SAFETY

Detectives of the air

An AAIB presentation opened the eyes of **Ian Ridgers** to its invaluable work

AAIB HQ in Farnborough

> The pilot wasn't wearing his shoulder strap

AT the AAIB presentation at its HQ in Farnborough, 14 of us were greeted by AAIB inspectors Niall Robertson and Steve Connor.

Their presentation consisted of some PowerPoint slides and discussion in the conference room, followed by a visit to the hangars where current investigations are under way.

The presentation in the conference room began with a description of the purpose of the AAIB and its relationship with other organisations and authorities.

It reports directly to the Secretary of State for Transport, and is independent of the CAA or the police.

Its function is to determine the cause of an accident and issue a report which makes recommendations to external agencies to prevent a recurrence.

The report may result in other organisations taking action independent of the AAIB. The CAA may issue a mandatory modification notification, or an established aircraft manufacturer may instigate a design change. The police may even pursue a prosecution, but this would be completely independent of the AAIB.

The presentation worked through a typical investigation, showing us how the investigators collect data from surveillance videos, eyewitness accounts, radar track replays, onboard devices running applications like SkyDemon, or even a GoPro camera. No black boxes in many microlight aircraft, obviously.

The AAIB is likely to be the last authority to arrive at the scene to determine the likely cause of the accident. This might be the behaviour of the pilot, mechanical failure, inferior design, poor maintenance or an unofficial modification.

An accident might be caused by behaviours that have become "what everybody does" but are not necessarily best practice. Two such examples were illustrated to us.

There's a popular belief in the flexwing community that only the lap strap is needed to be worn to be safely secured in the aircraft, and that the shoulder strap is not at all necessary. *(Hence the BMAA's current Belt-up campaign – Ed).*

Furthermore, that the shoulder strap can or will restrict the pilot's movement to such an extent that full deflection of the control bar is restricted.

In the accident that was presented to us, a flexwing cartwheeled in a field, the pilot was thrown forward, his helmet came into contact with part of the aircraft structure and he suffered a fatal rotational injury to the brain.

The pilot wasn't wearing his shoulder strap, which was buckled up behind him out of the way. Had the harness been worn correctly, there's every chance he would have been restrained and thus not come into contact with part of the aircraft.

In an accident like this, rotational brain injury occurs when the skull moves forward, stopping abruptly when it strikes an object. The brain continues to move forward, due to its inertia, and strikes the inside of the skull at full speed. This may only be a few millimetres, but is enough to cause a fatal injury.

Considering this, the inspectors at the AAIB turned their attention to the helmet worn by the pilot.

Ideally, the padding inside the helmet should absorb the momentum of the head, decelerating it slowly, thus reducing the impact speed of the brain when it strikes the skull. In this investigation, while the type of padding material could not be identified, the helmet was only designed to protect the wearer from a direct collision, and not from rotational injury caused by an oblique impact, which is the most common type of impact.

The inspector noticed a label on the helmet that stated that it was "for use in Airborne Sports (UL)".

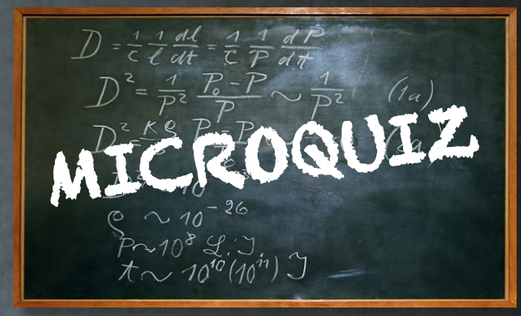
UL stands for Ultra-Light, but in the UK we do not have an official definition of Ultra Light, so it was unknown what category of aircraft these helmets were suitable for.

This led to further investigations into the specification of helmets, with the discovery that there is no rotational protection in aeronautical helmets in the UK, unlike in other activities such as cycling, skiing, rock climbing, motocross etc.

The accident was aggravated by a second "cultural norm" exhibited by the pilot. It had become accepted practice to secure the control bar to the front strut with a strap before starting the engine. However, the pilot may not have noticed that the hand ▷

Now here's a problem. Do we call the AAIB, or just the AA? (photo: *Shropshire Star*)

If Biggles was around today, he'd be working at Farnborough



1 **What will happen to the engine rpm of an aeroplane with a fixed-pitch propellor if it enters a dive and the TAS increases?**
   a It will increase.
   b It will decrease.
   c It will remain constant.

2 **What is the name of the part that connects the piston to the driveshaft?**
   a connecting bar
   b coil drive bar
   c conrod

3 **What is meant by "FU" on a METAR?**
   a smoke
   b funnel clouds
   c frequent

4 **Which type of precipitation is associated with nimbostratus clouds?**
   a light rain and drizzle
   b heavy showers
   c persistent moderate rain

5 **Buys Ballot's Law states that if a person stands with their back to the wind in the northern hemisphere, low pressure is:**
   a to the left
   b to the right
   c straight ahead

***MF*'s quizmaster Lawrence Bell is the developer of QuizAero, the online groundschool for microlight student pilots, quizaero.co.uk.**

Answers overleaf

GASCo, the General Aviation Safety Council, is a charity whose members are aviation organisations. Its aim is to make aviation safer through education. It presents the CAA safety evenings, runs seminars and provides safety information through its magazine and website, gasco.org.uk.

CHIRP, the Confidential Human Incident Reporting Programme, reviews and analyses reports from pilots, then publishes them so others can learn. Get the app at chirp.co.uk.

▷ throttle was set to fully open.

When he started the engine, the aircraft immediately started to move. It rapidly accelerated, struck a noticeboard next to the runway and became airborne.

The pilot was unable to release the control bar to regain control of the aircraft and, possibly due to surprise, the stressful situation prevented him from shutting down the engine via the throttle or the mag switches.

The aircraft gained height, banked to the left and crashed in the adjacent field, fatally injuring the pilot.

Flexwing aircraft have a hand throttle beside the seat. An optional modification (and standard on some models) is an interlock that prevents engine start unless the hand throttle is set to closed.

However, some aircraft do not have this interlock installed on the grounds that if they have an in-flight engine failure, they want to be able to operate the starter at any throttle setting. This was a conflicting requirement and a safety issue that could be addressed during pilot training.

Because the inspectors are last on the scene, sometimes evidence is destroyed or unintentionally altered by the first responders, who may find it necessary to cut through a flexwing structure to extract a pilot or passenger. This means the AAIB does not know if a cut in the fabric occurred before, during or after the event.

Another serious point to note is that Ballistic Recovery Systems in three-axis aircraft are triggered via a cable from the cockpit to the device.

If it's not deployed in the air, the device will still be armed following an accident, and therefore there's a risk of accidental release at any time.

The deformation of the superstructure may have increased the tension on the trigger wire, meaning it could be inadvertently triggered by the movement of dislocated components at the scene. These devices can cause fatal injuries.

In the hangars, we saw the remains of everything from a flexwing, a Eurostar, a EuroFox, a Jabiru 450, a hot air balloon, the Hawker Hunter that crashed at Shoreham in 2015 and a replica Spitfire that crashed on its test flight.

All in all, it had been a sobering but instructive day. □

MICROQUIZ answers

1a It will increase.
2c conrod
3a smoke
4c persistent moderate rain
5a to the left

The lessons learnt

- On our departure, the inspectors emphasised the need for good meteorology. "Bombard your friends with continuous weather forecasts," they said.
- Don't turn back if you suffer an engine failure after takeoff.
- Watch your airspeed when turning onto base leg.
- If you witness an accident, the first priority is attending to the casualties.
- Render the site safe by ensuring fuel taps are closed, ignition switches turned off etc, *but* remember what you have done and tell the AAIB so it can be sure that it was you who tore the canopy after the accident or turned off the fuel cock.
- Take pictures of the damaged aircraft, cockpit switches and accident site, but avoid pictures of any casualties, as they are sensitive. Pictures of the actions of fire and rescue teams may help the AAIB with its follow-on investigation.
- Be aware that the wreckage may contain an armed Ballistic Recovery System which could be triggered by yourself or first responders.
- When you go flying, leave your passwords of devices and navigational aids with a loved one in case the AAIB needs to investigate your last flight and you are unable to help it. Leave them in a sealed envelope if necessary.

Make your flying a treat – not a threat

Chloe Eriksen on how threat and error management can stop us falling out of the sky

You don't have to have tasteful red nail varnish to plan a flight, but then again, why not!

WHAT is threat and error management? It sounds complicated, doesn't it?

Or at least that's what I thought when I first heard the term. If you regularly read my *MF* contributions, you'll know that I like to bang on about preparation, and threat and error management is essentially just that: the process of carrying out thorough preparation and identifying potential errors and threats prior to a flight.

Flying is inherently dangerous, and can, at busy times, require multitasking of the highest order to stay safe.

When describing it to my non-flying friends, I've often used the analogy of a car breaking down, and how this is in *no way* comparable to experiencing a mechanical malfunction of an aircraft in flight.

For a start, there's no pulling over and calling the breakdown recovery service. Unexpected events can create chaos when flying, and require management not only of our current position in space, but clear communication and problem-solving, all while being in control of a moving object: complex indeed.

It's therefore essential that we prepare ourselves for these eventualities. I've spoken before about the importance of preparation, and threat and error management is essentially contingency planning and risk management rolled into one.

The exploration and anticipation of possible threats provides the opportunity to develop mitigation strategies, or "actions on", as we called them in the Army – the "what will I do if…?" sort of scenarios.

It's vital that we prepare for threats and errors, because a flight that is conducted without either of those popping up at some point is rare.

What are threats in aviation?

The *Skyway Code* describes in detail the different types of threat that we might encounter and need to consider.

Anticipated threats are those which we are able to predict: for example, poor forecast weather or high densities of air traffic.

Unanticipated threats are those threats which are not necessarily expected, but the possibility of which should be considered. These include mechanical failures and/or technical difficulties, which all of us should have a plan for, should we encounter them during flight.

Finally, ***latent threats*** could include things like external time pressure, fatigue or insufficient pilot skill. These sorts of threats are harder to mitigate but an awareness of their potential influence is important.

Errors

Errors are to be expected, and can often be the unintended consequences of a mismanaged threat.

The *Skyway Code* defines errors as "actions or inactions by the pilot (or other operational personnel) that lead to a potential reduction in safety."

It goes on to say: "Unmanaged and/or mismanaged errors may lead to undesired aircraft states. Errors are broadly considered to be either aircraft handling, procedural or communication. Errors often occur due to the failure to manage threats effectively."

The *Skyway Code* also states that a common cause of error is distraction and/or mental overload.

Distraction and interruption are the topics of a recent safety sense leaflet ▷