SAFETY SPOT

WE LIVE AND LEARN… SOMETIMES

With **Malcolm McBride**
Airworthiness Engineer

In-flight control failures on a Silence Twister and an Auster lead to forced landings – and more reasons to carry out that deep inspection

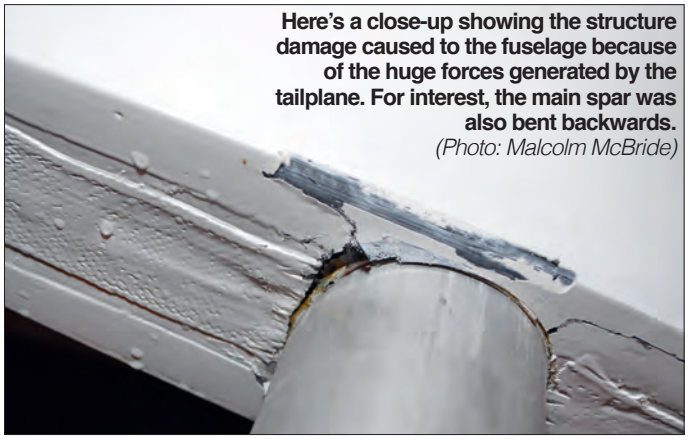
Here's a sorry sight and, although it seems impossible, that's the position that the tailplane, complete with the elevator, ended up after the tailplane securing pin failed on this Silence Twister. It's a pretty big airbrake… so big in fact that the pilot was only just able to maintain directional control and maintaining height was impossible even at full power. As you can see, the undercarriage has failed and although it cannot be seen in this picture, there was a fair amount of damage to the underside of the fuselage. *(Photo: John Marriott)*

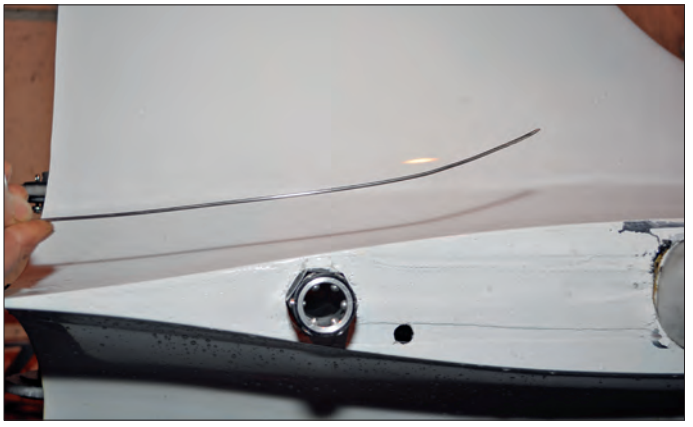
Hello again, and welcome to this month's Safety Spot. I hope that you are doing OK and the weather where you are isn't driving you completely mad. I live in a North Oxfordshire village which, as is the general nature of such places, has a stream running around the edge. We got fairly close to getting wet during the recent Jetstream-powered invasion of low pressure systems, the water started squirting up through the manhole covers and the little brook grew in stature. Thank goodness, a rescuing high pressure system saved us from a drenching at the last minute. I know that this salvation didn't arrive in time for many and, well, if you've been negatively affected, I hope that you're able to keep a smile on your face whilst sorting things out.

I know that many of you are affected by standing water on your runway. Just a tip, be careful if you're going to fly off a waterlogged runway, even if you know that the surface underneath is firm, take off and (especially) landing distances can be dramatically increased and, to be honest, it will be an unusual year if nobody ends up in a hedge because of this… don't let it be you!

Thanks to all of you that have written and telephoned letting me know that you liked Bite Sized Maintenance, you will note that it is missing this month, primarily because I had so much other material this month and our esteemed Editor couldn't let me have any more space; it'll be back next month hopefully. Thanks also to the members who offered a strong critique, one chap's view

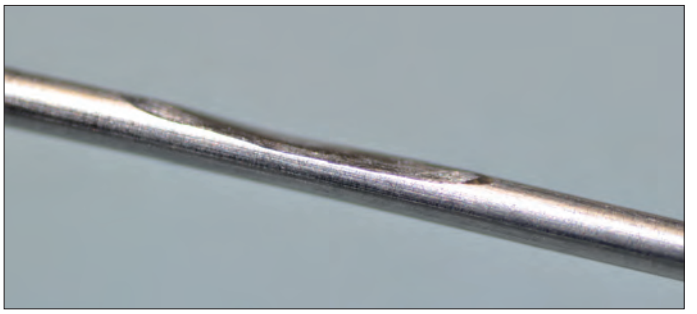
Here's a close-up showing the structure damage caused to the fuselage because of the huge forces generated by the tailplane. For interest, the main spar was also bent backwards. *(Photo: Malcolm McBride)*





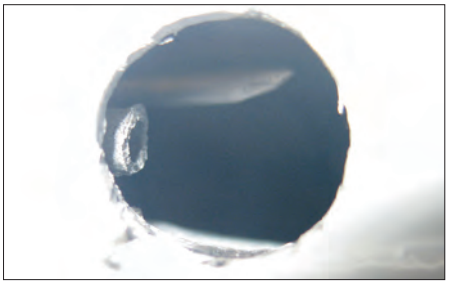
Above is a view of the rear fuselage section of the Silence Twister; note that the rudder has been removed. The locking pin is inserted through a hole at the rear of the fuselage and has to pass under the elevator drive (that's the clever hexagonal fitting slightly left of centre), hence the bend in the pin. You can just see the edge of the tailplane's main spar. It is not necessary to remove the pin completely as the pin really only needs to clear the tailplane locking spigot, but complete pin removal appears to be the precursor for this type of location issue. *(Photo: Malcolm McBride)*

***(Left)* A picture of the other half of the equation, the female side of the elevator drive is clearly visible and the tailplane rigging spigot takes centre stage.** *(Photo: Malcolm McBride)*



Above is another view of the tailplane rigging pin, and another clue as to what went wrong with the rigging operation that led to an in-flight control failure. This wear has been caused because the guide tube has been fitted too close to the elevator drive tube. What looks to have happened is that the guide tube has worn through and this has allowed the pin to leave through the side of the tube. *(Photo: Malcolm McBride)*

Above is a picture of the elevator drive tube of the Silence Twister that nearly lost its tailplane. You're looking from the rudder-end of the fuselage, the rudder cable is visible (from centre to bottom right). You can see that the rigging pin's guide tube (arrowed) is rubbing on the elevator drive. *(Photo: Malcolm McBride)*



***(Left)* This picture shows why the locking pin failed to go through the tailplane spigot… and how the fact that it had done this was so easily missed by two experienced LAA flyers.** *(Photo: Malcolm McBride)*

was that the feature was 'full of inaccuracies' especially towards Chipmunk maintenance; all of the critique has been taken on board and will, hopefully at least, serve to improve the feature. We live and learn!

This month's Safety Spot's planned emphasis has changed over the last couple of days which, in a way, makes me feel a little better about leaving the task of writing it until the very last minute! I was going to travel up from the wheel bearings, if you remember, the January Bite Size topic, and chat about the need for deep undercarriage inspections; I have a couple of serious undercarriage failure-related accident tales that I'd like to share with you, both of which could have been avoided if an undercarriage strip inspection had been included in the owner's Tailored Maintenance Schedule.

Of course, it's easy, after an event, to be clever; villagers near us have been flooded-out for the first time in the village's history. The official line, such as it is, that the change in status from 'inshore' to 'aquatic' is due to climate change. The view of the villagers is slightly different, they think that the recent deluge has more to do with a recent housing development in the fields on the edge of the village. Perhaps we should say, "We live and learn (sometimes… if it suits us)".

SILENCE TWISTER – TAILPLANE ATTACHMENT FAILURE

Yes, you read it right, tailplane attachment failure. Scary stuff for all concerned, I can tell you. The most important thing, naturally, is that the pilot, John Marriott, walked away from the resulting crash without a scratch – primarily because he did just about everything right. In retrospect, and having spoken to him, I'm sure that he would agree there was more than a pinch of luck involved. Lady Luck aside, when John was confronted with a horrible in-flight situation the first thing he did was continue to fly the aircraft right down to the ground. John, by doing this, gave himself the time to assess the situation, make a plan and sort things out so, a very big well done to him.

Anyway, what happened to initiate the first reportable accident involving an LAA aircraft in 2014? Probably the best place to start is to share a letter I wrote, pretty ›

much straight after the incident, to all the other LAA Twister owners letting them know what had happened.

DEAR SILENCE TWISTER OWNER,

I am writing to let you know that there has been a serious in-flight control failure involving a Silence Twister and to explain, as far as I am able, what happened and what you need to do during your pre-flight inspection to ensure that a similar event doesn't happen again. The investigation is at a very early stage and discussions haven't taken place between the aircraft's kit manufacturer or the UK agent so we're not sure whether it would be possible for this event to be repeated on other machines; nonetheless, we feel that it is important to act early by letting you know about the incident… just in case.

The aircraft had been de-rigged to conduct minor maintenance and was subsequently re-rigged by the maintainer for the owner; both the LAA Inspector and the owner conducted a thorough pre-flight inspection, including normal post-rig control checks.

During the post-maintenance test flight conducted by the owner (an experienced pilot but fairly new to the type), a loud bang was heard and the aircraft simultaneously yawed and rolled to the right. The pilot was able, just, to keep the aircraft in a relatively level attitude using full opposite rudder and nearly full opposite aileron. The pilot noted that the aircraft's rate of decent was 'quite high' and application of power didn't appear to change this very much.

The pilot was wearing a parachute and considered evacuating the aircraft but felt that he was too low for this to be done with any real confidence; he therefore selected a field and conducted a forced landing. During the subsequent landing the aircraft's undercarriage gave way and the underside of the aircraft, engine cowling and propeller suffered damage. The pilot was uninjured.

The pilot, having evacuated the aircraft, noted that the starboard tailplane and elevator assembly had rotated on its tubular main spar and was at 90° to the normal airflow.

The aircraft was recovered back to its operating base by road and, on inspection, it was found that the wire securing pin (4800115) had left the side of the plastic guide tube before the end of the tube and hadn't, therefore, been in a correct position to direct the pin into the securing spigot (4800053), thus the tailplane was not mechanically secured to the fuselage before flight.

It is highly recommended that before you next fly your aircraft, you ensure that the tailplanes are securely locked in place; this can be done by firmly trying to remove the tailplane by pulling them sideways (as you would normally do when de-rigging). It would be appropriate, to be absolutely sure, to engage the services of an assistant to hold the fuselage in place during this process. One owner has commented that he always checks that the pin is actually passing through its plastic guide correctly before finally fitting the tailplane… this sounds like good advice.

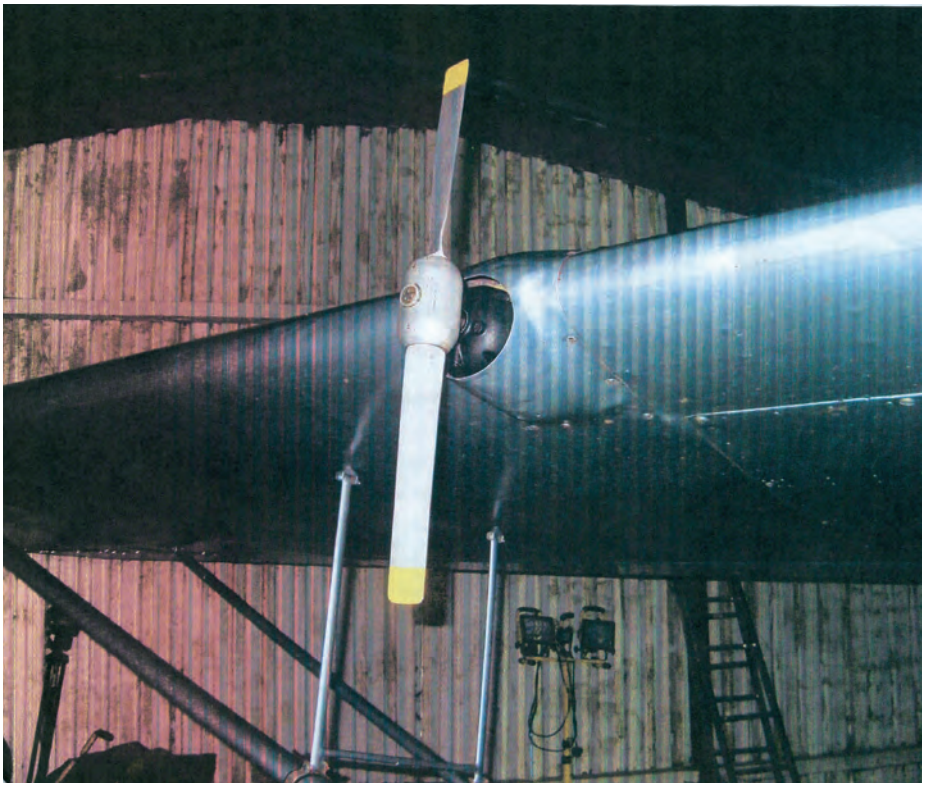
If, when you check your tailplane's security, you do find anything amiss please let me know as soon as you are able.

Yours etc.

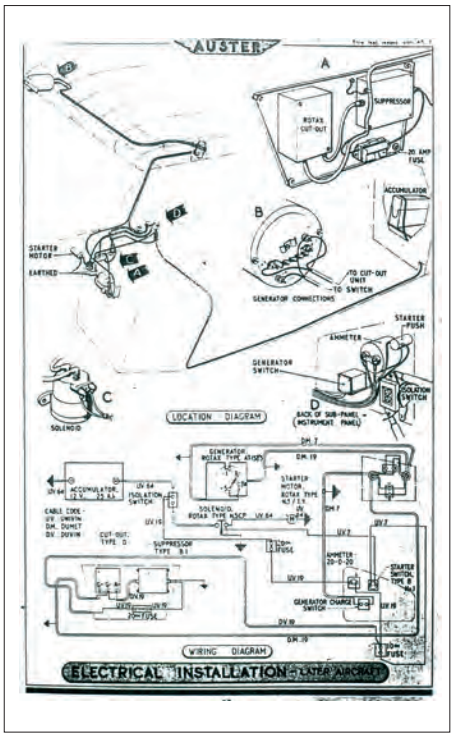
We've currently got twelve Silence Twister aircraft resident in the LAA's fleet; eight (well seven now) are flying, three are still in project stage. This single-seat machine is a kit-built, aerobatic, all composite, low-wing monoplane; the kit originates from Germany. In the UK we've got both the 80hp Jabiru 2200 and the 100hp UL260i engines represented, John's machine was fitted with the Jab engine. This aircraft kit comes with a fixed-gear option but most, nine of the twelve in the UK, have opted for the rather more complicated (but aesthetically rather pleasing) retractable gear version; John's aircraft is fitted with a fixed gear.

The machine itself is completely de-riggable, in other words, both port and starboard tailplanes, complete with their attached elevators, can be removed from the fuselage as can both mainplanes. The tailplane is secured to the fuselage using a thin piano-wire rigging pin that locates through a hole in a spigot fitted to the tailplane. In this case, after rigging the machine, the pin was seen to be 'fully home' but, because of a failure in the pin's guide tube, the pin itself hadn't gone through the hole in the spigot – the tailplane looked as if it was secured but, in fact, hadn't been. The accompanying pictures explain this better.

Naturally, the LAA's Design Team will be looking at the design of this primary structure fixing to see whether improvements need to be made and, by highlighting this potential gotcha, both directly to the owners by letter and in this column, we can reenforce the importance of conducting thorough pre-flight inspections to all our members… if you've



The picture above shows the wing-mounted, wing-driven generator as fitted to Arthur Boon's Auster J5G. Once these devices were commonplace but wind-driven generators are rarely used these days (except as emergency back-ups!). Read about what happened when this generator slowly crept backwards in its mountings in the accompanying article. *(Photo: Malcolm McBride)*



This picture shows the general arrangement of the installation and wiring for the Auster with the optional generator and electrical starter. This generator shown is the early type where, as you can see, the output terminals emanate from the rear of the casing. *(Photo: Auster Aircraft)*

re-rigged an aircraft, remember, thorough means thorough.

AUSTER J5G – IN-FLIGHT AILERON CABLE FAILURE

Yes, again you've read the title right… and that makes two primary control failures in one Safety Spot feature – that's got to be a record of some kind. As with the story of the Silence Twister losing tailplane control, this potential failure was spot-able but you can easily see why the potential issue wasn't seen. Also, perhaps more importantly, the pilot, LAA-er Arthur Boon, kept his head during this in-flight emergency and, in my view, due to a very skilful piece of flying, landed the aircraft safely… so again, a very big well-done to him.

Interestingly, the failure itself was a result of a problem that was identified by the Rearsby manufacturer in December 1951 and, because of their worries, they issued a Service Bulletin warning engineers of a potential problem. "Come on," I can hear you thinking, "get on with it and tell us what happened?" Well, perhaps the wording of the 1951 SB will give you a clue:

Auster Service Bulletin – Issue 22 – All Austers Embodying a Wind Driven Generator:

The following HINT should be borne in mind whenever the wind-driven generator has been removed from the leading edge of the starboard mainplane for the purposes of overhaul etc.

When re-installing the generator, always ensure that it is not pushed too far into the wing since its mounting will foul the aileron cables and possibly cause shorting, with serious results.

Our Design Department is drawing up a modification to obviate this trouble, and further information will be given in a subsequent Bulletin.

Auster Aircraft (1951)

Here's the story in, more or less, Arthur's own words:

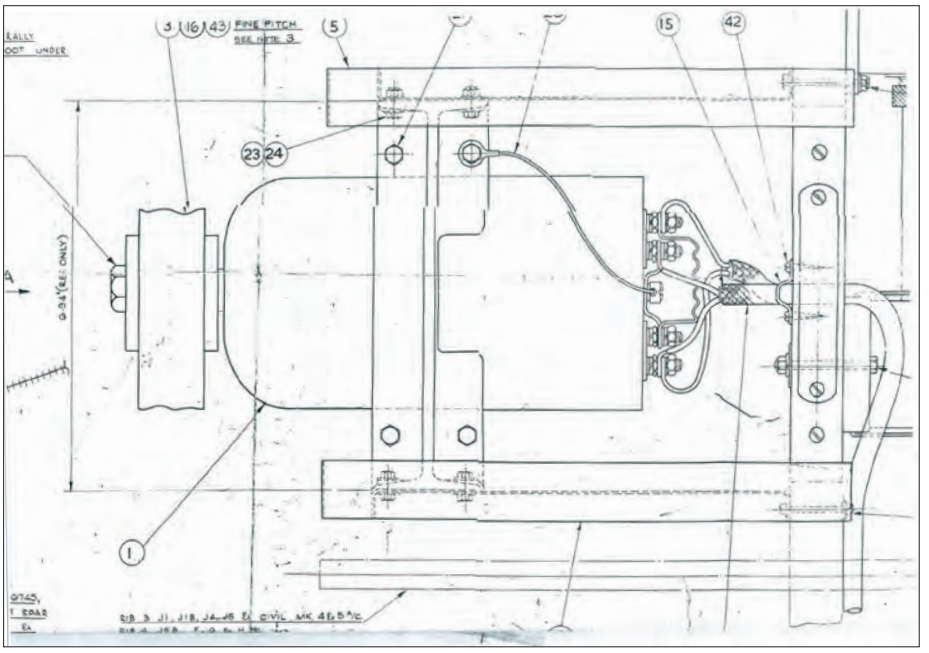
Dear Malcolm,

Re: Description of events caused by Aileron operating cable break.

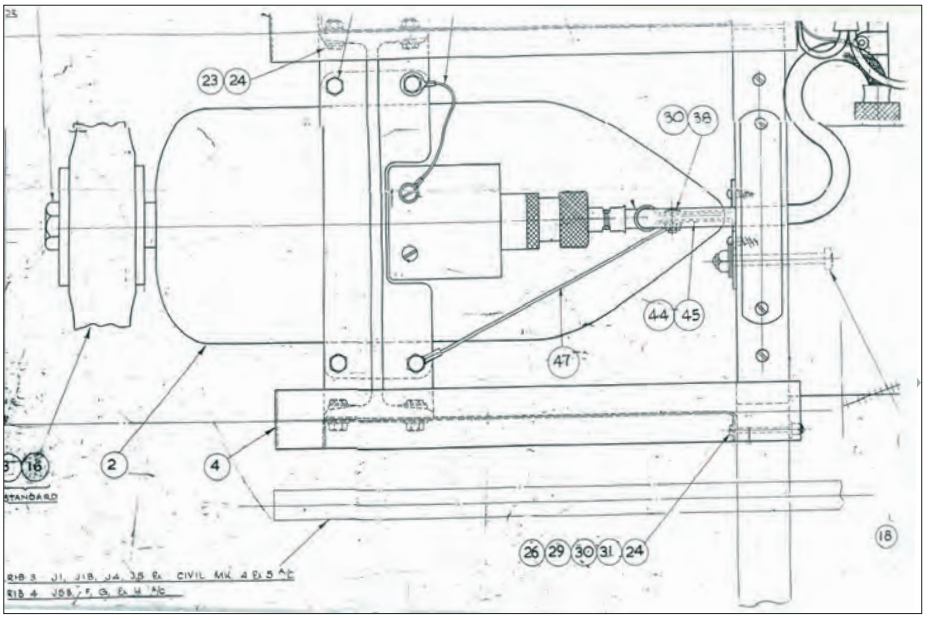
Whilst carrying out some local flying, accompanied by a friend who is an experienced pilot, I suffered loss of aileron control. We had been airborne about 55 minutes when at 2,000ft I decided to do a couple of steep turns. The plan was one to the right then, on completion of the orbit, one immediately to the left. We started the right turn with 45° bank; the turn was fine until I rolled-out to start the left-hand orbit… half-way through rolling from right to left, the aileron operating cable went twang! I felt it go through the control stick followed by the sickening sight of the cable, which is normally visible in the cockpit (by the door post) unravel and hang slack.

As we were half-way from rolling right to left I didn't (couldn't!) commence the left turn and the aircraft went into the straight and level attitude and, thankfully, stayed there.

After a quick discussion with my passenger we tested the aileron by gently attempting a turn to the left (so as not to initiate any excessive roll); we noted that we still had had port aileron but no starboard, I didn't want to use any aileron now as I was concerned



Harold Hall, an LAA Inspector and an Auster Specialist for very many years, checked his archive of Auster drawings for any information relating to the Rotax Generator. He came up trumps, above is a picture of the early type as fitted to Arthur's machine. In this drawing, even though the aileron cables are not drawn in, the issue can be clearly seen. *(Photo: Auster Aircraft)*



Seek and ye shall find. Above is a drawing showing the more common version of this wind-driven generator installation. You can see that the electrical energy is now taken from the top of the unit, far away from the flight control cables. The rear of the generator has been re-designed into a taper effectively halting any rearward creep. *(Photo: Auster Aircraft)*

When Arthur removed the failed aileron cable from his Auster he could immediately see what had happened; if you look closely at this picture you can see clear evidence that the cable itself has melted. Initially, it was thought that the generator had moved back into the cable in one movement, allowing a charge to pass through the cable melting it immediately. Because this failure has a clear taper I wasn't so sure, so Arthur set up a test to see what would happen if a similar cable was asked to conduct the generator output. *(Photo: Malcolm McBride)*

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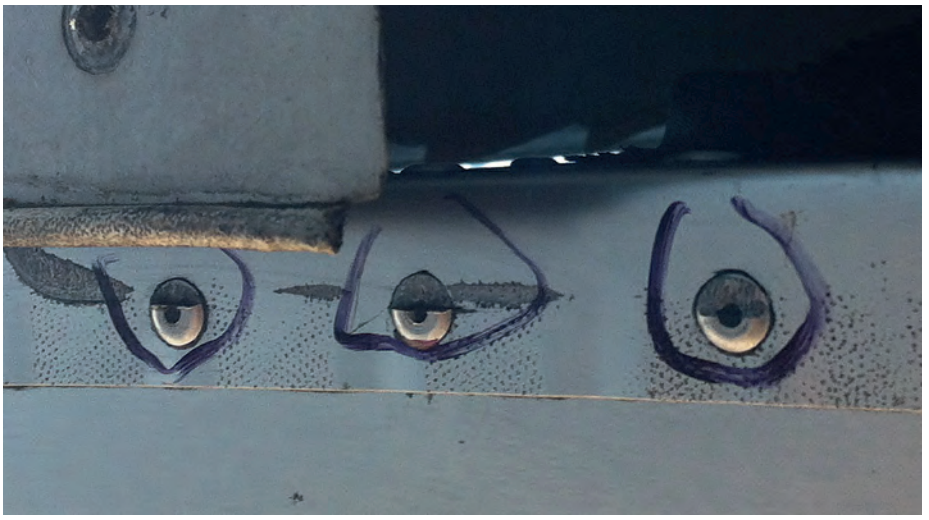

(Above) **The real reason for my visit to Booker was to see first hand why Light Sport Aviation had issued a Bulletin requiring the removal of the wing/fuselage fairing within the next ten hours. Surely this would be something that would be automatically removed at each 100 hour or Annual check? As you can see from the 1,400 hour example above, this panel appears not to have been taken off for quite some time and, because the fibreglass has been rubbing against the rivets, the rivet heads have all but disappeared. There are two clear reasons why aircraft panels should come off regularly. The first is inspection; the owner of this aircraft was trusting to luck when it came to the security of the wing/fuselage connection, although he or she signed that all was all OK at every annual. The second is to gain access for essential servicing. I wonder how it would have been possible to lubricate the control mechanisms? Perhaps it wasn't felt necessary in this modern 'plug and play' world.** *(Photo: Auster Aircraft)*

Here's a picture of the new EV-97 agents Edmund Otun and Steve Pike who together make up Light Sport Aviation Ltd. I took this shot during a visit a week or so ago when I took the opportunity to visit their brilliant facility at Booker Aerodrome. They are seen leaning on the new SportStar Max, the latest Light Sports category machine which, if interest is big enough, they hope to 'kit'. Good luck to Edmund and Steve in their new venture. *(Photo: Malcolm McBride)*

that putting any angle of bank may not be retrievable and would be quickly followed by a spin or spiral dive. We were about eight miles from my home airfield, which was behind me.

I started a very gentle flat turn with the rudder until we were on a long straight in approach; the weather was calm so there was no real need to use the ailerons to maintain level flight. My next concern was that when we slowed down to the approach speed what would the loose aileron do? With hind-sight, it wouldn't have dropped as the balance cable would have kept it in the neutral position but, worrying about this, I decided to come in a bit faster than normal just to make sure the airflow kept the aileron in neutral. As it was I came straight in over the hedge into a 'three pointer' for a quite normal landing.

Following the landing we began to investigate what had gone wrong. We found that cable had broken behind the wind driven generator mounted on the leading-edge of the wing. The generator is mounted in the wing by the means of a flat steel band that clamps round the body of the generator. We noticed that the generator was ever-so-slightly loose! We checked and the clamp and bolts were however, still tight. The generator should have a cork gasket round the body for the clamp to bite down tight and hold it firm, but unless you removed the generator there was no way of seeing if the cork gasket was there or not; there were only a few small bits left. We guessed that either it had degraded with age or hadn't been there at all!

And the reasons for the cable break?

When the generator moved backwards, the positive pole made contact with the aileron cable which is earthed to the airframe and the resulting dead-short burnt the cable! After close inspection of the broken cable ends when you placed them together, the short looks to have burnt 99% of the way through the cable and the few strands that were left failed under the load of the turn.

Since the incident I have looked at lots of Auster generators and it turns out that mine is quite a rare two-stage charge type and so is different to most other Austers, the difference being mine is square on the back and the more common type is slightly tapered. If the tapered type comes loose it will move back and rest against the wing spar and not make contact with the control cables.

These other generators also appear to have a 'location' method which fixes their position. I believe the incident was caused by three things:

1. The generator cork gasket wasn't fitted or degraded with age thus allowing the generator clamp to bottom out when the bolts

These photos show a couple of samples showing what happens when you pass an electrical current through a wire; the left photo shows a single failure event, in other words, the cable was touched against the wire and held there until it failed: note that the failure is roughly at right angles through the cable. The second photo shows what happens when the cable is just momentarily touched against the electrical supply; in this example three short touches. You will see that there are three clear failure points. We think that the cable was occasionally touching the live generator output and this slowly eroded the cable, hence the taper in the failed cable. *(Photo: Malcolm McBride)*

where tight and not grip the generator body fully.

2. The generator was fitted in such a way that the positive pole lined up perfectly with the aileron cable.

3. The electric cables did not have rubber insulation boots fitted that covered the poles and nuts.

The generator is now refitted correctly with a new cork gasket, rotated round 180° which puts the live pole below the aileron cable and all the electric cables have had heat shrink insulation covering fitted with rubber boots.

Yours Sincerely, Arthur Boon.

Thank you, Arthur, for a very comprehensive report; I think that the aforementioned Lady Luck was definitely on side during this incident. I think that you are right and a complete loss of control could have been a definite possibility… the consequences of which doesn't bear thinking about.

Early, post-WWII, Austers weren't fitted with a complex electrical system, the 'electrics' being limited to a small rechargeable accumulator and a back-up dry cell battery; these batteries simply powered the navigation and cockpit lighting. When the aircraft went through its 'civilianisation' process in the late 40s and early 50s the aircraft was, initially as an option, fitted with a 12V, 150 Watt, wind-powered generator. The generators were manufactured by Lucas (which bought out London-based Rotax Electrical in the 1920s). The generator design went through usual improvements and Auster's planned Service Bulletin relating to the dangers of the generator being pushed too far back in the leading edge wasn't, in the end, felt necessary as the design of the generator, and its connection, was changed.
You can see the design change in the accompanying drawings.

The LAA has a growing library of engineering-related information and within it I was able to find the service information for the Rotax EDG and noted that there is a regular (40 hour) brush-check requirement. I wonder how many Rotax generator owners have included this regular servicing point into their Tailored Maintenance Schedule?

In any event, the LAA inspector involved was annoyed that the aileron cable run in the leading edge didn't look to have been inspected 'for a very long time'. This aircraft, incidentally, has only been on our fleet for a few years, having transferred from a C of A in 2010. The owner has written up the story of this event for the Auster club magazine so people all round the world will get to hear about it.

As far as we know, this is the only example left in the UK of this very early design of Rotax generator; it's easily identified by the way, by the fact that it has a two stage field coil, one section of which can be switched in or out using a cockpit mounted switch marked HIGH – LOW. I would be interested to hear if any of our readers also use this generator model to supply their Volts and Amps so don't be frightened to put pen to paper.

I think that I probably say the following at least once in every Safety Spot one way or another so you must know that I mean it: For goodness sake, build deep inspections into your Tailored Maintenance Schedule… even if you're not doing many hours. In the next item, not, I hasten to add an LAA machine, a CAA Surveyor was surprised to find a serious structural problem that should have been spotted about thirteen hundred hours ago. Naturally, he wasn't very chuffed; here's the story.

EV-97 EUROSTAR – DAMAGED RIVETS IN FUSELAGE

I became involved in this story when a Bulletin landed in my inbox from Light Sport Aviation, the new Evektor agents. If I'm honest, when I saw the Bulletin's origin I got a pang of guilt as I remembered that I hadn't yet popped over to Booker for a visit. One reason why the LAA's system of self-governance and shared responsibility works so well is that the association model means that we're all working to the same end: safe, affordable flying. Even though Light Sport Aviation (LSA) is primarily a CAA A1 Approved Aviation Company (and, by the way, very well done to the company's directors, Steve Pike and Edmund Otun for achieving this hallowed status), they as the Evektor agent sit in the hot-seat as agents for the LAA fleet of kit-built Eurostars.

I was surprised that I hadn't seen a draft of the Bulletin that would, or at least may, affect many of the LAA's 89 EV-97 owners! Naturally, at my earliest opportunity I jumped in the car and met-up with the new team. Readers will I expect know that the basic EV-97 was originally designed and marketed as a 450kg microlight; the factory-built machines are managed by the BMAA through their CAA Approval system – that's why the new agent needed CAA A1 approval. These aircraft can be used as training machines in dedicated flight training schools. The aircraft, as is often the case, grew a bit in weight carrying capacity and a kit-built 480kg group 'A' version became available. Recently a new 575kg version has been released which, when they sort out the continuing airworthiness process, will be available as an EASA Permit machine. Confused? Join the club! Anyway, Steve and Edmund want to bring this machine into the UK as a kit and, according to Edmund, Evektor is backing this plan all the way – I watch with interest!

Anyway, what's all the fuss about? Well, from personal experience, it's not a good idea to get on the wrong side of a CAA Surveyor and I'm not surprised when, after removing a belly panel from a 1,400 hour microlight training version during a routine audit, he saw that the panel itself had nearly wiped off the rivet heads; especially as these particular rivets were critical in holding the structure together around the undercarriage and wing trailing-edge connections. I can read the AAIB report into the 'tragic loss' as I write.

My feeling, when I read the Bulletin that requires this check is that it's not really Bulletin material. The maintenance schedule for this type, and that's the device that dictates the work schedule in a factory-built machine, calls for these panels to be taken off each 100 hours so that the wing/fuselage connections can be checked. This is especially important, incidentally, where the flaps are driven through torsion tubes… hence my earlier comment about this fretting problem should have discovered 1,300 hours ago during the aircraft's first 100 hour check. Anyway, I've run out of steam and space at the same time so, as always… Fair Winds. ■

LAA ENGINEERING SCALE OF CHARGES – PLEASE NOTE NEW PERMIT FEES APPLY FROM MARCH 1 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	£105
391 - 499kg	£140
500kg and above	£190
Three seats and above	£210
Modification application	
Prototype modification	£45
Repeat modification	£22.50
Transfer	
(from CofA to Permit or CAA Permit to LAA Permit)	
Up to 499kg	£135
500 kg 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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