04/01/2018	B	OTHER - Military (Prefect)	OTHER - Military (King Air)
2018003	07/01/2018	A	AIRBUS - A319	UNKNOWN (RPAS)
2018004	07/01/2018	B	BOEING - 747	UNKNOWN (RPAS)
2018005	10/01/2018	B	CYCLONE AIRSPORTS - PEGASUS QUANTUM15	OTHER - Military (C130)
2018006	10/01/2018	C	DIAMOND - DA42	SCHLEICHER - K8
2018007	14/01/2018	C	COMCO IKARUS - IKARUS C42	FLIGHT DESIGN (CT)
2018008	16/01/2018	C	AIRBUS - A320	EUROCOPTER - EC135
2018009	16/01/2018	C	AIRBUS - A320	UNKNOWN (RPAS)
2018010	22/01/2018	C	OTHER - Military (Merlin HC3)	OTHER - Military (Wildcat HMA Mk2)
2018011	16/01/2018	E	OTHER (RPAS)	OTHER - Military (F15)
2018012	26/01/2018	A	OTHER (Paraglider)	OTHER - Military (Hawk)
2018013	25/01/2018	B	PZL BIELSKO	UNKNOWN
2018014	19/01/2018	A	CESSNA - 152	CESSNA - 182
2018015	01/02/2018	E	OTHER - Military (Typhoon)	EUROCOPTER - EC135
2018016	01/02/2018	B	OTHER - Military (Tucano)	OTHER - Military (Tucano)
2018017	04/02/2018	C	OTHER - Military (Viking)	GLASER DIRKS - DG1000
2018018	30/01/2018	C	CESSNA - 525	CESSNA - 152
2018019	11/02/2018	C	OTHER - Military (C17)	CESSNA - 182
2018020	07/02/2018	C	OTHER - Military (Hawk)	CESSNA - 152
2018021	12/02/2018	B	CESSNA - 150	UNKNOWN
2018022	16/02/2018	B	AVIONS ROBIN - DR400 (+ glider)	PIPER - PA38
2018023	15/02/2018	C	SCHEIBE - SF25	OTHER - Military (Apache)
2018024	16/02/2018	E	AGUSTA (AW101)	UNKNOWN
2018025	21/02/2018	B	OTHER - Military (Squirrel)	UNKNOWN
2018026	25/01/2018	C	OTHER - Military (C21)	VANS - RV6
2018027	23/02/2018	C	OTHER - Military (Puma)	MUDRY - CAP231
2018028	22/02/2018	C	EUROCOPTER - EC135	UNKNOWN (RPAS)
2018030	21/02/2018	B	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018031	07/02/2018	E	OTHER - Military (RC135)	OTHER - Military (F15)
2018032	14/02/2018	C	OTHER - Military (F15)	UNKNOWN (RPAS)
2018034	06/03/2018	C	PARTENAVIA - P68	PIPER - PA28
2018035	10/03/2018	B	CESSNA - 152	DE HAVILLAND (Vampire)
2018036	13/03/2018	A	CHAMPION - 7KCAB	ROBINSON - R44

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018037	14/03/2018	E	BOMBARDIER (Global 6000)	OTHER - Military (F15)
2018038	14/03/2018	E	OTHER - Military (RC135)	OTHER - Military (F15)
2018039	21/03/2018	C	BOEING - 727	PIPER - PA28
2018040	25/03/2018	A	CESSNA - 182	DIAMOND - DA40
2018041	26/03/2018	A	DASSAULT - FALCON2000	UNKNOWN (RPAS)
2018042	25/03/2018	C	AIRBUS - A321	UNKNOWN (RPAS)
2018043	01/04/2018	C	BOEING - 747	UNKNOWN (RPAS)
2018044	25/03/2018	A	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018045	05/04/2018	E	EUROCOPTER - EC135	CESSNA - 152
2018046	08/04/2018	B	THRUSTER - T600	GLASFLUGEL - 304
2018047	01/02/2018	D	AIRBUS - A321	UNKNOWN (Object)
2018048	05/04/2018	B	SIKORSKY - S92	UNKNOWN (RPAS)
2018049	09/04/2018	E	SIKORSKY - S92	BAE - JETSTREAM4100
2018050	12/04/2018	C	OTHER - Military (Tornado)	BOEING - 757
2018051	14/04/2018	C	OTHER - Generic (Ozone Delta 2 Paraglider)	PIPER - PA30
2018052	14/04/2018	C	COMCO IKARUS - IKARUS C42	UNKNOWN
2018053	14/04/2018	A	BOEING - 787	UNKNOWN (RPAS)
2018054	15/03/2018	C	OTHER - Military (Chinook)	UNKNOWN (RPAS)
2018055	19/04/2018	A	EMBRAER - ERJ195	UNKNOWN (RPAS)
2018056	22/04/2018	B	AIRBUS - A320	UNKNOWN (RPAS)
2018057	21/04/2018	C	GULFSTREAM - AA5 - A	PIPER - PA28
2018058	23/04/2018	C	OTHER - Military (Chinook)	OTHER (AWG 29)
2018059	22/04/2018	A	AIRBUS - A320	UNKNOWN (RPAS)
2018060	22/04/2018	C	OTHER (Cirrus glider)	PIPER - PA28
2018061	25/04/2018	B	OTHER - Military (Hawk)	OTHER - Military (Typhoon)
2018062	25/04/2018	C	ROLLADEN SCHNEIDER - LS4	CESSNA - 525
2018063	20/04/2018	B	OTHER (Q400)	UNKNOWN (RPAS)
2018064	01/05/2018	B	PIPER - PA28	AVIONS ROBIN - DR400
2018065	02/05/2018	C	OTHER - Military (Chinook)	PIPER - PA28
2018066	03/05/2018	B	CESSNA - 172	CESSNA - 525
2018067	04/06/2018	A	AIRBUS - A319	UNKNOWN (RPAS)
2018068	04/05/2018	E	AEROSPATIALE - AS365	OTHER (CAP232)
2018069	03/05/2018	C	OTHER (eBee SQ RPAS)	BEECH - 55
2018070	06/05/2018	A	AIRBUS - A320	UNKNOWN (RPAS)
2018071	04/05/2018	C	BOEING - 777	UNKNOWN (RPAS)
2018072	06/05/2018	B	OTHER - Military (Typhoon)	UNKNOWN
2018073	09/05/2018	C	EVEKTOR AEROTECHNIK - EV97	UNKNOWN (RPAS)
2018074	28/04/2018	B	EVEKTOR AEROTECHNIK - EV97	PIPER - PA28
2018075	29/04/2018	B	OTHER (Q400)	UNKNOWN (RPAS)
2018076	05/05/2018	B	BOEING - 757	UNKNOWN (Object)
2018077	08/05/2018	A	PIPER - PA28	ROBINSON - R22
2018078	09/05/2018	B	DE HAVILLAND - DHC8	UNKNOWN (RPAS)
2018079	10/05/2018	C	PIK - PIK20	CESSNA - 550

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018080	11/05/2018	E	OTHER - Military (Tutor)	OTHER - Military (Prefect)
2018081	11/05/2018	C	AIRBUS - A321	UNKNOWN (RPAS)
2018082	15/05/2018	D	OTHER (Canopy Suspended)	CIRRUS - SR22
2018083	12/05/2018	A	COMCO IKARUS - IKARUS C42	AEROSPATIALE - AS350
2018084	11/02/2018	B	BOEING - 767	UNKNOWN (RPAS)
2018085	15/05/2018	C	PIPER - PA28	PIPER - PA28
2018086	16/05/2018	B	OTHER (Liberty XL2)	UNKNOWN (RPAS)
2018087	11/05/2018	B	PIPER - PA28	CESSNA - 172
2018088	05/05/2018	A	OTHER (Magni Gyroplane)	CESSNA - 120
2018089	15/05/2018	B	BOEING - 787	UNKNOWN (RPAS)
2018090	18/05/2018	C	DIAMOND - DA42	PIPER - PA28
2018091	19/05/2018	C	AEROSPATIALE - AS365	OTHER (Microlight)
2018092	20/05/2018	C	PIPER - PA32	PIPER - PA28
2018093	17/05/2018	A	PIPER - PA28	CESSNA - 152
2018094	21/05/2018	B	CESSNA - 150	OTHER (Helicopter)
2018095	13/05/2018	C	AIRBUS - A321	UNKNOWN (RPAS)
2018096	21/05/2018	B	ROLLADEN SCHNEIDER - LS7	PIPER - PA28
2018097	21/05/2018	B	OTHER - Military (C130)	UNKNOWN (RPAS)
2018098	19/05/2018	C	UNKNOWN (RPAS)	UNKNOWN
2018099	16/05/2018	A	DE HAVILLAND - DHC8 - 400	UNKNOWN (Object)
2018100	14/05/2018	A	PILATUS - PC12	UNKNOWN (RPAS)
2018101	30/05/2018	C	OTHER - Military (C130)	SIKORSKY - S92
2018102	28/05/2018	B	AEROSPATIALE - AS350	JODEL - D112
2018103	01/06/2018	C	DIAMOND	BEECH - 90
2018104	02/06/2018	C	BAC - 167	PIPER - PA28
2018105	02/06/2018	C	EUROCOPTER - EC135	DIAMOND - DA40
2018106	04/05/2018	E	UNKNOWN (RPAS)	AEROSPATIALE - AS355
2018107	06/05/2018	A	AIRBUS - A320	UNKNOWN (RPAS)
2018108	11/05/2018	C	PIPER - PA28	BOEING - 737
2018109	20/05/2018	C	AIRBUS - A319	UNKNOWN (RPAS)
2018110	05/06/2018	B	OTHER (AW169)	SUPERMARINE - SPITFIRE
2018111	23/05/2018	C	BOEING - EC135	PIPER - PA28
2018112	20/05/2018	B	OTHER (P&M Aviation Explorer (Trike))	SUPERMARINE - SPITFIRE
2018114	28/05/2018	A	AIRBUS - A319	UNKNOWN (RPAS)
2018115	20/05/2018	C	AIRBUS - A319	UNKNOWN (RPAS)
2018116	13/05/2018	C	CESSNA - 560	UNKNOWN (RPAS)
2018117	28/05/2018	C	DE HAVILLAND - DHC8	UNKNOWN (RPAS)
2018118	02/06/2018	E	UNKNOWN (RPAS)	MD HELICOPTER - 902
2018119	02/06/2018	B	VANS - RV8	UNKNOWN (RPAS)
2018120	11/06/2018	A	PIPER - PA31	UNKNOWN (RPAS)
2018121	09/06/2018	B	OTHER - Military (Chinook)	SUPERMARINE - SPITFIRE
2018122	03/06/2018	B	AIRBUS - A321	UNKNOWN (RPAS)
2018123	09/06/2018	C	BOEING - 757	PIPER - PA28

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018124	03/06/2018	B	CESSNA - 182	DIAMOND - DA42
2018125	06/06/2018	B	SAAB - 2000	UNKNOWN (RPAS)
2018126	10/05/2018	D	AIRBUS - A380	UNKNOWN (RPAS)
2018127	03/06/2018	C	BOEING - 737	UNKNOWN (RPAS)
2018128	14/06/2018	C	AIRBUS - A320	UNKNOWN (RPAS)
2018129	14/06/2018	A	BOEING - 767	UNKNOWN (RPAS)
2018130	15/06/2018	B	AIRBUS - A320	UNKNOWN (RPAS)
2018131	17/06/2018	A	AIRBUS - A320	UNKNOWN (RPAS)
2018132	06/06/2018	C	SIKORSKY - S92	PIPER - PA28
2018133	16/06/2018	C	OTHER (AW169)	UNKNOWN (RPAS)
2018134	19/06/2018	B	AIRBUS - A320	UNKNOWN (RPAS)
2018135	21/06/2018	B	OTHER (Cabri G2)	HUNTING PERCIVAL - JET PROVOST
2018136	21/06/2018	B	AEROSPATIALE - AS365	UNKNOWN (Glider)
2018137	23/06/2018	C	OTHER (Canopy Suspended)	AEROSPATIALE - SA341
2018138	17/06/2018	A	AIRBUS - A319	UNKNOWN (RPAS)
2018139	22/06/2018	C	PIPER - PA28	SCHEMPP HIRTH - NIMBUS3
2018140	17/06/2018	B	PIPER - PA28	BELL - 206
2018141	17/06/2018	A	OTHER (Foxbat)	JABIRU
2018142	22/06/2018	E	OTHER - Military (Hawk)	UNKNOWN
2018143	25/06/2018	E	AEROSPATIALE - AS365	NORTH AMERICAN - HARVARD
2018144	27/06/2018	C	NANCHANG - CJ6	UNKNOWN (RPAS)
2018145	27/06/2018	B	CESSNA - 208	BOEING - KC135
2018146	26/06/2018	C	CESSNA - 404	UNKNOWN (RPAS)
2018147	23/06/2018	A	CESSNA - 152	COMCO IKARUS - IKARUS C42
2018148	01/07/2018	B	BOEING - 787	UNKNOWN (RPAS)
2018149	22/06/2018	B	SCHLEICHER - ASW20	UNKNOWN
2018150	28/06/2018	C	BOEING - EC135	VANS - RV8
2018151	28/06/2018	B	SCHLEICHER - ASW27	PIPER - PA31
2018152	30/06/2018	E	UNKNOWN (Model Aircraft)	MD HELICOPTER - 902
2018153	28/06/2018	C	EMBRAER - EMB145	UNKNOWN (RPAS)
2018154	25/06/2018	A	BOEING - 787	UNKNOWN (RPAS)
2018155	13/05/2018	B	AIRBUS - A320	UNKNOWN (Balloon)
2018156	30/06/2018	B	PIPER - PA31	SCHEMPP HIRTH - STANDARD CIRRUS
2018157	05/07/2018	B	CESSNA - 152	BAC - JET PROVOST
2018158	29/06/2018	C	AIRBUS - A320	AIRBUS - A319
2018159	06/07/2018	B	AVIONS ROBIN - DR400	MIL - MI8
2018160	04/07/2018	B	UNKNOWN (RPAS)	OTHER - Military (Tornado)
2018161	07/07/2018	B	BOEING - 777	UNKNOWN (RPAS)
2018162	27/06/2018	E	SCHLEICHER - ASK13	BOEING - 737
2018163	09/07/2018	C	ROBINSON - R22	OTHER - Military (Osprey)
2018164	04/07/2018	C	UNKNOWN (RPAS)	DIAMOND - DA42
2018165	14/07/2018	C	OTHER (CSA Sportcruiser PS-28)	AGUSTA - A109
2018166	05/07/2018	C	BEECH - 90	UNKNOWN (Object)

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018167	01/07/2018	A	GULFSTREAM - GIV - X G450	UNKNOWN (RPAS)
2018168	27/06/2018	A	EMBRAER (E550)	UNKNOWN (RPAS)
2018169	08/07/2018	A	DASSAULT - FALCON7X	UNKNOWN (RPAS)
2018170	12/07/2018	C	OTHER - Military (Chinook)	UNKNOWN (RPAS)
2018171	07/07/2018	B	AIRBUS - A320	UNKNOWN (RPAS)
2018172	14/07/2018	C	OTHER (CSA Sportcruiser PS-28)	CESSNA - 182
2018173	16/07/2018	B	DE HAVILLAND - DHC8	UNKNOWN (RPAS)
2018174	12/07/2018	E	PIPER - PA18	SUPERMARINE - SPITFIRE
2018175	12/07/2018	C	DIAMOND - DA42	UNKNOWN (RPAS)
2018176	14/07/2018	B	AIRBUS - A321	UNKNOWN (RPAS)
2018177	14/07/2018	A	AIRBUS - A321	UNKNOWN (Object)
2018178	13/07/2018	C	BOEING - 737 - 800	CESSNA - 172
2018179	07/07/2018	B	ATR - ATR72	UNKNOWN (RPAS)
2018180	08/07/2018	A	PIPER - PA28	AVIAT - EAGLE II
2018181	21/07/2018	B	SCHLEICHER - ASW20	CIRRUS - SR22
2018182	15/07/2018	C	OTHER - Military (Typhoon)	DOUGLAS - C47
2018183	23/07/2018	C	OTHER - Military (Tornado)	OTHER - Military (F16)
2018184	13/07/2018	B	BOEING - 787	UNKNOWN (RPAS)
2018185	25/07/2018	C	SIKORSKY - S76	DE HAVILLAND - DHC6
2018186	27/06/2018	B	OTHER - Military (Prefect)	OTHER - Military (Prefect)
2018187	18/07/2018	A	OTHER (X-Air Falcon)	PIPER - PA28
2018188	28/07/2018	A	SCHEMPP HIRTH - DUO DISCUS	SIKORSKY - S76 - C
2018189	24/07/2018	E	PIPER - PA28	NANCHANG - CJ6
2018190	25/07/2018	C	SIKORSKY - S76	UNKNOWN
2018191	24/07/2018	C	TECNAM - P2002	ROBINSON (R66)
2018192	21/07/2018	A	CESSNA - 152	UNKNOWN (RPAS)
2018193	22/07/2018	A	BOEING - 777	UNKNOWN (RPAS)
2018194	17/07/2018	A	BOEING - 747	UNKNOWN (RPAS)
2018195	17/07/2018	C	BOEING - 787	UNKNOWN (RPAS)
2018196	24/07/2018	B	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018197	25/07/2018	B	AIRBUS - A319	UNKNOWN (RPAS)
2018198	25/07/2018	B	BOEING - 737	UNKNOWN (RPAS)
2018199	24/07/2018	C	DIAMOND - DA42	UNKNOWN (RPAS)
2018200	15/07/2018	A	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018201	25/07/2018	A	BOEING - 787	UNKNOWN (RPAS)
2018202	31/07/2018	B	CESSNA - 172	CESSNA - 152
2018203	30/07/2018	A	SAAB - 2000	UNKNOWN (Object)
2018204	03/08/2018	E	OTHER - Military (Typhoon)	AIRBUS - A400M
2018205	05/08/2018	B	PIPER - PA28	ROBINSON - R22
2018206	03/08/2018	B	ROCKWELL - 112	CESSNA - 152
2018207	20/06/2018	C	OTHER - Military (Wildcat)	OTHER (T61)
2018208	07/08/2018	A	OTHER - Military (Merlin)	OTHER - Military (Merlin)
2018209	10/08/2018	C	OTHER - Military (Hawk)	CYCLONE AIRSPORTS - PEGASUS QUANTUM15 - 912

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018210	16/07/2018	C	SAAB - 2000	UNKNOWN (RPAS)
2018211	09/08/2018	C	SOCATA - TB10	BAE - JETSTREAM4100
2018212	14/08/2018	B	OTHER - Military (F15)	SCHEMPP HIRTH - DUO DISCUS
2018213	16/08/2018	C	SIKORSKY - S92	OTHER - Military (Typhoon)
2018214	02/08/2018	C	AIRBUS - A321	UNKNOWN (RPAS)
2018215	30/07/2018	B	AIRBUS - A319	UNKNOWN (RPAS)
2018216	13/08/2018	B	EMBRAER - ERJ170	OTHER (Paramotor)
2018217	15/08/2018	B	CESSNA - 150	OTHER - Military (Chinook)
2018218	18/08/2018	E	AIRBUS - A320	PIPER - PA38
2018220	19/08/2018	B	OTHER (AW189)	UNKNOWN (Object)
2018221	13/08/2018	C	DE HAVILLAND - DHC6	PIPER - PA28
2018222	17/08/2018	A	BOEING - 737	UNKNOWN (RPAS)
2018223	20/08/2018	C	OTHER - Military (Juno)	AEROSPATIALE - AS350
2018224	17/08/2018	C	CESSNA - 152	CIRRUS - SR22
2018225	20/08/2018	A	AIRBUS - A319	UNKNOWN (RPAS)
2018227	24/08/2018	B	AIRBUS - A320	UNKNOWN (RPAS)
2018228	06/08/2018	C	AIRBUS - A320	UNKNOWN (RPAS)
2018229	20/08/2018	C	CIRRUS - SR20	DIAMOND - DA42
2018230	23/08/2018	E	OTHER (AW169)	OTHER (Chipmunk)
2018231	22/08/2018	B	UNKNOWN (RPAS)	OTHER - Military (Tucano)
2018232	23/08/2018	C	LOCKHEED - C130	PIPER - PA46
2018233	23/08/2018	B	CESSNA - 172	SOCATA - TB9
2018234	25/08/2018	B	AIRBUS - A321	UNKNOWN (RPAS)
2018235	31/08/2018	C	PIEL - CP30	AGUSTA - A109
2018236	29/08/2018	B	OTHER - Military (Chinook)	UNKNOWN (RPAS)
2018237	02/09/2018	A	PIPER - PA30	PIPER - PA28
2018238	22/07/2018	A	AIRBUS - A380	UNKNOWN (RPAS)
2018239	27/08/2018	C	OTHER (AW169)	PIPER - PA32
2018240	01/09/2018	C	TECNAM - P2002	SOCATA - TB20
2018241	21/08/2018	D	FLY BUY ULTRALIGHTS - IKARUS C42	UNKNOWN
2018242	07/09/2018	A	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018243	05/09/2018	E	AEROSPATIALE - AS365	OTHER - Military (Hawk)
2018244	04/08/2018	A	AIRBUS - A380	UNKNOWN (RPAS)
2018245	01/09/2018	B	OTHER (A220)	UNKNOWN (RPAS)
2018246	03/09/2018	B	OTHER - Military (Apache WAH64)	AVIONS ROBIN - DR400
2018247	02/09/2018	E	DE HAVILLAND - DHC8	AEROSPATIALE - AS355
2018248	05/09/2018	B	OTHER - Military (Sentinel R1)	OTHER (Microlight)
2018249	06/09/2018	B	EUROCOPTER - EC135	ROLLADEN SCHNEIDER - LS8
2018250	02/09/2018	A	DE HAVILLAND - DHC8	UNKNOWN (RPAS)
2018251	31/08/2018	C	OTHER - Military (Tutor)	UNKNOWN (RPAS)
2018252	12/09/2018	C	CESSNA - 152	OTHER - Military (Hawk)
2018253	08/09/2018	B	CESSNA - 152	BELL - AB206
2018254	23/08/2018	B	PZL SWIDNIK - PW5	UNKNOWN

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018255	13/09/2018	C	PIPER - PA25 (and K13 glider)	FLIGHT DESIGN (CTSW)
2018256	14/09/2018	B	OTHER - Military (Tutor)	UNKNOWN (RPAS)
2018257	15/09/2018	C	OTHER - Military (Spitfire)	PIPER - J3
2018258	17/09/2018	E	OTHER - Military (Hawk)	OTHER - Military (Tornado)
2018259	16/09/2018	B	AIRBUS - A321	UNKNOWN (RPAS)
2018261	19/09/2018	A	BOEING - 737	UNKNOWN (RPAS)
2018262	02/09/2018	A	OTHER (A220)	UNKNOWN (RPAS)
2018263	16/09/2018	A	AIRBUS - A321	UNKNOWN (RPAS)
2018264	23/09/2018	B	BOEING - 737	UNKNOWN (RPAS)
2018265	25/09/2018	A	BOEING - 787	UNKNOWN (RPAS)
2018266	26/09/2018	A	OTHER - Military (Hawk)	ROLLADEN SCHNEIDER - LS3
2018267	26/09/2018	C	FLY BUY ULTRALIGHTS - IKARUS C42	OTHER - Military (Tornado)
2018268	24/09/2018	C	WITTMAN - W8	CESSNA - 550
2018269	29/09/2018	E	OTHER - Military (Viking)	CESSNA - 182
2018270	28/09/2018	C	OTHER - Military (Prefect)	UNKNOWN (RPAS)
2018271	30/09/2018	C	PIPER - PA28	CESSNA - 172
2018272	29/09/2018	B	AIRBUS - A380	UNKNOWN (RPAS)
2018273	03/10/2018	A	PIPER - PA28	PIPER - PA30
2018274	05/10/2018	A	BOEING - 737	UNKNOWN (Balloon)
2018275	30/09/2018	B	AIRBUS - A319	UNKNOWN (RPAS)
2018276	29/09/2018	B	PIPER - PA28	SUPERMARINE - SPITFIRE
2018277	08/10/2018	C	OTHER (DJI Phantom RPAS)	OTHER - Military (Apache)
2018278	07/10/2018	E	UNKNOWN (Canopy Suspended)	GULFSTREAM - AA5
2018279	13/09/2018	C	PIPER - PA34	OTHER (Glider)
2018280	11/10/2018	C	BOEING - 737	OTHER - Military (F15E)
2018281	07/10/2018	A	HAWKER SIDDELEY - HS125	UNKNOWN (RPAS)
2018282	18/10/2018	E	AEROSPATIALE - AS365	OTHER - Military (Hawk)
2018283	26/09/2018	C	OTHER - Military (Apache)	CESSNA - 152
2018284	21/10/2018	E	PIPER - PA28	PIPER - PA28
2018285	22/10/2018	C	PIPER - PA34	AEROSPATIALE - AS350
2018286	23/10/2018	C	BOEING - 787	AIRBUS - A350
2018287	23/10/2018	B	AVIONS ROBIN - DR400	PIPER - PA28
2018288	03/10/2018	C	AIRBUS - A320	UNKNOWN (RPAS)
2018289	24/09/2018	E	BAE - BAE146	DIAMOND - DA20
2018290	25/10/2018	E	OTHER - Military (Tutor)	PIPER - PA28
2018291	27/10/2018	A	BOEING - 787	UNKNOWN (RPAS)
2018292	10/10/2018	C	PIPER - PA28	BEECH - 58
2018293	07/08/2018	C	OTHER - Military (Apache)	PIPER - PA28
2018294	29/10/2018	C	UNKNOWN (RPAS)	PIPER - PA28
2018295	01/11/2018	B	AIRBUS - A320	UNKNOWN (Object)
2018296	28/10/2018	A	AIRBUS - A320	UNKNOWN (RPAS)
2018297	04/11/2018	B	PIPER - PA18	UNKNOWN (RPAS)
2018298	28/10/2018	D	EMBRAER - EMB135	UNKNOWN (Object)

Airprox No	Date	Risk Category	Aircraft 1 Type	Aircraft 2 Type
2018299	01/09/2018	B	AIRBUS - A340	UNKNOWN (RPAS)
2018300	05/11/2018	E	OTHER (AW169)	EUROPA - EUROPA
2018301	31/10/2018	B	PIPER - PA31	PIPER - PA28
2018302	14/11/2018	C	AIRBUS - A400M	PIPER - PA28
2018303	29/09/2018	C	SCHEMPP HIRTH - DISCUS B	CESSNA - 525
2018304	17/11/2018	C	OTHER - Military (Tutor)	AEROSPATIALE - AS350
2018305	18/11/2018	C	AEROSPATIALE - AS350	AEROSPATIALE - SA341
2018306	21/11/2018	E	DE HAVILLAND - DHC6	OTHER - Military (F15)
2018307	24/11/2018	A	SAAB - 2000	UNKNOWN (RPAS)
2018308	07/11/2018	C	OTHER (A388)	UNKNOWN (Object)
2018309	21/11/2018	C	AEROSPATIALE - AS350	UNKNOWN (RPAS)
2018310	30/11/2018	C	EUROCOPTER - EC155	PIPER - PA28
2018311	04/12/2018	B	EMBRAER - ERJ190	UNKNOWN (RPAS)
2018312	03/12/2018	A	OTHER (Cabri)	CIRRUS - SR22
2018313	30/11/2018	A	DIAMOND - DA42	BEECH - 23 - C23
2018314	04/12/2018	E	CESSNA - 172	ROBINSON - R44
2018315	10/12/2018	C	EUROCOPTER - EC135	SIKORSKY - S76
2018316	14/12/2018	C	PIPER - PA28	EVEKTOR AEROTECHNIK - EV97
2018317	12/12/2018	C	CYCLONE AIRSPORTS - PEGASUS QUIK	UNKNOWN
2018318	14/12/2018	A	EMBRAER - EMB500	UNKNOWN (RPAS)
2018319	17/12/2018	B	CESSNA - 172	OTHER - Military (Tornado)
2018320	19/12/2018	A	OTHER - Military (Typhoon)	OTHER - Military (Typhoon)
2018321	23/12/2018	C	AIRBUS - A330	UNKNOWN (RPAS)
2018322	26/12/2018	B	DE HAVILLAND - DHC8	UNKNOWN (RPAS)
2018323	30/12/2018	A	EMBRAER - ERJ175	UNKNOWN (Object)
2018324	30/12/2018	C	AIRBUS - A319	UNKNOWN (RPAS)
2018325	02/07/2018	B	EMBRAER - EMB135	UNKNOWN (RPAS)

GLOSSARY OF DEFINITIONS AND ABBREVIATIONS

Risk Categories

Risk Category	ICAO 4444 PANS-ATM AIRPROX risk classification	Eurocontrol severity classification scheme (ESARR 2)[10]	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 just 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. Non-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 providence 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/safety not assured – risk of collision.** Situations where aircraft proximity resulted in safety margins being much reduced below the norm through either chance, misjudgement or inaction; or where emergency avoiding action that materially increased separation and averted a likely collision was only taken at the last minute.
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.	**Normal safety standards and parameters – no risk of collision**. Situations that met the criteria for reporting but where, after analysis, the occurrence was assessed to be benign and where normal procedures, safety standards and parameters were considered to have pertained.

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

AIRPROX BARRIER DEFINITIONS (2017/2018 VERSION)

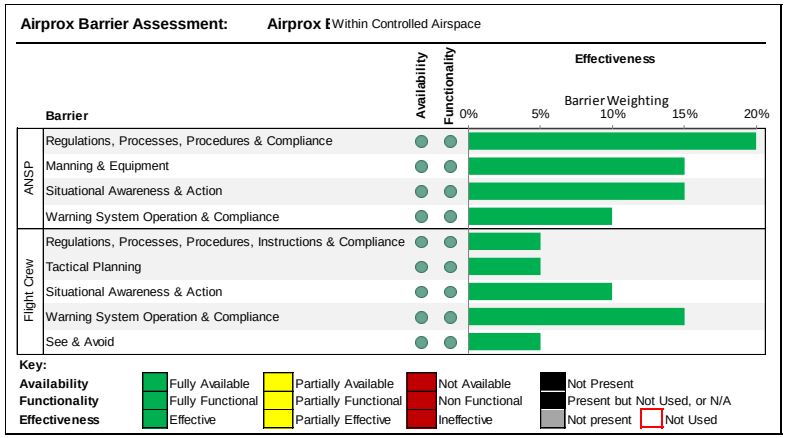
Availability and Functionality Word-pictures

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)	

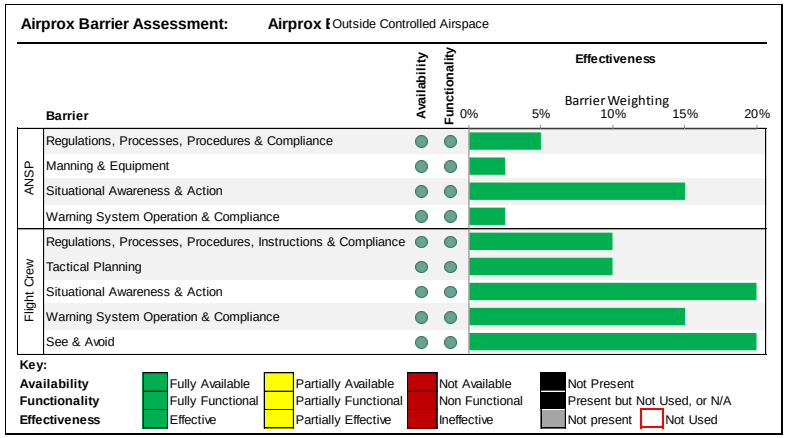
Note that these barrier definitions were only applicable to the 2017/2018 Airprox, having been modified since 2018 in light of experience gained as the safety barrier methodology evolved.

Barrier Effectiveness and Weighting

The 9 safety barriers used in 2017/2018 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**