



With Malcolm McBride  
Airworthiness Engineer

# RECORDING AND AVOIDING ACCIDENTS

Among Malcolm's investigations this month is a visit to the AIB's accident investigation workshop and cases of canopy failure

OK, I'll accept that this picture doesn't concern flight safety directly but I felt that the very rare event of a UK GA airfield, in this case the LAA base at Turweston, getting a brand spanking new tower facility, has got to be worth some magazine space. The picture shows the steel frame being positioned; the new tower will boast, along with the usual control tower stuff, a restaurant overlooking the lake.

*(Photo: Malcolm McBride)*



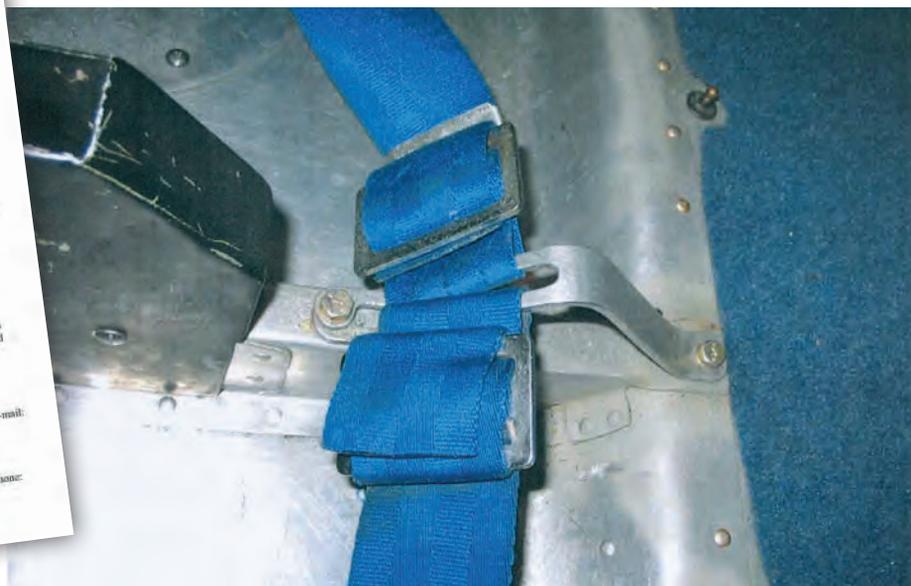
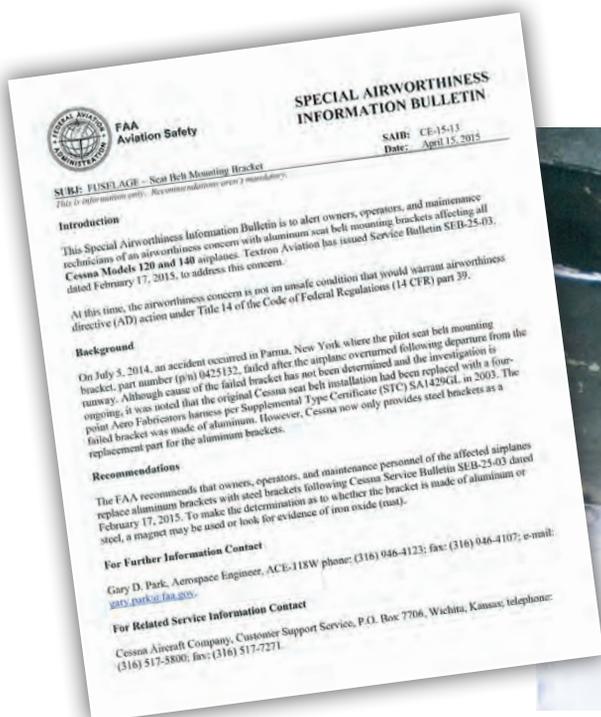
**W**elcome to this May edition of Safety Spot, as always, I hope all is well with you and those close to you. The balance of probabilities, bearing in mind that you've got the LAA's membership mag between your digits, is that you're an aviation enthusiast and I hope that you, like me, are enjoying this Spring weather, whatever 'bit' of aviation captures your interest. Certainly, one of the great things about aeronautics, as a subject, is the simple diversity of its specialities.

Naturally, pulling-off a squeaker of a landing figures high in most aviators' reckoning, but there's an equal pleasure in getting a difficult scarf joint or insertion patch to fit nicely and, although I'm not that much good at it, spotting an unusual type will lift the mood of many. Aviation certainly has a very diverse interest base.

Regular readers will know of my predilection for displacement activities (note the plural), especially when it comes to sitting down to pen this column. I must say that this inability to get all the lobes firing in sequence at a moment's notice has just been exacerbated by a call from our editor letting me know that, and yes, I could feel his grin through the telephone, "You've remembered that I'm off to Sun 'n' Fun at the end of the week so I'll need the Safety Spot copy by Thursday."

"What?" says I, not even sure what day of the week it is because I'm surrounded by so many Permit application forms. "I'm not sure that the 'fluids' have recovered from the last one!"

May already, it doesn't feel as if April's got off the blocks yet. So, what's been happening in the world of LAA continuing airworthiness? Well, and this next plea relates to Permit renewal matters, can I ask that you check the small print when it comes to Permit Renewal fees before sending in your application... Many of you (me anyway) haven't noticed but those above us have jiggled the fee structure around a bit and it's actually cheaper this year to Permit some types. Saying that, I note that because the weight categories have changed a bit, some aircraft will be paying a bit more this year. Every time we receive a wrong payment there's a glitch in the Certificate of Validity renewal machine which means that 'that' particular Permit will be delayed... those that know me will know that I don't like delays for no good reason. In fact, I'm a bit OCD about



maintaining a good and rapid turn-around when the renewal is relatively straightforward. Anyway, your help in this direction will be greatly appreciated, especially by Maxine and Fiona (our very-expert engineering admin team).

As you know, my responsibility here at engineering HQ doesn't extend into the approval of modifications, quite rightly that's a Design Office responsibility, but we're a pretty tight team here and it's clear that the modification system has been creaking under the strain for some time now. Our CEO, Phil Hall, alongside our Chief Engineer, Francis Donaldson, have recently re-vamped the modification process in a number of ways. You may have read our Deputy Chief Engineer, Jon Viner's, article describing the proposed changes in the April issue of *Light Aviation*. Part two, on page 20 of this issue, describes the actual process of making an application for a modification; it's worth a read-through if you're thinking about making any changes to your aircraft.

Certainly, one thing I'm applauding is the LAA's sponsorship of Standard (off the shelf, effectively) Modifications; we're doing this by returning any fees above the basic modification fee (£60) to the applicant when the Standard Mod is actually issued. Hear, hear, to that.

I know that there's a similar push towards increasing the number of Aircraft with a Propeller Type List which will mean, in the long run, that there will be a greater choice of propellers available to an aircraft owner without the need, where possible, for a lengthy investigation before fitment... Three cheers to that too!

Owners, more used to operating 'certified' aircraft on a Certificate of Airworthiness, are often bemused by the way the LAA's system of governance works. Primarily, from my experience chatting to new members, this bemusement originates from a basic misconception about the way we are able to look after so many different types. I've explained before that the LAA works on the basis of shared responsibility within an association environment; it's a system that has shown itself to work well...so well in fact that others all over the world are trying to emulate it, with rather varying degrees of success.

(Above) Readers of the April Safety Spot will remember the discussion surrounding the importance of regular inspections of seat belt anchorages. I made a bet that the FAA would issue an AD mandating the recent Cessna Service Bulletin about upgrading seat belt attachments on the 120 and 140 aircraft. I've lost the bet as the FAA has limited its response to a *Special Airworthiness Information Bulletin*. Check out the ALERTS page on the LAA's Website where a link to this document can be found. (Photo: FAA/Cessna Web Forum)

(Below) Here's a snap taken of the AAIB's sizable UK HQ by the crew of a light aircraft whilst climbing away from Farnborough Airport. Both the hangars are full to almost bursting point with bits and pieces from air crashes that they are currently investigating. Naturally, whilst the branch's job is the establishment of cause, a responsibility all staff clearly feel is part of their culture, the remains of an aircraft after an accident may often end-up as evidence in future legal proceedings. (Photo: Afandi Darlington)



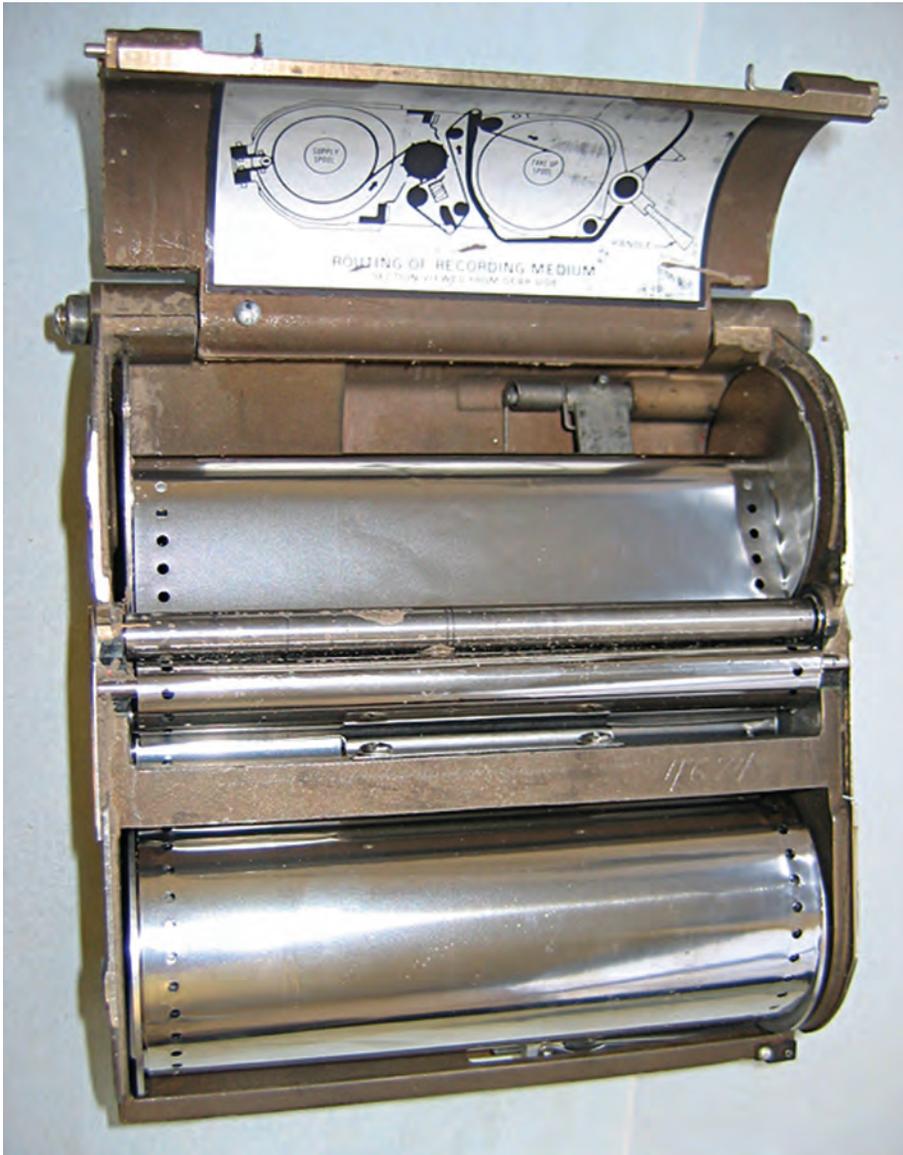
Another key principle is that we treat all aircraft operating under an LAA administered Permit to Fly as individuals; this is essential for our type of operation for pretty straightforward reasons. By 'individuals' I mean that we start from the premise that no two machines are the same, even if they've been delivered as identical kits from the manufacturer. Naturally, this 'one-off' approach to things can be a bit frustrating if you happen to own a 'series' type, especially a type that is operated under one of the newer 'light touch' certification and approval regimes elsewhere in the world. But the flexibility this affords us when assessing the continuing airworthiness of an aircraft later down the line is incredibly valuable, possibly one of the LAA's biggest assets.

Later in this month's Safety Spot, I will explain what can happen when owners decide to make changes to a design without going through the 'shared-responsibility' pathway, i.e. a modification application, but first I'd like to thank the chaps at the AAIB for hosting a fabulous meeting attended by the 'continuing airworthiness' principals from the UK's sporting organisations at its Farnborough HQ.

#### SPORTING ORGANISATIONS VISIT TO FARNBOROUGH – ACCIDENT INVESTIGATION WORKSHOP

Regular readers of Safety Spot will know that the LAA often takes a very active role in the establishment of the causes of various accidents and incidents, but the senior partner in any investigation is always the UK >

## SAFETY SPOT



This is a quite early foil recorder. I expect that readers who took their Silver 'C' badges in the 1970's, as I did, will remember the barographs of the day which, apart from only having height and time as parameters, worked on similar principles. I seem to remember having to smoke the foil before fitment and, after a recordable flight, hair spray became an important element in ensuring a successful application. (Photo: Mark Ford AAIB)



Air Accident Investigation Branch (AAIB). We like this arrangement. Over the last few years, budgetary constraints to almost all government departments here in the UK has meant that the service that the AAIB is able to provide, especially for the more minor events, is rather limited to investigation by 'correspondence', normally in the form of a report from the pilot. It's actually quite unlikely these days that the AAIB would deploy an investigation team to an accident involving an LAA (or BMAA) type unless the accident involved a fatality.

The reason for the 'workshop', the second I've attended, was to keep all of us with responsibility in this area up to date with recent AAIB procedural changes and discuss, in an open forum, ways that we could better work together. It was an interesting and useful day.

For a bit of a breather, a few of us paid a visit to their Flight Recorder Laboratory and were given, for me as a confirmed 'anorak' where gizmos and mechanical contrivances are concerned, a rather too brief tour, by Mark Ford, a Senior Inspector of Air Accidents.

Mark is a specialist in the extraction of data from Cockpit Voice Recorders (CVRs), Flight Data Recorders (FDRs) and pretty much all the modern navigational equipment (so long as it contains a memory chip). Mark's been involved in some pretty important investigations during his long career at the AAIB as you will imagine but confidentiality, where this type of very sensitive information is concerned, has to sit at the heart of the job. He did explain that it was he who managed to extract the data from the navigation equipment on board the LAA Kitfox involved in a mid-air collision with a Cessna near Bedford recently (this incident was featured in the March 2015 issue of Safety Spot).

Mark explained: "The AAIB has had a flight recorder laboratory for over 40 years and in 2006 it was relocated to this new state-of-the-art facility. This offers a 'secure' facility that provides two sound-proofed and electrically-shielded rooms where we replay the CVR. The shielding element provides a Faraday cage that is designed to prevent any external electromagnetic interference during readouts. We follow strict procedures of entry to the laboratory, which has its own additional security over and above that to gaining access to the main site and offices.

(Left) Here's a copy of an actual early trace from a flight recorder. Unfortunately I couldn't ask Mark Ford, one of the CVR/FDR specialist inspectors, what each of the two parameters are: I'll guess, power (at the top) and height (the bottom trace). If you know otherwise, please drop me a line! (Photo: Mark Ford AAIB)

(Right) The canopy of the featured CH 601 UL aircraft after a canopy failure; I have underlined the a because, in truth, this picture was taken after a subsequent failure – it just goes to show that lightning can strike in the same place twice! In this second failure the cause was absolutely established as an incorrectly latched canopy before take-off. (Photo: LAA Library)

*"In addition to the replay of the CVR, the FDR and indeed many other data, sources are read-out and analysed within the laboratory. This includes mobile devices such as iPads and other portable GPS units that we now commonly recover from General Aviation accidents. The recovery process can often require work at a forensic level, for which we have developed techniques to recover data from severely damaged units."*

One of the visiting group asked Mark whether the gradual increase in memory storage capacity has meant that more information could be stored, Mark explained. *"As far as data expansion is concerned, the earliest FDR recorded just five parameters, but this has now expanded to in excess of 2,000 parameters on aircraft such as the A380 and B787. The CVR was originally 30 minutes and this was extended to 120 minutes some years ago when solid state recorders became available. It is anticipated that this will grow eventually to 12 hours or more, as will the introduction of cockpit image recorders, which have been recommended for several years by accident investigation authorities."*

I was intrigued by the level of security, especially with regard to the avoidance of possible electronic surveillance, so I asked Mark who was allowed to listen to the CVRs after an incident. He explained that, initially at least, only the investigator in charge of the investigation and the members of the crew involved are permitted to hear the output. I can see why this care is necessary, much of the cockpit 'banter' might be completely irrelevant but, in the wrong hands, be sensationalised by a story-hungry press. These tight rules were put in place to get pilots to play ball... nobody wants to think that their every word should be laid-bare for scrutiny by all and sundry at some later date!

Mark continued: *"When the AAIB conducts an investigation into an accident or serious incident (as defined by ICAO Annex 13), the CVR becomes a protected record under Section 18 of the Civil Aviation Act of 1996. This addresses the legal protection of the CVR by mirroring ICAO Annex 13, Chapter 5.12 with regards to access to and disclosure of the recording and any transcript (EU Regulation 996/2010 Article 14 also refers)."*

**"The recovery process can often require work at a forensic level, for which we have developed techniques to recover data from severely damaged units"**

*"Regarding publication of the CVR, or sections from it, the AAIB follows explicitly the guidance given in ICAO Annex 13. The AAIB will only publish those parts of a transcript that are pertinent to the investigation and specifically excludes those that are not relevant. Extracts from CVRs (or Air Traffic recordings) will appear in our reports in small capitals and enclosed by double quotes."*

*"Following an accident or serious incident in the UK, the AAIB limits CVR access to those AAIB investigators working on the event, the flight crew involved and Accredited Representatives officially appointed by a State in accordance with ICAO Annex 13. All other personnel, including Advisors, Regulators, Operators and legal representatives, are excluded. For any AAIB-led investigation, no copies of the CVR or transcript are released outside of our laboratories as, to do so, would breach UK law."*

*"Under ICAO Annex 13, the operator is afforded no rights regarding access to the CVR recording or transcript but, as a matter of routine, the AAIB does share appropriate FDR data with them and the aircraft manufacturer."*

So, thanks to Mark and, of course, the rest of the team at the AAIB, for their hospitality during the day. Interestingly, during the afternoon, there was a sudden pause in the general forum and, with AAIB personnel rushing about in all directions, a team was 'deployed' to Blackpool to investigate why a Raytheon 'Premier', a small twin-engine light jet developed from the Beechcraft/Hawker 200 (not operating on an LAA Permit), over-ran the runway on landing. I'm looking forward to reading the report in the AAIB's monthly 'Red-Top' when they've found out what went wrong.

As a post-script to this story, perhaps emphasising the differences in approach towards accident investigation between countries, I was very surprised to see on the TV, only a couple of days after the horrible Germanwings A320 accident (where the aircraft appeared to have been flown intentionally into the ground), the French Public Prosecutor announcing to the world the content of the CVR and making his instant diagnosis to the circling, hungry media-crowd. Certainly, watching his performance, he didn't seem to be following the same rules as those normally entrusted with such complex information.

As a great (and quite long-term) fan of the *Son et Lumiere* French legal/police detective series, *Spiral*, I have grown well-used to the unusual way, at least unusual when viewed with a British eye, 'crimes' are investigated within the French system. All aviators will know that there's never a single cause for an aircraft incident - even one where the pilot looks to have lost the plot - and, where establishing causes has to be at the top of the agenda, I cannot see how criminalising an investigation can ever lead to a sensible outcome.

Flying is as safe as it is because everybody within the aviation system as a whole operates with an understanding that flight safety sits at the top of every decision tree, it's one of the very last bastions where accountants and lawyers don't rule the roost. I expect that there will be quite a few previous decisions, some that may have been made in haste, that might be reviewed after this latest tragedy; and that's as it should be. For a fully-working Safety Culture, all the participants need to know that when something goes wrong for them, and it does quite regularly around aircraft as



## SAFETY SPOT



*(Above)* By far the main cause of in-flight canopy failures is that they're not secured correctly before flight – in this case the pilot sent us a picture of what he thought must have happened. Fortunately, no bones were broken. Normally, the last two items on a light aircraft pre-take-off checklist are Hatches – Secure, Harnesses – Tight. Just chanting the checklist doesn't work, you have to actually check to make sure the job's been done! *(Photo: LAA Library)*



all aviators know, their name isn't going to get splashed all over the papers. I hope that this breach of trust doesn't lead to further accidents in the future.

So, what about continuing our discussion about the dangers of changing 'anything' on an aircraft without checking first with somebody who knows what the often hidden consequences might be? Here are a couple of examples where what looked like a good idea at the time, caused real problems for pilots later down the line.

### ZENAIR 601 (UL) – CANOPY FAILURE

Regular readers will know that LAA aircraft have suffered their fair share of canopy failures over the last few years, perhaps rather too many. So far, touch wood, we haven't seen this problem in 2015, but in 2014 we witnessed a cluster of canopy failures on Europa aircraft, most having at the problem's root a lackadaisical pre-take-off canopy/harness check. Naturally the last thing a pilot wants to find out after an incident is that he could have prevented the issue by doing his job more thoroughly!

Anyway, especially remembering my earlier comments about the 'general rule' that all incident and accidents have multiple causes, in any cause-hierarchy, poor, or perhaps better unsympathetic design often features. No designer would be able to identify all the possible 'gotchas' and that inability is shared by certification engineers and test pilots in equal measure. I remember, I think, back in the 1980s, first seeing the Zenair 601 (UL) and being mightily impressed with the design of the canopy hinge and latching mechanism. As it turned out, however, the design proved not to be rugged enough in service and was modified.

The 601 (UL), although designed by the Zenith Aircraft Corporation in the US, was also manufactured as a kit by the Czech Aircraft Works; most of the LAA's machines have this origin. The early Zenair 601 types all feature the three-piece 'cranked' wing and the 601 (UL) was specifically designed to meet the (then) new UK microlight maximum weight limit of 450kg. We've got 43 of these aircraft on our books, 10 of which are still in the 'project' stage. The UL version was a lighter variant of the already approved HD and HDS variants, which were essentially similar machines but certified to fly at a higher weight (540kg) and therefore flown in the SEP category. The introduction of the 601 (XL), a two-piece wing variant, also introduced a forward-opening canopy and Zenith, quite cleverly, offered a retrofit kit which became available for existing UL, HD and HDS after the change had been investigated and approved (as a factory option) by our Design Department. There are

*(Left)* This is the portion of the canopy frame that failed because the design had been changed by the builder and the small change hadn't been spotted by the signing inspector. The original design called for two pieces of tube to be assembled using a riveted gusset, but it was changed to a welded joint. When a material is heated, the individual crystals within the material start to change their form and this, in turn, will affect the material's properties; removing the gusset simply accelerated the process of failure. *(Photo: LAA Library)*

a few aircraft out there with the older design of side-opening canopy and the failure, that will be described shortly, relates to this type of canopy.

I liked the original design of canopy because I thought it was clever; when one entered the aircraft from the left, the latch was first unfastened and the canopy swung to the right around the right-hand latch... which had become a hinge. When entering from the starboard side, the opposite was true. One of the problems of this design was that it turned out that the latch/hinge mechanism could be released accidentally – on one occasion I remember, by tugging on a misplaced seat belt! Anyway, here's the story of one LAA pilot's experience when the canopy failed during a flight from the Isle of Bute to a private strip near Cumnock.

*On Sunday I arrived at the airfield at Benston Farm, near Cumnock, at around 1100hrs. I checked the condition of the runway by walking along its length before opening the hanger. I checked the aircraft and blew up all three tyres as they were slightly low. I checked the oil and coolant levels and then went to the caravan where I checked NOTAMS, METARS and METAFFS using my SkyDemon. My friend arrived about 11.45 and after he had checked his aircraft, we both ran-up our engines. I completed my pre-departure checks and took off at 12.30 hours for the short flight to Bute.*

*We routed past the Cumnock VRP and the Kilmarnock VRP, and then on to Fairley, flying at approximately 2,000ft QNH. After landing we walked to the hotel where we had a cup of tea and crisps before returning to the strip.*

*I have a pre-departure checklist which includes, inter alia, checking the canopy locks. The canopy opens side-to-side and is secured on each side with a hook fore and aft. A securing pin slots into the hook at the forward end of each rail. Final checks completed, I took-off at 14.25hrs following my friend's aircraft. We routed south of the power station then, after West Kilbride, through the centre of the gap between the Prestwick and Glasgow controlled airspace.*

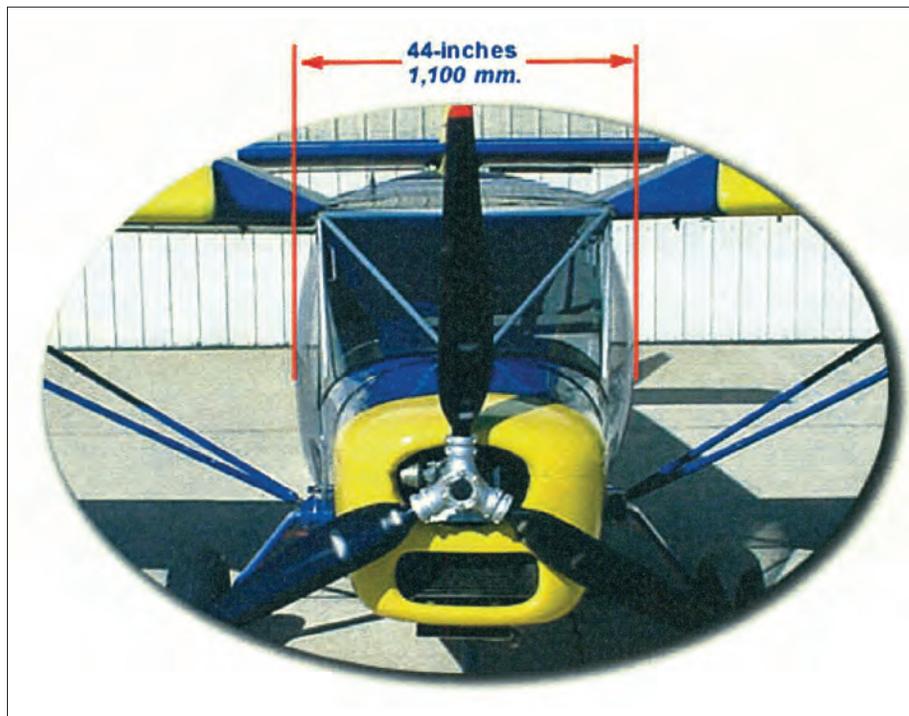
*About ten minutes into the flight, between West Kilbride and Kilmarnock, there was what appeared to be an explosion and the canopy separated.*

*The primary GPS and one of my charts flew out, my cap and headset also disappeared. I regained control of the aircraft and could see my small GPS, showing I was about five miles from Kilmarnock. The fields below were quite saturated and didn't look very inviting, so I continued en-route for a while keeping clear of any buildings. I descended to about 500ft AGL and slowed down to about 60kt and roughly followed the A71 and A76. I could see the Kilmarnock waypoint on the GPS and, a little later, the Cumnock waypoint. I couldn't read the distances because my glasses had gone.*

*As I reached Cumnock, my eyes were very sore and I could not see the ground clearly. I tried the rudder to check for maneuverability prior to landing. The rudder didn't feel right, so I elected to land in the nearest available field. I lined up and landed.*

*During the initial landing roll the front wheel collapsed and I realized that the field was rougher than it had looked. The aircraft slid to a stop and then tipped over onto its nose. I sat for a few moments to gather my thoughts, switched-off the switches, then tried to phone my friend. It took a few minutes and I began >*

“About ten minutes into the flight, between West Kilbride and Kilmarnock, there was what appeared to be an explosion and the canopy separated”



#### Formed Acrylic Bubble Door Option Kit "Better Visibility and More Cabin Width"



#### BUBBLE DOOR OPTION KIT for the STOL CH 701

The formed acrylic bubble doors maximize both the cabin width and visibility. The formed door is hinged on the top and has a 3 1/4" (82 mm.) dome for additional space.

(Above) Manufacturer's options can be very beguiling; fitting these 'bubble doors' to his 701 certainly was for a recent LAA builder. The problem was that these doors hadn't been checked out as suitable for LAA-built machines. The consequence of this was that they weren't properly tested and it was found during service that, above a certain speed, the extra 'pull' afforded by the curved screen (remember Bernoulli?) overcame the canopy latch and the door was ripped off. (Photo: Zenith Aircraft)

## SAFETY SPOT



*(Above)* Another canopy failure, this one happening to a US owner who swapped his CH 701 doors without checking that the door catch was strong enough. This is his tailplane after the impact from the door as it left the fuselage. The reality of the bubble doors on the 701 is that they're very successful and do improve the internal cockpit dimension (for a wide-shouldered chap); however, any change needs to be checked out by a design engineer before it is incorporated to guard against unintended consequences... which is what the LAA mods system has been designed to do.



*(Above)* LAA'er (and RV-6 owner) Tim Gibbs sent us this picture; he entitled the accompanying email 'An Interesting One'. Tim explains, "I was inspecting internals as part of my LAMS 150 hour check today and noticed some debris in the bottom of the fuselage. As the pics show, the plastic nine-pin D connector shell for my AFS magnetometer had failed. When I touched it, it just crumbled away. No 'biggy' in itself, as the metal D plug is held into the socket with retaining screws, BUT this unit is above my elevator bellcrank - and I don't like the thought of bits dropping onto that. I mention it as there are probably a few RVs set up like this.

"I wonder whether the vapour from the ACF50 anti-corrosion fluid I've been using has reacted with the plastic. I'll find myself a metal shell for the connector." I agree that this is a bit worrisome and it's the first time I've heard of ACF50 being 'in the frame' as a possible reactant. Naturally if you, dear reader, have other experiences or have another explanation for this unusual materials failure, please let me know. For your information, Tim's RV is six years old. *(Photo: Tim Gibbs)*

to shake uncontrollably. When I got through to my pal on the telephone, I told him what had happened and explained roughly where I was. I then got out of the aircraft, collected the small stuff from the luggage rack and walked to the nearby farm house. There was no one there, so I walked to the next one where I met three chaps who thankfully took me in and I was given a cup of tea; they told me where I was.

This sounds like an eventful Sunday and thank you to the pilot for putting together this interesting report which I've featured (nearly) in full. You can see that he seems to have done everything right and, for quite some time, we were quite bemused as to how this failure had occurred. Further investigations showed

that the hinge/latch mechanism all appeared to be in good order and that the required modification (LAA/MOD/162A/006), designed to prevent inadvertent in-flight opening, had been incorporated.

Then, during the repairs to the aircraft, the engineers involved noticed that the canopy frame wasn't made to drawing and alarm bells started to ring. It turned out that, during the build process, the builder had decided that, rather than assemble the canopy frame using riveted gussets at the corners, he would weld the aluminium frame together. The story is a little sketchy, all this work was done a long time ago, but even though we're not 100% sure that this 'introduced' design flaw actually caused

the canopy failure in its entirety, we can be sure that the change will feature in the 'cause hierarchy' where, in the order of things, the jury's still out on that one!

You can see (above left) that I've included another interesting example where the introduction of a change to an airframe has subsequently led to disastrous and unexpected results. Let's not forget that the modification system is a jewel in the LAA's crown, even if sometimes the process itself might seem to be a bit ponderous and, to some, unnecessary. You wouldn't think this if you were sat in my seat, Airworthiness Engineers are trained to expect the unexpected. Fair Winds. ■

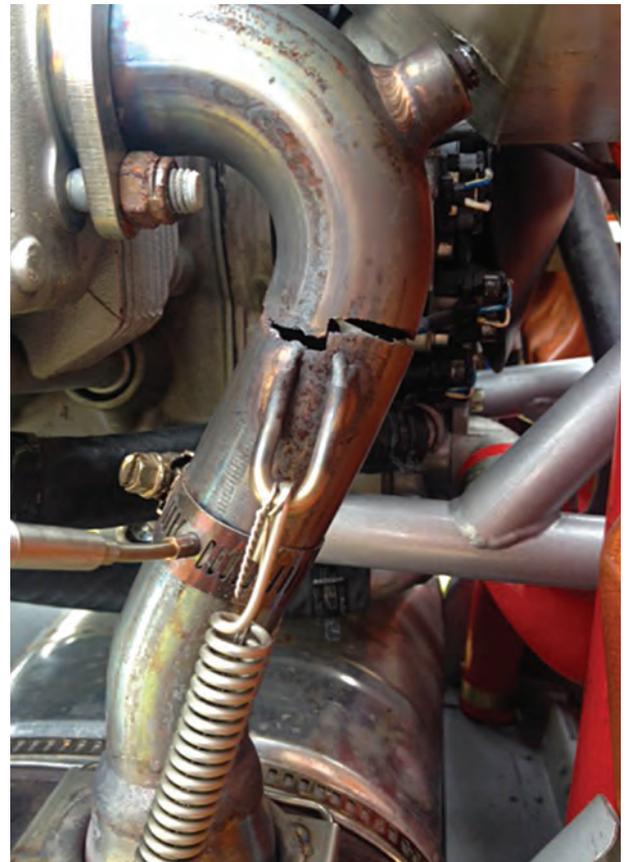
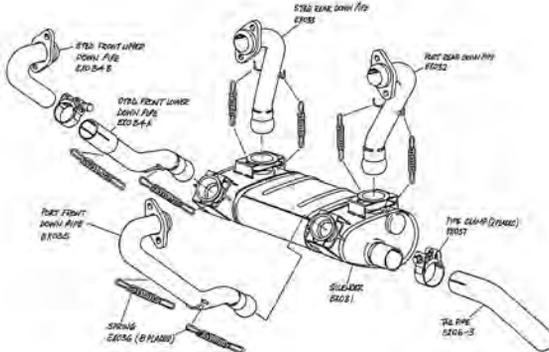
Thanks to Oban based LAA'er Donald Cameron for sending us this picture of the failed exhaust on his Europa XS. Donald explains, "Whilst on a flight earlier today, I was flying along and, all of a sudden, there was a sudden change in engine sound. No engine vibrations felt, it just got very noisy. Ts and Ps were within range and everything was performing as it should. I therefore presumed there was a problem with the exhaust system somewhere. Noting this wasn't normal, I performed a quick turn around and headed straight back towards my departure airfield."

Well done to Donald for expediting the landing; exhaust leaks, when they occur, can be quite dangerous for very obvious reasons.

You can see that this exhaust system, specially made by CKT Exhausts for the Europa, is actually quite a complicated piece of engineering. Naturally we've seen examples of exhaust cracking before, but I think that this sort of failure, after only 30 hours of running, is unusual. The failure appears to have emanated from the welded spring attachment tang and it's possible that the material has become thinned, or perhaps embrittled. I would imagine that the precursor crack would have been spotable some time before the complete failure and, perhaps, that's the lesson that should be drawn from this failure.

Whatever the cause of this particular failure turns out to be, hats-off to CKT who exchanged the damage part FOC without quibble.

(Photo: David Cameron)



## LAA ENGINEERING CHARGES – PLEASE NOTE NEW FEES APPLY FROM 1 APRIL 2015

### LAA Project Registration

Kit Built Aircraft £300

Plans Built Aircraft £50

### Issue of a Permit to Test Fly

Non-LAA approved design only £40

### Initial Permit issue

Up to 450kg £450

451-999kg £550

1,000kg and above £650

### Permit renewal

**Up to 450kg £155**

**451-999kg £200**

**1,000kg and above £230**

### Modification application

Prototype modification minimum £60

Repeat modification minimum £60

### Transfer

(from CofA to Permit or CAA Permit to LAA Permit)

Up to 450kg £150

451-999kg £250

1,000kg and above £350

### Four-seat aircraft

Manufacturer's/agent's type acceptance fee £2,000

Project registration royalty £50

### Category change

Group A to microlight £135

Microlight to Group A £135

### Change of G-Registration fee

Issue of Permit Documents following G-Reg change £45

### Replacement Documents

Lost, stolen etc (fee is per document) £20

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