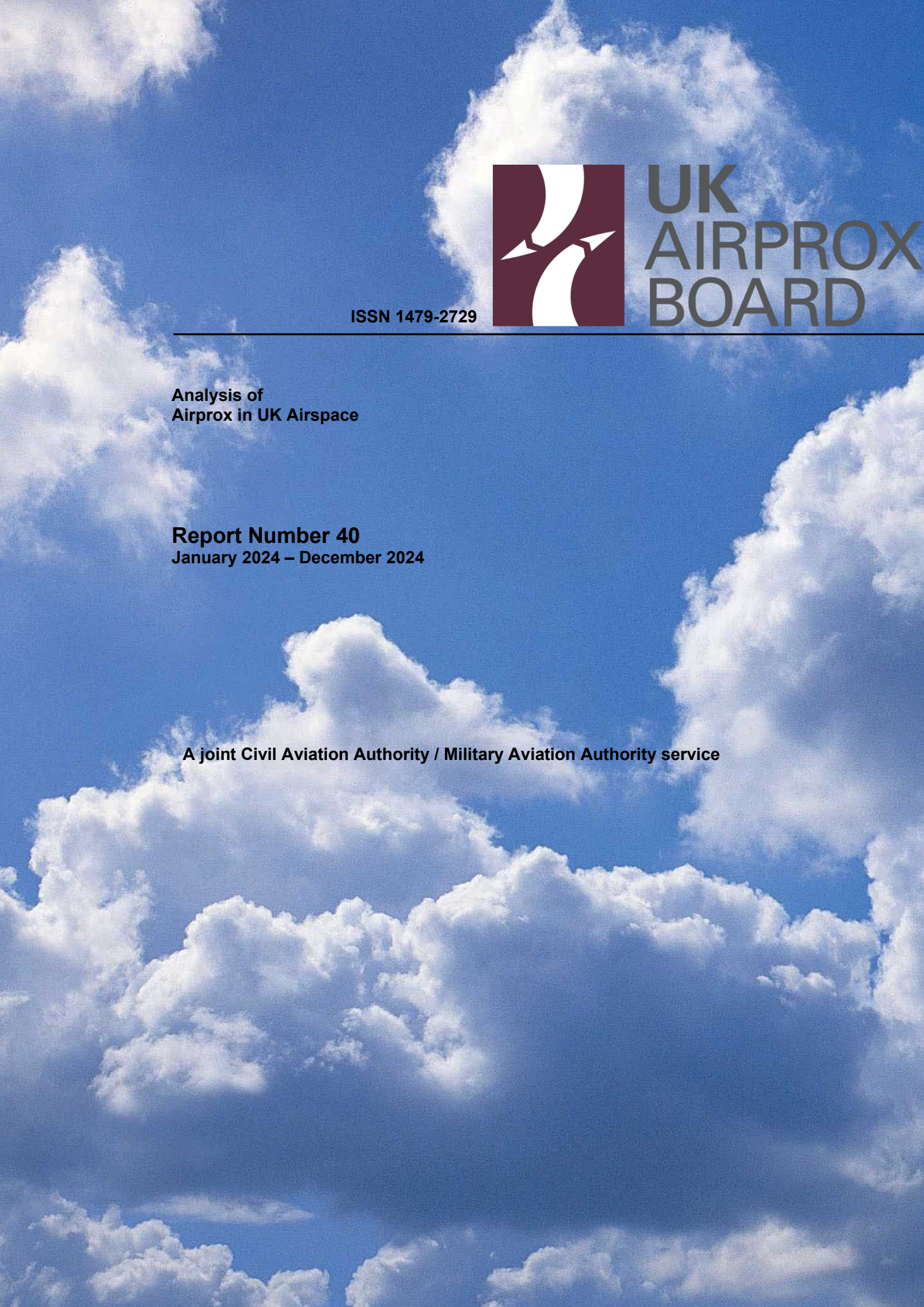

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UK AIRPROX BOARD

Analysis of Airprox in UK Airspace

Report Number 40
January 2024 – December 2024

A joint Civil Aviation Authority / Military Aviation Authority service

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Fortieth Report by the UK Airprox Board

Analysis of Airprox in UK Airspace
(January 2024 to December 2024)

Compiled by Director UK Airprox Board for

The Chief Executive Officer
UK Civil Aviation Authority

and

The Director
UK Military Aviation Authority

CONTENTS

EXECUTIVE SUMMARY

Airprox reporting in 2024, purely in terms of numbers, saw an overall increase in the order of 10% over the numbers reported in 2023. Within this, aircraft-to-aircraft Airprox reporting grew by 12% and Airprox involving UA/Other increased by around 7%. The impact of COVID-19 restrictions on GA flying in 2020 and early 2021 will clearly have an impact on the 5-year average figures for the next 2 years, so comparisons with previous years' levels will give a more coherent indication of reporting trends.

As with previous years, the vast majority (87%) of aircraft-to-aircraft events involved General Aviation Sports and Recreational aircraft. This is only very slightly higher than the 10-year average of 85% but represents a continuing trend whereby this sector is exerting an increasing influence on overall performance of the safety barriers to mid-air collision. Furthermore, the 5-year average figure of 88% indicates that the growth in the proportion of aircraft-to-aircraft events involving General Aviation has been greater during the last 5 years. Reinforcing this assertion is the fact that 99% of all risk-bearing aircraft-to-aircraft events involved a General Aviation Sports and Recreational aircraft (which includes those Airprox where the description of an unknown or untraced aircraft fitted this category). Therefore, it is by influencing the performance of this sector – by education and by regulation (if appropriate) – where the biggest gains in terms of a enhancing the safety of the contemporary operating environment will be made.

This contemporary operating environment continues to be, essentially, Class G airspace below an altitude of 3000ft. For aircraft-to-aircraft events, 92% occurred in class G airspace and 84% took place at or below 3000ft, so it is here where efforts on improving matters should be concentrated most. With the backdrop of an increase in RPAS BVLOS operations outside segregated airspace becoming a reality in the near future, this becomes even more important because an already highly populated sector of UK airspace will soon include new users.

The numbers of Airprox occurring in an ATZ or MATZ has increased when compared to 2023, and the trendline for these events is still indicating a positive gradient. Occurrences around airfields accounted for about a quarter of all aircraft-to-aircraft events at their peak in 2021, but have shown a reduction over the previous 2 years, representing 17% of all Airprox in 2023. However, in 2024 this reduction has been completely reversed and the proportion has once again increased to 24%. It is a concern that so many Airprox occur in areas where processes and procedures are in place which should reduce the likelihood of a loss of safe separation. To address this concern, education is the key – there is evidence that published procedures are not being followed and/or that non-standard activity is being undertaken without it being promulgated or announced, leading to the degradation of the situational awareness of others. Clearly, an aerodrome's procedures are published in order to maintain a degree of predictability to the activity around that airfield, but there does appear to be a reluctance from pilots to speak on the radio when they have chosen – or are obliged – to deviate from those published procedures. That a significant percentage of aircraft-to-aircraft Airprox involving deviation from published procedures is being seen year-on-year indicates that there may be room for pilot training (initial and refresher) to be enhanced in this regard, with more exposure to different types of airfield join and departure, and reinforcement training in considerations for any necessary deviations from the published procedures (Aviate, Navigate, Communicate).

Airprox involving military aircraft (which includes foreign military aircraft, such as visiting forces or those permanently based in the UK) represented 20% of all aircraft-to-aircraft Airprox in 2024 (including those cases involving RPAS where a full evaluation has been made). With such a small sample size (42) it can be difficult to draw any firm conclusions, but analysis of the factors contributing to these Airprox does draw out a number of recurring themes. It is clear that significant work has been undertaken to enhance the electronic conspicuity capabilities of military aircraft. Many now carry combinations of equipment that will give increased coverage of the myriad solutions that are available to the General Aviation market, but compatibility and/or performance issues are prevalent. Although the UKAB does not have the technical resource to understand why EC interactions do not occur when

they would be expected to do so, it is likely that this is down to both the siting in the aircraft of carry-on EC equipment, and the performance of internal equipment antennae, adversely affecting the detectability of the devices concerned. There is continued evidence that the transition to new military air traffic control equipment and a 'hub and spoke' model of regional control centres may still be having impacts on the performance of the Ground Elements barriers. The factors contributing to the performance degradation of these barriers are a failure to follow procedures, the late or non-passage of Traffic Information, controller instructions contributing to the Airprox and the initiation of short-term conflict alerts, all of which point towards a suggestion that controller workload was high. It is important that any second or third order effects of the transition to new equipment and working practices be closely monitored.

For Airprox involving RPAS when a full evaluation has been possible (i.e., where the Airprox was reported by the RPAS operator, or the UKAB has been able to trace the RPAS operator) the weaknesses of all the traditional barriers remains concerning. As with previous years, the sample size is extremely small (16), but little has changed – the Ground Elements are seldom, if ever, aware of the RPAS operations and so add little to the mitigation of the collision risk. For the Flight Elements, pre-flight notification of RPAS activity below 400ft in the Open category is essentially non-existent – the NOTAM system is not a viable method, and RPAS operators use a number of different notification systems for their activity (although there is no requirement for them to do so), none of which are regulated. Given the size of RPAS in the Open category, the See and Avoid barrier is only really viable from the RPAS operator's perspective, so it is difficult to see where effective barrier mitigations to an Airprox with an RPAS once airborne can be made UNLESS interoperable EC equipment is mandated throughout Class G airspace, to increase the effectiveness of the Electronic Warning Systems and Situational Awareness barriers for the Flight Elements. By extension, this should also improve the performance of the See and Avoid barrier, although pilots of crewed aviation need to be aware that, from their perspective, reliance on the See and Avoid barrier in Class G airspace currently offers little defence against an Airprox (or a collision) with an RPAS because, in all bar one of the instances of this type of Airprox in 2024, the pilot of the crewed aircraft was never aware of the presence of the RPAS.

The dominance of the GA Sports and Recreational community in the Airprox landscape is unsurprising, given the preponderance of Airprox that occur in Class G airspace. The proportion of risk-bearing Airprox which involve the GA community has once again reached near-total dominance – although 2023 saw a decrease in the GA share of risk-bearing Airprox and an increase in the military share, this has been reversed in 2024. However, the main driver behind the last 10 years' risk picture has been the success of the military sector in reducing their risk. It should also be noted that the commercial sectors' (CAT and Civil Commercial) share of aircraft-to-aircraft risk-bearing Airprox does remain low, but has increased from a 10% share in 2023 to a 19% share in 2024. This is its highest level for 10 years, and has been driven exclusively by the Civil Commercial encounters with, mostly, General Aviation.

The Barrier performance and Contributory Factors allow focus on certain areas, but the fact that the observations and the associated Contributory Factors are relatively constant, and have remained so since this data has been collected, continues to indicate that it may be time to look at regulatory intervention to improve the picture from an Airprox perspective. A review of the private pilot training syllabus in the General Aviation Sports and Recreational sector may help to identify areas where this can be expanded, to include additional training in those areas that have been identified as weak by UKAB analysis. Furthermore, an understanding that a lack of currency and recency has an effect on human performance will help individuals to plan to operate within their own personal limitations, but may also indicate that more frequent flights with an instructor, or even a periodic check flight, might be necessary. However, given the expansion into RPAS BVLOS operations outside segregated airspace, and the enablers for this to occur, the single improvement that would have the biggest impact in terms of mid-air collision risk mitigation remains a single – or suite of – interoperable electronic conspicuity protocol(s) being mandated throughout all classes of airspace in the UK.

INTRODUCTION

The UK Airprox Board (UKAB) assessed 298 Airprox that were reported in the calendar year 2024, of which 208 were piloted aircraft-to-aircraft events with 90 involving UA/Other. Whilst the overall total did not surpass the 328 reports received in 2019, the number of aircraft-to-aircraft reports is the highest ever received. This represents a total growth of 10% over 2023, which breaks down as an increase in aircraft-to-aircraft reports of 12% and an increase in drone reports of 7%, although the number of drone reports received is still well below its peak of 139 in 2018. There are many factors that can affect the rate of Airprox reporting, such as weather, flying rates and consumer demand, so caution should be exercised when looking for the reasons for the growth in reporting over the last year. It is highly likely that many Airprox events go unreported each year, so it is perhaps encouraging to see this increase in numbers of Airprox reports when compared to 2023, and this may be one of the effects of increased UKAB engagement with the stakeholder community over the last 2 years. It will take a number of years for the statistical effects of the COVID-19 restrictions on the aviation sector to be overcome but, when these restrictions are accounted for, the increased Airprox reporting pre- and post-COVID may not indicate a consolidated growth in reporting, rather, brief 'spikes' that would not be unexpected from a statistical standpoint.

Through the assessment of safety barriers and the collection of contributory factors, the insight that can now be achieved is continuing to provide an essential and consistent view of the factors which underpin the reasons behind Airprox; this will be the emphasis of the majority of this report. It is only by directly focussing on and targeting specific areas of the aviation community, and by tackling their specific behaviours, that the instances of Airprox can begin to be influenced, Mid Air Collision (MAC) risk can be mitigated, and a contribution can be made to augmenting Air Safety for all.

As with the approach adopted in the previous 4 years (since the inception of barrier methodology), this report will cover in detail the 5 weakest performing barriers and examine the observed behaviours behind them to identify areas where interventions can be more effectively focussed to better mitigate against the risk of MAC and enhance air safety. As in previous reports, statistics will, of course, be presented, but these need to be taken in the context of the environment from which they are elicited; care must be taken not to draw inaccurate or incomplete conclusions, and comparisons with previous years should not be made apart from in specific and focussed areas.

Although establishing what happened to lead to an Airprox is important in terms of understanding the context of an individual event, no two Airprox will ever be the same. It is for this reason that it is important to focus on the 'why' and the 'so what' as opposed to just the 'what' and 'how many'; observations from this Airprox year reinforce those of the last annual report in the identification of the areas in which the most difference can be made. By identifying the weakest barriers, understanding the reasons for their poor performance and targeting positive outreach action in these areas, the most tangible difference can be achieved. Notwithstanding, this approach does rely on each of the aviation communities understanding their own context and safety culture, and it is for them to ensure that there are appropriate mechanisms and measures in place to elicit change. Be they a General Aviation flying or gliding club, an airfield, a military unit, a commercial operating authority or an individual General Aviation pilot, the responsibility to exercise the privilege of operating in unregulated airspace and the ability to enjoy the freedoms it gives carries an individual and collective responsibility to continually strive to augment air safety and help to maintain a safe environment that can be enjoyed by all.

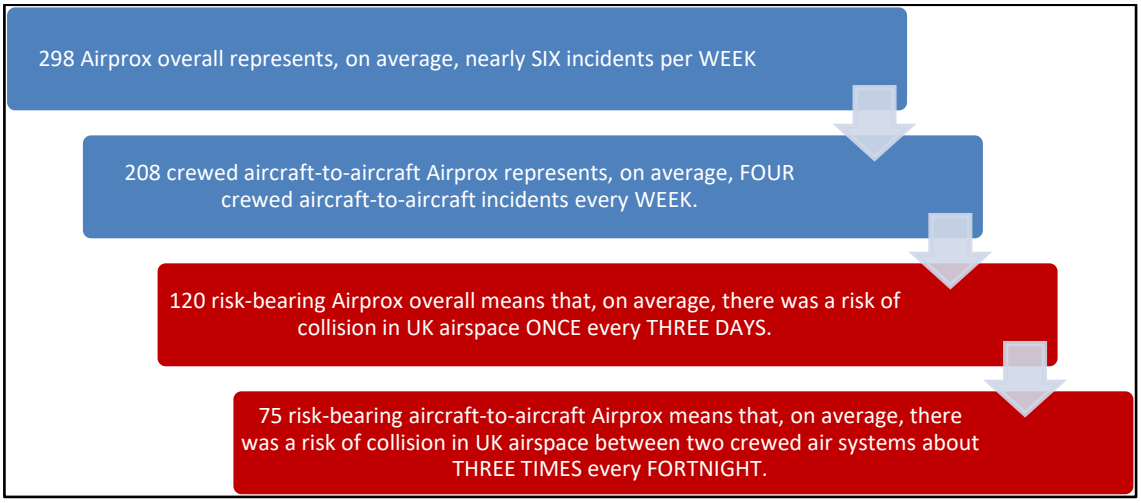
The weakest areas continue to be: situational awareness which is captured in the **Ground Elements – Situational Awareness barrier** and the **Flight Elements – Situational Awareness barrier**; communication, planning and execution which is captured in the **Flight Elements – Tactical Planning and Execution barrier;** Electronic Conspicuity (EC) which is captured in the **Flight Elements – Electronic Warning Systems barrier**, and; the **Flight Elements – See and Avoid barrier**. Within these barriers, the most common Contributory Factors (CF) are generic, inaccurate, late or no situational awareness; planning and communication; incompatibility/performance of EC

equipment, and; lookout and visual scanning for potential threat aircraft. There is still a welcome focus within the DfT and CAA on promoting EC, and a common approach will certainly improve situational awareness in both ground and air elements. Indeed, the March 2025 Joint Statement from the DfT and CAA on the use of 978MHz for remotely piloted vehicles already gives some certainty as to how these air vehicles might be detected by others. Furthermore, and although the latest EC funding initiative was discontinued on 31st March 2024, it is hoped that funding will once again be made available.

Ofcom CAA Joint Statement on use of 978 MHz for UAS and change in audio PMSE access
Electronic conspicuity devices | Civil Aviation Authority (caa.co.uk)

Whilst there is a technical element to the performance of the barriers (most noticeably the **Flight Elements – Electronic Warning Systems** barrier), it is increased adoption of EC, an understanding of how to best exploit the information it provides and, most importantly, an acknowledgement that there needs to be a consistency in approach which promotes compatibility of equipment which operate to agreed standards that will deliver the most benefit. It is also important to recognise that the performance of all the barriers can be compromised by Human Factors, and that this can be addressed through recognising and accepting the observations, a willingness to learn from the actions of others, a commitment to learning, a sense of personal responsibility with respect to threat and error management and an appreciation of the effects of poor preparation, currency and recency.

HEADLINE FIGURES AND HISTORIC DATA



All Airprox 2014 - 2024

RISK	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	10yr AVERAGE
A	28	41	51	45	65	60	17	43	37	27	27	41
B	68	66	72	82	96	86	41	60	77	78	93	75
C	86	78	104	111	120	147	73	118	128	118	122	112
D	9	12	11	12	5	11	3	6	5	13	13	9
E	33	20	27	22	33	24	29	26	30	34	43	29
Risk Bearing	96	107	123	127	161	146	58	103	114	105	120	116
% Risk Bearing	43%	49%	46%	47%	50%	45%	36%	41%	41%	39%	40%	43%
Total	224	217	265	272	319	328	163	253	277	270	298	266

Table 1: All Airprox 2014–2024 by Risk Category

Once figures have been adjusted to take account of the effects of the COVID-19 restrictions in 2020 and the first three months of 2021, the steady 10% year-on-year increase in the numbers of reported Airprox, which appeared to have reached a plateau last year, is once again apparent. Additionally, there has been a slight growth (~8% on average) in Airprox involving UA/Other over the figures for 2021, 2022, 2023 and 2024. Furthermore, the increase in reporting of Airprox by the RPAS community seen over the past 3 years has continued in 2024, demonstrating an increased belief in the value added by the submission of such reports. This increase in reporting from the RPAS community is encouraging as it allows a full evaluation process to be conducted and extract as many lessons as possible from these events which might otherwise go unreported; in all but one of the cases, the pilot of the other aircraft did not see the UA, and in the case where they did, their assessment of the separation differed greatly from that of the RPAS operator, leading the Board to wonder if separation from an RPAS can truly be assessed with any degree of accuracy, given that sizes of RPAS differ greatly. The particular sub-set of the aviation community reporting the most observations of encounters with UA/Other is still the Commercial Air Transport (large carriers) (CAT) category. It is likely that the reasons for this remain related to the stages of flight in which they observe the UA/Other, which are predominantly in the departure or landing phase, a phase typically characterised by high workload and high rates of climb/descent which tend to precipitate a fleeting encounter whereby it is impossible for the pilots to manoeuvre effectively to increase separation. This results in an event which, by its very nature, often presents a risk of collision. As a result, and in order to gain a better appreciation of Airprox and the associated risk of collision, it is useful to think about the 2 areas (aircraft-to-aircraft encounters and UA/Other encounters) separately.

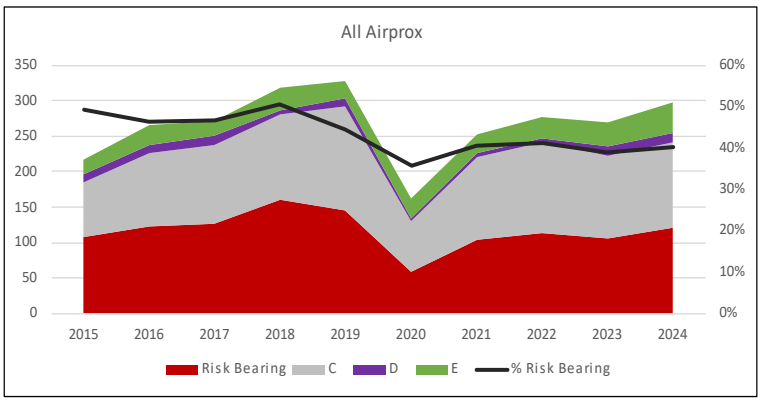


Figure 1: All Airprox 2015–2024 by Risk Category

All Aircraft-to-Aircraft Airprox 2014 - 2024

RISK	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	10yr AVERAGE
A	25	27	17	13	20	18	8	22	20	12	8	17
B	64	52	41	49	50	50	32	42	57	55	67	50
C	85	75	79	75	80	106	51	80	91	84	93	81
D	6	5	8	5	2	6	2	5	1	7	5	5
E	33	18	25	20	29	23	25	23	26	27	35	25
Risk Bearing	89	79	58	62	70	68	40	64	77	67	75	66
% Risk Bearing	42%	45%	34%	38%	39%	33%	34%	37%	39%	36%	36%	37%
Ac-Ac Total	213	177	170	162	181	203	118	172	195	185	208	177

Table 2: All aircraft-to-aircraft Airprox 2014–2024 by Risk Category

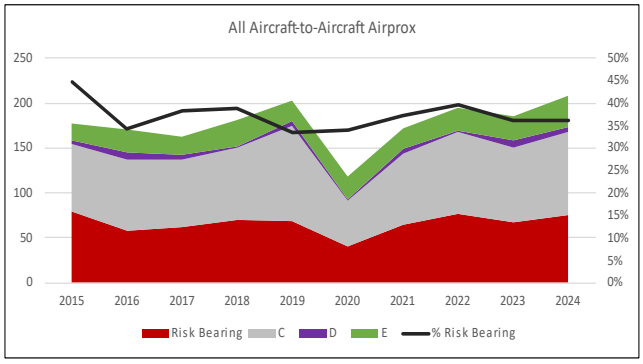


Figure 2: All aircraft-to-aircraft Airprox 2015–2024 by Risk Category

As can be seen in Table 2 and Figure 2, the reported numbers and the associated proportion of Airprox assessed by the Board to have been risk-bearing have remained largely constant over the last 10 years, notwithstanding the sharp drop in numbers of reported Airprox experienced as a direct result of the COVID-19 restrictions in 2020 and early 2021. In fact, the percentage risk-bearing figure for 2024 is only slightly lower than the current 10-year average at 36%. What is more interesting is the sector mix composition of risk-bearing events, where it is evident that the GA Sports and Recreational community has experienced a steady rise in the

proportion of risk-bearing Airprox over the past 7 years. Apart from a slight decrease in 2023, where the reduced GA share was transferred almost directly to the military community, this steady growth in involvement in risk-bearing Airprox by the GA Sports and Recreational sector is a concerning trend – there has been no significant reduction in this sector's participation in the most serious Airprox events since 2016. This will be explored further in the coming sections.

Turning specifically to Airprox involving UA/Other, the 10-year picture has been included to explicitly demonstrate the surge which started in 2014 as the small drone recreational market, and reports of Airprox with these types of aircraft, increased dramatically.

Airprox Involving UA/OTHER 2014-2024

RISK	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	10yr AVERAGE
A	3	14	34	32	45	42	9	21	17	15	19	23
B	4	14	31	33	46	36	9	18	20	23	26	24
C	1	3	25	36	40	41	22	38	37	34	29	28
D	3	7	3	7	3	5	1	1	4	6	8	4
E	0	2	2	2	4	1	4	3	4	7	8	3
Risk Bearing	7	28	65	65	91	78	18	39	37	38	45	50
% Risk Bearing	0%	70%	68%	59%	66%	62%	40%	48%	45%	45%	50%	55%
Total	11	40	95	110	138	125	45	81	82	85	90	82

Table 3: Airprox Involving UA/Other 2014–2024 by Risk Category

Following the initial increase in reported Airprox involving UA/Other, the picture began to stabilise with the introduction of regulation and registration. The increased and continued focus on this area remains critical as commercial entities seek to exploit technological advances, generating new opportunities which will take larger, non-recreational drones more into the realms of Class G airspace and Beyond Visual Line-Of-Sight (BVLOS). Observations from Airprox incidents have reinforced the concern over interactions in the sub-500ft AGL height band, where neither the RPAS flyer (often sub-400ft AGL), nor the piloted aircraft (military or those civilian-regulated aircraft that have been granted a CAA exemption from the '500ft rule' through ORS4) need to gain permission for, or are required to promulgate, their activities. The continued potential for increased risk in this area is concerning; however, the biggest area for potential risk lies in the development of BVLOS capabilities which will most likely see RPAS venturing into Class G airspace above 500ft AGL, and almost certainly in the 0-3000ft altitude band, which is where the majority of all Airprox occur. That said, it is pleasing that there is continued and increasing evidence of RPAS operators taking responsibility to report Airprox. This means that there is an opportunity to thoroughly examine the event, trace the other aircraft, understand the context and fully discuss and evaluate the circumstances surrounding the event. This has led to some interesting insights into Airprox involving UA/Other, and raised some previously unknown issues with regard to the performance of the 'traditional' MAC safety barriers and how those performance deficiencies can be mitigated. Please see the UA/Other section for analysis.

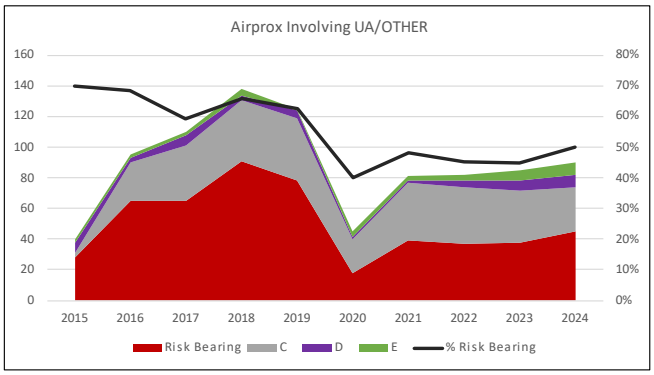


Figure 3:Airprox involving UA/Other 2015–2024 by Risk Category

SECTOR MIX 2015-2024

Airprox vary by sector. They vary by risk distribution, airspace and altitude and each sector requires specific examination to best understand the Airprox landscape. There are 7 sectors of interest: General Aviation (including Sports and Recreational and PPL/CPL training), Civil Commercial (including air taxis, and commercial rotary); Commercial Air Transport (primarily large air carriers); Military (including Foreign military); Emergency Services (covering air ambulance, fire, police and coastguard); Unknown aircraft (although the aircraft in this category could not be traced, their descriptions are almost exclusively descriptions of general aviation light aircraft or gliders) and, finally, UA/Other (which includes RPAS, model aircraft, balloons, kites, unknown objects etc).

> For the purposes of this report, these sectors will be abbreviated as follows: GA, Civ_Comm, CAT, Mil, Emerg-Servs, Unk ac and UA/OTHER

This section presents the data in graphical and diagrammatic form and describes Airprox in terms of sector mix, altitude, airspace, and risk category. It describes the 'what' and makes no attempt to deduce the 'why' at this point in the report. Observations and insights as to the 'why' will be explored in the Safety Barriers and Contributory Factors sections.

It is important to understand the context around those that operate within certain sector definitions: Civ_Comm, Emerg Servs and Mil sectors are professional pilots operating in primarily Class G airspace; The CAT sector represents professional pilots, primarily operating in Controlled Airspace and the GA and Unk ac (including untraced) sectors represent pilots flying primarily for recreational purposes, operating in Class G airspace and flying the most diverse set of air vehicles, including gliders, lighter-than-air vehicles, microlights and light-aircraft of numerous configurations. Figure 4 below depicts these sector interactions from 2015. The areas of interest are any mix which involves GA aircraft, specifically GA-GA, and any involving Military aircraft.

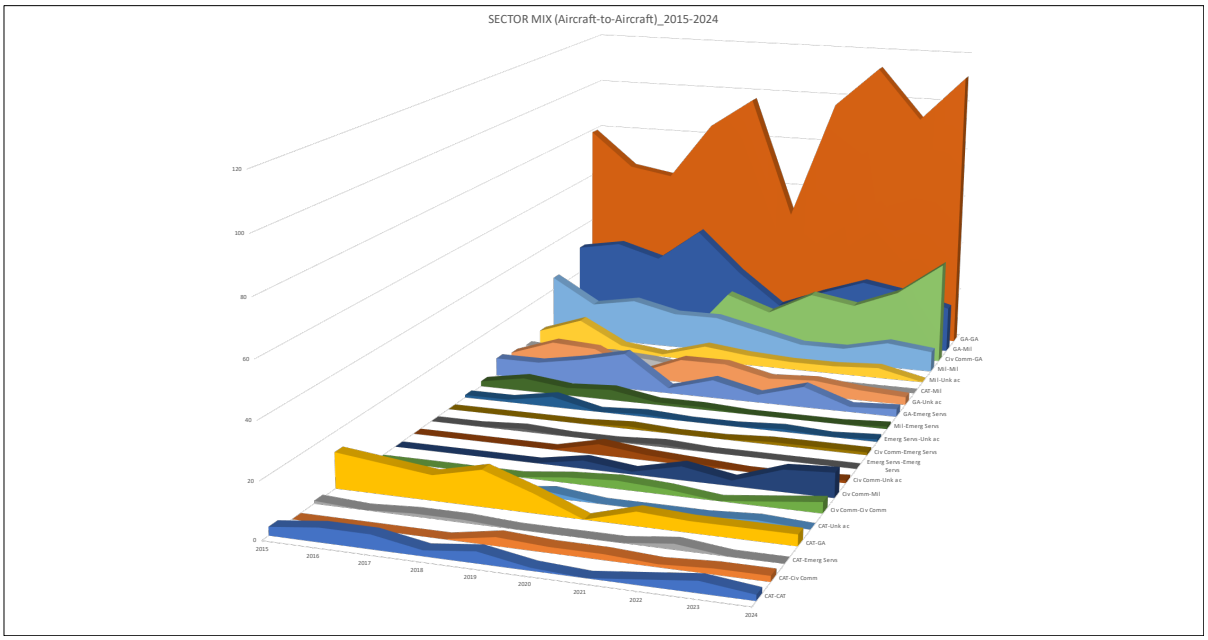


Figure 4: All Aircraft-to-Aircraft Airprox 2015–2024 by Sector Mix

Figure 5 shows the Sector mix interaction as a percentage of the 1771 aircraft-to-aircraft occurrences reported between 2015 and 2024 (note that the small numbers of Emerg Servs and Civ Comm reflect their relatively recent inclusion as a specific category where previously they would have been captured in either CAT or GA). It is striking that only 14% of the chart shows non-GA sector interactions. A similar ratio is also reflected in the 2024, 2023, 2022 and 2021 distributions.

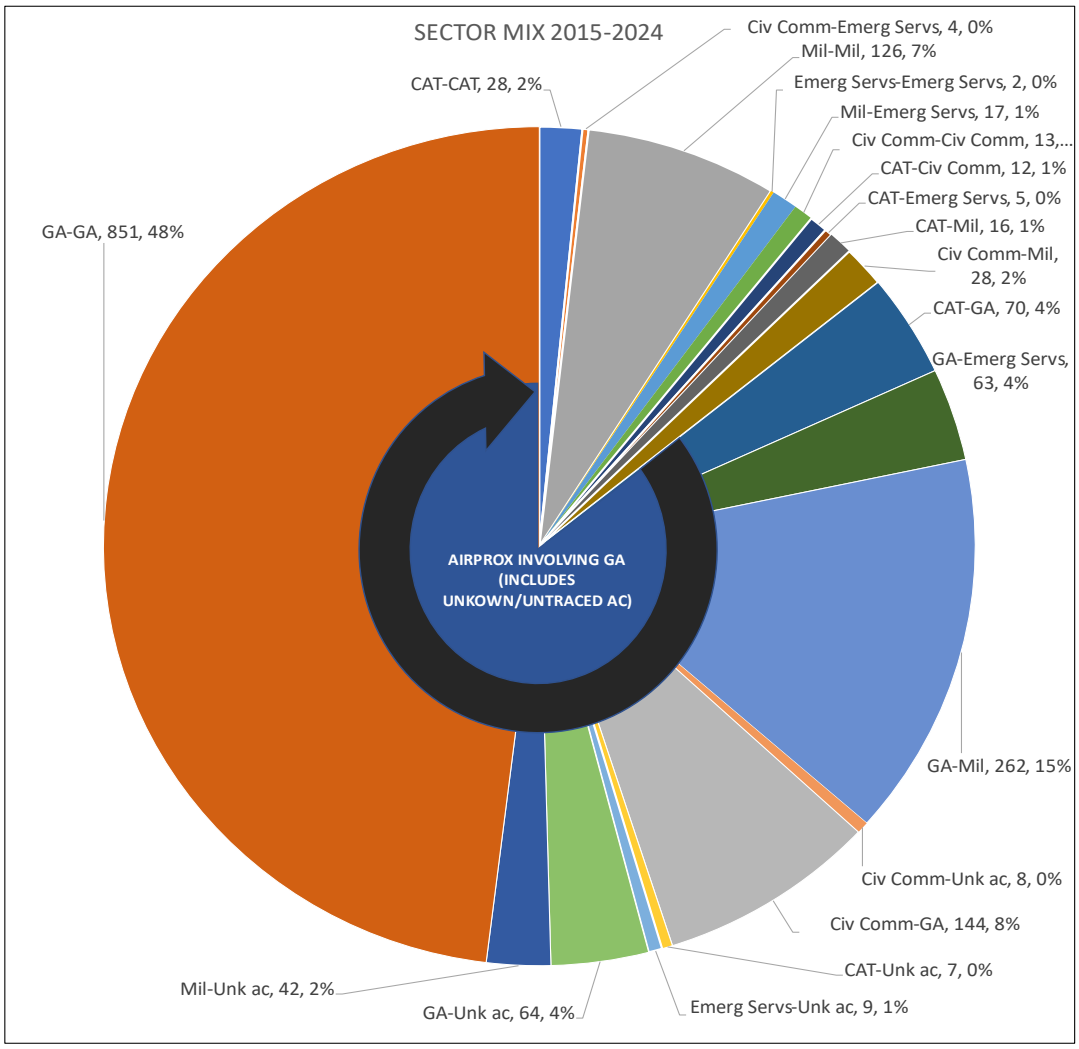


Figure 5: All Aircraft-to-Aircraft Airprox 2015–2024 by Sector Mix

Understanding this picture is important as it describes the significant influence of the GA Sports and Recreational community on the Airprox landscape and emphasises the importance and value of the sectorised approach to understanding Airprox.

2015-2024

86% of aircraft-to-aircraft events involved a GA Sports and Recreational light aircraft (this number includes Unknown_Untraced aircraft where the description fitted this category)

It is also useful to consider the percentage of risk-bearing Airprox, in terms of overall percentage, and percentages of risk-bearing of those events involving GA, Mil and CAT_Civ_Comm.

RISK BEARING TRENDS

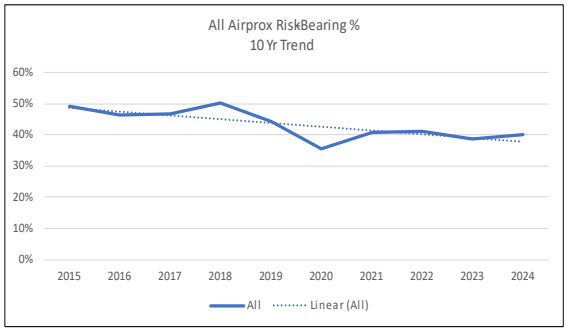


Figure 6: All Airprox Risk Bearing % 2015–2024

The percentage risk-bearing figures for 2024 are 3% lower than the 10-year average, and the overall linear trend does indicate a gradual decline in the percentage of risk bearing Airprox. It should be noted that Airprox involving UA/Other are included in this graphic which will have a more negative influence on the trend-line, given that the majority of UA/Other encounters are within the CAT and Civ_Comm sectors where a higher proportion of events that are determined to be risk-bearing are seen.

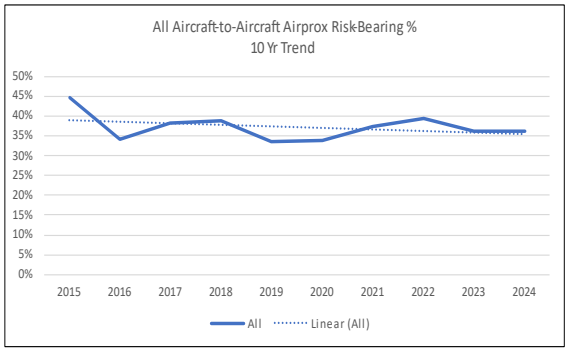


Figure 7: All Aircraft-to-Aircraft Airprox Risk Bearing % 2015–2024

When looking at aircraft-to-aircraft events in isolation – Figure 7 – the picture is not quite as positive; although it also shows a decreasing trend over 10 years, the downward gradient is shallower than the graph at Figure 6. However, to better understand those areas where there has been a change in the percentage of risk-bearing events it is useful to consider the sector distributions: Figure 8 depicts the risk-bearing percentage by sector of all aircraft-to-aircraft Airprox.

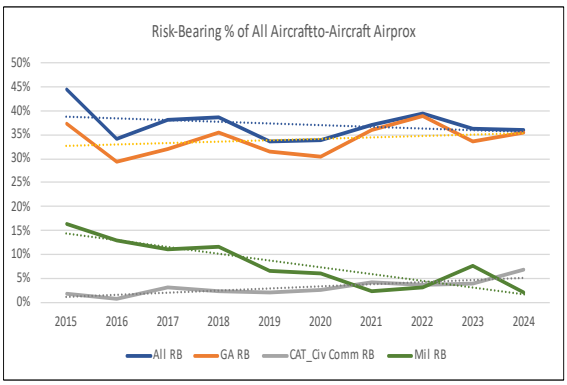


Figure 8: All Aircraft-to-Aircraft Airprox Risk Bearing % by sector 2015–2024

In 2024, risk-bearing Airprox involving Military aircraft represented 2% (down from 8% in 2023) of all aircraft-to-aircraft Airprox and risk-bearing Airprox involving GA aircraft represented 36% (up from 34% in 2023) of all aircraft-to-aircraft Airprox. The steady decline over the last 10 years in those risk-bearing events involving Military aircraft has been encouraging, although it appears likely that this may have now reached its nadir. Moreover, the military SMS is clearly effective, and the trend in military risk-bearing Airprox remains downward. It is unlikely that the military will be able to eradicate risk-bearing events entirely in the current regulatory landscape.

The final graphs and charts in this section – Figures 9 and 10 – show the *sector risk-bearing percentage* of all risk-bearing aircraft-to-aircraft Airprox. It can be seen that the GA Sports and Recreational community represented around 84% of all risk bearing aircraft-to-aircraft Airprox in 2015 and this has steadily increased over the years to 91% in 2018 and then to a near-total dominance of risk-bearing events at 99% in 2022 and also in 2024. Although there was a slight decrease to a 93% share in 2023, it is clear that the highest risk in terms of Airprox lies with the GA sector. For the military sector, 37% of risk bearing aircraft-to-aircraft Airprox involved military aircraft in 2015, decreasing to 30% in 2018 and now at 5% in 2024, although there was a marked increase last year over its previously lowest point of 6% in 2021. Nonetheless, the trend is still significantly downwards and so a single year's figures should not be taken in isolation. Note – the percentage totals per year do not combine to give 100%. This is because (at least) 2 aircraft are involved in a single Airprox event, and when those Airprox involve differing sectors, the instance will be counted in the figures for each sector.

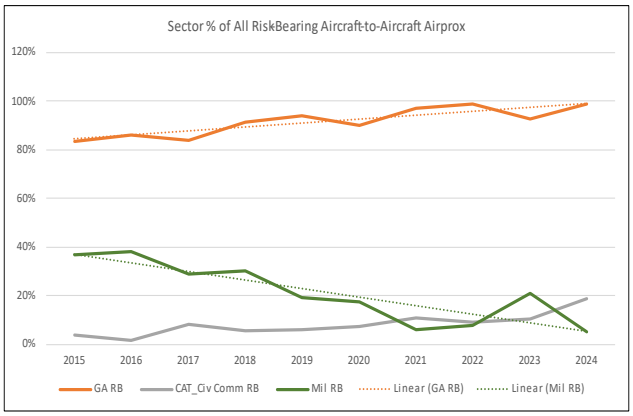


Figure 9: All Aircraft-to-Aircraft Airprox Risk-Bearing % by sector 2015–2024

In 2024, 87% of aircraft-to-aircraft events involved a GA Sports and Recreational light aircraft (this number includes Unknown_Untraced aircraft where the description fitted this category)

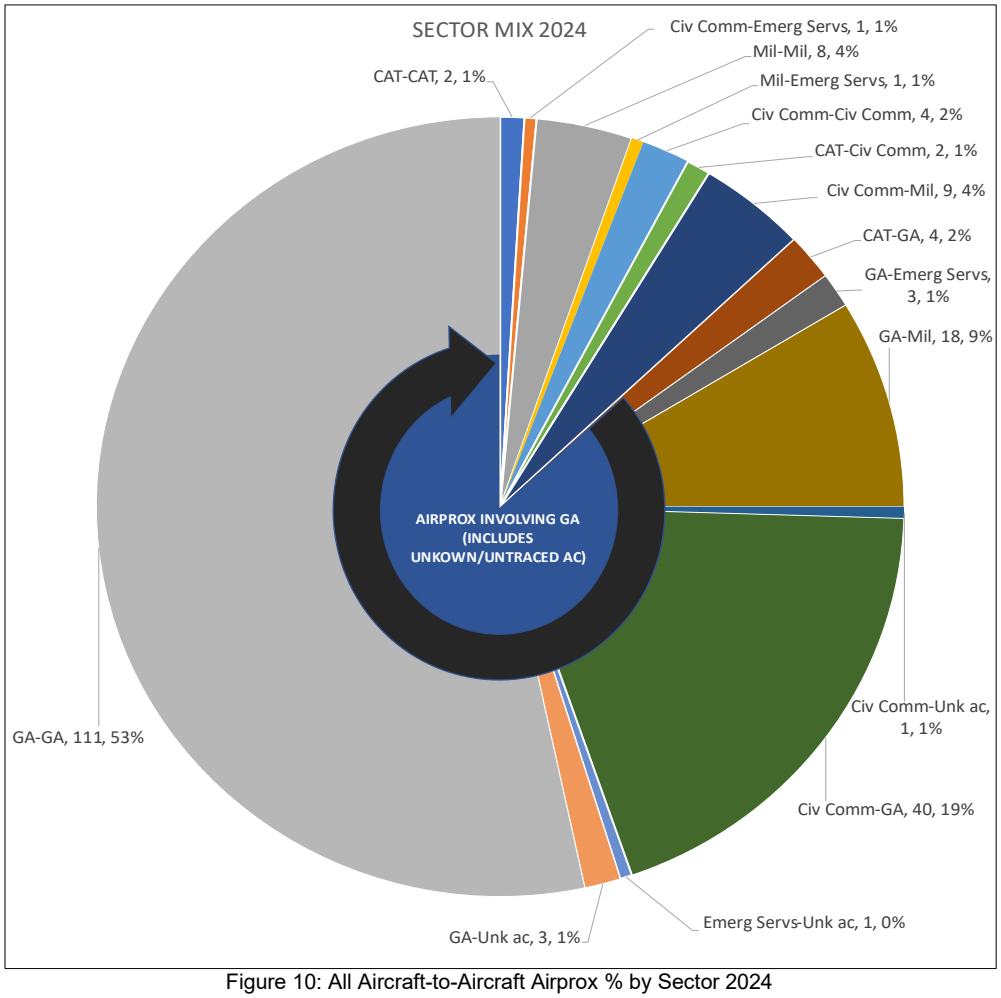


Figure 10: All Aircraft-to-Aircraft Airprox % by Sector 2024

In 2024, 99% of all risk-bearing aircraft-to-aircraft events involved a GA Sports and Recreational light aircraft (this number includes Unknown_Untraced aircraft where the description fitted this category)

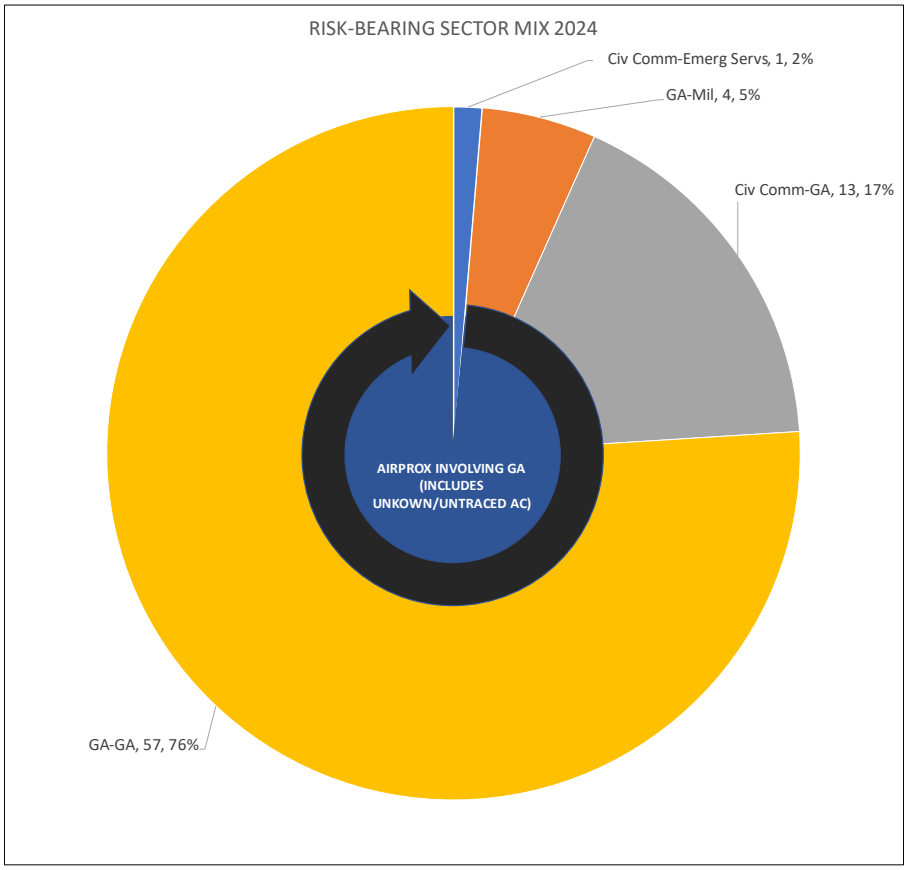


Figure 11: All Risk-Bearing Aircraft-to-Aircraft Airprox % by Sector 2024

ALTITUDE, AIRSPACE AND RISK – 2024 OVERVIEW

The following collection of charts depicts airspace, altitude, and risk combinations for 2024. As previously articulated, 87% of all aircraft-to-aircraft Airprox involved either the GA community or unknown/untraced aircraft; most of these occurred in Class G airspace below 3000ft.

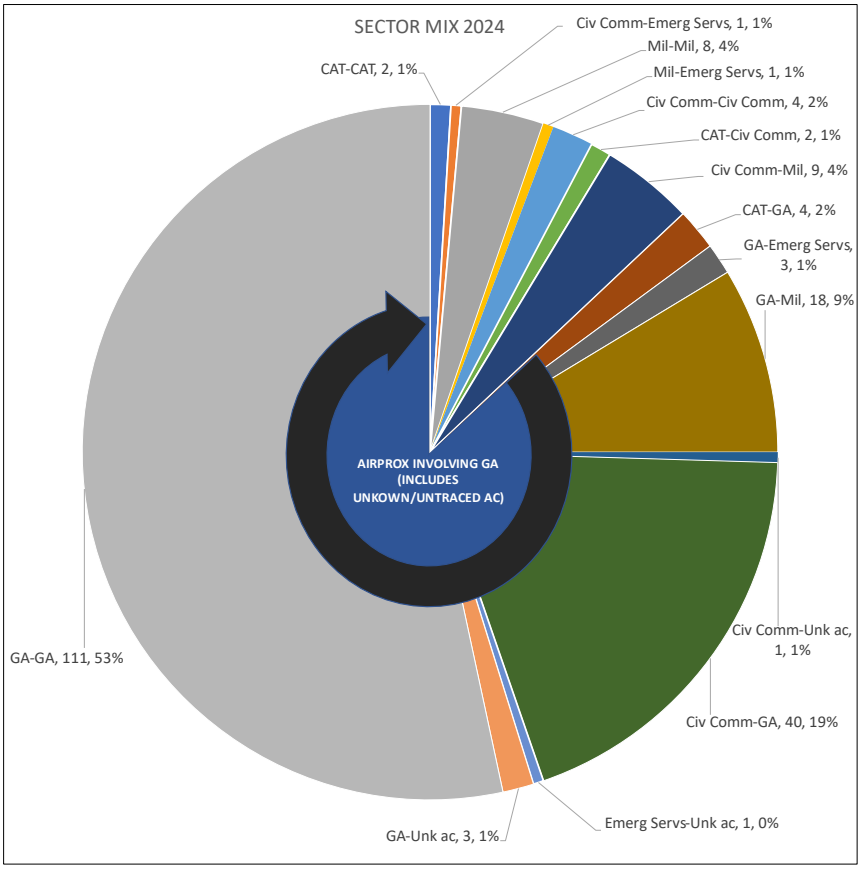


Figure 12: All Aircraft-to-Aircraft Airprox % by Sector 2024

In 2024, 87% of aircraft-to-aircraft events involved a GA Sports and Recreational light aircraft (this number includes Unknown_Untraced aircraft where the description fitted this category)

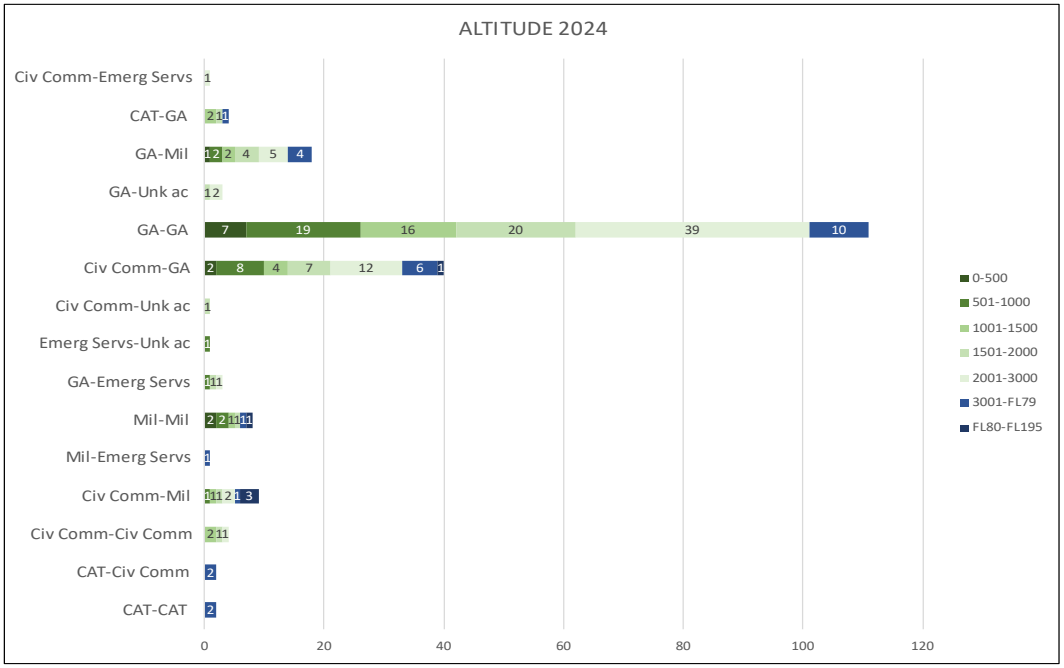


Figure 13: All Aircraft-to-Aircraft Airprox by Sector and Altitude 2024

In 2024, 77% of all events and 84% of all aircraft-to-aircraft events took place at or below an altitude of 3000ft.

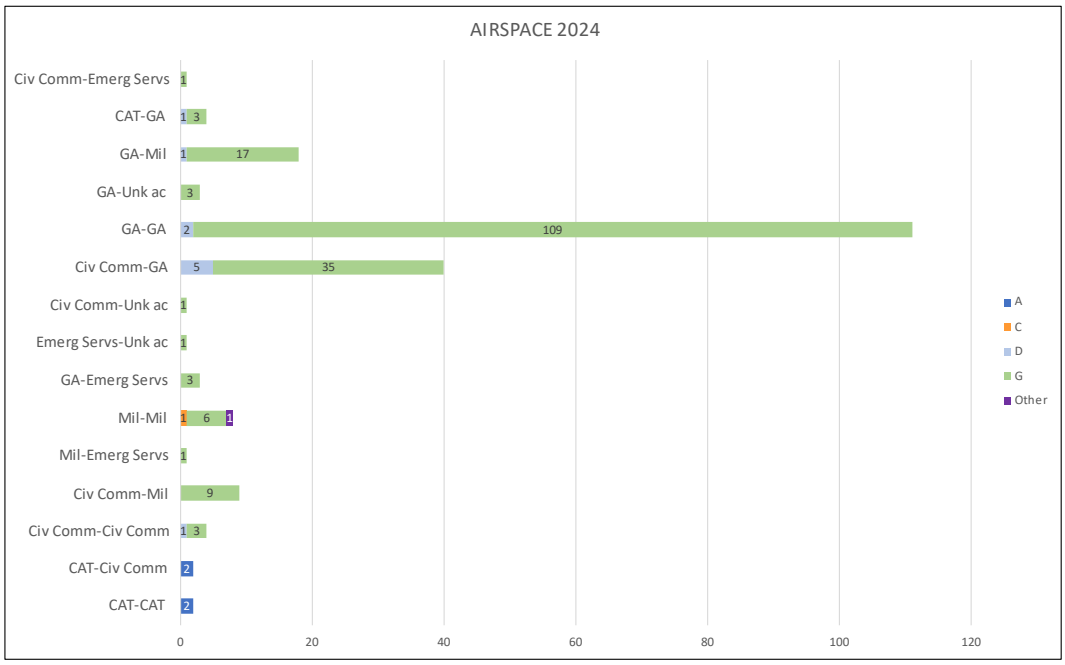


Figure 14: All Aircraft-to-Aircraft Airprox by Sector and Airspace 2024

In 2024, 76% of all events and 92% of all aircraft-to-aircraft events took place in Class G Airspace

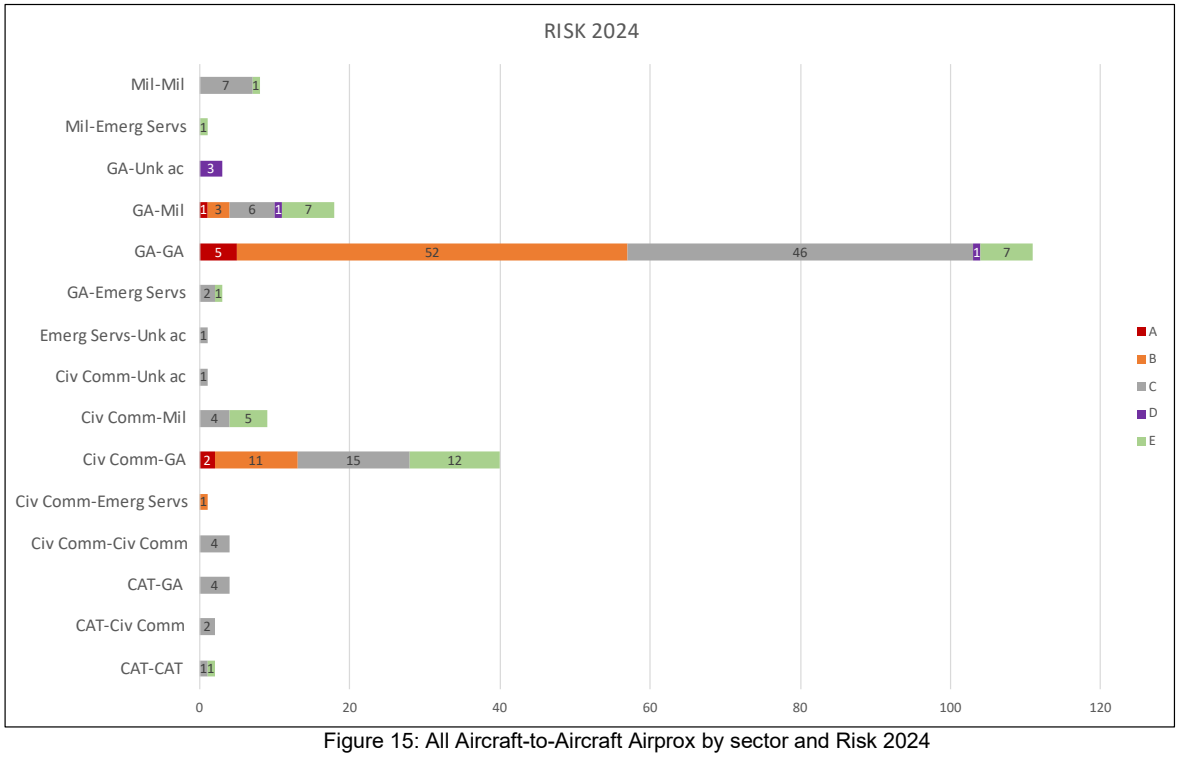


Figure 15: All Aircraft-to-Aircraft Airprox by sector and Risk 2024

It has already been shown that 99% of all risk-bearing aircraft-to-aircraft Airprox occur in the GA Sports and Recreational community, but it is useful to have a graphical breakdown of the specifics. The above chart clearly shows the sector mix distributions, and the levels of risk for each sector combination. Tables 4 and 5 provide links to all aircraft-to-aircraft risk-bearing events.

In 2024, **ALL** Category A aircraft-to-aircraft Airprox involved GA Sports and Recreational light-aircraft.

Airprox No	Year	Alt Block	Risk Category	Sector Mix
2024039	2024	501-1000	A	Civ Comm-GA
2024055	2024	1501-2000	A	GA-GA
2024100	2024	1501-2000	A	GA-GA
2024117	2024	1501-2000	A	GA-GA
2024162	2024	3001-FL79	A	GA-Mil
2024242	2024	1001-1500	A	GA-GA
2024256	2024	1501-2000	A	Civ Comm-GA
2024297	2024	501-1000	A	GA-GA

Table 4: 2024 Category A Aircraft-to-aircraft Events

Airprox No	Year	Alt Block	Risk Category	Sector Mix
2024002	2024	501-1000	B	GA-GA
2024012	2024	1501-2000	B	GA-GA
2024013	2024	1501-2000	B	GA-GA
2024015	2024	2001-3000	B	GA-GA
2024019	2024	1501-2000	B	GA-GA
2024023	2024	1501-2000	B	Civ Comm-GA
2024031	2024	1501-2000	B	GA-GA
2024035	2024	2001-3000	B	GA-GA
2024036	2024	2001-3000	B	GA-GA
2024041	2024	501-1000	B	GA-GA
2024042	2024	2001-3000	B	GA-GA
2024044	2024	0-500	B	GA-GA
2024051	2024	501-1000	B	Civ Comm-GA
2024054	2024	501-1000	B	GA-GA
2024058	2024	2001-3000	B	GA-GA
2024061	2024	1501-2000	B	GA-GA
2024067	2024	1501-2000	B	GA-GA
2024068	2024	2001-3000	B	Civ Comm-GA
2024075	2024	2001-3000	B	GA-GA
2024079	2024	501-1000	B	GA-GA
2024080	2024	2001-3000	B	GA-GA
2024086	2024	3001-FL79	B	Civ Comm-GA
2024087	2024	2001-3000	B	GA-GA
2024093	2024	2001-3000	B	GA-GA
2024097	2024	2001-3000	B	GA-GA
2024098	2024	2001-3000	B	GA-GA
2024099	2024	2001-3000	B	GA-GA
2024115	2024	2001-3000	B	GA-GA
2024120	2024	3001-FL79	B	GA-GA
2024126	2024	1501-2000	B	GA-GA
2024130	2024	2001-3000	B	Civ Comm-Emerg Servs
2024131	2024	2001-3000	B	GA-GA
2024134	2024	1501-2000	B	GA-GA
2024139	2024	2001-3000	B	GA-GA
2024145	2024	1001-1500	B	GA-GA
2024157	2024	1001-1500	B	Civ Comm-GA
2024158	2024	1501-2000	B	GA-GA
2024160	2024	0-500	B	GA-GA
2024167	2024	3001-FL79	B	GA-GA
2024168	2024	2001-3000	B	GA-GA
2024169	2024	1501-2000	B	GA-GA
2024176	2024	2001-3000	B	Civ Comm-GA
2024180	2024	1001-1500	B	Civ Comm-GA
2024181	2024	3001-FL79	B	Civ Comm-GA
2024185	2024	2001-3000	B	GA-GA
2024187	2024	2001-3000	B	GA-GA
2024188	2024	1501-2000	B	GA-GA
2024189	2024	0-500	B	GA-GA
2024192	2024	3001-FL79	B	GA-GA
2024197	2024	3001-FL79	B	GA-GA
2024201	2024	2001-3000	B	GA-GA
2024213	2024	2001-3000	B	GA-GA

2024219	2024	1501-2000	B	GA-GA
2024226	2024	501-1000	B	GA-GA
2024227	2024	3001-FL79	B	GA-Mil
2024231	2024	1501-2000	B	GA-GA
2024237	2024	1501-2000	B	GA-Mil
2024246	2024	2001-3000	B	GA-GA
2024250	2024	2001-3000	B	Civ Comm-GA
2024252	2024	1001-1500	B	GA-GA
2024255	2024	501-1000	B	Civ Comm-GA
2024258	2024	2001-3000	B	GA-GA
2024274	2024	2001-3000	B	GA-GA
2024281	2024	1001-1500	B	Civ Comm-GA
2024284	2024	1001-1500	B	GA-GA
2024290	2024	501-1000	B	GA-Mil
2024295	2024	1501-2000	B	GA-GA

Table 5: 2024 Category B Aircraft-to-aircraft Events

In 2024, **66 out of 67** Category B aircraft-to-aircraft Airprox involved GA Sports and Recreational light-aircraft.

In 2024, there were only **1** Category A and **3** Category B aircraft-to-aircraft Airprox involving Military aircraft.

ATZ AND MATZ AIRPROX

The number of instances occurring within an ATZ or MATZ has remained relatively constant over the past 10 years, although the trend is a gradual increase year-on-year (Figure 16). That said, the total number is relatively low when taken in the context of all Airprox, and the percentage of risk-bearing events that take place in a MATZ or an ATZ is lower still. All of these risk-bearing events involve the GA Sports and Recreational sector and the top 5 Flight Elements' contributory factors (CF) associated with these risk-bearing Airprox are shown in Table 6; unlike 2023, where the top 5 CF included pilots not adhering to regulations, processes or procedures, in 2024 it is evident that the incompatibility of electronic conspicuity equipment is a more common contributor to risk-bearing Airprox in ATZ/MATZ than a failure to follow procedures. Links to those events occurring in 2024, including the risk and sector mix, are in Table 7 for ease of reference.

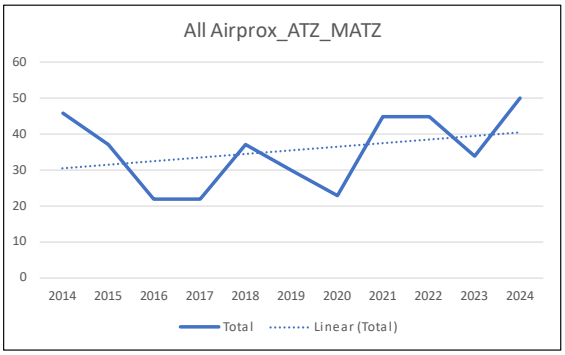


Figure 16: All Aircraft-to-Aircraft Airprox in ATZ_MATZ 2014-2024

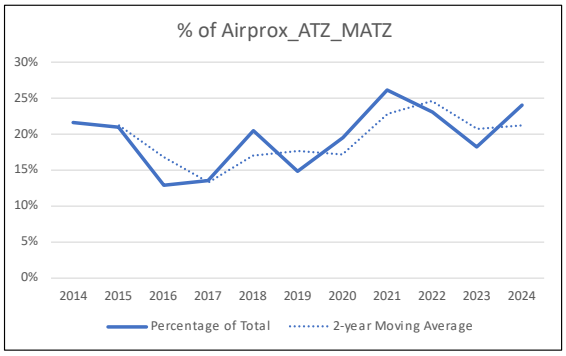


Figure 17: % of All Aircraft-to-Aircraft Airprox in ATZ_MATZ 2014-2024

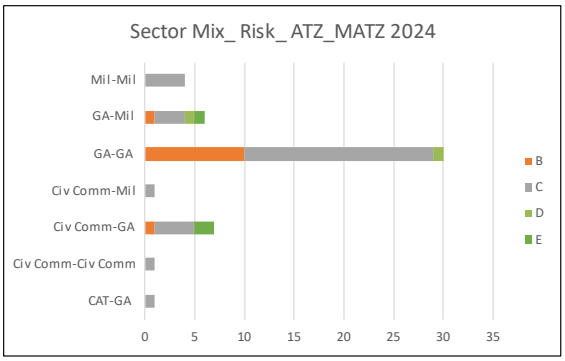


Figure 18: Risk Profile of Aircraft-to-Aircraft Airprox in ATZ_MATZ 2024

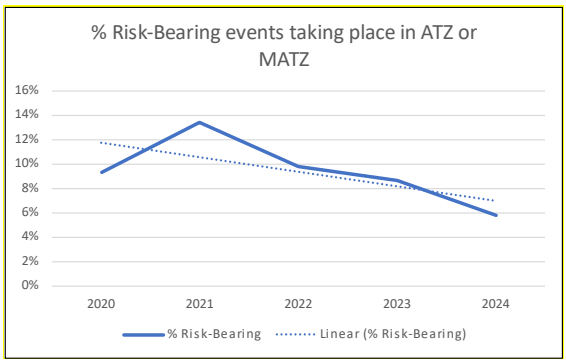


Figure 19: 5-year trend for Aircraft-to-Aircraft Airprox in ATZ_MATZ

Barrier	CF
Tactical planning and Execution	Did not conform with or avoid the established pattern of traffic
Situational Awareness	Pilot had no, late, inaccurate or only generic Situational Awareness
Electronic Warning Systems	Incompatible CWS equipment
See and Avoid	Non-sighting or Effective non-sighting
	Late sighting by one or both pilots

Table 6: Top 5 CF – ATZ_MATZ 2024 (Risk-Bearing)

Airprox No	Year	Alt Block	Risk Category	Sector Mix
2024002	2024	501-1000	B	GA-GA
2024016	2024	501-1000	C	GA-GA
2024017	2024	501-1000	C	GA-GA
2024018	2024	1001-1500	C	Mil-Mil
2024026	2024	2001-3000	C	Civ Comm-Civ Comm
2024031	2024	1001-1500	B	GA-GA
2024041	2024	501-1000	B	GA-GA
2024044	2024	0-500	B	GA-GA
2024047	2024	1501-2000	C	Mil-Mil
2024051	2024	501-1000	B	Civ Comm-GA
2024054	2024	501-1000	B	GA-GA
2024069	2024	0-500	C	Civ Comm-GA
2024072	2024	501-1000	C	GA-GA
2024085	2024	1001-1500	C	GA-Mil
2024091	2024	501-1000	C	Civ Comm-GA
2024108	2024	501-1000	C	GA-GA
2024111	2024	1001-1500	C	GA-GA
2024112	2024	1001-1500	C	GA-GA
2024113	2024	501-1000	E	GA-Mil
2024114	2024	3001-FL79	D	GA-Mil
2024129	2024	0-500	C	GA-GA
2024132	2024	3001-FL79	C	Civ Comm-GA
2024145	2024	1001-1500	B	GA-GA
2024146	2024	2001-3000	C	GA-GA
2024151	2024	501-1000	E	Civ Comm-GA
2024158	2024	1501-2000	B	GA-GA
2024160	2024	0-500	B	GA-GA
2024161	2024	1001-1500	D	GA-GA
2024169	2024	1501-2000	B	GA-GA
2024198	2024	1001-1500	C	GA-GA
2024206	2024	1001-1500	C	Civ Comm-Mil
2024214	2024	1001-1500	C	GA-GA
2024222	2024	501-1000	E	Civ Comm-GA
2024226	2024	501-1000	B	GA-GA
2024229	2024	1001-1500	C	CAT-GA
2024230	2024	501-1000	C	GA-GA
2024232	2024	501-1000	C	Mil-Mil
2024233	2024	501-1000	C	GA-GA
2024235	2024	2001-3000	C	GA-Mil
2024239	2024	0-500	C	Mil-Mil
2024247	2024	1001-1500	C	GA-GA
2024251	2024	0-500	C	GA-GA
2024253	2024	0-500	C	GA-GA
2024254	2024	501-1000	C	GA-GA
2024263	2024	1001-1500	C	GA-Mil
2024275	2024	501-1000	C	GA-GA
2024277	2024	501-1000	C	GA-GA
2024285	2024	0-500	C	Civ Comm-GA
2024290	2024	501-1000	B	GA-Mil
2024302	2024	501-1000	C	GA-GA

Table 7: All Aircraft-to-aircraft Airprox in ATZ/MATZ – 2024

SAFETY BARRIERS AND CONTRIBUTORY FACTORS

The Conceptual Barrier Model, which was first presented in the Annual Report for 2020, has undergone stages of development and is now mature. However, it is worth taking some time to explain the depictions below. For completeness, and by way of example, the concept of barrier weighting will be introduced, and the different weightings assigned when in Controlled Airspace will be explained, as it serves to demonstrate a little more of the rationale behind those used for analysis within Uncontrolled Airspace.

In the model developed by the UKAB, there are 9 barriers to Airprox. They interact fluidly and not necessarily sequentially, nor do they all have to be engaged; they are, however, all linked, and a path through them can be drawn for any given occasion by examining their specific performance and Contributory Factors as they are evaluated, on a collective or an individual basis. In addition, there is a recognition that the type of airspace will dictate the relative influence of the barriers on an Airprox – is it in Controlled Airspace, a known traffic environment, or in Uncontrolled Airspace, a normally unknown traffic environment?

An Airprox must be considered as a whole event, where the constituent parts – in terms of barrier performance – add up to 100%. With 9 barriers available to be operative, each makes a hypothetical contribution, but some are more influential than others: the conceptual depictions below have been scaled to represent the relative influence of the Ground Elements and the Flight Elements and the associated barriers within each of the Elements. The first thing to note is that, inside Controlled Airspace, the Ground Elements collectively constitute 60% of the total barrier weighting, with Regulations, Processes and Procedures carrying the most weight. This is closely followed by the supporting barriers of Manning and Equipment and Situational Awareness which are then complemented by Electronic Warning Systems. For the Flight Elements, the emphasis is largely on the Electronic Warning Systems barrier. This speaks directly to EC in all its forms and, for operations inside Controlled Airspace – particularly in Classes A and C airspace – the carriage of such equipment is mandatory and required to meet certain standards of accuracy and technical compatibility.

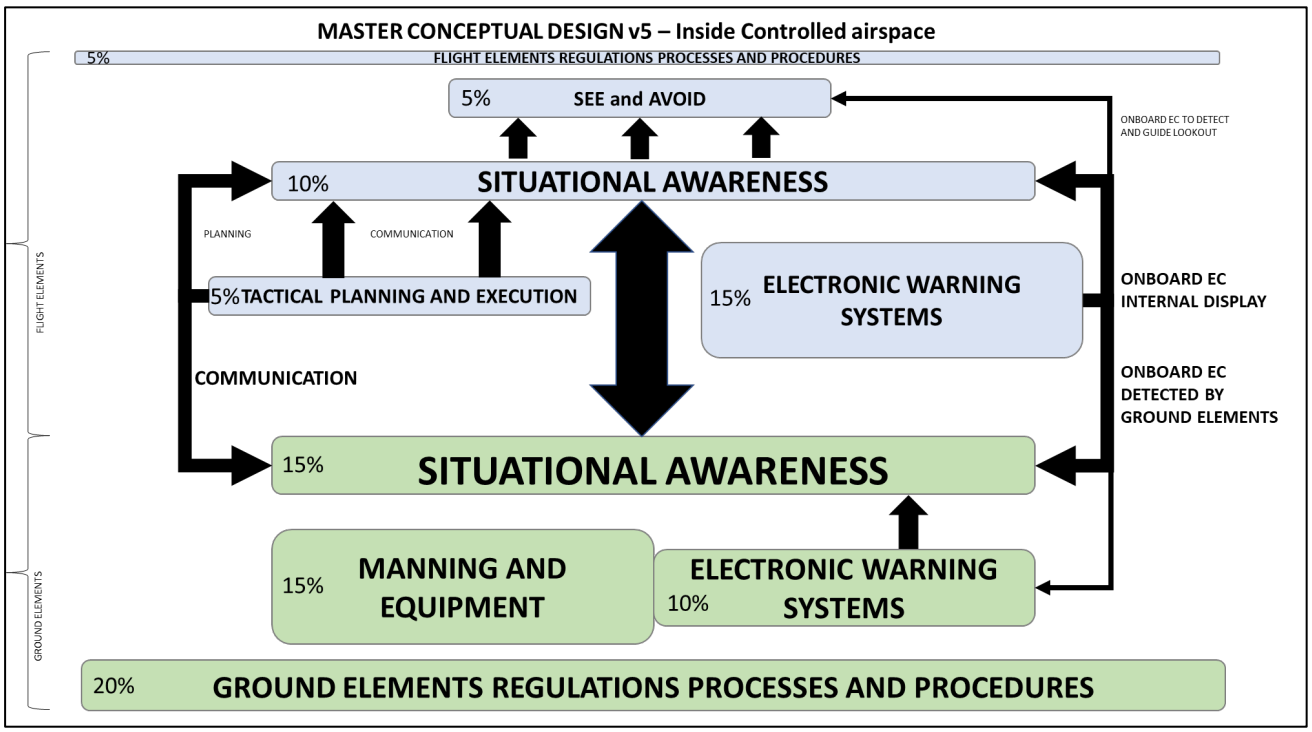


Figure 20: Schematic representation of top-level barrier interactions INSIDE CONTROLLED AIRSPACE

It should be noted that there is minimal emphasis on the See and Avoid barrier, and the reasons for this are obvious – Controlled Airspace is a known traffic environment and is relatively highly regulated. ANSPs conform to traffic separation minima, and it is their responsibility to control the traffic in such a manner as to not compromise these minima. See and Avoid is, therefore, almost redundant and appropriately so, although it should not be discounted altogether because, as is often seen, inadvertent penetrations of Controlled Airspace by other traffic do occasionally occur.

In contrast to the barrier diagram for Inside Controlled Airspace, with that of Outside Controlled Airspace – Class G airspace – the emphasis is almost entirely with the Flight Elements, with 75% of the barrier influence residing in this area. See and Avoid and Situational Awareness are paramount for the Flight Elements and are complemented with Electronic Warning Systems (in the form of EC) and the communication, planning and the execution aspects, which are contained in the Tactical Planning and Execution barrier.

Only 25% of the total barrier contribution comes from the Ground Elements and is captured primarily in the Situational Awareness barrier. In Airprox barrier methodology, the only way to augment the Ground Elements' Situational Awareness is through communication, the use of an appropriate level of Service and through the use of EC – which for the Ground Elements refers directly to transponding traffic which can be verified and identified on radar displays (although the use of Flight Information Displays (FIDs) – which use information from both assured and unassured sources – is on the increase, supported by appropriate regulation for the use of such devices).

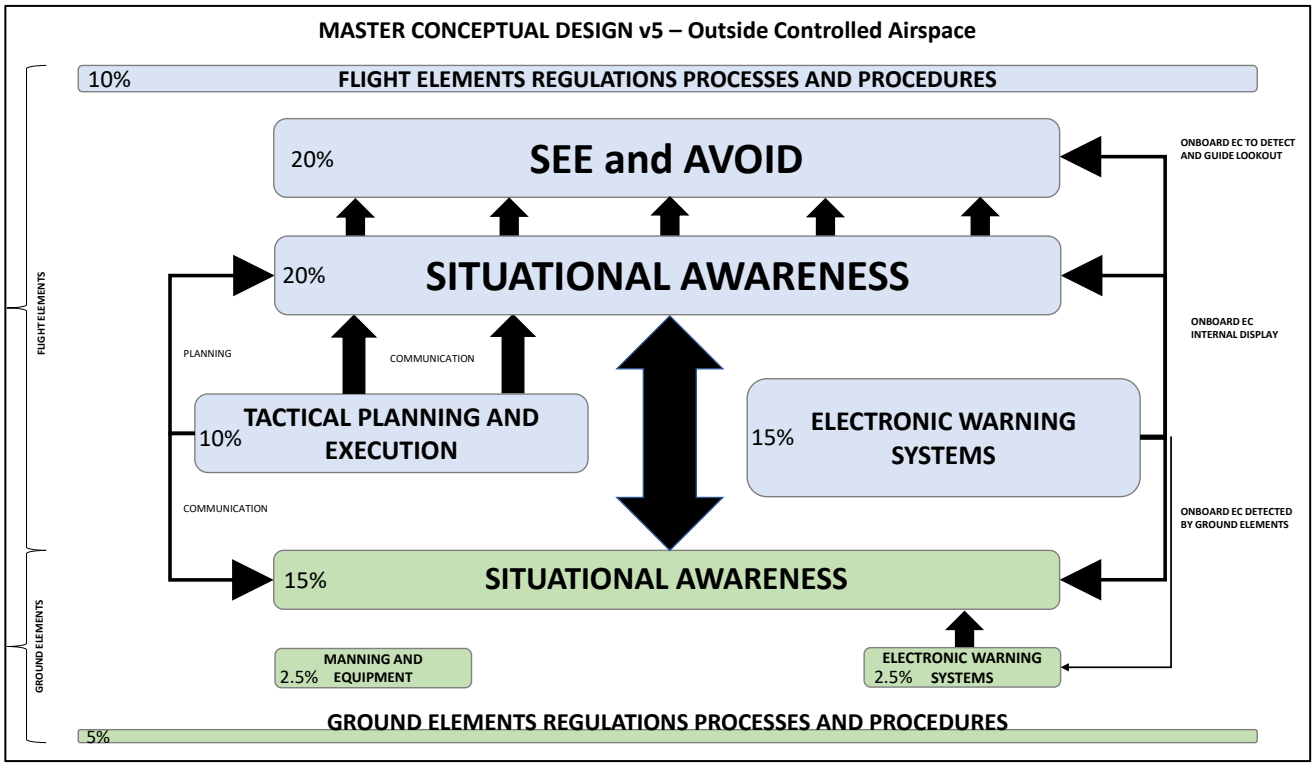


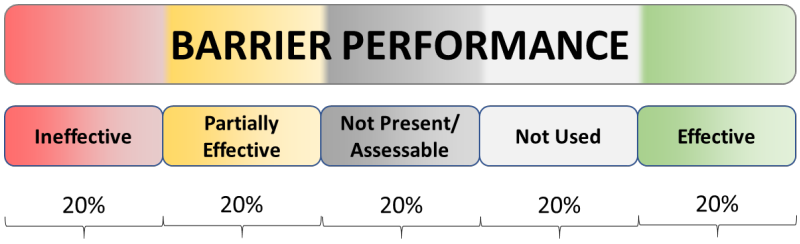
Figure 21: Schematic representation of top-level barrier interactions OUTSIDE CONTROLLED AIRSPACE

The specific weightings are shown in each diagram and assist in focussing on appropriate areas where potentially minimum action will have a proportionately significant effect.

The vast majority of Airprox reported in the UK take place in Uncontrolled Class G Airspace. Therefore, it is the diagrammatic representation in Fig 21 that will be taken forward and developed further. The following section uses colour to indicate the overall performance of each barrier and uses the percentage performance distributions in representative proportions dependent on the risk being examined at the time. This is a continued development of the concept and a way of illustrating the barrier performance and interactions. As with the last 4 years, risk-bearing performance will be

compared with Category E barrier performance and also the Category C events. Category C events are important because they qualify those occurrences where safety has indeed been degraded but where there has not been an actual risk of collision. By comparing the performance of the barriers for these categories, it will be evident that the principle of See and Avoid is the overriding factor in MAC mitigation outside Controlled Airspace. It will also be shown that the effectiveness of the See and Avoid barrier can be enhanced most effectively by focussing effort on promoting the use of compatible EC equipment, carrying a transponder and communicating with an appropriate ANSP whilst engaging the best Service possible. As further mitigation, adopting a considerate, defensive and responsible attitude to flying will strengthen the Tactical Planning and Execution barrier – as long as the rules, regulations and procedures have been followed.

Colouring metric with consistent ordering from left to right:



Each of the following diagrams of this type has accurate barrier colouration and accurate barrier proportion; the GA Sports and Recreational community is used as the example Sector Mix, unless otherwise stated.

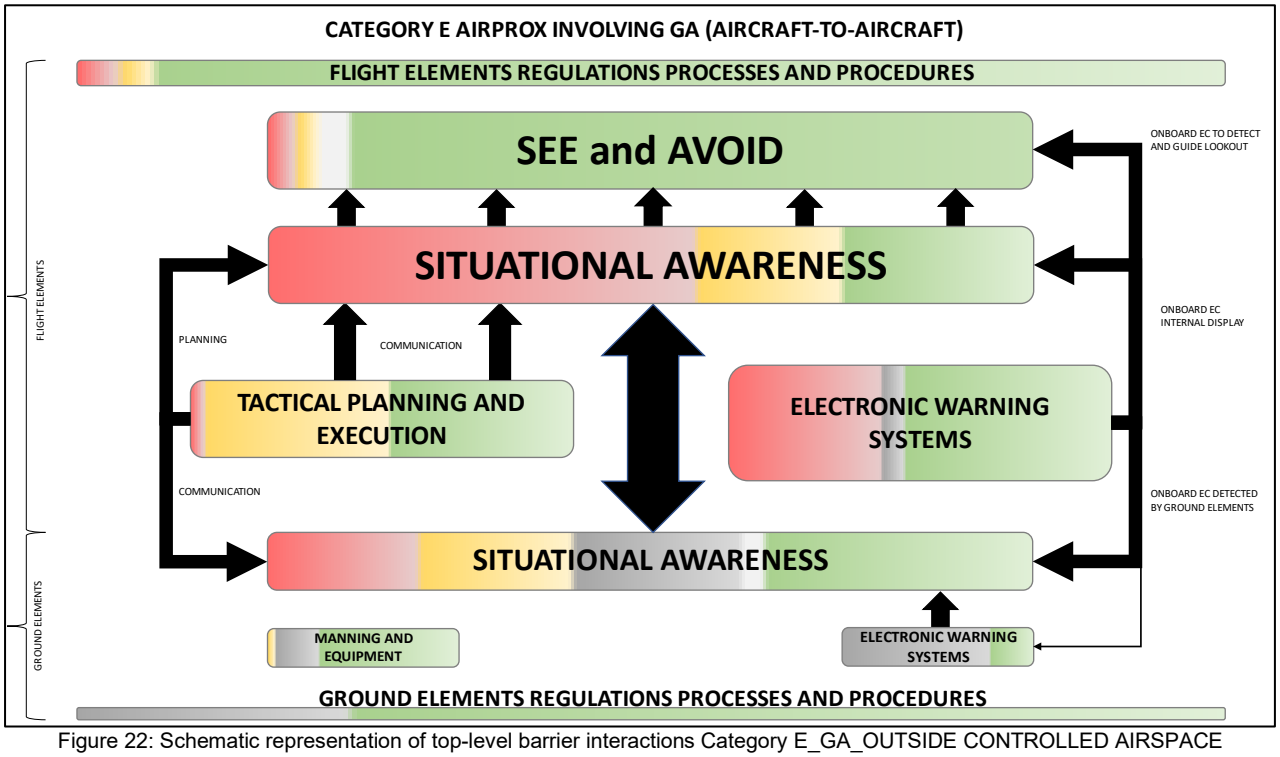


Figure 22: Schematic representation of top-level barrier interactions Category E_GA_OUTSIDE CONTROLLED AIRSPACE

For Category E Airprox:

Figure 22 above depicts barrier performance for all category E events in 2024 that involved GA. These are events in which the Board has determined that there was no degradation of safety and normal safety parameters were met (for the context in which the Airprox took place). Category E

events are useful because information can be collected that details the perspectives of the individuals, the facts and the circumstances of an event which would otherwise not be available. If the performance of the barriers over the set of category E events is analysed, it can be shown what an uneventful encounter looks like and use it as a baseline comparator for Airprox where safety is degraded and where one is risk-bearing.

What is most noteworthy from the examination of Figure 22 is the fragility of the Flight Elements Situational Awareness barrier. Once airborne, this barrier can only be augmented through the use of an appropriate ANSP (coupled with the use of an appropriate service – captured in the Tactical Planning and Execution barrier) or through information gleaned from an EC device. The green portion of the Tactical Planning barrier shows that, on the whole, the pilots had planned and executed their sortie effectively and that they were talking with an appropriate agency for most of the time. However, the white portion of the Ground Elements Situational Awareness barrier tells us that there are still a few occasions where pilots only choose a Basic Service – i.e., the barrier is engaged through communication, but it is Not Used as the pilot(s) are only in receipt of a service where ATC is not required to monitor their aircraft or the controller/FISO is not equipped with surveillance equipment. Where the barrier is green, this represents occasions where a Traffic Service (or higher) has been agreed with the controller or ATC happens to be actively involved in communicating with the pilot(s) of one or both of the aircraft at the time of the Airprox.

Encouragingly, Electronic Warning Systems were employed by the Flight Elements 94% of the time. However, they were only effective for 54% of the Category E Airprox in 2024. Use of compatible EC equipment significantly enhances Flight Elements Situational Awareness and directly influences the See and Avoid barrier. With See and Avoid being the primary (and usually final) barrier to avoiding Airprox, it is essential that any and all tools are employed to strengthen this barrier.

For Category E Airprox, the Flight Elements Electronic Warning Systems barrier was Effective (Green) in 60%, Partially Effective (Yellow) in 2.5%, Not Present (Grey) in 5% and fitted but Ineffective (Red) in 32.5% of the total aircraft-to-aircraft occurrences in 2024.

For Category E aircraft-to-aircraft Airprox in 2024, the Ground Elements Situational Awareness barrier was Effective (Green) 37.5% of the time, Partially Effective (Yellow) 22.5% of the time, Not Used (Basic Service) or Not Present at all 22.5% of the time and Ineffective 17.5% of the time.

For Category E aircraft-to-aircraft Airprox in 2024, the Flight Elements Situational Awareness barrier was Effective (Green) 32.5%, Partially Effective 20% and Ineffective 47.5% of the time.

For risk-bearing Airprox, the picture is noticeably different:

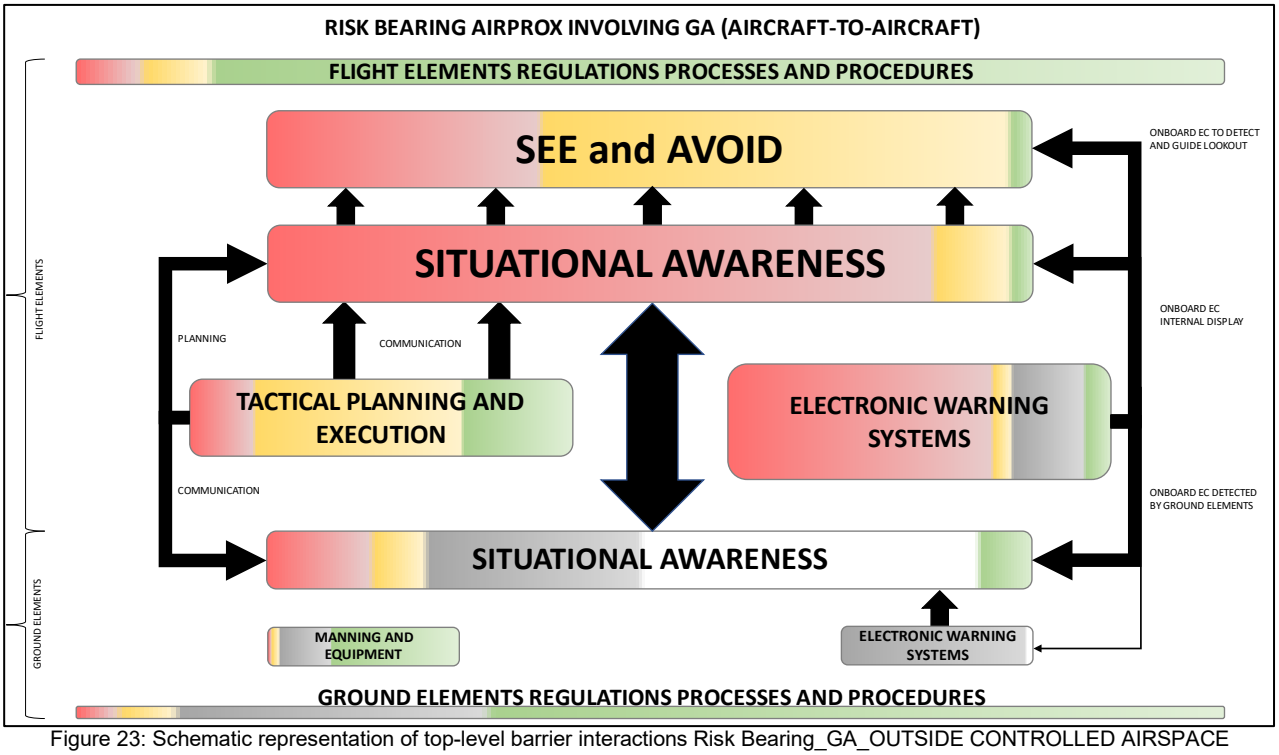


Figure 23: Schematic representation of top-level barrier interactions Risk Bearing_GA_OUTSIDE CONTROLLED AIRSPACE

The changes in the performance of all the Flight Elements barriers, together with that of the Ground Elements Situational Awareness barrier, is evident. The poor performance of the Electronic Warning Systems barrier, through either incompatibility, performance issues or non-fitment of EC equipment, combined with poor planning and execution and the proportion of the time when the Ground Elements Situational Awareness barrier (normally ATC) was not engaged at all or Not Used (Basic Service), means that the Flight Elements Situational Awareness barrier was only Fully Effective on 3.5% of occasions. With little or no chance of any external influence to guide pilots' lookout, it is often purely the quality of an individual's lookout, or indeed providence, which led the outcome to be an Airprox and not a MAC.

For risk-bearing aircraft-to-aircraft Airprox in 2024, the Flight Elements Electronic Warning Systems barrier was Effective (Green) only 7.5%, Partially Effective (Yellow) 5%, Not Present in either aircraft (Grey) 18% and fitted in at least one aircraft but Ineffective (Red) 69.5% of the time.

For risk-bearing aircraft-to-aircraft Airprox in 2024, the Ground Elements Situational Awareness barrier was Effective (Green) 7.5%, Partially Effective 6.5%, Not Present at all 28%, Not Used (Basic Service) 43% and Ineffective 15% of the time.

For risk-bearing aircraft-to-aircraft Airprox in 2024, the Flight Elements Situational Awareness barrier was Effective (Green) 4%, Partially Effective 9% and Ineffective 87% of the time.

Category C Airprox represent those times where there has been no risk of collision but where safety has been assessed by the Board to have been degraded. The main changes in the barrier performances of this set of occurrences is evidence of an increase in the effectiveness of the Electronic Warning System barrier (albeit the performance of this barrier remains far from satisfactory), a marginal improvement in the performance of the Flight Elements Situational Awareness barrier, a marked reduction in the proportion of time that pilots are not communicating at all with an ANSP and a resultant and significant increase in the performance of the See and Avoid barrier. Of course, it could just be that pilots who have Category C Airprox conduct a better lookout or are better served by the application of 'the big sky theory'. However, it is more likely to be as a result of increases in performance of the other critical barriers and their combined influence on the significant, and final, See and Avoid barrier.

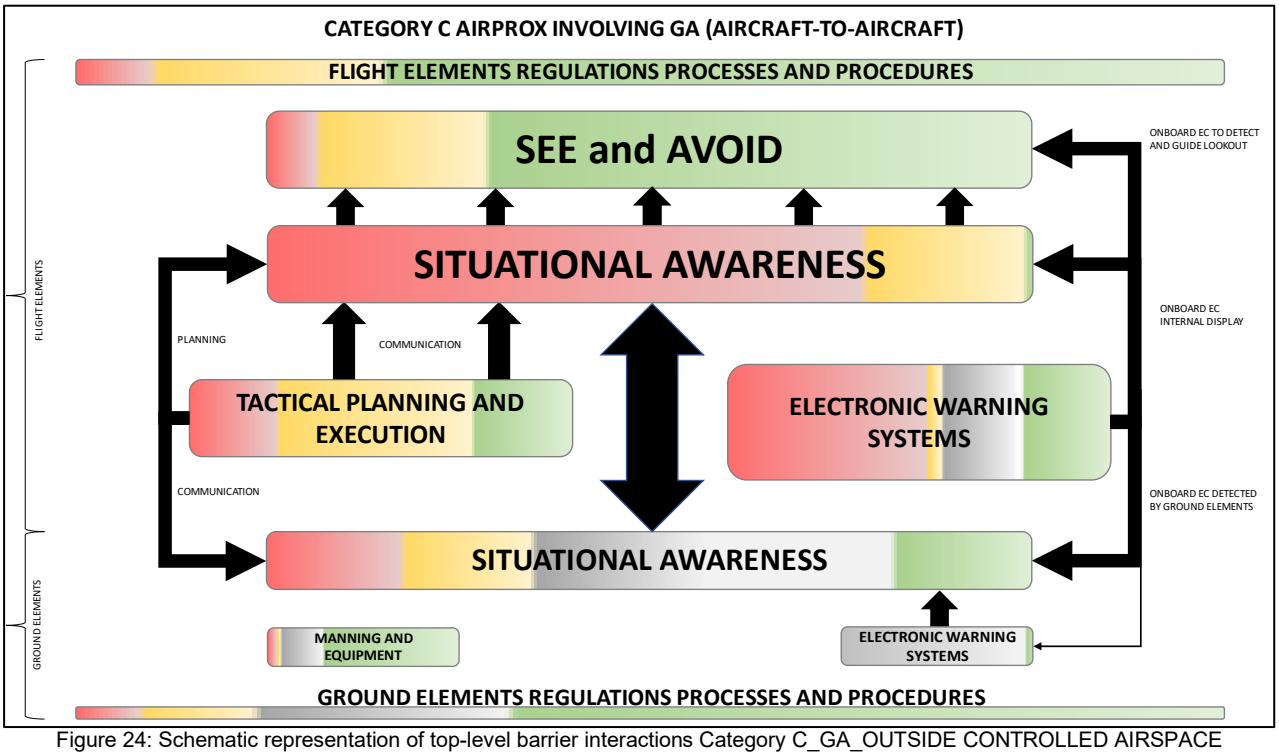


Figure 24: Schematic representation of top-level barrier interactions Category C_GA_OUTSIDE CONTROLLED AIRSPACE

For Category C Airprox in 2024, the Flight Elements Electronic Warning System barrier was Effective (Green) 33%, Partially Effective (Yellow) 2%, Not Present in either aircraft (Grey) 16%, Not Used (White) 4% and fitted in at least one aircraft but Ineffective (Red) 45% of the time.

For Category C Airprox in 2024, the Ground Element Situational Awareness barrier was Effective (Green) 22%, Partially Effective 18%, Not Present (Grey) 22%, Not Used 19%, and Ineffective (Red) 19% of the time.

For Category C Airprox in 2024, the Flight Elements Situational Awareness barrier was Effective (Green) only 5%, Partially Effective (Yellow) 20% and Ineffective (Red) 75% of the time.

In the 2020 annual report the concept of barrier interactions was introduced, and these interactions were demonstrated by plotting the effectiveness of one barrier against another. Book 36, 2020 annual report can be found at this link: https://www.airproxboard.org.uk/media/oahp00s3/bluebook36.pdf.

BARRIERS AND CONTRIBUTORY FACTORS BY SECTOR

Having examined the barrier interactions by scaling the relative influences of each on Airprox outcomes, and having used colour to represent the collective performance of the barriers for GA Sports and Recreational instances, it is still useful to examine performance of the specific barriers as individual entities, and to draw out the top five Contributory Factors which have influenced those performances. It is important to remember that Contributory Factors are generally (but not exclusively) only assigned when the barrier has been compromised, so these Contributory Factors indicate areas for individuals, clubs, operating authorities, or responsible bodies to consider when assessing what can be done to improve either individual or collective performance and help to inform risk mitigation strategies and develop regulation with a view to improving collective safety.

In the following section, the barriers and top 5 Contributory Factors for Airprox involving the GA Sports and Recreational community, those involving the military community and those where the RPAS flyer reported the Airprox will be considered.

Before looking at each of the sectors, it is useful to summarise the key points associated with the five barriers with the weakest performance where Human Factors are the main influence:

Ground Elements Situational Awareness

The Ground Elements Situational Awareness barrier is a two-sided barrier based largely upon the relationship between an ANS provider (controller/FISO/AGO) and a pilot. For the barrier to be fully effective, the controller/FISO themselves *must* have situational awareness about the 2 aircraft involved in the Airprox. For a large number of Airprox, the type of service provided either did not require the ANS provider to monitor the aircraft on surveillance equipment (Basic Service), did not have access to surveillance equipment, or did not permit the management of traffic in the visual circuit ((A)FISO/AGO i.e., not a controller). In these circumstances, the Board normally assesses the barrier as 'not used'. Furthermore, even when providing a service whereby the controller was required to give Traffic Information, if the controller has no knowledge of the conflicting aircraft, Traffic Information cannot be provided; examples of this might be a glider not displaying on radar or an intermittent primary-only contact. Finally, the controller must be able to pass on the associated information to the pilot in a timely manner, and so 2-way communication is essential to this barrier's function.

Flight Elements Situational Awareness

The Flight Elements Situational Awareness barrier describes all elements of situational awareness available within the cockpit, be that controller-derived from listening-out on a frequency or receiving Traffic Information, or from on-board EC equipment. The Board may also be of the view that a pilot should have generic situational awareness derived from planning documents: e.g., gliders should be expected to be encountered near a glider site marked on a chart, increased aerial activity can be expected in areas marked on charts as an AIAA.[1]

Flight Elements Tactical Planning and Execution Barrier

The Tactical Planning and Execution barrier involves both pre-flight and in-flight planning, plan adaption, communication and execution and it is available to be used in all Airprox environments. It also forms a fundamental and intrinsic part of Threat and Error Management and should be diligently undertaken prior to every flight. This barrier is primarily concerned with conducting thorough flight preparation on the ground to release capacity in the air, which then enables accurate and effective execution of the task and comprehensive communication with ground agencies and other air users. As such, it should be the easiest barrier for pilots to address. It is, however, the barrier most

[1] Area of Intense Aerial Activity.

susceptible to human performance-driven errors – especially those rooted in inexperience, poor preparation or where there may be gaps in a pilot's knowledge.

Flight Elements Electronic Warning Systems Barrier

The Electronic Warning Systems barrier is available for use in all Airprox and, indeed, forms a key element in the safety barrier system. Like the Tactical Planning and Execution barrier, it contributes to both the Ground and Flight Elements Situational Awareness barriers, but also contributes to the See and Avoid barrier (through guiding visual acquisition) and additionally to the Ground Elements Electronic Warning Systems barrier. This barrier is slightly different from the others in that it is independent to a very large degree of Human Factors: a system is either fitted (appropriately) or it is not, and it is either compatible or incompatible with equipment carried by other aircraft. Of course, its efficacy also depends on the geometry of the Airprox and the familiarity of the user with their equipment (amongst other factors), however, these factors feature less than the presence of EC equipment or its compatibility/performance. It should be noted that the proliferation of carry-on EC equipment has led to a higher proportion of Airprox where the barrier is available, but this may not equate to an improved performance of this barrier.

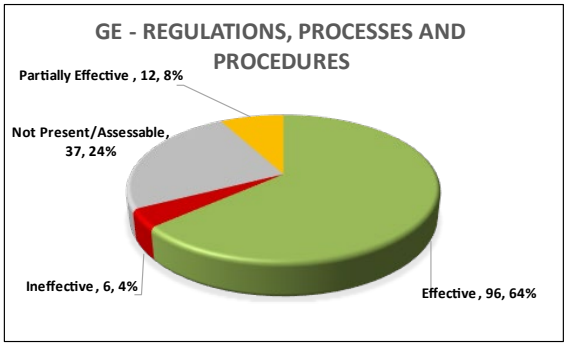
Flight Elements See and Avoid Barrier

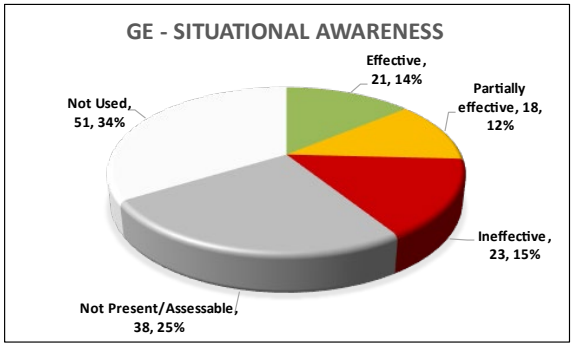
The See and Avoid barrier, according to the conceptual model presented at Figure 21, can be considered to be the last barrier to any Airprox – however, it should be noted that barrier interactions are rarely consecutive in nature and any one of them can be in play at any one time; indeed, from the Barrier Conceptual Model, most of the barriers will influence the performance of a number of others. Additionally, the influence of the See and Avoid barrier overrides the performance of any of the others.

In 2024, where the Flight Elements See and Avoid barrier was FULLY EFFECTIVE**,** the result of the encounter was either a Category C or E (i.e., non-risk-bearing) event in **94%** of those Airprox.

AIRPROX INVOLVING GA SPORTS AND RECREATIONAL AIRCRAFT – RISKS A/B/C

GROUND ELEMENTS

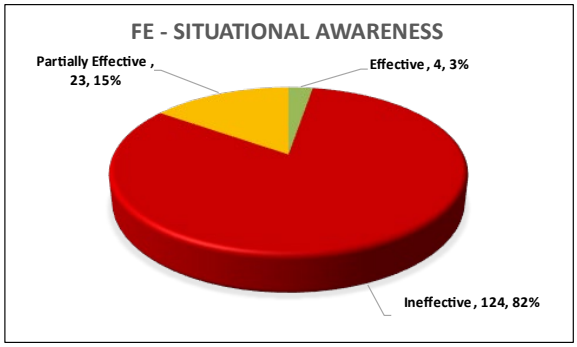


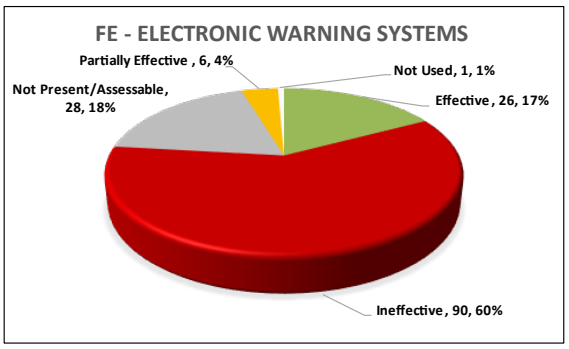


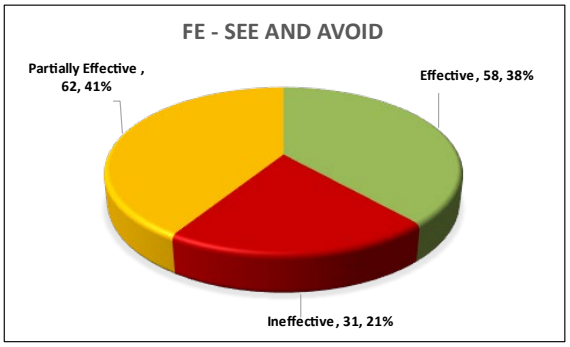
These Barriers were not engaged at all on 37 occasions (24% of the time). This is because neither aircraft's pilot was communicating with an ANSP, or there wasn't one available (e.g., no coverage or away from the environs of an airfield). Where the Regulations, Processes and Procedures barrier was engaged, it was largely effective; however, it is also evident that the Situational Awareness barrier was Not Used 34% of the time – which, disappointingly, is the same proportion as in 2023 which itself was a decline from 2022 – and this shows that either a pilot had only agreed a Basic Service with the controller, or the aircraft was joining/departing an airfield or in a circuit environment with an AGO or AFISO. There was an opportunity for the Ground Elements to play a positive role in the interaction on 75% of occasions, but they were either denied the ability to do so by the Flight Elements, or were unable to do so by virtue of the privileges of their licence, 59% of the time. This has a direct impact on the Flight Elements Situational Awareness barrier and is evidenced by its particularly poor performance in Category A/B/C Airprox.

> Agreeing an appropriate level of service (surveillance-based, where available) from an ANSP will markedly increase the performance of the Ground Elements and will directly affect the performance of the Flight Elements Situational Awareness barrier.

FLIGHT ELEMENTS







The key point from this set of charts is that, for 97% of the time, the Flight Elements have only partial or no situational awareness of the evolving scenario, and so reference must be made to the Tactical Planning and Execution and the Electronic Warning Systems barriers to understand why this might be the case. The most prevalent Contributory Factors for the Flight Elements Situational Awareness barrier are:

FLIGHT ELEMENTS SITUATIONAL AWARENESS - AIRPROX INVOLVING GA SPORTS & RECREATIONAL – RISKS A/B/C
Situational Awareness and Sensory Events-Pilot had no, late or only generic, Situational Awareness
Understanding/Comprehension-Pilot did not assimilate conflict information
Lack of Action-Pilot flew close enough to cause concern despite Situational Awareness
Lack of Communication-Pilot did not request additional information
Monitoring of Communications

Table 8: Flight Elements Situational Awareness – Airprox involving GA Sports and Recreational aircraft.

The Board evaluations determined that the Tactical Planning and Execution barrier was only fully effective 29% of the time (worse than this barrier's performance in 2023). The Contributory Factors for this barrier are key and it can be seen from Table 9 that they are, essentially, all aspects of what is known as Threat and Error Management. This barrier includes the checking of NOTAMs (pre-flight and in-flight), planning the route to avoid areas of active airspace (e.g., avoiding overflying glider sites, where possible), understanding and following the departure/arrival procedures at airfields, reacting to information received in-flight, recognising personal limitations in terms of currency and recency and finally in the communication plan for the flight.

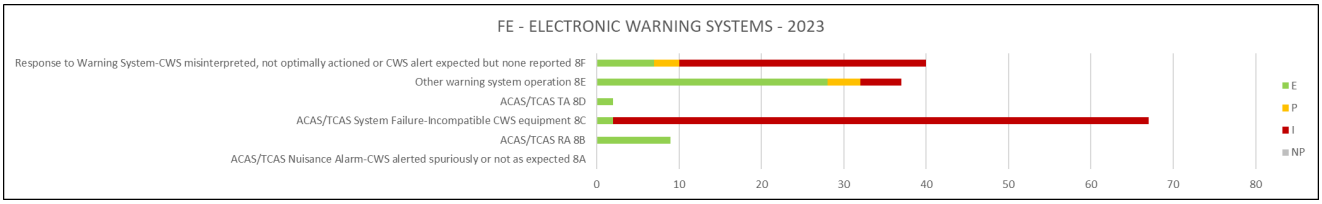
For the Tactical Planning and Execution barrier the following are the Contributory Factors which are worthy of further consideration by all communities:

TACTICAL PLANING AND EXECUTION – AIRPROX INVOLVING GA SPORTS & RECREATIONAL – RISKS A/B/C
Communications by Flight Crew with ANS (Pilot did not communicate with appropriate ATS provider)
Monitoring of Environment (Did not avoid/conform with the pattern of traffic already formed)
Accuracy of Communication (Ineffective communication of intentions)
Insufficient Decision/Plan (Inadequate plan adaption)
Action Performed Incorrectly (Incorrect or ineffective execution)

Table 9: Tactical Planning and Execution barrier – Airprox involving GA Sports and Recreational aircraft.

Finally, the EWS barrier is either not present or is ineffective 78% of the time. With no equipment fitted the barrier does not contribute in any way to the mitigation of mid-air collision; with incompatible EC equipment fitted it is equally redundant, which is one key take-away from the work of the UKAB is this area and this specific point. Although the percentage of Airprox where there is no EC equipment fitted had been declining year-on-year (34% in 2021, 24% in 2022 and 17% in 2023), this may now have reached its nadir (18% in 2024), possibly due to uncertainty over which protocol(s) might become a regulatory requirement in the not-too-distant future. Additionally, there has also been an increase in the number of interactions from warning systems other than TCAS/ACAS over the last few years. However, the current regulatory position regarding EC in Class G has led to myriad systems available to GA pilots, very few of which are compatible with each other, and so the percentage of occasions where incompatibility has been a factor has increased from when the UKAB first started collecting this

data and has not improved over the last 3 years (48% in 2021, 63% in 2022 and 61% in 2023 and 60% in 2024). Furthermore, and as a secondary but equally influential factor, training in the interpretation of the information available from the interactions of compatible equipment is essential. After incompatibility, this is the second most prevalent reason for the failure of the EWS barrier.

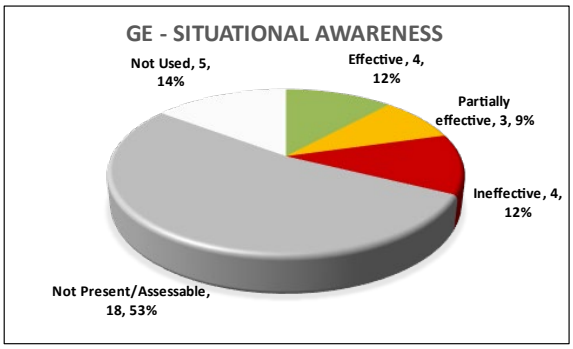


Every opportunity to augment Situational Awareness should be taken; plan, revise if necessary and communicate. Fit EC equipment and understand how it operates – react to what it shows and don't necessarily wait until the contact is sighted. Proper preparation will increase capacity and all of the above will contribute to the ability to concentrate on a robust and thorough LOOKOUT, which is the **final** (but by no means the only) barrier to mid-air collision in Class G Airspace.

AIRPROX INVOLVING GLIDERS – RISKS A/B/C

Probably the largest sub-sector within GA Sport and Recreational aircraft is those Airprox involving gliders. There are specific challenges which highlight areas of concern with the integration of powered and non-powered aircraft into the same, minimally regulated, regions of the UK FIR that is characterised by operations in Class G airspace.

GROUND ELEMENTS

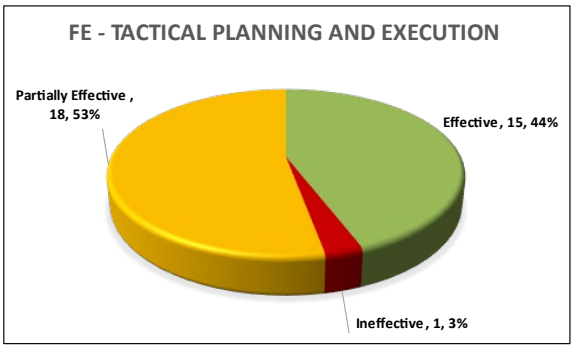


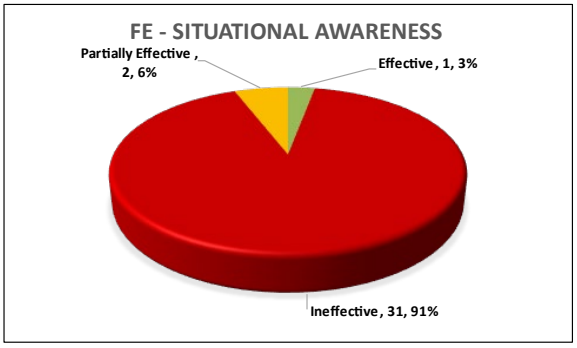
For Airprox involving gliders, the Ground Elements are only engaged in an active manner 33% of the time, with only a Basic service being provided on 14% of the occasions (almost exclusively by the pilot of the powered aircraft). The engagement of the Ground Elements has reduced slightly compared to that seen in 2023 (where the Situational Awareness barrier was Not Present 46% of the time and Not Used 20% of the time) and there remains much room for improvement in this regard. It is acknowledged that Flight Radio Telephony Operator's Licences (FRTOL) are not required for glider pilots. However, the utility of communicating with Air Traffic Control cannot be understated and the efforts taken by the BGA in promoting the benefits of obtaining a FRTOL are extremely welcome. It is, however, too early to assess whether this increase in the number of FRTOL-holders in the glider pilot community is having an effect – the barrier is still only being engaged in about one third of Airprox involving gliders.

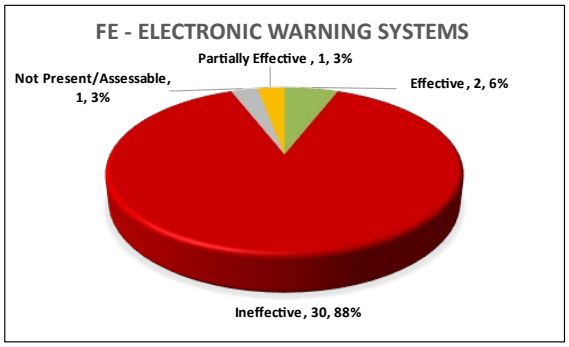
There is little else to comment on with regard to the Ground Elements for Airprox involving gliders, apart from noting that the majority of gliders do not carry transponders and will only occasionally appear as primary returns with no information on ATC radar equipment, if installed. However, it has become apparent that more glider pilots are carrying devices with an ADS-B-out function to highlight their presence to those capable of receiving an ADS-B signal. It is worth noting, though, that glider pilots tend not to exploit the data from these devices, preferring to use a system designed specifically for the gliding community. As the use of Flight Information Displays (FIDs) – harvesting data from sources other than ATC surveillance radar – becomes more prevalent amongst Ground Elements, an improvement in the performance of the Ground Elements – Situational Awareness barrier may follow, but this is also dependant on the ability (and willingness) of pilots to communicate with controllers, FISOs and AGOs.

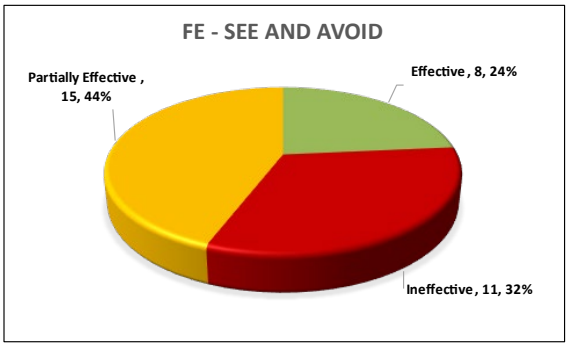
FLIGHT ELEMENTS

There are, however, a number of significant differences when the barriers pertinent to the Flight Elements are examined, either in the performance of the barriers or, where the performances seem similar, in the contributory factors that underlie them:









Whilst the Tactical Planning and Execution barrier appears to perform markedly better in Airprox involving gliders, this could be due to the relatively small sample size. The Contributory Factors are similar, but with noticeable differences when it comes to pilots' decision-making regarding considerations for flights in the vicinity of glider sites. For Airprox involving GA Sports and Recreational aircraft (which also includes gliders), the most frequent were 'Communications by Flight Crew with ANS' and 'Monitoring of Environment'; for those involving gliders, they were 'Communications by Flight Crew with ANS' and 'Accuracy of Communication'.

For Airprox involving Gliders, the top 5 Contributory Factors are:

TACTICAL PLANING AND EXECUTION – AIRPROX INVOLVING GLIDERS – RISKS A/B/C
Communications by Flight Crew with ANS (Pilot did not communicate with appropriate ATS provider)
Accuracy of Communication (Ineffective communication of intentions)
Pre-flight briefing and flight preparation
Aircraft Navigation-Flew through promulgated and active airspace
Insufficient Decision/Plan (Inadequate plan adaption)

Table 10: Tactical Planning and Execution barrier – Airprox involving Gliders

There is clearly a theme when it comes to communication – pilots of powered aircraft are not only choosing not to contact an ATS provider, they are also – generally – not making a call to glider sites as they fly past or close to them. This appears to stem from the pre-flight planning phase (see CFs 3 and 4 in Table 10 above), where the planned track passes close to or over a glider site but with no associated plan to contact the site to enquire about activity or to alert users at the site to their presence. Of course, it may be that the pilots' routeing may have been adapted in flight from that which was pre-planned, so the opportunity to fully consider the implications of routeing close to a glider site was not taken; nonetheless, CF5 in Table 10 points to insufficient margins being given around active glider sites, increasing the likelihood of an Airprox with a glider.

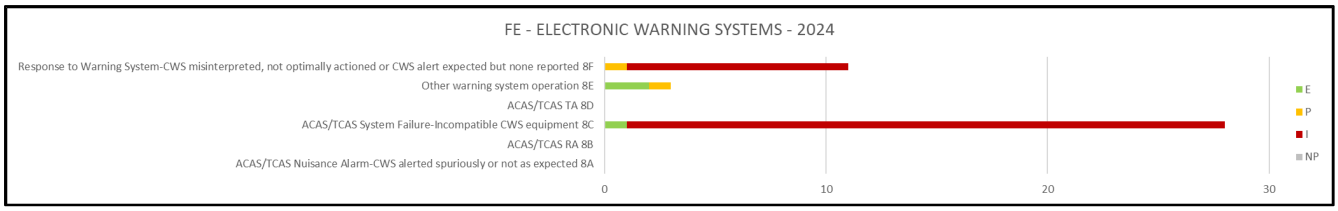
The Situational Awareness barrier was only fully Effective on one occasion and was completely Ineffective on 91% of occasions – this is normally only observed with risk-bearing Airprox, not with Airprox categorised A to C. Because so few glider pilots are permitted to communicate by radio with ATC (unless they hold a FRTOL), the only other way to positively influence the Situational Awareness barrier in real-time is through EC as captured in the Electronic Warning Systems barrier, which is also extremely weak. It is well known that the 'EC of choice' for glider pilots is FLARM (and its derivatives), and this equipment works particularly well within the gliding community; however, only a handful of other popular EC devices can detect FLARM, and none of them are able to transmit FLARM's protocol so, at best, the EWS barrier can only work in one direction – warning the 'other pilot' that a FLARM-equipped aircraft is nearby.

For the See and Avoid barrier, it is the quality of lookout, cued from EC equipment where it is fitted and compatible. It therefore follows that the performance of the EWS barrier is important and intrinsically linked to SA and the See and Avoid barrier. That said, it should also be noted that the See and Avoid barrier is not simply about sighting the other aircraft – a sighting MUST be followed by appropriate action to resolve any potential conflict, otherwise this barrier will be weakened. Although

SERA stipulates that powered aircraft must give way to sailplanes, relying on the pilot of the powered aircraft having sighted the glider is not a reliable mitigation to mid-air collision.

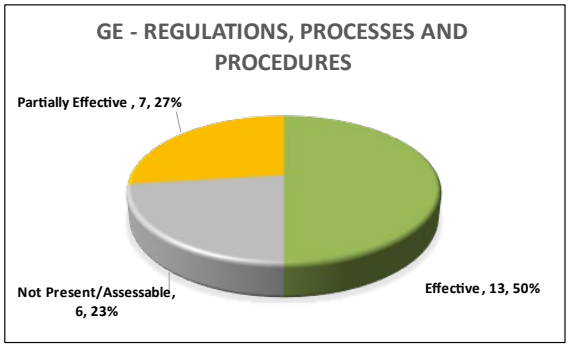
Alarmingly, for the subset of Airprox in the GA Sports and Recreational sector which involve gliders, the Electronic Warning Systems barrier is Ineffective 88% of the time and only Effective on 6% of occasions. Where the barrier is Ineffective, it is as a result of incompatibility of electronic compatibility equipment on 73% of those occasions.

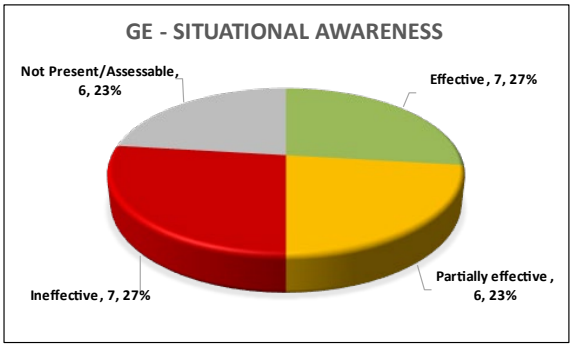
EC equipment which responds and reacts only to transponding traffic will NOT be effective with gliders, as the majority of them do not have transponders. Of those that do have them fitted, they are often turned OFF to conserve battery power.



AIRPROX INVOLVING MILITARY AIRCRAFT – RISKS A/B/C

GROUND ELEMENTS





For Airprox involving military aircraft, a markedly different distribution of the performance of these 2 barriers is evident. Note the percentage of time that the Ground Elements Situational Awareness Barrier is not employed at all – only 23% (compared to 25% for Airprox involving GA). This means that, for 77% of the time, one or both of the pilots were engaged with ANSPs. Additionally, the barrier is NEVER Not Used (compared to 34% of occasions for Airprox involving GA). This indicates that the ANSPs involved were offering a service greater than a Basic Service for all Airprox involving military aircraft where ATC was available and contacted by at least one pilot. With Airprox, it is the case that information is collected when something strays from normal operations – it is crucial that the correct conclusions are drawn as it would be easy to conclude that the performance of the Ground Elements Situational Awareness barrier is 'not as bad' when the barrier is not used (as in Airprox involving GA). However, it is noteworthy that, even when the barrier is engaged, it is Ineffective for a much greater proportion of the time than in those Airprox involving GA (27% compared to 15%). The Regulations Processes and Procedures barrier also appears to perform less well than with GA, and the proportion of Partially Effective is larger, but it is also notable that it is NEVER Ineffective. Although this may appear to be an overall weaker performance of the Barrier, the fact that the Barrier, when present, is always adding value in terms of MAC mitigation is encouraging. If the proportions of Partially Effective and Effective for each sector are combined, then it can be seen that the Barrier is at least Partially Effective for a broadly similar proportion of events in both sectors, as will be seen when the performance of the Flight Elements Situational Awareness barrier is analysed. What this data reveals are the main areas that compromise a barrier *when that barrier is* engaged. Note that there were only 42 Airprox involving Military aircraft where a full assessment of the barrier performance was possible, and this includes 4 that were reported by the UA/Other operator but were fully evaluated.

Where the Ground Elements Situational Awareness barrier was Ineffective or Partially Effective, the Ground Elements Regulations, Processes and Procedures barrier was also compromised on 46% of occasions (usually due to Traffic Information having not been passed when it should have been – see Table 11 below). Of note, 2023 saw a marked increase in the number of STCA (Short-Term Conflict Alert) events reported but this has not been repeated in 2024. It is assessed that this reduction is due to the maturing understanding amongst military controllers and rule-makers regarding when to activate this barrier to ensure it has best effect.

GROUND ELEMENTS SITUATIONAL AWARENESS BARRIER – AIRPOX INVOLVING MILITARY AIRCRAFT – RISKS A/B/C
ANS Traffic Information Provision-TI not provided, inaccurate, inadequate, or late
Conflict Detection-Not Detected
Traffic Management Information Provision-The ANS instructions contributed to the Airprox
Conflict Resolution-Inadequate
ATM Coordination

Table 11: Ground Elements Situational Awareness – Airprox involving Military Aircraft

Airprox worthy of further study from the Ground Elements perspective are:

Airprox No	Year	Alt Block	Risk Category	Sector Mix
2024047	2024	1501-2000	C	Mil-Mil
2024057	2024	501-1000	C	GA-Mil
2024062	2024	3001-FL79	E	Mil-Mil
2024085	2024	501-1000	C	GA-Mil
2024128	2024	0-500	B	Mil-UA/Other
2024136	2024	FL80-FL195	E	Civ Comm-Mil
2024179	2024	2001-3000	E	GA-Mil
2024206	2024	1001-1500	C	Civ Comm-Mil
2024227	2024	3001-FL79	B	GA-Mil
2024237	2024	1501-2000	B	GA-Mil
2024241	2024	FL80-FL195	C	Mil-Mil
2024263	2024	1001-1500	C	GA-Mil
2024278	2024	0-500	C	Mil-Mil
2024289	2024	3001-FL79	E	Civ Comm-Mil

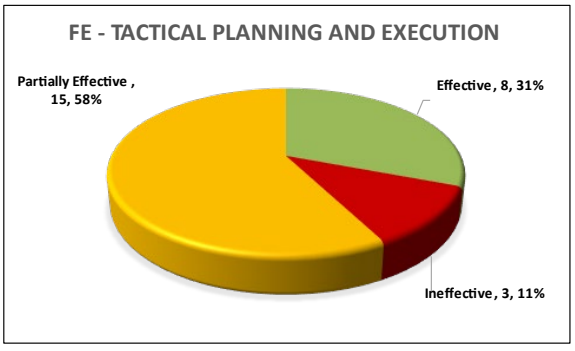
Table 12: Airprox involving Military Aircraft – worthy of study

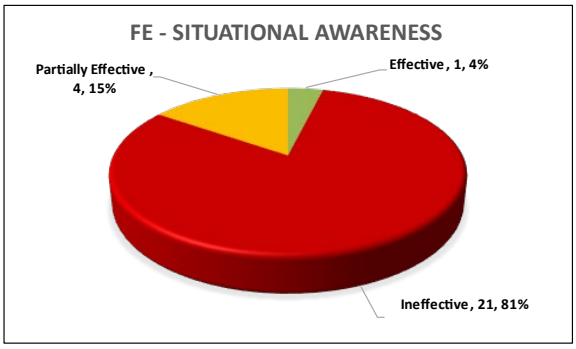
FLIGHT ELEMENTS

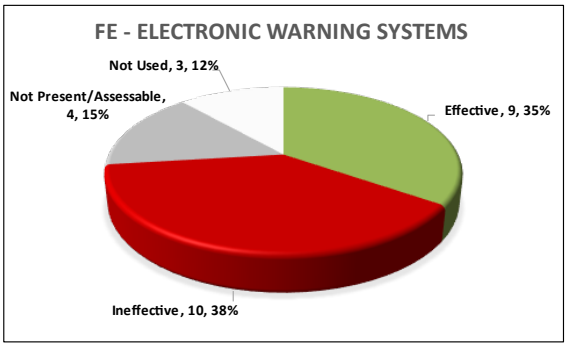
What is noticeable in this set of graphics is the similarity in performance of the Tactical Planning and Execution and Situational Awareness barriers when compared with the General Aviation sector. This is perhaps surprising when considering that less than half (43%) of aircraft-to-aircraft Airprox involving military aircraft were with the GA sector, but it does follow an established pattern across all aircraft-to-aircraft Airprox. However, the Electronic Warning Systems barrier does perform markedly better than for the GA sector, with only a slightly higher percentage of encounters where EC equipment is fitted, reflecting the extensive work that Defence has undertaken in fitting this equipment and ensuring its ability to interact with myriad other systems; it also reflects an increased carriage of EC equipment in the GA sector. Regrettably, Electronic Warning Systems barrier performance will remain weak unless or until a common standard for EC is agreed and mandated for carriage in Class G airspace.

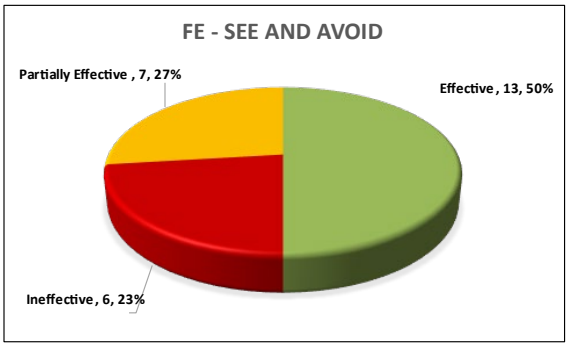
FLIGHT ELEMENTS SITUATIONAL AWARENESS BARRIER – AIRPROX INVOLVING MILITARY AIRCRAFT – RISKS A/B/C
Situational Awareness and Sensory Events-Pilot had no, late or only generic, Situational Awareness
Unnecessary Action-Pilot was concerned by the proximity of the other aircraft
Understanding/Comprehension-Pilot did not assimilate conflict information
Lack of Action-Pilot flew close enough to cause concern despite Situational Awareness
Monitoring of Communications

Table 13: Flight Elements Situational Awareness – Airprox involving Military Aircraft









The Tactical Planning and Execution Barrier performs better than in those Airprox involving GA Sports Recreational aircraft; 3 of the top 5 reasons for barrier compromise are the same as for the GA sector, but note the appearance of Flight Planning Information Sources and Pre-Flight Briefing and Flight Preparation:

TACTICAL PLANING AND EXECUTION – AIRPROX INVOLVING MILITARY AIRCRAFT – RISKS A/B/C
Pre-flight briefing and flight preparation
Flight Planning Information Sources
Monitoring of Environment-Did not avoid/conform with the pattern of traffic already formed
Pilot did not request appropriate ATS service or communicate with appropriate provider
Insufficient Decision/Plan-Inadequate plan adaption

Table 14: Tactical Planning and Execution barrier – Airprox involving Military aircraft

Noting that the top 2 contributory factors reflect either insufficient/incorrect pre-flight planning or appropriate information not being available to crews during the planning stage, it is perhaps a little concerning that, with dedicated resources to ensure that full and accurate planning information is available to crews, this barrier is compromised by information being unavailable on the ground prior to flight or being available but not referenced by crews. With so few Airprox involving Military aircraft, it must be said that there is not a very high count of these contributory factors but, nonetheless, it can be seen that a less-than-thorough pre-flight preparation can have an impact on the safe execution of the flight.

Finally, when the Electronic Warning Systems barrier was Ineffective, it was usually a mix of Military and either GA Sports and Recreational aircraft or RPAS, where compatibility and/or carriage of equipment was a significant issue. However, and perhaps disappointingly, there was one occasion where the mix was Military-Military.

It should be noted that there were only 4 aircraft-to-aircraft risk-bearing Airprox that involved Military aircraft from a total of 75 across all sectors. The majority aircraft-to-aircraft Airprox involving Military aircraft were categorised as Category C, where safety was degraded but there was no risk of collision. This distribution is largely down to the performance of the See and Avoid barrier, meaning that the proximate aircraft (either sector) was seen with sufficient time to introduce deconfliction without the need for emergency or radical avoiding action. It is noteworthy that, in 2024, the performance of the Situational Awareness barrier is much reduced over that seen in 2023 (81% ineffective in 2024 compared to 62% ineffective in 2023). Some of this reduction in performance may be attributable to the Electronic Warning Systems barrier, the performance of which, when present, is very similar to its performance in 2023. Additionally, there is a higher proportion of events where the Electronic Warning Systems barrier is not present (3 events involving Typhoons and one involving an AH-64 helicopter); although these aircraft do have other on-board systems that assist in the detection of proximate traffic, they do not provide the pilot of the other aircraft with any information regarding the presence of the military aircraft, thus denying a proportion of the barrier's overall potential effectiveness. Although these 2 barriers can and do contribute to the performance of the See and Avoid barrier, clearly this

barrier can act independently of inputs from other barriers. This is likely to be the reason for the higher percentage of occasions where the See and Avoid barrier was Fully Effective compared to 2023, but this does mean that the separation between the aircraft at the point of action being taken has, on average, increased. However, if the proportions of occasions where the See and Avoid barrier was Fully Effective or Partially Effective are combined, then the performance of this barrier is very similar to 2023.

With such a small sample size, it is impossible to draw firm conclusions. However, there are areas which deserve focus, and these are summarised below:

ALL AIRPROX INVOLVING MILITARY AIRCRAFT	
GROUND ELEMENTS	**FLIGHT ELEMENTS**
ANS Traffic Information Provision-TI not provided, inaccurate, inadequate, or late	**Situational Awareness and Sensory Events-Pilot had no, late, inaccurate or only generic, Situational Awareness**
ATM Regulatory Deviation-Regulations and/or procedures not fully complied with	**Monitoring of Other Aircraft-Non-sighting or effectively a non-sighting by one or both pilots**
Traffic Management Information Provision-The ANS instructions contributed to the Airprox	**Incompatible CWS equipment**
ATM Coordination	**Accuracy of Communication-Ineffective communication of intentions**
Aeronautical Information Services-The Ground entity's regulations or procedures were inadequate	**Insufficient Decision/Plan-Inadequate plan adaption**

Table 15: General Contributory Factors – Airprox involving Military Aircraft

AIRPROX REPORTED BY RPAS (FULL BOARD EVALUATIONS) – RISKS A/B/C

The final bespoke section concerns the findings relating to interactions between RPAS and piloted air vehicles. Although the numbers are small, these Airprox are significant because the RPAS flyer has reported the occurrence, or because the RPAS flyer has been traced. This simply means that the Board is therefore able to conduct a full evaluation of the event.

This is not the case with most UA/Other Airprox, where the non-piloted vehicle is usually untraceable. As with all sectorised Airprox, it is the differences in the barrier performances which are illuminating, so it is useful to use the barrier conceptualisation diagram to illustrate the dynamics of the situation. For these cases, the See and Avoid barrier qualified from both the perspective of the RPAS flyer and then the Piloted aircraft will be presented.

It is clear that the Ground Elements play very little, if any, part in this type of Airprox, although there were opportunities, on at least 2 occasions, where known information could have been disseminated better. This realistically leaves the Flight Elements with the only levers to mitigate against an Airprox or mid-air collision.

It can be seen that the Flight Elements – Regulations, Processes and Procedures barrier generally performs reasonably well.

For the Tactical Planning and Execution barrier, the main Contributory Factors to an Ineffective or only Partially Effective barrier are planning, preparation and plan adaption, driven by the difficulties of either party having any prior knowledge during the pre-flight planning stage of the presence of the other, and are therefore unable to modify their plan to take account of this. Additionally, the Situational Awareness barrier is ALWAYS Ineffective, meaning that pilots and RPAS operators are relying on reacting to what they see.

> The Ground Elements are not able to add much, if any, value to RPAS Flyer operations.

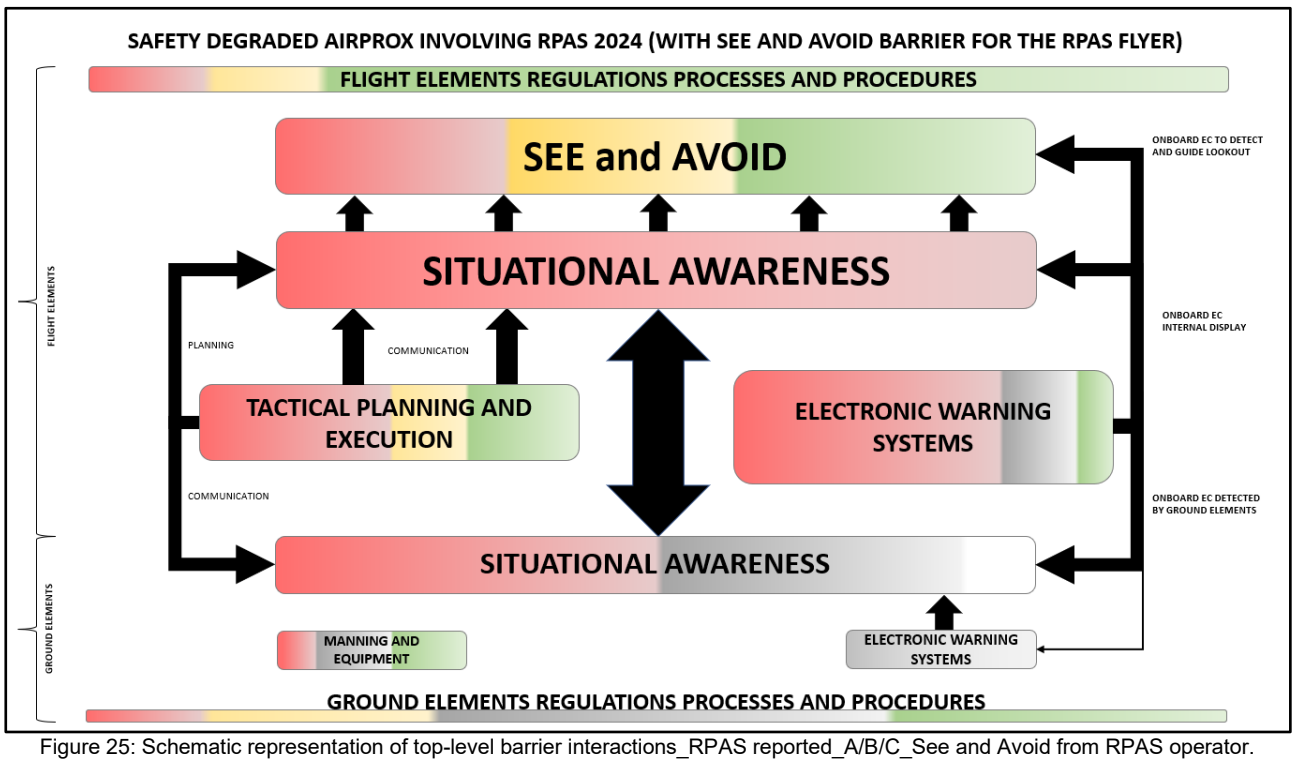


Figure 25: Schematic representation of top-level barrier interactions_RPAS reported_A/B/C_See and Avoid from RPAS operator.

On 2 occasions, the RPAS was fitted with a form of EC which alerted the RPAS operator to the presence of the approaching aircraft; in one case a Risk Category of E was assigned by the Board, and in the other a Risk Category C. This indicates the utility of early warning of an aircraft's presence, as neither of these encounters were assessed to have carried a risk of collision. In all other cases, the Situational Awareness barrier was either Ineffective through incompatibility, where equipment was fitted to the piloted aircraft and not fitted to the RPAS, an alert was not received or there was no equipment fitted to either aircraft.

When all these points are taken into consideration, the contributors to the See and Avoid barrier are degraded significantly. However, looking at Fig 25 the barrier performs quite well. This is because on every occasion where this barrier was fully effective it was the RPAS operator who heard an aircraft in the vicinity and was able to acquire it visually and take action to avoid it.

Figure 26 has been constructed using the See and Avoid barrier information from the perspective of the piloted vehicle – the pilots involved only saw the RPAS on one occasion and managed to take sufficient avoiding action to remove the risk of collision.

> In all of the cases where the RPAS flyer has reported the Airprox, the pilot of the crewed aircraft was NEVER aware of its presence.

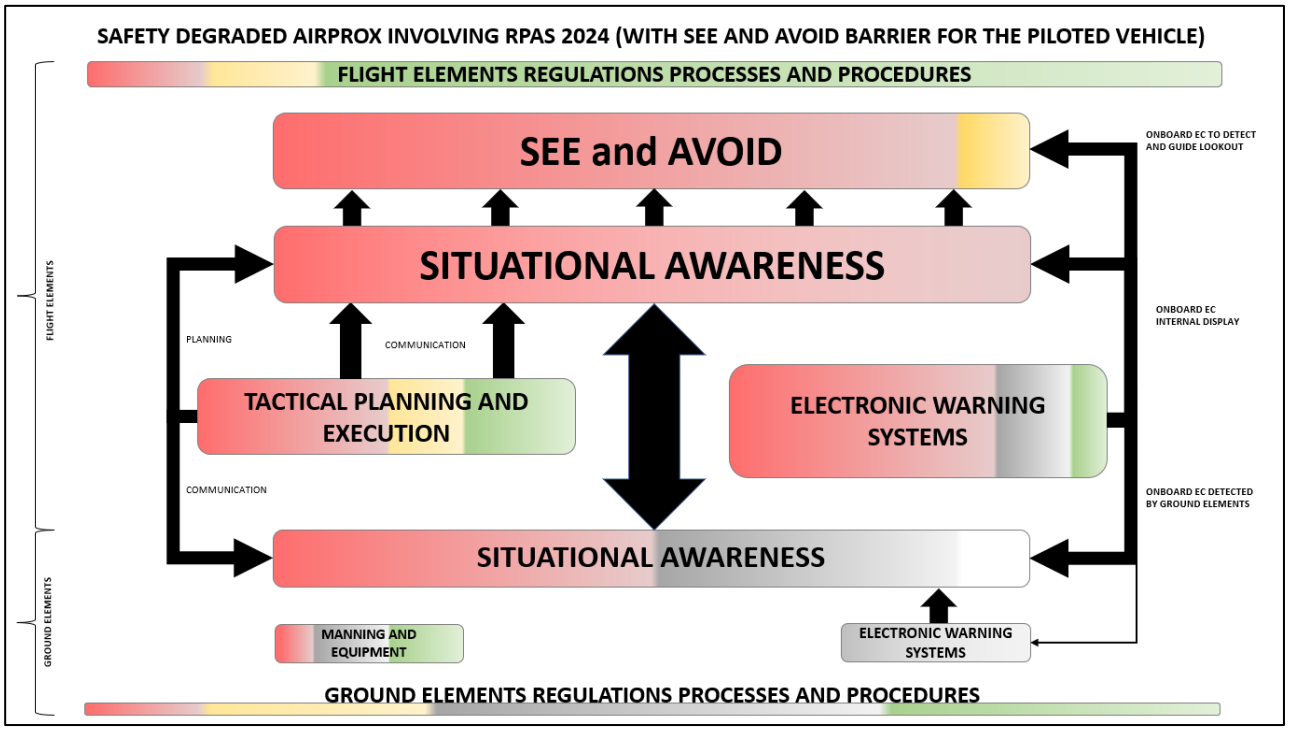


Figure 26: Schematic representation of top-level barrier interactions_RPAS reported_A/B/C_See and Avoid from piloted vehicle.

Although the data set for these occurrences is incredibly small, consisting of only 16 Airprox, these 16 Airprox elicited 2 Safety Recommendations where the Board was seeking to improve the promulgation of planning information for RPAS activity. It is difficult to cater for all circumstances, but there is justifiable apprehension surrounding the regulatory requirements as technological advances bring us ever closer to civilian BVLOS RPAS operations in Class G Airspace. Although BVLOS RPAS are likely to have a larger visual cross section, they will still be significantly smaller than piloted aircraft, rendering the See and Avoid barrier more vulnerable than it already is. For the RPAS, the See and Avoid is likely to be some form of a Sense and Avoid, yet Class G airspace does not require, and the current regulations do not support, a known air traffic environment. It is difficult to see where effective barrier mitigations to an Airprox with RPAS once airborne can be made UNLESS interoperable EC

equipment is mandated throughout Class G airspace. Pilots of crewed aviation need to be aware that, from their perspective, reliance on the See and Avoid barrier in Class G airspace offers little defence against an Airprox (or a MAC) with an RPAS.

The table below provides links to the 16 Airprox where the Board was able to conduct a full evaluation:

Airprox No	Year	Alt Block	Risk Category	Sector Mix
2024049	2024	0-500	E	GA-UA/Other
2024088	2024	1501-2000	C	Mil-UA/Other
2024106	2024	1501-2000	D	Emerg Servs-UA/Other
2024128	2024	0-500	B	Mil-UA/Other
2024138	2024	1501-2000	E	GA-UA/Other
2024140	2024	501-1000	B	Civ Comm-UA/Other
2024156	2024	1001-1500	C	Civ Comm-UA/Other
2024174	2024	501-1000	C	GA-UA/Other
2024205	2024	501-1000	E	Mil-UA/Other
2024257	2024	501-1000	B	Emerg Servs-UA/Other
2024260	2024	1001-1500	E	GA-UA/Other
2024273	2024	0-500	C	GA-UA/Other
2024280	2024	0-500	C	Mil-UA/Other
2024283	2024	501-1000	B	Mil-UA/Other
2024288	2024	0-500	C	Mil-UA/Other
2024300	2024	0-500	E	GA-UA/Other

Table 16: Airprox involving UA/Other – worthy of review

Final Comments

This report has been compiled in such a way as to highlight the criticality of barrier interactions for all sectors. The dominance of the GA Sports and Recreational community in the Airprox landscape is unsurprising, given the preponderance of Airprox that occur in Class G airspace. The proportion of risk-bearing Airprox which involve the GA community, after a decrease in 2023, has regained the level of the previous 2 years and now represents a near-total dominance of the aircraft-to-aircraft risk-bearing landscape. Similarly, last year's uptick in the percentage of risk-bearing Airprox involving military aircraft has been, as expected, short-lived and the 10-year downward trend continues – the military's 'share' of risk-bearing events is now at its lowest level for over 10 years. Conversely, the proportion of risk-bearing events involving Commercial Air Transport or Civil Commercial aircraft has doubled since last year – these sectors have historically held a very low percentage of risk-bearing Airprox, so this year's figures may simply be a spike in sectors that otherwise hold a low risk.

Airprox analysis has consistently highlighted these key areas:

- Performance and compatibility of carry-on EC equipment
- Appropriate selection of available ATC services
- Planning, including choice of routes, NOTAMs, weather, proximity to CAS etc.
- Understanding the value and use of Basic Service, Traffic Service, Listening Squawks, and responsibilities when flying IFR in Class G airspace
- Lack of familiarity with airfield and circuit procedures and/or services provided by and responsibilities of AGOs, FISOs and controllers
- Effectiveness of lookout

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ADDITIONAL INFORMATION

The following section is additional data comprising the following:

- A set of 5 charts for each sector where one can easily refer to the Sector Mix, the Altitude, the Airspace and the Risk distributions. These charts provide a quick access overview of the Airprox demographic:

UA/OTHER	CAT_Civ_Comm	GA_Unk ac	Mil

- A summary of Safety Recommendations (2024)
- The 2024 Airprox Catalogue including links to specific reports.

UA/OTHER SECTOR MIX

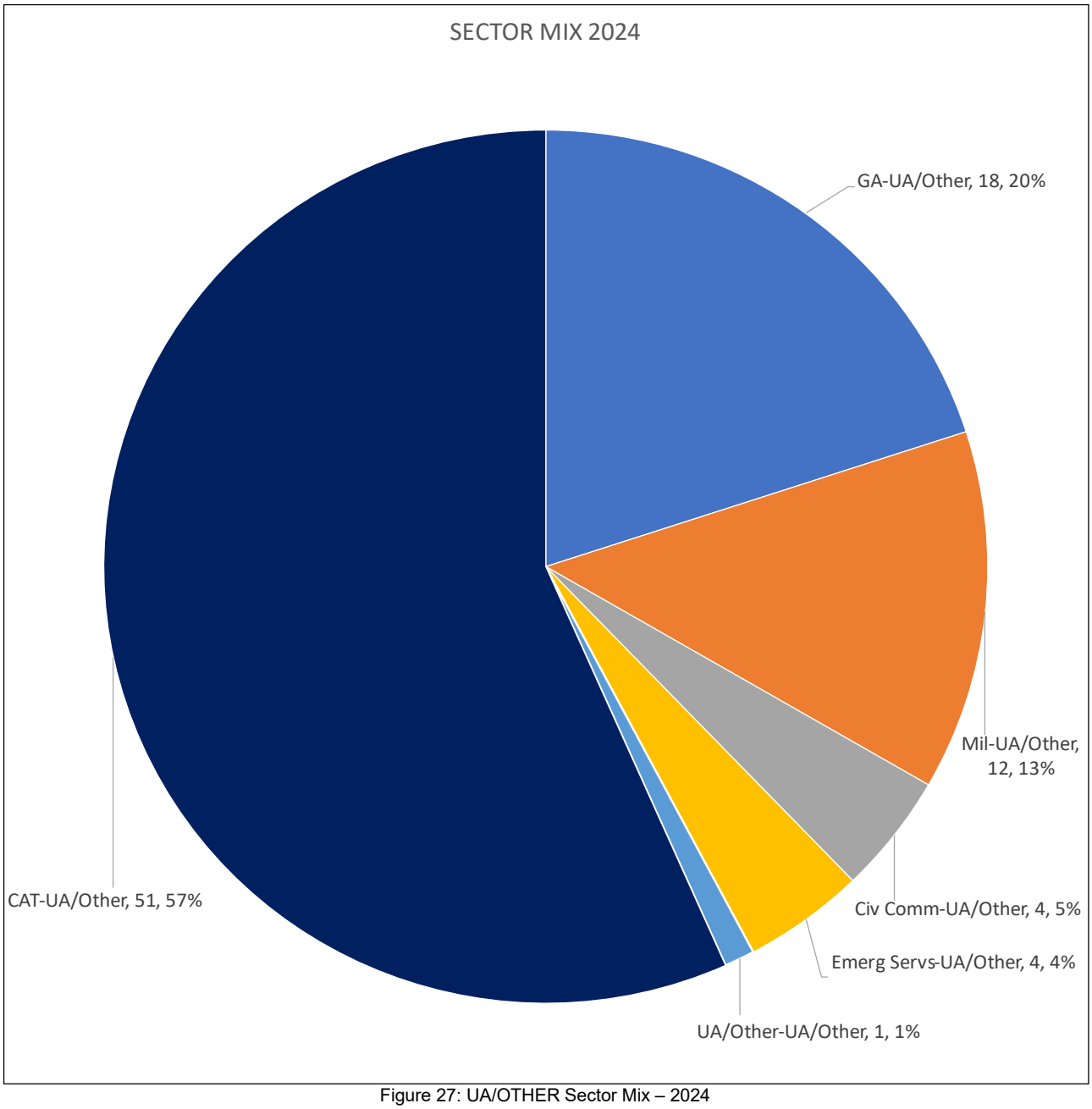

Figure 27: UA/OTHER Sector Mix – 2024

UA/OTHER SECTOR MIX – ALTITUDE

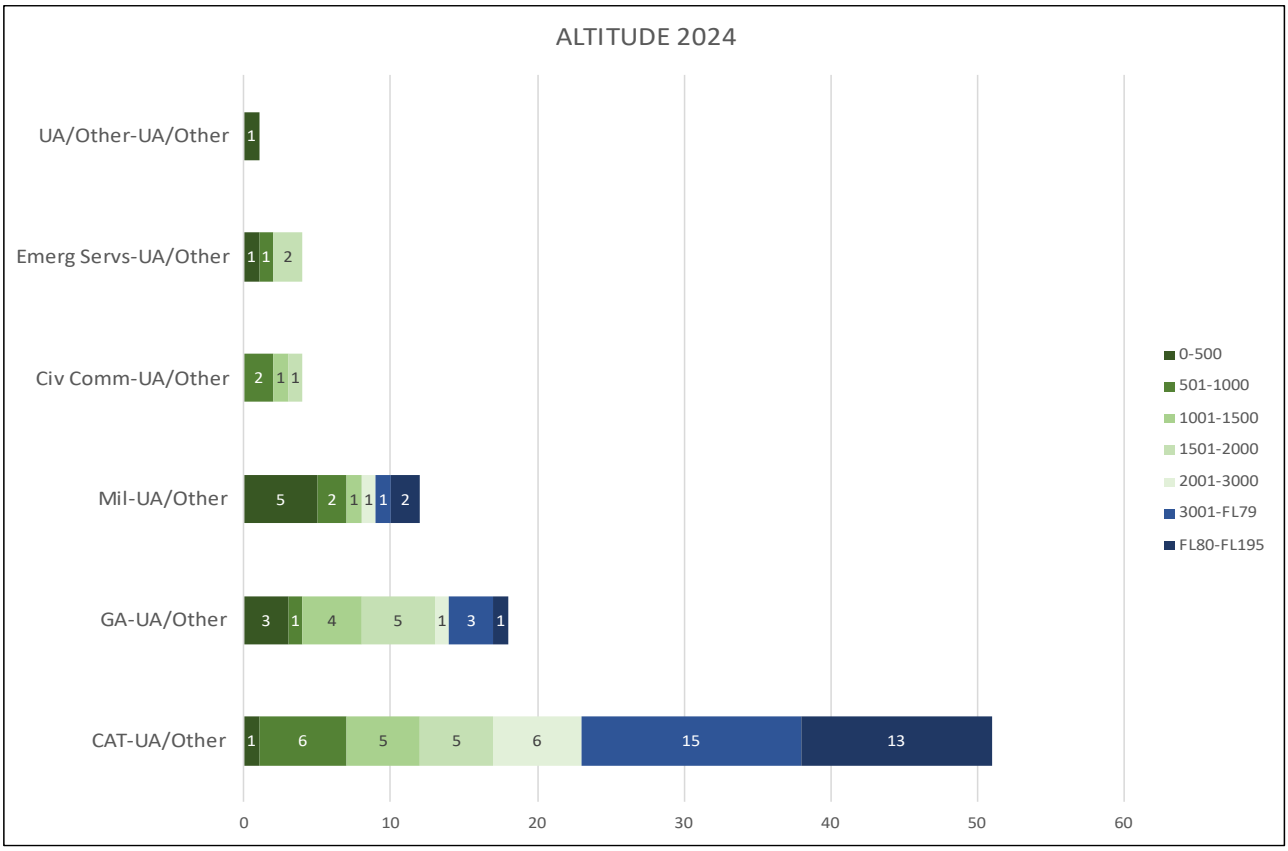

Figure 28: UA/Other Sector Mix – Altitude – 2024

UA/OTHER SECTOR MIX – AIRSPACE

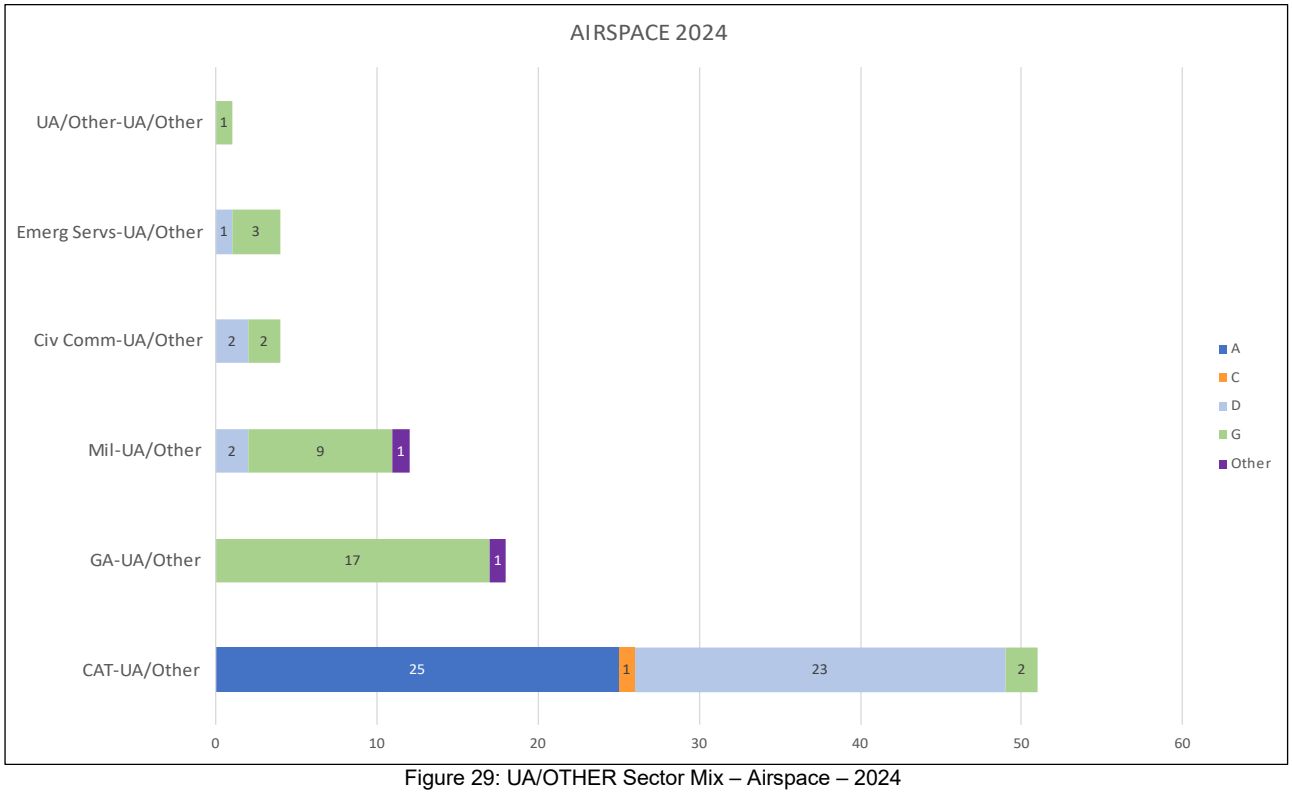

Figure 29: UA/OTHER Sector Mix – Airspace – 2024

UA/OTHER SECTOR MIX – ALTITUDE – RISK-BEARING

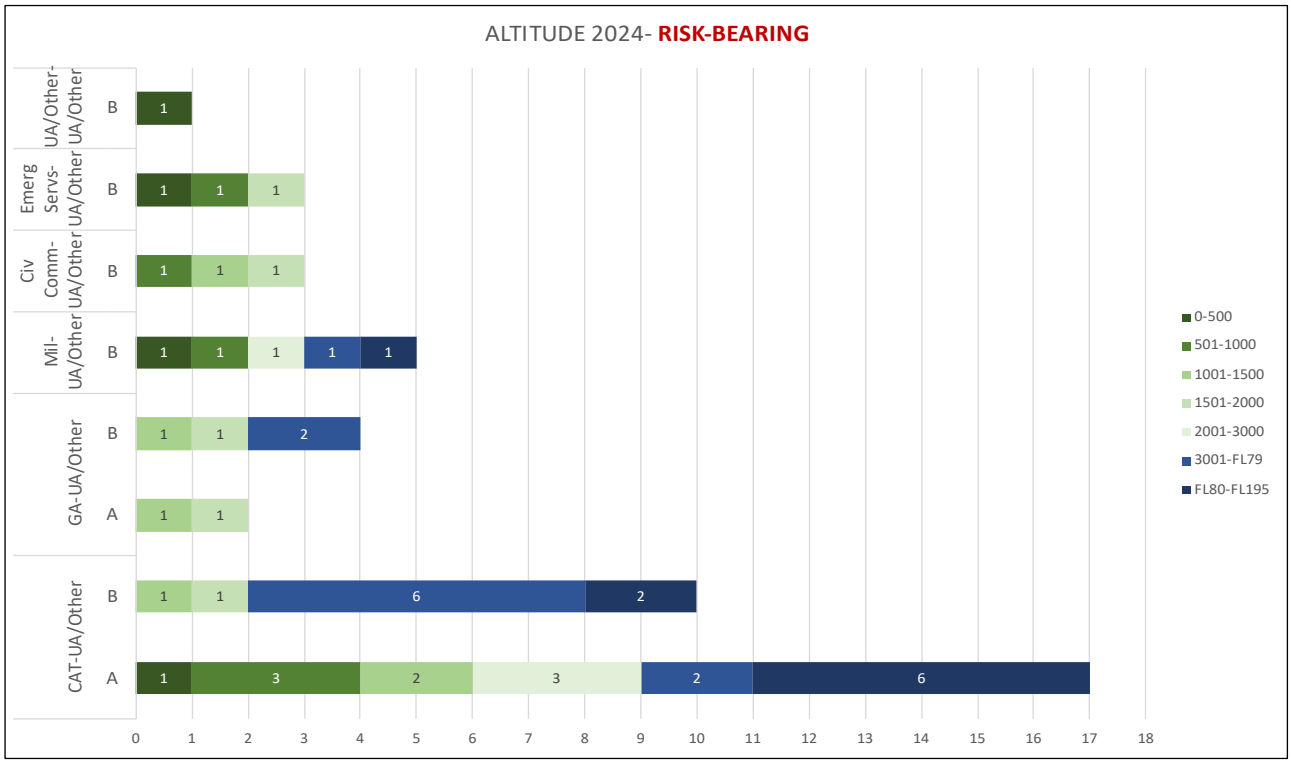

Figure 30: UA/OTHER Sector Mix – Altitude – Risk-Bearing 2024

UA/OTHER SECTOR MIX – RISK

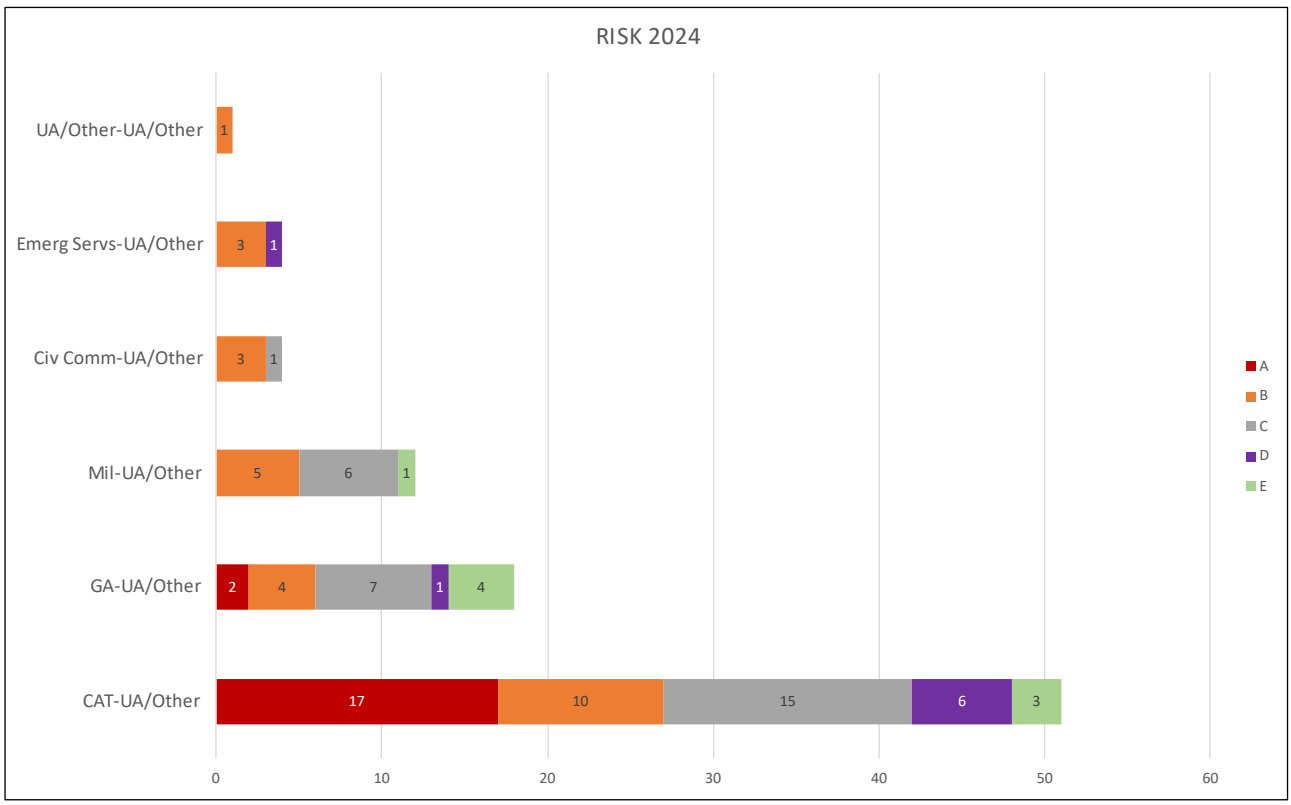

Figure 31: UA/OTHER Sector Mix – Risk – 2024

CAT_CIV COMM SECTOR MIX

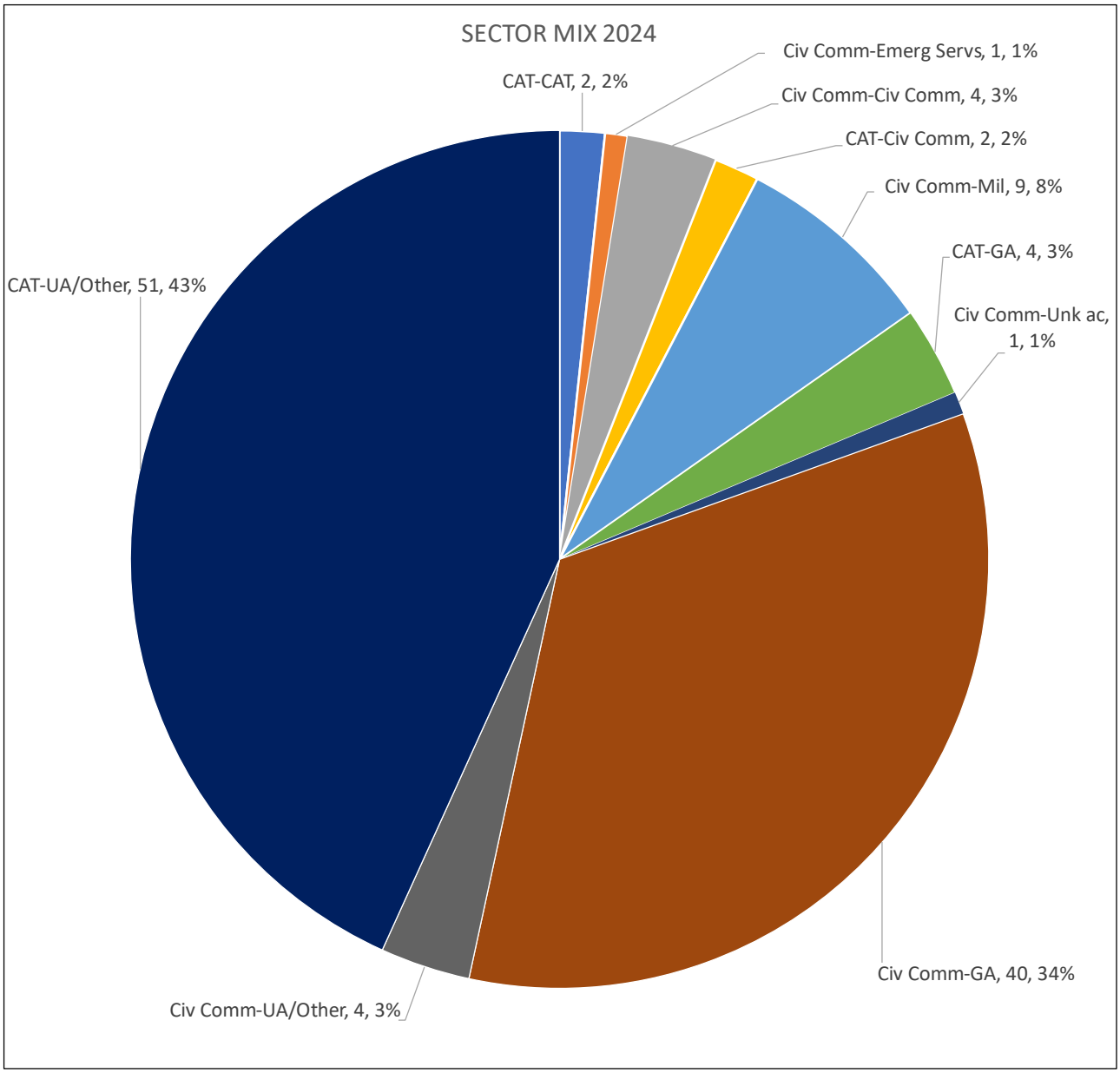

Figure 32: CAT_Civ Comm Sector Mix – 2024

CAT_Civ Comm SECTOR MIX – ALTITUDE

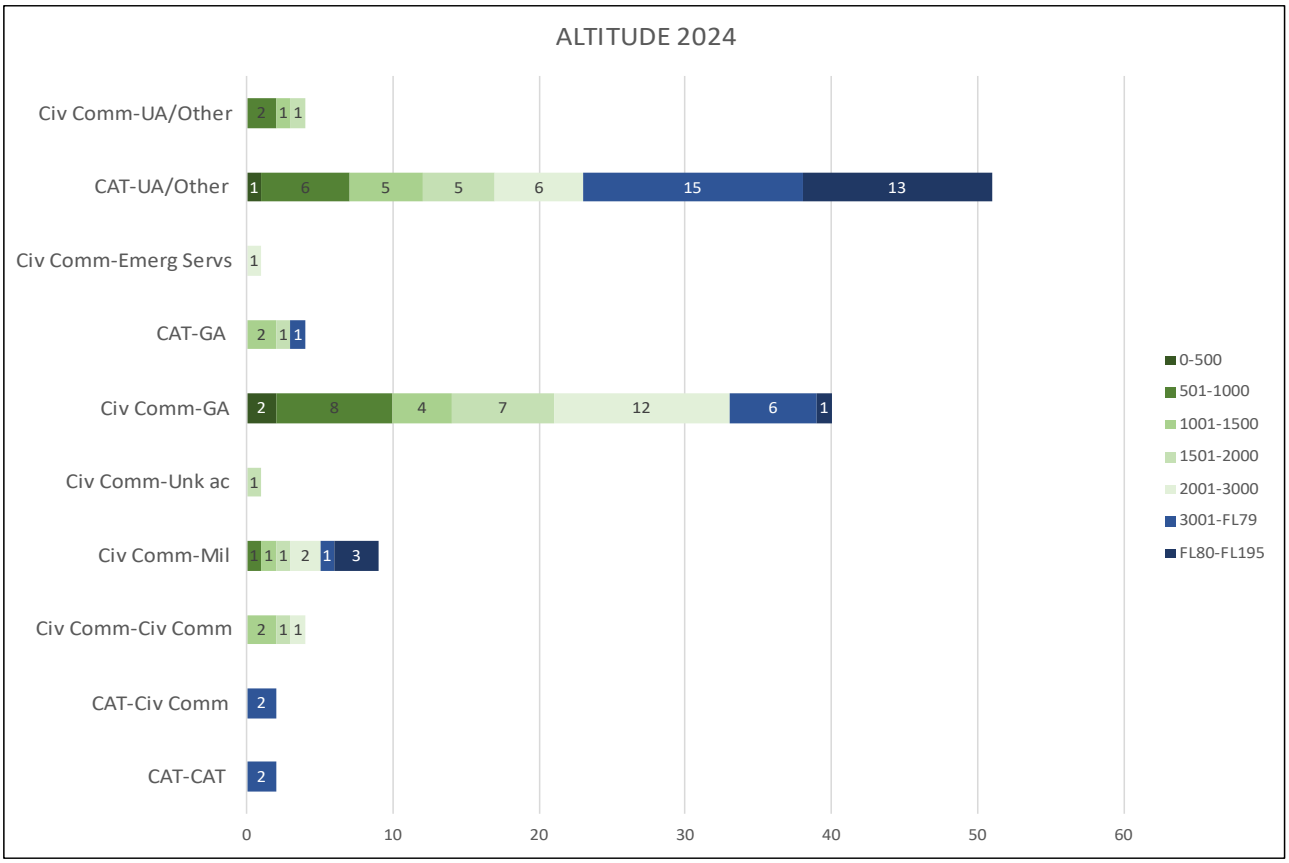

Figure 33: CAT-Civ Comm Sector Mix – Altitude – 2024

CAT_Civ Comm SECTOR MIX – AIRSPACE

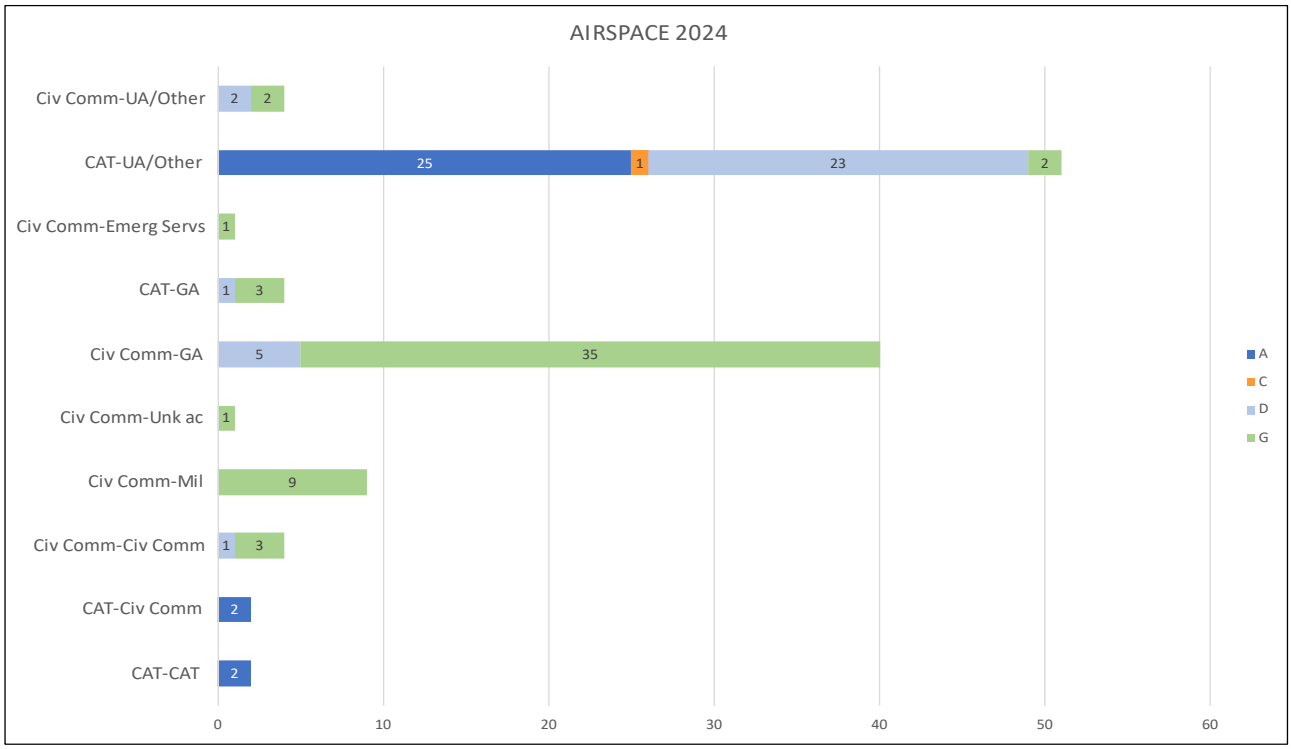

Figure 34: CAT-Civ Comm Sector Mix – Airspace – 2024

CAT_Civ Comm SECTOR MIX – ALTITUDE – RISK-BEARING

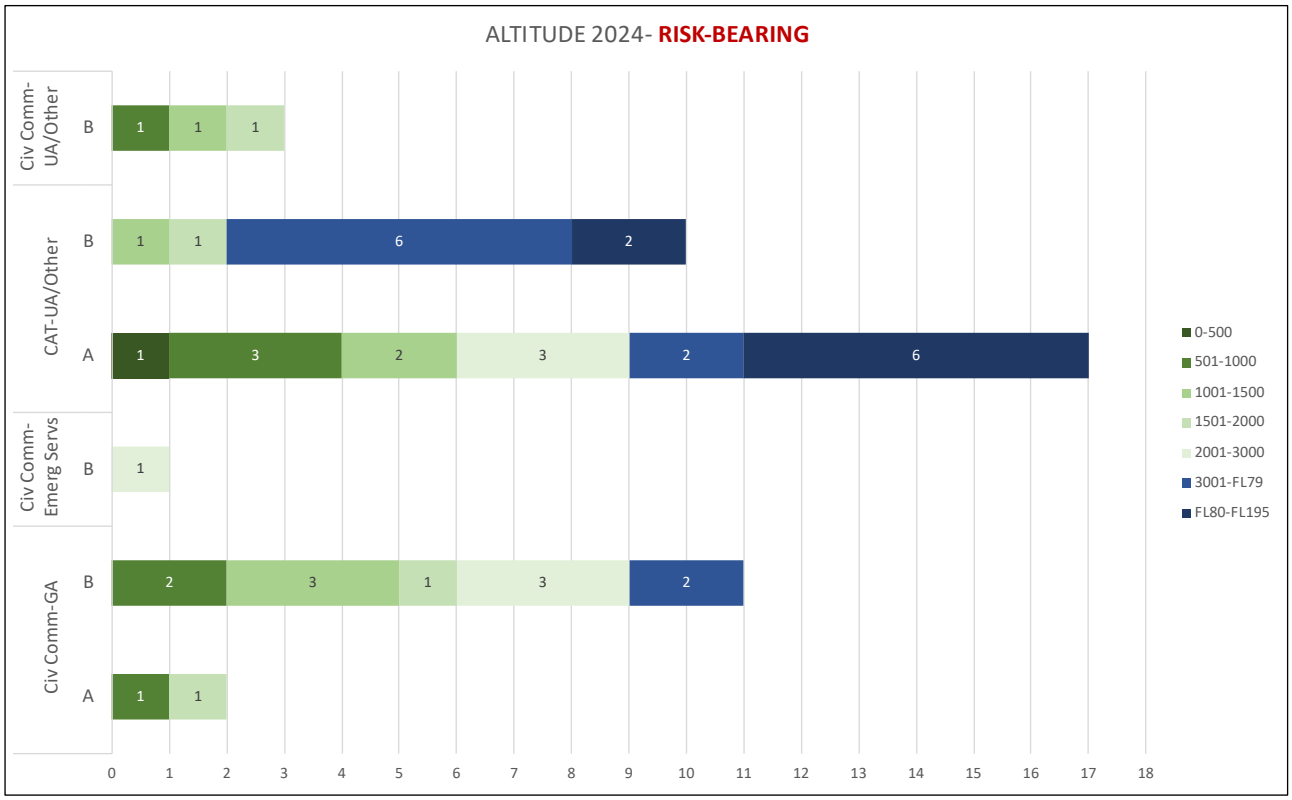

Figure 35: CAT_Civ Comm Sector Mix – Altitude – Risk-Bearing – 2024

CAT_Civ Comm SECTOR MIX – RISK

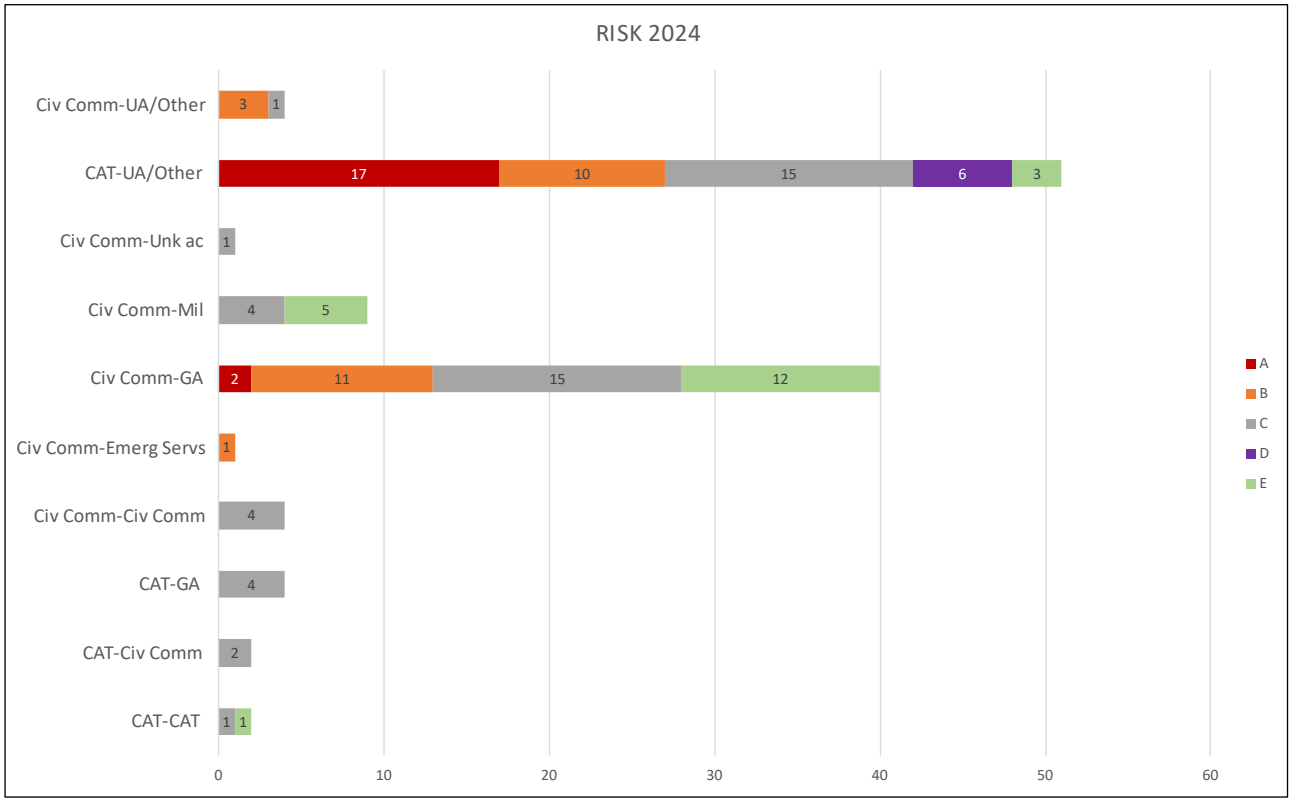

Figure 36: CAT_Civ Comm Sector Mix – Risk – 2024

GA (Sports and Recreational – including Unknown/Untraced) SECTOR MIX

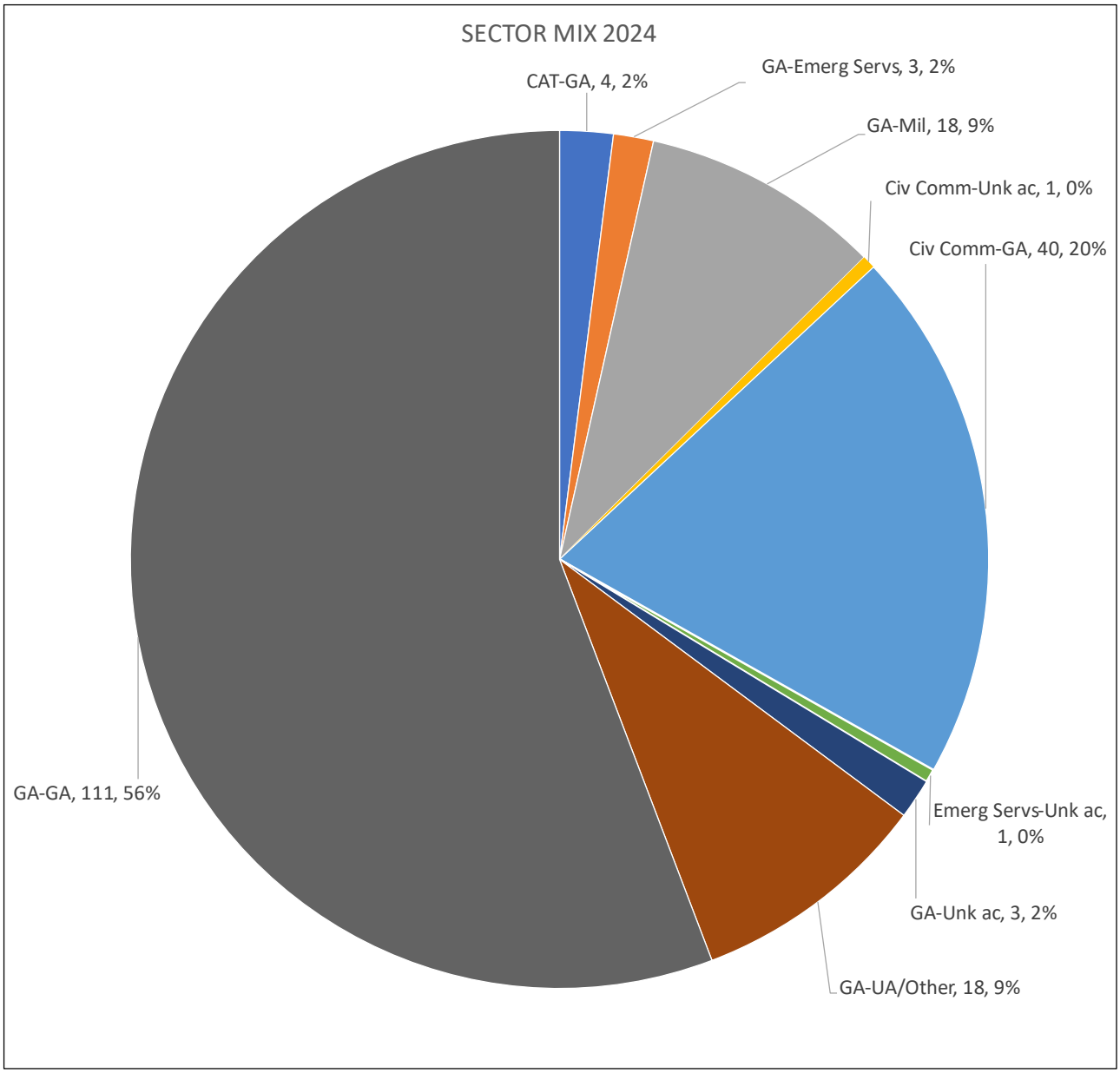

Figure 37: GA_Unk ac Sector Mix – 2024

GA_Unk ac SECTOR MIX – ALTITUDE

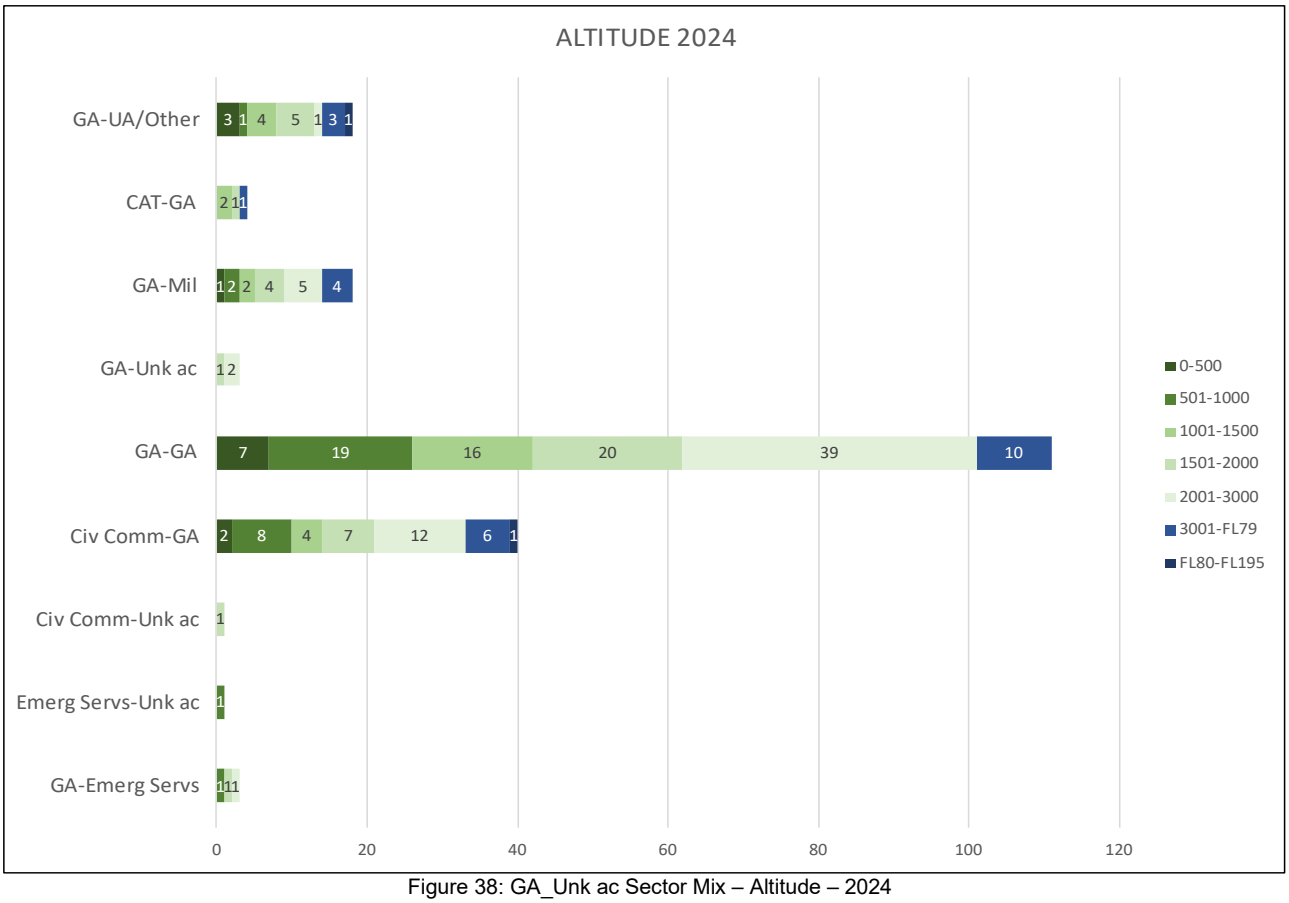

Figure 38: GA_Unk ac Sector Mix – Altitude – 2024

GA_Unk ac SECTOR MIX – AIRSPACE

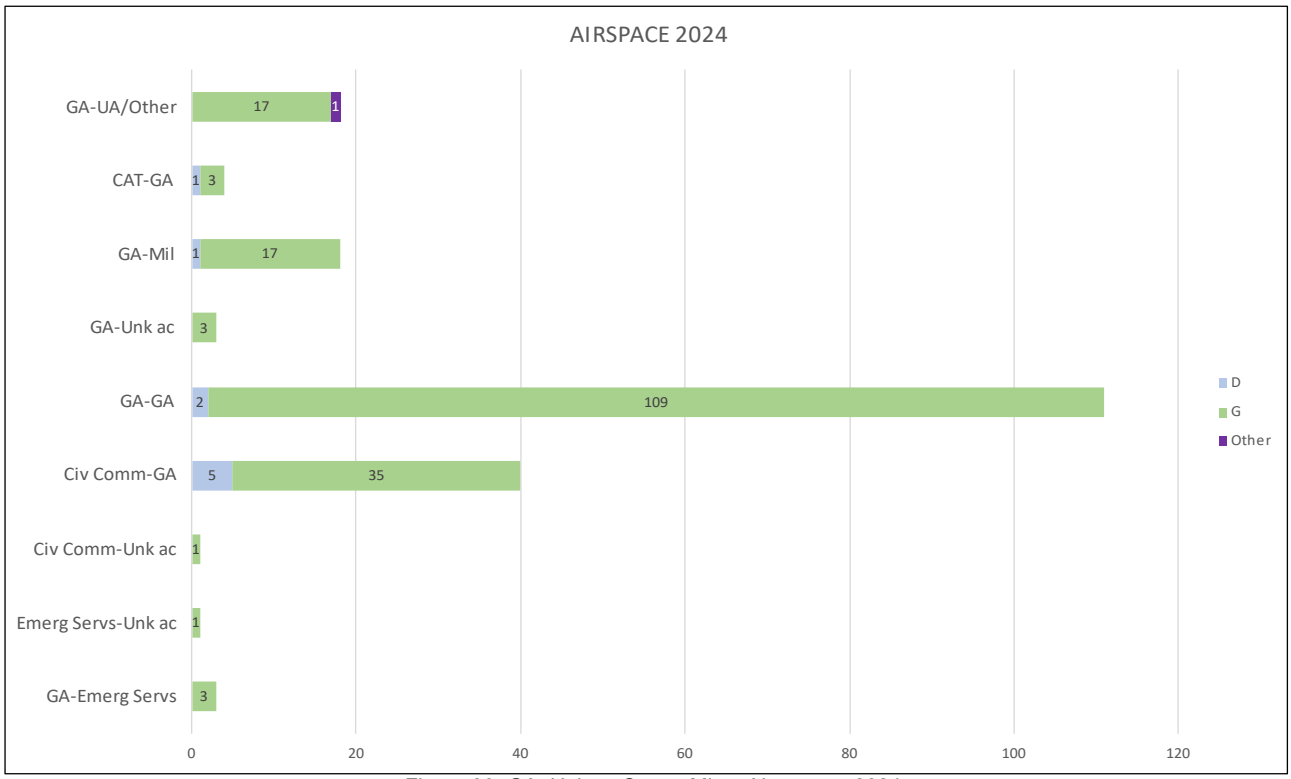

Figure 39: GA_Unk ac Sector Mix – Airspace – 2024

GA_Unk ac SECTOR MIX – ALTITUDE – RISK-BEARING

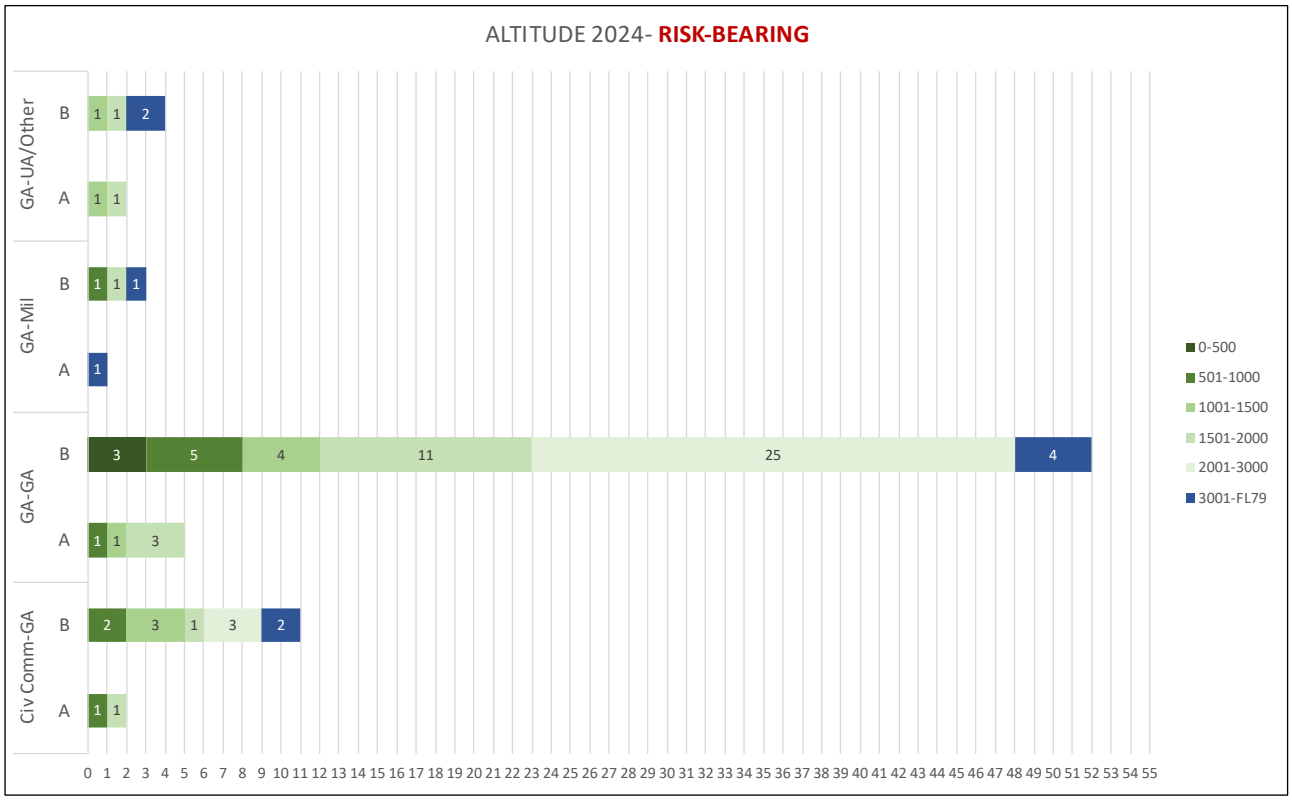

Figure 40: GA_Unk ac Sector Mix – Altitude – Risk-Bearing – 2024

GA_Unk ac SECTOR MIX – RISK

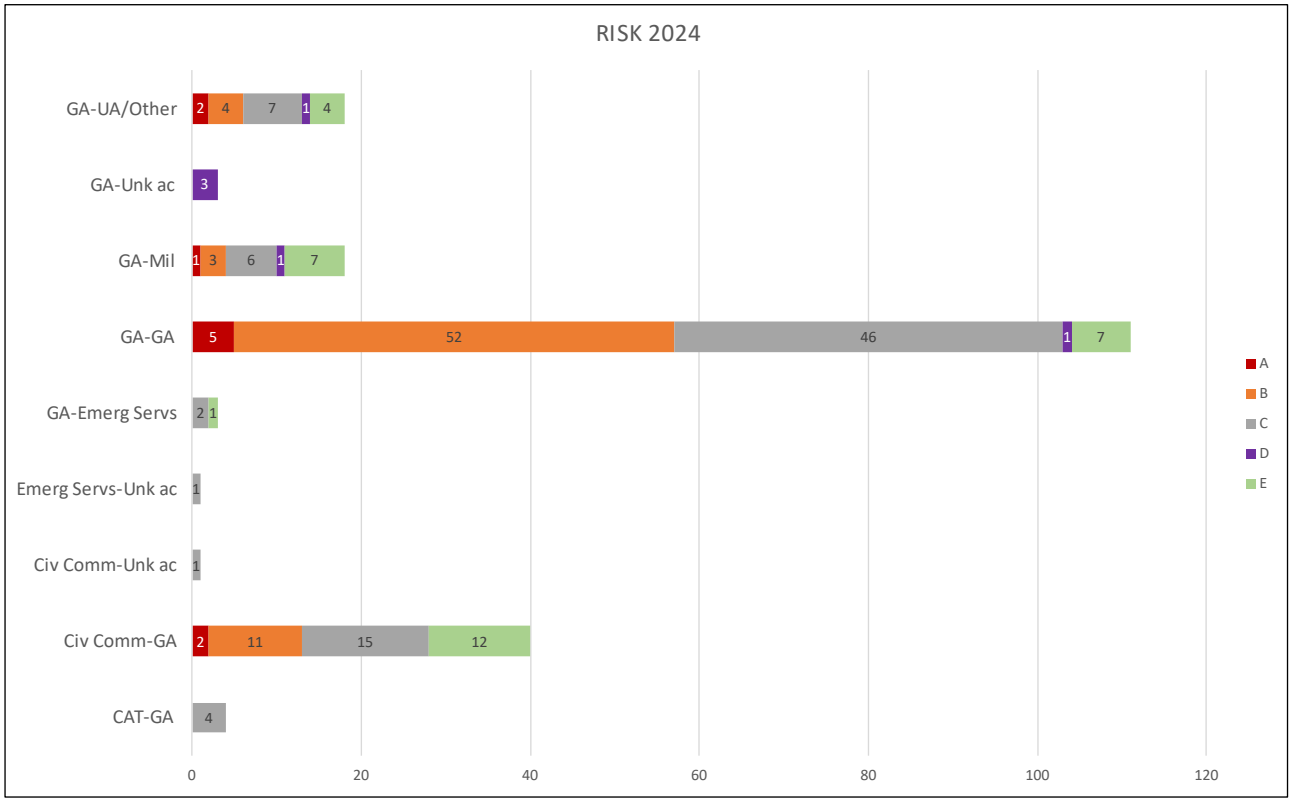

Figure 41: GA_Unk ac Sector Mix – Risk – 2024

MILITARY SECTOR MIX

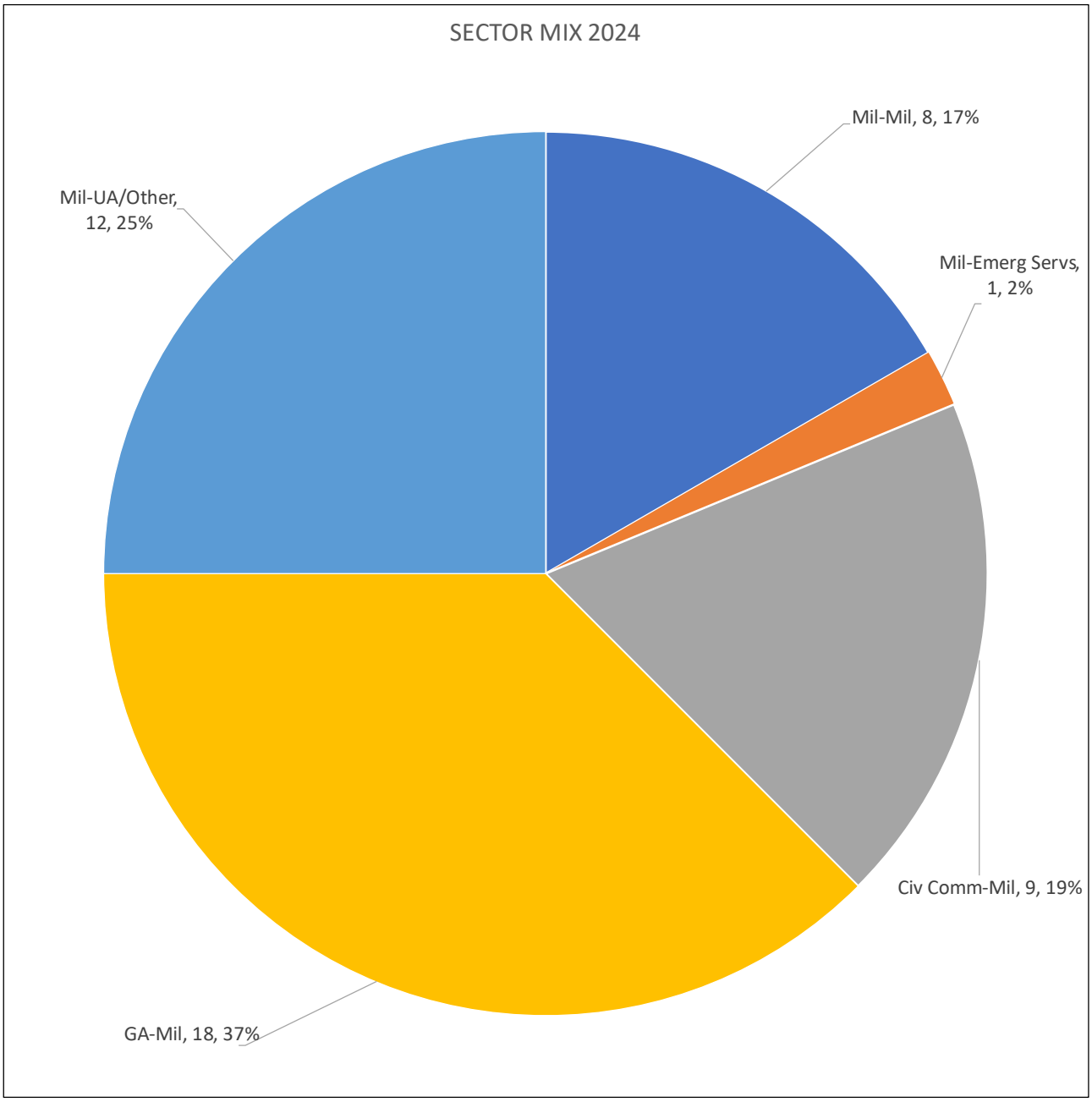

Figure 42: Mil Sector Mix – 2024

MILITARY SECTOR MIX – ALTITUDE

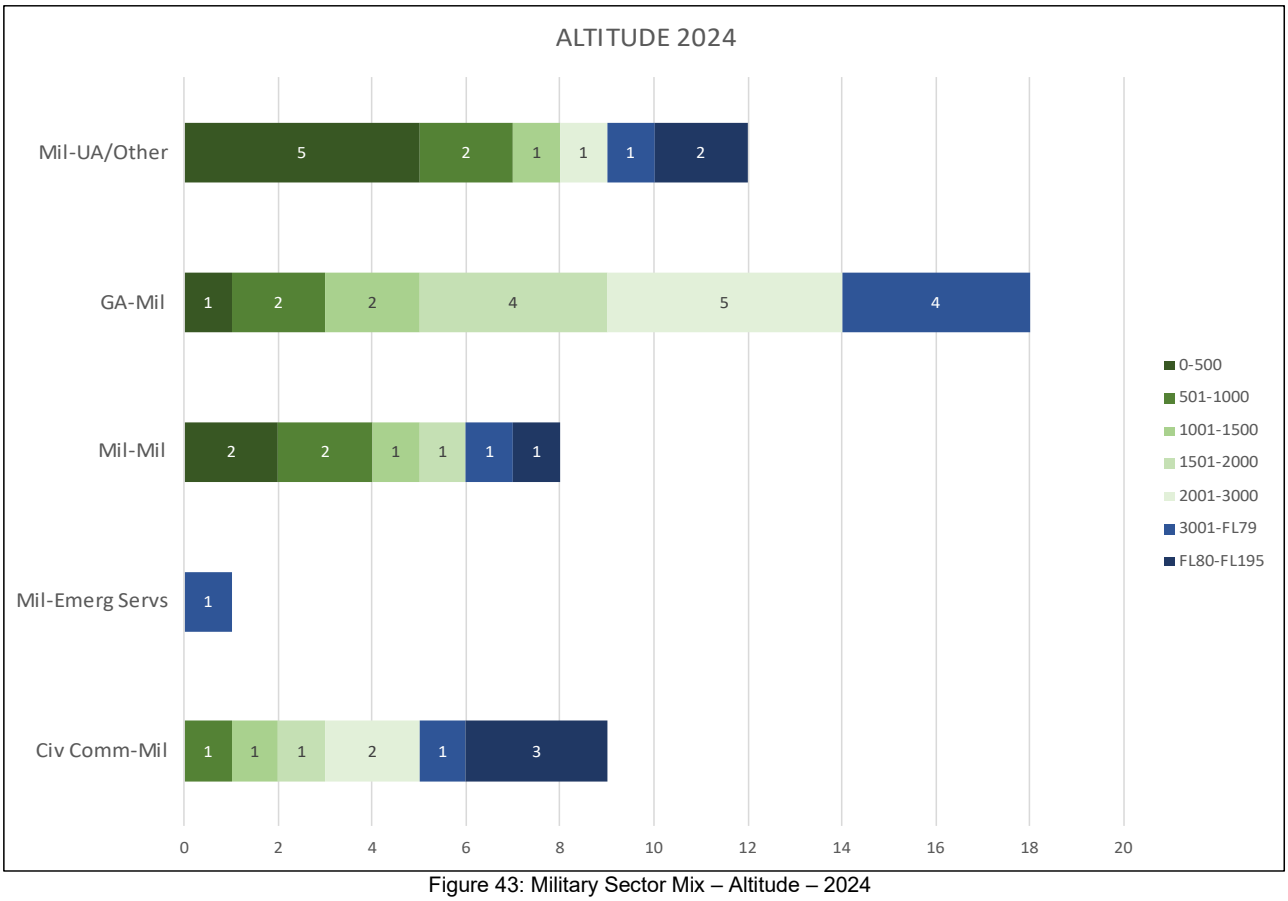

Figure 43: Military Sector Mix – Altitude – 2024

MILITARY SECTOR MIX – AIRSPACE

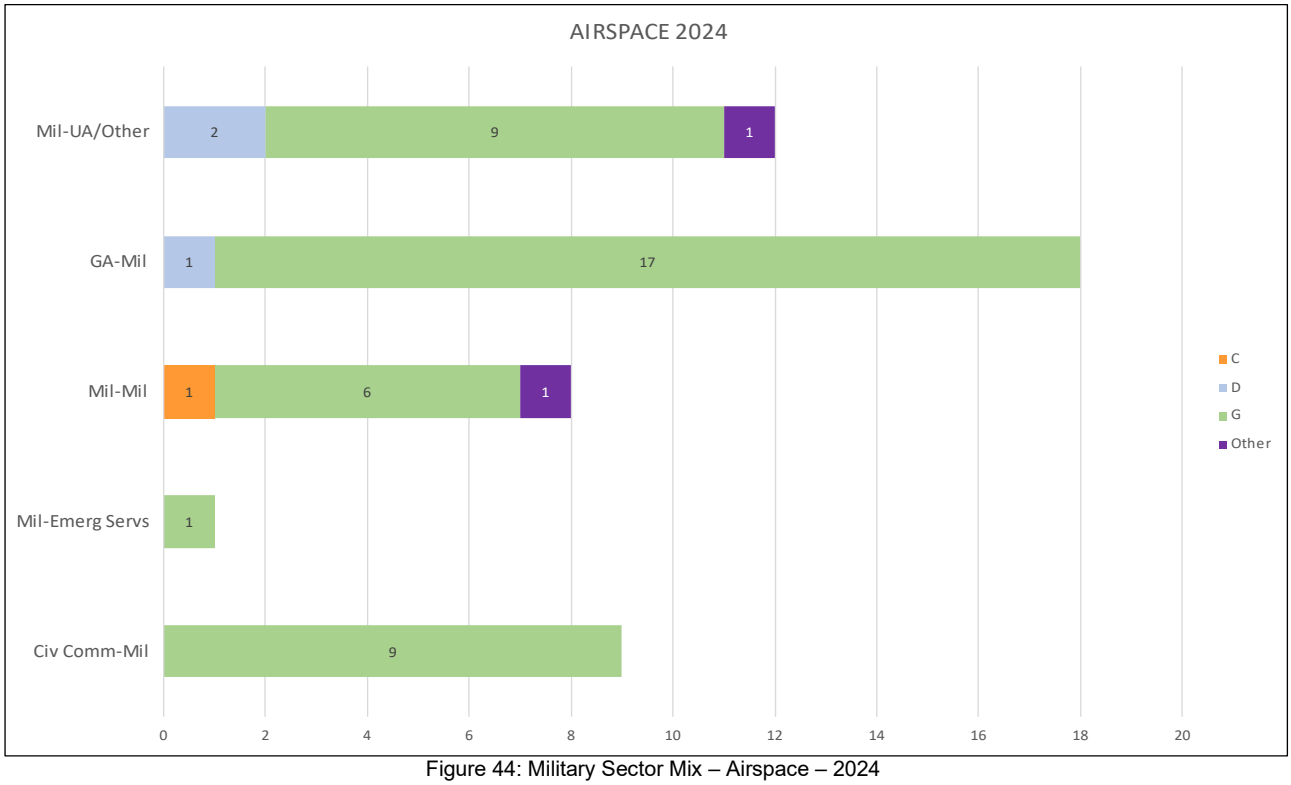

Figure 44: Military Sector Mix – Airspace – 2024

MILTARY SECTOR MIX – ALTITUDE – RISK-BEARING

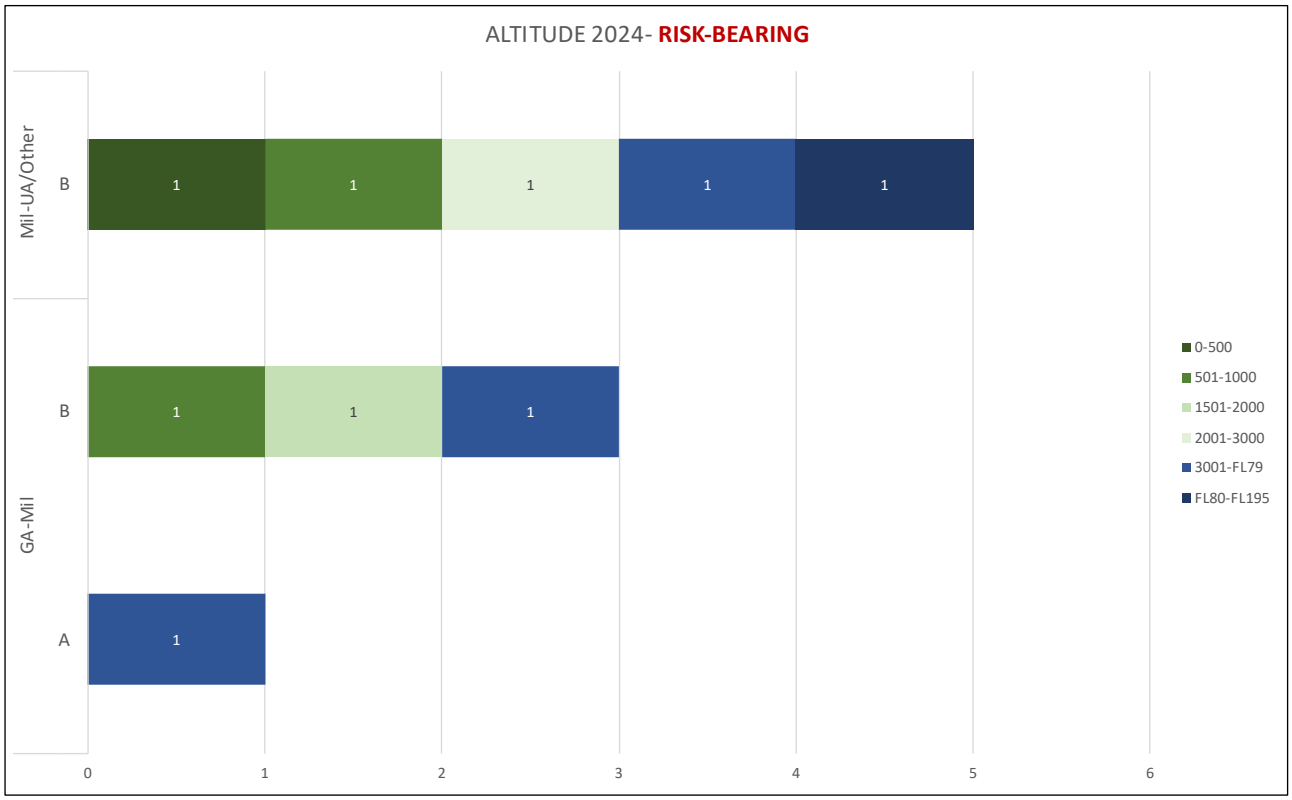

Figure 45: Military Sector Mix – Altitude – Risk-Bearing – 2024

MILTARY SECTOR MIX – RISK

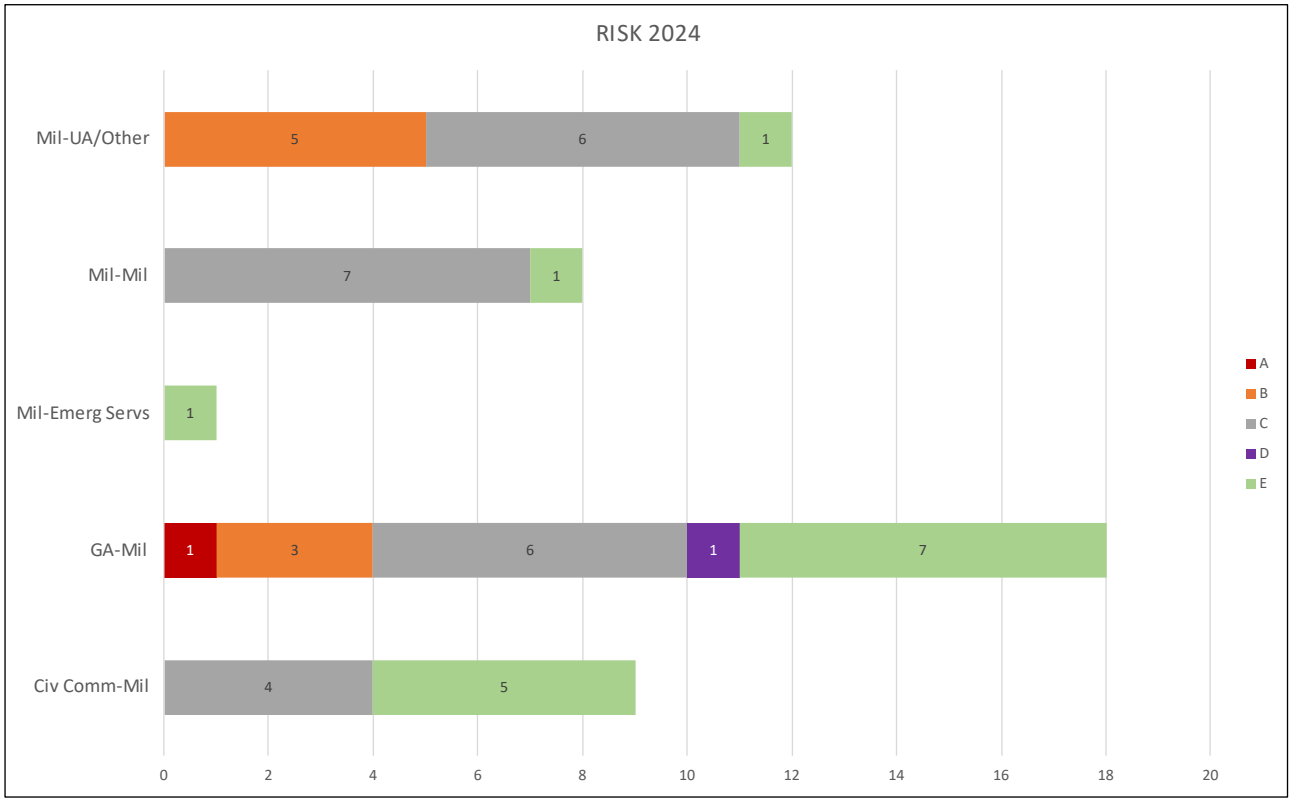

Figure 46: Military Sector Mix – Risk – 2024

UKAB 2024 SAFETY RECOMMENDATIONS

The table below is correct at the time of publication of this report. More up-to-date information on the status of OPEN Recommendations can be found on the UKAB website at https://www.airproxboard.org.uk/reports-and-analysis/safety-recommendations/.

ACCEPTED	PARTIALLY ACCEPTED	REJECTED	OPEN

Airprox	Recommendation	Comments
2024002	Leicester Aerodrome Operator reviews circuit procedures with a view to introducing greater lateral separation between fixed-wing and rotary-wing traffic on final approach.	Following a meeting between the aerodrome manager and interested parties, the following actions have been agreed: 1. Rotary approaches will follow the established rotary circuit. A Rotary approach may be made to the grass runway provided the final approach is clear of fixed-wing traffic. In the case of any conflict, the aircraft further out on approach will perform a go-around. Parallel approaches will not occur and are not permitted. 2. For all circuit traffic, a call of "Left/Right Base – Visual/Not visual with Fixed/Rotary traffic", where radio congestion/capacity permits, will be made. This will be added to the Leicestershire Aero Club Operations manual. 3. Landing lights will be switched on during all circuit operations for both fixed- and rotary-wing aircraft. 4. When flying the NDB training approach procedure, fixed-wing aircraft will not descend below 1200ft AGL if there is rotary traffic operating in the circuit. 5. These procedures will be communicated throughout the club, club website and AIP.
2024057	Edinburgh Airport reviews the naming of their VRPs.	Edinburgh ATC has completed the review of the naming of the VRPs. The review concluded that the Kirknewton VRP is still useful for routeing and co-ordination purposes. The review also concluded that the existing VRP does not effectively meet the UK policy statement for the establishment of VRPs in that it is not based upon a prominent ground feature. An ACP (CAA ref - OTH-2025-003) has been raised to move the VRP to the railway station at Kirknewton and to rename the VRP as KIRKNEWTON RAILWAY STATION. The change process timescales are unknown at this time.
	Edinburgh Airport publishes the details of the Kirknewton Designated Gliding Area in the UK AIP entry for Edinburgh Airport.	The details of the Kirknewton DGA have been included in the EGPH AD section of the AIP from AIRAC 04/2025, published on the 17th April 2025.
2024157	Oxford review their MATS Pt. 2 procedures to include R/T instructions for visiting pilots operating under VFR to remain clear of EGD129.	A Supplementary Instruction to the MATS Pt 2 was issued which, amongst other things, includes the following: Notification of parachuting or gliding at WOTG is to be included in the ATIS broadcast. For D129 activation, the ATIS is to include an instruction to pilots to remain outside D129. Tower will instruct all visiting aircraft arriving/departing via, or established in, the standard circuit (left hand Runway 19, right hand Runway 01) to remain outside D129.

2024158	The MAA reviews the UK Mil AIP aerodrome entries for gliding activity maximum winch altitudes and hours of operation to ensure coherence with information contained within the UK 'Civilian' AIP.	Under Consideration.
2024203	Gloucestershire Airport reviews its procedures with regard to integration of IFR and VFR traffic during multiple runway operations.	Procedures to limit volume of traffic have already changed since this Airprox occurred, which have had a profound and positive effect on traffic. Additionally, a risk assessment has been conducted, the outcome of which was that any associated risks are manageable. Following this, a survey of ATCOs has been undertaken to garner views on the current procedures. The majority of ATCOs were content and, to address the concerns of those that were not, a new safety notice has been issued highlighting the appropriate recommended actions when using multiple runways. Finally, a new FID is due to be installed in early 2026 which should aid controllers' situational awareness.
2024226	Gloucestershire Airport reviews its procedures to ensure that effective mitigations are in place for occasions when the ATM is unserviceable.	Since the Airprox, Gloucestershire Airport has implemented procedures which have regulated the volume of traffic. As the ATM had remained unserviceable, a FID is due to be installed in early 2026 and, in the meantime, a temporary operating instruction has been issued to allow ATCOs to transfer IFR traffic to Tower earlier. Additionally, safety notices have been issued to remind controllers of the change in traffic management procedures, and that the preferred method of join is via the overhead.
2024239	RAF Cranwell reviews the procedure for VRIAB with respect to the altitude at which a VRIAB is conducted when mixed aircraft types are in operation at the airfield. This should be coordinated through the MAA in case any findings are relevant to other Defence airfields where similar circumstances exist.	Under Consideration.
2024273	Sandtoft aerodrome operator ensures that the notified hours of operation of the ATZ and provision of AGCS are established in accordance with CAP 452 Supplementary Amendment 2022/01.	Under Consideration.
	Sandtoft aerodrome operator ensures that a robust method of promulgation of unusual air activity within the ATZ/FRZ is established.	Under Consideration.

AIRPROX CATALOGUE 2024

The table below is an abbreviated form of the 2024 Airprox Index that is available on the UKAB website - individual reports can also be accessed using the hyperlinks within the table.

Airprox No	Risk Category	Aircraft 1 Type	Aircraft 2 Type	Sector Mix
2024001	B	EMBRAER - ERJ190	UNKNOWN - Object	CAT-UA/Other
2024002	B	OTHER - Guimbal Cabri G2	CESSNA - 152	GA-GA
2024003	D	AIRBUS - A320	UNKNOWN - Object	CAT-UA/Other
2024004	A	AIRBUS - A321	UNKNOWN - RPAS	CAT-UA/Other
2024005	B	BOEING - 787	UNKNOWN - RPAS	CAT-UA/Other
2024006	C	SLINGSBY - T61 Venture	MOONEY	GA-GA
2024007	E	PIPER - PA28	PIPER - PA38	GA-GA
2024008	C	OTHER - WAG-AERO ACRO	CESSNA - 182	GA-GA
2024009	E	SOCATA - TB10	SOCATA - TBM700	GA-Mil
2024010	E	DIAMOND - DA42	AGUSTA - A109	GA-GA
2024011	E	ROBIN - DR400	SIKORSKY - S76	Civ Comm-GA
2024012	B	OTHER - FOLLAND GNAT T MK1	TECNAM - P2008	GA-GA
2024013	B	PIPER - PA28	PIPER - PA28	GA-GA
2024014	B	BELL - 429	UNKNOWN - RPAS	Emerg Servs-UA/Other
2024015	B	CESSNA - 172	VANS - RV9	GA-GA
2024016	C	ROBINSON - R22	DIAMOND - DA42	GA-GA
2024017	C	CESSNA - 152	PIPER - PA28	GA-GA
2024018	C	OTHER - Military - Prefect	OTHER - Military - Prefect	Mil-Mil
2024019	B	EVEKTOR AEROTECHNIK - EV97	OTHER - T61	GA-GA
2024020	E	OTHER - Skyranger Nynja	AGUSTA - A109	Civ Comm-GA
2024021	C	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024023	B	CESSNA - 150	PILATUS - PC24	Civ Comm-GA
2024024	B	OTHER - Military - F35	UNKNOWN - RPAS	Mil-UA/Other
2024026	C	PILATUS - PC21	DIAMOND - DA42	Civ Comm-Civ Comm
2024027	B	CESSNA - 172	UNKNOWN - RPAS	GA-UA/Other
2024028	A	BOEING - 787	UNKNOWN - RPAS	CAT-UA/Other
2024029	A	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024030	B	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024031	B	PIPER - PA28	CESSNA - 152	GA-GA
2024032	C	OTHER - Military - Merlin	UNKNOWN - RPAS	Mil-UA/Other
2024033	C	BEAGLE - B121	UNKNOWN - Object	GA-UA/Other
2024034	B	OTHER - Yuunec Typhoon RPAS	UNKNOWN - RPAS	UA/Other-UA/Other
2024035	B	PZL BIELSKO - SZD51	CIRRUS - SR22	GA-GA
2024036	B	PIPER - PA28	VANS - RV-14	GA-GA
2024037	C	AIRBUS HELICOPTERS - MBB BK117	OTHER - Military - Typhoon	Civ Comm-Mil
2024038	E	OTHER - Military - A400M	PIPER - PA28	GA-Mil
2024039	A	BELL - 429	EUROCOPTER - EC130	Civ Comm-GA
2024040	C	OTHER - Military - F35	UNKNOWN - Object	Mil-UA/Other
2024041	B	CESSNA - 152	PIPER - PA28	GA-GA
2024042	B	SCHEMPP HIRTH - STD CIRRUS	CESSNA - 182	GA-GA
2024043	C	OTHER - Not mapped - Nynja	PIPER - PA28	GA-GA
2024044	B	PIPER - PA28	EVEKTOR AEROTECHNIK - EV97	GA-GA
2024045	C	ROBIN - DR400	PIPER - PA28	GA-GA
2024046	C	OTHER - Military - Chinook	UNKNOWN - RPAS	Mil-UA/Other
2024047	C	OTHER - Military - Phenom	OTHER - Military - Tutor	Mil-Mil
2024048	C	SIKORSKY - S92	PIPER - PA28	Civ Comm-GA
2024049	E	OTHER - UAS/RPAS - DJI Phantom	AEROSPATIALE - AS350 - B2	GA-UA/Other
2024050	A	BOEING - 737	UNKNOWN - Object	CAT-UA/Other
2024051	B	BEECH - 90 - E90	CESSNA - 150	Civ Comm-GA

2024052	C	AIRBUS - A320	MONNETT - SONEX	CAT-GA
2024053	C	BOEING - 737	UNKNOWN - Object	CAT-UA/Other
2024054	B	PIPER - PA28	DIAMOND - DA40	GA-GA
2024055	A	ROBINSON - R22	SOCATA - TB20	GA-GA
2024056	C	SOCATA - TB20	UNKNOWN - RPAS	GA-UA/Other
2024057	C	OTHER - Military - Viking	PIPER - PA28	GA-Mil
2024058	B	CESSNA - 152	AERO VODOCHODY - L29	GA-GA
2024059	C	CESSNA - 152	CESSNA - 152	GA-GA
2024060	E	SCHEMPP HIRTH - VENTUS 2C	OTHER - Military - Typhoon	GA-Mil
2024061	B	DE HAVILLAND - DH82	DE HAVILLAND - DHC1	GA-GA
2024062	E	OTHER - Military - Atlas	OTHER - Military - prefect	Mil-Mil
2024063	C	AIRBUS - A350	UNKNOWN - RPAS	CAT-UA/Other
2024064	D	EMBRAER - ERJ190	UNKNOWN - RPAS	CAT-UA/Other
2024065	C	GLASER DIRKS - DG300	PIPER - PA28	GA-GA
2024066	C	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024067	B	CENTRAIR - ASW20	VANS - RV14	GA-GA
2024068	B	PARTENAVIA - P68 - B	BEECH - 58	Civ Comm-GA
2024069	C	AGUSTA - A109	PIPER - PA28	Civ Comm-GA
2024070	A	AIRBUS - A320	UNKNOWN	CAT-UA/Other
2024071	C	GROB - G109	BELL - 206	GA-GA
2024072	C	PIPER - PA22	OTHER - Chipmunk	GA-GA
2024073	C	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024074	C	JODEL - D112	UNKNOWN - Balloon	GA-UA/Other
2024075	B	CESSNA - 152 - NO SERIES EXISTS	COMCO IKARUS - IKARUS C42	GA-GA
2024076	C	EMBRAER - ERJ190	CIRRUS - SR22	CAT-GA
2024077	B	OTHER - Paraglider	UNKNOWN - RPAS	GA-UA/Other
2024078	C	SCHLEICHER - ASW28	DIAMOND - DA62	GA-GA
2024079	B	GROB - G103	ROBINSON - R44	GA-GA
2024080	B	PIPER - PA28	PIPER - PA28	GA-GA
2024081	C	GLASFLUGEL - STANDARD LIBELLE	CESSNA - 208	Civ Comm-GA
2024082	C	CESSNA - 172	CESSNA - 152	GA-GA
2024083	C	MAGNI	VANS - RV8	GA-GA
2024084	A	AIRBUS - A319	UNKNOWN - RPAS	CAT-UA/Other
2024085	C	OTHER - Military - Prefect	PIPER - PA28	GA-Mil
2024086	B	SCHLEICHER - ASG29	CESSNA - 208	Civ Comm-GA
2024087	B	AEROS - DISCUS	ROBIN - DR400	GA-GA
2024088	C	OTHER - UAS/RPAS - Phantom 4	OTHER - Military - Texan	Mil-UA/Other
2024089	C	EUROCOPTER - EC135	EAA - BIPLANE	Emerg Servs-Unk ac
2024090	C	SUPERMARINE - SPITFIRE	DIAMOND - DA42	Civ Comm-GA
2024091	C	COMCO IKARUS - IKARUS C42	PILATUS - PC12	Civ Comm-GA
2024092	C	EUROCOPTER - AS355	AGUSTA - A109	Civ Comm-Civ Comm
2024093	B	OTHER - Not mapped - Falke	PIPER - PA28	GA-GA
2024094	C	DE HAVILLAND - DHC6	PIPER - PA30	CAT-GA
2024095	C	AIRBUS - A319	CESSNA - 560	CAT-Civ Comm
2024096	C	PARTENAVIA - P68	ROBIN - DR400	Civ Comm-GA
2024097	B	ROBINSON - R44	PIPER - PA28	GA-GA
2024098	B	DIAMOND - DA40 - NG	VANS - RV6 - A	GA-GA
2024099	B	BRM AERO - BRISTELL NG5	DIAMOND - DA40	GA-GA
2024100	A	SCHEMPP-HIRTH - ARCUS	PIPER - PA28	GA-GA
2024101	B	ROBINSON - R44	UNKNOWN - Model Aircraft	Civ Comm-UA/Other
2024102	C	SCHEMPP HIRTH - Arcus T	UNKNOWN - RPAS	GA-UA/Other
2024103	B	COMCO IKARUS - IKARUS C42	UNKNOWN	GA-UA/Other
2024104	E	DIAMOND - DA42	OTHER - Not mapped - Chipmunk	GA-GA
2024105	C	CESSNA - 550	BOEING - 737	CAT-Civ Comm
2024106	D	EUROCOPTER - EC145	UNKNOWN - Model Aircraft	Emerg Servs-UA/Other
2024107	D	BEECH - 18	UNKNOWN	GA-Unk ac

2024108	C	ROBIN - DR400	CESSNA - 150	GA-GA
2024109	E	DIAMOND - DA42	CESSNA - 208	Civ Comm-GA
2024110	B	AIRBUS - A321	UNKNOWN - RPAS	CAT-UA/Other
2024111	C	DIAMOND - DA42	PIPER - PA28	GA-GA
2024112	C	DIAMOND - DA42	PIPER - PA28	GA-GA
2024113	E	PIPER - PA38	OTHER - Military - A400M	GA-Mil
2024114	D	GROB - G103	GLASER DIRKS - DG1000	GA-Mil
2024115	B	GROB - G109	PIPER - PA28	GA-GA
2024116	C	AIRBUS - A321 - 100	UNKNOWN	CAT-UA/Other
2024117	A	OTHER - Paramotor/paraplane	GLASER DIRKS - DG505	GA-GA
2024118	A	AIRBUS - A320	UNKNOWN - Object	CAT-UA/Other
2024120	B	PIPER - PA28	SCOTTISH AVIATION - BULLDOG	GA-GA
2024121	E	OTHER - Military - C17	HAWKER - HUNTER	Civ Comm-Mil
2024122	E	OTHER - Military - Hawk	RAYTHEON - B300	Civ Comm-Mil
2024123	B	OTHER - Alpi Pioneer 300	UNKNOWN - RPAS	GA-UA/Other
2024124	C	DIAMOND - DA40	SCHEMPP HIRTH - VENTUS 2C	GA-GA
2024125	E	AEROSPATIALE - AS350	SCHEMPP HIRTH - VENTUS B	Civ Comm-GA
2024126	B	PIPER - PA28	PIPER - PA28	GA-GA
2024127	A	BOEING - 737	UNKNOWN - Balloon	CAT-UA/Other
2024128	B	OTHER - Military - Chinook	OTHER - UAS/RPAS - Parrot Anafi	Mil-UA/Other
2024129	C	SUPERMARINE - SPITFIRE	GUIMBAL - CABRI - G2	GA-GA
2024130	B	VULCANAIR - P68	PAC - 750XL	Civ Comm-Emerg Servs
2024131	B	CESSNA - 172	GRUMMAN - AA5	GA-GA
2024132	C	BAE - AVRO146RJ - 70 - 70	SCHEMPP HIRTH - VENTUS 2C	Civ Comm-GA
2024133	B	OTHER - Military - Voyager	UNKNOWN - RPAS	Mil-UA/Other
2024134	B	DIAMOND - DA42	FLYLIGHT - EXODUS DELTAJET	GA-GA
2024135	C	BOEING - 737	UNKNOWN - RPAS	CAT-UA/Other
2024136	E	CESSNA - 525	OTHER - Military - F15	Civ Comm-Mil
2024137	E	BOEING - 727	ASCENT INDUSTRIES - EUROFOX	Civ Comm-GA
2024138	E	OTHER - UAS/RPAS - Inspire 2	VANS - RV7	GA-UA/Other
2024139	B	DIAMOND - DA40	CESSNA - 152	GA-GA
2024140	B	AEROSPATIALE - AS355	OTHER - UAS/RPAS - Matrice 300	Civ Comm-UA/Other
2024141	D	UNKNOWN - Paraglider	UNKNOWN – light aircraft	GA-Unk ac
2024142	E	PIPER - PA28	PIPER - PA28	GA-GA
2024143	C	DASSAULT - FALCON 7X	ROCKWELL - 695	Civ Comm-Civ Comm
2024144	E	DIAMOND - DA40	SCHEMPP HIRTH - VENTUS B	GA-GA
2024145	B	PIPER - PA22	OTHER - Tiger Moth	GA-GA
2024146	C	ROLLADEN SCHNEIDER - LS6 - 18W	PIPER - PA31	GA-GA
2024147	C	OTHER - Paraglider	AGUSTA - A109	Civ Comm-GA
2024148	A	BOEING - 737	UNKNOWN - Object	CAT-UA/Other
2024149	B	AIRBUS - A321	UNKNOWN - Object	CAT-UA/Other
2024150	E	ECLIPSE AEROSPACE - EA500	PIPER - PA28	Civ Comm-GA
2024151	E	ECLIPSE AVIATION - 500	COMMANDER - 114	Civ Comm-GA
2024152	C	ROTORSPORT - MT03	VANS - RV6	GA-GA
2024153	C	SCHLEICHER - ASK21	TECNAM - P2006T	Civ Comm-GA
2024154	C	AGUSTA - A109	PIPER - PA28	Civ Comm-GA
2024155	D	VANS - RV6	UNKNOWN - RPAS	GA-UA/Other
2024156	C	OTHER - UAS/RPAS	AEROSPATIALE - AS355	Civ Comm-UA/Other
2024157	B	SHORT - SC7 - Skyvan	PIPER - PA28	Civ Comm-GA
2024158	B	SCHLEICHER - ASK21	BEECH - 36 - Beechcraft Bonanza	GA-GA
2024159	C	DORNIER - 228	SOCATA - TB20	Civ Comm-GA
2024160	B	CESSNA - 182 - R	VANS - RV6 - A	GA-GA
2024161	D	CHAMPION - BGCBC	VANS - RV8	GA-GA
2024162	A	OTHER - Military - C17	SCHLEICHER - ASH31	GA-Mil
2024163	C	DE HAVILLAND - DHC1	PIPER - PA28	GA-GA
2024164	B	OTHER - Not mapped - EC145	UNKNOWN - RPAS	Emerg Servs-UA/Other

2024165	B	OTHER - Military - A400M	UNKNOWN - RPAS	Mil-UA/Other
2024166	E	EMBRAER - EMB505 - Phenom	OTHER - Military - Tutor	Civ Comm-Mil
2024167	B	SCHEMPP HIRTH - NIMBUS 3DT	CIRRUS - SR22	GA-GA
2024168	B	SLINGSBY - T65 - Vega	CESSNA - 152	GA-GA
2024169	B	PIPER - PA20	ROBIN - DR400	GA-GA
2024170	C	PIPER - PA28	HUGHES - 369	GA-GA
2024171	C	LANGE - Antares	PIPER - PA28	GA-GA
2024172	A	BOEING - 737	UNKNOWN - RPAS	CAT-UA/Other
2024173	E	OTHER - Military - A400M	ROBIN - HR200	GA-Mil
2024174	C	UNKNOWN - Model glider	CESSNA - 208	GA-UA/Other
2024175	E	BEECH - 300 - B300	BELL - 505	Civ Comm-GA
2024176	B	PIPER - PA28	TECNAM - P2006T	Civ Comm-GA
2024177	A	AIRBUS - A320	UNKNOWN - Balloon	CAT-UA/Other
2024178	A	AIRBUS - A319	UNKNOWN - RPAS	CAT-UA/Other
2024179	E	OTHER - Military - C17	PIPER - PA28	GA-Mil
2024180	B	CESSNA - 172	PIPER - PA32	Civ Comm-GA
2024181	B	SCHEMPP HIRTH - DISCUS B	BEECH - 200 - B200	Civ Comm-GA
2024182	A	AIRBUS - A350	UNKNOWN - RPAS	CAT-UA/Other
2024183	A	AIRBUS - A321	UNKNOWN - RPAS	CAT-UA/Other
2024184	A	PIPER - PA28	UNKNOWN - RPAS	GA-UA/Other
2024185	B	SCHLEICHER - ASW27	PIPER - PA28	GA-GA
2024186	D	BOEING - 737	UNKNOWN - Object	CAT-UA/Other
2024187	B	JABIRU - J400	PIPER - PA28	GA-GA
2024188	B	GROB - G109	CESSNA - 172	GA-GA
2024189	B	CESSNA - 172	BEAGLE - Pup	GA-GA
2024190	C	BOEING - 737	UNKNOWN - RPAS	CAT-UA/Other
2024191	B	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024192	B	SCHLEICHER - ASK18	PIPER - PA24	GA-GA
2024193	B	AIRBUS - A320	UNKNOWN - RPAS	CAT-UA/Other
2024194	E	BOEING - 787	UNKNOWN - Object	CAT-UA/Other
2024195	D	BOEING - 787	UNKNOWN - Object	CAT-UA/Other
2024196	C	AEROPRO - EUROFOX	PIPER - PA28	GA-GA
2024197	B	PIPER - PA28RT	SCHEMPP HIRTH - DISCUS 2A	GA-GA
2024198	C	SOCATA - RALLYE180	ROBINSON - R44	GA-GA
2024199	B	AIRBUS - A350	UNKNOWN - Object	CAT-UA/Other
2024200	B	LEARJET - 45	UNKNOWN - RPAS	Civ Comm-UA/Other
2024201	B	SCHLEICHER - ASG29	DIAMOND - HK36	GA-GA
2024202	C	OTHER - Military - Chinook	OTHER - Military - C130	Mil-Mil
2024203	C	DIAMOND - DA40	DIAMOND - DA42	GA-GA
2024204	E	AIRBUS - A321	UNKNOWN - RPAS	CAT-UA/Other
2024205	E	OTHER - UAS/RPAS - Mavic 2	OTHER - Military - Chinook	Mil-UA/Other
2024206	C	AIRBUS HELICOPTERS - AS350	GROB - TUTOR	Civ Comm-Mil
2024207	C	OTHER - Military - A400M	EVEKTOR AEROTECHNIK - EV97	GA-Mil
2024208	C	OTHER - Military - Tutor	SUPERMARINE - SPITFIRE	Civ Comm-Mil
2024209	C	COMCO IKARUS - IKARUS C42	UNKNOWN - Paraglider	GA-GA
2024210	D	BOEING - 787	UNKNOWN - RPAS	CAT-UA/Other
2024211	C	ATR - ATR72	UNKNOWN - Object	CAT-UA/Other
2024212	B	ATR - ATR42	UNKNOWN - Object	CAT-UA/Other
2024213	B	GROB - G109	PIPER - PA17	GA-GA
2024214	C	PIPER - PA22	THRUSTER	GA-GA
2024215	E	OTHER - Military - A400M	UNKNOWN - Paramotor	GA-Mil
2024216	C	SLINGSBY	CESSNA - C152	GA-GA
2024217	B	AIRBUS - A319	UNKNOWN - RPAS	CAT-UA/Other
2024218	C	SCHEMPP HIRTH - DISCUS 2C FES	COMCO IKARUS - IKARUS C42	GA-GA
2024219	B	SCHEMPP HIRTH - MINI NIMBUS	P & M AVIATION - PEGASUS QUIK	GA-GA
2024220	C	PIPER - PA38	GLASER DIRKS - DG1000	GA-GA

2024221	D	PIPER - PA28	UNKNOWN	GA-Unk ac
2024222	E	AIRBUS HELICOPTERS - H160	SLINGSBY - T67 - C - Firefly	Civ Comm-GA
2024223	C	DIAMOND - DA42	SOCATA - TB10	GA-GA
2024224	A	AIRBUS - A320	UNKNOWN - Object	CAT-UA/Other
2024225	C	AIRBUS HELICOPTERS - EC135	UNKNOWN - Paraglider	GA-Emerg Servs
2024226	B	BELLANCA - Decathlon	DIAMOND - DA42	GA-GA
2024227	B	OTHER - Military - Typhoon	SPORTINE AVIACIJA - LAK19	GA-Mil
2024228	A	AIRBUS - A319 - 100 - 111	UNKNOWN - Object	CAT-UA/Other
2024229	C	DE HAVILLAND - DHC6	ROBIN - DR400	CAT-GA
2024230	C	PIPER - PA28	PIPER - PA46	GA-GA
2024231	B	GUIMBAL - CABRI	PIPER - PA28	GA-GA
2024232	C	OTHER - Military - Prefect	OTHER - Military - Tutor	Mil-Mil
2024233	C	PIPER - PA28	ROCKWELL - 112 - TCA	GA-GA
2024234	E	EMBRAER - ERJ190	BOEING - 737	CAT-CAT
2024235	C	OTHER - Military - Apache	SCHLEICHER - ASW27	GA-Mil
2024236	C	JODEL - D112	CESSNA - 172	GA-GA
2024237	B	OTHER - Military - Tutor	BEECH - 33	GA-Mil
2024238	C	AGUSTAWESTLAND - AW109	PIPER - PA28	Civ Comm-GA
2024239	C	OTHER - Military - Phenom	OTHER - Military - Prefect	Mil-Mil
2024240	E	PIPER - PA34	PIPER - PA28	Civ Comm-GA
2024241	C	CASA - CN295	BOEING - KC135	Mil-Mil
2024242	A	COMCO IKARUS - IKARUS C42	VANS - RV10	GA-GA
2024243	C	AIRBUS - A319	UNKNOWN - RPAS	CAT-UA/Other
2024244	E	EMBRAER - ERJ190	UNKNOWN - Object	CAT-UA/Other
2024245	A	ASCENT INDUSTRIES - EUROFOX	UNKNOWN - RPAS	GA-UA/Other
2024246	B	PIPER - PA25	PIPER - PA28	GA-GA
2024247	C	PIPER - PA28	VANS - RV9	GA-GA
2024248	E	BOMBARDIER - Challenger 350	AUTOGYRO - Calidus	Civ Comm-GA
2024249	C	SCHLEICHER - ASK21	PIPER - PA28	GA-GA
2024250	B	SCHEMPP HIRTH - DISCUS 2A	PILATUS - PC12	Civ Comm-GA
2024251	C	DIAMOND - DA42	OTHER - A22 Foxbat	GA-GA
2024252	B	OTHER - Wag Aero CUBy	PIPER - PA28	GA-GA
2024253	C	ROBINSON - R44	ROBINSON - R44	GA-GA
2024254	C	CESSNA - 152	CESSNA - 152	GA-GA
2024255	B	PIPER - J3	AGUSTA - AW119	Civ Comm-GA
2024256	A	PIPER - PA31	UNKNOWN - Aircraft	Civ Comm-GA
2024257	B	AIRBUS HELICOPTERS - EC135	OTHER - UAS/RPAS - Matrice 300	Emerg Servs-UA/Other
2024258	B	EVEKTOR AEROTECHNIK - EV97	CESSNA - 208	GA-GA
2024259	C	AGUSTA - AW109	UNKNOWN - Flexwing	Civ Comm-Unk ac
2024260	E	OTHER - UAS/RPAS - Mavic Air	MD HELICOPTER - 500	GA-UA/Other
2024261	C	CESSNA - F406	DIAMOND - DA42	Civ Comm-GA
2024262	E	AGUSTA - AW169	COMCO IKARUS - IKARUS C42 - B	GA-Emerg Servs
2024263	C	OTHER - Military - Texan II	PIPER - PA28	GA-Mil
2024264	C	PIPER - PA28	PIPER - PA28	GA-GA
2024265	C	ROBINSON - R44	OTHER - Military - Typhoon	GA-Mil
2024266	C	AIRBUS - A320 - 200	UNKNOWN - RPAS	CAT-UA/Other
2024267	A	EMBRAER - Embraer 190LR	UNKNOWN - RPAS	CAT-UA/Other
2024268	E	GLASFLUGEL - STANDARD LIBELLE	VANS - RV7	GA-GA
2024269	C	BOEING - 737	AIRBUS - A320	CAT-CAT
2024270	E	GRUMMAN - AA5	ROBIN - DR400	GA-GA
2024271	C	BOEING - 787	UNKNOWN - RPAS	CAT-UA/Other
2024273	C	OTHER - UAS/RPAS - DJI MAVIC	CESSNA - 150	GA-UA/Other
2024274	B	PIPER - PA28	PIPER - PA28	GA-GA
2024275	C	CESSNA - 152	ROBIN - DR400	GA-GA
2024276	C	OTHER - Military - AH64	AGUSTA - A109	Civ Comm-Mil
2024277	C	CESSNA - 150	PIPER - PA28	GA-GA

2024278	C	OTHER - Military - Merlin	OTHER - Military - Wildcat	Mil-Mil
2024279	C	PIPER - PA28	DIAMOND - DA42	GA-GA
2024280	C	OTHER - Military - Juno	OTHER - UAS/RPAS - M300	Mil-UA/Other
2024281	B	ROBINSON - R44	BEECH - 33	Civ Comm-GA
2024282	C	AIRBUS HELICOPTERS - EC175	PIPER - PA31	Civ Comm-Civ Comm
2024283	B	OTHER - UAS/RPAS - DJI Mini 4 Pro	OTHER - Military - Typhoon	Mil-UA/Other
2024284	B	PIPER - PA28	PIPER - PA28	GA-GA
2024285	C	AIRBUS HELICOPTERS - EC135	DIAMOND - DA42	Civ Comm-GA
2024286	C	EMBRAER - ERJ190	UNKNOWN - RPAS	CAT-UA/Other
2024287	C	AIRBUS - A319	UNKNOWN - Balloon	CAT-UA/Other
2024288	C	OTHER - UAS/RPAS - Drone	OTHER - Military - Puma	Mil-UA/Other
2024289	E	OTHER - Military - Voyager	EMBRAER - EMB550	Civ Comm-Mil
2024290	B	OTHER - Military - Hawk	OTHER - Paramotor/paraplane	GA-Mil
2024291	C	OTHER - Paraglider	UNKNOWN - Model Aircraft	GA-UA/Other
2024292	E	BOMBARDIER - BD700	EVEKTOR AEROTECHNIK - EV97	Civ Comm-GA
2024293	D	ATR - ATR72	UNKNOWN - Object	CAT-UA/Other
2024294	E	AIRBUS HELICOPTERS - EC135	OTHER - Military - F15	Mil-Emerg Servs
2024295	B	BELL - 407	AEROPRAKT - A32 - Vixxen	GA-GA
2024296	C	DIAMOND - DA42	DAHER - TBM9	GA-GA
2024297	A	CESSNA - 152	PIPER - PA28	GA-GA
2024298	C	AIRBUS - A319	UNKNOWN - RPAS	CAT-UA/Other
2024299	C	DIAMOND - DA42	CESSNA - F406	Civ Comm-GA
2024300	E	OTHER - UAS/RPAS - Matrice 350	ALPI AVIATION - PIONEER400	GA-UA/Other
2024301	C	AGUSTA - AW169	CESSNA - 152	GA-Emerg Servs
2024302	C	DENNEY - KITFOX - III	THRUSTER	GA-GA