With Malcolm McBride
Airworthiness Engineer

SAFETY SPOT: LESSONS LEARNT FROM OTHERS' MISTAKES

Another 'runaway' after a hand start – a costly blunder

I am pleased to say that my campaign of self-denial in the chocolate department is now starting to pay off and the slope on my weight graph is, with some reluctance, starting to become solidly negative (rather than something akin to a ECG trace). Persistence in sticking to my new year resolutions seems to be paying off.

I'm writing this mid-January, the lake outside our offices here at Turweston aerodrome is frozen solid and the grass is covered with a beautiful white sheen, and there's a lovely light casting long tight shadows. It's a welcome change as it's been foggy and damp for the last couple of weeks here in the south Northamptonshire borders. It's one of those mornings when one just has to be pleased to be a person on the planet.

Actually, it's first thing in the morning, 'the best part of the day', and I'm the only person in the building. Give it half an hour and chaos will reign again, after all, we're in the process of moving offices so a quiet space is hard to find. I'm shifting upstairs which, thinking about those stairs, might help my aim to recapture a sylph-like figure... though I know I'll never be 20 again, it's always good to have a goal.

So, in amongst the territory changing here, what's been happening in the LAA's continuing airworthiness world?

Firstly, thanks to all of you who have sent in comments about some of the previously featured issues. I say this at least once a year so it must be true, 'Safety Spot is only as good as the content sent in by you'. I think the column works because it reflects real issues faced by LAA members. As the author, I'm very lucky of course that, with such a large and diverse fleet of aircraft, my desk is usually quite full of incident and accident reports which form the ingredients of a hopefully interesting dish. Please keep your stories coming in.

If you are new to the LAA, and therefore *Safety Spot*, then I should point out that all of the previous *Safety Spots*, back to 2008, are available to read from our website, *www.laa.uk.com* From the front page, click on 'Our Publications' and *Safety Spots* will be one of the next selections.

Whilst I'm chatting about this, it would be worth suggesting that, once you are 'online' you take a wander through the section entitled Technical Leaflets, there's a whole library of good advice and technical information in there which is definitely worth a read (click Aircraft and Technical, then Data Library). If you are a regular reader you will know that LAA Engineering is moving towards a Type Acceptance Data Sheet (TADS) method of type information promulgation. In the fullness of time, bearing in mind it's quite a big project, we hope to provide a link to type-specific issues that have been discussed in Safety Spot in a type's TADS.

That said, all continuing airworthiness engineers know that an incident is only very rarely the result of one failure point. In fact, from experience, accidents and incidents affecting humans are generally the end-point of

(Above) **This lovely example of a DHC-1 Chipmunk 22 has only recently joined the LAA fleet. It was first registered in the UK in 2004, having been built under licence in Portugal in 1958. The aircraft is (effectively) a Mk.10, badged as a Mk.20 (as an 'overseas' build) then re-badged as a 'civilianised' Mk. 22. I thought that the DHC-1 was the first post-war de Havilland design to go into production, but was reminded by Bill Taylor of de Havilland Support that, though ground-breaking in design, the de Havilland Dove takes this honour. Don't be fooled by its simple appearance, the 'Chippy' is still a complex ex-military design requiring specialist care… especially as many of the examples still flying are entering their seventh decade..** *(Photo: G-INFO)*

a story containing many characters.

Often, the best safety-related 'stories' discuss generalisations in the human condition, rather than specific technical failings. In other words, though it's essential to establish the most likely cause(s) for a failure, the facts surrounding an actual event itself can only really ever act as feedstock for creative safety responses.

The issues discussed in this month's *Safety Spot* are a good case in point. Firstly, we'll talk about a specific incident where a DHC-1 Chipmunk aircraft ran away when the engine started during a hand-start. Yes, I echo your thoughts, "What, another one?" We'll then move on to issues that might have been prevented by owners having a better inspection regime.

So, let's get going with a story where a pilot, and possibly his passenger, could have been killed because correct engine start-up procedures weren't followed.

DHC-1 CHIPMUNK – RUNAWAY AFTER ENGINE START

I'm not sure that there can be any aviation-lover who was a teeny in the 1970s who hasn't got a soft spot for the Chippy. For me it was the first powered aircraft I'd ever flown in, although as a 'just starting' air cadet only four feet something tall, the flight, during a summer camp at RAF Little Rissington, was less of a visual experience than most first flights are because, even with a booster cushion between my bum and the Irvin parachute, I couldn't see out the sides of the aircraft! It is possible that this vertical challenge helped me later on because all of my early hands-on flying was done on instruments!

Anyway, in those days, many RAF engines were started using the Coffman cartridge starter. The Coffman used a blank shotgun-like cartridge containing Cordite that, when fired, pushed a piston forward. A screw thread, driven by the piston, engaged with the engine, turning it over. Though still permitted, most of the Coffman units were replaced with electric starters when the aircraft transferred to civvy street. Perhaps because of the explosive nature of the start, or maybe just because military discipline reigned, starting the Gipsy before a flight was a very formal affair. "Fuel on – Brakes on – Throttle Closed - Switches Off". Signal, with a 'thumbs-down' clearly to the ground crewman who then carefully primed the engine. When primed and sucked in, and assured that all personnel clear: "Switches on – Throttle set - Contact".

I only remember one occasion when this procedure didn't end up with an engine rotating under its own steam. This was when a Coffman unit jammed and the cockpit ended up being filled with burnt cordite fumes... I smelt like a gun cabinet for some weeks after that!

Personally, perhaps because of this early training, I've always treated any engine start as an important procedure. It is, when you think about it, but in this modern age, where everything seems to work first time without any operator skill needed, perhaps it's easy to get lackadaisical.

To start from the beginning, and I'm using multiple reports to piece together the story, the aircraft overflew the airfield, conducted a circuit, landed, taxied up to the pumps for fuel and stopped. The aircraft was refuelled and moved away from the pumps by hand.

The pilot then re-boarded the aircraft and prepared to start the engine to continue his journey; a non-pilot friend occupied the rear seat. The pilot attempted to start the engine using the electric starter, but the battery apparently didn't have enough oomph to turn the propeller sufficiently quickly to achieve a start. The pilot then, probably cursing under his breath, got out having decided to start the engine by hand-swinging the propeller. There were a number of other aviators about watching proceedings.

The engine was not playing ball and didn't seem to want to start despite multiple swings; it soon became clear to the onlookers that the pilot was getting tired. Then, almost as a surprise, the engine started and immediately accelerated to "a very high rpm".

The aircraft wasn't chocked and moved forward immediately the engine started, the rotating propeller narrowly missing the pilot. Fortunately, the pilot, who was clearly no sloth, jumped clear and was almost immediately struck by the port wing. He was unable to stop the aircraft's forward movement and, as quickly as possible, he worked his way to the wingtip where, with a supreme effort, managed to redirect the aircraft from a forward direction to a rotational one. If this wasn't such a serious situation one might think it the plot of a Laurel and Hardy sketch from a bygone era.

Naturally, all this happened very quickly indeed and it took a few moments for the onlookers to realise what was going on and begin to react. The aircraft, still accelerating, described a number of ellipses over the apron, eventually reaching the edge of the smooth surface. Unfortunately there was quite a step between the grass of the airfield and the concrete hard standing, and during the course of these pirouettes, the tailwheel got swiped, causing quite serious damage to the tailwheel assembly and possibly structural damage elsewhere..

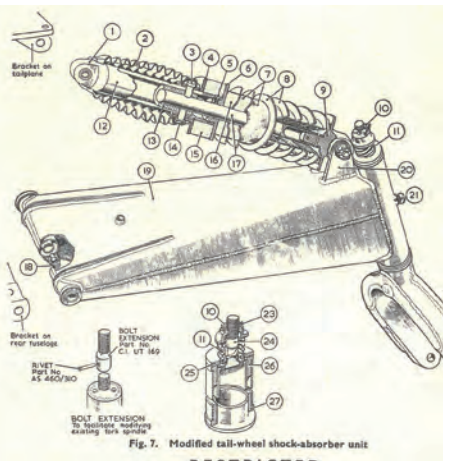
By this time, one of the fellow aviators managed to grab the starboard wing and, with the aid of a couple of other chaps, the aircraft was brought to a halt. The pilot was able to climb aboard and shut down the engine. I don't have any further information regarding the mental state of the untrained passenger, but I feel sure that he might think twice before getting into an aircraft again.

I certainly don't want to get 'preachy' here, misfortune can sit around any corner, but there is clearly a great disparity between what ›

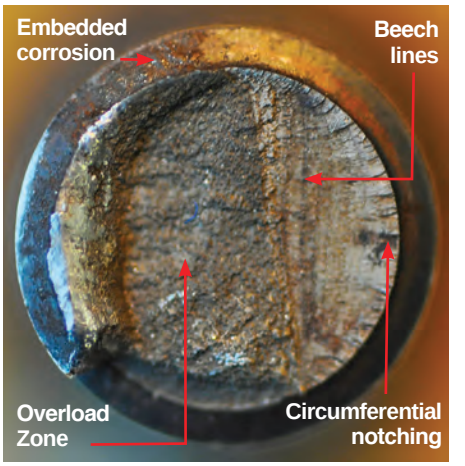
(Above) **The tailwheel on this DHC-1 was damaged when it struck the edge of the concrete apron sideways after control was lost during a hand start. You'll need to read the text to understand what happened.** *(Photo: Supplied)*

(Above) **When the owner removed the tail cone, the damage to the lower and, though not shown, the upper bulkhead attachments became clear. Though it's early days in the inspection process, we're hoping that the damage is limited to the rear brackets and doesn't involve the fuselage or tailplane structure.** *(Photo: Rex Ford)*

(Above) **I took this picture of the tailwheel/ tailplane support structure of an 'under-rebuild' Chipmunk here at Turweston. As you can see, there's a lot going on and this rear bulkhead is being asked to do a lot of work during normal operation. You will also note that the basic geometry doesn't lend itself well to excessive side-loads. This bulkhead and associated bracketry needs regular inspection.** *(Photo: Malcolm McBride)*



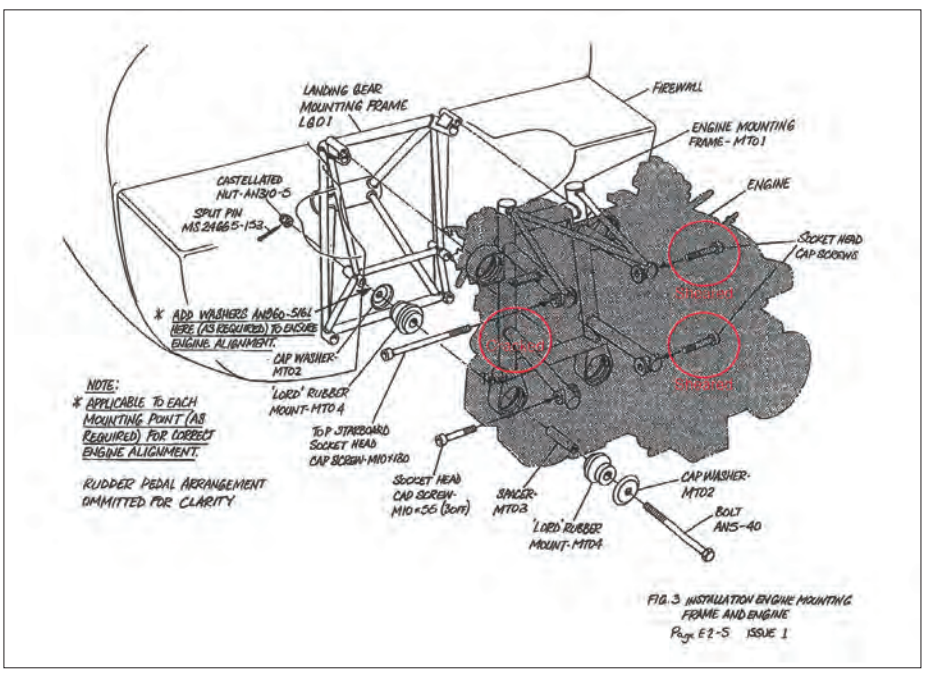
(Above) **This picture, taken from the DHC-1's repair manual, shows how complicated the tail-wheel assembly really is. The main support arm is fixed to the rear fuselage bulkhead by cast brackets, these brackets resist the primary side to side loads during normal operation. The shock absorber is connected to a bracket mounted on the tailplane.** *(Photo: de-Havilland Aircraft)*



(Above) **Roger sent us the remains of the failed port top engine mounting bolt from his Europa Monowheel. Note the clear evidence of high-cycle low-stress fatigue in this fracture face, also note the corrosion in the rolled thread which may have led to corrosion pits in the thread itself which, when established, would have caused local stress concentrations. Notice also the multiple failure origins around the circumference (notching between 360° and c. 170°).** *(Photo: Malcolm McBride)*

(Right) **These pictures help to tell the failure sequence story in a recent event where the owner and LAA Inspector discovered that the Europa aircraft's engine was effectively being held in place by only one engine mount bolt. The picture on the left shows the in-situ port upper bolt, the oxide and fretting shows us that this bolt has been broken for some time. The right picture is of the port lower bolt (see that it's been drilled to accept an easy-out). You can see that there's clear fretting in the face and corrosion is present on the bolts fracture face. The failure sequence looks to be: port upper first, then port lower, then starboard lower engine mount frame… probably because it wasn't able to resist the side to side movement of the (now) only partially restrained engine.** *(Photo: Roger Sheridan)*

(Right) **Europa owner Roger Sheridan, bought his aircraft from the original builder in March 2015 and operated the aircraft 'successfully' through the 2015 season. Through the spring of 2016, the aircraft was refurbished and brought up to 'top quality' status! Another successful year followed, and all was well until, in December 2016, the engine started misbehaving - misfiring, vibration, difficult to start - so Roger bought himself a soft-start module, hoping the problem was connected with the ignition timing. Unfortunately, the engine was still vibrating badly so he decided to bite-the-bullet and ask his inspector to take a look. On close inspection it was found the both the port engine mounting bolts had broken and the lower starboard engine mount frame support was badly cracked. In essence, the engine was being held into the airframe by one 10mm cap bolt.** *(Photo: Europa Aircraft)*



should have been and what was. There are a few simple lessons here that must be taken on board. Let's not beat about the bush, this incident could have resulted in the death of two, possibly more, people. I can imagine a situation where the pilot, having been struck by the propeller, would not have been able to stop the aircraft which, with the untrained passenger aboard, would continue accelerating to take-off speed across the airfield. As it turned out, the damage was limited to serious damage to the aircraft – a full survey has yet to be carried out.

Let's start the brief dissection of events from first principles; why was the battery flat, effectively the first hole in the cheese?

Well, the aircraft's inspector for the previous renewal inspection noted that the battery, or the charging system, needed attention because, when presented for the annual, the battery was nearly flat. The owner assured the inspector that he was going to replace the battery. Should he have signed the aircraft out in this condition? Food for thought from an inspector's point of view.

Secondly, if a hand start is necessary, especially with an ergonomically difficult aircraft like the Chipmunk, take every precaution to ensure that the aircraft, whatever the engine does, cannot move. Never rely on untrained personnel. Never assume that a person, however clever they might appear, understands the difference between a trim wheel and a throttle lever. Notice, I haven't used the words 'chocks', which may or not always be available, or any specific method, which varies widely between aircraft types, indeed, even between experts. In this case there were trained chaps about, qualified and experienced pilots who, with some type briefing, would have been able to take charge in the aircraft's cockpit. I'm sure they would have been happy to help.

As I said earlier, I don't want to sound preachy, but we've had too many near misses with engine hand-starting over the last couple of years and too many aircraft have been damaged, some beyond economical repair. Regular readers of this feature will know that there have also been a number of serious injuries where limbs have been lost or permanently damaged, and at least one death in a ground-related propeller accident. For goodness sake, before engaging the engine starter, be it electrical, explosive or muscle powered, engage the brain first.

EUROPA MONOWHEEL/ROTAX 912 – ENGINE MOUNTING BOLT FAILURE

This is the first of two very similar stories concerning the security of engines in airframes. This first story concerns a Europa, the second has an Evektor EV-97 taking the lead part though, in truth, the main character could be drawn at random from any aircraft at the audition.

I received an email from LAA'er Roger Sheridan with a link to a video he'd made showing horrible engine vibration at low rpm with his Europa Mono. Certainly it was clear from the video that something wasn't quite right as the engine was bouncing about badly in the engine compartment to the point where it looked like there might be damage any time soon.

Roger bought his Europa from the original builder in March 2015 and loved the aircraft, which had a good maintenance history and had completed about 500 hours flying time (and 700 or so landings). Many of you will be aware that the early 9 series Rotax engines had a bit of an issue with rough running after start-up, in some installations the rough running could sometimes prevent the engine from getting up to idle speed. Conrad Beale, the Rotax expert, worked out what was happening to cause this starting issue and designed a bit of circuitry to cure the problem; he called it the Soft Start module.

To start an engine from stationary, engine designers normally devise a way of bringing the point where the ignition sparks just after top dead centre, rather than before it. Engine manufacturers refer this as retarding the spark. During normal running, the spark has to be advanced to allow the necessary time for combustion to be properly synched with the power stroke.

On very early cars and motorcycles, this was often done by the driver using a lever at the centre of the steering wheel or on the handlebars. Later, vacuum or centrifugal drivers were added to automatically retard the spark for starting. Later again, these timing devices became electronically mediated – the Rotax 9 Series employs an electronic advance-retard system based on engine rpm.

What Conrad discovered was that if one cylinder fired, because it's a very low inertia engine, it accelerated sufficiently to tell the timing sensor to advance the spark; this was instantaneous and could happen before the next cylinder fired. This very early firing, relative to real rpm, meant that the engine either stopped dead or ran in a very lumpy way. In other words, Rotax's initial ignition system was an either/or device.

Conrad's solution to this was to introduce a time delay in the timing's change-over circuitry which prevented the ignition timing from advancing to its normal running setting just long enough for all the cylinders to start firing, therefore allowing the engine rpm to rise above the critical point where it could successfully sustain the more advanced ignition timing. This used to be called getting the engine 'over the hump'. The Soft Start module transformed the starting characteristics of this engine and later on, Rotax incorporated a similar device into the engines, with this delayed start module incorporated into the timing circuitry at initial build.

Roger thought initially that the engine had started to run roughly because it had got damp, so he borrowed a hairdryer and warmed the unit for a while and tried again. This time the engine ran far more smoothly. The next day he had to go through the same performance to get the engine running properly again. Bemused at what might be going wrong, Roger asked a Rotax engineer at '*FLYER* Live'. The engineer suggested the Soft Start module. Duly purchased and fitted, Roger was upset to find that the engine was still jumping about in the airframe!

In the end, Roger got his inspector to come and have a look; he could see that the engine wasn't firmly 'in' the airframe and found, by looking a little closer, that two of the four attachment bolts were broken – worse still, when the engine was removed from the engine mounting frame, a large crack was found in the frame – effectively the engine was being held in place by just one attachment bolt.

I think that it's very likely that during a normal start-up the engine was wobbling about so much that the fuel in the carburettor was splashing about which, in turn, messed up the fuel air mixture.

I guess that the first lesson here is that if something changes in the behaviour of a piece of equipment then it's imperative that you establish why the change has occurred. You wouldn't, after all, just paint the ceiling in the corner of your living room because it was turning brown. You'd try first to find out 'why the stain?'

We'll never know for certain if it was the rough start-ups that caused the bolts to break, or the broken bolts that caused the rough starts, but we're issuing an Airworthiness Information Leaflet requiring Europa owners to check tighten the engine mount frame to engine connections on their aircraft as soon as possible. It's clear, from the corrosion present on the fracture faces of the failed bolts that these bolts had been failing for some time, but this hadn't been noticed.

Next time you carry out a walk round pre-flight check on your aircraft, open up the engine compartment and physically check that the engine is firmly held in place by giving it good heave in different directions, to see if there is undue movement or suspicious noises. If you can't see the attachment clearly, and some of the attaching bolts in some Rotax installations are difficult to see, then use a torch and a mirror. The last thing anybody wants when flying is for the engine to fall out, and the Europa we've just discussed was only one bolt and a thin section of 4130 tube away from that.

EV-97 EUROSTAR – ENGINE MOUNTING BOLT FAILURE

Almost the only reason why I'm featuring this incident under a separate heading is so that the issue can be added to the EV-97's TADS, as we've discussed earlier this is part of our cunning plan to give owners better access to specific to type safety information.

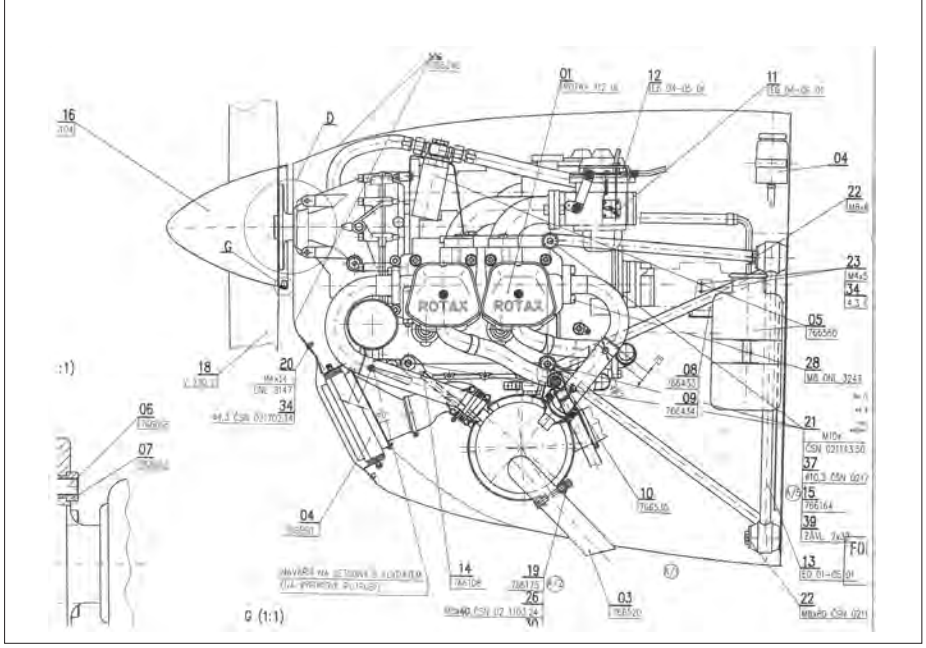
Now we're here we might as well tell the story, it's subtly different from the earlier tale featuring the Europa. Gareth wrote me the following email. I hadn't heard from him by the way since 2012 when, by coincidence, he suffered an engine mount bolt failure on his Auster Kingsland. If you want to read about this you can download the article from the LAA website (July 2012).

Gareth writes:

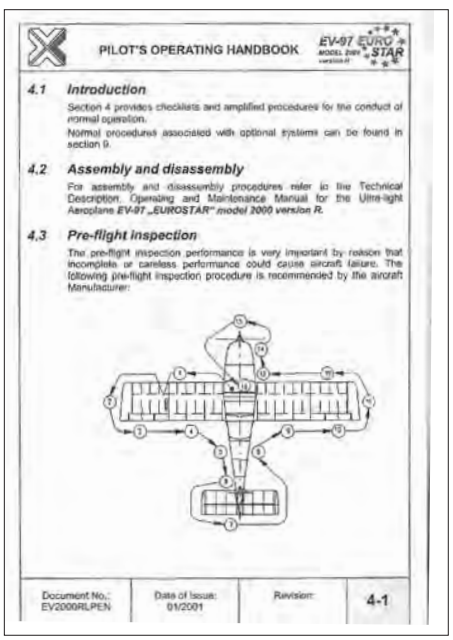
Hello Malcolm, we were prepping our aeroplane for its Permit inspection this afternoon when we found the attached. We'd noticed some vibration recently when flying and on inspection it appeared there was more movement in the engine/mount than there should be in one direction. Turned out the front lower port engine bolt had failed.

The aeroplane has just short of 1,500 hours on it now. The only thing keeping the broken bolt in place was the plastic cap on the engine mount. The other end of the bolt is still in the engine block. LAA Inspector Dave Bonsall (from Dukeries Aviation at Netherthorpe, his brother Mark is our LAA Inspector) happened to be passing the hanger and had a quick look. We intend removing the engine and taking it to the Bonsalls for them to remove the broken piece still in the engine and check the engine mount for any possible damage.

Assuming they can get the broken piece out, and the engine mount is not damaged, we intend on replacing all the engine mount bolts. We'd welcome your thoughts on this ›



(Above) **This drawing, reduced from an original manufacturers design drawing, shows a side-view of the Evektor EV-97 Rotax engine installation. The installation is essentially similar to the installation seen in the Europa, where the engine mount frame is solidly mounted to the engine using four ten millimetre bolts and the frame is attached to the fuselage firewall through rubber vibration mounts. Clearly, with this type of engine installation the key mechanical connections, and therefore key inspection points, are the engine mounting frame to engine connection and the engine frame mounting to firewall. Movement between the engine and the engine mounting frame and damaged rubber isolation mounts will end up causing fatigue failure.** *(Photo:Evektor Aircraft)*



PILOT'S OPERATING HANDBOOK

EV-97 EURO STAR

4.1 Introduction

Section 4 provides checklists and amplified procedures for the conduct of normal operation.

Normal procedures associated with optional systems can be found in section 9.

4.2 Assembly and disassembly

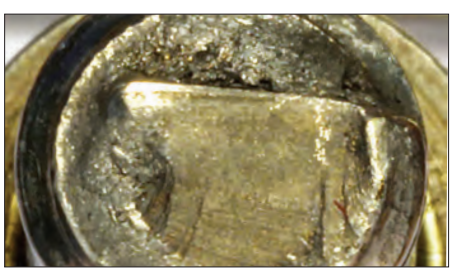
For assembly and disassembly procedures refer to the Technical Description, Operating and Maintenance Manual for the Ultra-light Aeroplane *EV-97 „EUROSTAR" model 2000 version R.*

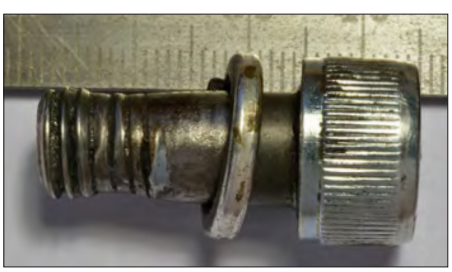
4.3 Pre-flight inspection

The pre-flight inspection performance is very important by reason that incomplete or careless performance could cause aircraft failure. The following pre-flight inspection procedure is recommended by the aircraft Manufacturer:

Document No.:	Date of Issue:	Revision:	
EV2000RLPEN	01/2001		4-1

(Left) **The EV-97 is an extremely well-supported type, especially here in the UK where there's an excellent agent (Light Sports Aviation at Booker Aerodrome) looking primarily after the factory-built machines, and the LAA which has primary responsibility for the amateur kit-built machines. Of course Evektor themselves are still very much in business and very pro-active where continuing airworthiness safety is concerned. Hear, hear to that. This picture shows a page from the high-quality 'factory supplied' Pilots Operating Handbook, most of you will, I'm sure, recognise the pre-flight (walk-around) inspection plan. Personally I think that this picture would be better if the top engine cowl was off during the inspection, reminding us that the engine shouldn't be thought of as a 'file and forget' item only needed to be checked thoroughly at the 50 or 100 hr inspection point.** *(Photo: Evektor Aircraft)*





(Above) **Just as I had finished creating a file on the Europa engine mount frame bolt failure, I received an email from EV-97 Eurostar part-owner, Gareth Horne. Gareth belongs to a group of five LAA flyers and a recent 'joiner' to the group felt some vibration through the rudder pedals during his check flight, and they decided to remove the engine cover – primarily thinking that the minor vibration was "just normal" but the new boy's concerns shouldn't be ignored! This picture of the lower port engine frame to engine attachment bolt shows what they found. As with the fracture face in the Europa bolt shown elsewhere, there is clear evidence of fatigue, though the origin appears to be rather more in the centre of the fracture face. This may be because of the unusual loads generated some distance from the failure point (note the waisting in the accompanying picture showing the shaft).** *(Photo:Gareth Horne)*

matter, is it something other Eurostar owners need to be checking for?

Thanks Gareth for the report and yes, we will be issuing an Airworthiness Information Leaflet to the LAA's EV-97 fleet offering some advice about this. I spoke with Dave Bonsall and asked him how he was going to remove the embedded bolt from the engine without damaging the engine's crankcase. I explained that removing the bolt from the Europa engine previously discussed was proving troublesome and that, after breaking off the easy-out they had resorted to taking the crankcase to a company specialising in spark erosion. As an aside, I spoke to one of the engineers at the spark erosion company and he's promised me a couple of pictures of the process. I'd never heard of this method for removing troublesome bolts before. I'll try to feature this in the March *Safety Spot*.

Anyway, Dave said that he's developed a secret method involving a TIG welder; but then Dave, and for that matter Mark, are both very experienced welders. I don't think that this is a method for the faint of heart.

The lesson here, similar really to the story featuring the Europa bolt failure, if you notice something not quite right, a change to the normal behaviour of a mechanical system or device, check it out. In this case it was slight engine vibration, easy to ignore, but something's causing it. Take time to check out what that is.

ISAACS FURY II – IN FLIGHT LEADING EDGE FAILURE

I received a call from Isaacs Fury owner, Ed Styles, explaining that he'd just had a minor problem with his aircraft which required him to land at an airstrip somewhere in Essex. He explained that, "[he'd] made a good landing and there was no 'other' damage to the aircraft". I thanked him for letting us know that he'd had a problem and, reaching across my desk for the day-book, asked him why he'd had to land somewhere unintended. I was, if truth be told, expecting Ed to explain that the engine had been playing up – could it have been icing? – but when Ed started telling the story I noticed that my body was starting to sit to attention.

Ed explained as I quietly wrote: "I'd been at about 3,000ft practicing a few gentle aerobatics, just to the south of Ingatestone, Essex. I entered a loop in the normal way and all was well until, at the bottom, I felt like I'd flown through turbulence, not bad turbulence, more like bumps in the air."

I suggested that he may just have described a perfect loop and asked whether he might have flown through his own wake. Ed thought for a moment and said that was a possibility, though he didn't think so, it was more like clear air turbulence. I asked what happened next.

"Well, everything happened quite quickly then. There was a bit of a bang, thump rather, then the aircraft rolled and yawed to the left very suddenly. I looked around the airframe and everything seemed intact though it was difficult to keep the aircraft straight. I know this area well because it's my usual aerobatic practice area. My base, Damyns Hall has a height restriction right over it so I head over here quite often. Luckily, the small airstrip at Napps Field was virtually within gliding range so I carefully flew the aircraft there to put it down. As I explained, the landing was uneventful."

Ed continued that he'd just sent me some pictures and a video he took with his mobile phone and, sure enough, the ping alerting me to a new arrival in my inbox sounded.

I've featured the picture Ed sent showing the fabric damage to the top of the port wing which, I'm sure you will agree, is quite extensive. My boss, Francis Donaldson, and I travelled over to Napps Field to take a look for ourselves and see what may have happened to cause this partial leading edge failure. We met the aircraft's inspector, Richard Kimberley, and Ed on a cold, wet and windy morning. Richard has been mentoring Ed and flies the aircraft himself regularly. Ed has owned the aircraft since the middle of 2015 and is an experienced flyer – his usual steed is a commuter aircraft out of London City airport.

During our inspection, we removed the fabric from the top surface of the leading edge region. As you can see from the attached photographs, most of the ribs attaching the leading edge in place have broken, which has allowed the very beefy leading edge member to be forced upwards a couple of inches by the airflow. As the leading edge member moved, so it slackened the fabric covering between the main spar and the leading edge itself. The rest of the wing and its attachments were sound.

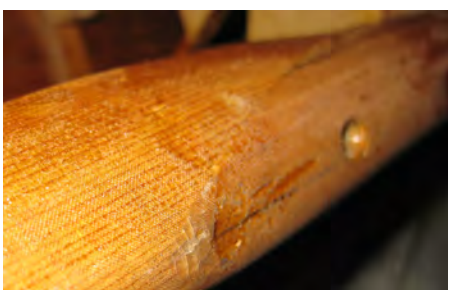
Because the loose fabric would no doubt have been thrashing about, most of the forward sections of the ribs are broken in multiple places but there is a clue to one possible reason for this failure in the few broken, but mostly intact, ribs near the leading edge. Once the fabric had been peeled off the leading edge, there was a clear sign that the leading edge itself was bruised, as if it had at some stage suffered some strike damage. After discussion, we all felt that the signs pointed to some previous hangar damage, possibly the leading edge being swung into a hangar steel support, and because the leading edge member is so thick, the fact that it had broken a few leading edge ribs was missed at the time.

We're still not 100% sure why this leading edge has failed, it's in Richard's workshop now undergoing an extensive repair. The strongest suggestion is that this wing had ›

(Above) **This picture shows LAA'er Ed Styles' beautiful Isaacs Fury sometime before the aircraft's port wing leading edge structure failed as the aircraft was being pulled out of a loop. The incident is described more fully in the accompanying text, but suffice to say here that it was definitely a white knuckle ride for the pilot. Because Ed kept a clear head after the in-flight failure and managed to regain at least partial control, there was no further damage to the airframe found after landing.** *(Photo: G-INFO pic)*

(Above) **This is a picture of the port top wing taken straight after the emergency landing; as you can see there is severe fabric damage, though the leading edge looks intact. Further inspection revealed that the forward section of the wing ribs (forward of the main spar) had almost completely failed, which allowed the leading edge member to be forced upwards an inch or two which, in turn, slackened the fabric causing an enormous amount of drag. Fortunately the leading edge member remained attached at both the inboard and outboard ends.** *(Photo: Ed Styles)*

(Above) **Though we cannot be completely sure, we think that it is possible that this Isaacs Fury suffered a bash to its leading edge, somewhere near the tip, at some point in the past: it is possible that this impact broke two or three of the leading edge ribs, weakening the wing's leading edge structure. It may be that inner ribs failed sequentially over time, perhaps because they were being overloaded taking the stress from their missing brothers, finally leading, whilst the aircraft was manoeuvring well within its design limits, to a complete failure of the leading edge.** *(Photo Malcolm McBride)*



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(Above) **This is a close-up picture of the forward sections of the ribs at the outboard end of the port upper wing of the Isaacs Fury involved in the recent, and very unusual, wing structure failure. Look closely at the top member of the rib and you can see that it has broken, probably in compression. Notice that, just inboard of the leading edge member to tip hoop scarf joint, that the leading edge is bruised.** *(Photo: Malcolm McBride)*

(Above) **Two reasons for this photo of the Isaacs Fury. One, you can see that it is actually quite easy to check the structure of the ribs, especially around the leading edge. A simple 'tap test will tell you if all's well below the fabric and, by running your thumb along the top and bottom of the rib, you should be able to pick-up any cracking in the rib's structure. The second reason is that it shows that you cannot inspect the top surface of high mounted wing without climbing up steps. We've spoken elsewhere about not spotting problems early (by removing engine cowls regularly), just because it's difficult to see doesn't mean that the top surface of a high wing aircraft doesn't need checking!** *(Photo: Malcolm McBride)*

been damaged on the ground and the high loads it needed to resist pulling out from a loop sequentially overloaded the remaining undamaged ribs – rather like unzipping a zip fastener. I think that the lesson here, and we should try to extract one, is that even if an area of the aircraft is difficult to inspect, and the top of a Fury wing cannot be inspected properly without a step-ladder, it doesn't mean that it doesn't need checking. 'Out of sight' mustn't mean 'out of mind'.

Looking at the word-count at the bottom of my computer screen shows me that I'm now 'out of space'... so Fair Winds. ■

STOP PRESS: VAN'S SB 16-12-16

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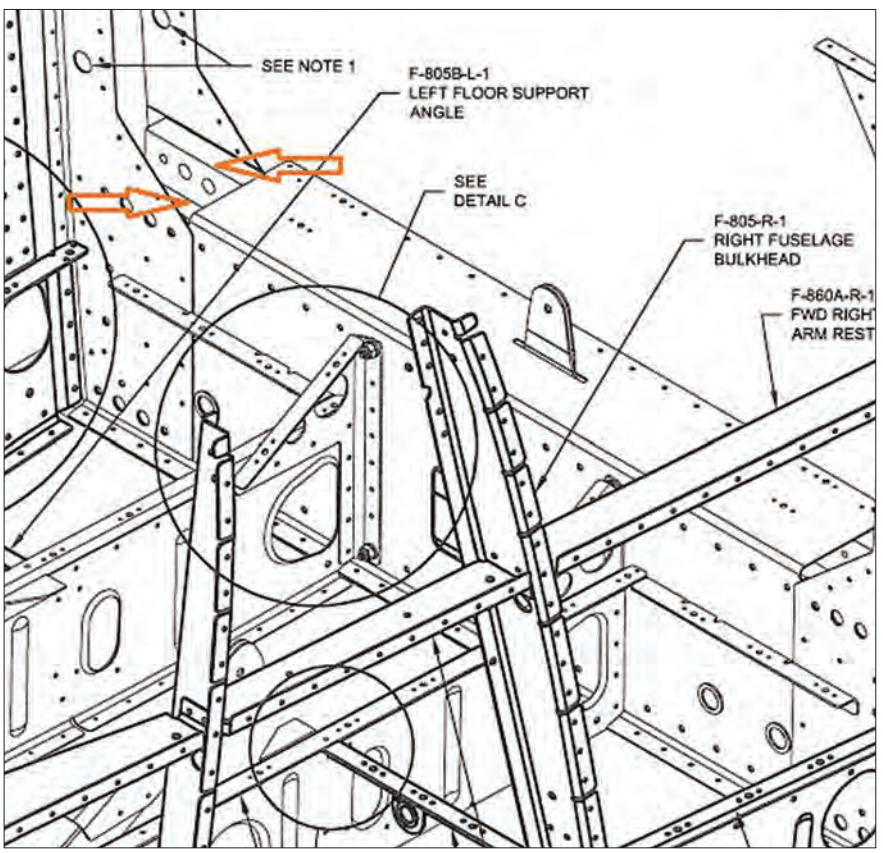
LAA Engineering has become aware of a Van's Service Bulletin (SB) affecting all Van's RV-8 taildragger aircraft. The SB requires aircraft built from the Quick-Build kit to be inspected to ensure that the main undercarriage centre section bolts are fitted as these may have been missed out during the build.

The RV-8 wing was load tested with these bolts in place though the bolts themselves are only used as a connection in the nose-wheel versions. Van's Aircraft have stated that the fitment of these bolts is carried out 'before further flight' as they cannot be sure of the wing's integrity should these bolts be missing. Though the SB only affects the QB kits at least one example where these bolts have been missed out of a scratch built example has been discovered in the LAA fleet.

LAA Engineering is exploring ways in which this SB can be accomplished without endangering the structural integrity of the main spar carry through. We will be writing to owners of RV-8 aircraft as soon as possible letting them know how they should proceed should they find the bolts missing on their aircraft. For further details of, and access to, this SB see the LAA Alert on the LAA Website.



LAA ENGINEERING CHARGES – PLEASE NOTE NEW FEES HAVE APPLIED SINCE 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 (can now be paid online via LAA Shop)	
Up to 450kg	**£155**
451-999kg	**£200**
1.000kg and above	**£230**
Modification application	
Prototype modification	minimum £60
Repeat modification	minimum £30
Transfer	
(from CofA to Permit or CAA Permit toLAA 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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