

What we can do with data

IAN STUART CONTINUES HIS RESEARCH INTO DATA ANALYSIS

In my last article ['What does the data tell us?' Skywings, May 2017] I explored the BHPA's membership and incident data. I concluded that, in general, the data we had available led us to inconclusive results that fuelled further speculation. I recommended three courses of action to help improve this: an electronic logbook, further and wider analysis and increased incident reporting.

I hope we are seeing an increase in incident reporting, but I still get asked questions like: 'You don't have to submit an incident report for that do you?' What comes to my mind when I hear this is that we should want to submit Incident Reports rather than seeing it as a chore and/or an embarrassment.

On the subject of the electronic logbook and further and wider analysis, I have received a number of very encouraging and supportive calls and emails, not least from David Thomson (chair of the FSC's Pilot Development Panel) who informed me that developing such a logbook is on their agenda.

I have since had follow-up calls with the Pilot Development Structure team and I hope to show you what I demonstrated for them: that rich insights can be gleaned from the data collected in a properly-designed electronic logbook. Ultimately this could help our members to become more aware and safer pilots.

DAFT but Safe!

For those that don't know, 'DAFT' (Dover And Folkestone Team) is the name of any DFHGC team in the BCC or other competition. As a club we are often heard referring to ourselves as DAFT pilots (I am sure there are many that would agree!) Seriously, we are much like any other club in that we have experienced and less-experienced pilots, considerate and less-considerate pilots, safe and less-safe pilots.

During my tenure as Club Safety Officer I worked with the DFHGC committee to develop the concept of 'DAFT but Safe' to assist those of us who would like to become safer pilots. It is a crude but, we believe, effective manner of monitoring and improving our personal safety. It comprises three key components:

- Safe Flight definition
- Flight logging
- Flight analysis and Safety Factor

Safe Flight definition

The definition is written in the form of an affirmation, as used by top sports people to help programme the subconscious mind. They must be positive and written in the present tense: 'Every flight is a safe flight.'

- I always check NOTAMs/raise CANPs when necessary
- I always check the weather
- I always do all my pre-flight (and betwixt-flight) checks
- I always remain on my feet during take-off and landing
- I am always aware of others and I fly courteously and safely
- I always feel in control of both my glider and my situation
- I always feel good at the end of my flight.

Your own definition of a safe flight may be different, but we thought this was a good starting point. I have this affirmation laminated and velcroed on my flight deck. My primary goal for every flight is that it be a Safe Flight.

On reviewing our flights at the end of the day, if we can honestly say that all the above were true we can award ourselves a 'Safe Flight' (or flights). Alternatively, if one or more of the above was not right and we decided not to fly, we can also record a 'Safe Flight'.

Flight logging

We can enter our flights into our logbook or have them automatically uploaded (a feature being discussed) and we can add

Flight Type	Date	Wing	Launch site	Hours	XC distance	Max height	Max height	No of flights	No of flights	Conditions	Notes
HR	2017-02-05	Adversus Ltd	Two Rivers	2:20	0	300	300	4	4	13-14 mph	Procedural check in strength conditions - worked really. Ca
HR	2017-02-21	Adversus Ltd	Beauly Head	0:13	0	190	190	2	2	3-10 mph	Nice
HR	2017-02-26	Adversus Ltd	Two Rivers	0:42	0	190	190	2	2	13-14 mph strong and gusty	Good practice - pushed out and better handled but credit have been 3
HR	2017-03-04	Adversus Ltd	South Dymley	0:28	0	190	190	2	2	2-10 mph	Forgot before flight check to area
HR	2017-03-05	Adversus Ltd	Harling Down	0:05	0	0	0	0	0	1-10 mph strong	Conditions not right - decided not to fly
HR	2017-03-18	Adversus Ltd	Mount Calverton	2:05	0	250	250	4	4	5-15 mph	Good call near Harling. Incident report covered
HR	2017-03-19	Adversus Ltd	Southdown Cliff	0:05	0	0	0	0	0	1-10 mph	TTR
HR	2017-03-19	Adversus Ltd	Canterville	1:53	0	300	300	2	2	13-15 mph	
HR	2017-03-19	Adversus Ltd	Two Rivers	2:73	0	450	450	2	2	3-10 mph	
HR	2017-03-07	Adversus Ltd	Canterville	1:18	0	200	200	10	10	8-17 mph	
HR	2017-03-11	Adversus Ltd	Marble Hill Range	1:00	0	300	300	3	3	13-18 mph smooth	
HR	2017-04-01	Foxford Rowan	Two Rivers	0:07	0	200	200	1	1	13-16 mph thermic	
HR	2017-04-02	Foxford Rowan	Harling Down	1:07	0	300	300	3	3	8-10 mph thermic	
HR	2017-04-02	Foxford Rowan	Two Rivers	1:05	0	300	300	17	17	13-18 thermic	
HR	2017-04-03	Foxford Rowan	South Dymley	1:12	0	400	400	2	2	2-14 mph thermic	
HR	2017-04-08	Adversus Ltd	Marble Hill Range	4:27	0	400	400	10	10	11-15 thermic	One incident - slip landing hit sea
HR	2017-04-10	Adversus Ltd	Canterville	0:00	0	0	0	0	0	8-10 mph	Tripped on slip landing once
HR	2017-04-10	Adversus Ltd	Blaker Wood	1:08	0	200	200	14	14	8-14 mph thermic	
HR	2017-04-10	Adversus Ltd	Canterville	1:47	0	300	300	10	10	8-10 mph thermic	Discussed why on back of wing form due to rear configuration
HR	2017-04-17	Adversus Ltd	Harling Down	1:12	0	300	300	8	8	8-10 mph thermic	Ready but dry - underachieved - PD hang in bushes three times hit
HR	2017-04-23	Adversus Ltd	Marble Hill Range	1:58	16	2600	3300	2	2	1-10 mph strong	Full sea on landing once
HR	2017-04-23	Adversus Ltd	Two Rivers	0:29	0	200	200	1	1	1-10 mph smooth	
HR	2017-04-23	Adversus Ltd	Harling Down	1:38	0	450	450	5	5	3-10 mph thermic	Full sea near on landing
HR	2017-05-07	Adversus Ltd	Harling Down	0:48	0	150	150	7	7	8-20 mph thermic	
HR	2017-05-10	Adversus Ltd	High A Level	0:08	0	300	300	2	2	2-10 mph thermic	Clips on the deck
Mountain	2017-05-10	Adversus Ltd	Isleham	0:02	0	5700	5700	1	1	1-10 mph thermic	Two releases, top ears, accelerate top ears, wing covers
Mountain	2017-05-10	Adversus Ltd	Isleham	0:03	0	9000	9000	1	1	8-5-10 mph thermic	Big strong accelerated asymmetric tactics - hit out of control but all

Fig. 1

notes. Here is an extract of my own which is simply an Excel spreadsheet (Fig. 1).

The above format is not ideal as it is a hangover from my paper logbook and has multiple flights per line. Ideally we should have one flight per line.



Fig. 2

You may have other things you want to record. A task for the team developing the electronic logbook is to come up with a superset of fields required and/or allow for custom fields.

Sam Jenkins, a para-buddy of mine, has created a similar logbook using Google Sheets with an improved interface that you can access directly from your smartphone (Fig. 2).

However the data is recorded, and whatever fields may be decided upon, such centralised flight logging opens up a world of possibilities for analytics, as long as a significant number of pilots use the same tool and the data is in a standard format and accessible. The following analyses show some of what can be done with just one pilot's records.

Flight analysis and Safety Factor

We define the Safety Factor as the number of Safe Flights divided by the number of flights. Our ultimate goal should be 100% (but it is possible to exceed 100% if we decided not to fly on occasion). However this is not a perfect measure and it is very subjective; we should not compare one pilot's Safety Factor with another's.

However, if we are honest with ourselves and consistent, we can set personal goals with respect to our Safety Factor alongside other flying goals. For example, my personal goals this year are: a 90% Safety Factor, 50 hours on the clock, and a 100km XC flight. Let's see how I am doing (Fig. 3) ...

That's a lot of information on a single page. Initially too much to take in, probably, and too small (in print) to be able to read and understand in some places. Information technology innovator,

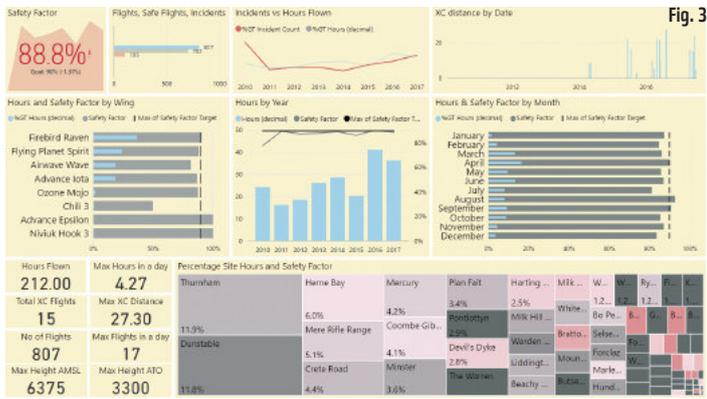


Fig. 3

towards my 50-hour goal this year with 36 hours logged by July 8th when this screenshot was taken.

But what happened in 2015? If we click on the bar it automatically filters all the other visualisations and/or highlights the 2015 data (Fig. 5). Notice, for example, how the Safety Factor has dropped to 86.4% – my score in 2015 – and how all the headline figures at the bottom left similarly show 2015 data only.



Fig. 5

teacher and consultant Stephen Few* would describe this as a 'dashboard':

'A dashboard is a **visual display** of the **most important information** needed to achieve **one or more objectives**, that has been **consolidated** on a **single screen** so it can be **monitored** and **understood** at a **glance**.'

Stephen teaches other techniques, such as putting the most important information at the top left of the screen (in my case my Safety Factor) and telling the story in order of importance from left to right, top to bottom – as per the way we read a book. There may need to be some compromise as we also need to consider the space used by each graphic and how that impacts the overall layout.

You may also have noticed a lack of data being displayed in tables – no 3D effects, no pie charts and certainly no speedometer-type gauges. There are good reasons for not using these (and other) popular visualisation types – read on.

I have used common colour coding across the visualisations:

- Blue** Flight Time
- Black** Targets
- Grey** Safety Factor/Safe Flights
- Red** Incidents/Unsafe Flights

If we look at a dashboard like mine frequently it will become very familiar and we will be able to spot trends and outliers (extraordinary events) easily. Our dashboards should be designed with that in mind.

We should also note, from Stephen's definition, that dashboards are designed for screens (rather than print). In this article we lose the interactivity that is inherent in a live reporting platform such as the one I use for my dashboard. Let me try to give you a flavour of what is possible though.

If we zoom in on my Hours by Year graph (Fig. 4) we see what may be a typical weekend pilot's progression pattern.



Fig. 4

In my first year out of school, waking at 4am and getting some flights in before work afforded me a total of 24 hours in the year! The exact figure can be seen live as a 'Tooltip' by hovering the mouse over the 2010 year bar. The following year I was obviously less keen and still spent a lot my day walking up hills! I only managed 16 hours. Thereafter I made steady progression through the years and, with the exception of 2015, there is almost a straight-line increase in hours per year. I am well on target

We can do a similar thing on any other graph, so I could see just my Firebird Raven flights for example. After clicking on 2015 and zooming in to the Hours and Safety Factor by Month Graph (Fig. 6) we can see that no flying (blue bars) took place in February, March and April and very little in January and May.

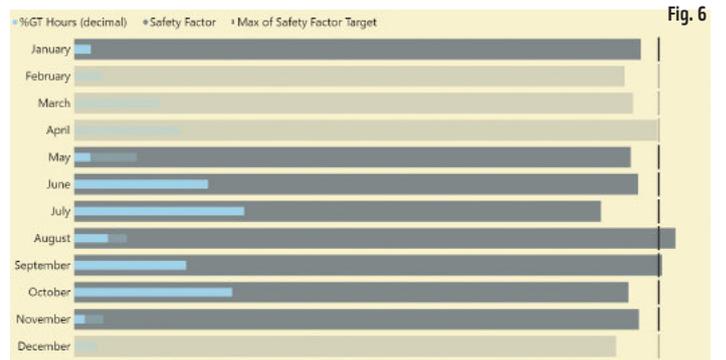


Fig. 6

If we drilled in further, to the flight notes, we would see that I broke my ankle in January! Also on the dashboard (Fig. 3 again) we can see my incident count in the second and third visualisations on the top line. An 'incident' on this dashboard is defined as any flight that wasn't a 'Safe Flight', as per the definition I set out earlier. This could just mean that I tripped on landing for example – not something that I would fill out an Incident Report for (otherwise BHPA Tech Officer Dave Thompson would be inundated), but it is useful for me to know. Too many such incidents could cause an injury and therefore may be something for me to work on.

The bottom right visualisation is a tree map, also referred to as a heat map (Fig. 7). The size of each rectangle represents the percentage hours I have flown per site, whilst the colouring indicates my Safety Factor (grey being safe and red being unsafe, with graduations in colour in between). We can see that the two sites I have flown the most have relatively good Safety Factors (88% and 94% can be seen in the Tooltips).

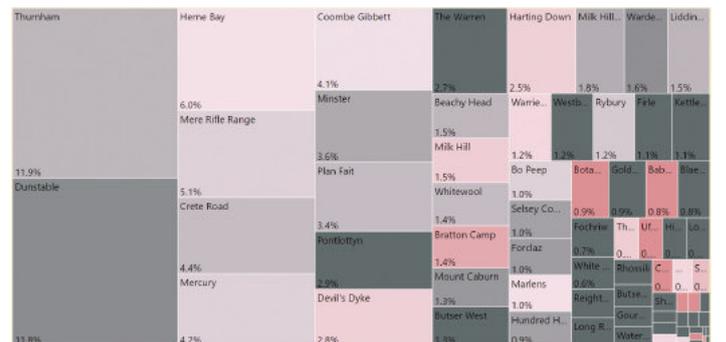


Fig. 7

The last of my goals for this year is nothing to write home about – my XC ambitions! It took me four years to register my first hop over the back, landing after 9km, and my progression since has been slow. I won't bore you with all the excuses, but I know I have stuff to work on and a coaching need (Fig. 8).

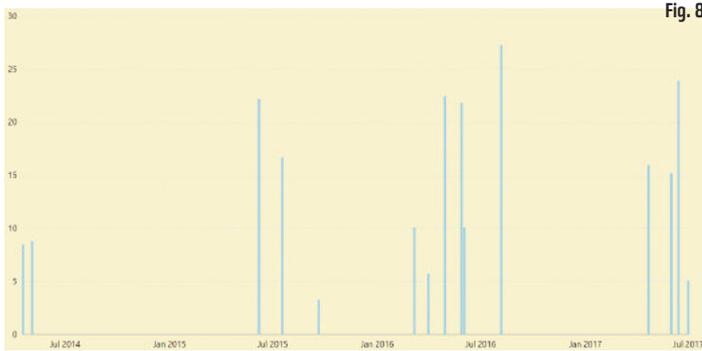


Fig. 8

The future

If just a few hundred pilots were using a common electronic logbook we would have a very rich data set. It would then be possible to compare flight time with incident occurrence (Fig. 9). My data certainly seems to support the theory that we have more incidents when fresh out of school and then, after tailing off, they seem to increase linearly with hours flown.

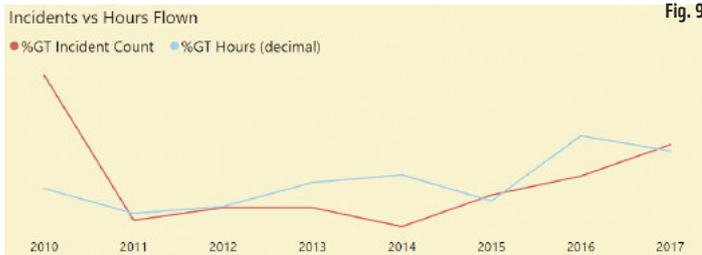


Fig. 9

But the data from one pilot proves nothing. With more data we could prove or disprove that theory, and then the Pilot Development Panel may be able to target their efforts more effectively:

- We could see the least-safe sites and whether they are actually less safe per hour flown or whether they share the same 'incident per hour' rate as the same as lesser-flown sites. In other words, does busyness cause the incident rate to increase?
- We could truly see the effects of a lack of currency as we would have accurate historical records of a pilot's flying, rather than what might be a best estimate that they enter onto an incident form.

The possibilities go on and are endless – a data analysts dream!

But the intellectual stimulation is secondary: Ultimately, good data collection and carefully thought-through analysis and data presentation may help make our sport a little bit safer.

Finally

There is much more that can be gleaned from this dashboard by interacting with it. I would be happy to arrange a talk and demonstration session for any club at one of their regular meetings. Similarly, I will gladly demonstrate and answer questions from individual pilots either face to face or using Skype or similar.

If you would like to create your own logbook now (in advance of an official BHPA version) I have instructions for setting up Sam Jenkins' Google Sheets version, or you can copy my Excel spreadsheet – just email me.

To create dashboards you can use Microsoft's Power BI free of charge (<https://powerbi.microsoft.com/en-us/pricing>) and there is free online training available; just Google!

Training in data visualisation principles does come at a cost – contact me for details or, for a much lower investment, look up Stephen Few's books on Amazon (*Show Me The Numbers* and *Information Dashboard Design* are good starters).

Update on the BHPA Pilot Development Structure

It has been a while since the last update, but there has been much background progress on the Pilot Development Structure. It's a web-based edifice which defines every single aspect of paragliding into clearly-defined Skills, each with an exercise for the pilot to demonstrate that they have 'mastered' the skill.

These skills are arranged in three Layers:

Foundation. For pilots who have just completed CP and in their first season in the club environment.

Development. For pilots who are beginning to develop and widen their experience.

Performance. For pilots who want to develop further in their chosen areas of the sport.

The Skills are grouped into Modules, each covering a specific aspect of the sport (e.g. glider control, meteorology and site assessment, flight planning and decision making, equipment, XC flying).

Each of the wide variety of Skills is described in a consistent-format webpage which includes:

- A description of the skill
- An exercise to demonstrate that the skill has been mastered

- Any specific site/met. conditions required
- Links to available resources (articles, videos, books, etc.).

The Structure is not intended to be a 'Teach Yourself Flying' guide. The overall principle is to bring together the best coaching practices which currently exist within our clubs. Each of the Skills has 'Guidance for Coaches' containing tips and advice collated from Coaches from all our clubs.

The advantages of the Structure include:

- New pilots arriving in a club will have clear view of the progressive steps in developing their flying
- It will provide a means for pilots to clearly define their current level of knowledge and experience
- Defining specific exercises will provide a clear basis for pilots to seek coaching assistance
- It provides a means of passing on useful advice to Coaches on techniques for coaching specific exercises
- The rate of progress will be determined entirely by the pilot
- It will be easy to integrate with the existing Pilot Rating System.

Phase 1 is well underway, with the website at an advanced development stage and undergoing user testing. The Structure for paragliding will be rolled out first, with hang gliding, paramotoring and speed flying to follow. Whilst the online version is being developed, a version of the Foundation Layer, in the same format as the Student Training Record Book, is currently provided to new pilots. It is available at www.bhpa.co.uk/pdf/PDS_foundation_layer_phases.pdf. Feedback has been good so far.

In parallel with developing the software, we are collecting the content which is being provided by Coaches, Instructors and experienced pilots. We always welcome more volunteers to help write content at all three Layers, both for pilots and Coaches. Please email PDP@bhpa.co.uk.

Phase 1 of the Structure will be launched at the BHPA Trainer's Conference in February 2018, and will be fully accessible after that. Phase 2 will improve the smartphone interface and include an online logbook feature.

For more background info, rationale and aims, please see the webcast at: www.theparaglider.com/webcasts/bhpa-pilot-development-structure-an-introduction-9

David Thomson, Co-ordinator, FSC Pilot development Panel

Acknowledgments

Once again my company sponsored the writing of this article and some of the time taken to create the dashboard – thank you Altis. Joe Schofield, Colin Fargher, Sam Jenkins, Peter Hopwood, Sam Riggs, David Thomson and others have also contributed by providing ideas, material and critical review.

** Stephen Few has worked in information technology for over 25 years. The principal of the Perceptual Edge consultancy (www.perceptualedge.com), he focuses on practical uses of data visualisation to explore, analyse, and present quantitative business information.*

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.

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Ian Stuart analysing the likelihood of an incident