With Malcolm McBride
Airworthiness Engineer

ACCIDENT STATS AND DEEP MAINTENANCE

Some interesting corrosion issues this month plus Europa doors, missassembled Foxbat harnesses and EFATOs

Welcome again to Safety Spot; as always, I do hope all's well for you and those close to you. Personally, I'm feeling a lot better now that I've shed a bit of the Christmas growth… mostly round the middle. January has been a month of meagre portions and very little in the way of exciting food. I know that I'm in trouble in the weight department, not only because of the obvious difficulty in doing up the trousers but also by measuring the trouble I have hauling my personal mass upwards after squatting-down to get the ice cream from the bottom cabinet of our stand-up freezer. The ice cream, and therefore this test, has had to go: along with the biscuits, chocolate and sadly most of the other enjoyable taste experiences.

Touchy? Me? Surely not… But then you haven't started reading this Safety Spot to hear about my personal weight maintenance failure over the Christmas break or even my recent successes in that department, so what's been going on in the continuing airworthiness world I inhabit here at LAA HQ?

I've just added up all the 'Reportable' accidents involving LAA machines that were recorded in 2014 and, rather like the recent announcements about 'improvements' in the airliner crash statistics, we didn't, in my humble opinion, have too bad a year.

With regard to the airliner accident statistics published recently in Flight magazine, which are based upon its FlightGlobal database, its analysis suggest that there were 19 accidents 'involving a fatality' in 2014 against 26 fatal accidents in 2013; quite a drop and, on the surface, good news. But, perhaps demonstrating again that a clever person can adapt any statistic to prove any individual point, there's a bit more that needs to be considered before using adjectives like good or bad. For instance, if you count the number of deaths due to these accidents, you'll see that the number was substantially higher in the period; 671 in 2014 against 281 in 2013 so, from the perspective of individuals who have died, it might be considered a bad year. After all, each death is a death too many.

There's a reason for this divergence of course as David Learmount, in his excellent safety article, points out; three of the accidents in the 2014 period involved pretty big jets and one large turboprop.

We, rather more relevantly to this publication, suffered two fatalities in 2014, which is a little less than 50% of the ten-year average. Incidentally, this average annual number of deaths in LAA-administered Permit aircraft has remained fairly constant, even though our fleet size has more than doubled during the period. We should take some pride, as a family of flyers, in this fairly low number, especially when one considers the types of aircraft we all fly. But, as I said earlier, one death is too many and we all must continue in our joint safety efforts. As many of you will know, this year has started badly with the report of a fatal accident involving a Pioneer 400.

So, what about our numbers in 2014? Well, Maxine Oades, who as many of you will know manages our excellent Engineering Admin Department, has just sent round the Engineering 'Activity' totals for 2014 and I think that it's worth sharing these before we look at the accident totals. When Maxine publishes these activity reports each month, I'm mostly interested in the number of Permit renewals carried out during the period; this reflects the number of LAA aircraft that are operating.

Naturally, we have quite a few aircraft that have just been issued with their first Permit which don't feature in this number and, importantly in this safety context, a number of aircraft yet to receive a Validity Certificate, but are flying on test.

Looking through the data, without being too precise, we renewed 2,564 Certificates of Validity (about 80 up on the 2011-13 average) last year. Add to this, 123 aircraft which received their first Permit and some 50 aircraft flying on initial test permits, and you see that there are about 2,737 aircraft flying, one way or another, in our fleet.

You might be interested to hear that our total fleet size, as I write (this number fluctuates day by day, as you will imagine), is 6,473 aircraft, so something a little over two thirds of our fleet is either being restored, repaired, under construction or just plain languishing groundside for the time being. For the purposes of my simple flight safety review for 2014, as I mentioned, I'm only interested in aircraft that are currently flying and, for this purpose we'll settle, if you let me, on 2,737.

So, what did 2014 look like from the flight safety perspective, overall? Well, before I give you the numbers, I should relate one statistical tale that I've been hearing of late. I appreciate that the following might go against the grain in our new environment, where reductions in regulation and doing away with, so-called, 'gold plating'; knowing my role as a safety engineer, I know you wouldn't expect less. To the tale, which I nearly started to believe!

"Don't you know that almost all of the money in continuing airworthiness support goes on trying to prevent failures due to technical issues and almost nothing on errors caused by pilots"?

"No," says I, wondering about my career prospects.

"Yes, with over 90% of accidents caused by pilots 'screwing things up' and have nothing to do with things breaking, are we spending the money wisely?"

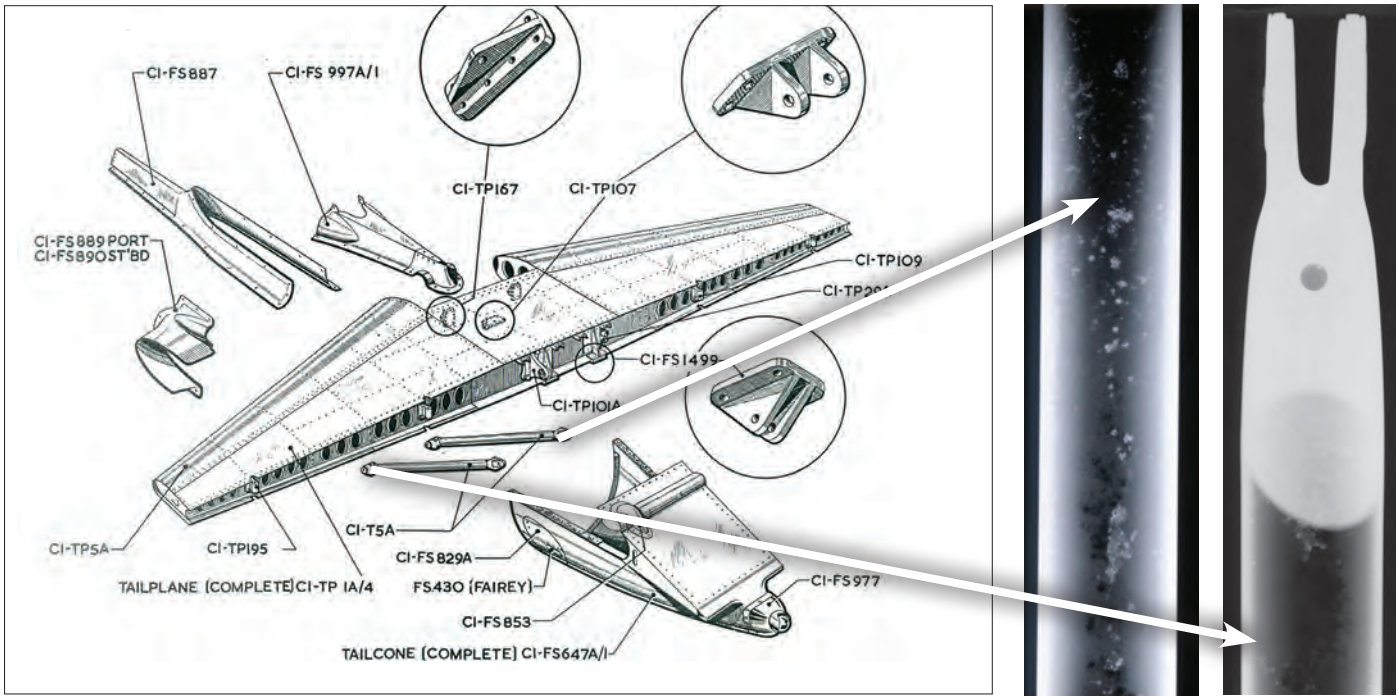
I definitely agreed that more resource should be allocated to pilot educational programmes and I know that discussions about how we might better do this are being held at LAA Director level.

The claim that most accidents start with an error by the pilot might be true, especially when you consider that an LAA machine's maintenance is managed by the owner (who, more often than not, is also the pilot) and not necessarily a trained aircraft engineer, and this deserves a closer look. Here's what I found when I started to crunch the numbers.

REPORTABLE ACCIDENTS IN 2014 – A BRIEF ROUND-UP

First of all I should explain that the numbers I lay out below reflect only those incidents that have been reported to the UK AAIB; that's important as we have no way of knowing how these numbers relate to accident rate 'reality'. We have to start somewhere however, so it's probably worth starting as I mean to go on, with a lot of health warnings. First health warning then: we don't have an accurate percentile input recording rate. For some types of accident this is probably close to 1, a crash on an airfield is likely to be reported one way or another but I suspect that field damage caused, just for example, by an engine failure might not be. Because we're an honest lot in the LAA, I would put the figure quite high, perhaps 0.7, maybe a bit higher, but it won't be 1.

These days, where clever computer systems and ruthless accountants rule, it's unlikely that the AAIB will conduct a full investigation into a light aircraft accident unless the accident ends up in a fatality or if there is some other serious safety implication. ›



These pictures show why it's important to include, as part of the aircraft's Tailored Maintenance Schedule, checks for problems found in the past. The schematic shows a number of components where history has demonstrated that a close look is warranted at regular intervals. For the Chipmunk aircraft, information about the empennage area is covered in a number of Technical News Sheets and engineers consider that these checks are so important that they're actually backed-up by CAA Airworthiness Directives so they become 'must do' jobs. The Chipmunk tail is effectively held on by brackets and steel tubes, you can see the tubes in the schematic, marked CI-T5A. History has shown that these steel tubes are prone to corrosion and because of their structural importance, they need to be X-rayed every seven years. The X-ray pictures I've shown offer guidance as to the maximum acceptable limit of corrosion before the parts are scrapped. The method to be used and the period between checks is laid out in *TNS 186.*

Some owners have been asking the LAA whether the period between checks, currently seven years, could be increased to, say 12 years, bringing them into line with other Chipmunk X-ray checks. I asked Bill Taylor, De Havilland Support's knowledgeable boss, whether these requests could be considered. He explained, "Certainly, we could consider extending the distance between checks but we'd need some evidence before we could explore this possibility. If LAA members can provide us with evidence that the safety of the aircraft wouldn't be compromised, then we'd be happy to re-visit the issue." So, if you've got radiological evidence that, in service, weakening corrosion isn't forming then send it to Bill. He's already got a 'file', so he tells me! Incidentally, the part circled (CI-FS1499) is subject to another TNS, *TNS 209*… but that's another story!

(Diagram: DHC-1 Parts Manual (1959)/DHSL)

I suppose, like everybody, every now and again I get a little boost. I received a lovely email from Finnish LAA'er Raimo Toivio a few weeks ago which, in excellent English for somebody who lives in such a different land, reminded us that we've still not found a mechanical solution to prevent pilots of Europa aircraft taking-off without first securing their doors. Here's the slightly edited email from Raimo.

Hello Malcolm. I am a Finnish LAA Member, regular reader and an absolute fan also! I have built an Europa XS and have flown it since 2007: 430 hours and 690 landings without problems. In Light Aviation (September 2014) you wrote about Europa door accidents and I got a déjà vu moment! Years ago, I decided to write you my thoughts about Europa doors and now I finally do it.

(You can see why I got a boost)

When built correctly, the Europa´s doors are easily closable. When Europa is operated correctly, they are surely and safely closed before take-off. But, because of slight variations in the build and a human error in the pre-flight inspections, a door is easily not-correctly closed and will open unintentionally. That action is dangerous, make hassle and is frightening, and demands an awful much work, time and money to repair that error. That´s possible, if you are even alive to do that work. When building, I wanted to prevent this situation so I planned and built a mod involving microswitches and panel-mounted warning lights. If port or/and starboard side door is incorrectly closed (i.e. one or even two shooting bolts are not engaged deep enough in the tunnel) I have red lights. If I add some power, as I do usually during take-off, because of a throttle switch, I get also a loud buzzer. I get two greens when closed. To get this simple system I needed couple of hours, five microswitches, four LEDs, a buzzer and some wire. The weight penalty is only around 100gr.

(Photo: Raimo Toivio)

The AAIB relies instead for its brief monthly write-up and overall accident statistic on information received from, normally, the pilot involved in the incident; the AAIB calls these 'Correspondence Reports'. Interestingly, in the January 15 AAIB 'Red Top', there were no 'investigations' undertaken in the GA world but about half a dozen reports created from information gained from telephone calls, emails and by letter. Obviously, this is health warning number two: it's very hard to put one's hand up to a mistake that's led to an accident, we're all, as a basic requirement for LAA membership, human.

The LAA has, as a matter of policy, rather shied away from taking up the role as the accident investigator; we rather support the independence offered by the UK AAIB. Naturally though, when an incident or accident involves one of our aircraft, we try hard to get to the root cause. It wouldn't be correct though to assume that an individual cause is always fully or sometimes even correctly elucidated. You guessed it, health warning number three.

For example, we know of one incident where the loss of control on take-off has been listed in the subsequent report as 'poor engine performance', a technical matter which should focus our efforts into improvements in maintenance and, perhaps, the annual flight test. Closer investigation by the LAA later demonstrated clearly that aircraft was being flown, at least flight was being attempted, in a considerably overweight condition.

> "When an incident or accident involveso one od our aircraft, we try hard to get to the root cause"

I must admit to quite liking the idea about a microswitch driven door warning system and, stimulated by Raimo's email (see p49) took some time to chat this idea through with the LAA's Europa Guru, Design Engineer, Andy Draper. I asked Andy how the various safety options were going. He explained, "There are a number of ideas on the table, for example, there are two different proposals which mechanically prevent the shoot-bolts from going into their respective orifices in the fuselage frame unless the door is fully shut. Both are good ideas but, in practice, have been difficult to get to work reliably enough to be called a safety system. We have considered warning lights but really this sort of thing needs to be built in when the aircraft's made and would be difficult to retro-fit".

Andy went on to explain that there was a number of owners working on the project in the field and he hopes to have an approved mod completed shortly. However, he continues, "I've got reservations about whether any 'bolt-on' safety solution would ever be 100% reliable and that good pre-take-off checks are surely the answer."

As it turns out, Raimo has some proof that Andy's predictions are probably accurate. Raimo continues, *"Despite all this safety system, once I was in so much hurry that I took-off despite one red light (and a screaming buzzer). I couldn´t think it is possible (for me) but it was! The reason for my hurry was because my willing to follow my fast wife taking off before me! I was wondering 'What the hell is screaming here in the cockpit?', until I noticed: the door was just going open but I managed to grab it back and close it (during take-off). Shame on me, but it was not closed at all! Hey I´m human also! So, this system is not an idiot-proof (a pilot who is following his dream lady), but at least works in normal circumstances!"*

Raimo went on to describe some other issues he's had with his Europa which I 'filed' for later use… I think that the point's been made. Before committing to flight in any aircraft remember 'Hoods and Hatches – Closed and latched'.

(Photo: Raimo Toivio)

"Well, it was alright last year when we went off on our holiday; can't understand it, very embarrassing!"

All that said, the total number of reportable accidents in 2014 was 63. The last time we did a thorough (with health warnings) analysis was in 2011 and the total number of reportable incidents was listed as 60 (see the 2011 Accident Summary in the December 2012 edition of Light Aviation). Our active population of aircraft in 2011 was 2,505, so we've seen our fleet increase in size by about 11% in the period but our reported accident rate only rose by a little under 5%.

As I've explained before in Safety Spot, we file the accidents into two basic categories: pilot error, which we call out of kindness, Operational Incidents; and those that have, at their root, some kind of technical issue, which we call Technical Incidents.

OPERATIONAL INCIDENTS

The total number of Operational Incidents throughout 2014 was 38; these break down into the following individual failure areas:

- Technical error by the pilot = 2 (both related to undercarriage operation)
- Loss of Control by the pilot = 35 (Taxi/Start-up/Parking = 4, Take-Off = 9 (1 Fatal)
- Landing = 22.
- Collision = 1 (Fatal)

TECHNICAL INCIDENTS

The total number of Technical Incidents throughout 2014 was 25; these break down into the following individual failure areas:

- Accidents where the origin was a failure of the engine = 13 (Take-Off = 7, other = 6).
- Accidents where the origin was a structure or component failure = 12; these break down as follows:
- Undercarriage Failures = 8 (Nose = 6, Main = 2)
- Door/Canopy Failure = 2
- Pitot Head Failure = 1
- Primary Structure Failure = 1 (Tailplane)

Out of interest, perhaps stimulated by recent problems being suffered by one engine manufacturer because of an apparent lack of reliability, I looked at a breakdown of engine failures leading to an accident by engine type The following is what I found:

- Rotax = 10 accidents - (R447 = 2, R582 = 4, R503 = 1, R9 (series) = 3).
- Jabiru = 1 accident - (J 2200A).
- Lycoming = 1 accident (O-360).
- HAPI = 1 accident (H60).

Naturally, because these engine failure numbers relate only to incidents that reach or surpass the 'reportable' threshold, in other words where there's a subsequent accident which causes damage to the airframe or injury to the pilot or their passengers, our health warnings need to be applied with regard to this engine failure rate. The majority of engine failures suffered by LAA'ers are competently handled and don't lead to an accident, meaning that many will therefore remain unreported. Also, it must be remembered that an engine failure caused by a structural failure of the engine itself is a relatively rare thing, even among our aging engine fleet. Most engine stoppages are the result of failures in the associated ancillary items, like the magnetos and carburettors (which should be counted as part of the engine) or a fuel supply issue (which is normally considered as part of the airframe).

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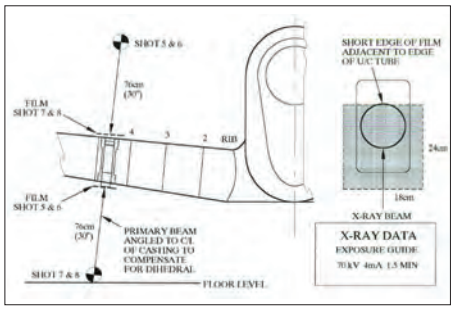
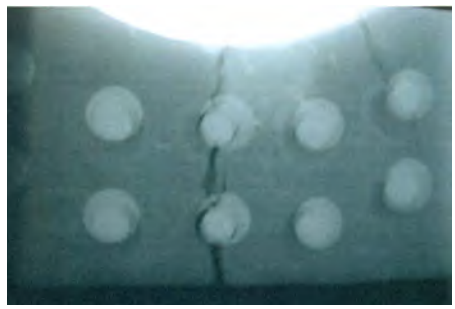
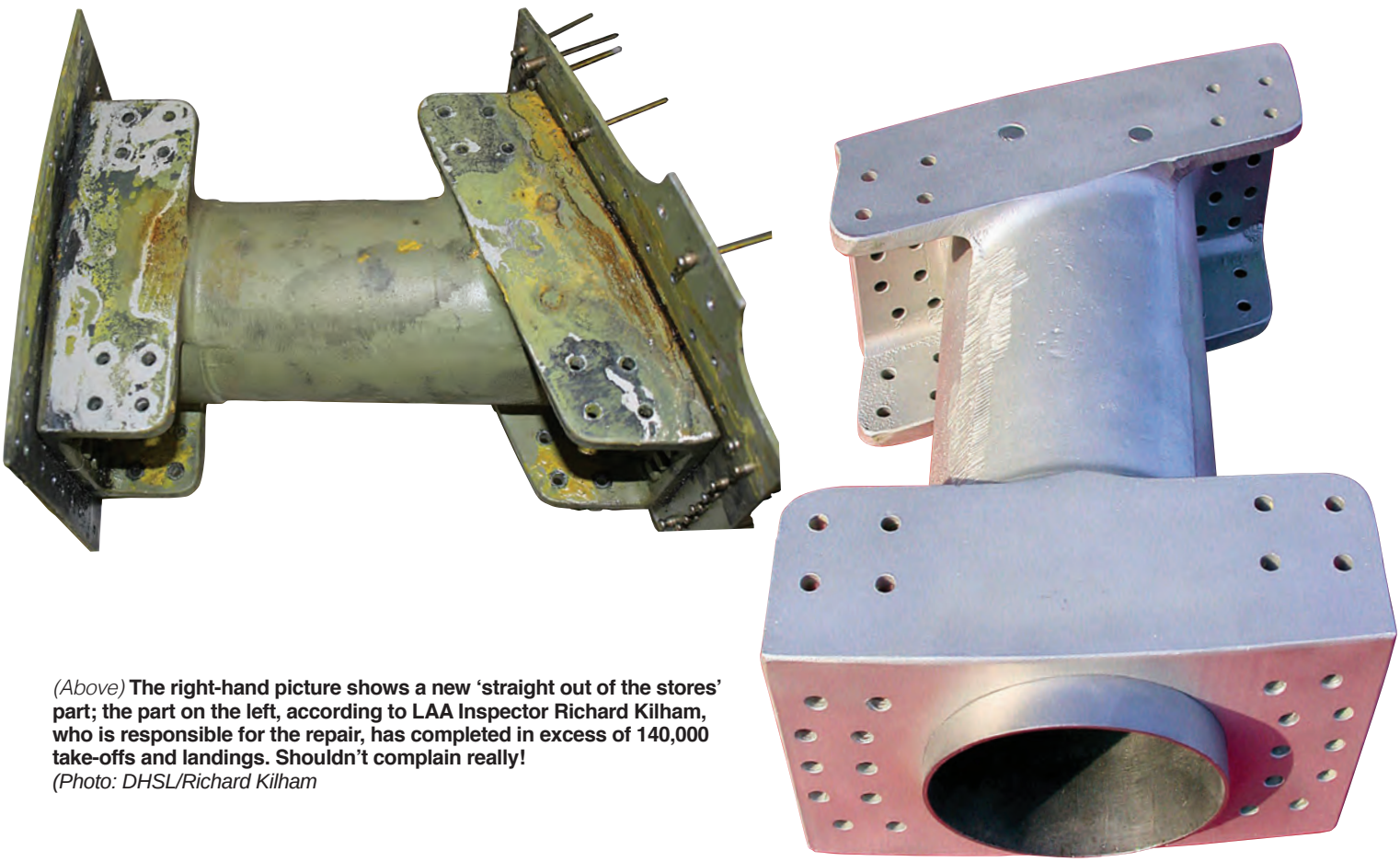




(Left) **X-ray beams travel in straight lines so there are a number of different angles used to check the undercarriage casting on the Chipmunk aircraft. This is the angle that found the crack. I've included the X-ray picture for your interest, the crack is clearly visible. Remember, this crack would normally be hidden by the top wing skin and casting so, without actually removing the casting, X-rays are the only way of inspecting the part.** *(Photo: DHSL)*



(Above) **The right-hand picture shows a new 'straight out of the stores' part; the part on the left, according to LAA Inspector Richard Kilham, who is responsible for the repair, has completed in excess of 140,000 take-offs and landings. Shouldn't complain really!**
(Photo: DHSL/Richard Kilham

The series of pictures above and right clearly show the good use of X-ray inspection to look inside hollow structures. This picture of the Chipmunk wing shows just how much of the surrounding structure, which completely masked visual inspection, had to be removed to gain access to the component.
(Photo: Richard Kilham)

(Below) **Once removed, the cracks can be easily seen although, in situ it would be virtually impossible. Clearly this part has seen better days and needs replacing.**
(Photo: Richard Kilham)

Regular readers of Safety Spot will know that many of the incidents listed above will have been discussed at some length already. As I sit here I note that some remain on the chopping block and some still sit in the larder… Perhaps future food for thought.

DE HAVILLAND DHC.1 CHIPMUNK – MAIN UNDERCARRIAGE LEG MOUNTING – SERIOUS CRACK

Certainly, one way of reducing accidents and potentially dangerous incidents is to ensure that the aircraft you're flying is in top-notch condition. Military and airline pilots get used to enjoying the fantastic engineering back-up provided; this 'division of responsibility' between aircrew and technical support has, to some extent, bled-through into operating practice in the PPL training school and, although less so, in the flying club environments. When operating an LAA Permit aircraft, the onus of responsibility for all things rests with the owner, who is normally the pilot or, in the case of a group owned machine, the technical representative.

One element necessary to keep the flying machine in this near-perfect state is adherence to a carefully thought-through maintenance schedule. This is part of the deal when you hire an aircraft with a full Certificate of Airworthiness but, in the Permit to Fly world, the application of the maintenance is primarily the responsibility of the owner. Naturally, in reality, responsibility for good continued airworthiness is, in the LAA system, shared three ways.

First, HQ Engineering plays its part by offering technical assistance where necessary and by sharing continuing airworthiness information, either directly or in technical publications (like this one). The LAA also provides the 'platform' upon which the aircraft can be safely managed.

Secondly, an important member of the team is the LAA Inspector. These very special aircraft engineers, carefully selected because of their ability to spot issues on an airframe or engine before they become problems, are integral to the success of the LAA's system.

Thirdly, last but not least, perhaps the most important person in the three legged stool supporting all of this is, naturally, the owner him or herself.

The LAA recommends that all aircraft owners create a Tailored Maintenance Schedule for their aircraft and offer guidance in the form of a number of Technical Leaflets which are easily downloadable from our website, including a Generic Maintenance Schedule, which covers the basics, as a starting point. If you're thinking of doing this, it's best to get your inspector on-board with the project early. A Tailored Maintenance Schedule should not only include the normal manufacturer's maintenance requirements but should also include maintenance applicable to any specific equipment fitted (for example VP propellers or installed ballistic parachute).

Local operational effects, that won't normally have been considered by the manufacturer, also need to be considered. For example, one particular machine might operate from a perfect runway in only perfect weather; another similar machine may operate from a rough farm strip in the roughest of conditions. A Tailored Maintenance Schedule should be designed to reflect these differences.

Another factor that we've talked about before in this column is the effects of low utilisation

> "The LAA recommends that all aircraft owners create a Tailored Maintenance Schedule for their aircraft"

on an airframe. Your Tailored Maintenance Schedule needs to be written in such a way that calendar time limits are given more weight if the airframe is only rarely used. I'm not actually sure (yet) about the average annual hours flown by the average LAA pilot, if there is such a thing. Perhaps another health warning? But I'd be surprised if it were more than 25 hours per year. That's four years between 100 hour maintenance checks, clearly not sensible. The LAA's general system, where the annual check which takes place at the Permit renewal inspection, is based upon a 100-hour check and goes some way towards filling this gap but, unless deep-checks are mandated, as in the case of this particular story, there's a natural reluctance in carrying them out.

Whilst we're on the subject of calendar-driven checks, when you design and construct your Tailored Maintenance Schedule, build-in regular deep inspections. Personally, with low utilised aircraft I like to see a relatively deep inspection after three years, then a very deep inspection at six years. If you're clever, where appropriate you can synchronise this very deep check with your six-yearly CS propeller overhaul requirement.

So, what of the crack found in a fairly high-hour Chipmunk? Well, I've included it in this month's Safety Spot because it's an interesting example of how continuing airworthiness is managed on an aircraft with known 'problem' components. In this case, because of the material specification and manufacturing method used in the main undercarriage attachment housing, they have been known to crack. In actual fact, materials experts have worked out that the cracking is primarily due to stress corrosion cracking and not because of locally applied overloads. That means, in short, that crack propagation is a function of time and not operational effects.

To accommodate this known weakness and

> "Crack propagation is a function of time and not operational effects"

to avoid complete failure, a Technical News Sheet (DHSL TNS 165 issue 7) was issued laying out the rules engineers must follow both in the frequency of checks and the limits of acceptable cracking. Notice that this TNS has reached issue seven, this is because, as more experience has been gained through the years, the rules have been tweaked to become more appropriate to the problem. The only way to check these components in situ is using X-Ray technology and this can be very expensive. I've discussed this particular 'Spot' in a more focussed way under the pictures. This narrative, stressing the importance of creating and adhering to a Tailored Maintenance Schedule, wouldn't be complete without reminding owners of the importance of including engineering advice gained over the years. This information, in the aircraft engineering world, comes in many forms which include Airworthiness Directives (ADs), Service Bulletins (SBs), Airworthiness Information Leaflets (AILs) and, as in this case, Technical News Sheets (TNSs). We try to maintain an accurate record of all this information in the aircraft's Type Acceptance Data Sheet (TADS) which, for many types, can be downloaded from the technical section of our website. The diligent owner would be wise to explore all this technical information and, where appropriate, add these requirements into their Tailored Maintenance Schedule.

AEROPRAKT A22-L FOXBAT – SEAT BELT INCORRECTLY FITTED

I received an email from midlands LAA'er, Graham Elvis, who was concerned that he's been flying around for the last 100 hours or so in his Foxbat A22L microlight aircraft thinking that he was securely strapped in. However, when he looked more closely at the straps adjustment fitting because one of the straps was a bit 'stiff', he discovered that both he and his passenger might as well not have bothered to put the shoulder strap on at all. Here's a copy of Graham's email:

Hi Malcolm,
Here's a new subject for you. Since I bought my Foxbat I've had one of those minor, nagging, problems - one of the two shoulder strap-adjusters has been very hard to alter. Oddly, the same was true of the passenger side, I had tried lubrication but to no avail. I have just found the cause and thought I'd better let other people know about it through your Safety Spot column. I found that the webbing had been threaded the wrong way round in the adjuster (see my picture). Naturally I put things right so to speak, and all was well. I felt pleased with myself, as one does on solving a long-term problem.

It was a little while before I realised the true significance and how dangerous to my health this situation was. The way the belt had been assembled meant that the webbing would have parted company with the adjuster in a crash because only the plastic frame was holding the two parts together! I think that this error was made by the belt manufacturer and has gone undetected since new.

Since this type of adjuster is very common in our LAA fleet, as I said, it's worth letting other members know.

I look forward to reading your Safety Spots in 2015!
Regards, Graham

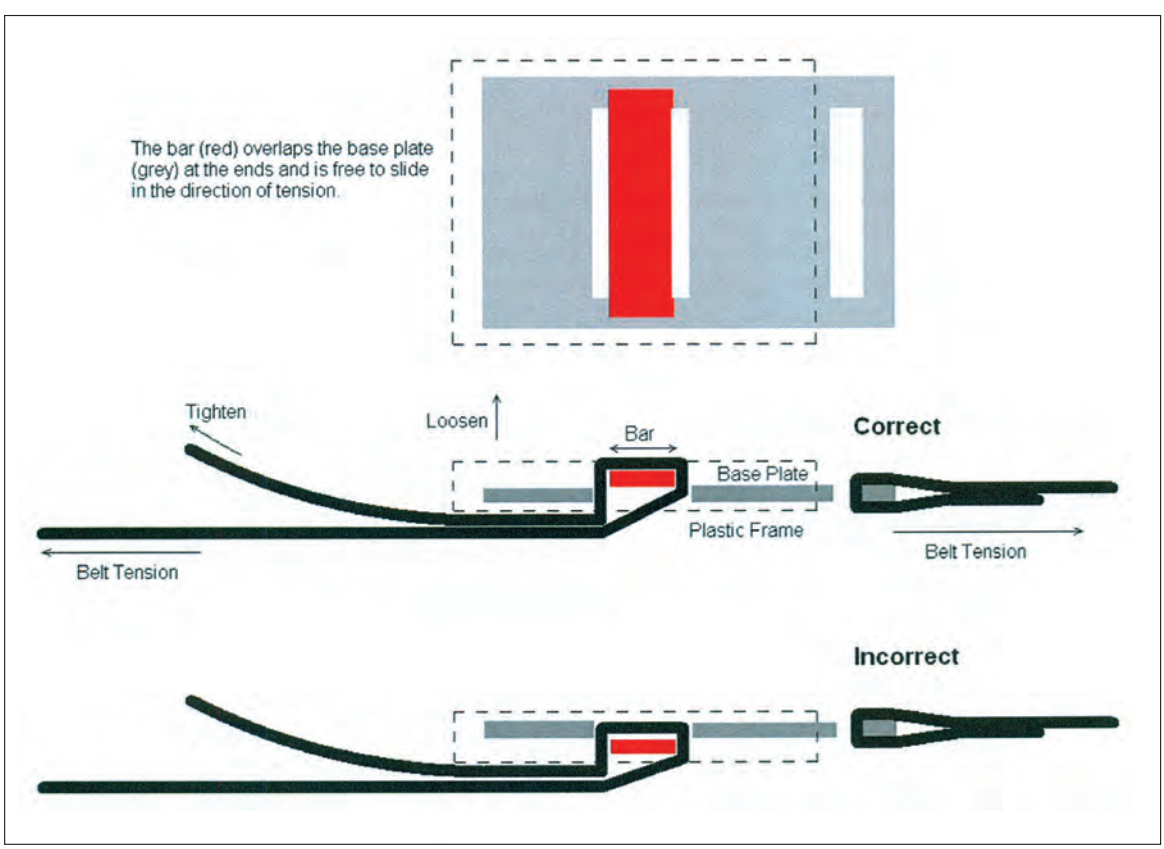
Thanks Graham for your 'head's-up' about this issue and, as you can see, I've included your picture and sketch showing the problem you found. I agree with Graham that this type of harness is used extensively, especially among the kitbuilt microlight types in the LAA fleet. We've got 50 Foxbats on our books, 36 of them currently flying. The machine has a number of variants which, depending on the model, are classified in the UK as either an SEP (Single Engine Piston) with a maximum weight of 475kg or 600kg, or as a microlight, where the maximum all up weight is limited to 450kg.

Graham's actual aircraft bucks the trend slightly when it comes to annual flying hours achieved; I note that last year the aircraft flew over 70 hours. I don't blame him, if I had one I'd be in the air in it whenever I could too! This aircraft is coming up for 250 flight hours old and received its first Permit in 2007 so, aside from the initial Permit issue inspection, this aircraft has had seven annual inspections, two of which should have been relatively deep inspections, yet this issue with the straps wasn't discovered.

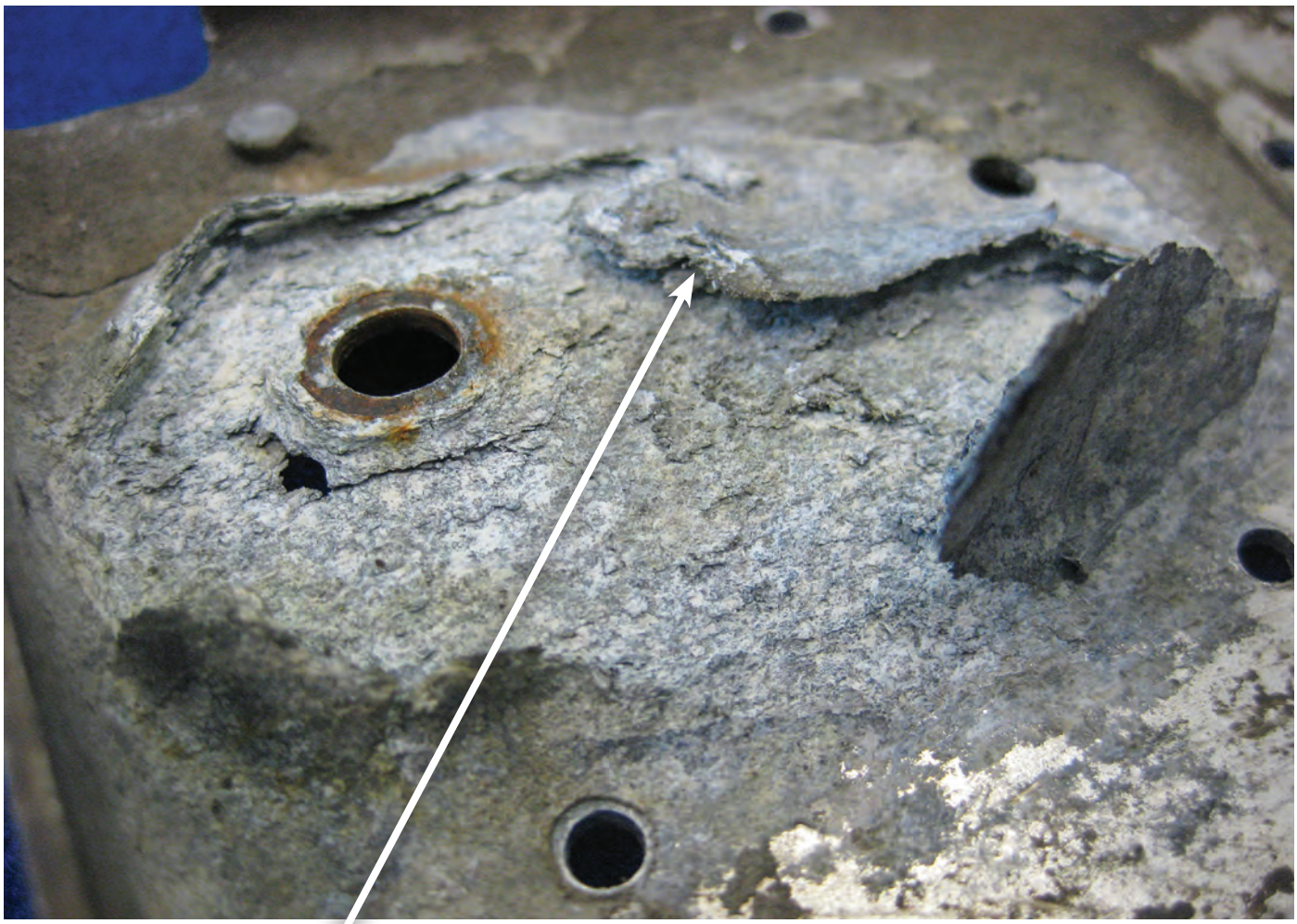
Had Graham, or either of the aircraft's two previous owners, suffered an accident where these straps were needed, the outcome may have ended up much worse, especially in terms of upper body and facial injury. My advice, when carrying out an annual inspection, is to start with a clean sheet of paper; don't assume, just because things look OK on the surface that all's well behind the scenes. I've got the renewal paperwork for this aircraft on my desk and quite a few people have signed over the years that the harness is fit for service despite the serious assembly (or, perhaps, re-assembly) error.

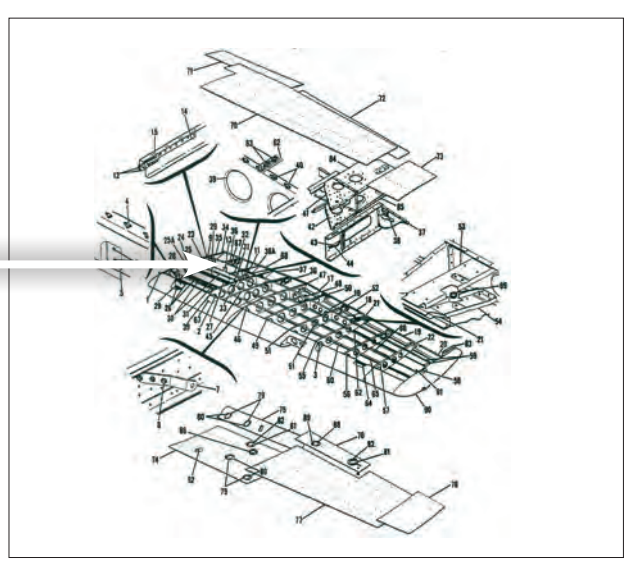
There's more than the average number of pictures this month so limitations in space means I'll have to put my pen down for another month. Fair Winds. ■

This picture shows a shoulder strap adjustment buckle from a Foxbat aircraft. From the surface, the strap looks perfectly normal but, because the webbing was incorrectly looped against the restraint, forces imposed were only reacting against the plastic cover and this device would have undoubtedly failed when called upon to restrain a pilot in an emergency. *(Photo: Graham Elvis)*



This sketch, created by Foxbat owner Graham Elvis, shows what was wrong with the assembly. We think that there are three engineering points where this error may have been introduced: the first is that it was a manufacturer defect; the second possibility is that the harness was misassembled during initial build; and the third is that at some point during maintenance or repair the straps were removed and incorrectly re-fitted. In any event, checking the function of the straps is an annual requirement so this error should have been picked up earlier. *(Diagram: Graham Elvis)*

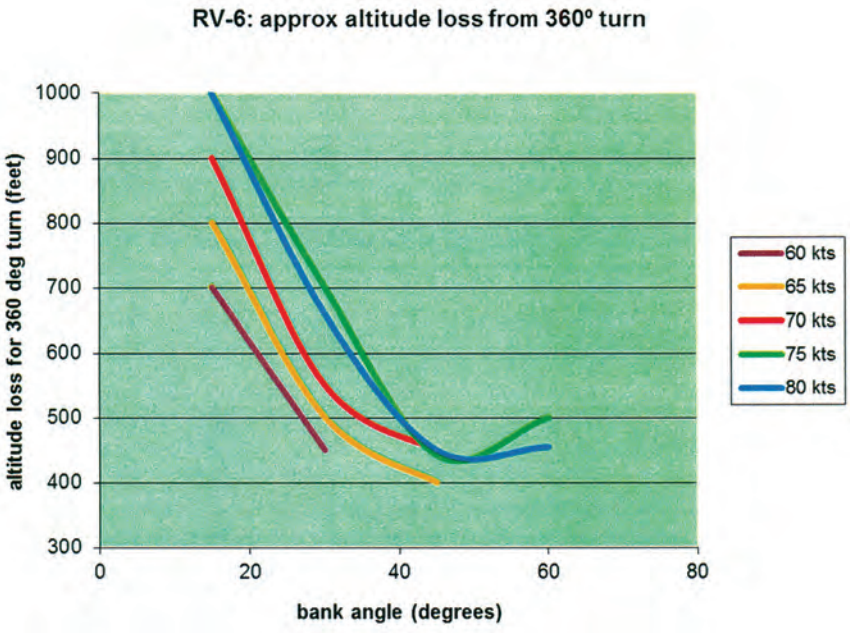




Here's a picture of a part that Ken Craigie, our Chief Inspector, gave me the other day. The part was provided by St Athan-based LAA Inspector John Sparks after a site visit which is part of the LAA's audit programme. I gave John a call, both to thank him for the gift and to find out a little more about its origin. John explained that he had purchased the aircraft, a Cessna 150A, with a view to refurbishing the machine. The aircraft itself needed a new firewall because of serious cracking; this, as you will imagine, is a job not for the faint-hearted!

When the old firewall was finally removed, John was shocked at the level of corrosion he found and so decided to carry out a deep inspection of the whole aircraft. This particular machine first went into service as a training machine in 1968, nearly half a century ago, and has, in this time, accumulated nearly 7,000 flying hours. The actual rib shown in the picture is the one that holds the electric motor that drives the flap. You can see that this rib appears to have corroded from the inside out; from the surface this type of corrosion is easily missed and, as you can see, this attachment wasn't that far away from failure.

What I think has happened is that the flap motor has probably been changed at some time in the past and the mechanic doing the job refitted the new part without including some corrosion protection (for example, chromate paste) in the joints, especially the joint between the attaching steel bolts and the aluminium alloy of the rib. In this case the bolt has acted as a cathode and the rib the anode. The small, but continuous current created in this little battery has led to this intergranular corrosion which was only discovered after John called for a 'finger-tip' inspection of the whole aircraft. Certainly, had this structural weakness not have been found then there would have always been the possibility of a flap failure which would have certainly spoilt somebody's day.



"Instructors should be able to give relevant actionable advice and training to pilots for an EFATO scenario"

As Airworthiness Engineer for the LAA, I have the very great privilege of being able read most, if not all, of the local strut newsletters; some, I have to say, make a very good read. I saw the above graph in the excellent Devon Strut January 2015 newsletter and thought that, because it relates to a very important topic, I'd share it more widely. As you can see, the lines on the graph relate to the height loss in a 360° power-off turn at varying angles of bank. The graph was based upon experiments made by LAA'er Peter Gorman who, when I had the opportunity to chat to him directly, explained that his early career started as an engineer and mathematician but ended up as a chartered accountant. He's been flying now since the 1990s and has toured extensively in both a Jodel and, latterly, in his RV-6. He added that "The 6's cockpit feels like home!"

In the newsletter, Peter writes, 'This is an interesting confluence between engineering, empirical flying, aviation culture and mass psychology!'

'I think we should not limit our study of these matters for fear that it might be unsuccessfully attempted by those who are not competent to do so. In that case no-one should ever practise stalling or other manoeuvres which, if botched, could lead to mishap. The competence of 'average Joe' should not be the limits of possibility for everyone, especially for those who fly a type regularly or fly their own aeroplane and who ought to know its envelope of practical possibilities in the event of an engine failure.

'Instructors, all the more so, should be able to give relevant actionable advice and training to pilots for an EFATO scenario. Just saying that turn-back is out of the question, and therefore should not be taught or practised because rusty pilots might mishandle it and come to grief, is a counsel of despair – you could say the same about average Joe going flying at all!'

I do agree that it's necessary to include all types of failure situation into a pilot's training and well done to Peter for going out there and getting some interesting 'real life' data and sharing it with us all.

Clearly, in some circumstances, it might be possible to turn-back with relative safety. Peter's graph is useful albeit a bit optimistic in my view, in that it shows that, up to a point, quite a steep turn appears to be the option that equates to the least height loss: in some cases, it might be possible to turn back straight into the down-wind leg of a circuit pattern and land normally. If this is an option, a sensible rate turn would be, as the graph suggests, the most sensible plan. The reason why the 'Never Turn Back' concept was introduced, I think, between the first and second European wars, was that people were getting killed regularly attempting it.

The biggest problem faced by the pilot when his or her engine quits will be that they won't be expecting it and, in all too many cases, pilots stop flying the aircraft and start doing a complicated analysis about options available. My message is, and will remain, in an emergency situation, 'Fly the Aircraft First' . Once you're doing this, explore as many options you want, but bear in mind that in real life your options after an EFATO will almost always be very limited.

LAA ENGINEERING SCALE OF CHARGES – PLEASE NOTE NEW PERMIT FEES HAVE APPLIED SINCE 1 MARCH 2014

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 390kg	£320
391 - 499kg	£425
500kg and above	£565
Three seats and above	£630
Permit renewal	
Up to 390kg	**£115**
391 - 499kg	**£155**
500kg and above	**£210**
Three seats and above	**£230**
Modification application	
Prototype modification	£45
Repeat modification	£22.50
Transfer	
(from CofA to Permit or CAA Permit to LAA Permit)	
Up to 499kg	£135
500kg and above	£250
Three seats 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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