UK AIRPROX BOARD

ISSN 1479-2729

Analysis of Airprox in UK Airspace

Report Number 35
January 2019 – December 2019

A joint Civil Aviation Authority / Military Aviation Authority service

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Thirty-Fifth Report by the UK Airprox Board

Analysis of Airprox in UK Airspace
(January 2019 to December 2019)

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 328 Airprox in 2019, of which 203 were manned aircraft-to-aircraft encounters and 125 were incidents with Small Unmanned Air Systems (SUAS)[1]. This represents an increase in aircraft-to-aircraft and a small decrease in aircraft-to-SUAS reports compared to 2018 (when there were 180 aircraft-to-aircraft and 139 aircraft-to-SUAS incidents). As in previous recent reports, data for Airprox has been provided 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. I shall continue this approach in this and subsequent reports.

328 Airprox overall represents, on average, about six incidents per week - almost one every day.

203 manned aircraft-to-aircraft Airprox represents, on average, a manned aircraft-to-aircraft incident every other day.

146 risk-bearing Airprox overall means that, on average, there was either a risk of collision in UK airspace or safety was much reduced below norms about two to three times a week.

68 risk-bearing manned aircraft-to-aircraft Airprox means that, on average, there was either a risk of collision in UK airspace or safety was much reduced below norms between two manned aircraft slighty more often than once a week.

The mid-air-collision (MAC) safety barrier assessment methodology is now well established within the Airprox process and is proving to be a useful approach which allows more consistent and objective evaluation of the areas where normal safety processes are vulnerable to compromise. The Contributory Factors (CF) which underpin the barriers allow an even more in-depth view, which highlights where effort should be focussed to tackle specific areas of weakness and thereby enhance the efficacy of the barrier. This is the first year in which the CF have been brought into this report and as we progress through 2020 we will continue to refine our processes and procedures to best exploit the rich data captured by their inclusion. I would also like to highlight the continued emphasis on electronic reporting through our website and our mobile application. These are advances which have undoubtedly streamlined the reporting process but there is still work to do to ensure that all the relevant fields are filled out by the reporting individual. Initiatives are already in train to address this, not only in making the system even more user friendly, but by introducing mandatory drop-down boxes or text entry fields to consistently capture the most important information.

The performance of the safety barriers is consistent with last year; namely that the weakest areas reside in Electronic Conspicuity (EC), Planning, Situational Awareness (SA) and See and Avoid. Within these barriers, the most common CF are incompatibility

[1] For Airprox reporting purposes, SUAS are broken down into 4 categories: drones; balloons (including toy balloons and meteorological/research balloons); model aircraft; and unknown objects. SUAS Airprox usually involve only a fleeting encounter wherein the reporting pilot is often only able to give an outline description of the other air vehicle; as a result, the distinction between a drone, model aircraft and object is often down to the choice of wording by the reporting pilot. UKAB policy is to review the associated description and, if the reporting pilot 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.

of Collision Warning Systems (CWS), planning and communication, generic or late SA and monitoring of other aircraft. There is still a welcome focus within the CAA on promoting EC within the General Aviation (GA) community and a common approach will certainly improve SA in both ground and air elements. However, it is clear that the most vulnerable barriers are those where there is a 'human in the loop'. This will be further explored in the Safety Barrier section. Suffice it to say that the granularity that is emerging from our approach will undoubtedly help shift focus towards the 'why' and 'so what's' as well as describe the 'what'. Indeed, this particular section will become the main focus of the report in future iterations as it allows us a deeper insight into the culture of the aviation community and highlights areas for focussed intervention. However, for this report, I will follow the basic format of previous years:

With an initial focus on the aircraft-to-aircraft incidents: the 10 Year data at Table 1 and at Figure 1 shows a continuation of the gradual increase in reported Airprox, however 67% of these were classed as non-risk bearing, with the majority sitting in classification C. Indeed, the percentage of risk-bearing Airprox (risk categories A or B)[2] is at its lowest since 2013 and is now below the 10 year average. The fact that 67% are in the non-risk bearing categories reinforces the idea that the aviation community is more comfortable with reporting incidents as they perceive them and that attention should be directed more towards the percentages of risk bearing incidents rather than concentrating on the total number. Additionally, occurrences per million flying hours are an important metric which allows a more informed insight into the situation.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	10-year Average
Category A	12	23	18	22	26	27	17	13	20	**18**	20
Category B	33	36	27	43	65	52	41	49	49	**50**	44
Category C	116	88	97	72	85	75	79	75	80	**106**	87
Category D	6	2	5	9	6	5	8	4	2	**6**	5
Category E		12	14	26	33	18	26	18	29	**23**	22
Annual Totals	167	161	161	172	215	177	171	159	180	**203**	176
Risk Bearing Airprox	27%	37%	28%	38%	42%	45%	34%	39%	38%	**33%**	36%

Table 1. Aircraft-to-aircraft Airprox Notifications and Risk Assessment Statistics

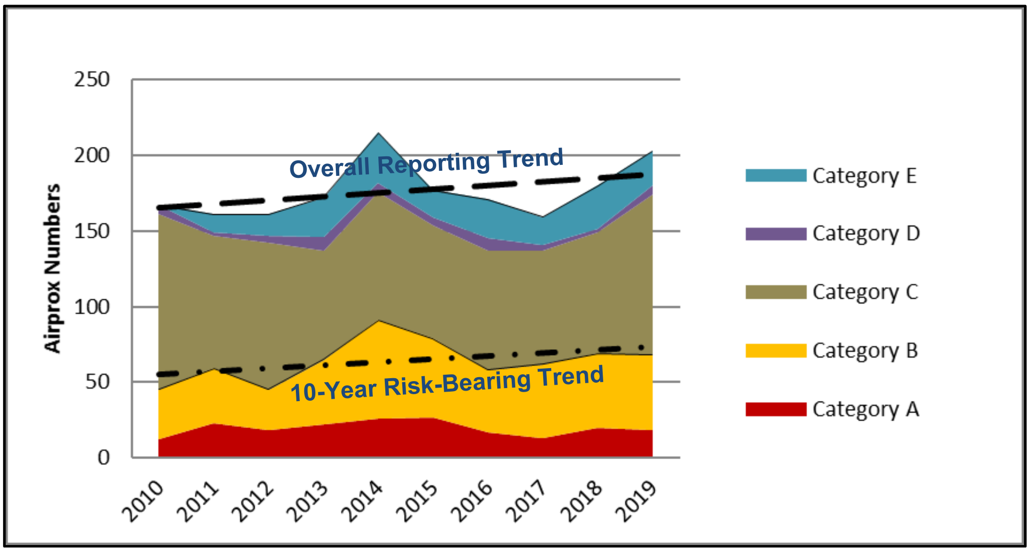


Figure 1. Aircraft-to-aircraft 10-year Airprox Trend and Risk Distribution

[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.

On inclusion of the SUAS figures, those in the risk bearing categories rise to 45%. Historically we have used the 10 year data in order to describe the effect of SUAS activity on the Airprox statistics. For this report I have chosen to include the 5 year figures for aircraft-to-SUAS Airprox as I believe that it adds a little more detail to the overall picture.[3] As shown in Table 2 the widespread availability of Drones since 2014 has indeed raised the bar in terms of numbers of Airprox, and contributed significantly to those which are risk bearing, but I believe that we are reaching a plateau with regard to SUAS activity. Table 3 and Figure 2 show the 5-year figures for aircraft-to-SUAS incidents where, in percentage terms, risk-bearing occurrences are now below the 5 year average. This should not lead into complacency though, as if one encounters a SUAS in an Airprox reportable circumstance, then the chances that it will be risk-bearing are high (Approx 62%).

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	10-year Average	5-year Average
Category A	12	23	18	22	28	41	51	45	65	**60**	37	52
Category B	33	36	27	43	68	66	72	82	96	**86**	61	80
Category C	116	88	97	72	86	78	104	111	120	**147**	102	112
Category D	6	2	5	9	9	12	11	12	5	**11**	8	10
Category E		12	14	26	33	20	27	22	33	**24**	23	25
Annual Totals	167	161	161	172	224	217	265	272	319	**328**	229	280
Risk Bearing Airprox	27%	37%	28%	38%	43%	49%	46%	47%	50%	**45%**	43%	47%

Table 2. Total Airprox Notifications and Risk Assessment Statistics

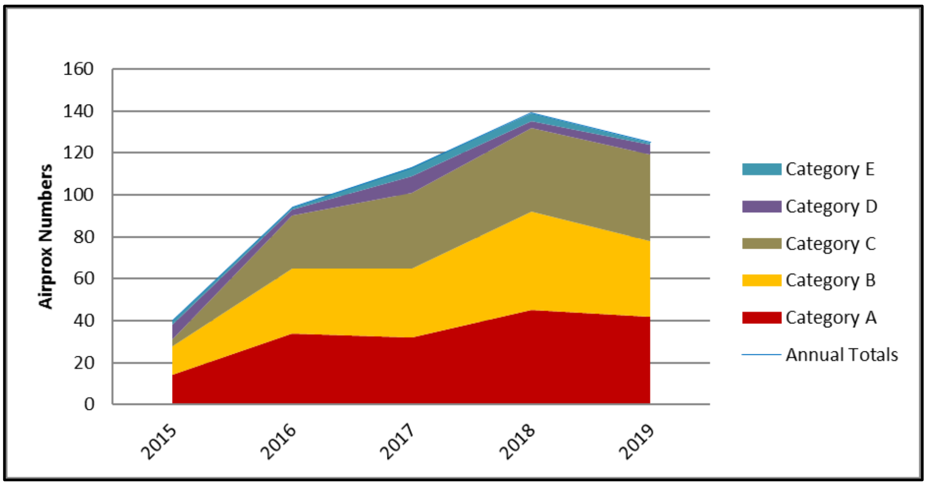


Figure 2. 5-year Aircraft to SUAS Risk Distribution

	2015	2016	2017	2018	**2019**	5 year Average
Category A	14	34	32	45	**42**	33
Category B	14	31	33	47	**36**	32
Category C	3	25	36	40	**41**	29
Category D	7	3	8	3	**5**	5
Category E	2	1	4	4	**1**	2
Annual Totals	40	94	113	139	**125**	102
Risk Bearing Airprox	70%	69%	58%	66%	**62%**	64%

Table 3. 5-year aircraft to SUAS Risk Distribution

[3] As SUAS, esp. Drones, only became widely available in 2014 I will revert to a 10 year data set for SUAS statistics and trends In 2023.

Should there indeed be a plateau, I would only expect it to hold until advances in technology begin to support widespread commercial and logistic SUAS activity which would probably be operated, at least in part, using Beyond Visual Line of Sight (BVLOS) technologies. At this point it is possible that we will experience an increase in aircraft-to-SUAS incidents. Although advances such as these will be regulated accordingly, I do believe that the very nature of the occurrences will change and could require an adjustment in approach and/or resource in order to effectively investigate, process and analyse them. With this in mind I have invited a SUAS Subject Matter Expert (SME) to act as an advisor to the UK Airprox Board, with a view to making this a permanent arrangement next year (2021).

For the moment it is still true that SUAS events are mainly associated with CAT aircraft, specifically passenger carrying airliners.[4] This fact still raises societal concern about the perceived level of threat and the associated impact hazard. However, it is not for the Board to comment on the risk from collision, but simply to communicate 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.

Risk-Bearing Trends

Figure 3 shows the aircraft-to-aircraft incidents from 1995 to 2019. Very long-term, it can be seen that overall incident trend and risk-bearing trends are reducing however the *percentage risk-bearing trend* is remaining virtually constant[5].

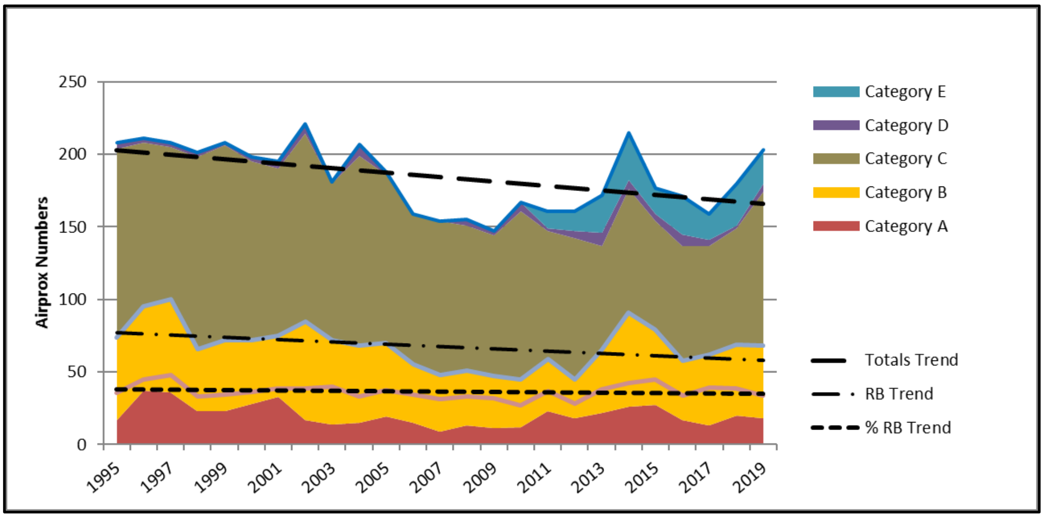


Figure 3. Aircraft-to-aircraft Long-Term Trend and Risk Distribution

[4] Any potential change in the SUAS landscape would probably shift the emphasis to SUAS-GA occurrences

[5] Overall Flying hours are also reducing: the percentage risk bearing trend suggests a Status Quo in the level of riskiness over the very long term.

Concentrating on the nearer term and on the percentage risk bearing Airprox in particular: the 10 and risk-bearing trends for aircraft-to-aircraft (Figure 4) is steadily increasing, as opposed to the 5 year risk-bearing trend, which is steadily reducing. This is also borne out in Figure 5 which shows percentage trends for all Airprox.

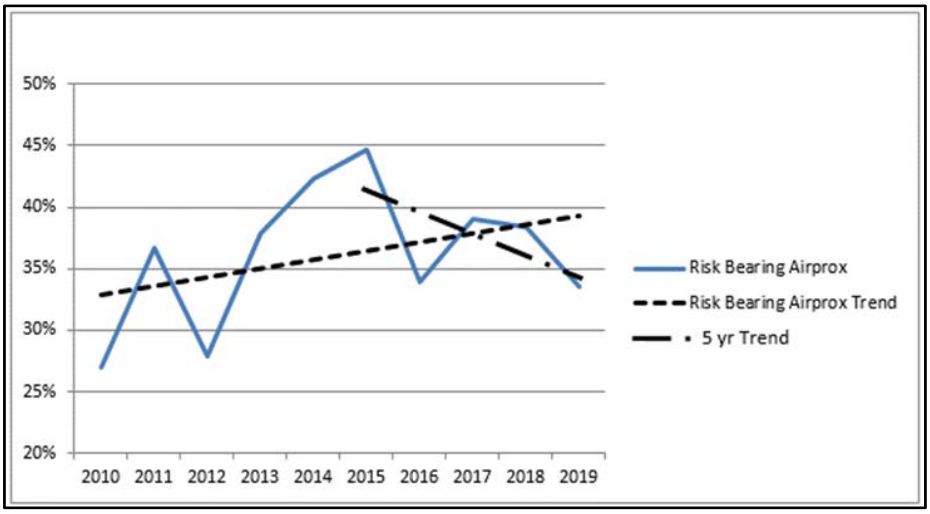


Figure 4. Aircraft-to-aircraft Risk-Bearing Airprox – 10 and 5-year Percentage Trends

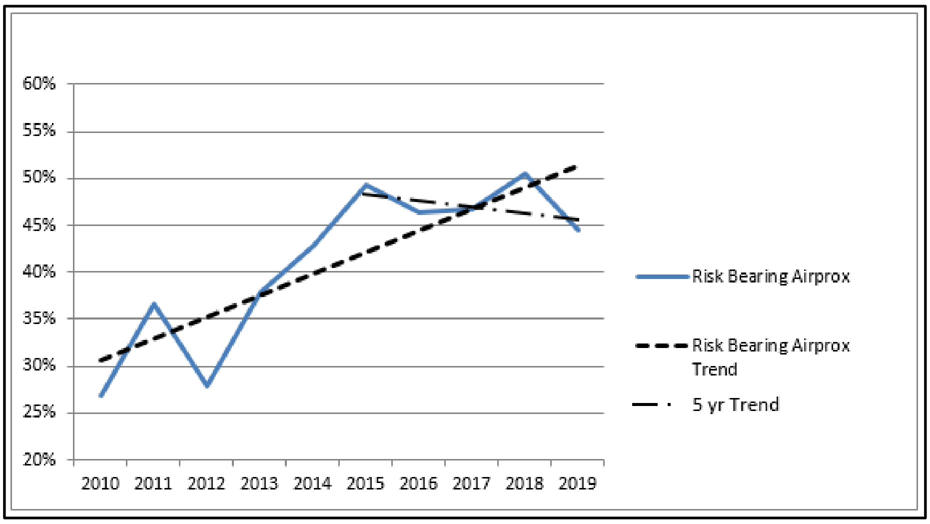


Figure 5. Overall Risk-Bearing Airprox – 10 and 5-year Percentage Trends

Drawing conclusions from these observations is always problematic as trying to interpret statistically small numbers, derived from a subjective process (however objectively administered) will always yield inconsistencies that are subject to variation and interpretation. Additionally, the culture of reporting has changed over the years to one which is more open and accepting, and where the emphasis is on learning from others: that said, a 'safer' environment would be described by reductions in overall reported numbers[6], percentages of risk bearing occurrences AND actual reductions in occurrences per million flying hours.

[6] Assuming the positive reporting culture continues to thrive.

Before examining the graphs per million flying hours, it is useful to see the raw numerical distribution per sector: as can be seen in Table 4 and Figure 6, sub-categorising the aircraft-to-aircraft risk bearing numbers provides further granularity which highlights that the 10-year increasing trend seems to be exclusively within the GA sector.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GA	29	46	33	51	78(1)	64(6)	46(10)	52(18)	63(15)	**61(15)**
Emergency Servs	1	1	2	3	5	2	2	6(1)	2(2)	**2(2)**
Mil	25	30	21	28	31(2)	29(3)	22(6)	17(7)	21(5)	**12(6)**
CAT	0	1	1	4	4(2)	3(19)	1(48)	3(42)	1(70)	**3(57)**

Table 4. Aircraft-to-aircraft Risk-Bearing Airprox by Aircraft Group (Risk-Bearing figures including SUAS in brackets)

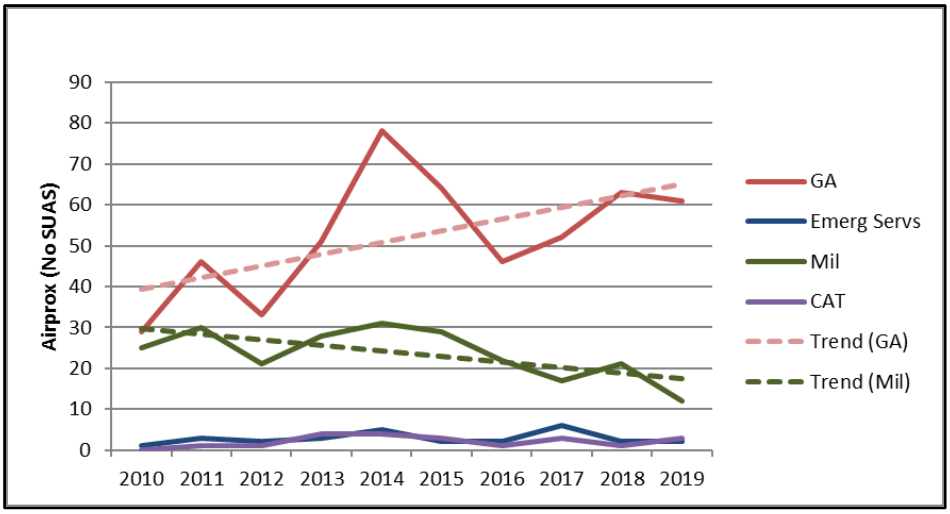


Figure 6. Aircraft-to-aircraft Risk-Bearing Numerical Trends by Group

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 – indeed this year the CAA Safety Intelligence Unit has revised and improved its methods for data capture which bodes well for the accuracy of figures from this point forth regarding GA hours[7]: it still stands, however that much of sports-aviation activity is not logged, and obtaining accurate military flying hours for UK flying is complicated by the lack of a centralised and ratified hours collection database[8]. For transport aircraft, both civilian and military, many flights are a mix of UK and non-UK activity that is not easily apportioned to either. With this in mind, Table 5 shows the best estimates I can obtain from all sources, which indicate that, overall, UK flying hours had reduced gently from 2012 to 2017 and a little more steeply from 2017 to 2019. These larger reductions (2018 and 2019) are mainly as a result of the continued decline in GA hours; there has been a marked reduction in all GA classifications, especially FW, Gliders and Microlights, however, as the revised numbers reach back to 2010 I am reasonably confident that the figures are more representative of the true picture.

[7] The CAA Safety Intelligence Unit revision reached back to 2010. The numbers presented here are therefore different to previous years reporting – but do reflect a significantly more accurate evaluation of GA activity.
[8] I acknowledge that this is especially difficult when trying to extract purely UK FIR hours – hence the military hours shown here are from direct approaches to each Service and individual Groups where necessary. Including submissions from USAFE.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	10-year Average
CAT Hours x 10K	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6	167.3	**172.2**	155.8
GA Hours x 10K	106.5	102.3	94.2	91.0	92.2	76.7	83.0	70.9	64.6	**56.9**	83.8
Mil hrs x10K	31.8	31.1	28.0	24.2	25.0	24.2	25.6	21.1	17.7	**19.3**	24.8
Total Hrs x10K	279.9	280.5	267.6	264.3	268.7	255.7	270.0	259.6	249.7	**248.4**	264.2
Total Airprox/mfh	60	57	60	65	80	69	63	61	72	**82**	67
RB Airprox/mfh	16	21	17	25	34	31	21	24	28	**27**	24

Table 5. UK Flying Hours 10-year Statistics (Aircraft-to-Aircraft Airprox)

Figure 7 shows the total aircraft-to-aircraft per mfh and associated risk-bearing occurrences. Even discounting the 2014 peak, it can be seen that over the last 10 years the total Airprox trends per mfh are steadily increasing, and, although risk-bearing occurrences are also increasing, they are doing so at a lower rate. The fact that the linear trend lines are diverging is positive as it suggests that reporting is increasing although the positive gradient on the risk-bearing trend line is indicative of a slightly riskier picture overall.

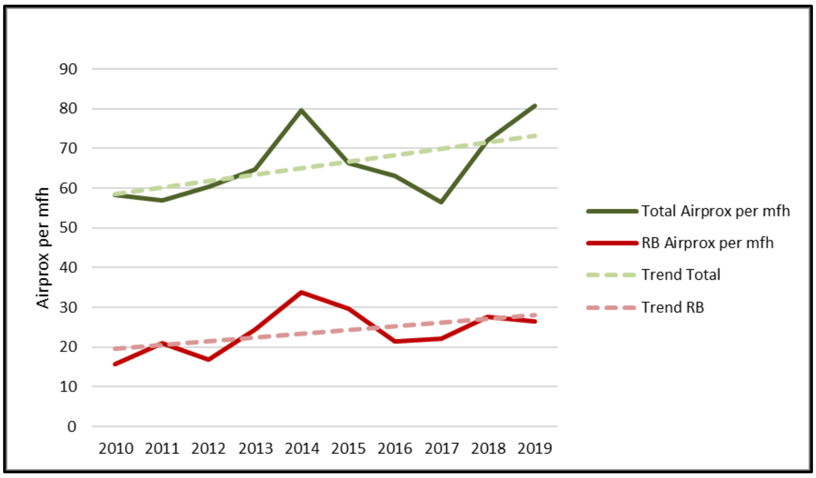


Figure 7. Aircraft-to-aircraft 10-year Trends Compared with Flying Hours

Table 6 and Figure 8 show aircraft-to-aircraft Airprox per mfh by aircraft sectors.[9] And Figure 9 shows the risk bearing aircraft-to-aircraft figures per mfh. In contrast to previous years, it is seems to show that the GA sector is becoming riskier than all others. For the first time you are more likely to have an Airprox in a GA aircraft than you are in a military aircraft. As already stated, the CAA collection protocols regarding GA have changed and the military methods of collection are open to error. Having said that the only significant change in hours over all the sectors is with GA leading me to conclude that the others have been historically more accurate – or at least consistent in their errors.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total GA Airprox per mfh	95	114	110	135	177	183	158	181	243	**315**
GA Risk Bearing Airprox per mfh	27	45	35	56	85	83	55	73	97	**111**
Total Mil Airprox per mfh	308	270	278	339	380	277	270	252	355	**252**
Mil Risk Bearing Airprox per mfh	78	96	82	116	124	120	86	81	118	**61**
Total CAT Airprox per mfh	23	14	22	21	18	14	12	11	8	**19**
CAT Risk Bearing Airprox per mfh	0	1	1	3	3	2	1	2	1	**2**

Table 6. Aircraft-to-aircraft Airprox per mfh by Sector - last 10 years

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

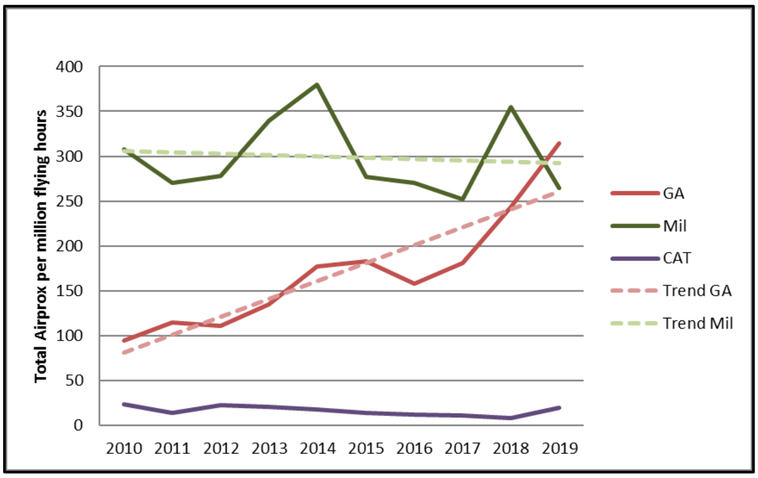


Figure 8. Aircraft-to-aircraft Airprox per mfh by Sector - Last 10 years

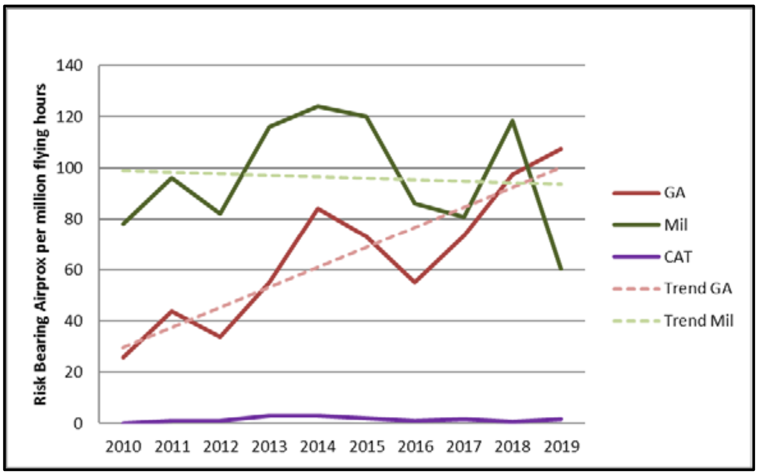


Figure 9. Risk Bearing Aircraft-to-aircraft Airprox per mfh by Sector

Given the seeming radical revision of GA hours and in an attempt to not over estimate any potential increases in risk within this sector as a result, I have included the same graphs representing aircraft-to-aircraft Airprox per sector and risk bearing aircraft-to-aircraft Airprox per sector **per the 10 Year Average flying hours for GA and Mil sectors** (the 10 year average for each sector is then used to establish the 'per million flying hours' figure; CAT numbers are too low to be of relevance).[10]

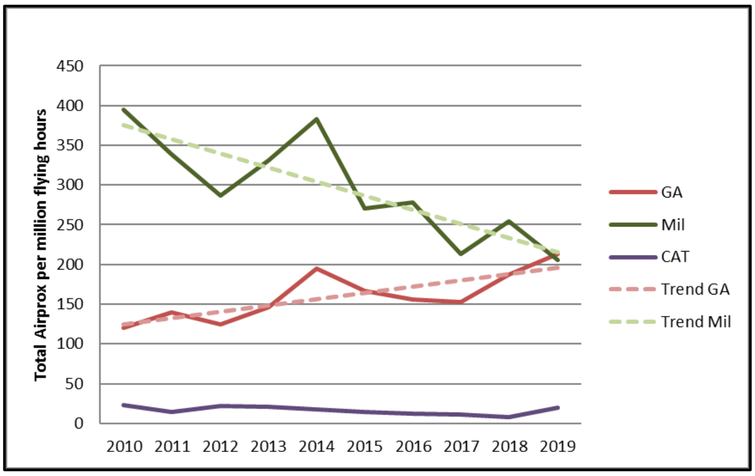


Figure 8a. Aircraft-to-aircraft Airprox per 10 year Average mfh by Sector

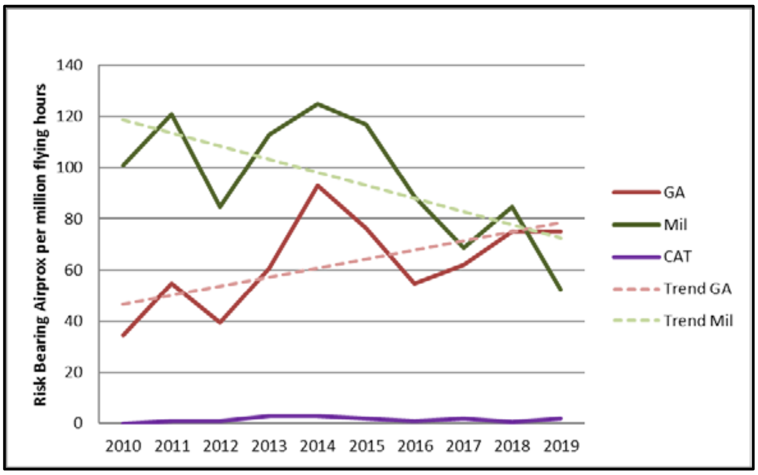


Figure 9a. Risk Bearing Aircraft-to-aircraft Airprox per 10 year Average mfh by Sector

On examination of Figures 8a and 9a one can see that although the gradients for each sector have changed, they are still in the same sense. On the assumption that the evaluation methods have remained reasonably objective and consistent over the past few years, it is reasonable to state that the previous assertion is true – namely, for the first time in the last 10 years one is more likely to have an Airprox in a GA aircraft than in a military one. Moreover, the risk bearing trend for GA is also steadily on the rise.

[10] 10 Year Average GA flying hours 2010-2019:838000hrs vs 2019 figure of 569000hrs and 10 Year Average Mil flying hours 2010-2019: 248000hrs vs 2019 figure of 193000hrs.

Airprox by Sector Involvement

Table 7 and Figure 10 illustrate the 2019 Airprox-by-numbers breakdown by sector involvement.[11] The 2 pie charts of Figure 10 show these figures graphically both for all Airprox (1st chart) and the aircraft-to-aircraft 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 201 Airprox involving GA in the first chart: 58% were with other GA aircraft; 16% were with Military aircraft; 13% were with CAT; 11% were with SUAS; and 2% were with Emerg Servs aircraft).

The headline figures for all Airprox in 2019 are:

- 61% involved GA
- 18% involved Military
- 2% involved Emerg Servs
- 39% involved CAT (mostly vs SUAS)
- 38% involved SUAS (mostly vs CAT)

For aircraft-to-aircraft Airprox, the corresponding Airprox headline figures are:

- 88% involved GA
- 25% involved Military
- 2% involved Emerg Servs
- 16% involved CAT

	CAT	**Military**	**GA**	**Emerg Servs**	**SUAS**	**Unknown**	**Total**	**Total as %** of Airprox
CAT	5	2	26	1	93	0	127	39%
Military	2	15	33	1	8	0	59	18%
GA	26	33	117	3	22	0	201	61%
Emerg Servs	1	1	3	0	2	0	7	2%
SUAS	93	8	22	2	0	0	125	38%

Table 7. 2019 Total Airprox by Sector Involvement

[11] Note that the sum of the sector figures in each chart will not add up to the total number of Airprox in the year (328 for all Airprox and 203 for aircraft-to-aircraft 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.

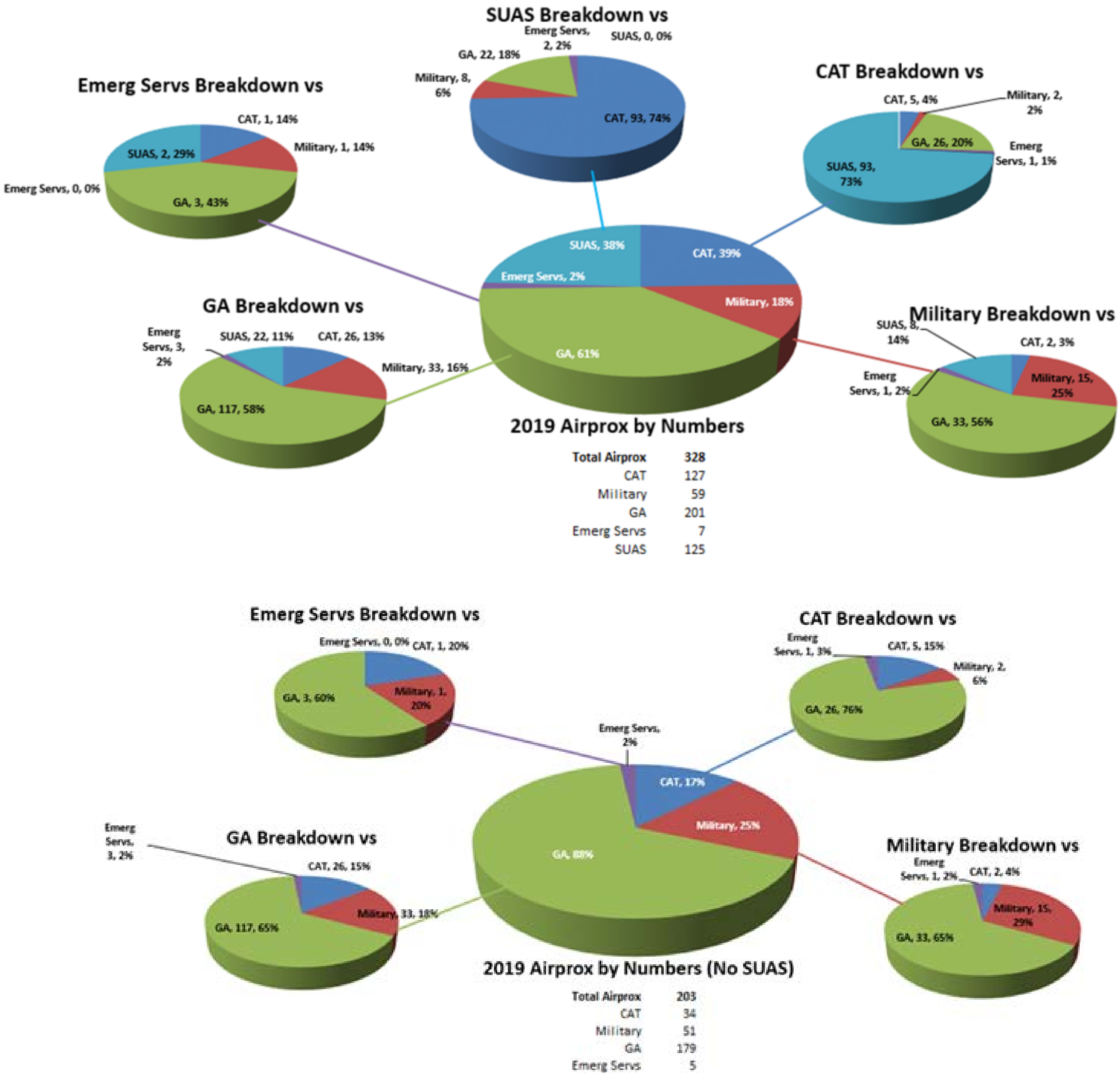


Figure 10. 2019 Airprox by Sector Involvement

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 2019 word-picture chart for each barrier is shown at the end of this report. The word-pictures are intended to ensure consistency in assessment although not every incident fits neatly into a word picture therefore, on occasion, a degree of additional subjective judgement is required. 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 2019, Table 8 and Figures 11 & 12 show the combined outcomes as a percentage of the Airprox assessed in this manner.[12]

Barrier Assessment:	Effectiveness Percentage Count					Effectiveness Numerical Count				
	Absent	Ineff	Partly Eff	Fully Eff	Not Used	Absent	Ineff	Partly Eff	Fully Eff	Not Used
ATC Regs, Processes, Procedures & Compliance	15%	5%	12%	68%	0%	30	11	24	136	0
ATC Manning & Equipment	15%	1%	6%	77%	0%	30	3	13	155	0
ATC Situational Awareness & Action	15%	22%	10%	24%	28%	30	45	20	49	57
ATC Warning System & Compliance	92%	1%	0%	6%	1%	184	2	0	13	2
Pilot Regs, Processes, Procedures & Compliance	0%	23%	13%	63%	0%	1	46	27	127	0
Pilot Tactical Planning	0%	21%	38%	40%	0%	1	43	77	80	0
Pilot Situational Awareness & Action	0%	51%	29%	20%	0%	1	102	58	40	0
Warning System Operation & Compliance	35%	33%	4%	26%	1%	70	67	9	52	3
See & Avoid	0%	23%	30%	42%	5%	0	46	60	84	11

Table 8. 2019 Aggregate Barrier Performance

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 whilst 'Not Used' refers to incidents where the barrier was available but not used.

Some pertinent deductions from the raw figures are:

- **ATC SA and Action** was only fully effective 24% of the time – however this was often as a result of the actions of the flight elements. For example, if the aircraft in question was not fitted with a transponder and/or the pilot was not in communication with an ATS, it was highly unlikely that ATS would have had SA on that particular aircraft. The underlying CF reinforce this observation and, as we collect more data in this area we will begin to be able to best exploit the information to focus educational outreach initiatives.
- **Pilot SA and Action** was either ineffective or only partially effective in 80% of incidents. The lack of SA regarding other aircraft is a key area for focus.
- **Pilot Tactical Planning and Execution** of the plan was fully effective in only 40% of incidents but only partially so in 38% (often due to pilots not modifying their plan in flight to account for changing circumstances).
- **Collision Warning Systems:** Onboard collision warning/avoidance equipment was absent, not used or ineffective (mostly due to incompatibilities between equipment) in 69% of incidents.
- **See-and-Avoid** was only fully effective as a barrier in 42% of incidents.

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

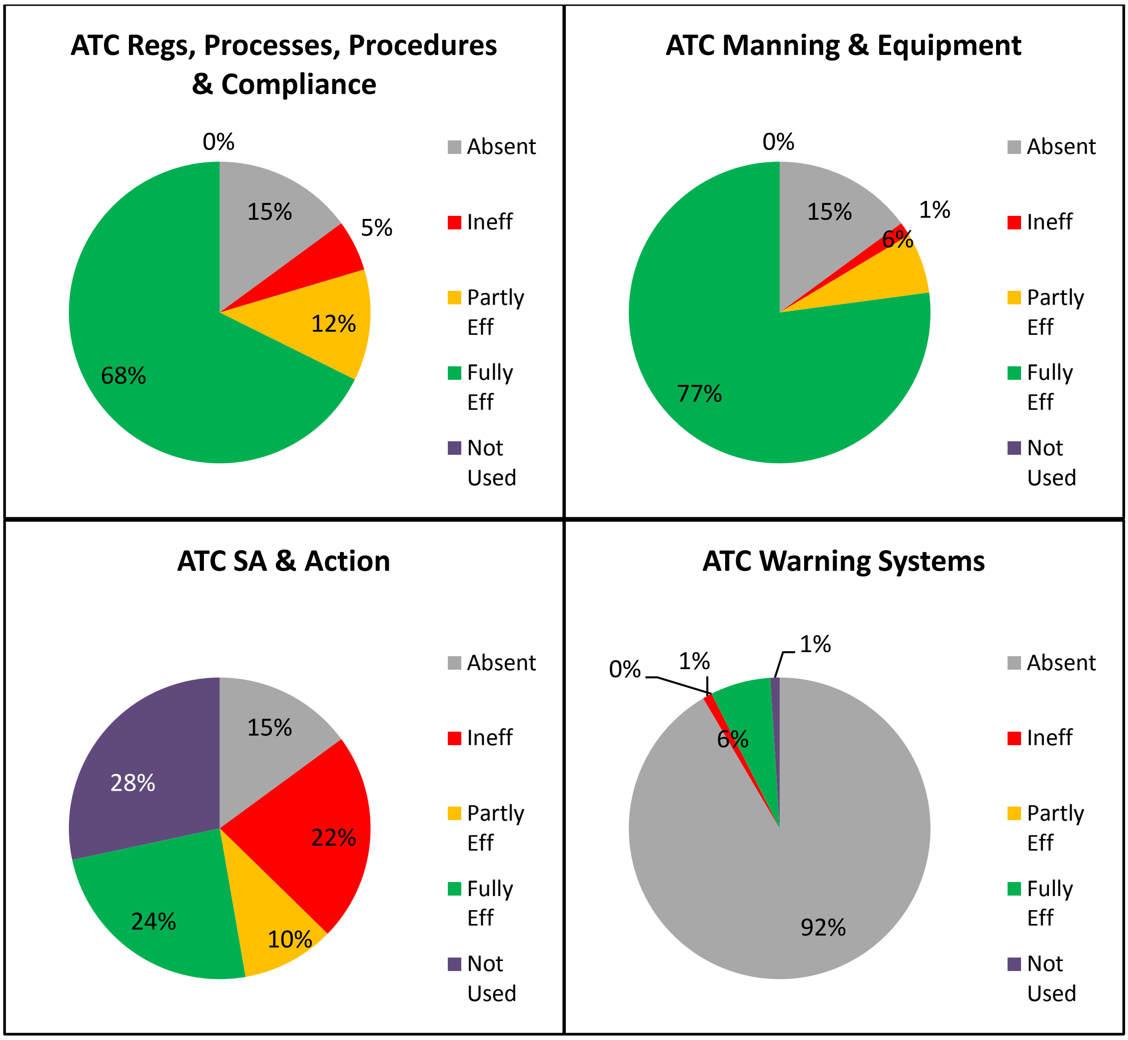


Figure 11. 2019 ATC Barrier Dashboard

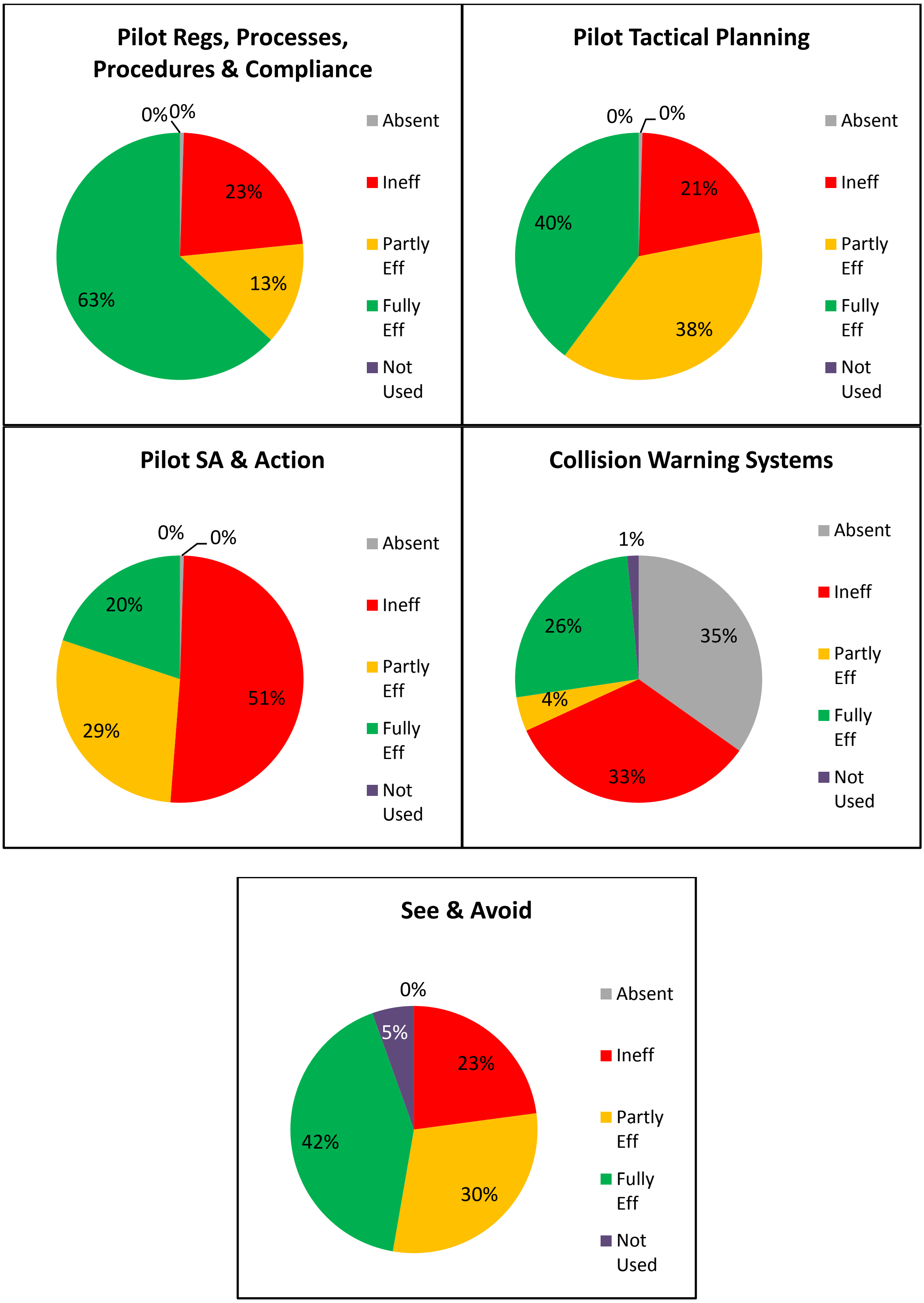
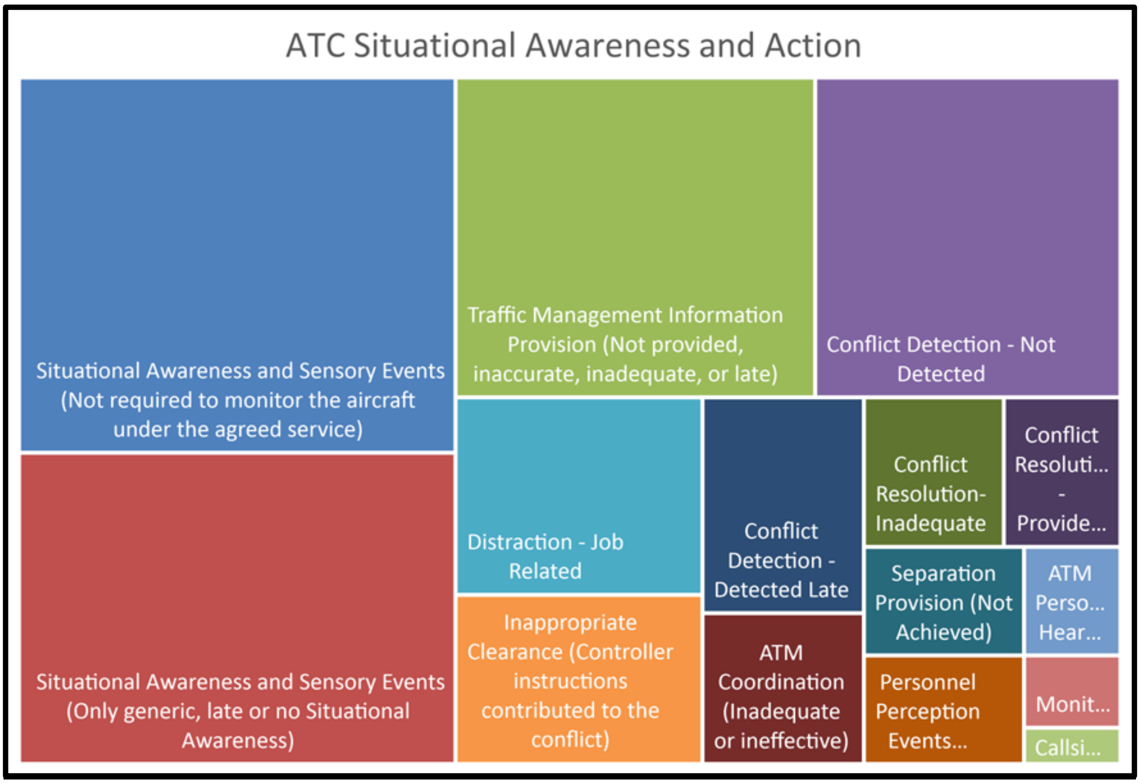


Figure 12. 2019 Flight Crew Barrier Dashboard

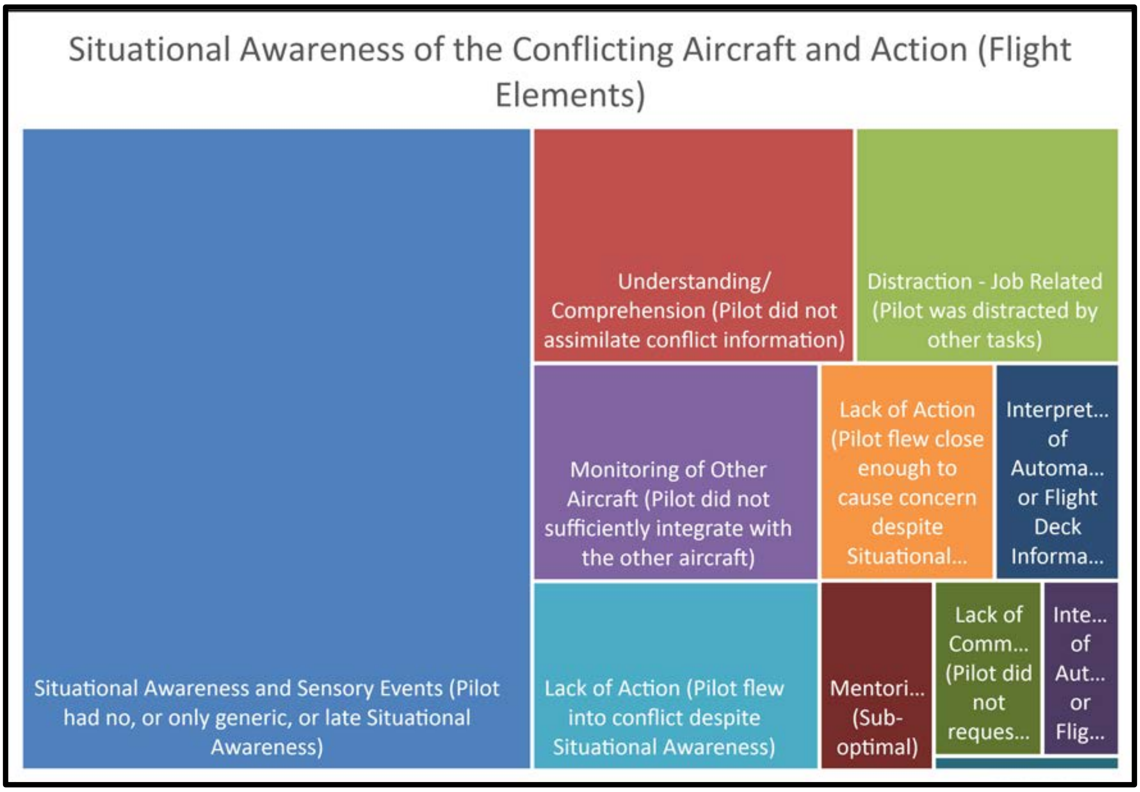
Contributory Factors and Airprox Themes

As ever, the analysis of Airprox shows that most incidents stem from multiple CF with each having a greater or lesser bearing on the outcome depending on the circumstances. This is the first report where I am able to present this emergent data array which underpins the Safety Barrier approach as 2019 was the first year in which the CF were used in the Board's assessment process. Their inclusion in our evaluation system has already provided significantly more granularity to the underlying issues than was available before. The Hierarchical charts embedded in the text show the most frequent CF, where the bigger the box, the more instances of that particular factor there were. Additionally, I have chosen to focus on the 5 Safety Barriers highlighted above and will concentrate on the top 2 or 3 most frequent CF for each (apart from Tactical Planning and Execution which has a more even distribution of elements which deserve attention)

ATC Situational Awareness and Action: The two most frequent areas within this barrier are overwhelmingly within the gift of the pilot to enhance. *'Not required to monitor….'* Appears almost exclusively as a result of the aircrew either not requesting an ATS, requesting a sub-optimal ATS for their sortie profile or weather conditions or an incorrect understanding of what the selected ATS will give them. *'Only Generic, late or no Situational Awareness'* is overwhelmingly as a result of pilots not making themselves known to an ATS through direct communication over the radio, or not being electronically conspicuous to an ATS (should that ATS be so equipped). Additionally, the '*Traffic Management Information…..'* CF normally appears hand in hand with '*Generic Situational Awareness…'* for exactly the same reasons.



Pilot Situational Awareness and Action: Approaching 50% of the time this barrier is deemed ineffective as a result of '*no, only generic or late Situational Awareness'* and is almost exclusively for Airprox within Class G airspace. In harmony with the ATC SA barrier, it is overwhelmingly as a result of sub-optimal communication (if any) with an ATS or lack of an electronic means to gain SA. This is not to say that the pilots should be communicating at all points, indeed they are under no remit to talk with anybody under most conditions, however, communicating one's presence and intentions is an easy way of enhancing everybody's SA. Where one chooses not to communicate, the next most reliable mitigation is to have planned thoroughly – should communication be absent (deliberately or otherwise) and/or planning be poor, the SA barrier *can never* be fully and reliably effective. This type of data collection and collation allows us to highlight these areas and potentially provides compelling evidence which may nudge a change in culture. The second and third most frequent CF are *'understanding…..did not assimilate conflict information'* and *'distraction…..by other task'*. Both of these CF speak to spare capacity (or lack of) in the cockpit and can generally also be addressed through thorough initial planning, thinking through contingencies and being prepared for the unexpected – each of these intrinsically relies on an awareness that flying, in general terms, is not a risk-free occupation or pass-time.

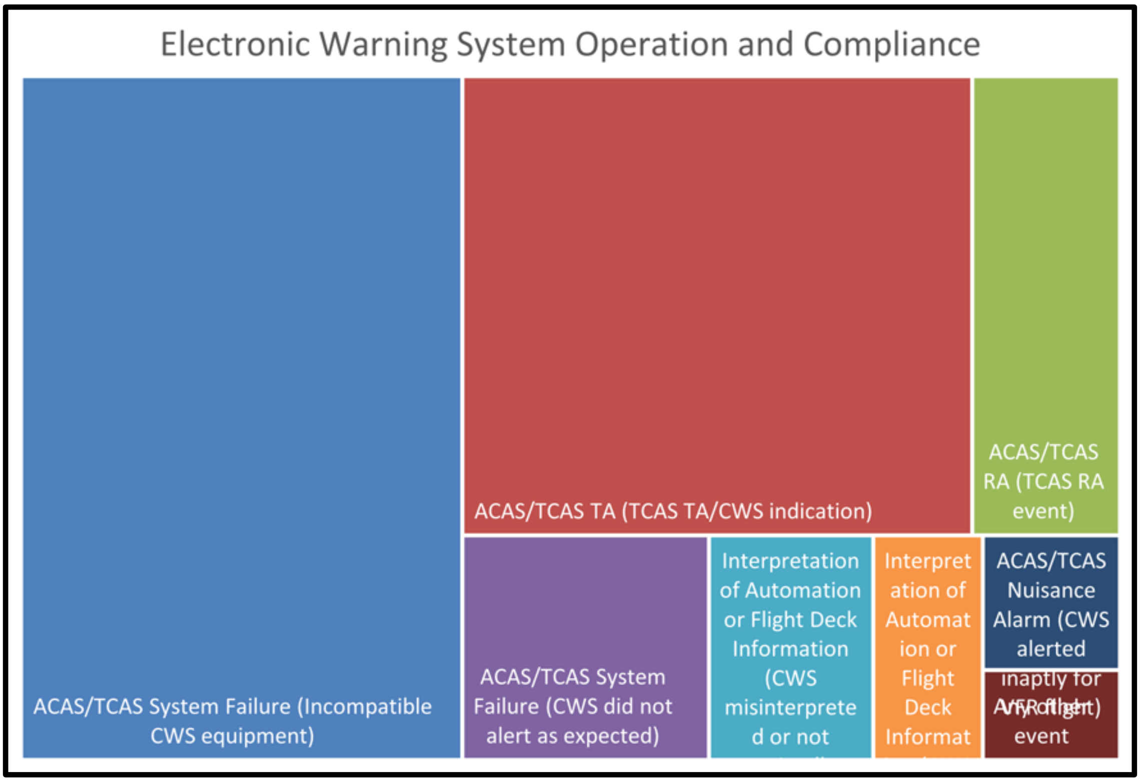


Tactical Planning and Execution: This area is one of the easiest to address yet, if this barrier is weak it has a disproportionate effect on the SA barrier potentially leaving only See and Avoid in play for the in-flight elements.

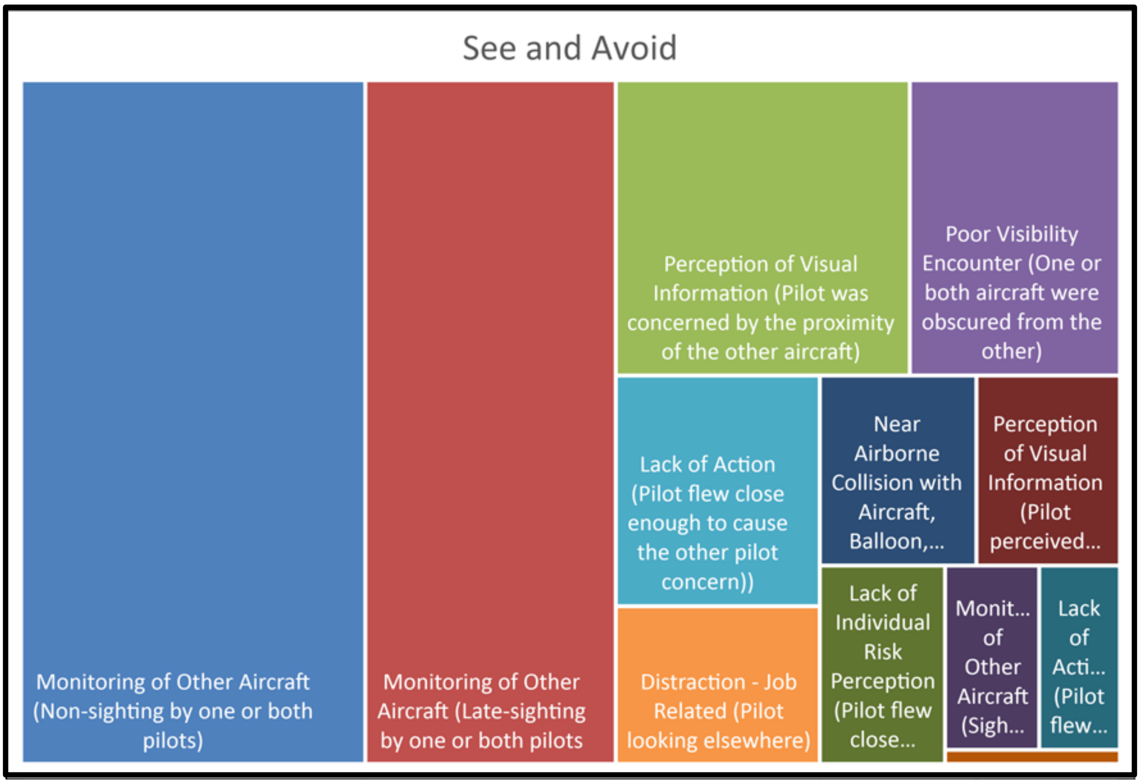
One cannot help thinking of the familiar mantra 'Aviate, Navigate, Communicate' when one looks at this hierarchical diagram, especially for those activities which fall within the 'execution' remit of this barrier. When one then considers the two most frequent 'planning' related CF *'inadequate planning'* and *'inadequate plan adaption'* the picture feels quite bleak. I see this particular barrier as the key – the planning side mitigates inexperience and low hours and intrinsically enhances the SA of any pilot regardless of experience. The Execution side is highly reliant on the Planning side and also incorporates Threat and Error management (TEM), highlights the need to think through not just what to do, but how to do it and ultimately is dependent on self-awareness in terms of ambition and complexity. The more that can be done on the ground, where generally one has access to all the information required and where one's capacity is at the greatest then the better the chances of executing a safe and uneventful flight. I have listed some of the most common occurrences which have all been cited in Airprox for 2019:

- Unaware of conflicting NOTAMS.
- Overflight of glider sites (or needlessly close to them at inappropriate altitudes).
- Overflight of small airfields (at inappropriate altitudes).
- Disregard of local arrival/departure and circuit procedures.
- Flying through the Feathers 'unannounced'.
- Reluctance to communicate with ATS or communicating with the wrong ATS or asking for a sub-optimal service through misunderstanding.
- Poor knowledge/appreciation of others; specifically, gliders, parachuting, microlights, hang-gliders etc was also frequently evident.

Electronic Warning System Operation and Compliance: One can see from the chart below that in approximately 50% of cases *'incompatible CWS'* or *'CWS did not alert as expected'* (The blue and purple boxes) caused this Barrier to be either ineffective or partially effective. The main reasons being that one or both aircraft did not have any equipment fitted – or where fitted, they were incompatible. When compatible equipment is fitted, the barrier is strong and allowed either ATS or pilot action to occur which prevented a more serious situation developing. We continue to push the message of EC as one of the easiest methods of enhancing SA however, it is not the place of the Board or for me to recommend particular equipment, but it is clear that effort is required to ensure compatibility between the current systems and I am pleased to note the CAA's continued focus in this area as we move towards potential universal equipage in all air vehicles.



See and Avoid: It is no surprise that 'non-sighting' and 'late sighting' form over 50% of the CF count for the See and Avoid barrier. However, there is now further detail relating to perception, obscuration and *'Pilot flew too close'* (which one could term courtesy). In many circumstances See and Avoid is the last barrier to Airprox or collision however, it is one of the weakest due primarily to the physiological limitations of the human eye and the fallibility of the human brain. There are well known mitigations to compensate for our intrinsic weaknesses in unusual environments, namely a robust lookout, methodical scanning techniques, and an awareness that stationary objects are on a collision course. Distraction also plays an important part and I believe that it will become a more prevalent CF as pilots rely more and more on in-cockpit aids which are designed to increase SA but are detrimental to Lookout if not used with discipline or prioritised appropriately.



Airprox Education Themes

The above barrier analysis in this report has yielded much the same type of assessments to the 2017 and 2019 reports. The CF analysis and presentation has now begun to add granularity to the situation and will allow a sharper focus to be brought to bear when communicating with the aviation community. The consistency, although demonstrating seemingly little progress, is positive, in that it reinforces that we are identifying the correct themes, namely those associated with Human Factors rather than technological or structural issues. With this in mind we will continue with the educational themes detailed below:

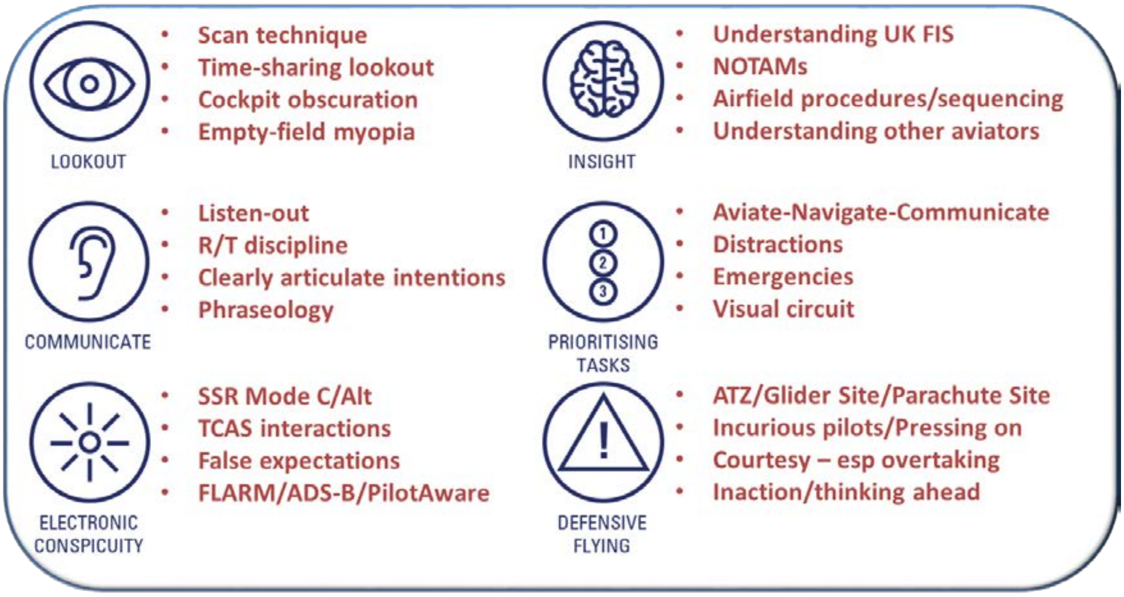


Figure 13. Airprox Education Themes

- **Lookout.** Specifically: the limitations of the human eye; developing a scan technique; the problems of cockpit obscuration; 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.

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. This report's following sections provide additional presentations of Airprox statistics and trends by sector and is intended to provide *complementary* information to this main body. 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 offer key opportunities for improvements.

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 (or by email on request). Additionally, I am revising the external communication strategy to incorporate 2 short magazines per year each of which will focus on one of the themes above and will continue the 3 year rolling information campaign. These are supported and complemented by a monthly newsletter and are also published online (along with other relevant MAC, Airprox and collision avoidance educative material), and generally focus on GA Airprox incidents and issues in a more digestible and relevant format for the wider aviation community.

Rachael Caston
Director UK Airprox Board

AIRPROX REPORTING STATISTICS

Airprox Analysis and Trends - Overview

In common with normal Airprox annual trends, 2019 saw proportionally more incidents in the summer months (when GA are more active), than the rest of the year. Figure 14 shows the breakdown of 2019'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, This seems to follow for SUAS incidents as well although more data is needed to offer an accurate prediction

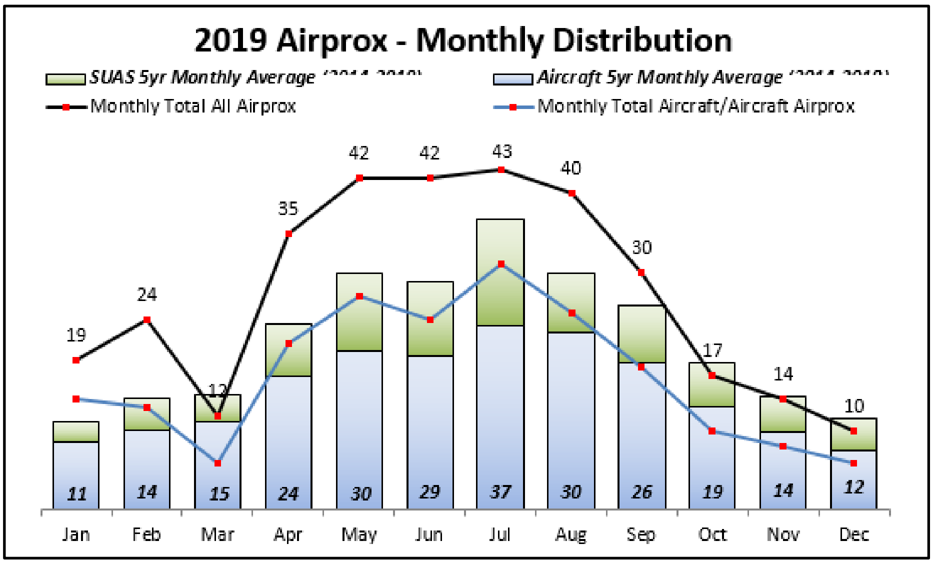


Figure 14. 2019 Airprox Monthly Distribution

Figure 15 shows the corresponding monthly breakdown of manned aircraft-to-aircraft Airprox incidents by risk overlain with the percentage of incidents that were risk-bearing (Category A & B).

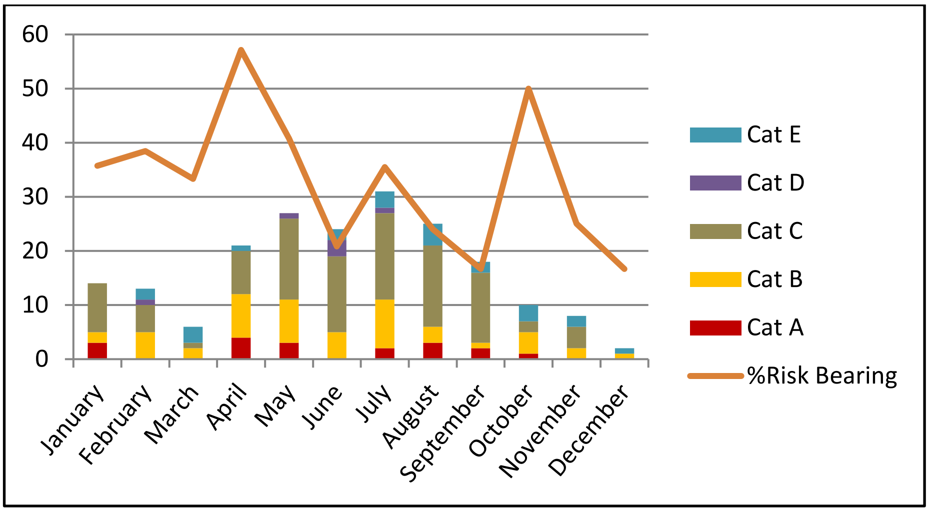


Figure 15. 2019 Airprox Risk-Bearing Trend by Month (Aircraft-to-aircraft)

As in previous years, the trend is for Airprox to be proportionally more risky at the start of the year as GA activity begins to rise and at the end of the year where, although total number of incidents is low, the proportion of risk bearing Airprox rise. The former is indicative of a return to flying after a period of low activity or inactivity, the latter is almost certainly due to a worsening of the weather towards the winter. Dealing with poor weather generally requires more detailed planning, increased communication with ATS, better SA and a more robust lookout, all areas which are highlighted above as weak in general terms.

Analysis by User Groups

Table 9 and Figure 16 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 35-45 incidents per year and the underlying Civil-to-Civil trend remains firmly upwards even discounting the peaks of 2014 and 2015. SUAS Airprox do remain a concern, however there is an indication in the 5 year average figures that we are approaching a plateau of activity with a slight reduction from 139 in 2018 to 125 in 2019.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Civil~Civil	67	75	85	90	120	111	105	103	117	152
Civil~Mil	54	50	39	54	57	41	41	39	49	36
Mil~Mil	31	26	28	19	25	23	15	17	14	15
SUAS	6	0	5	0	9	40	94	113	139	125
Totals:	**167**	**161**	**161**	**172**	**224**	**217**	**265**	**272**	**319**	**328**

Table 9. 10-year Total Airprox Statistics by User Group

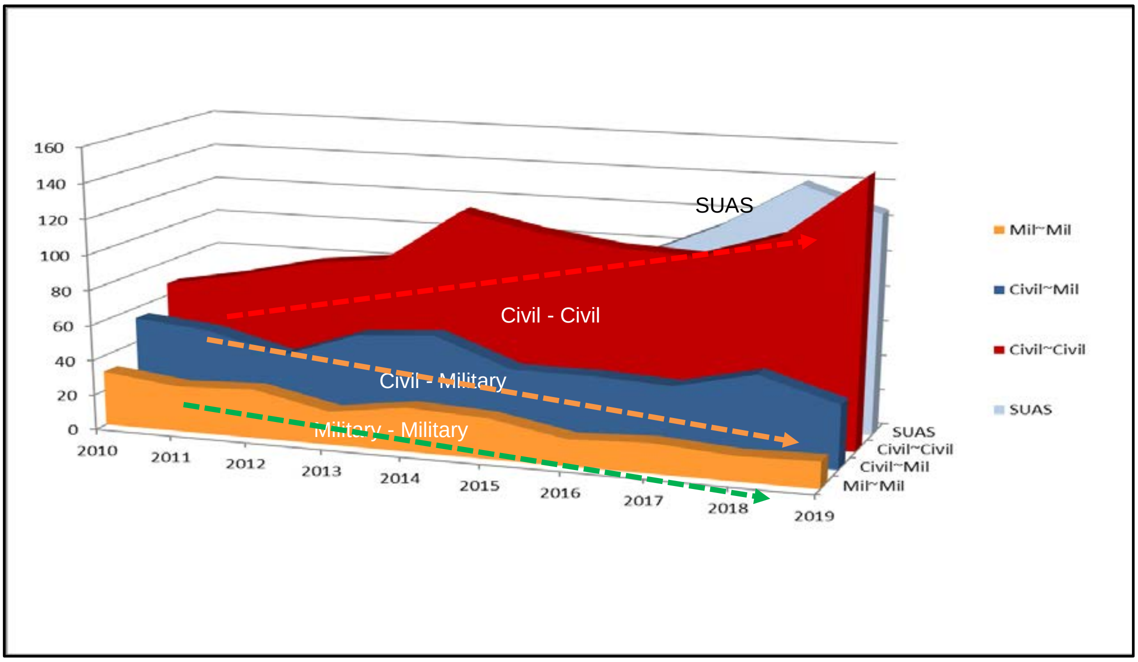


Figure 16. 10-year Total Airprox Trends by User Groups

Analysis by Sector

In order to gain greater granularity of civil Airprox trends, Table 10 and Figure 17 further break down the above user-group statistics into categories that distinguish CAT from GA and Emergency Services.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GA~Mil	50	52	35	55	54	35	44	31	43	33
GA~GA	43	50	54	59	89	82	76	75	91	117
CAT~CAT	5	4	11	9	5	3	5	5	2	5
CAT~GA	15	12	14	17	17	18	18	9	8	26
CAT~Mil	13	4	6	6	5	4	3	3	3	2
Mil~Mil	31	26	28	19	25	23	15	17	14	15
SUAS	6		3	0	9	40	94	113	139	125
Emerg Servs~GA	3	8	4	4	10	9	8	14	15	3
Emerg Servs~Mil	1	1	2	1	4	1	2	3	3	1
Emerg~Emerg								1	0	0
Emerg Servs~CAT		1	2	1		1		1	1	1
Unknown Ac	0	3	2	1	6	1	0	0	0	0
Total	**167**	**161**	**161**	**172**	**224**	**217**	**265**	**272**	**319**	**328**

Table 10. 10-year Total Airprox Statistics by Sector

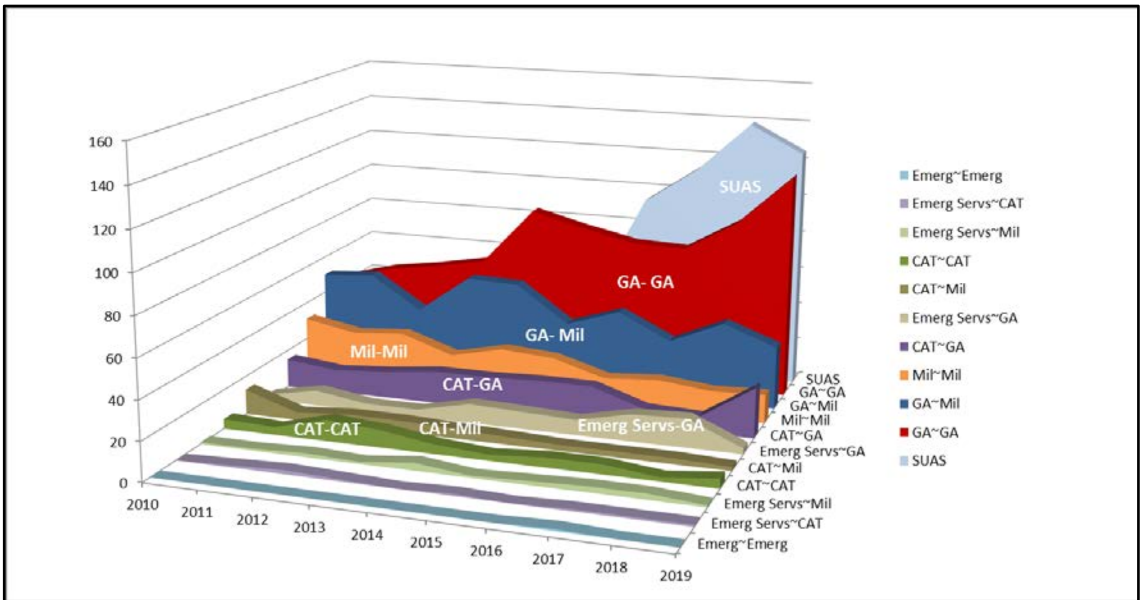


Figure 17. 10-year Total Airprox Trends by Sector

The following observations are pertinent:

- **CAT**: CAT-CAT incidents remain rare and sit at an average of 4 since 2014. Equally CAT-Mil incidents were also few (2 in 2019) and have been in a steady decline in the last 10 years; finally CAT-GA incidents have increased markedly, however it is difficult to draw a firm conclusion from this at the moment.

- **Mil**: Mil-Mil incidents continue to show an overall gradual decreasing trend over the last 10 years which is also true of Mil-GA incidents.

- **GA**: GA-GA incidents continue to rise and continue to represent the sector where the most difference can be made with a targeted educational approach.

- **Emergency Services**: Police, Ambulance and SAR Airprox have reduced markedly, however one should not read too much into this at this moment in time as the number seems to be anomalous with previous years.

Analysis by Airspace

Figure 18 shows the distribution of all 2019'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 19 shows the corresponding distribution of aircraft-to-SUAS which confirms the airspace distribution, and Figure 20 shows the aircraft-to-aircraft distribution. As in all previous Annual Reports, the most prevalent airspace for manned aircraft-to-aircraft Airprox is Class G airspace below 3000ft and for SUAS it is Class A and D.

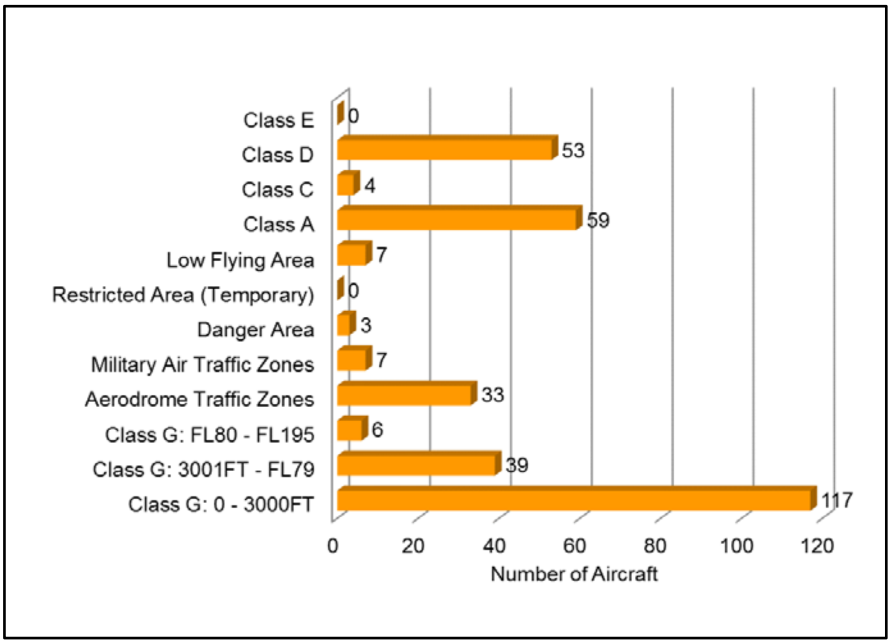


Figure 18. 2019 All Airprox by Airspace Involvement

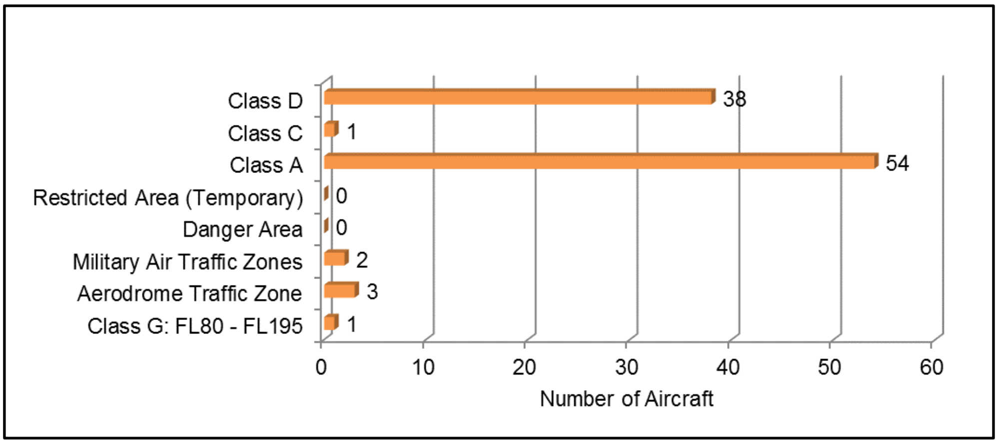


Figure 19. 2019 Aircraft-SUAS Airprox by Airspace Involvement

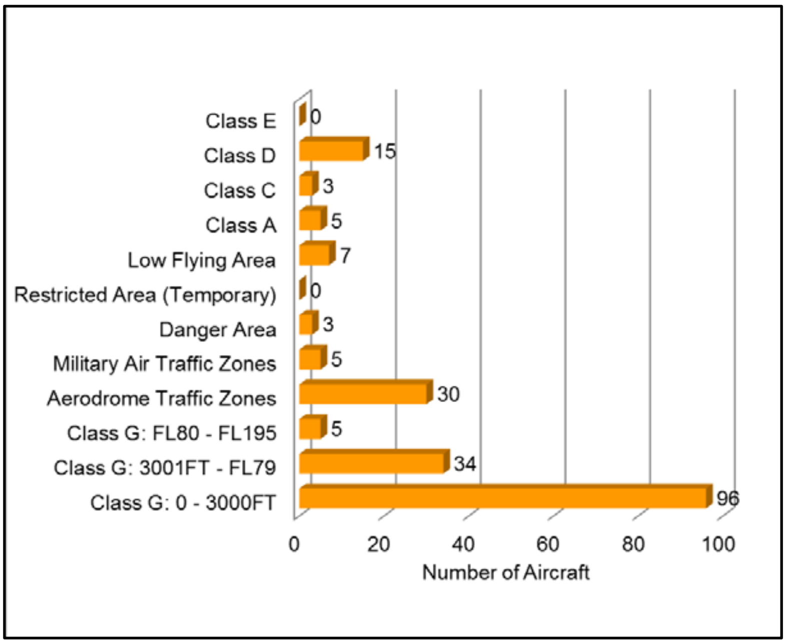


Figure 20. 2019 Aircraft-to-aircraft Airprox by Airspace Involvement

Manned aircraft-to-aircraft Airprox within ATZ/MATZ has reduced markedly, however the CF echo the anecdotal observations of previous years, in that they tend to be as a result of pilots failing to integrate with others already established in the visual circuit or pressing-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.

COMMERCIAL AIR TRANSPORT

The Majority of CAT Airprox continue to occur between CAT and SUAS with the number of instances increasing steadily since 2014 when Drone technology became widely available. In keeping with previous years reports I have included figures for All CAT Airprox (i.e including SUAS – of which there were 127) and for manned aircraft incidents only (of which there were 34).

CAT Airprox by Airspace

Figure 21 shows the breakdown of all CAT Airprox by airspace type. Of the 127 Airprox involving CAT: 57 involved aircraft in Class A; 46 in Class D; and 20 in Class G. Figure 22 shows the corresponding breakdown of the 34 aircraft-to-aircraft CAT Airprox: 4 occurred in Class A, 10 in Class D and 12 in Class G.

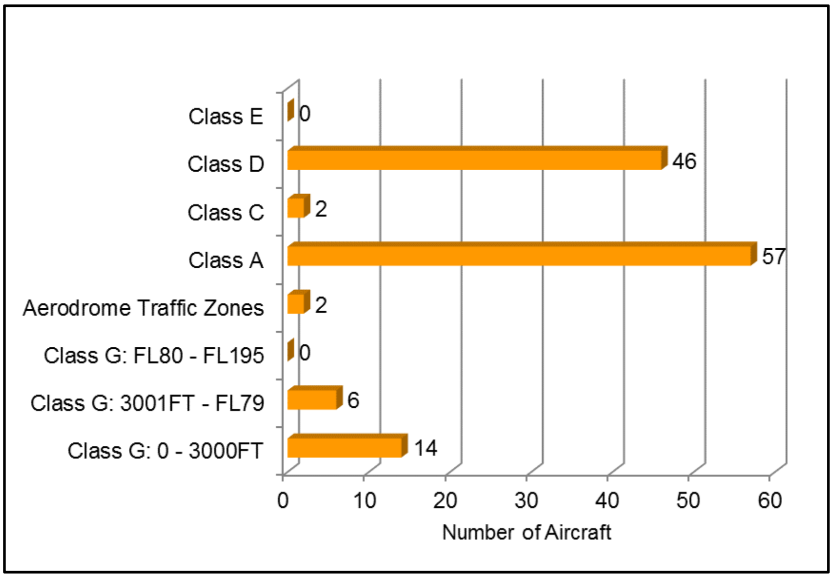


Figure 21. 2019 All CAT Airprox by Airspace Involvement

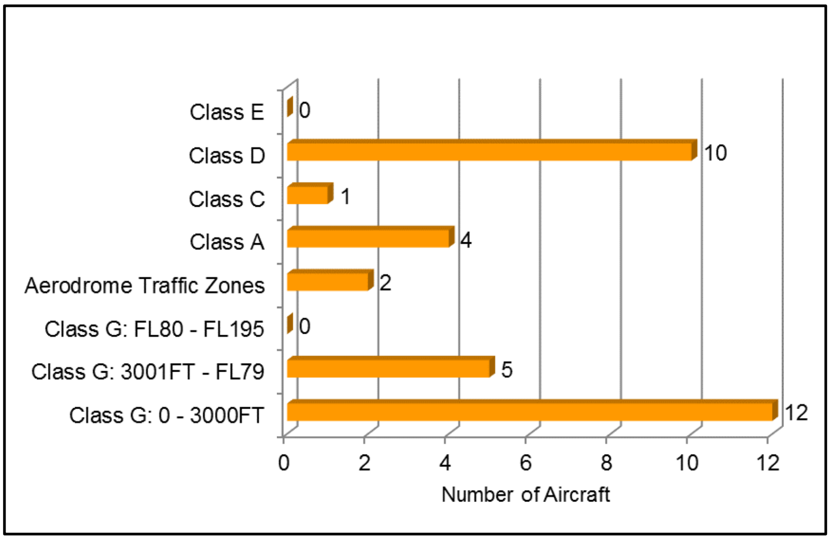


Figure 22. 2019 Aircraft-to-aircraft CAT Airprox by Airspace Involvement

CAT Risk Distribution

Table 11 and Figures 23 & 24 show the 10-year CAT Airprox totals and associated risk distributions. This is the first year since 2012 where the total number of aircraft-to-aircraft incidents has risen, and it seems to have done so sharply. It is important to note that this rise is exclusively in the non-risk Bearing area, and primarily in Risk Category C. This is a common theme across all Airprox, and points more towards an improvement in reporting culture rather than to a decrease in air safety. Discounting the SUAS data the distribution of Risk Bearing incidents remains effectively constant with 2 Category A and 1 Category B incident. The Category A incidents were both involving Civilian Commercial traffic in Class G airspace. One was a conflict with a glider and the other was against an aircraft conducting single pilot survey work. In both instances the CWS was either incompatible or not fitted, SA was degraded and Lookout was compromised. The full detail of these Airprox can be accessed here:

Airprox 2019201 – Category A: RV12 and P68
Airprox 2019282 – Category A: Shark Glider and DA62

The Category B incident took place in Class D airspace (on the Final Approach) and was reported as a Serious incident to the AAIB. For this occurrence, it was the CWS and the TCASII RA which was fully effective in resolving the situation as the SA of the Ground elements were deemed ineffective as was the Tactical Planning and Execution and the See and Avoid elements of the Air elements. The full details of this Airprox can be found here:

Airprox 2019207 – Category B: A320 and Saab 340

When considering SUAS incidents, the absolute majority occur in CLASS A and D Airspace with over 50% of them categorised as risk bearing. As has been said in previous reports, it is not the role of the UKAB to quantify the risk to CAT or any other ac of SUAS incidents, but to highlight that the risk of an incident taking place is a real one. Moreover 56 of the 60 Risk Bearing incidents were concerning commercial airliners, rather than any other type of commercial traffic. The sheer size differential between two entities and the fact that these occurrences were exclusively in CAT A and D airspace (primarily in the approach or departure phases of flight) indicates a fleeting encounter, where startle factor would have played an important part.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	**2019**
CAT Risk A	0	0	1	1	1(2)	0(9)	0(29)	0(20)	0(34)	**2(38)**
CAT Risk B	0	1	0	3	3(4)	3(13)	1(20)	3(25)	1(37)	**1(22)**
CAT Risk C	32	17	23	14	14(15)	11(13)	11(24)	11(32)	9(28)	**21(53)**
CAT Risk D	2	0	4	3	1(2)	1(7)	1(3)	0(6)	0(2)	**1(5)**
CAT Risk E	0	3	7	12	8(8)	6(7)	7(7)	4(5)	4(4)	**9(9)**
CAT Total	34	21	35	33	27(31)	21(49)	20(83)	18(88)	14(105)	**34(127)**

Table 11. 10-year CAT Airprox by Risk Classification (figures in brackets include SUAS Airprox)

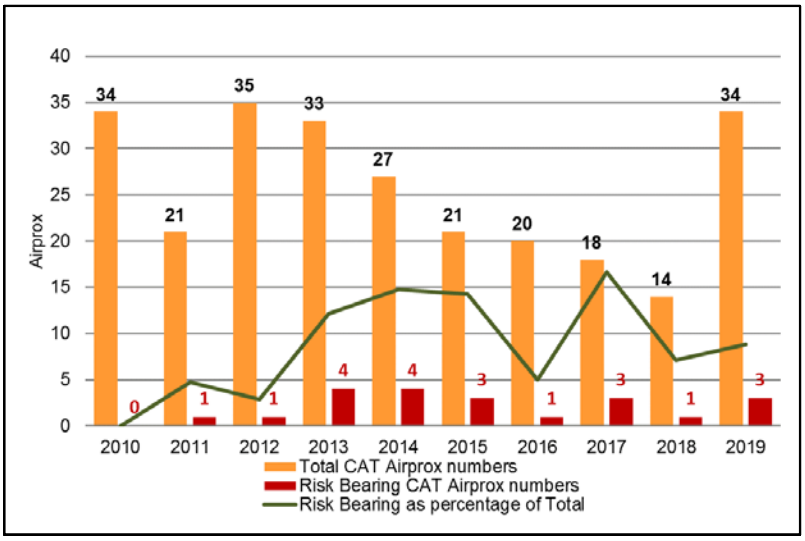


Figure 23. 2019 CAT Airprox Risk Bearing Distribution – Aircraft-to-aircraft

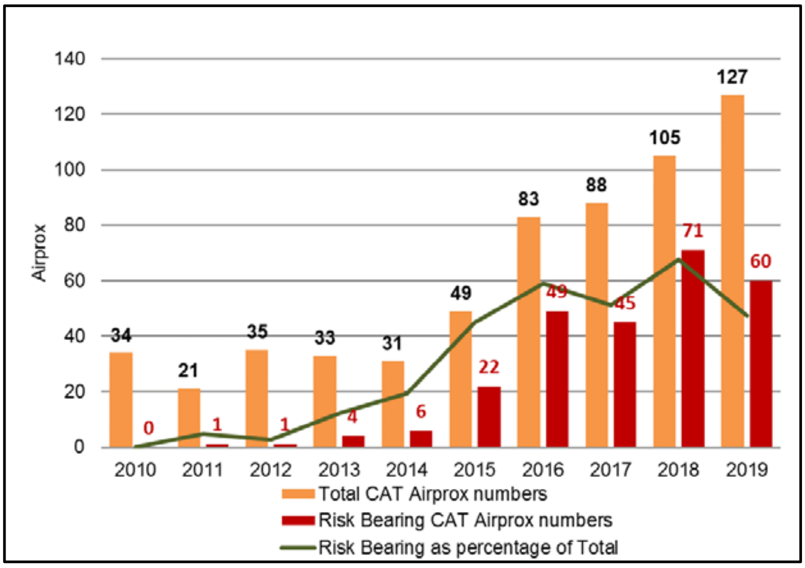


Figure 24. 2019 CAT Airprox Risk Bearing Distribution – inc SUAS

CAT Airprox Rates

Table 12, along with Figures 25-28, 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 risk bearing trend is virtually constant per million flying hours (mfh). If SUAS incidents are included in the statistics then, as before, the picture describes an increasing trend for all categories.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Total CAT Airprox	34	21	35	33	27(31)	21(49)	20(83)	18(88)	14(105)	**34(127)**
Risk Bearing CAT Airprox	0	1	1	4	4(6)	3(22)	1(49)	3(45)	1(71)	**3(60)**
CAT Hours x 10K	141.6	147.1	145.4	149.0	151.5	154.8	161.5	167.6	167.3	**172.2**
Total per Million hrs	24	14	24	22	18(20)	14(32)	12(51)	11(53)	8(63)	**20(74)**
Risk Bearing per Million hrs	0	1	1	3	3(4)	2(14)	1(30)	2(27)	1(42)	**2(35)**

Table 12. 10-year CAT Airprox versus hours flown (figures in brackets include SUAS Airprox)

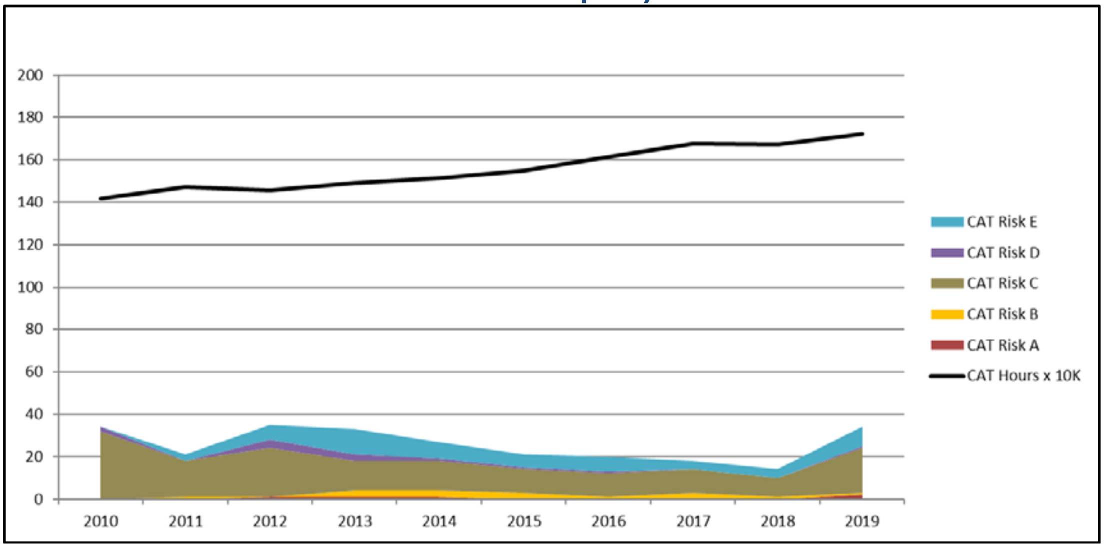


Figure 25. 10-year CAT Airprox Risk Distribution vs CAT hrs – Aircraft-to-aircraft

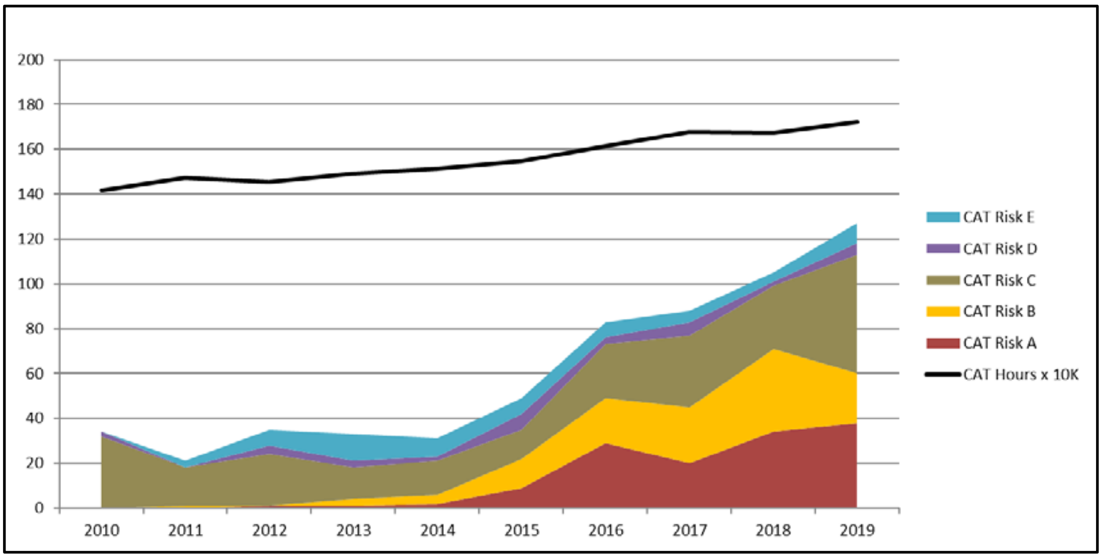


Figure 26. 10-year CAT Airprox Risk Distribution vs CAT hrs – inc SUAS

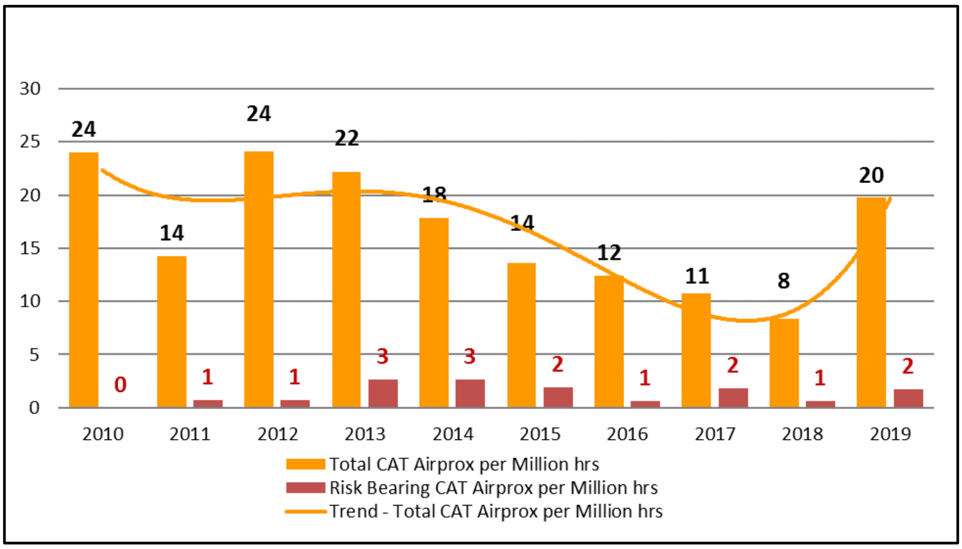


Figure 27. 10-year CAT Airprox Rates per Million Flying hrs – Aircraft-to-aircraft

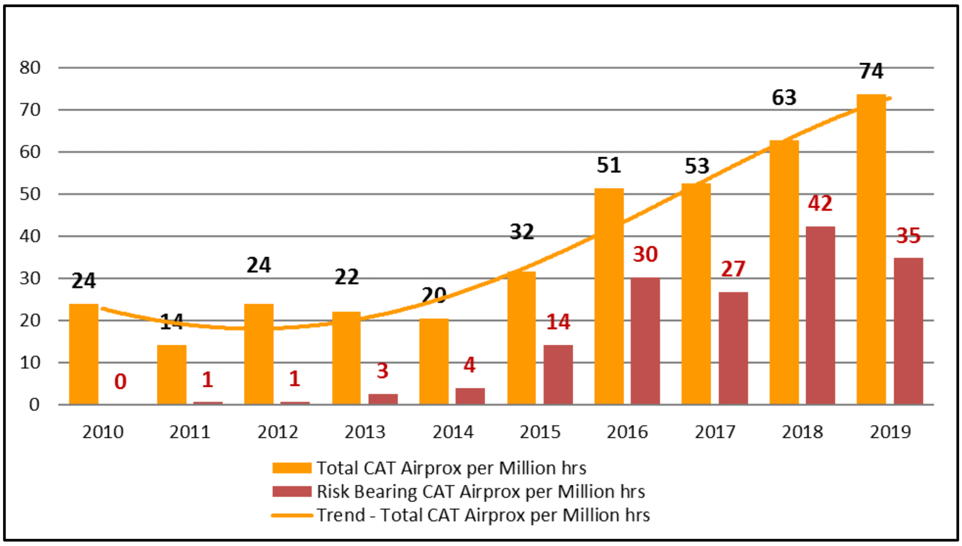


Figure 28. 10-year CAT Airprox Rates per Million Flying hrs – inc SUAS

Putting all this into perspective, the following headline statistics for 2019 are pertinent in framing the risk to CAT aircraft:

- **34** aircraft-to-aircraft CAT incidents represents nearly 3 Airprox per month (however most of these are in Category C).
- **3** aircraft-to-aircraft risk-bearing CAT incident reflects the strong barriers that exist for the prevention of MAC in controlled airspace.
- **93** SUAS CAT Airprox represents, on average, a SUAS incident almost twice a week.
- **57** 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 reduced slightly in 2019. Table 13 and Figure 29 illustrate the figures since 2010, when drone/SUAS incidents first began to be consistently reported[13] This reduction could be attributed to the strengthening of the regulations, requirement to register and the Drone Safe campaign having a positive effect on the SUAS community although the data from 2020 will hopefully validate this statement as the 2018 initiatives continue to bed in and the 2019 regulatory changes take effect.

As in previous years, it is useful to describe the UKAB approach to SUAS 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**
2019	91	0	5	29	**125**

Table 13. Airprox involving SUAS since 2010

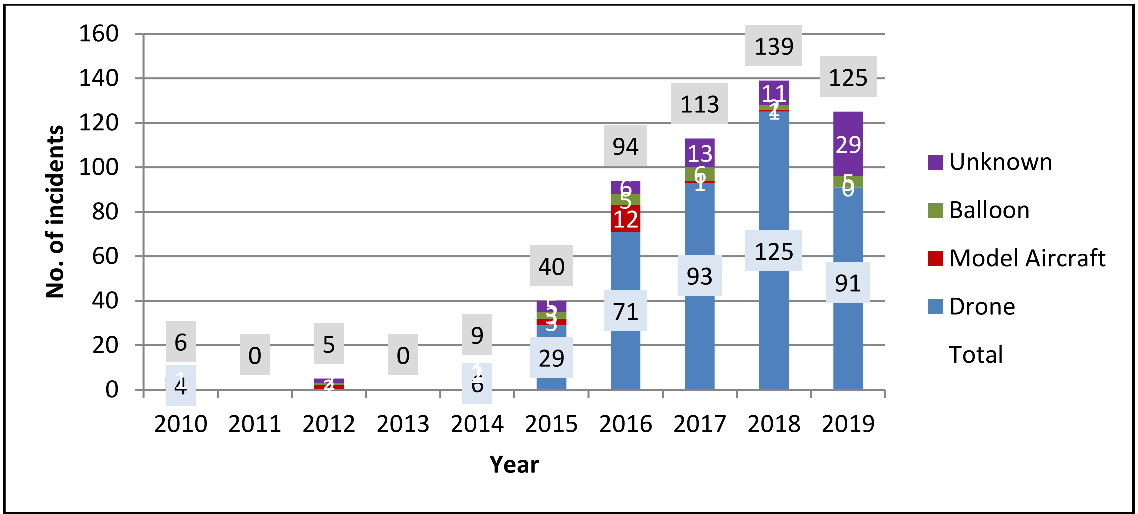


Figure 29. Airprox involving SUAS since 2010

[13] Although the stark increase since 2014 is as a result of the widespread availability and popularity of drones.

GENERAL AVIATION

GA Airprox by Airspace

There were 201 Airprox in 2019 where at least one aircraft was GA; of these, 22 involved SUAS. The corresponding 179 manned aircraft-to-aircraft GA Airprox represent 88% of the overall number of aircraft-to-aircraft incidents in 2019 (203 Airprox). This leads to a re-enforcement of the statement in this and last year's report, that GA are becoming increasingly predominant in their share of Airprox incidents. It is worthy of note however, that the number of Airprox occurring in ATZs and MATZs has almost halved from 45 (2018) to 25 (2019). This suggests that some educational initiatives are having an impact as, in the context of reduced hours yet increased incidents overall, instances in the circuit and inside ATZs and MATZs are falling.

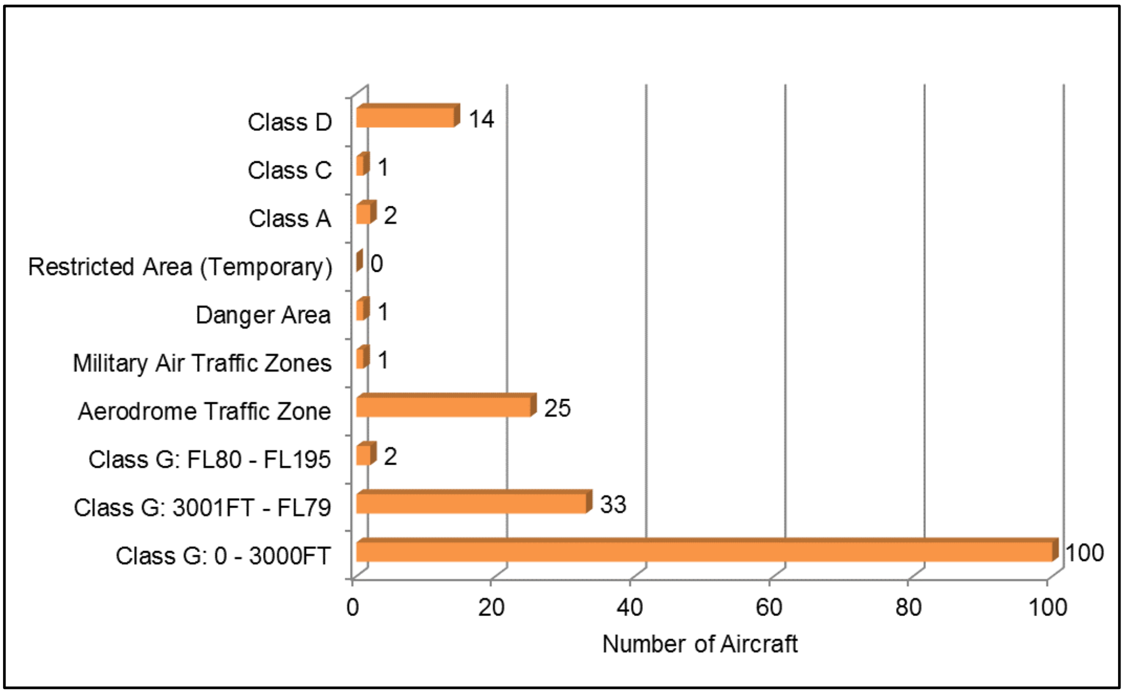


Figure 30. 2019 GA Airprox by Airspace Involvement – Aircraft-to-aircraft

GA Risk Distribution

As shown in Table 14 and Figures 31 and 32 the number of GA risk bearing Airprox is remaining statistically constant (too small a data set to put any weight on small variations), yet the overall number of incidents is continuing to rise which I believe is as a result of an increase in awareness and a willingness to report. However, this should be taken in the context of a continued reduction in GA hours. This indicates that there is still much work to be done with the GA community in terms of promotion of educational material and engagement.[14] In previous reports it has been difficult to draw any evidential conclusions with regard to the underlying reasons for Safety Barrier performance. With the introduction of the CF analysis I am now able to identify not only the weakest barriers, but the reasons for their vulnerability. Understanding this will allow us to focus effort in specific educational areas, namely Planning, SA and Lookout. The single biggest initiative (which does not rely on Human diligence and professionalism), remains rooted in EC and the compatibility of CWS within the community.

[14] It goes without saying that interaction with the GA community has been severely compromised throughout 2020 as a result of the COVID 19 Pandemic.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
GA Risk A	5	19	12	18	23(23)	23(26)	16(19)	10(19)	18(29)	16 (22)
GA Risk B	24	27	21	33	55(56)	41(44)	30(37)	42(51)	45(49)	47(56)
GA Risk C	70	61	61	53	59	57(58)	64(68)	59(70)	71(84)	93(99)
GA Risk D	2	2	1	2	3	4(5)	6(7)	4(6)	2(3)	5(6)
GA Risk E	0	8	9	17	23	15(16)	15(16)	13(16)	21(22)	18 (18)
GA Totals	**101**	**117**	**104**	**123**	**163(164)**	**140(149)**	**131(147)**	**128(162)**	**157(187)**	**179(201)**

Table 14. 10-year GA Airprox by Risk Classification (figures in brackets include SUAS Airprox)

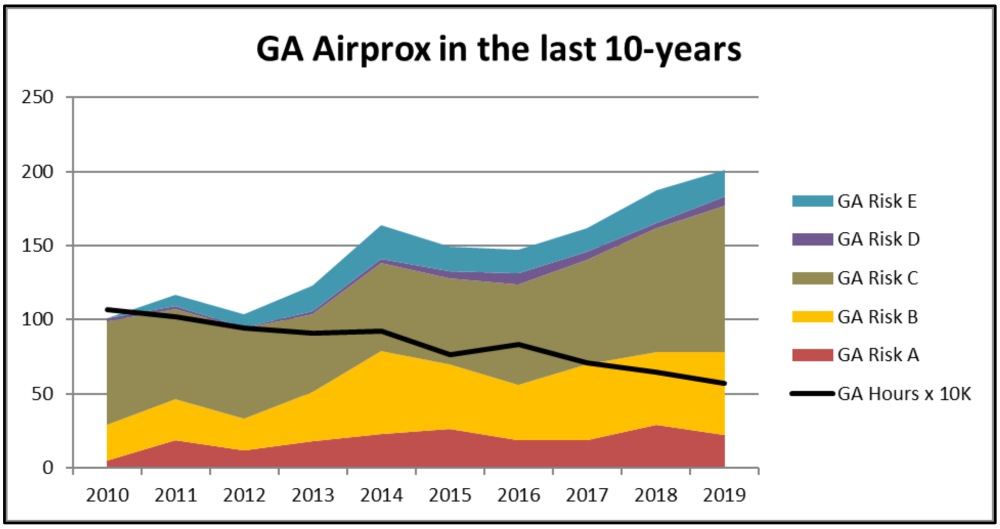


Figure 31. 10-year GA Airprox Risk Distribution and hours – Aircraft-to-aircraft

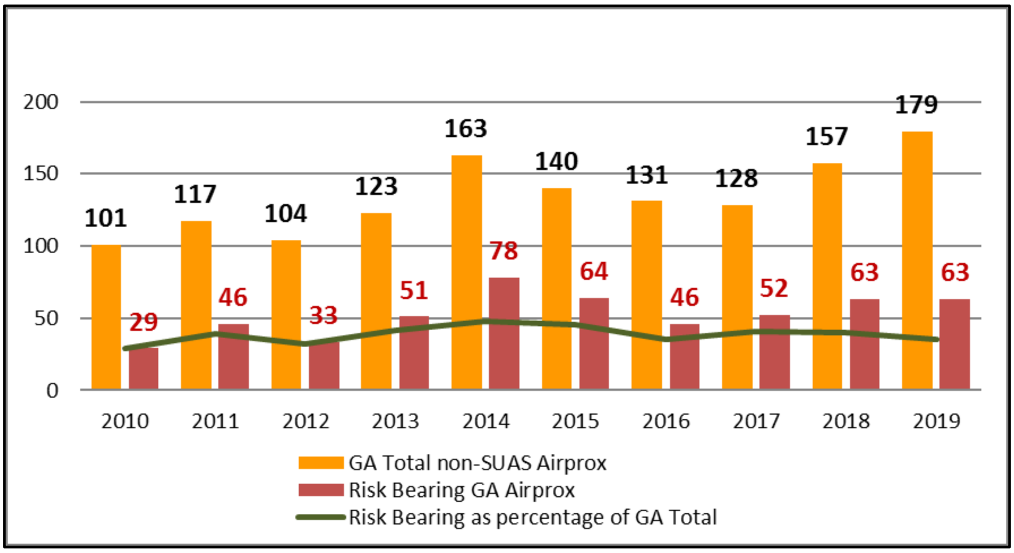


Figure 32. 10-year GA Airprox Risk Bearing Distribution – Aircraft-to-aircraft

GA Airprox Rates

As previously stated the CAA Safety Intelligence Unit has revised and improved its methods for collecting and compiling its data. This has both positive and negative effects: On the positive side we are now in a position where accurate data can be easily captured and used without speculative manipulation; on the negative side, it becomes difficult, misleading or confusing to compare current data to historical data. On initial inspection, using these figures, it does seem evident that GA flying is becoming more risky and has overtaken other sector Airprox rates for the first time. I would rather wait to see the new hours collection and collation system 'bed in' through 2020 before attempting to draw any specific conclusions but I have included the raw data in Table 15 below. What I can say is that there is at least one aircraft-to-aircraft Airprox for every 100 GA aircraft on the CAA register per year[15]. Additionally, the seasonality of GA flying means that the vast majority of GA related Airprox take place between March and October.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	**2019**
Total aircraft-to-aircraft Airprox	161	161	158	172	215	177	171	159	180	**203**
GA aircraft-to-aircraft Airprox	101	117	104	123	163	140	131	128	157	**179**
Risk Bearing GA Airprox	29	46	33	51	78	64	46	52	63	**63**
Risk Bearing as % of GA Total	29	39	32	41	48	46	35	41	40	**35**
GA Hours x 10K	106.5	102.3	94.2	91.0	92.2	76.7	83.0	70.9	64.6	**56.9**
GA All aircraft-to-aircraft per Million hrs	95	114	110	135	177	183	158	181	243	**315**
GA Risk Bearing per Million hrs	27	45	35	56	85	83	55	73	97	**111**

Table 15. 10-year GA Airprox and hours flown – Aircraft-to-aircraft

- **179** aircraft-to-aircraft GA incidents represents about 7 GA Airprox per week (March to October).
- **63** aircraft-to-aircraft risk-bearing GA incidents indicates there was either a real risk of a collision, or safety was much reduced below norms, over twice a week (March to October)

[15] This is based on the fact that there are 17350 GA aircraft on the CAA register and on the assumption all of these aircraft are flying at some point

MILITARY AVIATION

Military Airprox by Airspace

Overall, there were 59 Airprox involving Mil in 2019; of these, 8 involved SUAS. The 51 manned aircraft-to-aircraft Mil Airprox represents 25% of the overall total of 203 aircraft-to-aircraft incidents in 2019. This is lower than in previous years and further illustrates a gradual decline in Military Airprox in general terms. On considering Airspace, it comes as no surprise that the majority of incidents took place in Class G airspace, below 3000ft. This echoes the observations of previous years, as do the declining trends of Mil-Mil encounters.

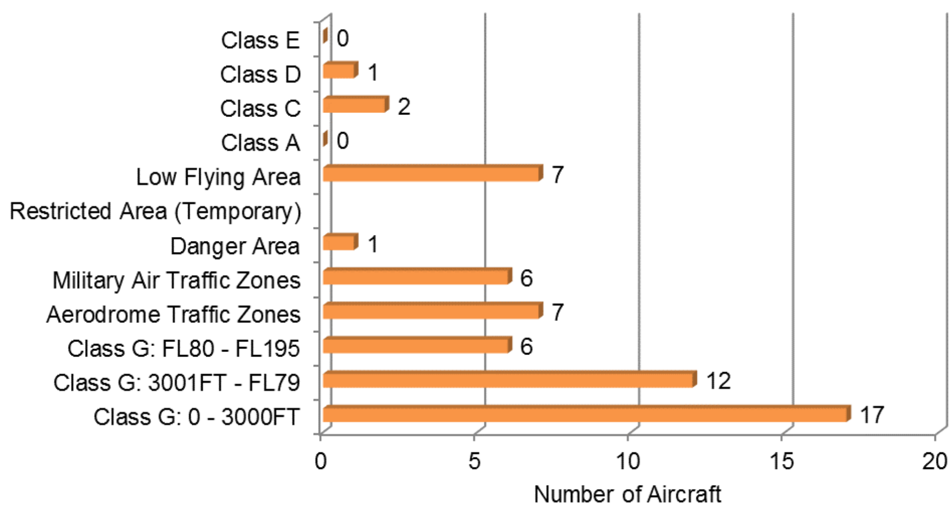


Figure 33. 2019 Military Airprox by Airspace Involvement – Aircraft-to-aircraft

Military Risk Distribution

Table 16 and Figures 34 & 35 illustrate the military Airprox statistics and risk distribution for the last 10 years. It is useful, for context, to retain the previously reported observations regarding peaks and troughs over the last 10 years: The high Airprox reporting rates of 2010 are likely to be accounted for by the introduction of formalised Air Safety Management processes and mandatory Airprox reporting when the MAA was formed. The trough in 2012/2013 was likely attributable both to reduced flying by the Tutor and Glider fleets as a result of their respective groundings due to maintenance issues, and to the Tornado fleet being employed on concurrent operations in 2 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.

There is now 10 years of evidence describing a slow but steady down turn in Mil Airprox. Not only that, the percentage of risk-bearing Airprox is at its lowest in 10 years.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Mil Risk A	7	9	8	8	7	9(11)	5(6)	4(7)	4(4)	**3(3)**
Mil Risk B	18	21	13	20	24(26)	20(21)	17(22)	13(17)	17(22)	**10(15)**
Mil Risk C	70	45	43	38	41	27	33(39)	29(34)	28(36)	**29(32)**
Mil Risk D	3	1	0	4	6	2	2	0	1(1)	**1(1)**
Mil Risk E	0	8	7	12	17	9	12	7(8)	13(14)	**8(8)**
Mil Totals	98	84	71	82	95(97)	67(70)	69(81)	53(66)	63(77)	**51(59)**

Table 16. 10-year Military Airprox by Risk Classification (figures in brackets include SUAS Airprox)

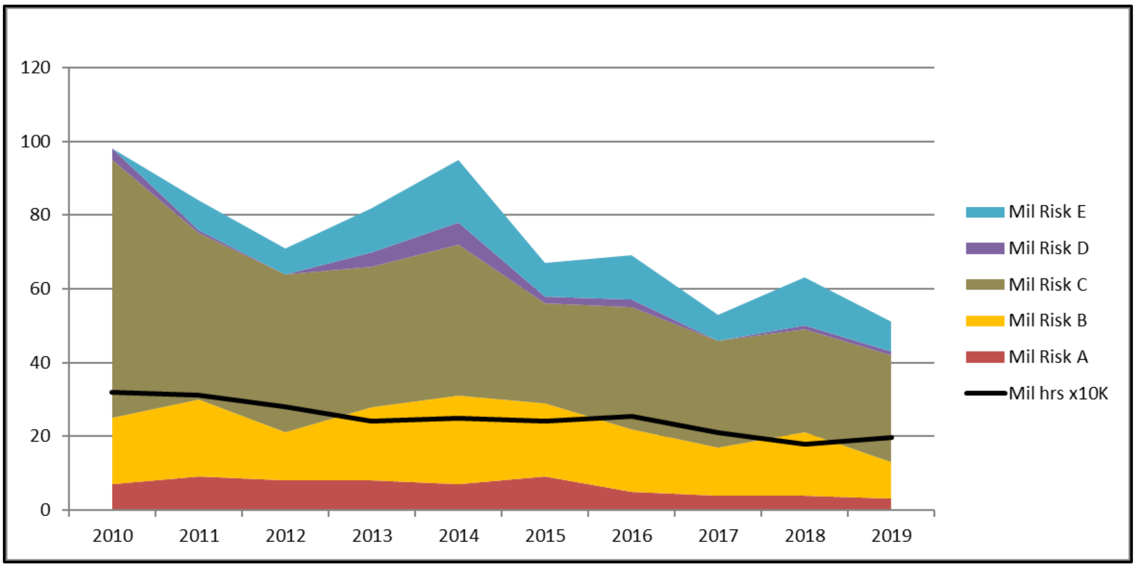


Figure 34. 10-year Military Airprox Risk Distribution and hours – Aircraft-to-aircraft

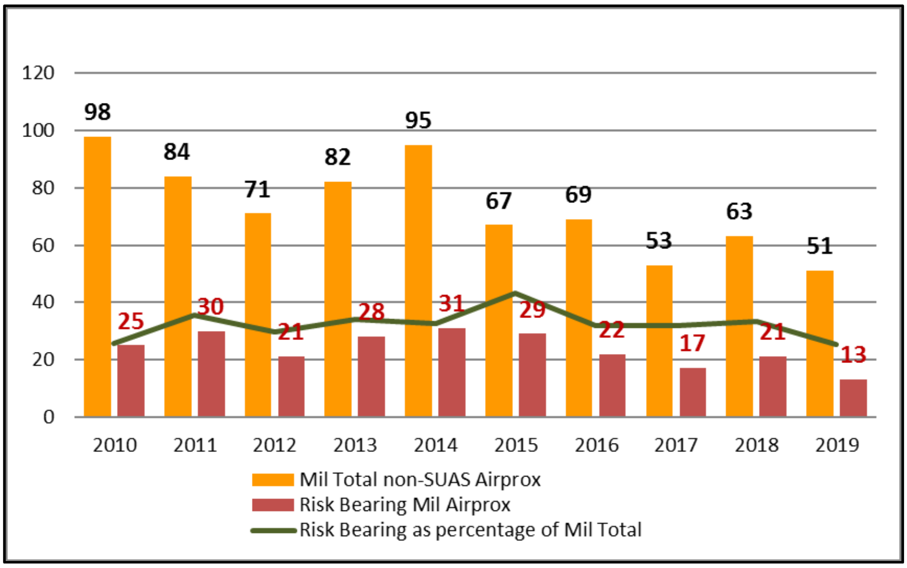


Figure 35. 10-year Military Airprox Risk Bearing Distribution – Aircraft-to-aircraft

Military Airprox Rates

As with the collation of all hours, there remains an element of uncertainty with regard to the absolute accuracy of the figures. That said, the totals are representative and have been compiled through enquiries to individual commands, Services and entities within the Military Aviation community. As ever, when dealing with small data sets one must be alive to the sensitivity of statistical variation. Last year, there was a concern that Airprox rates per million flying hours seemed to have risen to 2014 rates. The collated data from this year seems to indicate that this increase was anomalous and that actually, the rate of Mil Airprox is also steadily reducing. Indeed the risk-bearing rate is at its lowest for 10 years.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	**2019**
Total aircraft-to-aircraft Airprox	167	161	161	172	215	177	171	159	180	203
Total Mil aircraft-to-aircraft Airprox	98	84	71	82	95	67	69	53	63	51
Risk Bearing Mil Airprox	25	30	21	28	31	29	22	17	21	13
Risk Bearing as % of Mil Total	26	36	30	34	33	43	32	32	33	25
Mil hrs x 10K	31.8	31.1	28.0	24.2	25.0	24.2	25.6	21.1	17.7	19.3
Total Mil per Million hrs	308	270	254	339	380	277	270	252	355	264
Risk Bearing Mil per Million hrs	78	96	75	116	124	120	86	81	118	67

Table 17. 10-year Military Airprox versus hours flown – no SUAS

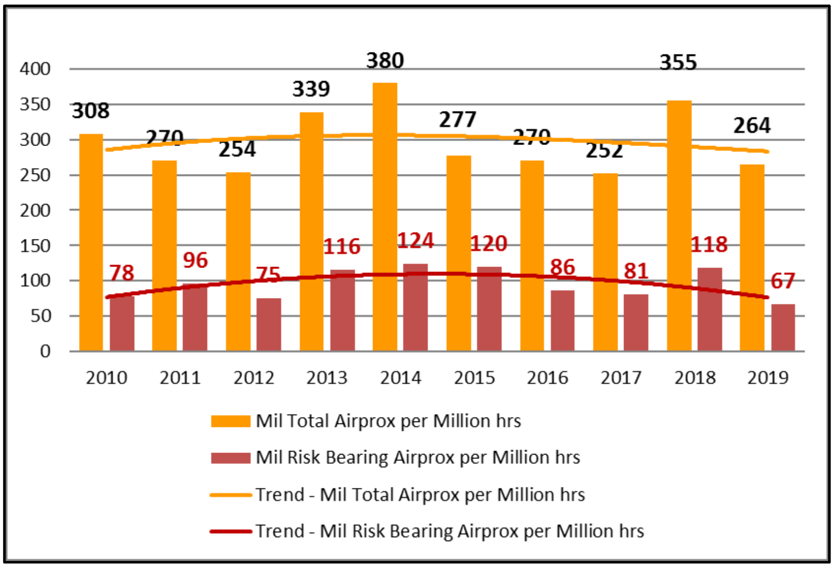


Figure 36. 10-year Military Airprox Rates per Million Flying Hours – no SUAS

As for the previous sections, putting all this into perspective, the following headline statistics for 2019 are pertinent in framing the risk to Military aircraft:

- **51** aircraft-to-aircraft Mil incidents represents, on average, one Military Airprox per week.
- **13** aircraft-to-aircraft risk-bearing Mil incidents means that, on average, there was either a real risk of a collision, or safety was much reduced below norms, just over once a month as opposed to once a fortnight in 2018

EMERGENCY SERVICES

Emergency Services Airprox by Airspace

There were 7 overall Airprox involving Emergency Services aircraft in 2019; of which 2 involved SUAS. The 5 manned aircraft-to-aircraft Airprox represent about 2% of the overall number of aircraft-to-aircraft incidents in 2019 (203 Airprox). With numbers this low, there is little scope to do anything other than present the actual figures and to state that of the 5 aircraft-to-aircraft, 4 were HEMS and one was NPAS. It must be pointed out that there still is no reliable method of compiling Emergency Services hours.

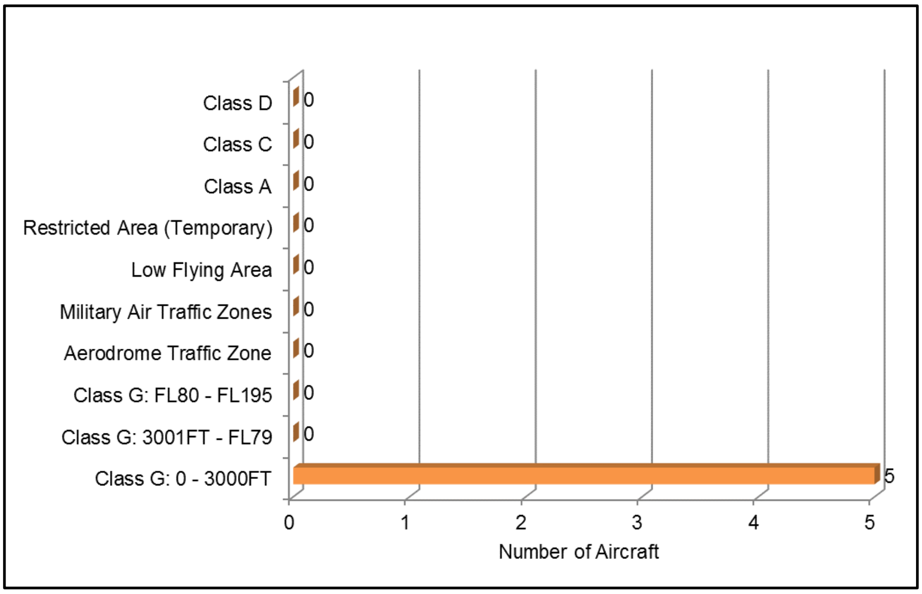


Figure 37. 2019 Emerg Servs Airprox by Airspace Involvement

Emergency Services Risk Distribution

Table 18, illustrates the Emerg Servs Airprox statistics and risk distribution over the last 10 years

	2010	2011	2012	2013	2014	2015	2016	2017	2018	**2019**
Emerg Servs Risk A	0	1	2	1	1	1	2	1	0	**0(1)**
Emerg Servs Risk B	2	2	0	2	4	1	1	5(6)	2(4)	**2(3)**
Emerg Servs Risk C	2	5	4	1	6	9	4	7(9)	9(9)	**2(2)**
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	**1(1)**
Emerg Servs Total	5	4	10	8	6	14	11	10	19(22)	**5(7)**

Table 18. 10-year Emerg Servs Airprox by Risk Classification (figures in brackets include SUAS Airprox)

- **5** aircraft-to-aircraft Emerg Servs incidents represents 1 Airprox every 2 months.
- **2** aircraft-to-aircraft 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 2019 SAFETY RECOMMENDATIONS

Accepted Recommendations

Airprox	Recommendation	Comments
2019002	Wellesbourne Mountford update their AIP entry to reflect the BRUNO approach.	Whilst we see the values and benefits in formalising the BRUNO procedures as an instrument training aid for use in VMC conditions, our CAA ATS Inspector has stated that the use of this approach is likely to introduce significant risk to the operation of the airfield, as well as the safety management system and has informed us that the practice of using this procedure even in VMC conditions must cease with immediate effect. Subsequently we have met with stakeholders and have communicated that the BRUNO procedure must not be used.
2019028	The P68 operating company consider the incorporation of a TAS.	PDG purchased 2 x SkyEcho2 portable ADSB receiver units to trial on their P68 aircraft. These units were evaluated over 3 months and pilot feedback was canvassed. The SkyEcho2 unit integrated with and overlaid onto on-board iPads running Sky Demon software. They found that this form of electronic conspicuity did add some value, however the effect was limited. Commercial airliners were all detectable. Some GA aircraft were detectable. The 'bearing-less target' mode for Mode C detection had been disabled by the manufacturer. The addition of a 'FLARM' licence for the Sky Demon software led to some suitably equipped gliders being detectable. The trial was extended onto one of their rotary survey helicopters for further evaluation.
2019101	SkyDemon review the selection and depiction of sites used for aerial sporting and recreational activities	SkyDemon agreed to review the selection and depiction of sites used for aerial sporting and recreational activities with a view to enhancing map conspicuity and preventing inappropriate deselection of such sites from map depiction.
2019110	SkyDemon review the selection and depiction of sites used for aerial sporting and recreational activities	SkyDemon agreed to review the selection and depiction of sites used for aerial sporting and recreational activities with a view to enhancing map conspicuity and preventing inappropriate deselection of such sites from map depiction.
2019210	Gloucestershire Airport to clarify their AIP entry regarding departure procedures.	An AIP change has been submitted and should be in place in the October AIRAC.
2019227	1. The C404 operating company considers further mitigations to MAC for survey operations.	RVL Group has reviewed the Risk Assessment, is considering TAS for the lighter (<5700kg) aircraft in their fleet, is reviewing supplementing lookout (through use of the task specialist, rather than a supplementary crewmember), is reviewing task locations and scheduling and has re-issued a Safety Notice to crews on the subject of operating ivo glider sites.

Partially Accepted Recommendations

Airprox	Recommendation	Comments
2019004	CAA and MAA provide advice and guidance on the interpretation and use of electronic conspicuity equipment.	Extract from response letter: the CAA is leading a programme to enable the carriage and operation of 'interoperable' electronic conspicuity equipment, this programme is well underway, having made a call for evidence and held a multi-stakeholder conference on the issue. The programme is now moving into the phase in which the strategy for deployment will be crafted; that phase will be led by the CAA but inclusive of ALL affected stakeholders. A full consultation on the draft final strategy will be held before mandated deployment is initiated. In support of that strategy there are a number of key issues that will be addressed, such as: the creation of and/or alignment to suitable standards for use and fitting of such equipment; a fully integrated trial to 'prove the concept'; consideration of the integration of other users, such as Drones; the Human Factors associated with the introduction of new equipment into the cockpit, and, the education of pilots in its use.
2019008	CAA and MAA provide advice and guidance on the interpretation and use of electronic conspicuity equipment.	As above.
2019071	The CAA review R/T procedures at non-ATS aerodromes.	We have reviewed CAP 413 (Radiotelephony Manual) Chapter 4 Aerodrome Phraseology but do not believe there is a case for introducing a requirement for pilots to report at all designated positions in the aerodrome traffic circuit. However, the review has highlighted the need for some structural changes to Chapter 4, and the following will be considered: • Page 1 subtitle 'Aerodrome Control Service Phraseology' to move to page 5. • Paras 4.6 and 4.7 to be moved to Chapter 4 Introduction. • 'Designated Positions in the Traffic Circuit' and 'Standard Overhead Join Procedure' content to follow the Introduction and be applicable to ATC, AFIS and AGCS alike. • New header to indicate applicability. • Requirement in both cases for aircraft to report base leg to be enhanced to read 'if required by ATS provider or aerodrome operator'. It may not be universally applicable - the decision can be made at local level to satisfy local requirements.

Airprox	Recommendation	Comments
2019201/208/226/227	1. The P68 operating company considers further mitigations to MAC for survey operations. 2. The CAA considers mandating additional cockpit crew to enable enhanced lookout for single-pilot survey operations.	CAA revised response - 'We recognise the unique hazard of the operations in question and therefore, in response to the recommendation, confirm that the CAA Partially Accepts this recommendation and will conduct a review of the risk assessments of survey operators, to ensure they meet the requirements of AMC SPO.OP.230(b) and are robust in addressing this risk.'
2019287	Nottingham/Tollerton airfield to consider publishing procedures for the integration of faster jet aircraft with other circuit traffic.	The airport safety committee re-visited the incident with the possibility of a fast jet circuit being implemented at Nottingham. Of the committee members present at the meeting, there was a unanimous decision against a fast jet circuit. Following on from a previous meeting the Jet Provost crews have agreed to re-join the circuit via an overhead join. The Nottingham AIP entry will be amended to warn users that a fast-jet operates from the airfield and posters have been displayed for increased awareness of local pilots.

Recommendations Remaining Unresolved

Airprox	Recommendation	Comments at time of writing report
2019151	Westonzoyland and Middlezoy airfield managers develop a letter of agreement regarding integration of their operations.	Awaiting response from WZ and MZ.
2019192	Gloucester considers reviewing fixed-wing and rotary-wing circuit separation.	30 Jul 20 - A steering group had been set up to conduct the review, but had to be suspended due to Cv-19. It is hoped that work will re-convene in September.
2019221	Old Sarum to review their AIP entry to ensure coherence with the Old Sarum website and proprietary flight guide information.	No Progress at time of writing.
2019238	The MAA ensures that military operators fully understand the definition and application of the term 'MARSA'.	No response received ATT.
2019257	Gloucester to consider applying for an SSR transponder conspicuity code.	30 Jul 20 - Cv-19 has led to reduced manpower and increased workload so that this work has been put on hold for now.
2019264	Goodwood to review fixed-wing and rotary-wing circuit deconfliction.	Response received 22 Jun. Delay due to Coronavirus (stakeholders unavailable). When flying trg orgs re-start then meeting to discuss recommendation will be held.
2019282	Kent Gliding Club and Lydd Airport establish a Letter of Agreement to address the risk of concurrent activities in the same volume of airspace.	No progress ATT.
2019294	The BGA reiterate guidance to gliding clubs regarding the significant mitigation to mid-air collision afforded by fitment of SSR transponders to tug aircraft.	
2019298	Dunkeswell airfield and the Devon And Somerset Gliding Club reach agreement to include parachuting operations within their Letter of Agreement.	
2019300	MoD considers the introduction of a flow arrow for the Honister Pass.	No progress ATT.

Airprox	Recommendation	Comments at time of writing report
2019323	The CAA considers reviewing the UK AIP, ENR 1.6, paragraph 4.5.5, to define the point at which the 'lifting' call is to be made.	Awaiting response.

AIRPROX CATALOGUE 2019

The table below is an abbreviated form of the 2019 Airprox Index that is available on the UKAB Website at 2019 Website Catalogue. Individual reports can also be accessed using the hyperlinks within the table.

Airprox Number	Risk	Aircraft 1 Type	Aircraft 2 Type	Airspace
2019001	B	AGUSTA - A109	MD HELICOPTER - 500	G
2019002	C	CESSNA - 152	CESSNA - 152	G
2019003	C	OTHER - Military (Hawk)	DE HAVILLAND - DHC1	G
2019004	A	OTHER - Military (Tucano)	OTHER - Military (Prefect)	G
2019005	B	AIRBUS - A320	UNKNOWN (RPAS)	A
2019006	C	BOEING - 737	UNKNOWN (RPAS)	A
2019007	C	OTHER - Military (Typhoon)	UNKNOWN (Object)	G
2019008	C	OTHER - Military (Dauphin)	AGUSTA - A109	G
2019009	B	AIRBUS - A320	UNKNOWN (Object)	A
2019010	C	DIAMOND - DA42	OTHER - Military (Typhoon)	G
2019011	C	CESSNA - 560	UNKNOWN (Paragliders)	G
2019012	B	CESSNA - 406	UNKNOWN (RPAS)	A
2019013	A	PIPER - PA28	PIPER - PA34	G
2019014	C	CESSNA - 152	PIPER - PA28	G
2019015	C	CESSNA - 172	PIPER - PA28	G
2019016	B	PIPER - PA28	GRUMMAN - AA5	G
2019017	C	OTHER - Military (Typhoon)	GRUMMAN - AA1	G
2019018	A	CESSNA - 152 - NO SERIES EXISTS	PIPER - PA28	G
2019019	E	OTHER (AW109)	CIRRUS - SR22	D
2019020	C	PZL BIELSKO - SZD51	SOCATA - TB20	G
2019021	E	OTHER (H175)	OTHER (Paramotor)	G
2019022	B	PIPER - PA28	OTHER (Magni M24)	G
2019023	B	BOEING - 787	UNKNOWN (RPAS)	A
2019024	C	EVEKTOR AEROTECHNIK - EV97	ROBINSON - R44	G
2019025	A	AIRBUS - A319	UNKNOWN (RPAS)	D
2019026	B	OTHER - Generic (Cabri G2)	SCOTTISH AVIATION - BULLDOG	G
2019027	A	BOEING - 787	UNKNOWN (RPAS x2)	A
2019028	C	VULCAN - P68	BEECH - 36	G
2019029	C	OTHER - Military (Tutor)	UNKNOWN (RPAS)	G
2019030	B	BOEING - 787	UNKNOWN (RPAS)	A
2019031	A	GULFSTREAM - GV - SP G550	UNKNOWN (RPAS)	G
2019032	D	OTHER (Parachutist)	DE HAVILLAND - DH82	G
2019033	B	AIRBUS - A319	UNKNOWN (RPAS)	D
2019034	C	AIRBUS - A320	PARTENAVIA - P68	D
2019035	B	EUROCOPTER - EC135	COMCO IKARUS - IKARUS C42	G

2019036	C	DASSAULT - FALCON2000	MOONEY - M20	G
2019037	C	PIPER - PA28	CESSNA - 152	G
2019038	A	BOEING - 777	UNKNOWN (RPAS)	A
2019039	C	EMBRAER - ERJ170	UNKNOWN (RPAS)	D
2019040	B	BOEING - 777	UNKNOWN (RPAS)	D
2019041	C	PIPER - PA31	UNKNOWN (RPAS)	G
2019042	D	BOEING - 787	UNKNOWN (RPAS)	A
2019043	B	BOEING - 787	UNKNOWN (RPAS)	D
2019044	E	PIPER - PA34	SLINGSBY - T67 - M	G
2019045	B	AGUSTA - A109	UNKNOWN (Light Aircraft)	G
2019046	A	EMBRAER - ERJ170	UNKNOWN (RPAS)	A
2019047	C	OTHER (Wildcat)	OTHER (AW169)	G
2019048	A	BOEING - 737	UNKNOWN (RPAS)	D
2019049	E	GROB - G115	CESSNA - 150	G
2019050	A	BOEING - 787	UNKNOWN (Object)	A
2019051	C	AIRBUS - A319	AIRBUS - A319	D
2019052	A	AIRBUS - A320	UNKNOWN (RPAS)	A
2019053	A	OTHER - Military (Typhoon)	OTHER - Military (Tutor)	G
2019054	A	AIRBUS - A320	UNKNOWN (RPAS)	A
2019055	B	CESSNA - 152	CESSNA - 152	G
2019056	B	AGUSTA - A109	CESSNA - 152	G
2019057	A	ATR - ATR72	UNKNOWN (RPAS)	D
2019058	A	SCHLEICHER - ASH25	GRUMMAN - AA5	G
2019059	C	PIPER - PA28	PIPER - PA28	G
2019060	C	GROB - G120	SCHLEICHER - ASH25	G
2019061	B	SCHEMPP HIRTH - VENTUS2C	OTHER (Cabri G2)	G
2019062	E	SAAB - 340	SIKORSKY - S92	G
2019063	A	AIRBUS - A320	UNKNOWN (RPAS)	A
2019064	A	SCHLEICHER - ASK21	UNKNOWN	G
2019065	B	CIRRUS - SR20	UNKNOWN (Paramotor)	G
2019066	B	CESSNA - 172	SCOTTISH AVIATION - BULLDOG	G
2019067	C	AIRBUS - A330	UNKNOWN (Object)	A
2019068	B	OTHER - Military (Tutor)	UNKNOWN (RPAS)	G
2019069	C	PIPER - PA28	UNKNOWN (RPAS)	G
2019070	C	OTHER - Military (C17)	UNKNOWN	G
2019071	B	CESSNA - 152	GRUMMAN - AA5	G
2019072	C	EMBRAER - EMB135	DE HAVILLAND - DH82	G
2019073	A	AIRBUS - A321	UNKNOWN (Object)	A
2019074	C	PIPER - PA17	PIPER - PA28	G
2019075	A	CESSNA - 208	CESSNA - 208	G
2019076	B	BOEING - 737	UNKNOWN (Object)	D
2019077	B	OTHER	MCDONNELL DOUGLAS (F15)	G
2019078	C	DORNIER - 228	COMCO IKARUS - IKARUS C42	D

2019079	B	OTHER - Military (Viking)	BEECH - 58	G
2019080	D	AIRBUS - A321	UNKNOWN (RPAS)	D
2019081	B	DIAMOND - H36	CESSNA - 172	G
2019082	A	SCHEMPP HIRTH - VENTUS A	UNKNOWN (RPAS)	G
2019083	B	OTHER - Military (Wildcat)	UNKNOWN	G
2019084	A	BEECH - 76	UNKNOWN (RPAS)	G
2019085	E	SAAB - 340	OTHER - Military (F15)	G
2019086	C	PIPER - PA28	UNKNOWN (RPAS)	D
2019087	C	OTHER - Military (Viking)	DIAMOND - DA40	G
2019088	C	BOEING - 787	UNKNOWN (RPAS)	D
2019090	C	AIRBUS - A319	UNKNOWN (Object)	A
2019091	B	AIRBUS - A320	UNKNOWN (Object)	A
2019092	C	PIPER - PA28	UNKNOWN	G
2019093	C	BOEING - 777	UNKNOWN (RPAS)	A
2019094	C	BOEING - 787	UNKNOWN (RPAS)	D
2019095	C	AIRBUS - A319	UNKNOWN (Object)	A
2019096	C	SCHEIBE - SF25	AGUSTA - A109	G
2019097	B	VANS - RV6	PIPER - PA28	G
2019098	A	AIRBUS - A320	UNKNOWN (Object)	A
2019099	A	OTHER - Military (Hawk)	OTHER (Glider 1 and 2)	G
2019100	A	OTHER (HPH Shark)	UNKNOWN	G
2019101	C	SCHLEICHER - ASK21	PIPER - PA28	G
2019102	B	AUSTER	CESSNA - 172	G
2019103	C	AIRBUS - A320	UNKNOWN (RPAS)	D
2019104	C	PIPER - PA34	PIPER - PA28	G
2019105	C	SCHEMPP HIRTH - STANDARD CIRRUS	PIPER - PA28	G
2019106	C	DIAMOND - DA40	PIPER - PA28	G
2019107	C	AEROSPATIALE - AS355	OTHER (Folland Gnat)	G
2019108	C	DE HAVILLAND - DH82	AEROSPATIALE - AS355	G
2019109	B	DE HAVILLAND - DHC1	OTHER (Sling 2)	G
2019110	C	PZL BIELSKO - SZD50	NORTH AMERICAN - P51 (and Sea Fury)	G
2019111	C	DASSAULT - MYSTERE FALCON20	UNKNOWN	G
2019112	C	SAAB - 340	AIRBUS - A321	A
2019113	B	BOEING - 787	UNKNOWN (RPAS)	D
2019114	A	AIRBUS - A320	UNKNOWN (RPAS)	A
2019115	C	AIRBUS - A320	UNKNOWN (RPAS)	D
2019116	B	BEECH - 58	SCHEMPP HIRTH - VENTUS2CT	G
2019117	C	OTHER (Eurofox 912)	AEROSPATIALE - AS365	G
2019118	C	PIPER - PA28	PIPER - PA31	G
2019119	C	GULFSTREAM - GIV - X G450	CIRRUS - SR22	D
2019120	C	AIRBUS - A319	UNKNOWN (Object)	D
2019121	B	PIPER - PA34	PIPER - PA28	D

2019122	B	SCHEMPP HIRTH - DUO DISCUS	SOCATA - TB20	G
2019123	B	BOEING - 737	UNKNOWN (RPAS)	A
2019124	A	AIRBUS - A319	UNKNOWN (Object)	A
2019125	C	SCHLEICHER - ASK21	DOUGLAS - DC3	G
2019126	B	OTHER - Military (Tucano)	UNKNOWN	G
2019127	B	DIAMOND - DA42	DIAMOND - DA42	G
2019128	C	AIRBUS - A320	UNKNOWN (RPAS)	D
2019129	C	CESSNA - 152	UNKNOWN (RPAS)	G
2019130	C	OTHER - Military (Wildcat)	OTHER - Military (C130x2)	G
2019131	C	PIPER - PA28	PARTENAVIA - P68	G
2019132	C	CESSNA - 560	PIPER - PA28	G
2019133	C	GROB - G102 - ASTIR CS	CESSNA - 172	G
2019134	B	BOEING - 737	UNKNOWN (Drone)	D
2019135	B	BOEING - 747	UNKNOWN (RPAS)	A
2019136	C	OTHER - Military (Typhoon)	PIPER - PA28	G
2019137	C	ECLIPSE AVIATION - 500	BEECH - 36	G
2019138	D	GROB - G102 - ASTIR CS	UNKNOWN	G
2019139	B	SCHEMPP HIRTH - DISCUS CS	CIRRUS - SR20	G
2019140	C	AIRBUS - A321	UNKNOWN (Object)	A
2019141	D	OTHER (Eurofox)	UNKNOWN (Object)	G
2019142	B	GLASER DIRKS - DG400	BOEING - 747 - 100 - 135	G
2019143	D	CESSNA - 150	PITTS - S1	G
2019144	C	AIRBUS - A321	AIRBUS - A320	A
2019145	C	BOEING - 737	UNKNOWN (RPAS)	A
2019146	C	BOEING - 787	UNKNOWN (RPAS)	A
2019147	B	BEECH - 76	UNKNOWN (RPAS)	G
2019148	C	BOEING - 787	UNKNOWN (RPAS)	A
2019149	B	AIRBUS - A319	UNKNOWN (RPAS)	A
2019150	C	OTHER - Military (Tutor)	OTHER - Military (Prefect)	G
2019151	D	MAINAIR - BLADE - 912	AUSTER - AUSTER J (with a Piper Cub and Aeronica)	G
2019152	C	VULCAN - P68	CESSNA - 172	G
2019153	A	BOEING - 737	UNKNOWN (RPAS)	D
2019154	C	AIRBUS - A319	LEARJET - 45	C
2019155	C	AIRBUS - A320	UNKNOWN (RPAS)	A
2019156	C	OTHER - Military (Apache)	VANS - RV8	G
2019157	B	SCHLEICHER - ASK21	PIPER - PA23	G
2019158	E	PIPER - PA28	OTHER (JetRanger)	G
2019159	C	DIAMOND - DA42	UNKNOWN (Canopy Suspended)	G
2019160	E	EUROCOPTER (EC175)	ROBINSON - R22	D
2019161	D	OTHER - Military (C130J)	UNKNOWN (Helicopter)	G
2019162	B	CESSNA - 560	SCOTTISH AVIATION - BULLDOG	D
2019163	B	PIPER - PA31	PIPER - PA28	G

2019164	C	SCHEMPP HIRTH - DUO DISCUS	OTHER - Military (Typhoon pair)	G
2019165	C	DENNEY - KITFOX	AVIONS ROBIN - DR400	G
2019166	C	CESSNA - 180	UNKNOWN (RPAS)	D
2019167	A	AIRBUS - A319	UNKNOWN (Balloon)	A
2019168	A	AIRBUS - A319	UNKNOWN	D
2019169	C	OTHER (Paramotors)	OTHER - Military (Chinook)	G
2019170	C	OTHER - Military (Prefect)	PIPER - PA28	G
2019171	C	AIRBUS - A319	UNKNOWN (RPAS)	A
2019172	C	BOEING - 747	UNKNOWN (RPAS)	A
2019173	A	BOEING - 737	UNKNOWN (RPAS)	A
2019174	A	OTHER (CS100)	UNKNOWN	A
2019175	B	GROB - G109	MILES (Miles Falcon)	G
2019176	B	SCHEMPP HIRTH - VENTUS2CT	CESSNA - 182	G
2019177	C	OTHER (Paraglider)	MCDONNELL DOUGLAS - 500	G
2019178	C	DE HAVILLAND - DHC6	EUROCOPTER - EC135	G
2019179	C	EMBRAER - EMB135	BOMBARDIER - BD700 1A10	A
2019180	C	MCDONNELL DOUGLAS - MD900	EUROCOPTER - EC120	G
2019181	E	AVRO	OTHER - Military (Tutor)	G
2019183	B	PIPER - PA28	SUPERMARINE - SPITFIRE	G
2019184	C	CESSNA - 152	CIRRUS - SR22	G
2019185	C	BOEING - 777	UNKNOWN (RPAS)	D
2019186	B	BAE - AVRO146RJ - 100 - 70	UNKNOWN (RPAS)	G
2019187	D	BOEING - 747	UNKNOWN	A
2019188	C	OTHER - Military (Voyager)	OTHER - Military (Typhoon)	C
2019189	A	BOEING - 777	UNKNOWN (RPAS)	D
2019190	C	DIAMOND - DA42 (and C152)	PIPER - PA16	G
2019191	C	BOEING - 737	PIPER - PA28	D
2019192	B	ROBINSON - R44	PIPER - PA28	G
2019193	B	OTHER - Military (Prefect)	EXTRA - 300	G
2019195	C	PIPER - PA28	PIPER - PA28	G
2019196	E	SCHLEICHER - ASW20	DIAMOND - DA42	G
2019197	B	SCHEMPP HIRTH - VENTUS2CT	PILATUS - PC12	G
2019198	C	PIPER - PA28	OTHER (Skyranger Swift)	G
2019199	B	GROB - G115 - E	SCHEMPP HIRTH	G
2019200	B	SAAB - 340	UNKNOWN (Balloon)	A
2019201	A	VANS (RV12)	PARTENAVIA - P68	G
2019202	C	AIRBUS - A320 - 200	UNKNOWN (Object)	A
2019203	B	BOEING - 747	UNKNOWN (RPAS)	A
2019204	C	AIRBUS - A380	UNKNOWN (RPAS)	A
2019205	A	AIRBUS - A320	UNKNOWN (RPAS)	D
2019206	A	CESSNA - 152	PIPER - PA28	G
2019207	B	AIRBUS - A320	SAAB - 340	D

2019208	E	PARTENAVIA - P68	PIPER - PA28	G
2019209	C	AIRBUS - A320	BEECH - 200	A
2019210	C	PIPER - PA34	CESSNA - 206	G
2019211	A	DE HAVILLAND - DHC8	UNKNOWN (RPAS)	D
2019212	B	PIPER - PA28	OTHER	G
2019213	B	AIRBUS - A320	UNKNOWN (RPAS)	D
2019214	A	AIRBUS - A321	UNKNOWN (Object)	D
2019215	E	UNKNOWN (DJI Phantom 4 RPAS)	OTHER - Military (Avenger T Mk1)	G
2019216	A	MILES (Miles Whitney)	EXTRA (Extra 330)	G
2019217	A	PIPER - PA22	PIPER - PA28	G
2019218	C	ROBINSON - R22	PIPER - PA38	D
2019219	B	EVEKTOR AEROTECHNIK - EV97	UNKNOWN (RPAS)	G
2019220	C	CESSNA - 150	OTHER (Quik Flex-wing)	G
2019221	C	PIETENPOL - AIRCAMPER	CESSNA - 208	G
2019222	B	PIPER - PA28	UNKNOWN (RPAS)	G
2019223	A	ROBINSON - R44	UNKNOWN (RPAS)	G
2019224	B	MOONEY - M20J	UNKNOWN	G
2019225	C	PARTENAVIA - P68	CESSNA - 172	G
2019226	C	PARTENAVIA - P68	PIPER - PA28	G
2019227	E	CESSNA - 404	OTHER (Unknown)	G
2019228	C	CESSNA - 172	CESSNA - 152	G
2019229	C	CESSNA - 150	GRUMMAN - AA5 - B	G
2019230	B	JABIRU - JABIRU - UL	HAWKER (Hurricane)	G
2019231	E	DE HAVILLAND - DHC6	PIPER - PA28	G
2019232	A	AIRBUS - A320	UNKNOWN (RPAS)	D
2019233	C	OTHER - Military (Tutor)	PIPER - PA28	G
2019234	C	OTHER - Military (Typhoon)	UNKNOWN (RPAS)	G
2019235	D	AIRBUS - A320	UNKNOWN (Object)	A
2019236	B	PZL SWIDNIK - PW5	AERMACCHI - SF260	G
2019237	C	CESSNA - 152	CESSNA - 152	G
2019238	C	OTHER - Military (Typhoon)	OTHER - Military (Typhoon)	G
2019239	A	AIRBUS - A319	UNKNOWN (RPAS)	A
2019240	B	AIRBUS - A319	UNKNOWN (RPAS)	D
2019241	C	OTHER - Military (Tutor)	OTHER (Sigma 10 Paraglider)	G
2019242	C	OTHER - Military (Chinook)	OTHER (Glider)	G
2019243	C	OTHER - Military (Juno)	PIPER - PA28	G
2019244	B	CESSNA - 152	UNKNOWN (RPAS)	G
2019245	C	PARTENAVIA - P68	CESSNA - 172	G
2019246	C	VULCAN - P68	CESSNA - 172	G
2019247	A	BOEING - 757	OTHER (RPAS)	D
2019248	C	VULCAN - P68	PIPER - PA28	G
2019249	A	AIRBUS - A319	OTHER (RPAS)	D

2019250	C	DIAMOND - DA40	UNKNOWN (RPAS)	G
2019251	A	BOMBARDIER - BD700 1A10	UNKNOWN	D
2019252	E	BEECH - 200 - B200	GRUMMAN - AA5	G
2019253	A	COMCO IKARUS - IKARUS C42	AGUSTA - A109	G
2019254	B	PIPER - PA25 (and PW-6)	UNKNOWN (Light Aircraft)	G
2019255	C	CESSNA - 152	VANS - RV6	G
2019256	A	AVIONS ROBIN - DR400	ENSTROM - 280	G
2019257	E	DIAMOND - DA42	CESSNA - 414	G
2019258	C	DE HAVILLAND - DHC8	UNKNOWN (Object)	A
2019259	C	PIPER - PA15	UNKNOWN (RPAS)	G
2019260	A	CANADAIR - CL600 2B16	UNKNOWN (Object)	G
2019261	A	EMBRAER - ERJ170	UNKNOWN (RPAS)	A
2019262	B	EMBRAER - ERJ175	UNKNOWN (RPAS)	A
2019263	C	SCHEMPP HIRTH - VENTUS CT	ROCKWELL - 112	G
2019264	E	OTHER (Cabri G2)	CHAMPION - 8KCAB	G
2019265	E	AIRBUS (EC175)	AGUSTA - A109	D
2019266	B	BOEING - 777	UNKNOWN (RPAS)	A
2019267	A	AIRBUS - A320	UNKNOWN (RPAS)	A
2019268	C	BOEING - 787	ROBINSON - R44	D
2019269	C	OTHER - Military (Merlin)	SLINGSBY - T67	G
2019270	A	EUROCOPTER - EC135	UNKNOWN (RPAS)	G
2019271	C	SCHEIBE - SF25	AEROSPATIALE - AS355	G
2019272	B	PIPER - PA28	UNKNOWN (RPAS)	G
2019273	B	AGUSTA (AW139)	OTHER (Paramotor)	G
2019274	C	BOEING - 737	JODEL - DR1050	D
2019275	A	EMBRAER - EMB145	UNKNOWN (Object)	D
2019276	C	EMBRAER - ERJ175	UNKNOWN (Object)	D
2019277	B	OTHER - Military (C130)	UNKNOWN (Object)	G
2019278	C	OTHER - Military (Juno)	OTHER - Military (Juno)	G
2019279	C	PIEL - CP328	PIPER - PA28	G
2019280	C	SLINGSBY - T67 - M	CIRRUS - SR22	G
2019281	C	PIPER - PA28	AVIAT (Aviat Husky)	G
2019282	A	OTHER (HpH 304 Shark S)	DIAMOND (DA62)	G
2019283	A	EVEKTOR AEROTECHNIK - EV97	PIPER - PA28	G
2019284	C	DE HAVILLAND - DHC1	TECNAM - P2002	G
2019285	C	DORNIER - 328	SUPERMARINE - SPITFIRE	G
2019286	C	BOEING - 777	UNKNOWN (RPAS)	D
2019287	C	PIPER - PA28	HUNTING PERCIVAL - JET PROVOST	G
2019288	C	BOMBARDIER (CS100)	UNKNOWN (RPAS)	D
2019289	C	AIRBUS - A320	OTHER (RPAS)	A
2019290	C	CESSNA - 152	CESSNA - 182	G
2019291	B	DASSAULT - FALCON900EX	UNKNOWN	G

2019293	E	CESSNA - 560	UNKNOWN	G
2019294	E	GLASER DIRKS - DG505 (Towed by PA25)	PIPER - PA34	G
2019295	B	OTHER - Military (F15)	OTHER - Military (F15)	G
2019296	E	SIKORSKY - S92	OTHER - Military (Typhoon)	G
2019297	B	MCDONNELL DOUGLAS - 500	OTHER - Military (Prefect)	G
2019298	A	PZL BIELSKO (SZD Junior)	OTHER (Canopy Suspended)	G
2019299	A	PIPER - PA28	UNKNOWN (RPAS)	G
2019300	C	OTHER - Military (Hawk T2)	OTHER - Military (Tucano x2)	G
2019301	A	EUROCOPTER (EC145)	UNKNOWN (RPAS)	G
2019302	B	OTHER - Military (Wildcat)	UNKNOWN (Object)	G
2019303	C	PIPER - PA28	PIPER - PA28	G
2019304	B	AEROSPATIALE - AS365	OTHER (Weight-shift M/L)	G
2019305	C	AIRBUS - A321	UNKNOWN (RPAS)	A
2019306	B	SIKORSKY - S92	UNKNOWN (Balloon)	G
2019307	C	AIRBUS - A319 - 100 - 111	UNKNOWN (Balloon)	C
2019308	B	OTHER - Military (Wildcat)	UNKNOWN (RPAS)	G
2019310	E	OTHER - Military (Hawk)	OTHER - Military (Hawk)	G
2019311	C	AIRBUS - A319	UNKNOWN (Object)	A
2019312	B	CESSNA - 152	CESSNA - 182	G
2019313	B	DIAMOND - DA42	PIPER - PA38	G
2019314	B	AIRBUS - A320	UNKNOWN (Object)	A
2019316	A	AIRBUS - A321	UNKNOWN (Object)	A
2019317	E	BOEING - EC135	AGUSTA - A109	G
2019318	C	BELL - 412	OTHER - Military (Tutor)	G
2019319	C	AEROSPATIALE - AS350	OTHER - Military (Tutor)	G
2019320	B	PIPER - PA28	UNKNOWN (RPAS)	G
2019321	B	UNKNOWN (DJI Inspire Operator)	UNKNOWN (RPAS)	G
2019322	C	OTHER - Military (Hawk T2)	OTHER - Military (Juno)	G
2019323	C	SIKORSKY - S92	SIKORSKY - S92	G
2019324	A	AIRBUS - A321	UNKNOWN (RPAS)	A
2019325	D	AIRBUS - A319	UNKNOWN (Object)	D
2019326	C	SCINTEX - CP301	CESSNA - 172	G
2019328	C	OTHER - Military (Chinook)	CIRRUS - SR20	G
2019329	C	OTHER - Military (Typhoon)	OTHER - Military (Typhoon)	C
2019330	C	DIAMOND - DA40	DIAMOND - DA40	D
2019331	A	AIRBUS - A320	UNKNOWN (RPAS)	D
2019332	C	AIRBUS - A380	UNKNOWN (Object)	A
2019333	E	OTHER - Military (Voyager)	OTHER - Military (Typhoon)	G
2019334	B	OTHER (AW169)	UNKNOWN (2 x RPAS)	G
2019335	B	SOCATA - TB20	CESSNA - 152	G

GLOSSARY OF DEFINITIONS AND ABBREVIATIONS

Risk Categories

Risk Category	ICAO 4444 PANS-ATM AIRPROX risk classification	Eurocontrol severity classification scheme (ESARR 2)[16]	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.

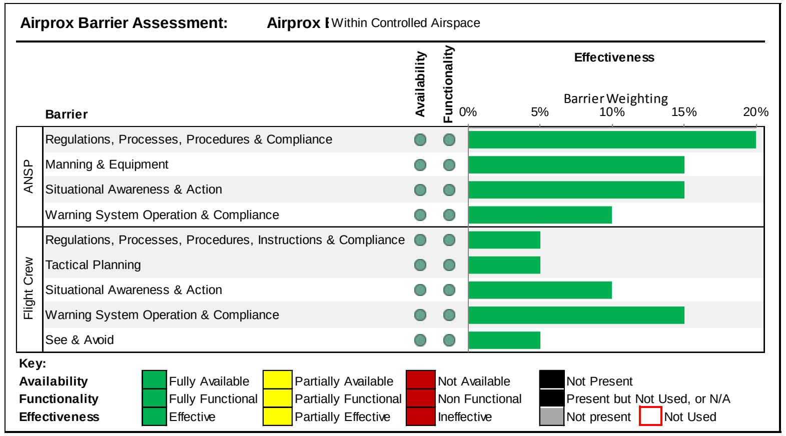
[16] ESARR - **E**UROCONTROL **Sa**fety **R**egulatory **R**equirement.

CURRENT AIRPROX BARRIER DEFINITIONS

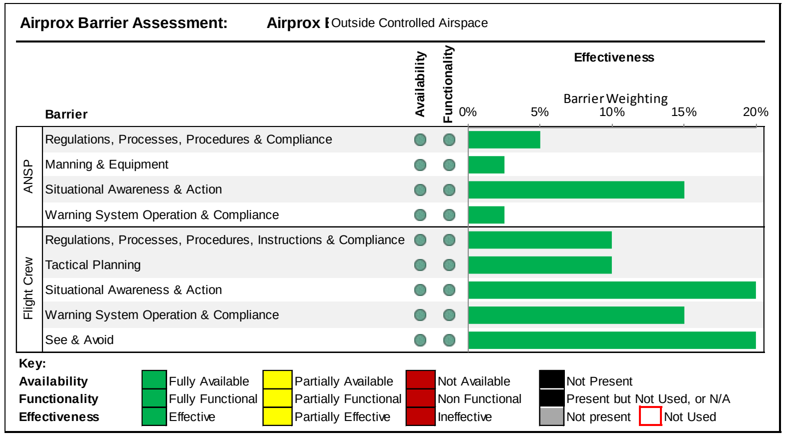
		Provision				Application				Guidance
		Full	Partial	None	Not Present	Full	Partial	None	Not Used	
Ground Elements	Regulations, Processes, Procedures and Compliance	Regulations Processes and Procedures were available and appropriate	Regulations, or Processes, or Procedures were available but were lacking in some respects	Regulations, or Processes, or Procedures were either not available or not appropriate	The Barrier was not relevant to the scenario (e.g. no ATC, no CWS fitted, aircraft obscured to each other or too far away to see) Note: U/S equipment is 'No Provision'	Regulations Processes and Procedures were fully complied with	Regulations, or Processes, or Procedures were only partially complied with	Regulations, or Processes, or 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; Basic Service where TI was not required to be passed; Electronic Warning Systems not used, Farnborough or Swanwick Mil)	Can include both organisational and unit regulations, processes or procedures
Ground Elements	Manning & Equipment	Manning and Equipment was appropriate and fully available	Manning was lacking in some respects Equipment was only partially serviceable (e.g. SSR only)	Manning was inappropriate or unavailable Equipment was inappropriate, non-functional or unavailable		Shift manning was optimal and relevant equipment was appropriately employed	Shift manning utilisation was sub-optimal Supervision was lacking in some respects Relevant equipment was not fully employed	Shift manning was inadequate or overtasked Supervision was inadequate Relevant equipment was not employed		Application should reflect how the available manning or equipment was used (e.g. If a sector is bandboxed unnecessarily then the assessment could be 'Partial' or 'None' subject to the outcome and controller workload)
Ground Elements	Situational Awareness of the Confliction & Action	Specific SA was available on both aircraft (e.g. both aircraft on frequency or on radar with SSR)	Only generic or late SA was available on one or both aircraft (e.g. no height or imprecise location)	SA relevant to the scenario was not available (e.g. conflicting aircraft unknown to the controller)		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		If the aircraft was receiving a *Basic Service*: **Application** = 'Not Used' (i.e. ATC not required to have SA or act) unless TI passed. If AGCS, did the **AG Op** influence the Airprox: *No* = Not Used; *Yes* = as per the input of the A/G Op
Ground Elements	Electronic Warning System Operation and Compliance	Appropriate warning systems were available and functional	Warning systems were available but were configured sub-optimally	Warning systems were available but were not utilised (e.g. not authorised for use) Warning systems were available but were either unserviceable or did not function as expected		Warning system alert was fully acted upon	Warning system alert was acted upon later than desirable	Warning system alert was not acted upon		Warning systems include Short Term Conflict Alert (STCA), Minimum Safe Altitude Warning (MSAW), Medium Term Conflict Detection (MTCD), Controlled Airspace Infringement Tool (CAIT).
Flight Elements	Regulations, Processes, Procedures and Compliance	Regulations, Processes and Procedures were available and appropriate	Regulations, or Processes, or Procedures were available but were lacking in some respects	Regulations, or Processes, or Procedures were either not available or not appropriate		Regulations, Processes and Procedures were fully complied with	Regulations, or Processes, or Procedures were only partially complied with	Regulations, or Processes, or Procedures were not complied with		Can include both organisational and flight regulations, processes or procedures
Flight Elements	Tactical Planning and Execution	Specific information, ATS or instructions were available	Only limited information, ATS or instructions were available (e.g. site not marked on map)	Information, instructions or ATS were either unavailable or inappropriate		The initial plan and its execution were fully effective	The plan execution, instruction-following, or requested ATS were partially effective	The plan execution, instruction-following or requested ATS were ineffective		Tactical planning can include pre-flight planning, en-route planning and/or dynamic planning. Execution of the plan and compliance with instructions should also be assessed.
Flight Elements	Situational Awareness of the Conflicting Aircraft & Action	Specific SA/TI from either external or onboard systems was available	Only generic or late SA/TI was available (e.g. gliders in the area, glider site active)	No SA/TI relevant to the scenario was available		The available SA/TI was fully acted upon	The available SA/TI was only partially acted upon	The available SA/TI was not acted upon		Refers to information gained on the other aircraft from R/T, TI or sensors (EC/CW Systems, Radar etc). It does not include SA from See and Avoid (assessed in a separate barrier).
Flight Elements	Electronic 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 alert was fully acted upon	Warning System alert was acted upon closer than desirable, or only partially acted upon	Warning System alert was not acted upon		Applies to system operation in the pure collision warning/avoidance function, not an assessment of the situational awareness that might be gained from information presented. Electronic warning systems include TCAS, TAS, PFLARM, FLARM, PilotAware etc.
Flight Elements	See & Avoid	At least one pilot sees the other aircraft early enough to take effective action.	Both or one pilot sees the other aircraft too late to take timely and effective action (i.e. the late-sighting scenario)	Neither pilot sees the other in time to materially increase separation (i.e. the non-sighting scenario)		At least one pilot takes timely and effective action/ inaction	At least one pilot takes emergency or late avoiding action	Neither pilot takes any effective action to increase separation		If the aircraft are not expected to see each other then = Not Used (e.g. both or one in cloud, or too far apart, or procedurally separated such that pilots would not be expected to apply see-and-avoid)

Barrier Effectiveness and Weighting

The 9 safety barriers used in 2019 were: ATM Regulations, Processes and Procedures, ATM Manning and Equipment; ATM Situational Awareness and Action; ATM Warning Systems and Compliance; Flight-Crew Regulations Processes, procedures and Compliance; Flight-crew Tactical Planning and Execution; Flight-Crew Situational Awareness and Action; Electronic Warning System Operation and Compliance 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 adjacent matrix. 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, 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.

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

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**