AIRPROX

Military Aviation Authority MAA
Civil Aviation Authority
UK AIRPROX BOARD

THE PUBLICATION OF THE UK'S AIRPROX BOARD 2015

INSIDE

ELECTRONIC EYE SPIES
Ins and outs of traffic warnings

THE RISKS IN CLASS G
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Much more to watch out for


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1884
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WELCOME...

to the annual Airprox Report Magazine 2015

A VERY WARM WELCOME to this third edition of the annual *Airprox* magazine. Building on the success of the last two years, feedback from readers has suggested that many would be interested in seeing more in-depth features on Airprox-related topics in addition to a sprinkling of précis reports. Therefore, we've tried to include articles in this edition that will hopefully be thought-provoking and, as ever, we're trying to engage with a broad range of experiences.

For seasoned aviators, some topics will serve more as reminders. For the less experienced, I hope there is an element of education as well. As you will see, I have gratefully accepted contributions from the BGA and ARPAS-UK, both of whom are keen to highlight their own operating environments and platform idiosyncrasies to the GA community. I've also press-ganged my inspectors to come out from behind the scenes and make their own contributions on electronic conspicuity and Class G risk studies, so I very much hope that you also find these illuminating and informative.

ICAO's Airprox definition is broad, but it's important to recognise that these events are near-accidents and, as the UK's focal point for investigating and reporting the circumstances, causes and risk of collision for all Airprox occurrences in UK airspace, I really want to stress that the UK Airprox Board's (UKAB) focus is purely on enhancing air safety by the prevention of mid-air collision. We do not engage in 'witch-hunts' or 'finger-pointing', and I'm indebted to those who freely report events and incidents for the benefit of all. I'd ask that anyone reading this magazine also does so in the spirit of 'there but for the grace of God go I…'. If you do recognise anyone (or yourself) within the reports then please respect confidentiality – we strive for a just culture within air safety, not a blame culture.

I'd also like to emphasise that we conduct our business as a distinct entity of our own away from direct oversight by the CAA and MAA. Although they fund us (both equally), they do not engage in our day-to-day business – please be assured that identities are protected. This is a really important point because it means that we can identify lessons without fear or favour, and that we can also be critical of regulation or suggest improvements to procedures if appropriate.

So, with all that in mind, I've chosen seven themes for this year's magazine: Glider Operations; Hang glider and Paraglider Operations; Military Low-Flying Operations; Electronic Conspicuity; Class G Risk Study; Airprox Risk Classification; and Remotely Piloted Air Systems. Each of these features has three Airprox précis reports from 2014 to help illustrate the key points and I could have easily chosen many more for each, but space constraints limited me. If I've whetted your appetite for more, then please go to *airproxboard.org.uk* and search through our reports to find any of interest.

We're slowly getting ourselves into the digital age, and my admin staff have done sterling work to get all the assessed reports since 2010 individually posted on the website – you'll also find the annual analysis for each year. I'm currently working on the 2014 analysis as I write this, but it seems that Airprox reporting trends continue to increase and I view this as a good thing. It's not that people are necessarily having more Airprox, but more that they are recognising the value of getting the lessons out to the wider community. Please do continue to report: keeping the lesson to yourself may indeed leave you a wiser person, but better that others also learn from your experience than be doomed to repeat it themselves – and perhaps less successfully at that.

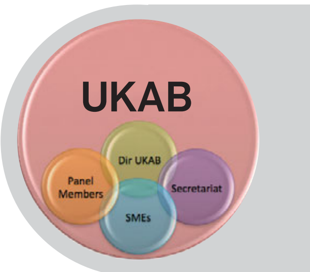
So, what messages for this magazine? There are some clear themes that spring to mind. Firstly, situational awareness, and especially in the visual circuit. In what should be the most predictable of airspace environments, I see too many incidents where people have lost the plot in the visual circuit and, instead of seeking help from ATC or getting out of the way until they can identify all the other aircraft, they press on regardless. This is particularly evident during the circuit joining process so, unless you have good reason to do something different, stick to the standard procedures and keep your ears and eyes open. Secondly, there are many incidents featuring inaction on receiving Traffic Information or when otherwise identifying a potential conflict. These often involve those who rely on 'right of way' in these situations. It's very dangerous to assume that the other pilot has seen you, even if they are supposed to give way. Self-preservation dictates that you do something about it first so, if ATC give you Traffic Information about a threat on a constant bearing, change something before it hits you! In doing so, your changing aspect might well also provide the visual cue that the other pilot needs in order to see you.

While on the topic of lookout and scan, my third top tip is to get your head moving and concentrate on lookout as your top priority in the 'aviate-navigate-communicate' cycle. Be aware of cockpit obscuration (and actively move your head to overcome them), don't get absorbed by the electronic gizmos in the cockpit and have a lookout/scan strategy that covers all the areas (and involves looking properly!). The human eye is notoriously poor at seeing things that are static in the field of view until they get very close and start 'blooming' in their own right, and it's also prone to focusing itself about 80cm ahead when not actively looking at something (called empty-field myopia). You really do have to work at lookout to make it effective.

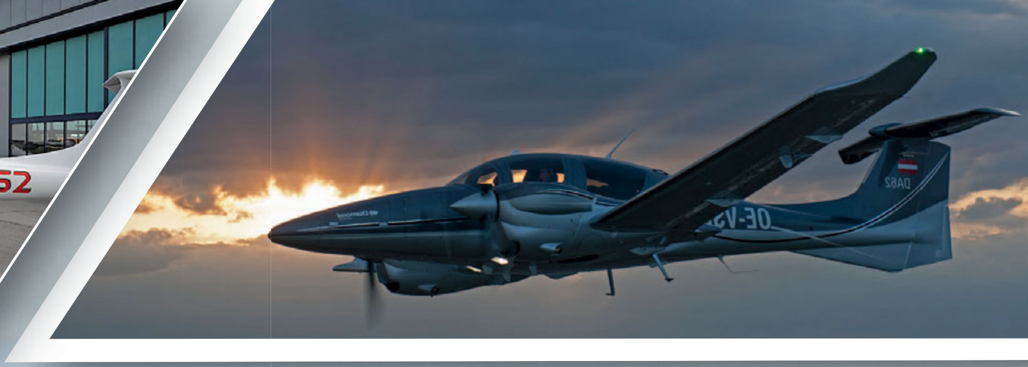
It just remains for me to once again offer my thanks to all of you who have taken the brave step of sharing your experiences through Airprox reporting. Without your altruistic approach to safety, we would be much the poorer in understanding how we can avoid events recurring or changes we can make to the benefit of all.

Safe flying to you all!

Steve Forward
Director, UK Airprox Board



Managed overall by the Director, the UKAB comprises three elements: 14 experienced aviator and controller voting members of the Airprox assessment panel (Chaired by Dir UKAB) who decide the causes and risks of Airprox; a collective of airspace and flight operations subject-matter expert advisors who provide the in-depth policy and operations experience (but have no vote in deciding cause and risk); and the Secretariat (currently comprising three Airprox inspectors and three administrative staff) who prepare the casework. In investigating the circumstances of Airprox, we draw on the resources of the CAA Safety and Airspace Regulation Group – principally their flight operations staff and the Air Traffic Standards Inspectorate; the military Radar Analysis Cell at NATS Swanwick; and relevant military HQs and their associated air safety organisations.



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>
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AIRPROX

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AIRPROX BY NUMBERS

They're up, and up by a great deal – but why?

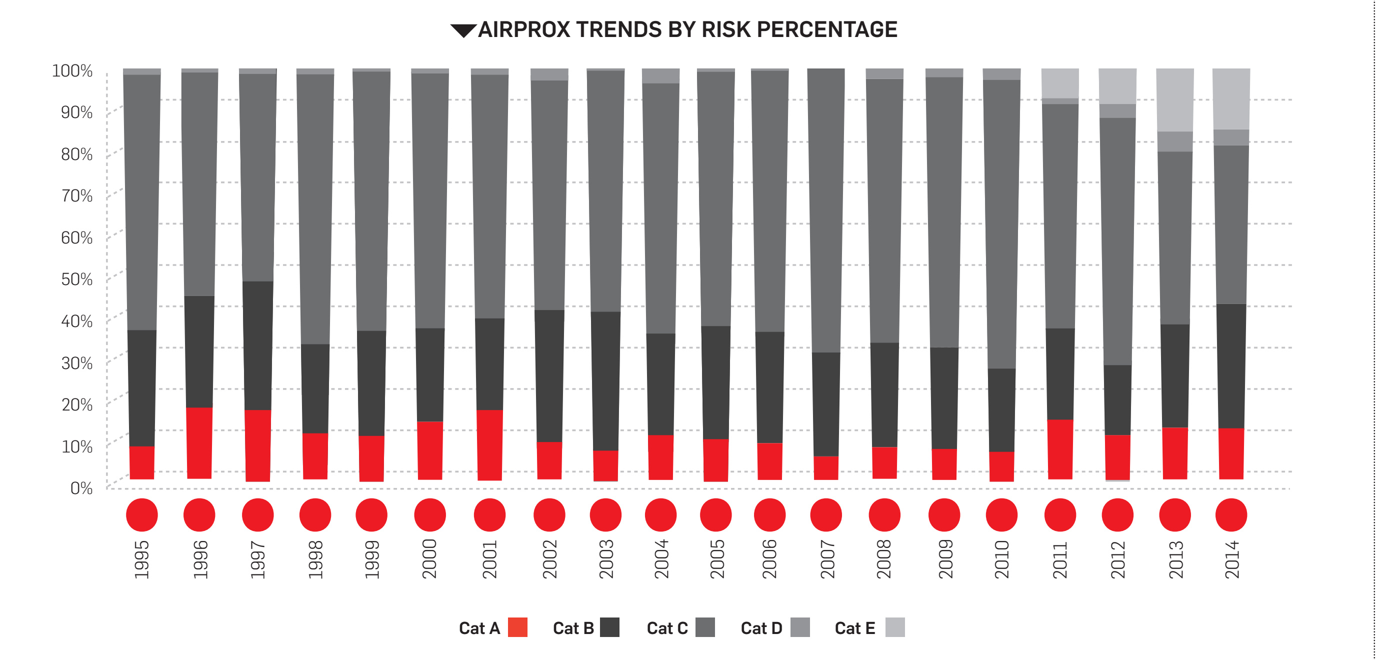
THERE WERE 224 Airprox reported in total in 2014, which is an increase of approximately 30% over the 2013 figure of 171. Over the last 20 years, this shows a return to historic numbers after a dip in reported incidents since 2006, as shown in Graphic A. Please note that Category E was only introduced in 2011, so these incidents would likely have been recorded as Category C in previous years. Whether this increase in 2014 is associated with increased GA flying after a reduction during the UK recession years is hard to tell for sure because there are no reliable records kept of the overall GA and sports aviation hours flown on an annual basis.

Risk-bearing Airprox are considered to be those that are categorised as Category A or Category B. In percentage terms, the graphic below shows that risk-bearing Airprox have hovered around 30% in recent years, but in 2013 and 2014 they increased to approximately 40% (43% in 2014). Therefore, not only were there more Airprox in 2014, but more of them were, percentage wise, risk-bearing.

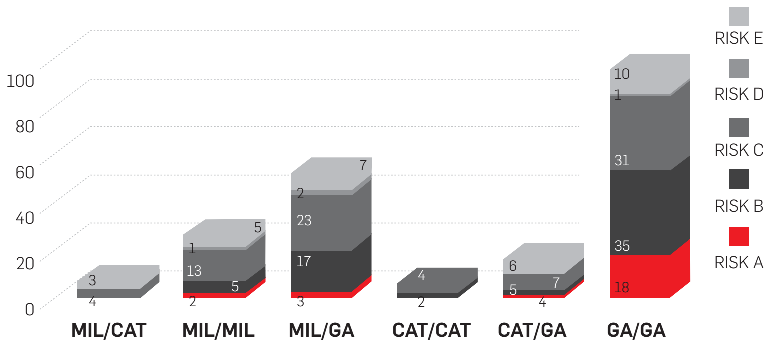
In terms of 2014 Airprox involvement, Graphic B shows that 75% of Airprox (168 Airprox) had GA involvement and, of these, 57% were with other GA aircraft. In 2013, the respective figures were 65% (111 Airprox) and 35% with other GA aircraft. Therefore, 2014 saw more GA Airprox; by percentage, more risk-bearing GA Airprox; and more of these Airprox were with other GA aircraft. For the purposes of the following charts and graphs: 'CAT' refers to the totality of commercial flying (including training schools and air taxis etc), 'Mil' refers to all military types, 'GA' refers to all private and sports aviation and 'Other' sweeps up everything else including air ambulances, police helicopters and any unknowns that were reported.

The sharp-eyed among you will no doubt have already added up the numbers in the central pie chart and come to more than 224! That's because some Airprox involve two categories and so are represented twice in the graphic. For interest, the sub-pie charts show the percentage of Airprox interactions within each of the involved category types.

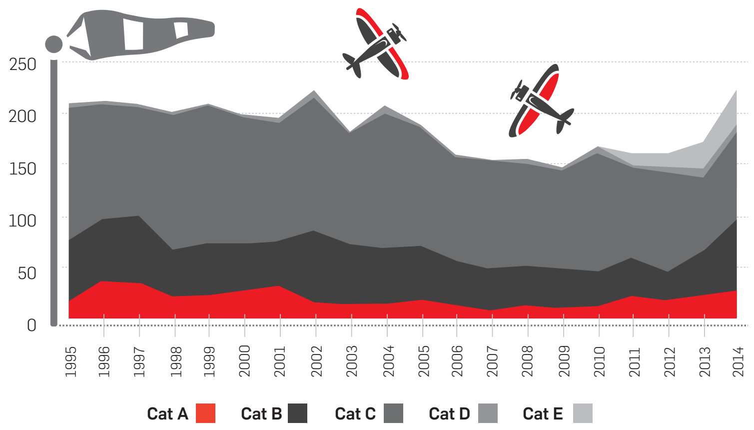
CATEGORY	ICAO Doc 4444PANS-ATM classification	UKAB collision risk descriptor/word picture
A	**Risk of collision:** ...aircraft proximity in which serious risk of collision has existed.	**Providence.** Situations where separation was reduced to the bare minimum and which only stopped short of an actual collision because chance played a major part in events: the pilots were either unaware of the other aircraft or did not make any inputs that materially improved matters.
B	**Safety not assured:** ...aircraft proximity in which the safety of the aircraft may have been compromised.	**Safety much reduced.** Situations where aircraft proximity resulted in safety margins being much reduced below the normal either due to serendipity, inaction, or emergency avoiding action taken at the last minute to avert a collision.
C	**No risk of collision:** ...aircraft proximity in which no risk of collision has existed.	**Safety degraded.** Situations where safety was reduced from normal but either fortuitous circumstances or early enough sighting/action allowed one or both of the pilots to either monitor the situation or take controlled avoiding action to avert the aircraft from coming into close proximity.
D	**Risk not determined:** aircraft proximity in which insufficient information was available to determine the risk involved, or inconclusive or conflicting evidence precluded such determination.	**Non-assessable.** Situations where insufficient information was available to determine the risk involved, or inconclusive/conflicting evidence precluded such determination.
E	**No risk classification**	**Non-proximate.** Met the criteria for reporting but normal safety standards and/or standard separation parameters pertained.



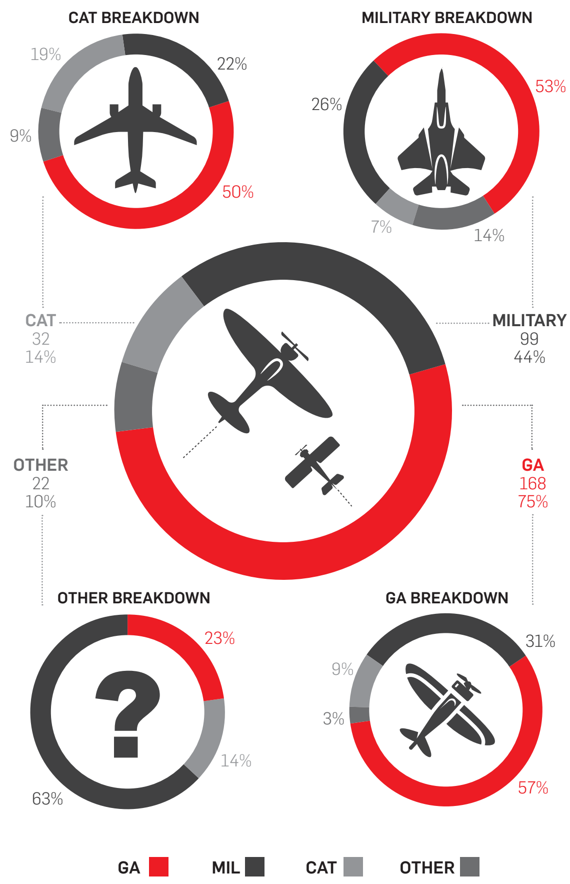
2014 AIRPROX BY AIRCRAFT MIX AND RISK D



AIRPROX TRENDS IN THE LAST 20 YEARS A



2014 AIRPROX BY INVOLVEMENT B

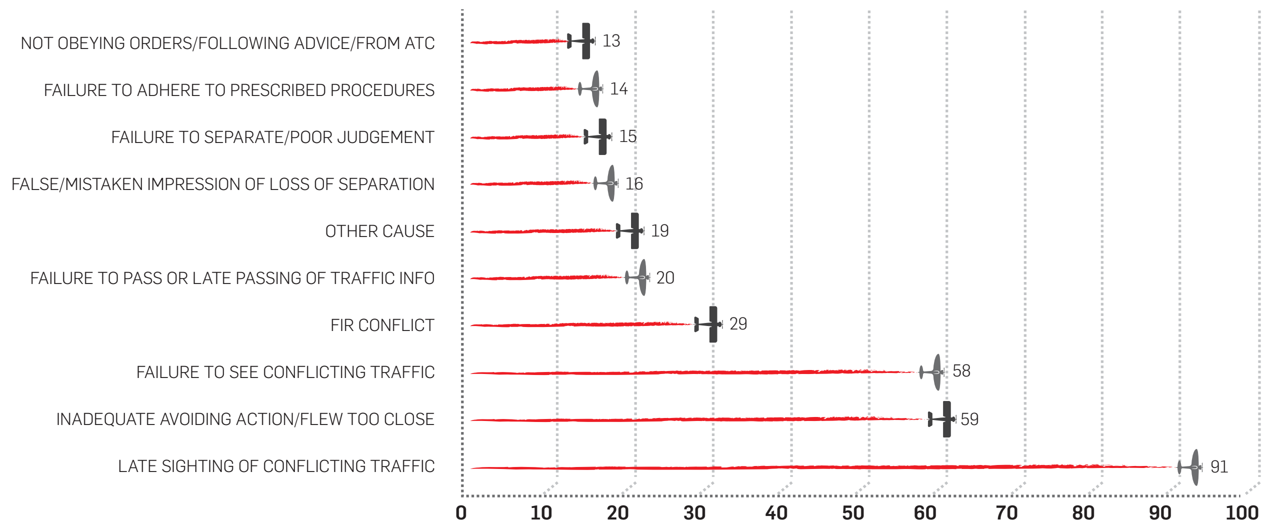


You can therefore see for yourselves which other categories are the main threats to your flights.

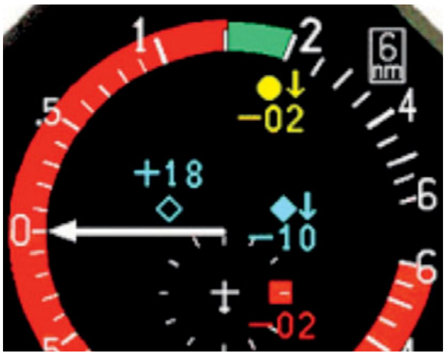
The next graphic (C) shows the breakdown of the 2014 Airprox by top 10 causes. ‘Failure To See Other Aircraft’ and ‘Late Sighting’ both feature highly, as might be expected in what is, after all, predominantly a ‘see-and-avoid’ environment. However, disappointingly, ‘Inadequate Avoiding Action/Flew Too Close’ was the second most prevalent cause. These incidents include those in which pilots took inadequate action on receiving Traffic Information, flew too close during overtaking manoeuvres or did not take positive action when sighting another aircraft due to their assumption that the other pilot had seen them and their having ‘right of way’.

Finally, the last graphic (D) shows the breakdown of 2014 Airprox by risk and mix of categories. It’s clear that GA/GA and Military/GA are the highest risk combinations, but the clearest risk to GA is from other GA aircraft – a whopping 56% of GA/GA incidents were risk bearing. The table on P6 gives the Airprox risk categorisation definitions.

2014 TOP 10 AIRPROX CAUSES C



KEEPING ALERT TO TRAFFIC



If you don't know your TCAS from your TAS or what to do when they give you a warning, you're not alone

AS IF THE acronyms aren't enough on their own, the details about traffic warning systems can be baffling unless you plough through the manuals. So with that in mind, here's a brief non-technical overview of how various systems operate, together with an appreciation of practical considerations from insights gained at the Airprox Board. Who knows, it might even tempt you to buy one...

IT'S AS EASY AS ABC...

Let's get some acronyms out of the way first. TCAS (Traffic Alert and Collision Avoidance System) is an implementation of the ICAO Airborne Collision Avoidance System (ACAS) standard. In fact, it's currently the only implementation of the ACAS so TCAS and ACAS are often used interchangeably.

TCAS gives traffic information about other 'co-operating' (i.e. TCAS compliant) aircraft

which are displayed as various symbols in various colours (depending on system parameters) and it will tell you how to get out of the way as long as the other aircraft is 'co-operating'.

For traffic assessed to be converging in plan and altitude, TCAS will first provide a traffic alert (TA), highlighting the traffic, followed by a resolution advisory (RA), which is the 'getting out the way' bit. The outer ring of the display, mostly in red in our example (P8, bottom left), indicates that an RA 'Climb' is required. In this example, the pilot has to pitch up to put the vertical speed needle on the green bit of the arc or at least get it off the red bit.

Following events such as the Überlingen mid-air collision in July 2002 (you can read the report online in English at *bfu-web.de* by putting Überlingen in the search box), it's now mandatory for commercial air transport pilots to follow a TCAS RA demanded rate of climb or descent. Among many other factors in that tragedy, one crew of two converging airliners followed their TCAS 'Descend' RA and the other followed ATC instructions to descend, contrary to their TCAS 'Climb' RA.

> **"**
>
> **Some TAS displays are quite 'TCASy', but it's important to remember that the only 'getting out the way' algorithm with these systems is in your brain**

So how does TCAS work? Rather than take up the rest of this magazine with the subject, let's just cover the basics. The first important fact is that TCAS operates independently of any ground equipment; it's a co-operative system that uses SSR transponders to gather and derive information such as bearing, location, altitude, slant-range and closure rate. It then applies anti-collision logic to calculate alerts based on time-to-go to the predicted Closest Point of Approach (CPA) between the aircraft (known as tau).

Traffic alerts and resolution advisories are triggered at defined tau values which, in effect, provide protected volumes around the aircraft.

// SUMMARY

THE AIRPROX INVOLVED a Fokker 70 (F70) and a formation of Hawks, the latter undertaking an air combat manoeuvring sortie in Class G airspace. The F70 was operating on an IFR flight in receipt of a Deconfliction Service from Durham Tees Valley (DTV). Its pilot did not receive any avoiding action but did receive traffic information (TI) and a TCAS RA. The Hawks were receiving a Traffic Service from Swanwick (Mil) and also received traffic information.

The F70 pilot was given TI about two aircraft approaching from the right. Shortly afterwards, he received a TCAS TA and became visual with the other aircraft. They were doing an evasive right turn, causing the TCAS TA to disappear. A few seconds later, the formation made a left turn towards him, triggering a TCAS RA to 'adjust vertical speed'. He responded but, before he had fully reached the pitch required, the TCAS RA ceased.

The Durham controller was advised by Leeming of two Hawks which would be manoeuvring in the area. He pre-noted Swanwick (Mil) that he would route the F70 to the east coast. TI was given on the Hawks and the F70 pilot replied that he had them on TCAS. Because the F70 had been pre-noted to Swanwick (Mil), the Durham controller had expected the Hawks to keep a reasonable distance. However, they closed to 3nm at the same altitude. At this point, the F70 reported a TCAS RA.

// ASSESSMENT

THE BOARD CONSIDERED the various aspects of this incident and reached the following conclusions:

Cause: The Durham controller did not achieve the desired Deconfliction Service deconfliction minima.

Contributory Factors:
1. Hawk pilot awareness of flight vector with regard to TCAS equipped aircraft. 2. Insufficient coordination between the Durham controller and Swanwick (Mil).

Degree of Risk: C

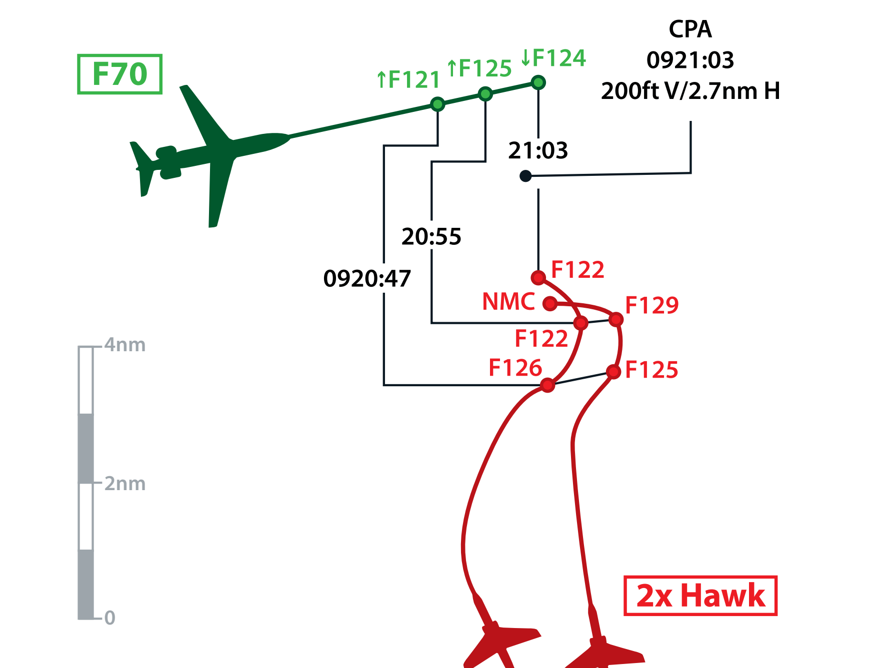


Diagram based on radar data and pilot reports

REPORT DETAILS

AIRPROX REPORT: 2014058

Date and time:
Apr 28 2014 0920Z

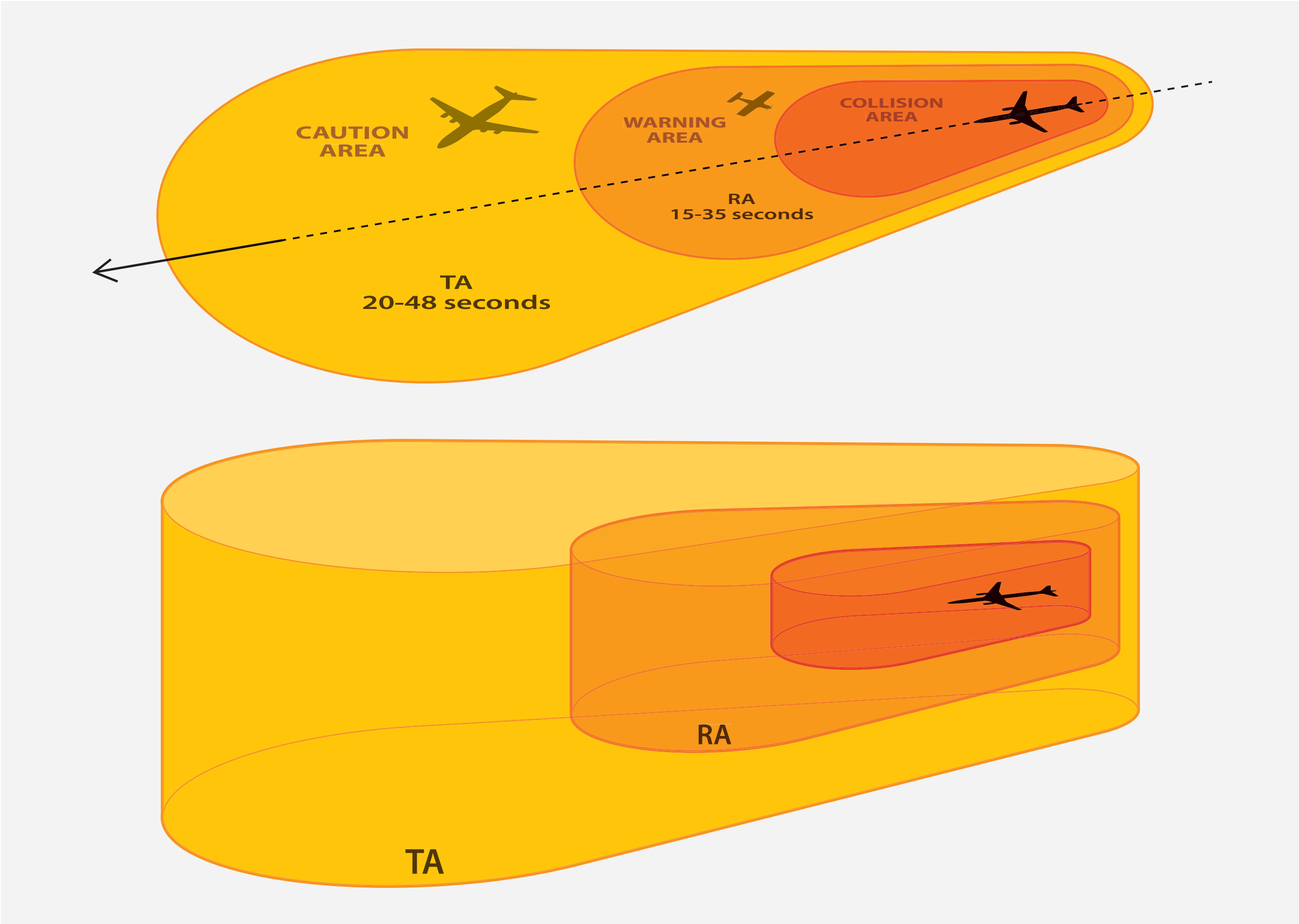
Position:
15nm E Durham Tees

Airspace:
Vale of York (Class: G)

	Reporting aircraft:	Reported aircraft:
	Fokker 70	Hawk
Alt/FL:	FL120	NK
Conditions:	VMC	VMC
Visibility:	NK	10K

Reported Separation:
0ft V/3nm H

Recorded Separation:
200ft V/2.7nm H



However, it is important to know that they may be inhibited by the system logic – for example, at low height when on the final stages of an approach, or for a more 'important' alert such as a ground proximity warning. As a result, you need to get into the TCAS manuals to understand when these warnings will be inhibited so that you are not relying on something that may not be generated.

IT'S LESS COMPLEX FOR GA

So that's TCAS, but what's TAS (Traffic Advisory/Alerting System) all about? TAS is a broad definition that covers all the systems which tell you where some of the traffic is, but won't tell you how to get out the way. Some examples are FLARM/PowerFLARM (FLight alARM), Avidyne TAS600, Garmin GTS800 and f.u.n.k.e. TM250.

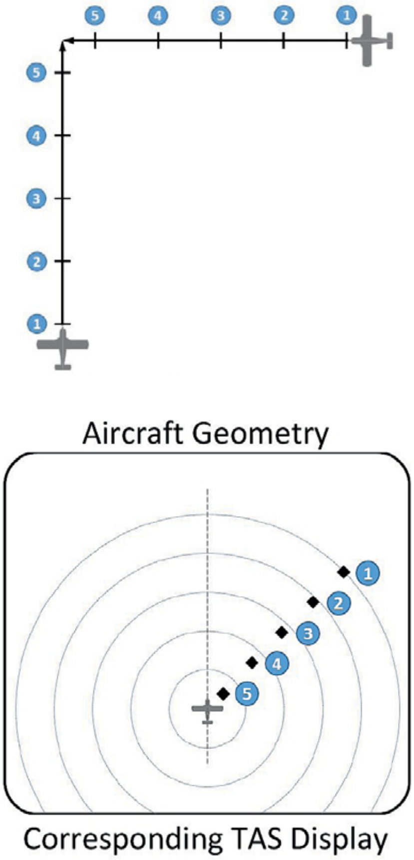
TAS uses a variety of data to generate traffic information and warnings or alerts. The obvious data source is SSR information, but systems also typically use GPS in conjunction. PowerFLARM, for example, uses GPS-derived data, SSR Mode C and S information and ADS-B 'out' data to give a hybrid picture. How this information is displayed varies from model to model and some displays are quite 'TCASy', but it's important to remember that the only 'getting out the way' algorithm with these systems is in your brain.

The cost of installing TCAS means that it's not common in anything other than airliners or major commercial fleets, where its fitment is mandatory or deemed essential to operations. For the vast majority of GA, any equipment installed will probably be a TAS. Because your input is required to resolve conflictions shown on TAS, Airprox Board experience indicates that it's worth having a good think about how to interpret and assimilate the information, formulate a plan of action and carry out an appropriate avoidance manoeuvre if required. Remember, you're still required to operate in compliance with the Rules of the Air/SERA, so you have to think about how you'd respond to TAS indications with that in mind too.

A common misconception is that TCAS/TAS will show track geometry, whereas what it actually displays is the bearing of the other aircraft.

Let's consider, for example, an aircraft approaching from the right-hand side, perpendicular to our track, at the same airspeed and altitude and on a collision course. What would that look like on a TAS screen? Let's examine this hypothetical situation and an associated TAS display (left) with the same time-based positions shown.

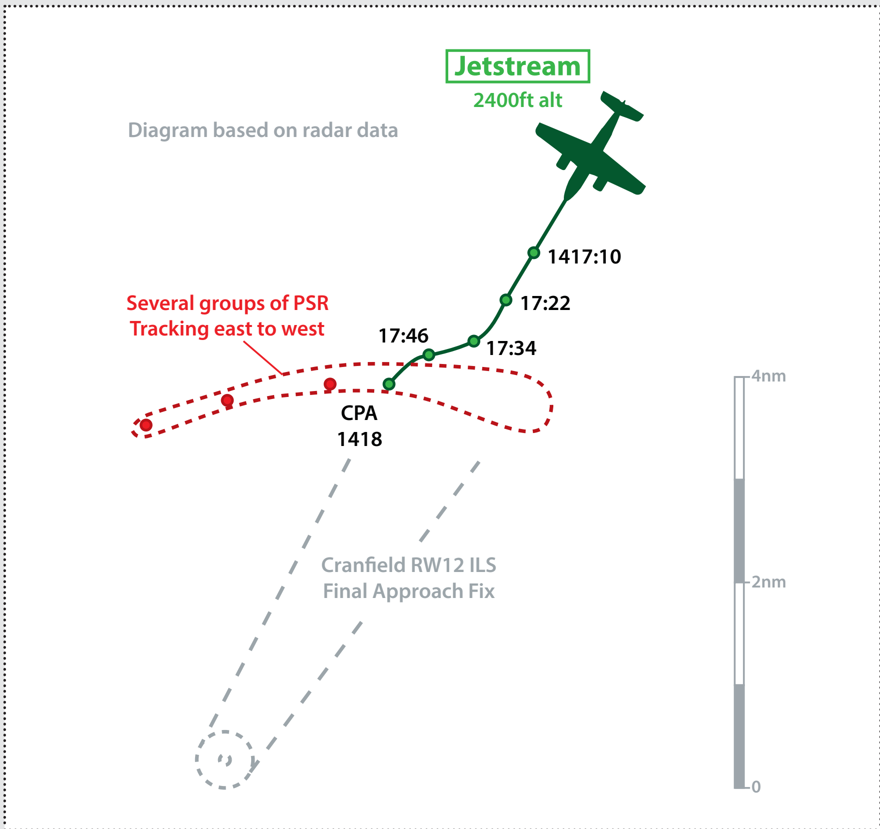
We're in the aircraft travelling from bottom to top, with equivalent positions of both aircraft marked by the same number (i.e, at time '3', both aircraft will be at their respective position '3'). At time '1', the other aircraft will be 45° right of the nose. At time '2', the other aircraft will still be 45° right of the nose but now at a reduced range. Similarly, at times '3', '4' and '5', the other aircraft will remain 45° right of the nose with the range



// SUMMARY

IN THIS INCIDENT, all pilots were operating under VFR in VMC and the Jetstream pilot was in receipt of a Basic Service from Cranfield Approach. The Cranfield controller was providing a service without the aid of surveillance equipment. Radar recording showed intense glider activity to the north of Cranfield.

The Jetstream was fitted with PowerFLARM, the 'pilot flying' was in the right seat and an examiner was in the left seat. On the final approach track, the PowerFLARM gave an indication of contacts ahead. Three gliders were seen and, in the next few seconds, two more gliders (which were thermalling) were seen too. The examiner took avoiding action. As they got closer to the thermal, more gliders were discernible until a total of seven were identified. The PowerFLARM warning resulted in no risk of collision



REPORT DETAILS

AIRPROX REPORT: 2014126

Date and time:
Jul 30 2014 1418Z

Position:
3.5nm NW Bedford

Airspace:
London FIR (Class: G)

Reporting aircraft:
Jetstream 31

Reported aircraft:
Untraced gliders

Alt/FL:
2,500ft, QNH (1,015hPa)

Conditions:
VMC

Visibility:
10km

Reported Separation:
0ft V/0.5nm H

Recorded Separation:
NK

against the FLARM-equipped gliders. He assessed the risk of collision as 'Low'.

FLARM supports 'see-and-avoid' by helping to identify potential threats and thereby directing lookout. FLARM equipage continues to rise among civilian and military Class G users.

// ASSESSMENT

THE POWERFLARM equipment fitted to the Jetstream had provided considerable mitigation against mid-air collision by warning the crew of the presence of other FLARM-equipped aircraft, cueing their lookout to enable early visual acquisition. The Board commended the Jetstream crew for their pro-active behaviour and their operating authority for having the foresight to fit PowerFLARM to their aircraft.

The Board was disappointed that none of the glider pilots could be traced and could but hope that the situational awareness of the pilots in the FLARM-equipped gliders had been increased by knowledge of the approaching Jetstream.

Cause: A conflict in Class G resolved by the Jetstream pilot.

Degree of Risk: C

Recommendation: The CAA considers producing a chart of UK airfield IFR holding pattern positions.

continually decreasing. Plotting all that on a TAS screen in one go produces the picture shown, with time positions also annotated. However, the effect in reality would be of the contact moving diagonally down the screen towards us.

So, in looking at the TAS display, you have to interpret the moving dot over time. Is that an aircraft crossing right to left or is it an aircraft heading straight for you? How will your perception of its track affect your decision to turn? Will you turn right or left? Does your decision conform to the Rules of the Air/SERA?

If, like me, you lose 50% of your ability to think properly as soon as you step into an aircraft, these issues are best considered in the bath rather than while closing with other traffic. You'll be pleased to hear there's a simple rule: if the other contact is on a constant bearing at the same altitude, you're on a collision course – so change something.

> **"It's worth having a good think about how to interpret and assimilate the information**

A small change in altitude is probably the quickest effective action, although there are other options. If time permits, perhaps request a Traffic or Deconfliction Service? Or, if that isn't possible, simply request Traffic Information? How about putting in a 45° turn for 30 seconds and then reversing back to track? It won't significantly delay arrival at your destination, but it will break the collision geometry. **Airprox 2014126** is a great example of where Power-FLARM saved the day for a Jetstream and some gliders through intelligent interpretation of the displayed information.

→

Another important consideration is the effect a new bit of kit will have on lookout. Perhaps counter-intuitively, putting a shiny new TAS into your aircraft can seriously hamper lookout. One of the Airprox quotes that stand out in my mind is "the traffic indicated inside a mile, so I turned the scale up". Or, in other words, the traffic was so close, I looked inside the cockpit, found the scale control knob, turned it in the correct direction to change the scale and looked at the display to try and resolve the other aircraft's position. Really? Getting your eyes outside the cockpit would be my priority in this circumstance, but it's amazing how seductive a new display in the cockpit can be.

Many TAS have the option of an audio output, which seems an excellent investment – the less you need to look inside, the better. Also, where will your TAS display be located? Buried at the base of the instrument panel on the other side of the cockpit would not be useful. Mounted in your eye-line on top of the coaming might also get in the way of your visual scan. There's no easy answer, but it's a question that needs thinking about carefully.

THE BEST EQUIPMENT IS BETWEEN YOUR EARS

That's a very brief look at TCAS and TAS, and here's the 'take-home' message: clearly, if SSR isn't selected on, TCAS can't react to it at all and, if Mode C or S isn't selected either, an RA can't be generated because the TCAS doesn't know the altitude of the other aircraft. That is the reason for the Airprox Board's almost monthly reiteration of the importance of selecting the SSR 'on', with all available Modes. Squawk 7000 plus Mode C in Class G airspace, even when you're not getting a service, might just save you if the other aircraft has a TCAS or TAS fitted even if you don't.

Give TCAS and TAS a chance! But, equally, be aware that your flight vector may well cause problems for other aircraft that are TCAS equipped. Remember that commercial aircraft pilots are mandated to follow any TCAS RA commands so, if you are operating near them, have consideration about pointing at them or flying close to them lest you cause a TCAS RA (and a subsequent likely Airprox report!). See **Airprox 2014058** and **2014207** for more.

Rob Curry is a Senior Airprox Inspector at the UK Airprox Board

REPORT DETAILS

AIRPROX REPORT: 2014207

Date and time:
Oct 24 2014 1533Z

Position:
6nm W Dundee Airport

Airspace:
Scottish FIR (Class: G)

	Reporting aircraft:	Reported aircraft:
	Do328	G115
Alt/FL:	2,600ft QNH (1005hPa)	2,600ft NK
Conditions:	VMC CLBC	VMC CLBC
Visibility:	10km	10km
Reported Separation:	200ft V/2nm H	0ft V/1nm H
Recorded Separation:	0ft V/0.9nm H	

// SUMMARY

SHORTLY AFTER DEPARTURE from Dundee Airport, the pilot of a Dornier 328 (Do328) received a TCAS RA against a Grob G115 (G115). Both flights were receiving a service from Dundee Tower/Approach. Both pilots were issued with traffic information about the other flight prior to the departure of the Do328, the crew of which noted a contact on their TCAS screen approximately 5-6nm southwest indicating +2,700ft.

Before commencing the take-off roll, the contact disappeared from the screen but, once airborne, it reappeared as a TA. On passing approximately 2,600ft, the contact became an RA descent which was followed but, within a second or two, they were 'clear of conflict'. The risk of collision was assessed as 'Medium'.

As the Do328 was taxiing out, the G115 pilot agreed to the controller's request that he hold over the south bank of the River Tay not above 3,000ft. He was unable to do so due to cloud, so was further north than the controller expected. The G115 pilot was visual with the Dornier throughout and was never concerned, assessing the risk as 'None'.

// ASSESSMENT

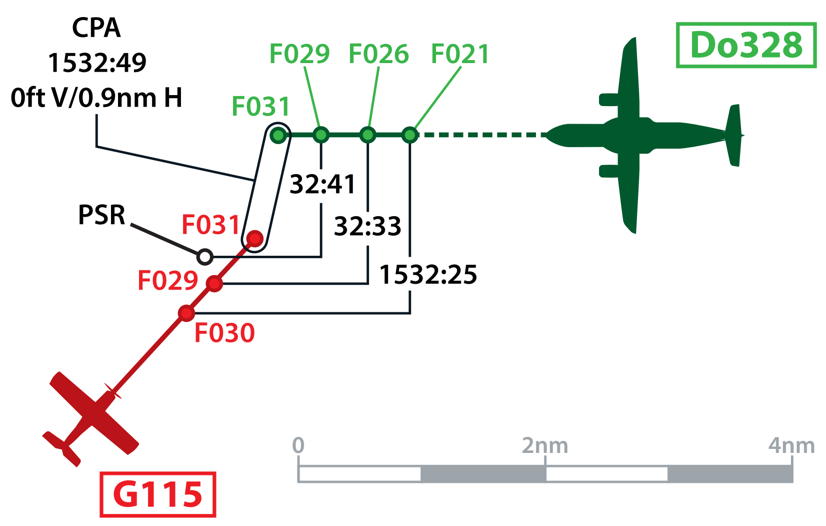
THE G115 PILOT had not informed ATC that it had not been possible for him to route to the south bank of the River Tay as agreed. Had the G115 pilot had been holding as agreed, the aircraft would have been further apart and the TCAS alert would probably not have been activated. It was noted that there have been a number of Airprox where pilots had manoeuvred sufficiently close to other TCAS-equipped aircraft to generate RAs and so a recommendation was made regarding GA pilots' education.

Cause: A TCAS sighting report.

Degree of Risk: E

Recommendation: That GASCo consider means to educate GA pilots on TCAS envelopes and the implication of flight vectors.

Diagram based on radar data



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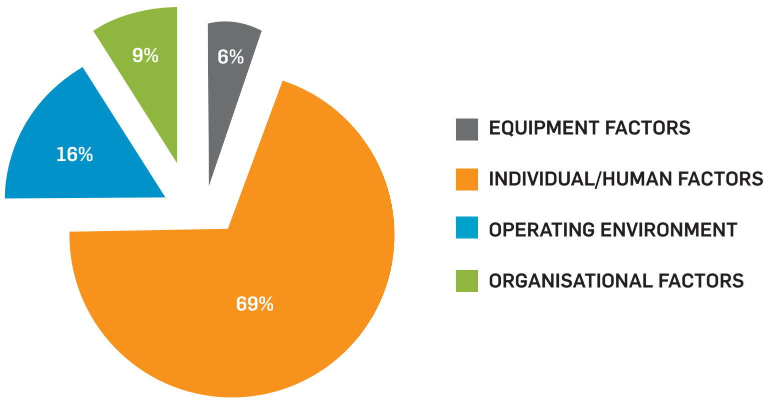
WHAT ARE THE RISKS IN CLASS G?

Not quite the devil, but the risk factors are exposed in the detail and, unsurprisingly, top of the list is 'scan'



AIRPROX HIGH-LEVEL RISK DOMAINS, WITH PERCENTAGE INVOLVED

SO WHY DO Airprox happen and how can we understand what lies behind the causes? There are, of course, many underlying factors and we've been struggling for years to identify key themes, hard facts and trends to back up our thoughts.

Last year, as part of its work to look at Class G Risks in the 21st Century, the CAA commissioned a study to try to shed light on our Airprox data, answer some of these questions and document the contributory risk factors that increase the likelihood of mid-air collisions (MAC). A copy of the report can be found on the UKAB website, but this is a précis of the findings.

THE THREE PHASES TO THE PROJECT

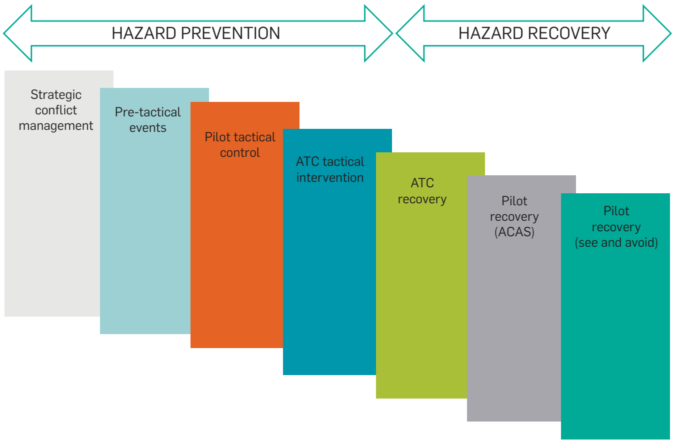
- A review of existing studies to help provide a common understanding and development of a barrier model that depicted key mitigations to collisions in Class G;
- A full textual analysis of all Airprox reports from 2000-2013 to provide a 'bottom-up' view to complement the 'top-down' analysis enabled by the barrier model; and
- An analysis on which to base a list of key factors that would hopefully lead to a set of leading indicators that we might in future be able to use to monitor key areas of risk.

To cut a long story short, all 1,813 Airprox reports from 2000-2013 where at least one of the aircraft involved was in Class G airspace were reviewed. In doing so, they found that there were frequently numerous causal or environmental factors which contributed to Airprox that were not →

captured in the (often singular) cause identified by the UKAB. That said, in defence of the historic reports, they recognised that they were never intended to be used for this sort of analysis and so it was not surprising that there were inadequacies.

To make sense of it all, a group of experts re-examined the Airprox texts and developed a new, more contemporary taxonomy to catalogue the additional factors. This contained four high-level domains (as shown) and, within these, they identified 137 different contributory factors.

Given that Class G flying is a very human endeavour rooted in the 'see-and-avoid' principle, it's not surprising that the majority of Airprox fell into the 'Human Factors' high-level domain. There were, though, some very interesting aspects



// SUMMARY

THE AS365 PILOT was operating IFR in receipt of a Basic Service from Oxford, requested just prior to the Airprox, while the DA40 pilot was operating IFR in receipt of a reduced Traffic Service from Coventry. The Coventry Radar controller provided traffic information (TI) twice to the DA40 pilot regarding the AS365, subsequently updating the TI as the two aircraft came into proximity. The AS365 pilot reported seeing the DA40 closing from the left and so took immediate action. Both pilots were responsible for their own collision avoidance and neither aircraft was fitted with a collision warning system. The AS365 pilot reports that he was operating an IFR flight outbound from Sywell in IMC, climbing his aircraft through cloud. Not being a local pilot, he had not been aware that Oxford had recently acquired radar and could therefore offer more than a Basic Service. He assessed the risk of collision as 'high'.

// ASSESSMENT

THE AS365 PILOT'S lack of awareness of Oxford's radar was perhaps indicative of limited pre-flight planning. Furthermore, bearing in mind that the helicopter was climbing IMC through cloud, the Board was surprised that the pilot had not requested a Traffic Service from the relevant LARS.

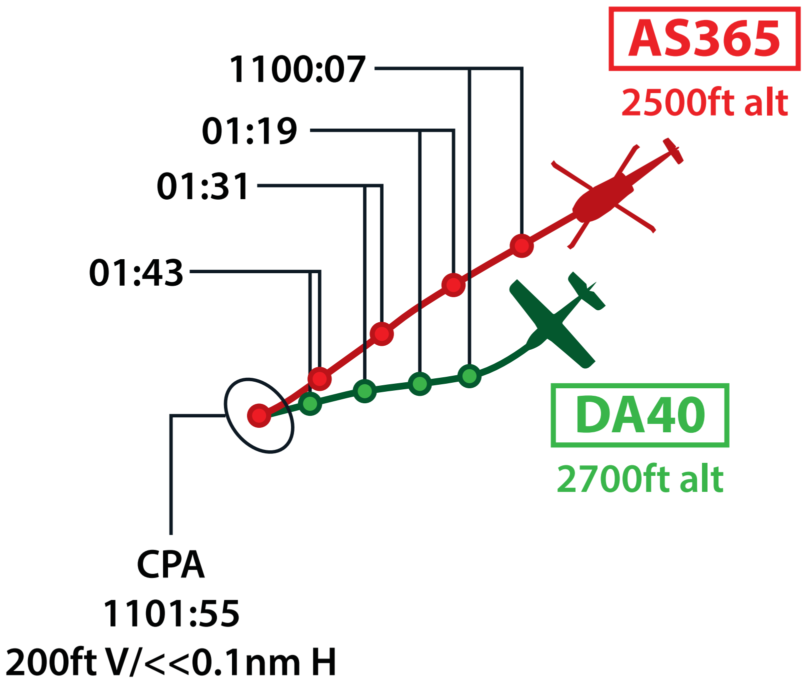
Members were pleased to note that the DA40 pilot had been in receipt of a Traffic Service. There was discussion whether he would have been better served by conducting his flight further above the cloud layer, but it as accepted that there were 'on the day' constraints. However, the Board noted that the DA40 pilot had been issued TI by Coventry but he had not taken action to avoid the reported traffic.

Cause: A late sighting by both pilots.

Contributory Factors:
1. The AS365 pilot chose to fly in IMC without a Radar Service.
2. The DA40 pilot did not act on the Traffic Information.

Degree of Risk: B

Diagram based on radar data



REPORT DETAILS

AIRPROX REPORT:
2014224

Date and time:
Dec 5 2014 1102Z

Position:
9.1nm SW Sywell

Airspace:
London FIR (Class: G)

	AS365	DA40
Type:	AS365	DA40
Alt/FL:	2,000ft QNH	2,800ft QNH (1,019hPa)
Conditions:	IMC	VMC
Visibility:	Nil	>10km
Reported Separation:	100ft V/30m H	300ft V/0.25nm H

Recorded Separation:
200ft V/<0.1nm H

> **Pilot scan was the top contributory factor (52.5%) and double the next most frequent**

that emerged from the other three which could offer useful mitigations in future – more of which are covered later.

Taking a 'top-down' view of Airprox, existing work has already identified safety barriers that help stop collisions. For more information, see the article on risk in this magazine on p50. There are two types of such safety barriers: those which prevent the hazard before it happens and those which aid recovery after the hazard is identified. Each of the 1,813 Airprox was assessed to find out which of these barriers had failed and which had been successful. At the same time, contributory factors were assigned to each of the pilot's actions and, where appropriate, to ATC.

Analysis of the associated 137 contributory factors provided the foundation of the report's conclusions. Remember, most incidents had more than one contributory factor and, although more than one factor may have been present, this did not automatically mean that there was a direct correlation between the two.

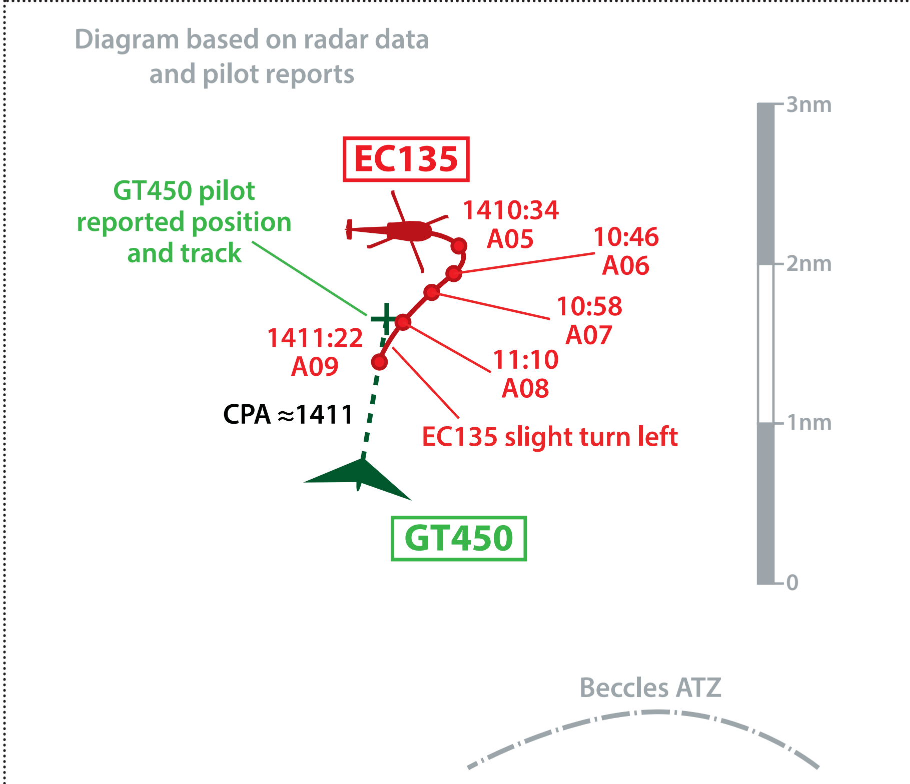
The ten most common factors (and the number of reports within which they featured) are shown on p20 in the charts for both pilots and controllers overall. Additionally, the five most prevalent contributory factors for each of the main user groups are also as shown.

SO WHAT ARE THE TOP THREE CONTRIBUTORY FACTORS?

1 – Pilot Scan. Perhaps unsurprisingly in see-and-avoid Class G airspace, pilot scan was the top contributory factor (52.5%) and double the next most frequent.

In analysing this, the study confirmed that pilots were far more likely to see another aircraft if they were given additional situational awareness such as ATC or ACAS-derived information. Other factors relevant to pilot scan were poor airmanship, the conflict's geometry, visual conspicuity and field-of-view.

The bottom line is: get your head out of the cockpit, actively scan, learn effective lookout, be aware of cockpit obscuration and use all available aids such as seeking a Traffic Service and having your SSR on with Mode C selected. **Airprox 2014165** was an example where pilot scan in both cockpits was not effective.



REPORT DETAILS

AIRPROX REPORT:
2014165

Date/Time:
Sep 7 2014 1411Z

Position:
4.6nm NNW Beccles

Airspace:
London FIR (Class: G)

	EC135	Quik GT450
Type:	EC135	Quik GT450
Alt/FL:	1,000ft QNH (1,016hPa)	1,300ft NK (1,016hPa)
Conditions:	VMC	VMC
Visibility:	>10km	15nm
Reported Separation:	75ft V/<100m H	200ft V/200ft H

Recorded Separation:
NK

// SUMMARY

THE EC135 PILOT reported that he was returning to base after completing a low-level task. He was operating under VFR in VMC and not in receipt of an Air Traffic Service but was listening out on Seething Radio. Heading 225° at 110kt in a straight and level cruise, he had a late sighting of a flex-wing microlight less than 100m away in the right one o'clock position and slightly above. He took avoiding action by turning left and descending. He assessed the risk of collision as 'High'.

The GT450 pilot was operating under VFR in VMC and was not in receipt of an Air Traffic Service. He listened first to Wattisham RTF, then changed to Seething as he approached Bungay and then to the Beccles frequency. He was about to make initial contact with Norwich RTF when he saw a helicopter in his right one o'clock position at a range of 300yd, approximately 200ft below and heading directly towards him. Assessing the situation, he applied full power and climbed to the left in order to avoid any potential rotor turbulence. The pilot noted that he was surprised he had not heard any calls from the helicopter pilot on any of the frequencies he had monitored en route. He assessed the risk of collision as 'Medium to High'.

// ASSESSMENT

THE GT450 PILOT had undertaken his flight with considerable attention to local factors. Members noted the degree to which the GT450 pilot listened out and communicated with local agencies and commended him for doing so. It was just unfortunate that the two pilots were not on the Seething frequency at the same time. The Board agreed that, although avoiding action had been taken, safety margins had been much reduced below normal.

Cause: A late sighting by both pilots.

Degree of Risk: B

THE REAL ALTERNATIVE TO AIRCRAFT OWNERSHIP

// SUMMARY

A CTSW MICROLIGHT and a Partenavia P68 flew into proximity in the vicinity of Damyns Hall Airfield. Both pilots were operating under VFR in VMC. The P68 pilot was returning to Thurrock Airfield 4.6nm east of Damyns Hall while in receipt of a Basic Service from Farnborough LARS(N). The CTSW pilot was arriving at Damyns Hall Airfield listening out on 'Hornchurch Radio'. Neither aircraft was fitted with a collision warning system.

On arriving in the Damyns Hall overhead, the CTSW pilot spotted another aircraft at the same level in the three o'clock position approximately 200m away on a collision course. He immediately climbed because there was no room to turn. The other aircraft continued to fly through the Damyns Hall overhead. He assessed the risk of collision as 'High'.

The P68 pilot stated that he was positioning to land on the easterly runway at Thurrock and did not see a microlight.

// ASSESSMENT

THE P68 WAS on a converging course in a slow descent and, as such, would have presented an almost constant sightline in the CTSW pilot's right three o'clock. This would have made visual acquisition extremely difficult.

The P68 pilot had been given Traffic Information on the CTSW, for which the Board commended the controller. Members felt that the P68 pilot should, when he could not see the traffic, have asked for further Traffic Information. They could not understand why the P68 pilot had chosen to track so near to the overhead of Damyns Hall on his way to Thurrock at an altitude close to the circuit altitude.

Cause: A late sighting by the CTSW pilot and a non-sighting by the P68 pilot.

Degree of Risk: B

REPORT DETAILS

AIRPROX REPORT:
2014030

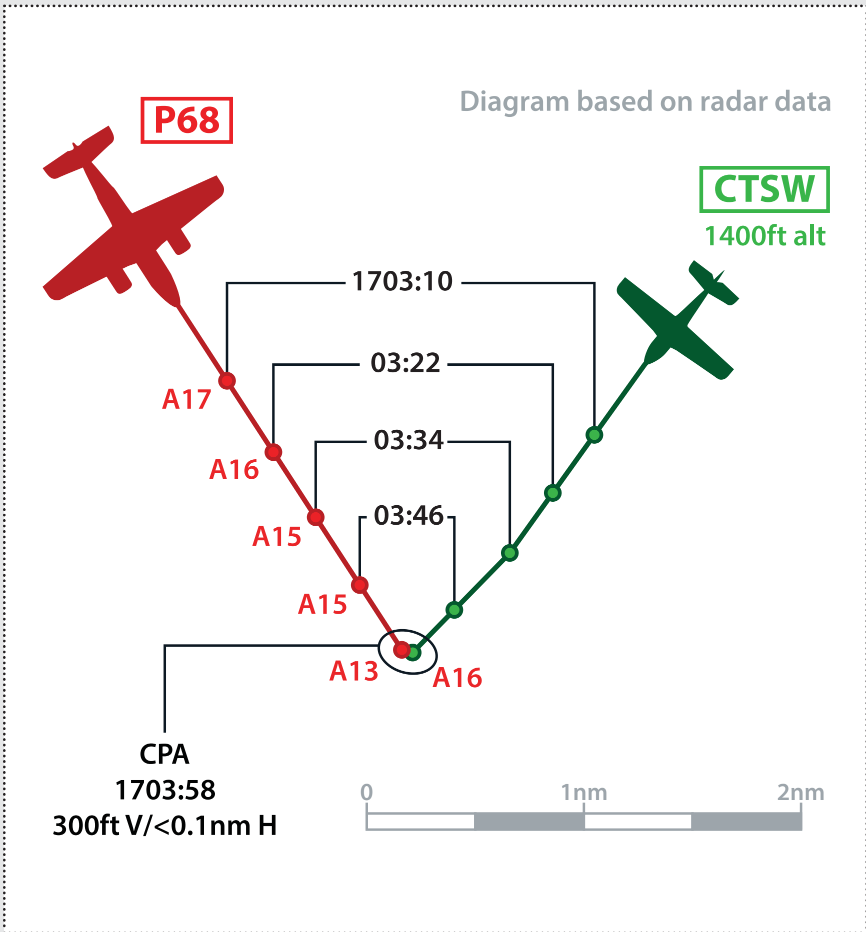
Date/Time:
Mar 28 2014 1704Z

Position:
Damyns Hall Aerodrome

Airspace:
Lon FIR (Class: G)

	CTSW	P68
Type:	CTSW	P68
Alt/FL:	1,400ft QNH (1,014hPa)	2,200ft QNH (NK hPa)
Conditions:	VMC	VMC
Visibility:	8km	10km
Reported Separation:	0ft V/100m H	Not Seen

Recorded Separation:
300ft V/<0.1nm H



2 – Airmanship. Frequent themes here were pilots flying too close to one another, ineffective integration in the visual circuit and inaction.

A third of pilots involved in an Airprox chose not to make radio contact with ATC or use an available common frequency. This directly impacted the situational awareness of other pilots who were unaware of the potential conflict.

While it's clearly not mandatory to be in radio contact in Class G, a quick call to ATC – even just stating your location and intentions – can often resolve confusion or uncertainty with others who might not be aware of your presence, or whom you may equally not be aware of.

The most concerning element was a tendency for pilots to assume that others would get out of their way. Their inaction on sighting a conflicting aircraft because they had 'right of way' meant that many incidents were not quickly resolved by early changes of track or height because the pilots relied on the other party to do the avoiding.

The assumption that the other pilot has even seen you is a dangerous one to make, let alone relying on them to react appropriately if the Rules of the Air place you 'in the right'. The Director of UKAB likens this to stepping out in front of a No. 10 bus on a pedestrian crossing – cold comfort to know that you were 'in the right' as you lie in your hospital bed... or worse. **Airprox 2014030** is an example where airmanship could have been better in avoiding Damyns Hall.

3 – Situational Awareness. The next most common causal factor at 21.5% was lack of situational awareness. In this respect, poor planning (including lack of route planning and appreciation of other airspace users such as glider sites, airfields and approach and departure lanes) was prevalent. For example, better planning might have alerted the helicopter pilot in **Airprox 2014224** to the fact that Oxford now had radar – which could have helped him.

For military users, there was a lack of awareness of other non-military aviators in the Low Flying System. The MoD is working to overcome this with the introduction of several initiatives such as allowing users of the Pipeline Inspection Notification System (PINS) to input directly into CADS (Centralised Aviation Data Service, a military system primarily designed to allow visibility and deconfliction between all planned military missions within the UK low-flying system) and, very recently, the trial of a new VHF low-level frequency in Scotland.

For more information on the latter, see the article on MoD operations on p36.

SO WHAT? SUCCESSFUL AND UNSUCCESSFUL BARRIERS

At UKAB, it can often feel we live in a gloomy and stygian world where we only see what went wrong, so it's important to recognise that most flights in the UK are conducted safely and successfully.

In this vein, the most effective barrier on the model's recovery side was pilot 'see-and-avoid' – good lookout really does work. Where recorded, 52% of successes in avoiding collisions resulted from lookout even if it was often only at a late stage. For their part, ATC tactical control accounted for almost 24% of successes in avoiding them by providing radar surveillance, Traffic Information and the intelligent application of UK FIS.

Finally, it's worth a mention that the use of TCAS/TAS accounted for 12% of successes in avoiding conflicts and electronic conspicuity is a real boon to effective lookout. Have we mentioned anywhere the importance of selecting SSR on and squawking Mode C in order to give TCAS/TAS a chance?

As for the unsuccessful barriers, it is perhaps unsurprising that these were often the ineffective application of the successful barriers, and 49% of Airprox were down to ineffective pilot tactical control (i.e, the actions of the pilot at the time of the Airprox). This was mostly down to not seeing in time, poor situational awareness, ineffective airmanship skills and poor navigation.

With regard to ATC, we all know it is not universally available as a barrier anyway due to radar and radio coverage but it is worth reflecting that almost a third of Airprox occurred when pilots were not in contact with ATC when perhaps they could have been, thus negating this barrier altogether.

On the other hand, as we also all know, ATC is not a universal panacea. In 18% of Airprox where an ATS was provided, the controller did not detect a conflict or could not implement an effective solution. That is not to malign the controllers; if you simply ask for a Basic Service, they have no duty to provide constant monitoring of your flight or advise you of conflictions unless they happen to be looking at that part of the screen at the time.

FIGURE X

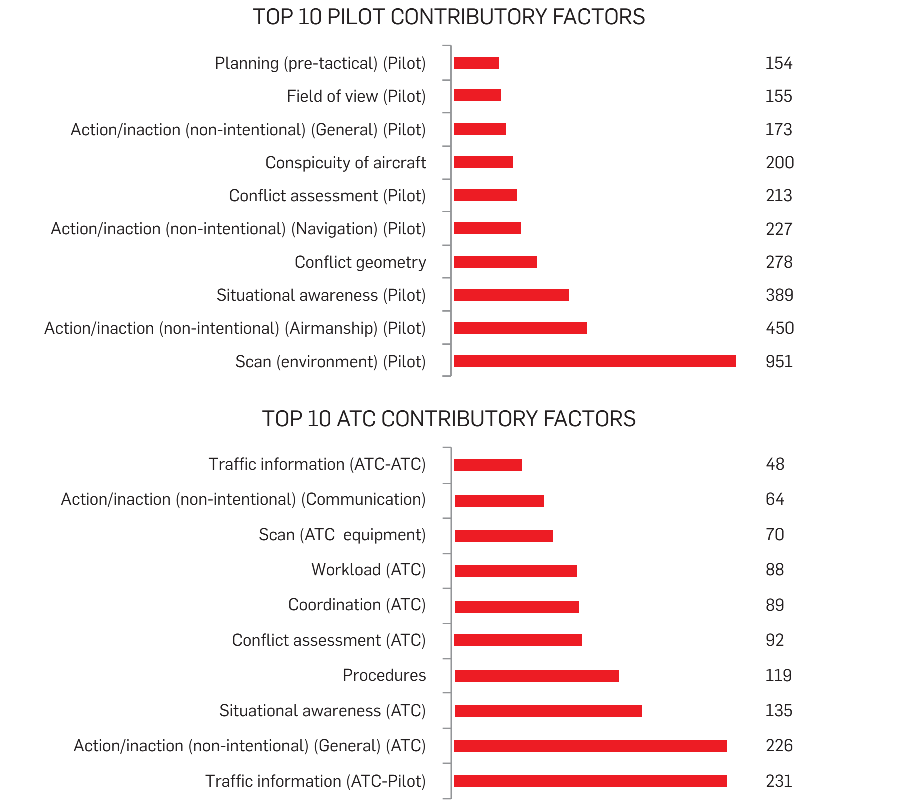


FIGURE Y

TOP 5 CONTRIBUTORY FACTORS FOR EACH MAIN USER-GROUP

GA	MILITARY	COMMERCIAL AIR TRANSPORT
Scan 20.4%	Scan 20%	Scan 16.1%
Airmanship 7.7%	Low flying 7.4%	Situational Awareness (Pilot) 9.6%
Conflict Geometry 6.9%	Situation Awareness (Pilot) 6.4%	Conflict Assessment (Pilot) 9.1%
Situational Awareness (Pilot) 6.8%	Conflict Geometry 6.3%	Visibility 5.7%
Navigation 3%	Airmanship 4.6%	Conflict Geometry 5.2%

NEXT STEPS

Assessing 13 years of Airprox data pinpointed 137 contributory factors, with the top three pilot factors being scan, airmanship and situational awareness. Well, we had guessed all of that anyway from our empirical approach, but what the study did do was to give quantifiable data on which to base further work. As such, it has moved us forward in our understanding and the next step is to start delving further into the data to try to identify mitigations and leading indicators.

Suzanne Sinclair is a UKAB Inspector

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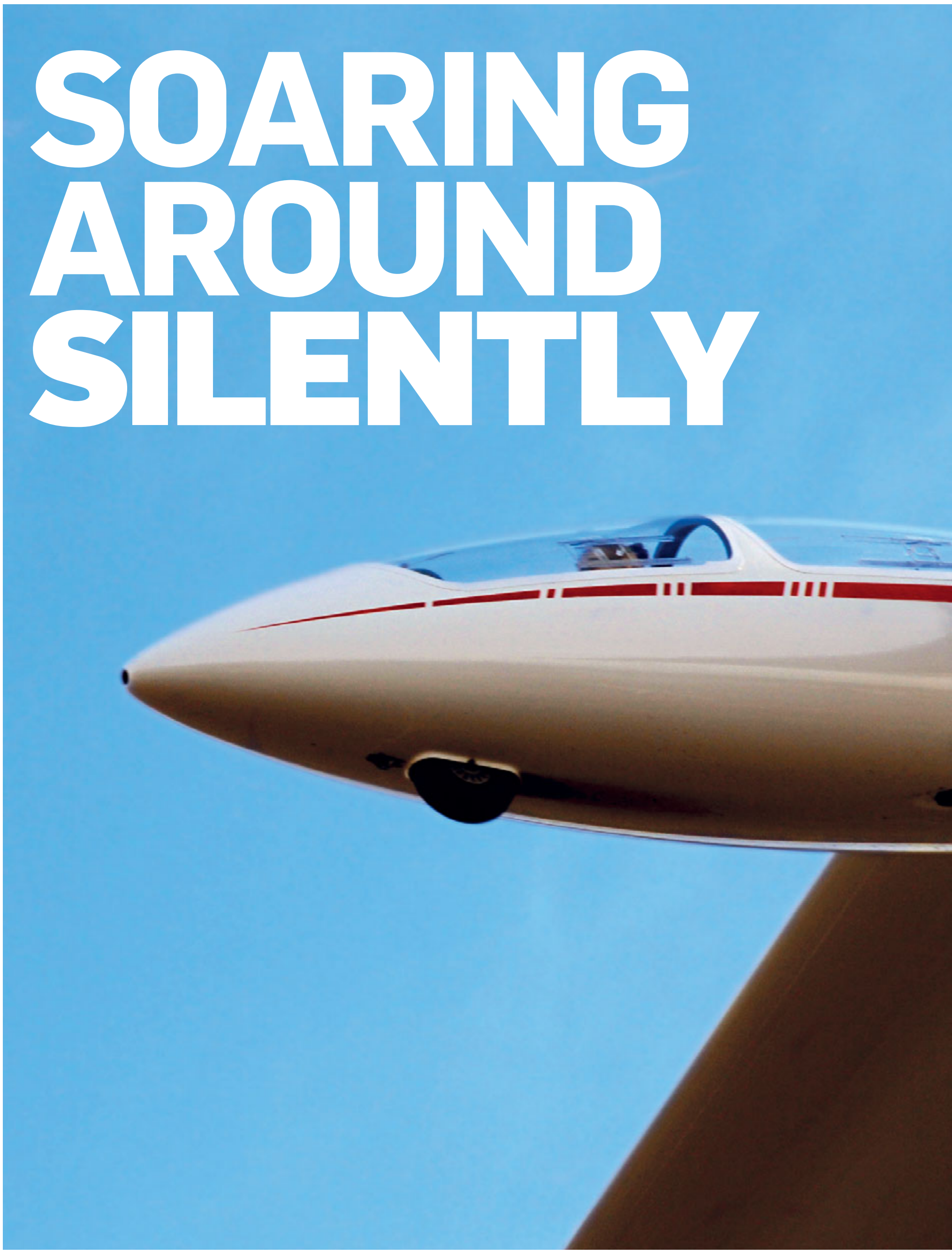
SOARING AROUND SILENTLY



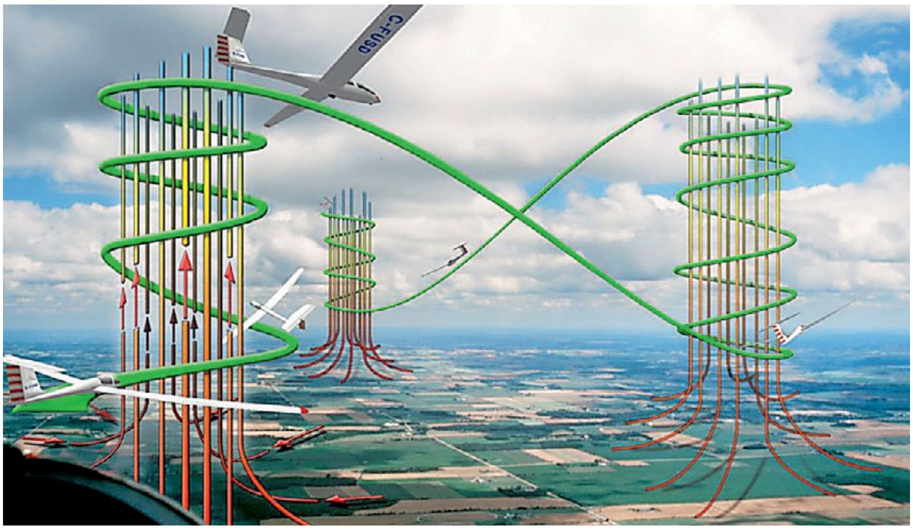
Gliders can be found just about anywhere, so how do you work out where they might be?

UNPOWERED FLIGHT HAS a long and proud history in the UK, from Cayley's (somewhat reluctant) coachman to a recent World Championship victory by the Jones brothers in Finland. It's a sport, so we are all doing it for fun, the beauty of soaring silently through a mountain landscape, the challenge of competition or aerobatics or simply for the shared pleasure of succeeding at something demanding with a group of like-minded friends. Gliding is a very social sport and it is almost always done in a club environment because getting airborne usually needs a team working together.

While there are those who believe gliding is all old gliders made of fabric and wood (which still happens in the very active Vintage Gliding movement), most modern gliding is much more like this main picture – remarkable aerodynamic aircraft that can have best glide ratios of more than 50:1 and, even at 100kt, can still make 40:1. Skilled pilots using thermals on a good day can achieve average speeds of 65-70kt over distances of 500km or more.

Gliding occurs pretty much all over the UK and in all sorts of weather. Thermals are used to make progress across country in summer, while spring and autumn see peaks in wave flying where, in favoured spots, gliders may climb up to FL245 and above (agreements with NATS permit this in defined areas). All-year-round gliders will ridge soar over hills in suitable wind directions.

So, on a decent summer afternoon when everyone is flying, what will gliders be up to? They'll be training novices and conducting local soaring close to their base sites so, if you route close to one, you're likely to get close to a glider. They'll also be doing cross-country tasks – up to 750km or more on a really good day – at all altitudes but



> **The whole launch takes a couple of minutes, so if you're doing 120kt the ground crew checking it's clear probably won't see you 4nm away when they start the launch**

// SUMMARY

ON A DAY of difficult gliding conditions, a Puma flew into proximity with up to four gliders, all of which were in the Benson MATZ and one of which was penetrating the Benson ATZ. The pilot of the glider that penetrated the ATZ had established communications with Benson Tower. Timing and position data confirm that this was not the glider involved in the Airprox. The Puma was receiving a Basic Service from Benson who were 'SSR only' and therefore could not see the gliders on radar.

Assessing the risk as 'Medium', the Puma pilot departing Benson saw a glider in the nine o'clock position at the same level at a range of 0.5nm. The pilot of the glider most likely to be the one seen by the Puma pilot reported that he was flying a FLARM-equipped self-sustaining glider. He did not see any other aircraft.

The Benson control team were pro-active and busy gathering information on glider activity from different sources, sharing it with crews.

REPORT DETAILS

AIRPROX REPORT: 2014143

Date and time: Aug 18 2014 1321Z

Position: 2nm W Benson

Airspace: Benson ATZ (Class: G)

	Reporting aircraft:	**Reported aircraft:**
	Puma	Nimbus
Alt/FL:	1,000ft	
Conditions:	VMC	VMC
Visibility:	30km	
Reported Separation:	0ft V/0.5nm H	NK
Recorded Separation:	NK	

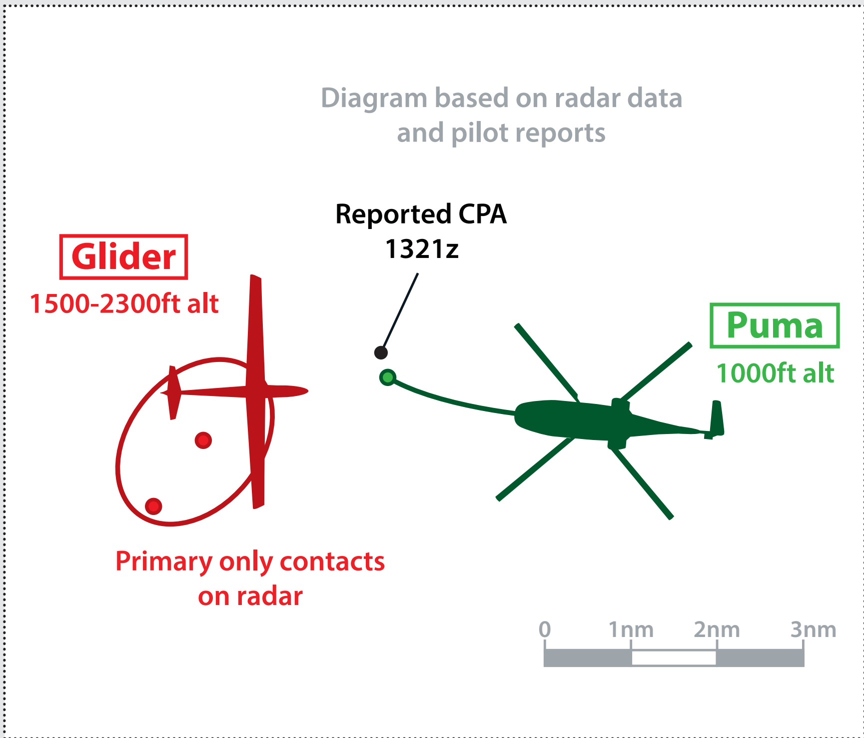
// ASSESSMENT

THE GLIDERS WERE entitled to be inside the MATZ, but good airmanship suggested a radio call to Benson ATC would then be advisable. That a number of the pilots had called Benson ATC was commendable.

Ways to improve the timely promulgation of such events, including dissemination which would aid military aviators, are being examined and what was required from both sides was co-operation and understanding. The glider pilots had a duty to fly responsibly: tracking right along the boundaries of ATZs did not represent good airmanship given the likely disruption to the operations of the airfield concerned irrespective of whether or not a radio call had been made.

Cause: A sighting report.

Degree of Risk: E



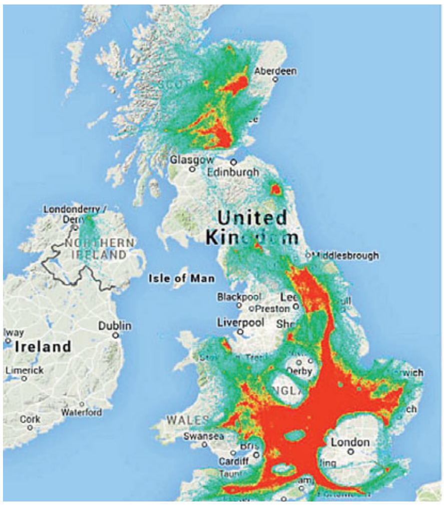
specifically making use of thermals. Finally, they'll be final gliding in long, straight glides from the top of their last climb back to base.

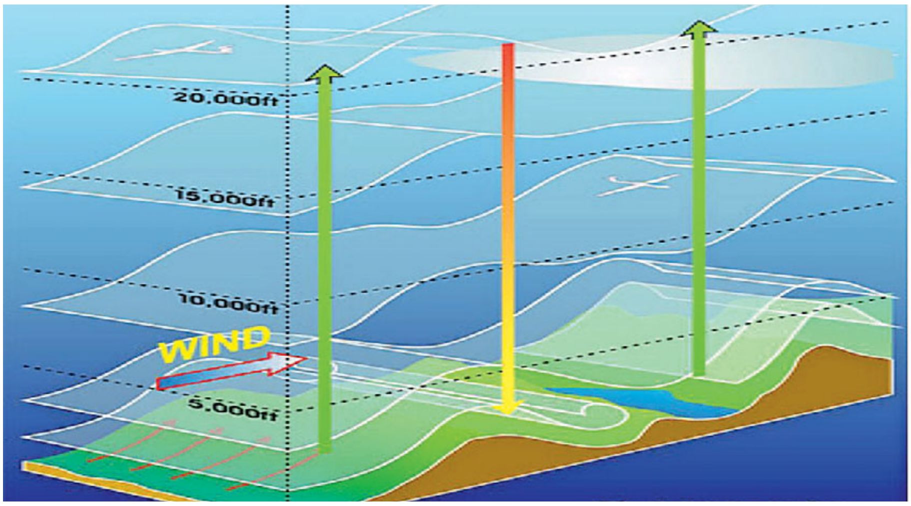
Flying above active gliding sites is particularly hazardous because of the likelihood of encountering winch-launching gliders (or their cables). Sites that use cable winching are marked on the VFR chart with the symbol 'G' and '/' followed by a max height AMSL – so '/3.2' means winching up to altitude 3,200ft. You're not only very unlikely to see the cable if you overfly one of these sites but, because the glider is climbing very steeply, its pilot might well not see you either. The whole winch-launch process takes approximately a couple of minutes so, if you're doing 120kt or so, you'll be far enough away that the ground crew who are checking that it's clear before the launch probably won't see you 4nm away when they start the launch. →

the winch. A tug/glider combination is connected by a rope approximately 200ft long, so it has limited manoeuvrability. For the purposes of the Rules of the Air and avoiding tugs and gliders, they are considered as a single unit that should be avoided by a large margin. Routing close to, or overhead, an active site on a good gliding day greatly increases your chances of coming across such a combination, as **Airprox 2014177** illustrates.

HOW WE STAY UP

Gliders obviously use rising air instead of engines to stay up. Summertime is thermal-time and, generally speaking, the best thermals are below cumulus clouds. Glider pilots like to stay closer to the clouds than the ground, so they might well be thermalling right up to cloudbase.



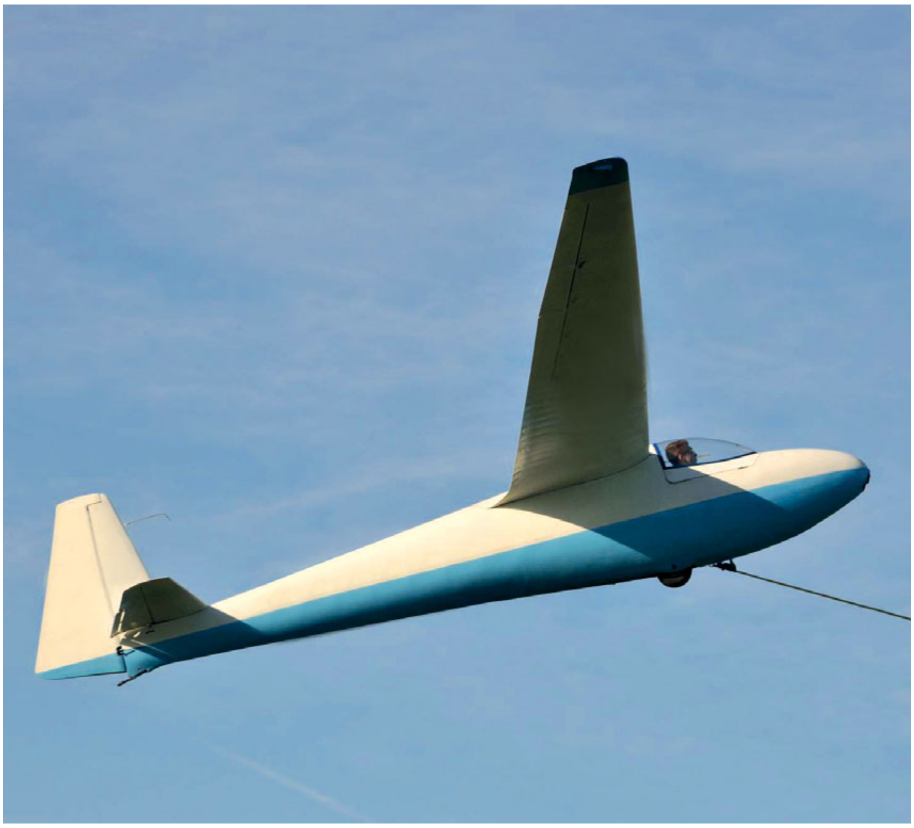


In the picture of a single-seat glider winch-launching (right), note the steep angle of climb which severely limits the pilot's view ahead. That's why they rely on the ground crew to check that the area is clear before launching. The cable might be visible against a light sky, but would you see this against the ground? Almost certainly not.

These kinds of Airprox seem to have increased in frequency recently and a common theme is that the overflying pilot assumes that, because the weather isn't wonderful, gliders won't be flying. This isn't the case: gliders will launch in winds that would shut down many GA airfields and in any cloudbase that lets them complete the winch launch without penetrating cloud.

Gliding sites may also operate non-radio or on one of the dedicated gliding radio channels. Unless a gliding site publishes a specific frequency for passing aircraft to use, don't assume that lack of response to a radio call also means there's no activity. **Airprox 2014211**, where the helicopter pilot was caught out by encountering a launching glider in poor weather conditions, was an example of this. Unless you have positive confirmation that a gliding site isn't operating, it's wisest to assume it's active.

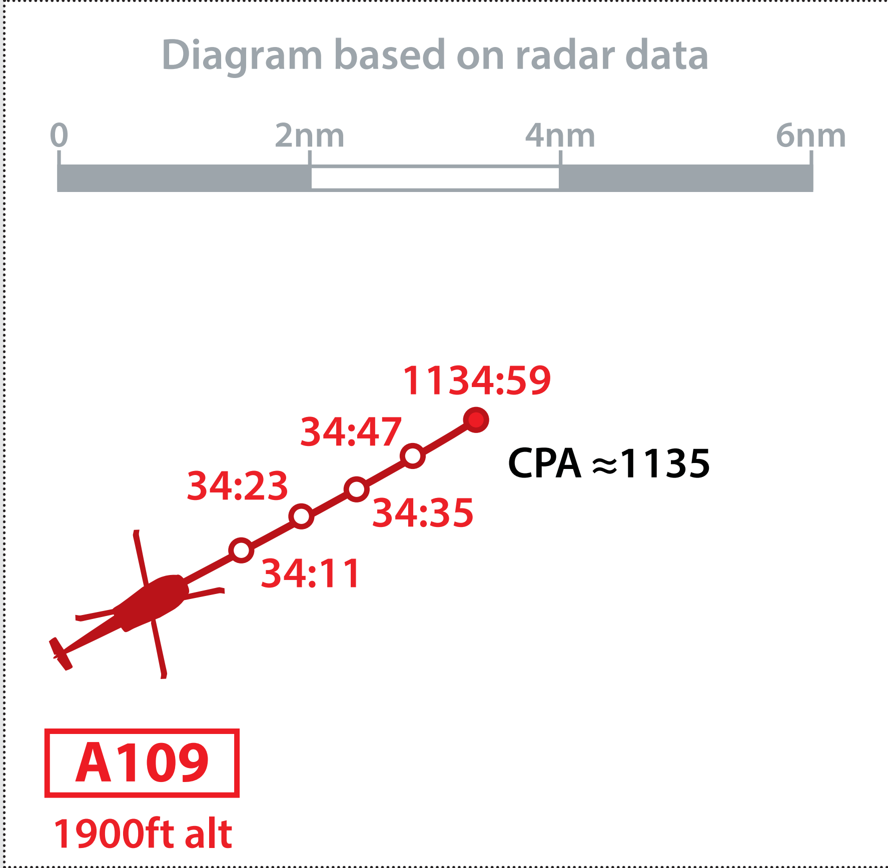
The majority of gliding sites also offer aerotowing. This has the benefit to the glider pilot of delivering them to where the lift actually is rather than simply to overhead



REPORT DETAILS

AIRPROX REPORT: 2014211

Date and time: Nov 8 2014 1135Z	
Position: Dunstable Downs Gliding Site	
Elevation: 500ft	
Airspace: Luton CTR (Class: D)	
Reporting aircraft: ASK21	**Reported aircraft:** A109
Alt/FL: ↑1,100ft QFE	1,900ft QNH
Conditions: VMC	VMC
Visibility: 25km	NK
Reported Separation: 0ft V/35m H	150ft V/150m H
Recorded Separation: NK	



// SUMMARY

THE ASK21 PILOT was instructing on a winch launch, near the top of which the instructor caught sight of a helicopter at the same level and on a converging course. It had previously been obscured from view due to the glider's high nose-up attitude. The instructor took immediate avoiding action, assessing the risk as 'High'.

Due to the poor weather and wind conditions, the A109 pilot had expected that gliding would not be taking place at Dunstable and consequently requested to route overhead. Luton ATC informed him that Dunstable was notified as active so he scanned the glider site, noting a cable-tow and two gliders on the ground. He scanned further and saw a glider in his left 9.30 position at approximately 200m in a right turn below his altitude. He assessed the risk of collision as 'Low'.

Intensive gliding activities can take place in surprisingly poor weather, much of it training to operate safely in those conditions. It would be good practice to assume that a gliding site is active unless positively notified otherwise.

// ASSESSMENT

THE A109 PILOT had assumed that there would be no gliding activity at Dunstable Downs due to the inclement weather and high wind speed, agreeing he had not avoided the site "...if at all possible" as requested in the UK AIP entry for Luton. Commending him for normally adopting a 'procedure' of avoiding gliding sites, members agreed that doing so on this occasion would have contributed significantly to collision mitigation. The glider pilot was commended for his prompt actions at a difficult stage of flight.

Cause: The A109 pilot flew close to a promulgated and active gliding site and into conflict with the ASK21.

Contributory Factor: The A109 pilot assumed that the weather conditions would preclude glider operations.

Degree of Risk: A

However, the most efficient way to travel across country in a glider is to minimise the time spent thermalling, so pilots try to link up areas of lift. They slow down to climb in the 'good' air and speed up (maybe to 100kt or more) in the sinking air. If the wind organises the thermals into long 'cloud streets', gliders will tend to follow these to maximise the energy gained, even if it means a significant deviation from their planned track.

But wind also gives us rising air in two forms. Wind blowing across a ridgeline will allow low-level soaring along the ridge, sometimes for quite long distances – for example, the South Downs in a northerly wind. Similarly, in the right conditions, lee waves can form downwind of mountain ranges (left middle picture, P24) and these can take gliders very high (the current UK record is in excess of 35,000ft) and a long way (there have been flights of more than 1,000km in Scotland using wave systems).

AIRSPACE

Gliders normally operate in Class G, although they are permitted to fly in Classes C, D and E with appropriate clearances and equipment. However, staying airborne and making progress across country without an engine takes concentration and, of course, it's not possible to follow a defined track or level. Therefore, gliders don't usually ask for clearances to fly in controlled airspace, preferring to 'route around'.

In competitions, Class D airspace is off limits even with a clearance. This is to maintain a level playing field – it would hardly be fair if one competitor got a clearance and the next one didn't. But all of this means that 'choke points' can give rise to particularly high traffic densities as depicted in the diagram (lower left, P24), where red indicates the especially high-density airspace areas – watch out!

But glider pilots also have responsibilities too, and **Airprox 2014143** was an example of a glider skirting around an ATZ; all legal but, as a glider pilot, if you can't avoid doing it then airmanship dictates that you talk with ATC so that they are at least aware and able to inform or route other aircraft to avoid you.

→

COMPETITIONS

Gliding can also be a competitive sport and, throughout the summer, organised competitions allow pilots to develop their skills and test themselves against each other. A competition involves anything from 20 to 60 (or more) gliders being based at an airfield and set a specific task around a defined course.

The task will be decided on the day depending on the weather and can change at short notice if the forecast and reality don't match up. Once the group of gliders has been launched (usually within an hour of each other), each pilot makes their own decisions about when to start the task and what route to take around the defined turnpoints. All of the gliders carry loggers, which record their position and altitude every few seconds to prove where they've been and how fast they went.

Individual competitions are NOTAMed for point of departure, but the task route and timing is so variable that each task is not usually subject to a specific NOTAM. However, all competition organisations are required to have a dedicated Airspace Co-ordinator, who will ensure that airfields close to the planned route will be notified on a daily basis.

There is also a website which will list the competition tasks set on any given day at *bgaladder.co.uk/SHOWTASK.ASP*. Tasks are usually finalised at approximately 10am in the morning, just prior to the mass briefing.

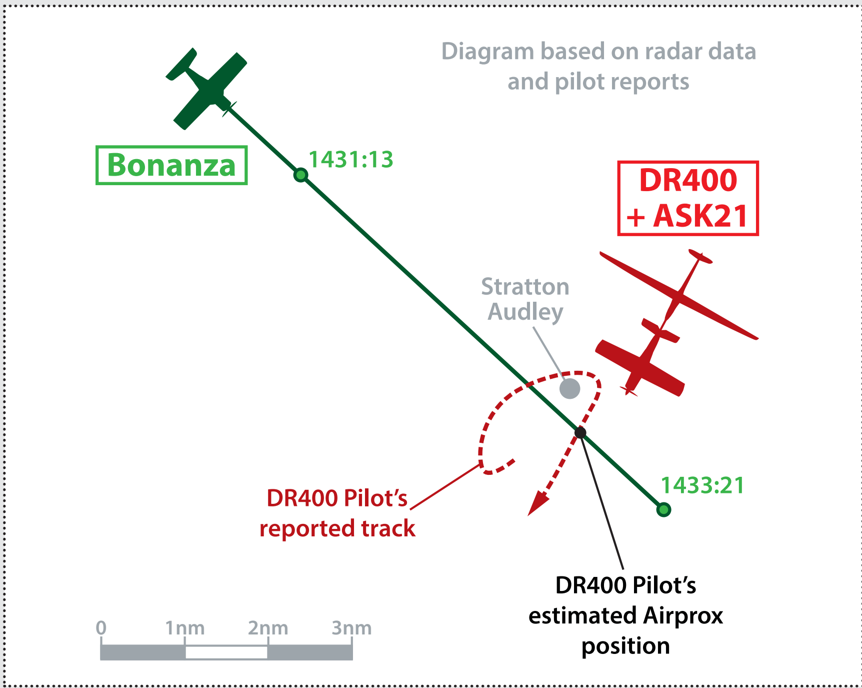
HOW NOT TO BUMP INTO A GLIDER

- Avoid routing over or close to gliding sites, especially below the winch-launching height.
- If it looks like a good thermal soaring day, watch out for gliders under cumulus clouds.
- Be aware of areas of intensive ridge soaring and the wind directions that make them busy.
- At higher levels, be aware of the gliding wave areas (primarily in Scotland, Yorkshire, the Pennines and Wales) and the conditions that give rise to wave.

WHAT ABOUT TECHNOLOGY?

Well, transponders remain a problem for aircraft that have to carry all their own power in batteries and may be airborne for many hours. Both battery and transponder technology has advanced in recent years and it's true that most new gliders are fitted with a Mode S unit, but there are significant technological (and regulatory) barriers to retrofitting these to existing gliders. However, glider pilots have been quick to adopt FLARM – a relatively low-cost and low-power device that can easily be fitted to most gliders. See the article about electronic conspicuity on p8-12 for more, and particularly the associated **Airprox 2014126** to see an example of its benefits beyond the gliding community.

Chris Fox is a UKAB Glider Member



// SUMMARY

AFTER TAKEOFF FROM Bicester, the DR400 pilot routed to the north of Stratton Audley before turning onto a heading of 200°. Passing approximately 2,000ft in the climb, he noticed a Bonanza at the same height approximately 50 metres away which was turning 'hard to the right' and climbing. The DR400 pilot did not have time to take any action, assessing the risk of collision as 'Medium'.

The Bonanza pilot reports that he frequently flies this route but, because of cloud in the Birmingham area, he had elected to transit at 2,100ft QNH. As he approached Bicester, he could see activity at the glider site. Continuing to scan, he saw a tug towing a glider 'low and slow' in his 10 or 11 o'clock. He assessed there was 'no risk of dangerous proximity' even with no change of course. However, he elected to turn right and climb until the other aircraft were clear. He assessed the risk of collision as 'None'.

// ASSESSMENT

THE BONANZA PILOT, while he had not flown directly over the glider site, was flying close-by and below the published maximum launch height. It would have been wiser to have given such a busy site a wider berth. The Bonanza pilot had seen the other aircraft and, although assessing that there was no risk of collision, took action anyway. The Board noted that gliders being towed usually have little ability to manoeuvre. Also, the glider might be released at any point, after which a tug is then likely to make swift manoeuvres to return to the glider site.

Cause: The Bonanza pilot flew into conflict with the DR400 tug and glider while in close proximity to a promulgated and active gliding site.

Degree of Risk: B

REPORT DETAILS

AIRPROX REPORT: 2014177

Date and time:
Sep 6 2014 1433Z

Position:
1nm NE of Bicester Glider Site

Airspace:
London FIR (Class: G)

	Reporting aircraft	Reported aircraft
Aircraft	DR400 + Glider	Beech A36 Bonanza
Alt/FL	2,300ft AGL (1,014hPa)	2,100ft QNH
Conditions	VMC	VMC
Visibility	20nm	10km
Reported Separation	0ft V/50-100ft H	200ft V/200m H

Recorded Separation:
NK

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HAVE WINGS, WILL TRAVEL

Hang gliding and paragliding have come a long way – and so have their pilots...

IF YOU THOUGHT foot-launched gliding is purely a glorified sledge ride involving nothing more than leaping off the top of a hill and gliding down to the bottom, you'd be wrong. It's a common misconception that belies the skills of the pilots and the abilities of their craft.

Nowadays, the aim is to gain as much height as possible above the take-off point using ridge lift and thermals, then head off across country seeking new thermals and staying airborne for as long as possible.

Experienced pilots who circle in thermals up to cloudbase routinely achieve height gains of several thousand feet and can travel hundreds of kilometres across country. The UK record height gain for a hang glider is 12,000ft above take-off in wave conditions and the duration record stands at just over eight hours. However, these achievements are exceptional and flights of approximately two to three hours with height gains of up to 5,000ft (if the cloudbase permits) are more the norm for many experienced cross-country pilots.

Given that hang gliders and paragliders don't generally carry radios or transponders, a good lookout near known launch sites is critical as the primary method of collision avoidance. However, see-and-avoid alone is insufficient to minimise the chances of an Airprox – it's essential to also understand hang gliding and paragliding practices and techniques, together with an appreciation of the weather conditions in which they fly.

Most hang glider and paraglider flying is initiated through foot-launching from →

> **"See-and-avoid alone is insufficient to minimise the chances of an Airprox – it's essential to also understand hang gliding and paragliding practices**

REPORT DETAILS

AIRPROX REPORT: 2014047

Date and time:
Mar 26 2014 1315Z

Position:
Carrock Fell

Airspace:
Lon FIR (Class: G)

	Reporting aircraft	Reported aircraft
Aircraft	Sea King	Paraglider
Alt/FL	NK	NK
Conditions	VMC	VMC
Visibility	10km	NK
Reported Separation	50ft V/100m H	NK
Recorded Separation	NK	

// SUMMARY

A SEA KING pilot reported carrying out a Search and Rescue Operation (SAROP) in the vicinity of Carrock Fell (Lake District). In a right-hand turn to transition away following deployment of a winchman to the ground, the right-hand-seat (RHS) pilot saw a paraglider canopy very close on the left. The RHS pilot took control, manoeuvring to increase separation. The Sea King pilot saw several paraglider pilots on the ridgeline above him, his impression being that they were waiting for his aircraft to depart before launching. He stated that the crew were aware of multiple aircraft in the area and had been flying defensively, transmitting safety calls on 'low-level common' to mitigate the risk. He assessed the risk of collision as 'High'.

Despite extensive tracing action, the paraglider pilot could not be located. For a variety of reasons, virtually no paraglider pilots fly with an air-band radio.

// ASSESSMENT

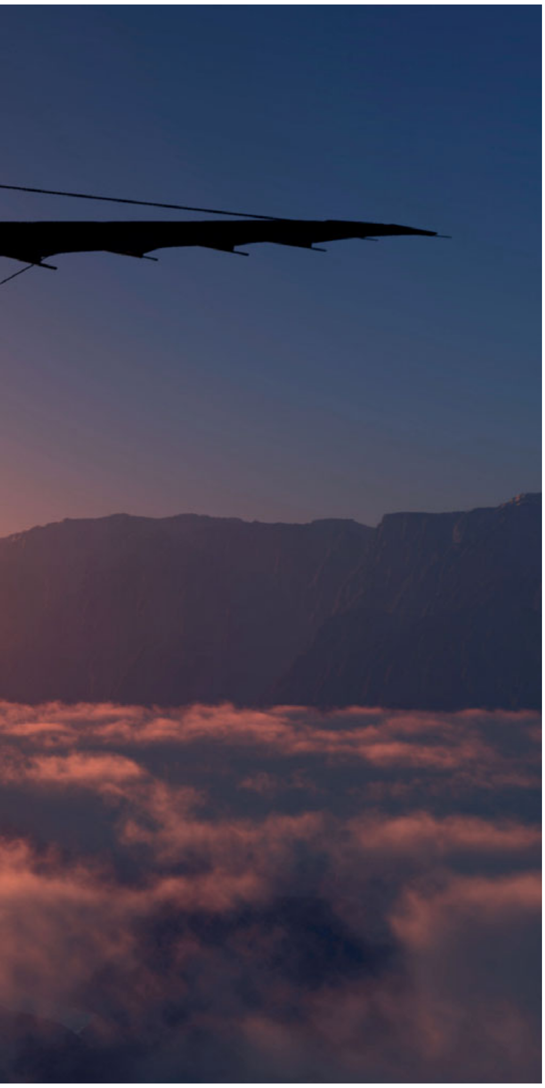
THE PARAGLIDER PILOT would most likely have heard the approaching Sea King from some distance. Visual acquisition of the yellow helicopter and then either landing or manoeuvring to increase separation and/or to aid visual acquisition by the Sea King pilot would have been wise. Although both airspace users were equally entitled to operate in Class G airspace, Board members expressed their strong opinion that all airspace users had a duty to make way for the self-evident priority of a SAROP.

The Board noted the RAF Safety Centre advice that helicopter crews should avoid hang gliders, paragliders and other ultralight aircraft by 2,000m laterally.

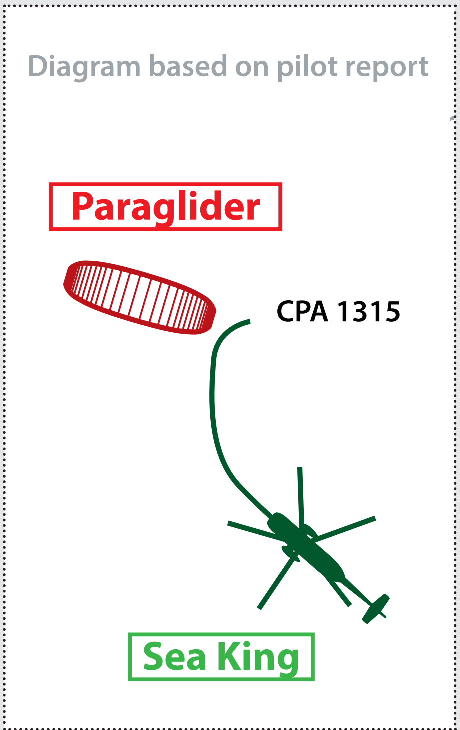
Cause: A conflict of flight paths resolved by the Sea King pilot.

Degree of Risk: B

Recommendation:
The BHPA consider producing a catalogue of paraglider launch sites, including usage under given wind conditions.



Paragliders favour lighter surface winds of up to 10kt, but hang gliders can launch quite comfortably in surface winds of up to 25kt. Thus, in surface winds of 25kt or below, activity on the 'into wind' sites should be expected



steep-sided hills or ridges that face into the prevailing wind (although winch and microlight tug launches from airfields are also undertaken) because most pilots prefer the freedom, independence and low cost associated with foot-launching from a hill or terrain feature. Furthermore, the thermal activity sought by pilots is more readily triggered by undulating terrain. That said, paramotor pilots can clearly launch from anywhere so, as **Airprox 2014062** demonstrates, you need to keep your eyes open wherever you fly.

Whether or not sites will be in use depends predominantly on the prevailing weather conditions and seasonal site restrictions, as described below:

- **Wind direction** Attempting to foot-launch a glider of any type in crosswind or downwind conditions is very hazardous. Therefore, as a rule, launches will only take place directly into wind. In most cases, the primary wind direction applicable to a marked foot-launch site is obvious from the topographical features shown on the chart (e.g. a northerly facing ridge will be used when the surface wind is northerly).

This will provide a general indication of whether the site will be in use at the time, but further research is necessary to establish the full range of wind directions suitable for launching and thereby obtain a more accurate picture.

A list of BHPA recreational clubs covering the whole of the UK can be accessed via the British Hang Gliding and Paragliding Association's website at *bhpa.co.uk* – click on 'Recreational clubs' in the Welcome text and then 'List of all BHPA recreational clubs'. This section also provides a map showing geographical locations. The club(s) relevant to the intended flight route can then be identified and their websites accessed.

For example, if intending to fly near the South Downs, the Southern Hang Gliding Club website should be visited and their 'Site Guide' accessed. On doing so, a compass rose will appear indicating the range of launch wind directions applicable to each club site. As an example, the well-known Devil's Dyke site is suitable for launching when the wind direction is anywhere between WNW and N. Accessing this site link reveals considerably more detail, but most significantly it specifies the best launch wind direction (NW) – a clear indication as to when the site will be at its busiest. Also, accessing the site guide provides a useful means of checking for all sites that may be on, or close to, the route planned.

Dir UKAB Note: It should be noted that the BHPA do not consider it wise to make planning assessments of site usage based on wind direction. They believe that microclimate factors render such assessments dangerous because it could cause powered pilots to have a false expectation of where hang- and paragliders might be. In their opinion, other aviators should simply expect to see hang- and paragliders in any location irrespective of wind direction.

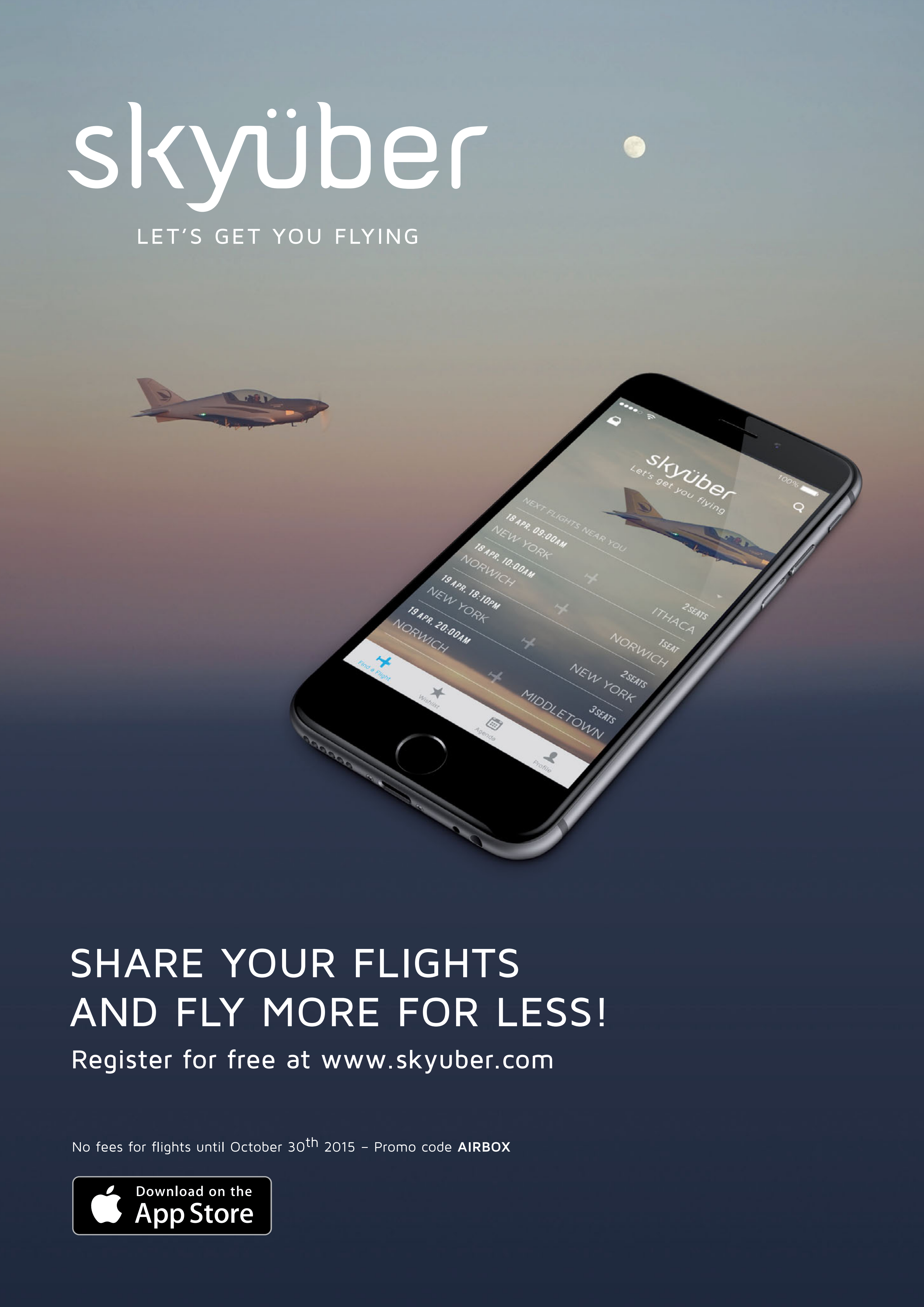
- **Wind strength** Paragliders favour lighter surface winds of up to 10kt, but hang gliders can launch quite comfortably in surface winds of up to 25kt. Thus, in surface winds of 25kt or below, activity on the 'into wind' sites should be expected.

These days, paragliders greatly outnumber hang gliders and sites will therefore be at their busiest in lighter wind conditions. Most of the gliders will fly in the ridge-lift band on the windward side of the hill and are therefore unlikely to rise much higher than 1,000ft ATO.

However, there will always be a cadre of more experienced pilots who will rise considerably higher (if conditions permit) and then head off across country. More often than not, these routes will be downwind of the launch site. However, out (often into wind) and return or triangular flights to prearranged waypoints are perfectly feasible, particularly in competition flying.

- **Cloudbase/Cloudcover** Hang gliders and paragliders are essentially 'VFR only', mainly due to their general inability to carry instrumentation. As a rule, they do not fly in cloud. However, they may well inadvertently enter cloud while working thermal lift. Similarly, on broken cloud cover days, they may well rise higher than some clouds while still maintaining VFR flight. Cloudbase only acts as a height limitation when the cloud cover is significant – as a guide, greater than 4/8. Additionally, low cloud will not necessarily prevent gliding activity unless it either obscures or is only marginally above the launch point.

- **Precipitation/Visibility** Precipitation has an adverse effect on the aerodynamic characteristics of foot-launched gliders.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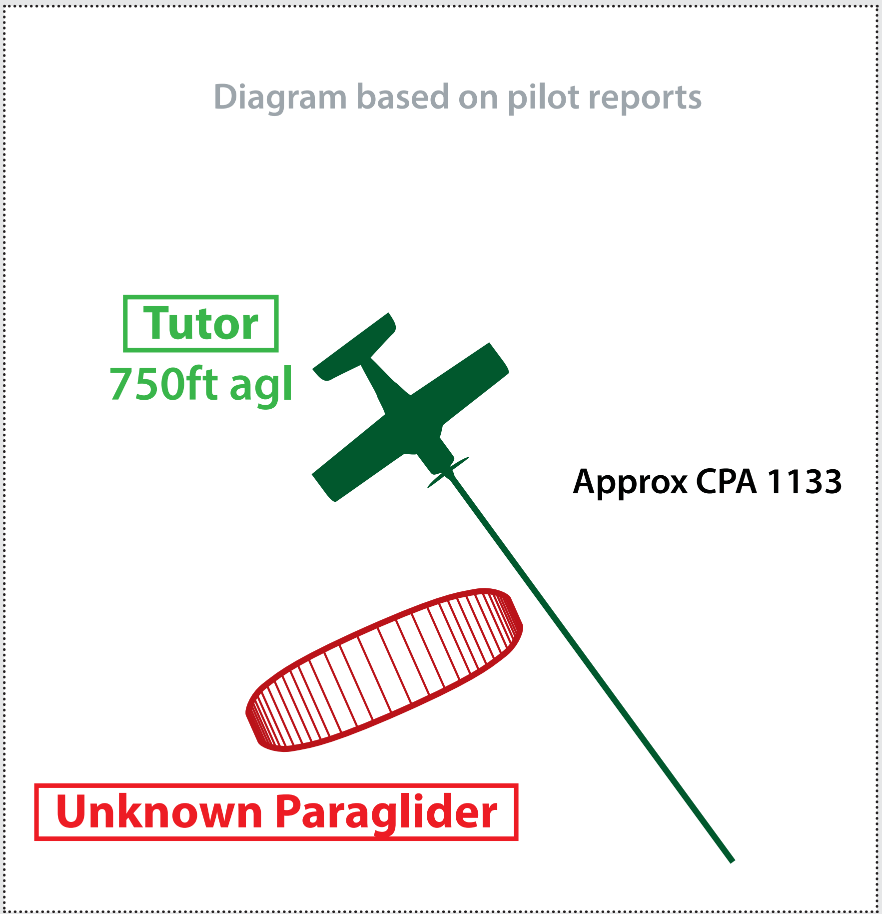


REPORT DETAILS

AIRPROX REPORT: 2014062

Date and time:
May 15 2014 1133Z

Position:
Approx. 6nm SW Huddersfield

Airspace:
Lon FIR (Class: G)

Reporting aircraft:	Reported aircraft:
Tutor	Untraced paraglider

Alt/FL:
750ft NK

Conditions:
VMC NK

Visibility:
>10K NK

Reported Separation:
100m V/<0.1nm H NK

Recorded Separation:
NK

// SUMMARY

THE PILOT OF a Tutor on a nav-ex was flying in VMC towards the Ladybower Reservoir in the Derwent Valley. He reported seeing a paraglider pass beneath the aircraft from front to back underneath the right wing, approximately 100m below. Both the student and the instructor were looking out, with the instructor in the LHS seeing nothing. Both pilots looked behind, but neither could identify the paraglider.

It should be noted that post-incident analysis of the wind conditions makes it much more likely that the aircraft was a paramotor. The severity of the incident was assessed as 'Medium'.

The incident cannot be seen on radar and it has not been possible to trace the paraglider/motor.

//ASSESSMENT

THE BOARD DISCUSSED whether the paraglider/motor pilot had seen the Tutor, deciding that the apparent lack of avoiding action would seem to indicate that (s)he had not. In the event, it was probably the Tutor pilot's look-out and avoiding action that prevented this from being a more serious incident, there being no ATC service that the Tutor pilot could have received to assist them. Both airspace users were entitled to operate in the area with an equal and shared collision avoidance responsibility.

After considering whether or not this should be a Risk B assessment, the risk was ultimately determined to be 'C', it being felt that effective and timely action had been taken by the Tutor pilot in achieving the reported 100m separation.

As noted by both HQ Air Command and the British Hang Gliding and Paragliding Association, this Airprox particularly highlights the need for good lookout by all in the see-and-avoid environment of Class G airspace.

Cause: A late sighting by the Tutor pilot and an assumed late sighting by the paraglider/motor pilot.

Degree of Risk: C

For example, rain will retard the airflow over a hang glider wing, which will result in a much higher stall speed and thus a greatly reduced stall margin. Therefore, launches will not take place in such adverse conditions.

However, it should also be remembered that gliders can frequently get caught in precipitation during flight and particularly so in 'light shower' or 'intermittent rain' conditions. Therefore, as a rule, precipitation will only prevent gliding activity when it is frequent, constant or heavy in nature. In the case of in-flight visibility, the limitations specified for maintaining VFR are equally as applicable to foot-launch gliders as they are to all other forms of aviation.

REPORT DETAILS

AIRPROX REPORT: 2014198

Date and time:
Oct 2 2014 1445Z

Position:
Rushup Edge

Airspace:
London FIR (Class: G)

Reporting aircraft: Paraglider
Reported aircraft: Untraced quadcopter

Alt/FL:
150ft AGL

Conditions:
VMC

Visibility:
5km

Reported Separation:
20ft V/0m H

Recorded Separation:
Not Recorded

// SUMMARY

THE PARAGLIDER PILOT reports ridge-soaring at approximately 150ft in VMC. He saw a 'DJI Phantom FC40 type' quadcopter drone descend to approximately 20ft above his canopy, noting that it was quite hard to see against the grey sky even with a row of LEDs on its underside. Reporting that he could not see anyone on the ridge nor in the fields below 'with a radio unit', he assumed that the quadcopter was being flown out of line of vision using a remote screen to monitor the 'view' from the drone. Each time the paraglider pilot changed direction, the quadcopter tracked the change, following him with approximately 25ft vertical separation and between zero and 25ft horizontal separation. Assessing the risk of collision as 'High', the hazard of a collision with his thin canopy-to-harness lines caused serious concern.

The quadcopter operator could not be traced.

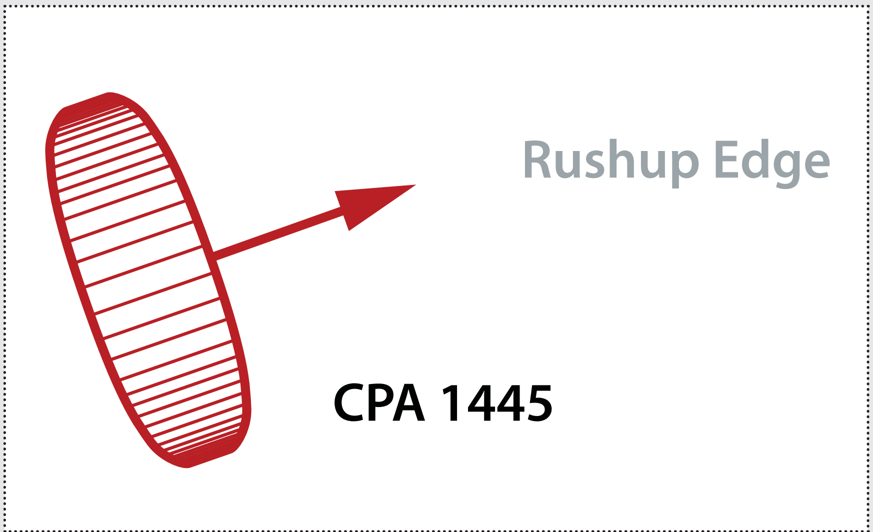
// ASSESSMENT

THIS INCIDENT WAS one of an increasing number of Airprox involving small unmanned aircraft (SUA). It appeared from the paraglider pilot's report that the quadcopter had been flown around him and his canopy at extremely close range as a deliberate act. The Board agreed that the paraglider pilot had been placed in great peril by the reckless actions of the SUA operator. If the ranges reported were accurate, the quadcopter's flight was in contravention of the Air Navigation Order and therefore a criminal offence.

Members considered that chance had played a major part in events and safety had been very much below acceptable levels. Short of the paraglider pilot landing immediately, he could not have done more to improve matters given that the quadcopter was seemingly being operated to deliberately follow him in flight.

Cause: The quadcopter was flown into conflict with the paraglider.

Degree of Risk: A



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- **Seasonal activity/Site limitations**

Comparatively little hang gliding or paragliding takes place in the UK during the winter months, largely due to short daylight hours, adverse and unpredictable weather conditions and greatly reduced thermal activity. Any flying that does take place is likely to be confined to ridge-soaring a few hundred feet above the windward side of a hill or top to bottom training flights. Additionally, many sites are closed during these periods due to seasonal activities such as pheasant/grouse shooting, lambing and crop sowing. Site operating periods and limitations (such as no fly areas) will be clearly specified in the relevant Club Site Guides, accessible through the BHPA website (see 'Wind Direction' above).

In summary, in order to minimise the risk of Airprox incidents with foot-launched gliders:

- Visit the BHPA website at *bhpa.co.uk/clubs/* and check which clubs operate in the area(s) to be overflown.
- Access the relevant Club(s)' Site Guide(s) and check which sites may be active in the prevailing surface wind conditions.
- Where unable to avoid the site(s), plan to fly upwind of the windward side of the hill/ridge, maintaining as much horizontal and vertical separation as possible.

Lastly, keep a good lookout from the surface all the way up to cloudbase. Gliders are constantly seeking lift (rising air) to stay airborne. To the casual observer, they may appear to fly together in 'gaggles' whereas they are in fact merely using the same thermal. The company of other gliders is not their goal. Rather, it is staying airborne by gaining as much altitude as possible from whatever lift is available.

Where one glider is observed circling in thermal lift, there are likely to be several others working the same lift at varying altitudes above and below. Also, there may well be foot-launch gliders flying cross-country by 'hopping' from one thermal to the next, particularly downwind of active sites.

Hang glider and paraglider pilots have their part to play in collision avoidance too. **Airprox 2014047**, for example, was an incident that should have been avoidable. If you see a hovering helicopter or one that has emergency markings, give it a wide berth because it's very likely to be conducting an emergency task.

Finally, if you're a drone operator, please do not try to take video or fly close to paragliders or hang gliders. As **Airprox 2014198** demonstrates, what might seem good sport to you is life-threatening to them – especially if your drone gets caught in the rigging or, even worse, severs some lines. In any case, it is illegal to fly your drone in such a way as to endanger others and/or closer than 50 metres to any person, vessel, vehicle or structure.

Major J P Gilbert REME

MIXING IT WITH THE MILITARY

Flying below 2,000ft? Think about fast-jets!

FIXED-WING AND ROTARY aircraft are considered to be low-flying when below 2,000ft and 500ft respectively, which brings them into potential conflict with a range of other Class G airspace users: light civilian aircraft, gliders, paragliders, helicopters and, of course, other military aircraft.

So why do the military still need to low-fly? How is it managed, what training do they undertake to stay safe and, finally, what could you as a pilot do to enhance your own safety when operating in the same areas?

As many pilots will know, military aircraft have been low-flying for decades, driven by a need to effectively support troops or deliver tactical munitions accurately below the coverage of enemy radar by using terrain-masking techniques to evade detection and gain tactical advantage.

Today, the requirement to low-fly remains. As seen in recent operations, it's not just the ability to drop weapons with precision in high-threat environments that's needed, but also the capability to conduct other tasks such as: 'shows of force' (high-speed low-level passes, requiring skilful piloting, to disperse enemy troops without the need for the use of weapons), the delivery of supplies to troops via air-drops, emergency medical recovery operations, or even delivery of humanitarian aid when the environment may not be guaranteed as friendly.

DANGER CLOSE

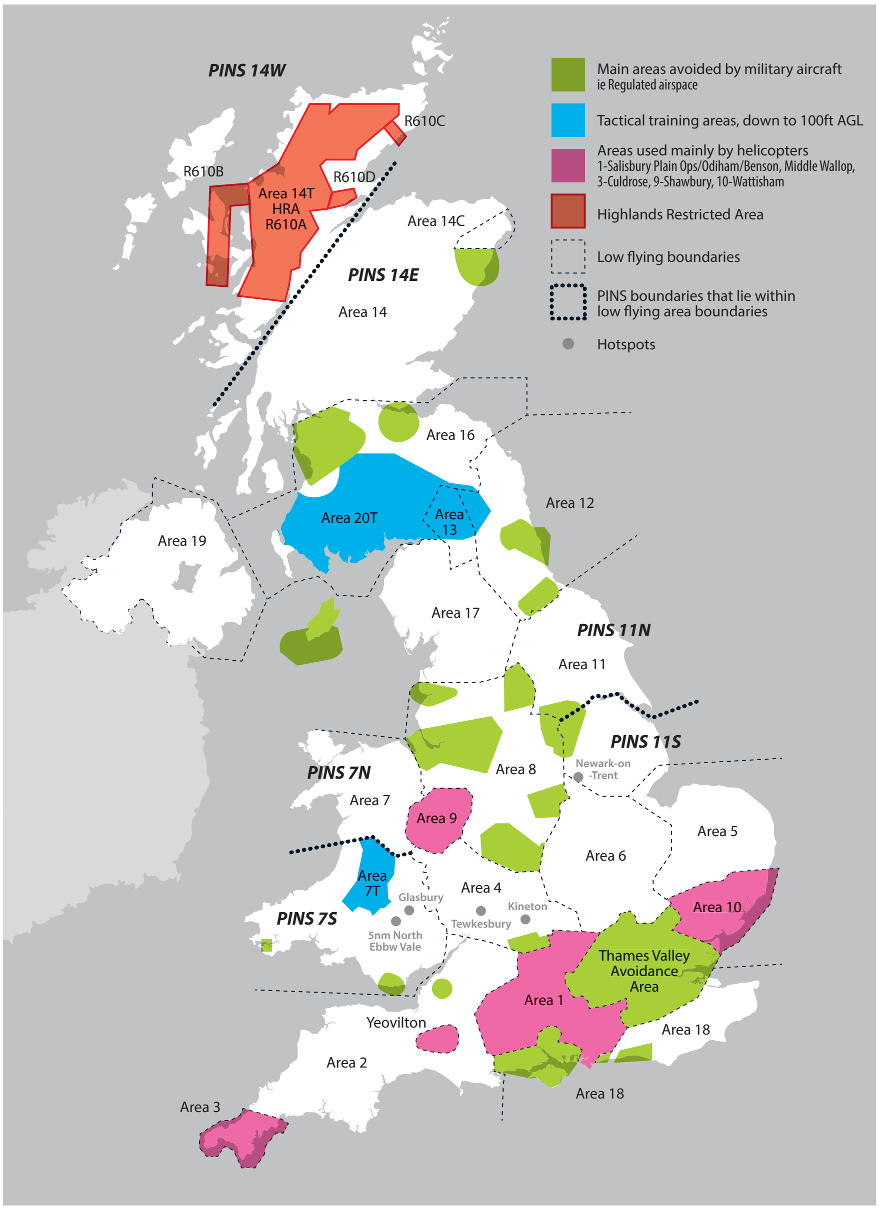
Low-level flying is demanding and there is little margin for error. Because of this, it is a constant theme during all stages of military flying training. Pilots are first introduced to some of the skills and techniques during elementary training in the Grob Tutor, which is conducted at the relatively slow speed of 120kt and no lower than 500ft.

The next step is in the Shorts Tucano, currently based in Yorkshire. Here the low-flying becomes more challenging, with speed doubled and pilots being trained to fly safely at heights of 250ft. Some students then move on to RAF Valley to conduct advanced flying training in the Hawk. A considerable part of this course is also flown at low-level, and speed is again increased to 420kt.

The final part of the lengthy training process sees pilots join an Operational Conversion Unit where they learn to fly high-performance frontline aircraft. Here the ability to fly and operate at low-level is very demanding and requires constant attention. Untested, the required skills can fade rapidly.

The number of military aircraft involved in low-flying has dropped considerably over the last 20 years, reflecting the reducing numbers of front-line aircraft and their more varied roles. Nevertheless, there were still approximately 20,000 fixed-wing low-level daytime movements alone in the past year.

To manage this significant amount of military low-flying, a system called the Centralised Aviation Data Service (CADS) ensures that information on other airspace users is commonly available and, where possible, known flight-path conflictions are resolved – more on that later.



HOW LOW CAN YOU GO?

The military's UK Low Flying System (UKLFS) extends vertically from the surface up to 2,000ft over land and sea out to the UK FIR Boundary and is managed by the Low Flying Operations Squadron currently based at RAF Wittering. Apart from aircraft which fly below 140kt, any military pilot who wishes to fly an aircraft in the UKLFS must make a prior booking to gain traffic information and any late warnings which may affect their sortie. Bookings are made on the day of the flight, or the day prior if after 20:00L.

Because of the different see-and-avoid considerations by day and night, there is a UK Day Low-Flying System (UKDLFS) and a UK Night Low-Flying System (UKNLFS). The day system comprises 20 Low Flying Areas (LFAs) as shown in the graphic above, six of which are Dedicated User Areas which are not available to all users. The five shown in green on the graphic are mostly for helicopter operations, while LFA19 covers Northern Ireland and is only for aircraft based at Aldergrove.

The night system has different area designations which, for obvious see-and-avoid reasons, are much more controlled in terms of access so that only individual military users are generally able to operate in any particular area at one time.

Additionally, there are three Tactical Training Areas (TTAs) for Operational Low Flying at 100ft; they are the only locations where fixed-wing flying is routinely authorised this low. These are only available during the day and, when active, the airspace is allocated to a single aircraft or formation. The three TTAs are LFA 7T (located in Wales), LFA 14T (located in Scotland) and LFA 20T (which overlays parts of the Scottish Borders). Their usage times are published on the *gov.uk* website to ensure people are made aware of when this very low-flying will take place.

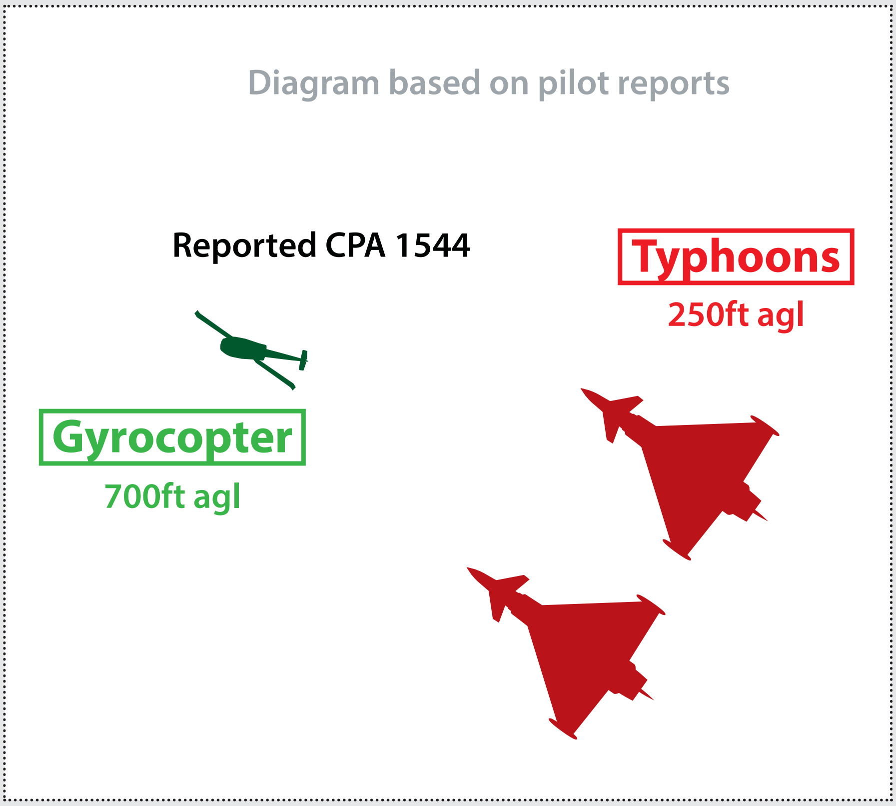
Finally, as can also be seen on the graphic, there is also the Highland Restricted Area – another segregation with the same boundaries as LFA 14T, but which is also used for low-level Terrain Following Radar training in IMC.

HOW LOW IS LOW?

The minimum height that fixed-wing aircraft can normally be booked down to in the UKLFS is 250ft, with the exception of the TTAs where the minimum height is 100ft for fast jets and 150ft for C130s. Rotary aircraft are able to book down to ground level throughout. However, this is the minimum height and aircraft can still be operating above this. For example, military aircraft will climb to 1,000ft when crossing coastlines to avoid birds. **Airprox 2014052** (shown on p40) was an incident where this was pertinent.

Inadvertently flying into the ground is, of course, an ever-present risk in military low-flying. However, another significant risk is that of mid-air collision. With no Air Traffic Services generally available at low-level due to terrain screening, pre-flight planning and 'see-and-avoid' become increasingly important.

For both day and night low flying, CADS is used to enhance situational awareness of other aircraft. The system provides a visual representation of the planned route an aircraft will take and gives an indication of any other entered routes that might conflict. All military pilots are required to enter their planned routes onto CADS, and many civilian commercial, Police and Air Ambulance pilots also have access so that those conducting helicopter pipeline inspections (PINS) or similar can also add their routes to the system.



REPORT DETAILS

AIRPROX REPORT: 2014167

Date and time:
Sep 9 2014 1544Z

Position:
4nm E Dolgellau

Airspace:
London FIR (Class: G)

Reporting aircraft: Typhoon	**Reported aircraft:** Gyrocopter
Alt/FL: 250ft RPS (1,016hPa)	700ft AGL
Conditions: VMC	VMC
Visibility: 10KM	20KM
Reported Separation: 350ft V/0ft H	200ft V/0ft H

Recorded Separation:
NK

// SUMMARY

THE TYPHOONS WERE in a military low-flying area and listening out on the low-level frequency. Known as the 'Machynlleth Loop', the valley concerned is regularly used by military fast jets for terrain flying training. On military charts, it is marked with flow arrows. The gyrocopter pilot was on a cross-country exercise and its pilot was on Welshpool's frequency. None of the aircraft were fitted with a collision warning system.

After approximately five minutes of flying low-level, both Typhoon pilots saw a gyrocopter less than 1nm ahead. The formation could not manoeuvre laterally to increase separation due to the valley sides and the position of the gyrocopter above them precluded a climb, so they passed beneath it with an estimated 350ft separation. They assessed the risk of collision as 'Medium'.

The gyrocopter pilot was following the valley and had instructed the student to climb to approx 700ft AGL to maintain a safe height. Just as they levelled, he heard and then saw two Typhoon fighters pass below, too late to take any avoiding action. He assessed the risk of collision as 'Low'.

// ASSESSMENT

NOTING THAT THE airspace was Class G where all the pilots were entitled to fly, members wondered whether the GA community were aware of the significance of this particular valley regarding military low-flying. Some members said that GA pilots should expect to encounter military low-flying below 2,000ft in any mountainous terrain and that flow arrows were irrelevant, while others noted that flow arrows were indicative of choke points which reflected more than usual low-flying activity. Members felt that the significance of this particular valley was great enough to warrant some form of warning.

Cause: A conflict in Class G airspace.

Degree of Risk: C

Recommendation(s): HQ Air Command reviews GA education with regard to flow arrows.

RISE ABOVE THE REST

CADS is all very well for those who have access, but what about GA pilots who don't? It simply isn't viable to roll out the system to individual users and GA pilots probably don't want to spend time inserting their planned routes anyway. Nevertheless, there are a couple of things you can do to help yourself and the military. First, a bit of pre-flight preparation can pay dividends in understanding where the likely military low-level choke points are so that you can try to avoid them. In this respect, there are a number of 'Flow Arrows' in the low-flying system where military pilots are required to fly down valleys or choke points in a specified direction. These are depicted on the UK AIP ENR 6-5-1-2, along with other information about Areas of Intense Aerial Activity.

Airprox 2014167 was an example where, had the pilot appreciated that he was flying in a valley covered by a Flow Arrow (also shown in the graphic from the military low-level chart on p36), he might have chosen another route.

Another thing that will help is to have SSR on and with Mode C selected. Increasing numbers of military aircraft are being fitted with collision warning systems and these are usually SSR-based. The military are also installing P-FLARM in some of their aircraft, so this can also be a useful tool for gaining situational awareness. Letting Air Traffic Control agencies know where you are operating can also be useful. Military aircraft will often be receiving a service before descending into the low-level system, so they might hear your call or might be informed of your presence by controllers.

Clearly, this might not work or be appropriate everywhere. Because of this, a trial is currently being carried out in Scotland using 135.475MHz as a low-level common VHF frequency to broadcast positions and intentions, exchange information and provide a means for pilots to communicate with each other when they see another aircraft. Not just intended for military encounters, it is hoped that use of this frequency will be expanded across the UK if the trial is successful. As shown, **Airprox 2014152** would have been an ideal opportunity to use this to clear up who was doing what.

> **“ The CADS provides a visual representation of the planned route an aircraft will take and gives an indication of other entered routes that might conflict**

WORK TOGETHER

In summary, low-flying remains an essential requirement for military aviators' training and continued practical experience remains a constant part of any military aviator's flying career. There is a comprehensive management system in place, with all involved working hard to minimise the chances of aircraft coming into conflict. →

// SUMMARY

THE SEA KING, its external lights illuminated, was mountain training and the glider was looking to gain lift in the mountains. The helicopter crew were monitoring the UHF low-level common frequency. Rolling out from a right-hand turn just under the cloud base, a glider was seen ahead. A further turn was promptly initiated. The risk of collision was assessed as 'Medium'.

The glider pilot reported seeing the helicopter from several miles away. He was unable to contact its crew by radio as they both used different frequencies. Using an updraught to gain height, he continued the flight along the Brecon Beacons with the Sea King in sight throughout. The flight paths were divergent so he perceived that no avoiding action was necessary, assessing the risk of collision as 'None'.

// ASSESSMENT

NOTWITHSTANDING THAT THE glider pilot saw the Sea King from some distance, he still flew close enough to cause its pilot concern. Glider members of the Board explained that, when ridge soaring in the mountains, pilots have limited options: once committed to one ridge, turning back is often not feasible.

The Board thought it likely that the Sea King crew were initially surprised by the sudden proximity of the glider and, having seen it relatively late, correspondingly judged the severity of the incident more highly than the glider pilot had.

The fact that both pilots were on different frequencies was discussed at length. It was noted that there are a number of different gliding frequencies.

Use of a common safety frequency accessible to all users might have allowed for greater deconfliction in this instance. A VHF safety frequency (135.475), accessible to all aviators operating below 2,000ft AGL, is now being trialled in Scotland.

Cause: A conflict in Class G.

Degree of Risk: C

REPORT DETAILS

AIRPROX REPORT: 2014152

	Reporting aircraft	Reported aircraft
Date and time:	Aug 22 2014 1208Z	
Position:	N Pen-y-Fan	
Airspace:	Lon FIR (Class: G)	
Reporting aircraft / Reported aircraft:	Sea King	LS6c Glider
Alt/FL:	3,000ft	NK
Conditions:	VMC	VMC
Visibility:	>10km	>10km
Reported Separation:	150ft V/200yds H	0ft V/300m H
Recorded Separation:	NK	

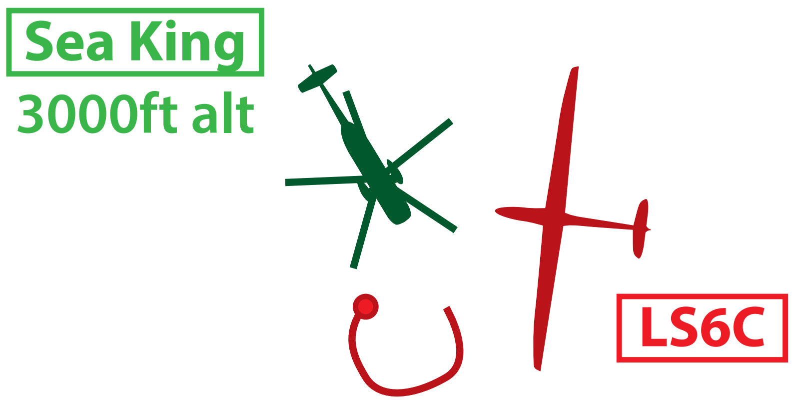


Diagram based on pilot reports

// SUMMARY

THE TORNADO WAS 'number two' in a low-level formation sortie while the AS355 was conducting a railway survey task. Both aircraft had external lights selected on and respective transponders with Modes A, C and S. The AS355 had a Traffic Advisory System (TAS) which alerted its pilot to the approaching Tornado. The Tornado pilot was in communication with the formation leader and was also listening out on the UHF low-level common frequency. The AS355 pilot was in receipt of a Basic Service from Warton. As the Tornado approached the coast, its pilot commenced a climb to 1,000ft. Local bird populations can increase significantly near the coast so, to reduce the risk of birdstrike, coastlines are normally planned to be crossed at 90° and the aircraft climbs from low-level to a height of approximately 1,000ft.

REPORT DETAILS

AIRPROX REPORT: 2014052

Date and time:
Apr 29 2014 1224Z

Position:
Morecambe Bay

Airspace:
Lon FIR (Class: G)

	Reporting aircraft	Reported aircraft
Aircraft	Tornado GR4	AS355
Alt/FL	820ft QNH (1,008hPa)	1,000ft Rad Alt
Conditions	VMC	VMC
Visibility	8km	10km
Reported Separation	0ft V/750ft H	150ft V/60m H

Recorded Separation:
200ft V/0.3nm H

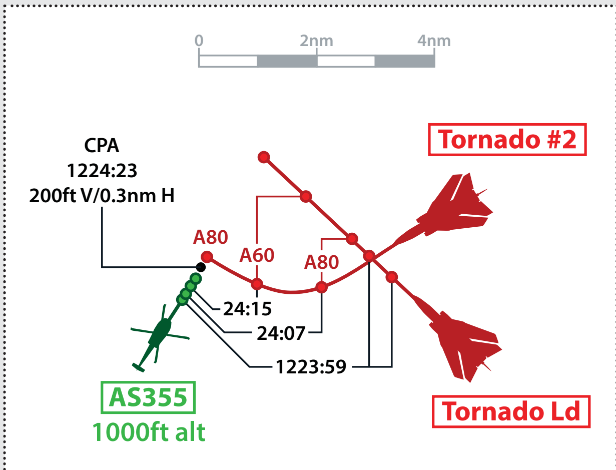


Diagram based on radar data

// ASSESSMENT

THE AS355 PILOT was necessarily constrained in altitude, speed and flight path by his task. Members suggested that the Tornado pilot, as number two of a pair, would have been concentrating his lookout to his right in order to regain formation integrity after the formation turn.

Other than noting that fitment of a TAS or similar to the Tornado would probably have provided a warning of the helicopter, the Board observed that the Tornado pilot had noted that 'PINS was active' for the entirety of his route. However, railway survey tasks are not currently included in PINS notification, which it was agreed was highly undesirable.

Cause: A late sighting by the AS355 pilot and effectively a non-sighting by the Tornado crew.

Degree of Risk: B

Recommendations:
1. HQ Air Command considers liaising with the CAA to publicise military fast jet behaviours near coastlines.
2. The CAA considers the inclusion of Railway Survey Flights in its PINS review.

Military low-flying generally only takes place during the week and comprehensive briefings for sorties are a key part in reducing any mid-air collision risk.

Lastly, military aviators are always keen to share views and information with other airspace users through the many Regional Airspace User Working Groups. These are hosted by relevant RAF stations and provide a really good forum for discussing local issues.

Most local airfields or flying clubs will have contact details for these – all are welcome, and you usually get a free lunch too. For those who would like to find out a bit more about military low-flying, the RAF Low Flying Ops Squadron can be contacted on 0800 515544.

RAUWG CONTACT DETAILS

Area	Hosting Unit	Point of Contact	Telephone
Central Southern England	MOD Boscombe Down	DSATCO	01980 662994
East Anglia	RAF Marham	SATCO	01760 337261 Ext 3425
East of Scotland	RAF Leuchars	SATCO	01334 857280
Lincolnshire	RAFC Cranwell	SATCO	01400 267283
London (location varies)	RAF Northolt	SATCO	0208 833 8364
North of England (location alternatives)	RAF Leeming/ RAF Linton-on-Ouse	SATCO RAF Leeming	01677 457229
North of Scotland	RAF Lossiemouth	SATCO	01343 817414
Oxfordshire	Oxford Airport	SATCO RAF Benson	01491 827008
Wales and West Midlands (location alternatives)	RAF Shawbury	SATCO	01939 250351 Ext 7231
	RAF Valley	SATCO	01407 762241 Ext 7204

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WHAT'S THE DEAL WITH DRONES?

They are becoming a bigger part of the flying world, but that's producing a set of new challenges

CHRIS DAVIES

IT SEEMS THAT hardly a week passes without an article in the media regarding spectacular footage of 'drones', their illegal flight operation or the potential for their nefarious usage. In fact, the reality is that any 'useful' technology will be widely adopted and adapted – and not always for the purpose the manufacturer intended.

Sub-20kg 'drones', variously referred to officially as Remotely Piloted Aircraft Systems (RPAS), Unmanned Aircraft Systems (UAS), Small Unmanned Aircraft (SUA) or Unmanned Air Vehicles (UAV), are the fastest growing aviation sector in the UK. Although nobody has thus far been seriously injured or killed by the operation of one in the UK, a number of near-miss incidents have been reported. So, just what are the rules and regulations for the operation of 'drones' in UK airspace, and do General Aviation and Military Aviation have anything to fear from them?

The Association of Remotely Piloted Aircraft Systems UK (ARPAS-UK) is a non-profit association formed in 2013 to represent our small RPAS industry and help promote best practice among its members. ARPAS-UK considers that legitimate users can be divided into three main groups:

MICHAEL KHENG/KURNIA AERIAL PHOTOGRAPHY

- **Consumers,** who purchase small ready-to-fly quad-rotors and operate them with little or no knowledge of rules and regulations, both with or without cameras.
- **Hobbyists,** who are fully aware of the rules, have many years of radio-controlled modelling experience, are insured for third party risk and generally confine their activities to dedicated sites.
- **Commercial,** many from a non-aviation background, who have either started a business (predominantly to capitalise on the opportunities these systems bring to the table) or have integrated RPAS into an existing business.

All operators must abide by the rules and guidance outlined in CAA publication *CAP 722* – the 'Bible' for UAS operations in UK airspace. Commercial users are expected to be fully conversant with this and hobbyists will likely be acquainted, but it is unlikely that consumers will be much aware of its existence or perhaps even that there are rules at all!

As a result, the CAA has distilled the key parts into a more readable form within *CAP 1202*. There is also a very useful website

→

ALWAYS REMEMBER

YOU are reponsible for each flight	You are legally responsible for the safe conduct of each flight. Take time to understand the rules - failure to comply could lead to a **criminal prosecuton.**	Keep your distance	It is illegal to fly your unmanned aircraft over a congested area (streets, towns and cities). Also, stay well clear of airports and airfields.
BEFORE each flight check drone for damage	Before each flight check that your unmanned aircraft is not damaged, and that all components are working in accordance with the **Supplier's User Manual.**	KEEP YOUR DISTANCE 50 metres (50m)	Don't fly your unmanned aircraft within 50m of a person, vehicle, building or structure, or overhead groups of people at any height.
Drone is in sight at all times	You must keep the unmanned aircraft within your sight at all times.	Consider rights of privacy	Think about what you do with any images you obtain as you may breach privacy laws. Details are available from the Information Commissioner's Office.
YOU are reponsible for avoiding collisions	You are responsible for avoiding collisions with other people or objects - including aircraft. Do not fly your unmanned aircraft in any way that could endanger people or property.	Permission to use drones for paid work	If you intend to use an unmanned aircraft for any kind of commercial activity. you must get a 'Permission' from the Civil Aviation Authority, or you could face prosecution. For more details, visit **www.caa.co.uk/uas**

at *caa.co.uk/uas* which provides plenty of useful information and guidance, and an animated video explains the rules for drone flying in an easily digestible form.

As for commercial operators, there are now more than 950 commercial operators in the UK using both multi-rotor and fixed-wing systems in connection with industries such as TV and film production, agriculture, surveying and inspection. Commercial operators must have a CAA 'Permission for Aerial Work' permit in order to fly an SUA, for which the CAA requires sight of a completed operations manual and evidence of pilot competency. The latter is broken into three critical elements: adequate theoretical knowledge/general airmanship; successful completion of a practical flight assessment on the class of SUA that is being applied for; and a minimum amount of recent flying experience.

For those coming from a non-aviation background, this is achieved by attending a course run by one of the National Qualified Entities. This involves ground school of approximately two to four days (where the process of writing the operations manual will be discussed in depth, followed by an exam); a flight test; and an assessment of your operations manual. If they are happy, they will recommend you for a permit.

> **"Although nobody has thus far been seriously injured or killed by the operation of one in the UK, a number of near-miss incidents have been reported**

The courses do not necessarily teach people how to fly, so there is a need to clarify this before signing up. For operators from an aviation background, the process could be simplified because to attend ground school might not be required. However, a flight test and operations manual will still be called for.

The permit allows operators to fly within the confines of the Air Navigation Order but, in most cases, to operate successfully commercially means operating in congested areas. The CAA places far greater emphasis on safety to do this and requires operators to have a UAS Operating Safety Case (UAS-OSC). This looks at not just improved operational procedures and safety management systems, but also at pilot competency and the safety of the aircraft. At the time of writing, only one UAS-OSC has been approved by the CAA, which allows the company in question to fly within 10 metres of people or property not under their control at up to 600ft AGL.

At the moment, the greatest demand comes from the most restrictive operating environment — that of urban areas like London. The introduction of the CAA's Urban Areas Operating Safety Case (UAOSC) congested areas 'licence' will also create a new tier of RPAS operators who are able to tackle the most demanding jobs in urban areas.

Commercial users in the UK are, on the whole, professional, enthusiastic and dedicated. A typical RPAS mission is conspicuous, with operators setting out a well-marked take-off and landing area and employing the use of airspace and groundspace observers (usually in high-visibility jackets). There is no requirement for 7kg or less operators to inform ATC of their operations, (but it is considered best practice to do so) whereas

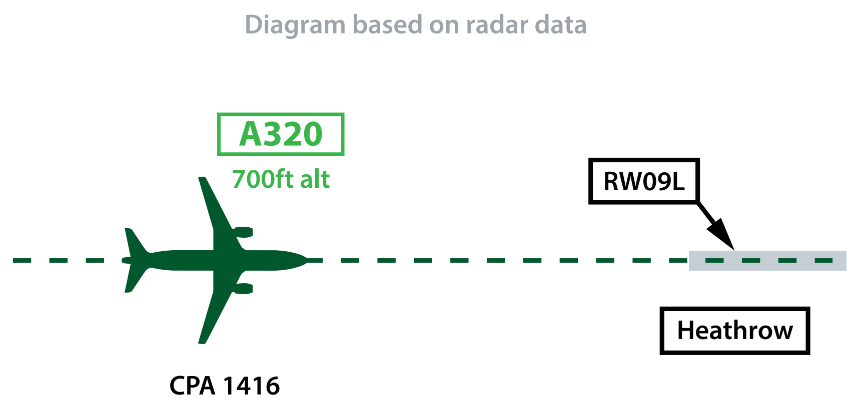
CHRIS DAVIES

7-20kg operators must have permission from any relevant ATC in the area (and it is worth noting that many operators have a very successful working relationship with their local ATC units). Similarly, operators will (as part of their pre-planning checks) inform relevant agencies (such as military low-flying cells, HeliMed, Police helicopters, the Police and local flying clubs) of their location and operations.

RPAS operations are generally short in duration so, unless specifically requested, Notams are kept to a minimum. Generally, you will find commercial RPAS flights operate no further than 500 meters from the pilot in control (PiC) and no higher than 400ft AGL because this is the basic permission issued by the CAA. Many operators have additional permissions such as EVLOS (extended visual line of sight) and night flight permissions. At night, the RPAS will be fitted with at least a single white strobe but many operators also fit coloured orientation/early warning LEDs.

RPAS operation is one of the most dynamic areas of aviation right now and this looks set to continue for many years. →

Diagram based on radar data



REPORT DETAILS

AIRPROX REPORT: 2014117

Date and time:
Jul 22 2014 1416Z

Position:
London Heathrow

Airspace:
London CTR (Class: A)

Reporting aircraft: A320

Reported aircraft: Unidentified model helicopter

Alt/FL:
700ft
QNH (NK hPa)

Conditions:
VMC

Visibility:
NK

Reported Separation:
20ft V/0m H

Recorded Separation:
NK

// SUMMARY

AN AIRBUS A320 was operating under IFR in VMC and in receipt of an Aerodrome Control Service from Heathrow Tower when it came into proximity with a suspected radio controlled model helicopter.

The A320 pilot stated that, as they passed 700ft in the descent, a small black object was seen to the left of the aircraft which passed approximately 20ft over the wing. It appeared to be a small radio-controlled helicopter. The object did not strike the aircraft, but was a distraction during a critical phase of flight. ATC was informed of the object's presence and following aircraft were notified.

Despite extensive tracing action and the proactive assistance of local model flying club members, it was not possible to trace the operator of the model aircraft in question.

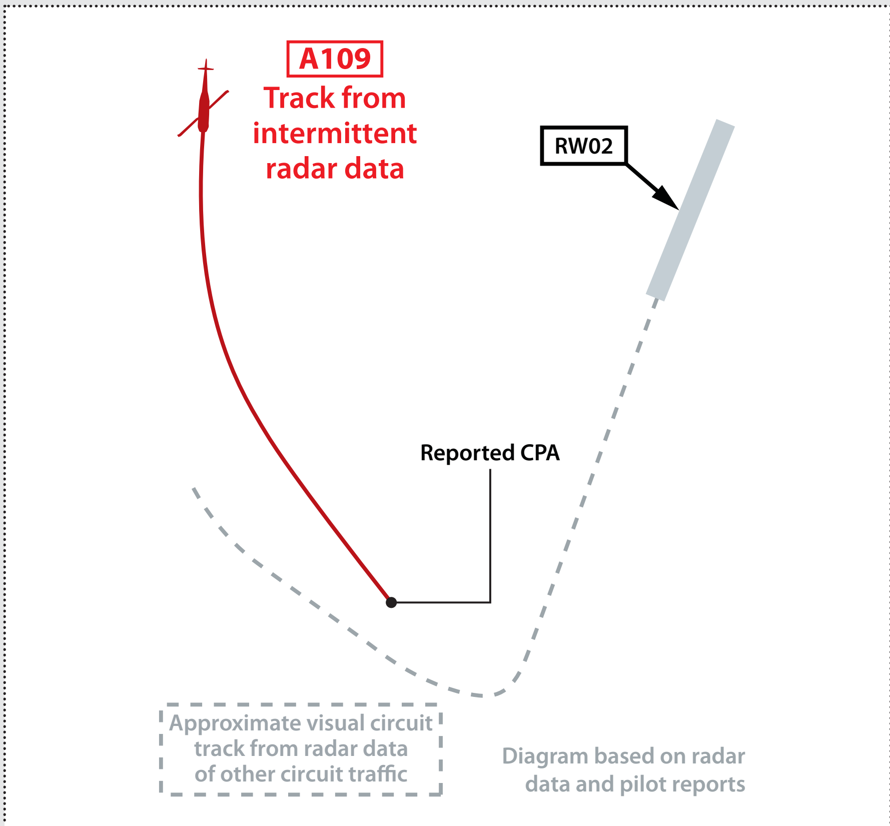
// ASSESSMENT

THE A320 CREW had seen a model helicopter and the Board was of the unanimous opinion that the operator of the model had chosen to fly it in an entirely inappropriate location. That the dangers associated with flying such a model in close proximity to a commercial aircraft in the final stages of landing were not self-evident was a cause for considerable concern. The Board were heartened to hear of work being undertaken by the CAA to bring the issue of remotely piloted aircraft operations to wider public attention, an example being the recent issue of *CAP1202* which gives advice for the conduct of such operations.

The Board concluded that the risk amounted to a situation that had stopped just short of an actual collision where separation had been reduced to the minimum.

Cause: A suspected model aircraft was flown into conflict with the A320.

Degree of Risk: A



REPORT DETAILS

AIRPROX REPORT: 2014187

Date and time:
Sep 16 2014 1512Z

Position:
1nm SW of Rochester

Airspace:
London FIR (Class: G)

Reporting aircraft: MTO Sport Gyroplane	**Reported aircraft:** Untraced model/UAV
Alt/FL: 1,000ft QFE (1,000hPa)	NK NK
Conditions: VMC	NK
Visibility: 7nm	NK
Reported Separation: 0ft V/10ft H	NK V/NK H
Recorded Separation: NK V/NK H	

// SUMMARY

AN AIRPROX WAS reported between an MTO Sport gyroplane flying in the visual circuit on final approach to RW02 at Rochester and an untraced model aircraft/UAV.

The gyroplane was conducting a training exercise in the left-hand circuit for RW02 at Rochester Airport. A Robinson R22 helicopter was also operating. The gyroplane pilot heard the R22 pilot report that he had seen a model aircraft on the ground. Approaching final, the instructor and student both looked and saw the white delta- or boomerang-shaped model aircraft still in the field. They noted that it was still there on their next circuit but that it had gone on their next circuit. Carrying out a further circuit, they positioned for final approach to RW02 at 70kt. The model appeared at their height (1,000ft) and "came straight for" them. The instructor immediately took control, banked the aircraft sharply right, and estimated that the model came within 10ft of them. The student was quite shaken, so the instructor elected to land and reported the Airprox to ATC. He assessed that the model had a wingspan of 5-6ft. He assessed the risk of collision as 'High'.

// ASSESSMENT

THE AIRPROX HAD occurred after several visual circuits had been flown to RW02 by more than one aircraft. Members were, therefore, incredulous that the operator of the model aircraft could possibly be unaware of the presence of the airport and the aircraft operating in the vicinity. Regarding the degree of risk, the gyroplane pilot had just had time to take evasive action. Therefore, after discussion it was agreed that the incident was Risk Category B.

Cause: The model aircraft was flown into conflict with the gyroplane.

Degree of Risk: B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ARPAS-UK foresees that the current media and commercial filming work will increase over time, and will be joined by work from the industrial sector such as oil rig flare inspection, wind farm maintenance or tasks that are repetitive or dangerous in nature and ultimately cost-saving to the end user. There is a real hunger to drive the industry forwards, with seemingly boundless opportunities facilitated by an enabling and supportive regulator.

There are challenging times ahead and it is certain that many early adopters could well fall by the wayside, but there is a real positive shift in the public opinion of these systems and it is being reflected by a change of mood in the media. Moving forward into 2016 and beyond, ARPAS-UK is keen to ensure that a balanced point of view is put forward. Commercial operators generally accept that they are ambassadors for the industry and they have a responsibility to conduct their operation safely and professionally.

> **The problem is that illegal or unthinking drone use is undoing all of the hard work put in by hobbyists and commercial operators**

However, the problem is that illegal or unthinking drone use is undoing all of the hard work put in by hobbyists and commercial operators. The Airprox illustrated here (**Airprox 2014117**, **2014187** and **2014194**) show examples of this and please also see p34 for one notable case (**Airprox 2014198**) in the paraglider feature which was particularly reckless.

The CAA has (so far) successfully prosecuted on two occasions which were not Airprox incidents, and the first involved a man from Cumbria who was successfully prosecuted for the dangerous and illegal flying of an unmanned aircraft. For its part, ARPAS-UK looks to educate and engage with key stakeholders to promote safe operation and is currently engaging with the National Police Chiefs' Council (NPCC) drone-lead to this end.

They are also engaging with manufacturers in looking at how to ultimately try to overcome the problem of consumer-level equipment straying into manned aviation airspace, potentially through software geo-fencing and height restrictions.

REPORT DETAILS

AIRPROX REPORT: 2014194

Date and time:
Sep 30 2014 1140Z

Position:
Norwich

Airspace:
Norwich CTR (Class: D)

	Reporting aircraft:	Reported aircraft:
	AW139	Unknown UAV
Alt/FL:	1,000ft NK (1,023hPa)	NK
Conditions:	VMC	NK
Visibility:	10km	
Reported Separation:	0ft V/50m H	
Recorded Separation:	NK	

// SUMMARY

AN AIRPROX WAS reported when an AW139 came into close proximity with an untraced UAV on the Norwich ILS glideslope. The incident did not show on radar.

The AW139 pilot reported that, although it was difficult to judge distance due to not knowing the actual size of the UAV, the crew estimated that it was almost perfectly on the ILS glideslope, level with their aircraft, in the 10 o'clock position and 50m away. The incident happened very quickly but, from the brief glimpse they had of the UAV, it was a type of quadcopter. They immediately broke off the ILS and continued with a visual approach. He assessed the risk of collision as 'Medium'.

// ASSESSMENT

THE AW139 PILOT considered it to be a sufficiently close threat that he elected to break off his approach.

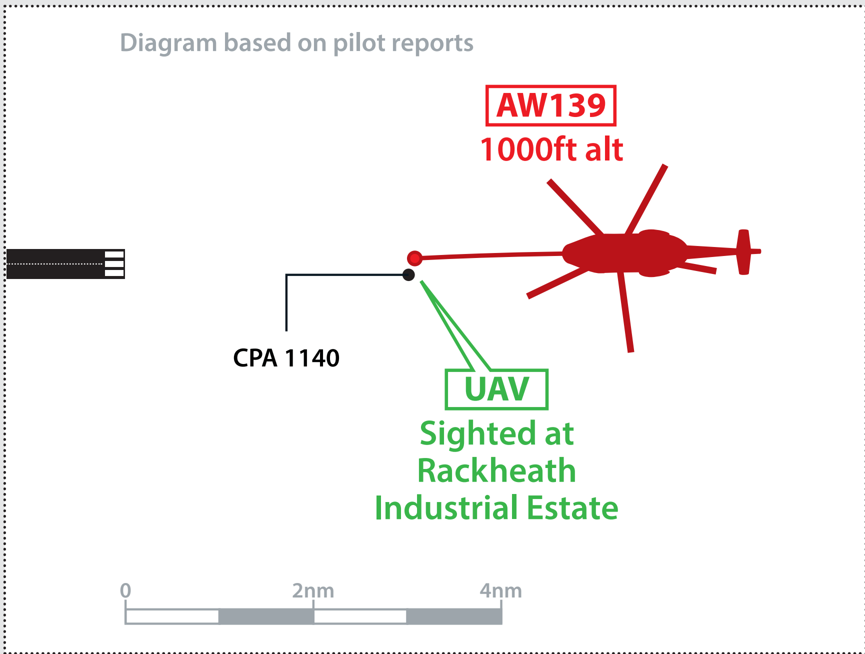
The quadcopter operator was not traced and so the Board was unable to determine whether the operator was aware of the danger that they had posed. Members wondered whether non-aviation-trained people operating quadcopters were aware either of the potential consequences of their actions or that they were breaking CAA rules by flying in proximity to other aircraft and by operating close to airfields.

The Board noted the AW139 pilot's estimate of proximity and that he had to manoeuvre to avoid the quadcopter. Members therefore assessed the risk as Category B because safety margins had been much reduced below normal.

Cause: The quadcopter was flown into conflict with the AW139.

Contributory Factor: The quadcopter was flown in the Norwich approach path.

Degree of Risk: B



TO READ MORE REPORTS OR TO FIND OUT MORE INFORMATION, VISIT: *AIRPROXBOARD.ORG.UK*

SO WHAT'S THE RISK?

Number crunching and 'bowties' can only produce some of the answers

AT THE END of Airprox reports, there is always a risk category rating from A to E and, until recently, an 'ERC' score. But have you ever wondered what these really mean, how they are worked out and what use they are?

As you've probably worked out, what we're fundamentally trying to establish is the amount of 'badness' in each Airprox and how this compares with other aviation risks. While it's often easy to quantify what went wrong in an accident, that Airprox all end with no accident means there needs to be another way to differentiate between those requiring the most attention and the less critical cases. The term used for this is Event Risk Classification (ERC).

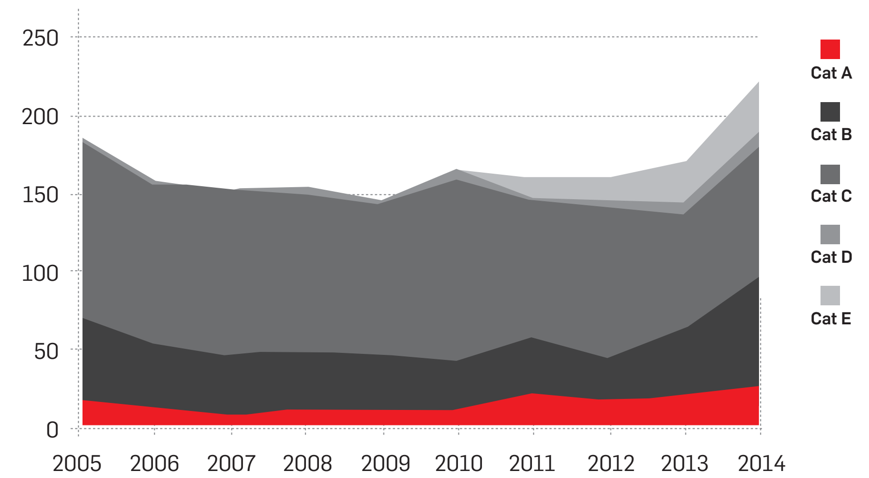
However, classifying risks consistently is a challenge. By their nature, reporting of Airprox is subjective because the outcome was that the aircraft ended up undamaged and everyone went home uninjured – albeit slightly wiser in some cases. In short, it's hard to put a definitive 'risk' figure on what is, in the end, a qualitative assessment of a pilot's or controller's concern about an incident.

We could simply try to classify events by how bad the potential accident might have been and how many lives might have been lost, but then we would simply skew things to focus on large-aircraft events and would miss valuable lessons from small-aircraft incidents.

> **"It's hard to put a definitive 'risk' figure on what is, in the end, a qualitative assessment of a pilot's or controller's concern about an incident**

EVENT RISK CATEGORY	ICAO DEFINITION	UKAB GUIDANCE
A	Risk of Collision	Stops just short of actual collision. Luck played a major part. Often very late or non-sighting.
B	Safety not assured	Safety margins much reduced. Late avoiding action has a position effect.
C	No risk of collision	Effective and timely actions taken. Separation may be less than ideal, but situation fully controlled by pilot or controller action.
D	Risk not determined	Too little information to make a meaningful assessment.
E	Normal safety standards pertained	Meets criteria for Airprox reporting, but analysis shows that normal safety standards pertained.

AIRPROX TRENDS IN THE LAST 10 YEARS



Alternatively, we could try to assess how close the aircraft were physically, but different sectors of aviation have very different comfort levels of proximity. After all, glider pilots wouldn't think twice about thermalling within not many feet of their compatriots. The point is that, while both methods are valid, they focus on the outcome when we'd really like to know is what went wrong and – very importantly – what went right to make an Airprox rather than an accident.

For those acolytes of psychologist and safety author Prof Erik Hollnagel, this is his

REPORT DETAILS

AIRPROX REPORT: 2014131

Date and time:
Jul 11 2014 1515Z

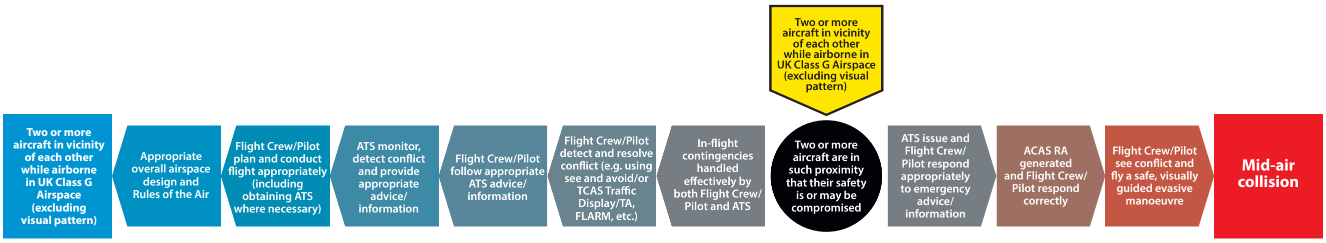
Position:
Leicester Aerodrome

Airspace:
Leicester ATZ (Class: G)

Reporting aircraft: R22	**Reported aircraft:** PA-34
Alt/FL: NK	0ft
Conditions: VMC	VMC
Visibility: >8KM	NK
Reported Separation: Not Seen	50ft V/100m H

Recorded Separation:
NK

A BOW-TIE RISK ASSESSMENT FOR AIRPROX IN CLASS G



Safety-I vs Safety-II debate. In short, Safety-I is learning from what went wrong, while Safety-II is about learning from what went right. The Eurocontrol website has a good introductory article on both of these – just put Safety-I in the site's search box.

SAFETY FIRST

We've been classifying Airprox based on the ICAO classification system (as shown) for many years and this has served well, but it also has some important shortcomings. First, there are really only three categories into which almost all serious occurences fit – Categories A, B and C. A and B are referred to as 'risk-bearing' and C as 'non-risk-bearing'. Category D is self-explanatory, and I'll come to Category E later.

Pigeon-holing incidents in this way is useful to give a broad feel for their severity, but it doesn't give much scope to differentiate them or work out what went wrong. It also makes it difficult to measure progress in preventing recurrence over time, which is what we're really after.

The graph below shows reporting and risk assessments over the last ten years, but it's hard to work out what progress is being made over time. For example, there were more Airprox reports in 2005 than there were in 2011, but fewer were assessed as Category A. Which was the worst or best year in terms of Airprox? What do we make of the steep increase in the number of reports in the last couple of years? Are there more Airprox happening because there is more flying going on or is it simply that more are being reported?

We might like to think it's the latter and, if we're right, we should probably be seeing an increase in the 'less risky' reporting given that people would probably have reported the 'cor blimeys' anyway. However, the statistics show that a growing proportion have been risk-bearing in the last few years. So where does that leave us? The current classification provides little help in answering any of these questions.

The ERC system, developed from the Airlines Risk Management Solutions (ARMS) system devised by a cross-industry group of risk experts, was our first attempt to improve our classification methods. Essentially, it gave a scoring system based on the status of the remaining safety barriers.

If you find this a little difficult to understand, imagine driving along a motorway alongside two cars in the next lanes. All have brakes fitted but the second and third cars have anti-lock brakes and, in addition, the third has airbags. Suddenly, an animal runs across the road and you all brake hard and stop without hitting the animal. You have all seen-and-avoided effectively and would have scored a 'Category B' in ICAO terms. However, the first car (without anti-lock brakes) only just stops before a collision, the second (with anti-lock brakes) stops well short of the collision point and the third not only stops early but also has an additional safety barrier remaining in the form of the airbags. Even though the airbags were not deployed, they were still there in reserve. Looking at events like **Airprox 2014131**, using ERC allows us to capture →

// SUMMARY

THE AIRPROX OCCURRED within the Leicester ATZ. Both pilots reported that they had made appropriate RT calls on the Air/Ground (A/G) frequency. Because the runway in use (RW04) was too short for his type of aircraft, the PA-34 pilot was conducting circuits on RW10. The R22 pilot departed from RW04, not realising that the PA-34 was on final approach to RW10. The pilot of the PA-34 reported that he was visual with the departing R22 and took appropriate action to resolve the situation by changing his initial intention of carrying out a touch-and-go into making a full-stop landing. He only reverted to his original intention after the R22 had cleared RW10 to the north.

The Leicester Aerodrome A/G Operator recalls that she did not view the incident. However, she did hear most of the radio calls and did hear the pilot of the PA-34 making two final approach calls at the time for RW10.

// ASSESSMENT

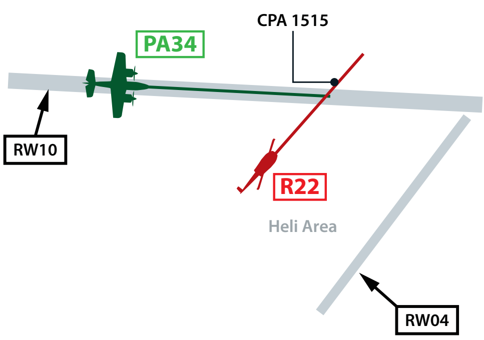
THE R22 PILOT should have been aware of the presence of an aircraft in the circuit to RW10. Although he checked that the RW04 approach was clear, he did not check the RW10 final approach area.

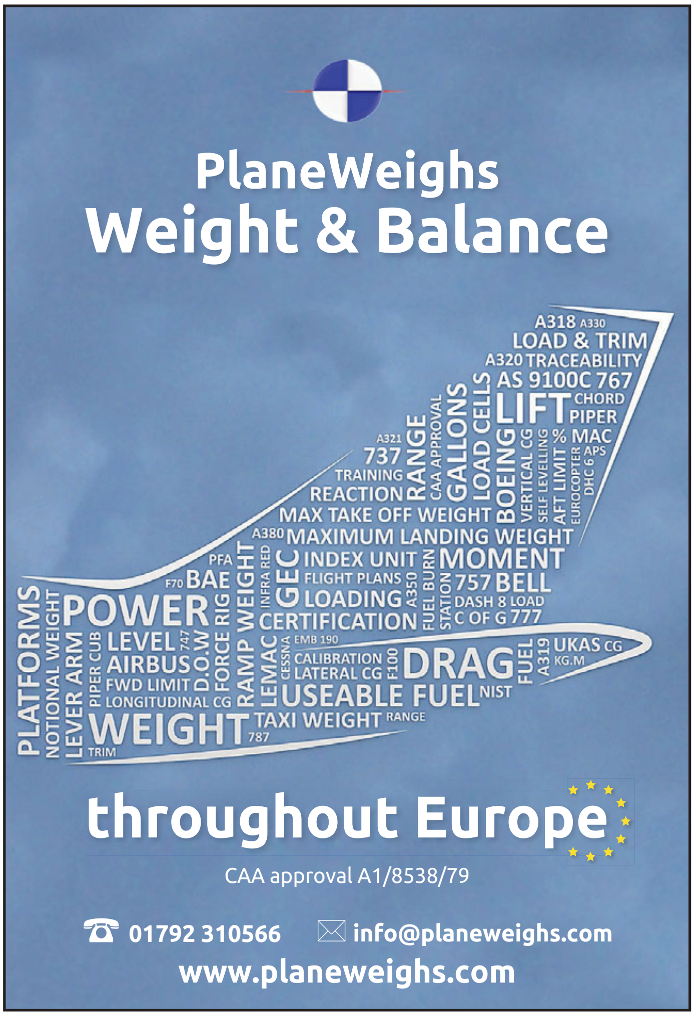
The majority of members believed that the PA-34 pilot's plan of initially making a full-stop landing and then continuing the touch-and-go if the R22 had passed clear of the runway was appropriate. Actual distances between the two aircraft could not be confirmed because there was no radar recording. Because the PA-34 had the R22 in sight at all times and had a plan to avoid any risk of a collision, the Airprox was categorised as Risk C.

Cause: The R22 pilot flew across an active runway and in front of the PA-34.

Degree of Risk: C

Diagram based on pilot reports
Not to scale

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A318 A330
LOAD & TRIM
A320 TRACEABILITY
AS 9100C 767
LIFT
CHORD
PIPER
% MAC
737
TRAINING
REACTION
RANGE
GALLONS
LOAD CELLS
BOEING
MAX TAKE OFF WEIGHT
A380 MAXIMUM LANDING WEIGHT
INDEX UNIT
MOMENT
FLIGHT PLANS
757 BELL
LOADING
CERTIFICATION
C OF G 777
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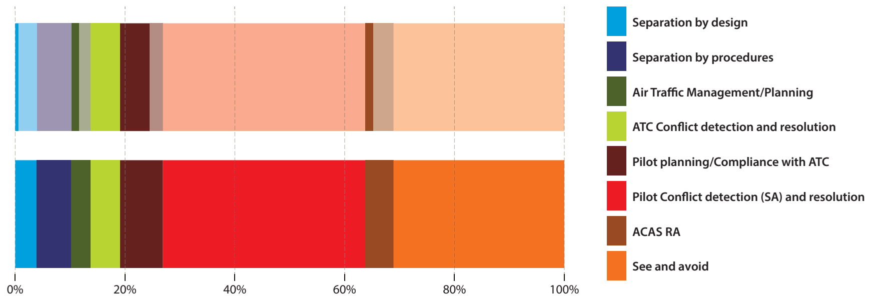
THE BARRIER MODEL



this concept of how many safety barriers were remaining and what their fundamental effectiveness was.

BOWTIES AND BARRIERS

But it was clear that ERC still didn't take enough account of the context within which the Airprox occurred or describe the barriers well enough, so it quickly became obvious that it needed further development.

The first thing was to better understand the barriers that were in place to prevent mid-air collisions in different airspace. Once some initial work had been done, we realised we could group our analysis into three areas: Class G airspace; controlled airspace; and visual circuits and patterns. We then used bowtie analysis to develop our barrier models. If you're not familiar with bowtie models, then take a look at *caa.co.uk/bowtie* for an introduction.

Bowties provide a visual picture to help understand the relevant barriers for different situations. The basic principle is that the preventative barriers which stop the whole Airprox happening sit on the left of the problem's knot (e.g. for our earlier car example, building animal-proof fences on the side of the road perhaps), and the recovery barriers (the brakes and airbags) which stop the Airprox becoming a mid-air collision sit on the right (see the graphic on P51).

The relevance of each safety barrier is different in each class of airspace. For example, see-and-avoid is very important in Class G but less so in Class A where procedural separation is more important. Therefore, we needed a way to give each barrier a weighting to reflect its importance and we did this by asking a number of pilots and air traffic controllers to go through a scoring exercise to create a weighted model. This isn't a mathematically perfect solution (and if you have one, please send answers on a postcard...), but it gave a reasonable level of assurance to the model.

CLASS G BARRIER MODEL

The diagram (above left) shows our current Class G barrier model, with the barrier names on the right and their relative importance shown in the graphic. The lower coloured bar shows the relevant weightings for an average Class G situation. The upper coloured bar shows the score for a ficticious Airprox which is similar to **Airprox 2014232**. The dimmed-out colours show the amount of each barrier that failed while the bright colours show their remaining effectiveness.

In this fictitious case, we can see that 'See-and-Avoid' completely failed (neither →

// SUMMARY

BOTH PILOTS WERE operating under VFR in VMC in Class G airspace. The Heron was in the RW27 visual left-hand circuit with four other aircraft and its pilot was receiving a service from Dundee Tower. The EC120 pilot was on a transit flight in contact with Leuchars and then Dundee, from whom he requested a Basic Service, stating that he was "just going to go through the gap" between the Dundee ATZ and Leuchars MATZ. The incident occurred below radar coverage.

Dundee ATC, experiencing 'medium' workload, was providing a combined Aerodrome and Approach Control service without the aid of surveillance equipment.

The Airprox occurred when the Heron, at 1,000ft in the late downwind position, and the EC120, at 7-800ft, came into proximity, most likely near the boundary of the Dundee ATZ. There was insufficient time for the controller to assimilate the position and routing of the EC120 prior to the Airprox.

REPORT DETAILS

AIRPROX REPORT: 2014144

Date and time:
Aug 19 2014 0941Z

Position:
Dundee

Airspace:
Dundee ATZ/
Scottish FIR (Class: G)

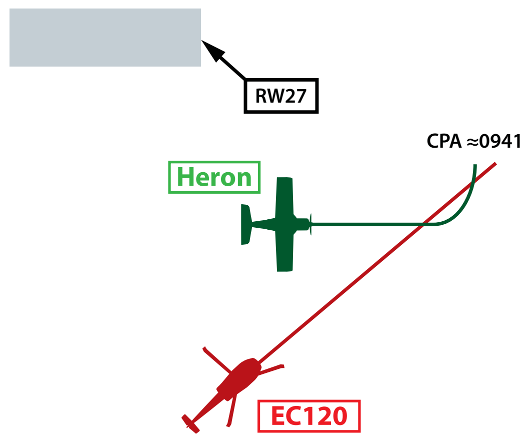
Reporting aircraft: Grob Heron	**Reported aircraft:** EC120
Alt/FL: 1,000ft QNH (1,010hPa)	700ft QNH (1,013hPa)
Conditions: VMC	VMC
Visibility: NK	>40km
Reported Separation: 200ft V/0m H	300ft V/500m H

Recorded Separation:
NK

// ASSESSMENT

THE EC120 PILOT chose to transit through the (just less than 500m) gap between the Leuchars MATZ and the Dundee ATZ at a level close to the Dundee circuit height. The chosen routing increased the potential for conflict with Dundee traffic that may have been flying at or just beyond the boundaries of the ATZ.

Diagram based on pilot reports
Not to scale



The Heron pilot was operating in the RW27 visual circuit. Members noted that a GA circuit would normally be expected to be flown within the ATZ but that *ab initio* circuit instruction can result in patterns which extend further.

Members' opinion was that the EC120 pilot's assessment that the aircraft would remain clear amounted to effective and timely action to prevent the aircraft colliding.

Cause: A non-sighting by the Heron pilot and a late sighting by the EC120 pilot.

Degree of Risk: C

pilot saw the other aircraft in time to take any action), but 'ATC Conflict detection and resolution' was fully successful (the controller issued effective avoiding action) and 'ACAS RA' was partially successful (perhaps indicating that one aircraft had a collision avoidance system installed which gave a warning, but the other did not).

Of course, these graphical representations are also supported by tables of figures, which can be difficult to assimilate but which will be extremely valuable in studying Airprox trends over time.

REALITY GETS THE DECIDING VOTE

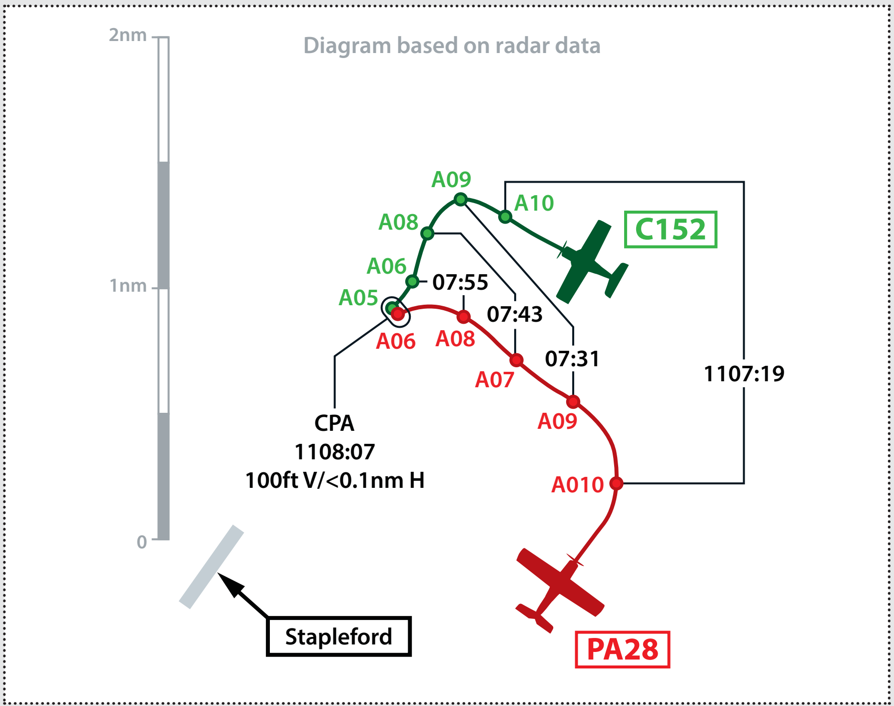
Currently, we can only tell you if the number of Airprox reports and Risk Categories A, B, C, D and E have gone up or down, and then offer some limited analysis or expert opinion on the causal trends. In future, we hope to be able to indicate not only the key barriers we need to improve, but also highlight defences that worked well or comment on relative risks (such as in **Airprox 2014144**) regarding MAC risk vs airspace, all of which could help in informing procedures, training, investment and further research.

For example, we know that see-and-avoid is an important barrier in Class G airspace, but how reliable is it and how much can it be enhanced if you invest in a simple traffic alerting system versus a fully-featured collision avoidance system?

We can also focus the time of our Airprox Inspectors more efficiently by looking at the occurrences which offer the most to learn from, which are not always the ones that frighten people the most.

Using our old system, we have been aware for a long time that there are many cases of what we might refer to as 'an interesting E'. Specifically, this means an Airprox where the outcome could be described as business as usual because the aircraft did not get particularly close, but where there are plenty of lessons to be highlighted.

The downside of all of this is that assessing occurrences using this process could be very time consuming. To give the speed and consistency needed, we turned our bowties and scores into a simple computer-based tool using a Risk Classification Wizard that does the maths for us. However, we don't want to end up in a position where "The computer says nah…", and so we will be using internal peer review to check our scores and the Airprox Board members will still bring their extensive knowledge and experience to bear by reviewing and endorsing all risk and cause classifications.



// SUMMARY

BOTH PILOTS WERE operating in the visual circuit in receipt of an Air/Ground (A/G) Service from Stapleford Radio. Runway 22 'left' was in use, with only hard surfaces being used due to the grass surfaces being waterlogged.

The C152 was on short final to land on RW22 when the aircraft was overtaken on the left and from above. Assessing the risk of collision as 'High', the C152 pilot instructed his student to go-around.

The PA-28 pilot reports recovering to Stapleford, verifying the runway in use and calling 'descending dead-side for 22 left'. He neither heard transmissions from nor saw any other aircraft ahead so made the assumption that he was 'number one' to land.

He commented that this non-sighting may have been due in part to a 'high-wing/low-wing' issue and to a very busy radio frequency.

// ASSESSMENT

IT WAS AGREED that it fell to the PA-28 pilot to avoid the C152 but, in the absence of visual contact and situational awareness of the C152's position, this was not accomplished. The PA-28 pilot had turned onto base from a shorter downwind leg, with the resultant ground track and slightly higher airspeed causing the PA-28 to overtake the C152 on final. The two aircraft missed each other by the narrowest of margins and a collision was only averted by pure fortune.

Members discussed the amount of flying activity at Stapleford. Agreeing that it was of such a level that an Air Ground Communication Service (AGCS) may not be appropriate, a Recommendation was made.

Cause: The PA-28 pilot flew into conflict with the C152.

Degree of Risk: A

Recommendation: Stapleford and the CAA review the suitability of the Stapleford A/G Service.

REPORT DETAILS

AIRPROX REPORT: 2014232

Date and time:
Dec 14 2014 1108Z

Position:
Stapleford

Airspace:
Stapleford ATZ (Class: G)

	Reporting aircraft	Reported aircraft
Aircraft	C152	PA-28
Alt/FL	400ft QNH (NK hPa)	NK QNH (1,013hPa)
Conditions	VMC	VMC
Visibility	50km	10km
Reported Separation	50ft V/15m H	Not seen

Recorded Separation:
100ft V/<0.1nm H

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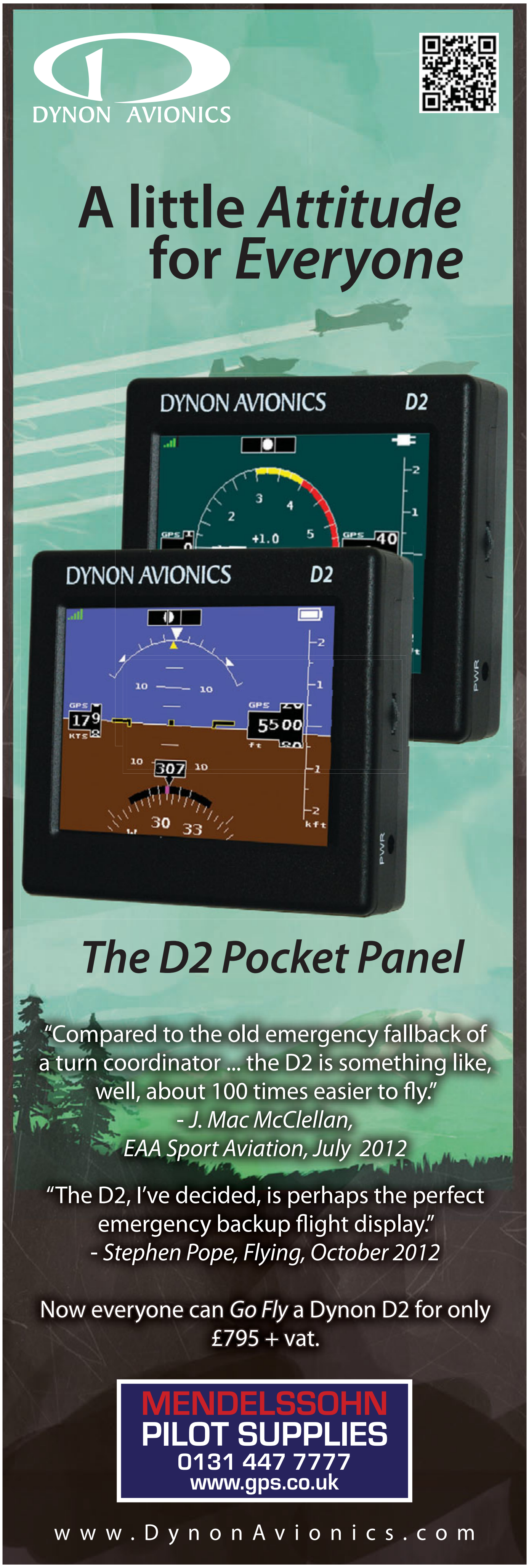

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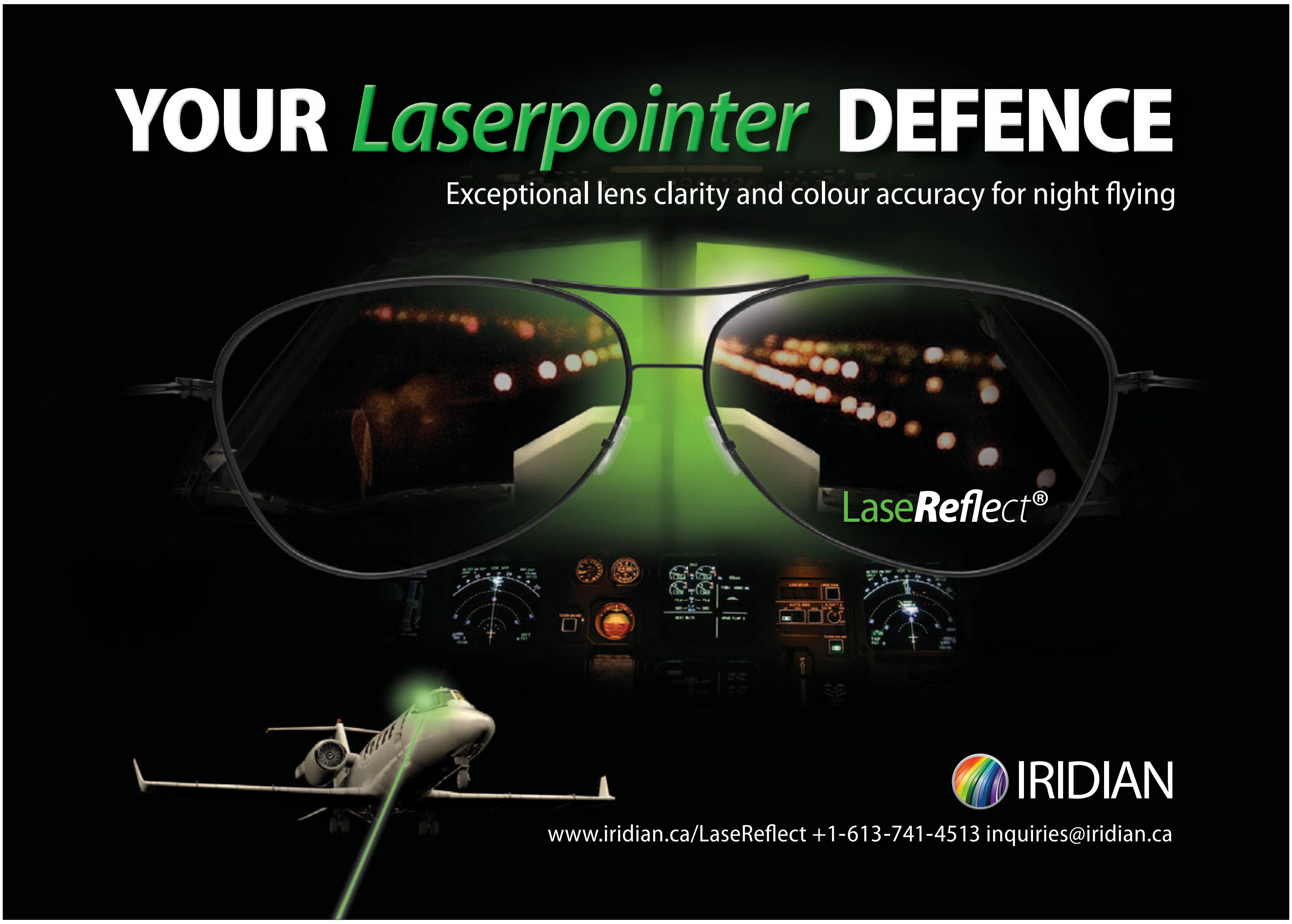
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