# What does data tell us?

IAN STUART REVISITS THE BHPA'S INCIDENT DATABASE

**YOUNG, EXPERIENCED, CURRENT PILOTS FLYING IN GOOD WEATHER ARE AT HIGH RISK OF HAVING AN INCIDENT.** Or so it may seem, let me explain…

I work for Altis Consulting in the field of Data and Analytics. This is essentially about helping organisations to make sense of their data and draw out hidden insights which may alter their decision making and the way they operate.

I have also served as safety officer for the Dover and Folkestone Hang Gliding Club for the last three years. Like most safety officers I began looking for ways to help improve safety. Given my background, the most obvious way to me was to look for patterns that were common to incidents and advise that our members avoid those patterns if possible.

However I found the patterns hard to spot. I felt that some safety advice may have been based upon hearsay or assumption and I thought that the facts may tell a different story. With that in mind I approached Dave Thompson, Senior Technical Officer at the BHPA, to see if Altis could get access to membership and incident data so we could do some analysis. As an added bonus my boss at Altis agreed that we do this work free of charge!

After signing the necessary confidentiality agreement, and agreeing that any reports would be anonymous, Dave Thompson came up trumps with the data and we were able to get started.

## About the data

Firstly, the data is limited in both quantity and quality. Less than 2% of our membership report incidents each year. The headline figures for the data were:

| Number of members | Number of incidents | Incidents per year |
|---|---|---|
| 7088 | 446 | 145 (2013 and 2014 data only) |

According to Dave Thompson this is similar to the reporting rate in France but much higher than in other European countries. Nevertheless, this is shockingly low. Even if only half our membership are active flyers, these figures tell us that the average pilot has one incident every 24 years. Now my record is probably worse than most (I became safety officer in an attempt to make me a safer pilot), but I reckon that most pilots have at least one reportable[1] incident per year – I have witnessed many and asked, often in vain, that the pilot(s) involved submit an incident report.

What this means is that conclusions drawn from the data are more subject to randomness than they would be with higher volumes of data. It reinforces an assumption that I and many others share:

## Most pilots do not report incidents

With respect to quality, much data is omitted by the reporter when filling out the reporting form so it is hard, for example, to accurately judge whether those that have attended a SIV course have fewer incidents than those that haven't. This is demonstrated in the graph in Fig. 1 where the clear majority of incident reporters have not stated (Blank) whether they have attended an SIV course or not.

Fig. 1: No of incidents by SIV course
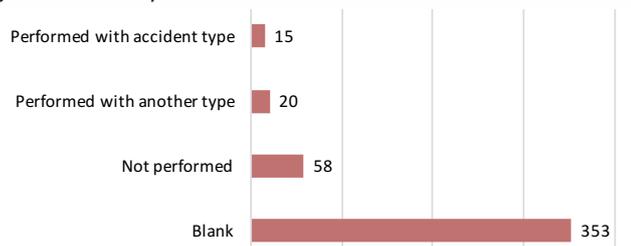


Furthermore, there are many 'free text' fields within the incident reporting form so it is not easy to analyse incidents by flying site as Combe Gibbet (for example), and other sites, may be mis-spelt.

## Findings

So let's look at the data and prove or disprove some hypotheses.

## Are Spring Thermals a major cause of incidents?

Fig. 2: No of incidents by month



This graph, showing the spread of incidents across the year, neither proves nor disproves that Spring Thermals are a major cause of incidents. There is a peak in March but that is lower than July and August (when presumably much more flying takes place anyhow). But why does it dip in April? We do not yet know, but further analysis may help and certainly more data would prove if this was consistent. Contrarily, our next graphics show that strong thermals and turbulence are not the main subject of incident reports.
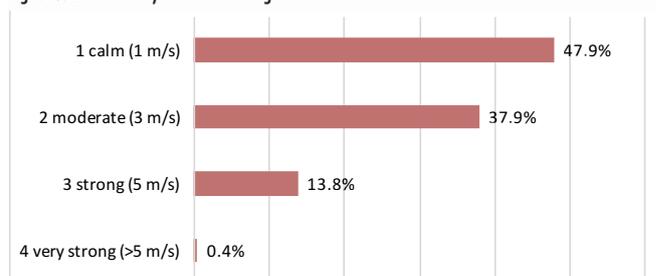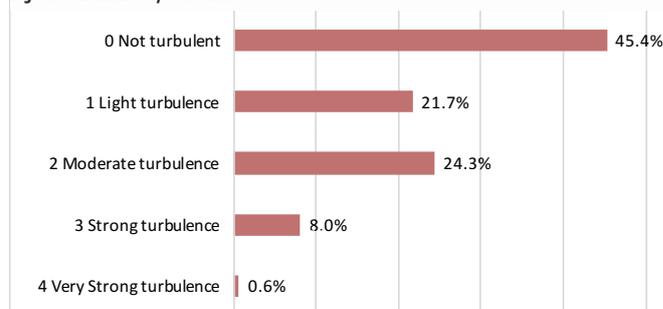
Fig. 3: % incidents by thermal strength



Fig. 4: % incidents by turbulence



Based upon this data there is an inverse correlation between reported incidents and turbulence or thermal strength. There are fewer incidents reported the stronger and more turbulent the conditions so, going back to our Spring Thermal analysis, the data suggests that the rise in incidents early in the year may be due to lack of currency (but read further) or just that more flying is taking place.

By no means does the data suggest that Spring Thermals are not something to be very mindful of – perhaps many pilots are being very wary and staying on the ground and that is the reason for fewer incidents being reported in turbulent thermic conditions.

## Are women or men safer pilots?

Fig. 5: % incidents by gender
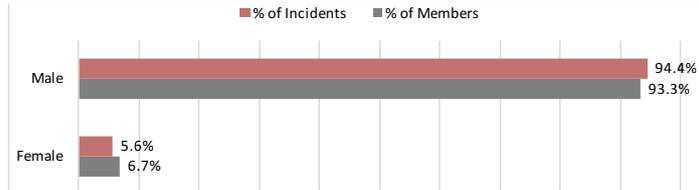


The available data shows a very small difference between the membership percentages and incident percentages. This can be accounted for by the expected randomness in such a small data set: 1% accounts for 3 incidents only. As Gender is often blank on the incident reporting form, this small difference could also be due to missing data.

## Is lack of currency a factor for incidents?

Fig. 6: % incidents by currency (total hours in last 6 months)
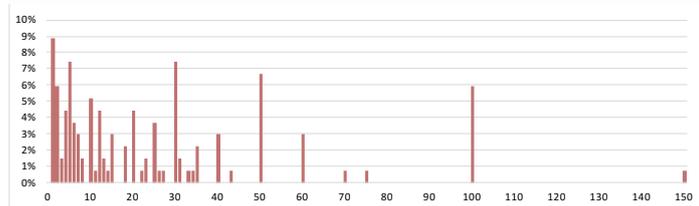


Most of us probably worry if we haven't flown in a while as we have heard that being current is an important safety factor. The picture here is interesting. Our first graphic shows, similar to overall experience (illustrated later), that we have a concentration of incidents at low levels of currency. For example 9% of all incidents involve pilots that have an hour or less flight time in the last six months.

Also notice the peaks at 20, 30, 40, 50, 60 and 100 hours. We will talk about this later.

If we group the incidents into 'experience buckets' the story is somewhat different.

Fig. 7: % incidents by currency band  (total hours in last 6 months)
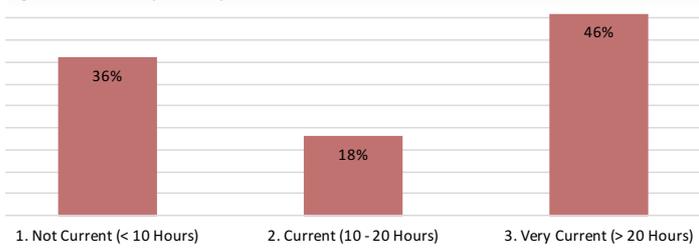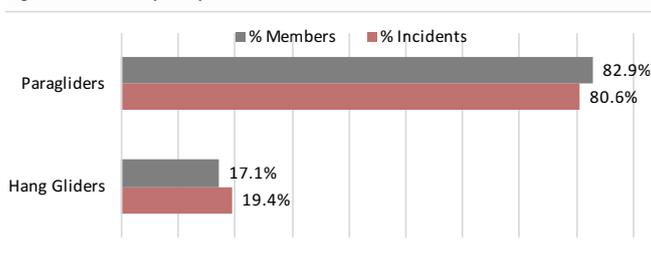


Here we see that 64% of all incidents are reported by current or very current pilots – perhaps the more we fly, the more likely we are to have an incident.

## Is paragliding more dangerous than hang gliding?

Our analysis shows that each discipline is equally risky:

Fig. 8: % incidents by discipline



## How does experience impact incident rate?

We may believe that more experienced pilots have fewer incidents. However on investigating this claim the data is more nuanced and requires a little explanation.

Fig. 9: Total number of incidents by total flying hours (in 100-hour bins)
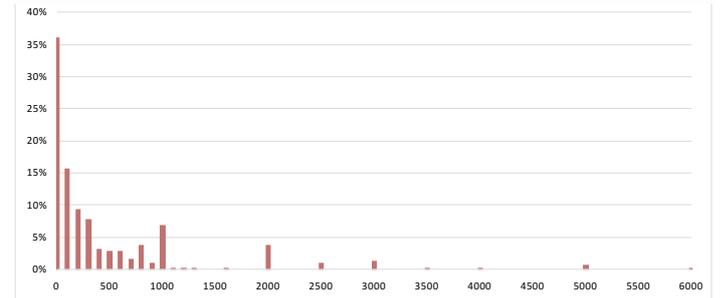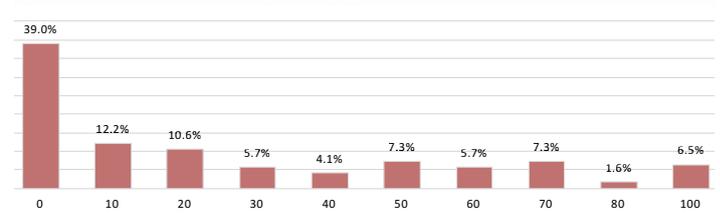


Fig. 10: Total number of incidents by total flying hours (100 hours or less, in 10-hour bins)



Figs. 9 and 10 are intended to show where there are peaks of incidents and, for clarity, they have been grouped into bins again (e.g. in the top chart the 0 bar shows the percentage of all incident reports for flyers who have between 0 and 100 flying hours). The charts generally show higher bars (more incidents) to the left (less experience) - thereby supporting the theory that less-experienced flyers have more incidents (to a point – keep reading!).

Drilling down on the data in the first bar from the second graph, Fig. 10 clearly shows that those fresh out of school are at high risk. This needs to be qualified in that the 39% of pilots with 0 - 10 hours experience relates to the total of all incidents that occurred with pilots with less than 100 hours experience only (36% in the first graph, Fig 9). Therefore 14% (36% x 39%) of all reported incidents occur in the first 10 hours. The data shows that pilots with more than 150 hours are only slightly more likely to report an incident than less-experienced pilots.

The data on incident occurrence related to flying experience (total hours) reveals peaks at 500, 1000, 2000, 2500, 3000, 3500, 4000, 5000 and 6000 hours experience (similar to the currency analysis earlier). Does this indicate that most pilots do not record their flights and approximate their hours experience rather than consulting their log?

## What about pilot ratings?

Our next graphic shows that those pilots with a higher rating are more likely to report an incident. The big difference between membership percentage and incident percentage strongly indicates that they are actually far more likely to have an incident. Advanced Pilots and Pilots account for only 44% of membership but report almost 83% of incidents!

Fig. 11: % incidents by pilot rating
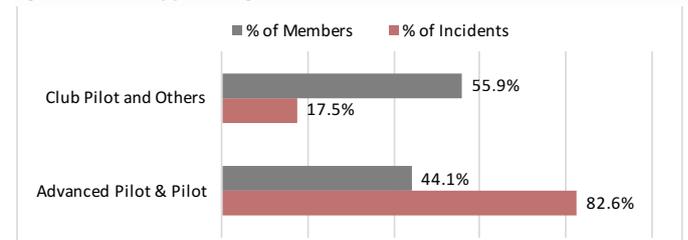


This difference could be accounted for by the more experienced pilot flying a lot more than a novice pilot who maybe spends a lot of time walking up the hill. Nevertheless, AP and P rated pilots do report more incidents even if they might have a similar rate of

incident per hour of flying (the latter cannot be proven with the current data).

## Does growing older make pilots less safe?

Fig. 12: %membership and incident incidence by age
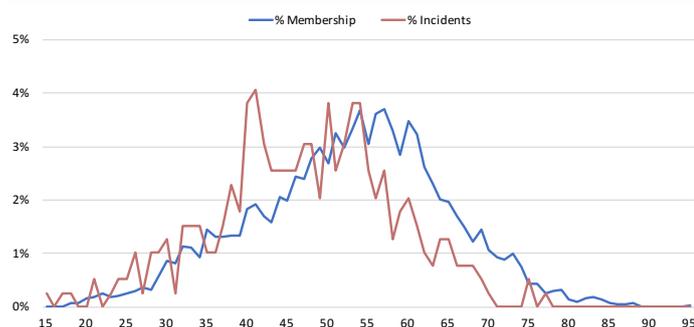


The red line denotes the occurrence of incidents overlaid on the blue line which shows the age distribution of our membership. This clearly shows that older pilots report fewer incidents and there is a peak of incidents for pilots aged 40 - 41, 50, and 53 - 54. Could the peaks represent mid-life crisis ages or are they due to the natural randomness of the small data set? These are rhetorical questions for now.

Additionally, until we can overlay this incident data on 'hours flown per year by age'. We do not know if older pilots have fewer incidents per hours flown or if they are intrinsically safer; in other words they have fewer incidents but they may fly a lot less.

| Average member age | Average incident pilot age |
|---|---|
| 53 | 47 |

## Do collisions account for most reported incidents?

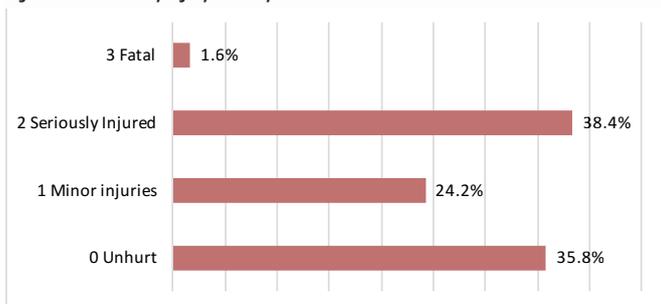Less than one fifth of incidents report any type of collision:

Fig. 13: % incidents by collision
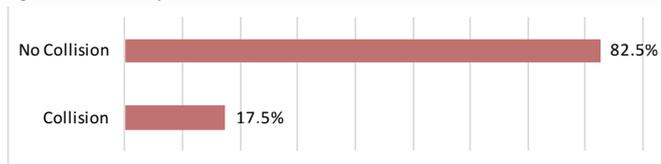


## What injuries are reported?

Thankfully there are few fatalities – only 7 out of 446 incidents in the spread of the data (Jan 2012 – May 2015) and 60% resulted in minor or no injury.

Fig. 14: % incidents by injury severity



## Conclusions

Many of the observations above are inconclusive, given the caveats noted earlier the article and that we have not correlated the results against actual flying activity (this is not possible with the currently available data). Given this, the expected randomness in a small data set, and the data quality issues we can still conclude that:

• Younger pilots tend to report more incidents

• More experienced pilots (>150 hours) report as many incidents as inexperienced pilots

• Those with a higher rating have a much increased risk of incidents

• Those fresh out of school seem likely to have an incident in their first few hours

• More incidents are reported on benign, less thermic days than on very thermic, turbulent days

Additionally we can, with high confidence, infer that:

• Most pilots do not report their incidents

• Many, if not most, pilots do not log their flights.

Conclusions beyond that are speculative and cannot be proven with the current data set. We cannot say with confidence that women are safer pilots, or what percentage of newly qualified pilots will have an incident in their first x hours for example. It is an assumption that pilots heed warnings and are more cautious as they get older and in testy conditions.

I have been surprised by some of what we were able to uncover, and it will alter some of the advice I give. However, we must remember that, until we can expand our analysis, many of the above observations should be treated with caution. Please do not hesitate to call or e-mail me for further explanation on any of our findings.

## Recommendations

The writing of this article has brought me to think about and compile three recommendations to improve safety and better understand the causes of incidents.

**1. Flight logging.** Whilst it is possible to upload flight details to the XC League, Leonardo and other repositories, there isn't to my knowledge a good electronic logbook that allows the capture of other information. A central (non-compulsory) flight log database that allows pilots to easily enter flights and incidents from their smartphone would greatly improve the quality (as data constraints could be built in) and, one hopes, the quantity of data. Eventually encouraging instrument manufacturers to build in automatic uploading of flights to this electronic logbook would undoubtedly increase the volume of data.

Within the Dover and Folkestone Hang Gliding Club we have introduced a rudimentary (and obviously voluntary) electronic logbook in the form of a spreadsheet which allows pilots to monitor their flights and 'safety factor'. Therein lies another article!

Whether the membership want such tools is not for me to comment on. We are all free flyers at heart and some of us are naturally repelled by conformity and control, but avoiding serious injury or worse allows that free spirit to continue!

**2. Further and wider analysis.** There is much more analysis that can be done on the data supplied by Dave and the team from the BHPA. What has been included in this article is a subset that we believe is most prominent and which can be easily converted to print. Viewing the reports live and slicing and dicing data 'on the fly' (excusing the pun) can yield greater insights.

Performing similar analysis as above on a European-wide basis may reinforce some of the conclusions whilst possibly showing differences between countries. The suggestion of electronic flight logging outlined above would allow the analysis of flying habits and frequency alongside membership and incident data. Adding publicly available weather data as another 'dimension' in our data may help our understanding of the spread of incidents across the year.

**3. Report your incidents!** Incident reporting is now an easy online process. If 15 minutes of your time can save another pilot having a similar experience, is it not worth it? Speak to your club safety officer if you need any help or guidance.

## Acknowledgements

This article has been critically reviewed by friends (co-pilots), colleagues and BHPA staff whose input has been essential. They have helped highlight some assumptions that needed further qualification and explanation, and have also provided me with further ideas for this article. Dave Thompson, John Finagin, John Morris, Joe Schofield, Angus Pinkerton, Peter Hopwood, Daley Davis Olu Omodara and Colin Fargher, thank you!

## Tools and process

Data was supplied by the BHPA from the membership database, and from the European Incident database (UK incidents only) in text formats. This data was pulled into Power BI, a Microsoft tool for extracting, transforming and visualising data. The data was then anonymised to ensure confidentiality, and cleansed and enriched in order to make visualising it easier to comprehend. The data visualisations conform to data presentation principles taught by Stephen Few[2] and hosted, and also taught, by Altis.

## About Altis

Since 1998 Altis have been deploying our skills in Business Intelligence, Analytics and Data Management to deliver successful outcomes for our clients by helping them maximise business performance.

Much of an organisation's operational efficiency can be gleaned from accurate and insightful reporting. Altis look to combine and analyse data in new and creative ways, giving customers the power to make better informed decisions and manage their business performance more effectively.

Altis is built on the philosophy that our people make our business and our clients' businesses successful. Our core ethos of 'Connecting with Courage, Heart, and Insight' means the firm commitment of our team to building lasting relationships with our clients and sharing the responsibility of delivering their outcomes.

Ian Stuart, Altis Consulting (ians@altisglobal.co.uk, www.altisglobal.co.uk)

*1 What constitutes a reportable incident is outlined at https://contact.bhpa.co.uk/incident.php*

*2 Information on Stephen Few and the courses Altis can offer can be found on his web pages at www.perceptualedge.com and on the training page of the Altis website.*

# what's on
🪁: Paragliding event  🪁: Hang Gliding event  ⊥: Powered flying event  ☉: Accuracy event

| | | | | | |
|---|---|---|---|---|---|
| **MAY** | | | | | |
| 5 - 14 | ☉ | **World Paragliding Accuracy Championships** | Vlore, Albania | **www.fai.org** | |
| 20 - 21 | ☉ | **French Classic Accuracy Grand Prix** | Persan-Beaumont, France | | arthur.bentley@virgin.net |
| 25 - 28 | 🪁 | **Super Paragliding Testival** | Kössen, Austria | **www.fly-koessen.at** | |
| 26 – 30 | 🪁 | **British Open Series Round 2** | Leyburn, North Yorkshire | **http://bhgcomps.co.uk** | hgmeethead@hotmail.com |
| **JUNE** | | | | | |
| 2 - 3 | 🪁 | **Buttermere Bash** | Buttermere, Cumbria | **www.airventures.co.uk** | |
| 10 - 11 | 🪁 | **Nova Testival** | Gt. Hucklow, Derbyshire | **www.facebook.com/activeedge.paragliding** | |
| 25 – Jul 1 | 🪁 | **British Nationals** | Monte Cucco, Italy | **http://bhgcomps.co.uk** | hgmeethead@hotmail.com |
| 30 - Jul 2 | 🪁🪁⊥ | **Parafest** | Prestatyn, North Wales | **www.parafest.co.uk** | |
| **JULY** | | | | | |
| 15 - 16 | 🪁 | **Lakes Charity Classic** | Grasmere, Cumbria | **www.cumbriasoaringclub.co.uk** | |
| 21 - 23 | ☉ | **Paragliding Accuracy World Cup** | Mont-Saint-Pierre, Canada | **www.pgawc.org** | |
| 22 - 23 | ☉ | **Classic Accuracy National Championships** | Woldingham, Surrey | **www.bhpa-accuracy.org.uk** | |
| 22 - 26 | ⊥ | **British Paramotor Championships** | Woldingham, Surrey | **www.ppgcomps.co.uk** | |
| 22 - 29 | 🪁 | **British Paragliding Championships Round 1** | Malvern area (TBC) | **http://pgcomps.org.uk** | |
| 29 - 30 | ☉ | **Paragliding Accuracy National Championships** | Woldingham, Surrey | **www.bhpa-accuracy.org.uk** | |
| **AUGUST** | | | | | |
| 6 - 12 | 🪁 | **BPCup Derbyshire Round** | Bradwell, Derbyshire | **www.bpcup.co.uk** | |
| 6 - 19 | 🪁 | **World Hang Gliding Championships** | Brasilia, Brazil | **http://bhgcomps.co.uk** | hgmeethead@hotmail.com |
| 26 - 28 | ☉ | **Birdwings Classic Accuracy League/UK Grand Prix** | South Cerney, Gloucester | | arthur.bentley@virgin.net |
| **SEPTEMBER** | | | | | |
| 2 – 6 | 🪁 | **British Open Series Round 3** | Long Mynd, Shropshire | **http://bhgcomps.co.uk** | hgmeethead@hotmail.com |
| 22 - 29 | 🪁 | **British Paragliding Championships Round 2** | St Andre les Alpes, France | **http://pgcomps.org.uk** | |
| 16 - 17 | ☉ | **Netherlands Classic Accuracy Grand Prix** | Numansdorp, Holland | | arthur.bentley@virgin.net |
| 21 – 24 | 🪁🪁⊥ | **44th Coupe Icare** | St Hilaire du Touvet, France | **www.coupe-icare.org** | |
| 22 - 24 | ☉ | **Paragliding Accuracy World Cup/Pre-Europeans** | Kobarid, Slovenia | **www.pgawc.org** | |