With Malcolm McBride
Airworthiness Engineer

PROP SWINGING, ENGINE FAILURES AND CORROSION

Advice and anecdotes including hand-swinging, 14 engine failures and corroded and malformed cable swages, to a split propeller blade and rodent-damage behind an instrument panel

Here you can see the damaged caused to David Hurn's Lycoming O-320 engine because a small part of a broken valve was left in the engine after a 'top-end' rebuild. The photo on the left shows the piston from cylinder number two (front left on the Lycoming) and the picture on the right shows the piston crown from cylinder number four (back left). To understand how one piece of exhaust valve could damage two pistons, you'll need to read the accompanying text. *(Photo: Tony Baron)*

Welcome to the August issue of *Safety Spot,* I hope all's well with you and your team. I've just caught myself 'spacing-out' looking through the window of my office here at LAA HQ at a rather colourful dragonfly, or some-such creature, hovering carefully over a half-submerged leaf in Turweston's little pond. Beautiful. Realising that I'm not paid to gawk out of the window, and pulling myself in check, I notice that, for the first time this week, there's just a glimmer of, albeit pale and insipid, blue sky. I do hope that this train of Atlantic low pressure systems had disappeared by the time you're reading this: there is, after all, only so much drizzle, low cloud, wind and rain a bloke can take.

If you're a regular reader of this column you'll know that I've just spent my annual leave sailing about the Mediterranean between southern Turkey and Greece. Naturally, as you can probably tell by my grumpiness about the weather earlier, I was away during the UK's 2015 warm weather week. The weather, just for your interest, in and around Rhodes was, to quote the weather charts, 'unusually windy' (which made for some exciting afternoons). Shouldn't moan really, if you wake up in the morning and your eyes can move left and right, life's good!

So, what's on the menu for this month's feast? Well, I've got quite a bit to tell you about but, truth is, I've a few 'must write about' items which rather constructs *Safety Spot* for me. As you know, this column is sometimes used as a method of closure for incidents that have happened to aircraft in our fleet. That's why, sometimes, hopefully rarely, interesting items and stories that you've sent in don't appear as expected. Rest assured, I'm a serial hoarder, so if you've sent me stuff about anything, it will be in one of my 'piles' which, although sounding painful, is my way of not losing anything!

A good example of the obvious frustration felt by some members was rather eloquently expressed by a long-term friend of the LAA, Eric Clutton. For those not steeped in PFA/LAA history, Eric, who now incidentally resides on the other side of the pond in a place I'd never previously heard of, Tullahomer, is the designer of the FRED homebuilt. Now, Eric wrote to me recently with some excellent advice about avoiding corrosion in bolts that pass through wooden structures. He finished the letter with the comment, *'Just see if you can give this advice better treatment than my prop-swinging epistle'.* I remembered the article and, after a bit of pile-shuffling (and please, no comments about this), found his comments on the 'art of hand-starting an engine'.

Readers will know that we've had a few scary examples recently where this procedure hasn't been carried out correctly. When the process goes wrong, and like all human activity it sometimes does, there's almost always damage to the aircraft and/or, as in the case of one cringe-making examples not long ago, serious personal injury. Eric's letter is item one. I also need to talk about a strange case of 14 flights with 14 partial engine failures; so this is item two. There's the inevitable corrosion issue, item three, and a little bit about a mouse where the picture actually tells the story without any words, plus a problem involving a propeller.

I am not going to publish the advice from Eric about corrosion in bolts just yet and, although sorely tempted, I'm not going to talk about a recent test flight of a rebuilt FRED where the instrument panel caught fire, even though it would be pretty slick to do so. For these stories you'll have to wait for the September issue.

Hand Swinging Propellers – Advice from Eric Clutton

Dear Malcolm

There has been much discussion of hand-propping of late and after about 60 years of doing this, mostly without any help, I feel qualified to pass on some tips.

First of all, most hand-propping accidents involve dead batteries and the pilot making the decision to start it manually because he has seen it done and knows the general principles. What has not been observed in most cases is the attention to detail taken by the experienced hand-propper. Chocks are absolutely essential. An alternative is to tie the aircraft securely to a fixture but this is not always possible and chocks are more convenient to carry around. They do not have to be great heavy things because it is their shape not their weight that does the job. Always use chocks even if brakes are available: the idea is to use chocks with brakes as a possible back-up.

Strap the stick back (or whatever works the flippers at the back), make certain the ignition is off and perform the necessary priming actions, then set the throttle open just a small amount. This (throttle position) will vary and is one of the main accident causes because anyone with an electric starter simply wags things about until the engine starts and has no idea what throttle setting to use for hand-starting. Ground surface around the starting area should be free of hazards such as pebbles and such. A successful start followed by falling into the revolving prop could spoil your whole day. If in any doubt, then move the aircraft to a safer place.

The position of the prop as it comes up on compression will vary and for a person of average height the twenty to two position seems about right for a prop rotating clockwise, and twenty past ten for anti-clock. In these non-analogue days, this may be difficult to understand!

It is worth remembering that if a reduction unit is part of the system, the prop will be at a different position for each rotation and the gearing makes it more difficult to turn, but when it does, the engine will be turning over faster than the prop. Grip the prop blade at about 2/3 of its span with fingertips curled around the propeller's trailing edge and, with the throttle set and ignition on, the engine should start as it is pulled through compression. It is advisable to practice this action a few times with everything turned off.

If there are no results after three pulls through compression, check for fuel dripping out of the carb. This shows the engine has too much fuel, so turn the ignition off, open the throttle wide, check the ignition is off AGAIN and turn the prop backwards about six times. ***Reset the throttle*** *and ignition and try again. If no fuel drips out then the engine may not be getting enough fuel, so OFF with the ignition, close the throttle and repeat the priming procedure before trying again. If all is well, the engine will start and the idle speed can be adjusted with the throttle.*

On a cold day the engine will not like running at too low a speed and the carb heat control can be used to partially richen the mixture. The engine should be allowed to warm up until pressures and temps are normal, then walk around the tail and remove the right-hand chock. The aircraft should not move. If all is well, walk around the tail once more and carefully remove the left-hand chock. If the aircraft begins to move, replace it immediately! Try lowering the idle speed and remove the chock again. It is possible that on a smooth surface the engine will give sufficient thrust to move the aircraft anyway, so time to switch off and have another think.

A trick I often use is to take a piece of PVC pipe and notch one end to fit over the LH brake pedal. The tube is then cut to a length where it can be jammed against the undercarriage box (under the left-hand seat). With this in place the aircraft becomes very difficult to move and the tubing is easily removed when sitting in the pilot position. This method can be used (with chocks) on most aircraft.

If the worst happens and the engine roars to life, the most important thing is, of course, to get out of the way of the prop, but it is a mistake to try to get in the cockpit. Simply get in front of the tail and stay there until help arrives or the aircraft runs out of fuel. This gives rise to another tip – if you're not sure of settings etc, after priming and before starting, TURN OFF the fuel! After starting you have to remember, if all is well, to tum the fuel on again of course.

Finally, NEVER, EVER, under any circumstances, start an engine in an enclosed space!

If you have ever seen a tornado you will know what I mean.

I hope the above will be useful and maybe save a few aircraft like that lovely Luscombe of Michael Cross. I would hate that to happen to my 1946 SA, especially after a four-year rebuild and fresh paint job! They are a great aircraft but not an easy one to repair.

Thanks Eric … all good advice. One thing I'd like to add which comes from a human factors angle and it concerns who is in charge! I've seen quite a few near misses, not only with hand-swinging but in many other areas of human-aeroplane activity, where there's confusion because nobody is directing the operation, whatever it might be. Equally, other instances where a number of different people take charge (at the same time); this last scenario often ends-up resembling a John Cleese sketch.

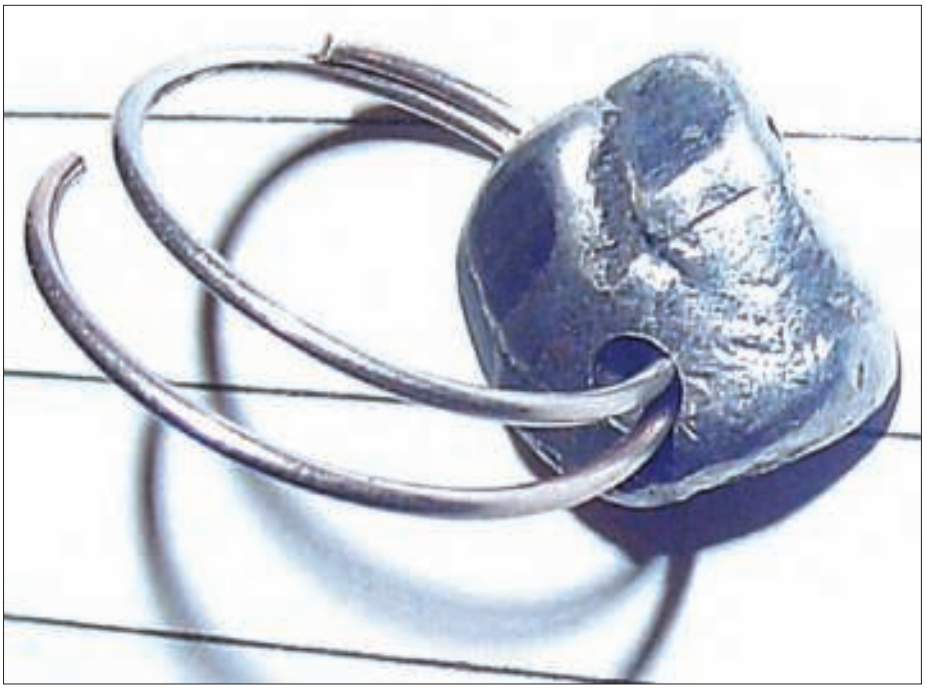
Often, hand-starting an aircraft involves more than one person so, before you start the process, make sure the hierarchy's sorted out and whoever becomes the head-honcho must ensure that everybody is correctly briefed. Things have a habit of going wrong rather quickly where aircraft are concerned. Remember, shout, "Fuel On – Brakes On – Throttle Closed – Switches Off," and give a clear thumbs down signal. The assistant will respond. OK, a bit formal, but I'm sure that you get the picture.

We had a near miss here at Turweston recently when an untrained person tried to swing a big radial. He found out, luckily without permanent damage, that they're not the same to start as an inverted in-line engine.

Wassmer WA-52 – Engine Failure(s)

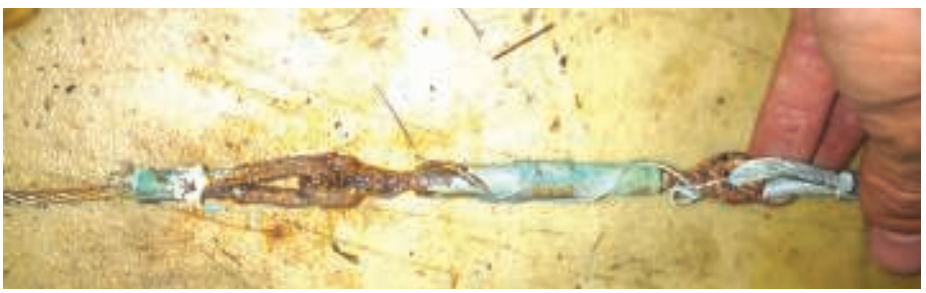
I received a letter from LAA Inspector, Tony Baron: the content of the letter was rather intriguing but, before I could respond with a few questions, Tony appeared at our Turweston ›

These two pictures show the corresponding damage to the brand new cylinders (replaced because of a partial engine failure on a flight between Sandown on the Isle of Wight and Popham). Unfortunately, the engineers involved weren't qualified to do this work on an LAA aircraft and cleared the aircraft for flight without ensuring that all the debris of a broken valve, the reason for the partial engine failure, had been removed from the engine. *(Photo: Tony Baron)*



As it turns out, this very expensive key ring, made from the pulverised remains of a Lycoming exhaust valve, could have ended up costing even far more that it did. We think that the remains of the exhaust valve, hidden in the induction chambers feeding the left-hand bank of cylinders on the Wassmer's Lycoming engine, eventually found its way into the cylinders, perhaps passing freely between number two and number four. Eventually, the remains stuck under a valve and the pilot suffered a complete loss of power, fortunately he was able to make it back to Sandown rather than ditching in the Solent. *(Photo: Tony Baron)*

This picture shows David's Wassmer WA-52 aircraft; the LAA has three of these 1960's fibreglass machines in its fleet, two of them flying with current Permits (both in the south) and one machine under restoration in Scotland. About 150 of these four-seaters were built by Societe Wassmer during the production run. *(Photo: Neil Bassett, G-INFO)*



When LAA Inspector Peter Montgomery took a look inside the rear fuselage of a Europa Classic for its annual inspection he was amazed to find that both left and right rudder cables had corroded to the point where at least one of them was on the point of failure. The aircraft itself received its first Permit to Fly in 2002 and has been inspected annually ever since. A detailed investigation into the aircraft inspection history by the LAA's Chief Inspector, Ken Craigie, revealed that it is likely that this corrosion had occurred in the previous year. You'll need to read the full text on page 50 to find out what most likely happened. *(Photo: Peter Montgomery)*

HQ carrying a rather large brown envelope. Let's start with the letter.

Dear Malcolm,

Please find enclosed my report on Wassmer WA-52. This aircraft was airborne from the Isle of Wight and was forced to do a landing at Lee-on-Solent because number four cylinder had a third of the exhaust valve missing. This was discovered when the cylinder was removed by the company at Lee-on-Solent.

Said company replaced number four cylinder but did not locate the missing piece of valve; they believed it had passed through the exhaust pipe, but it had not. The pressure from the exhaust forced the piece of valve back down into the air intake tube of number four cylinder; I found the piece in number four cylinder air intake tube when I removed the cylinder. I also found that the piece of valve had damaged number two cylinder.

Said piece is approximately 1/3 of the exhaust valve. I have now replaced the two damaged cylinders with two new cylinders. The engine is all up and running and is as sweet as nut. Total of forced landings 14 in two weeks (must be a record).

Now, don't tell me you're not intrigued by Tony's brief report, if only because of the claim that this aircraft had been involved in 14 engine failures. I checked my reports database and couldn't find anything about this, or rather these, incidents. Mind you, a partial (or even a complete) engine failure that doesn't result in any further damage to the aircraft isn't a 'reportable' incident in the legal sense, although, I hasten to add, we do like to hear about any engine failure events that occur on LAA machines here at LAA Engineering HQ.

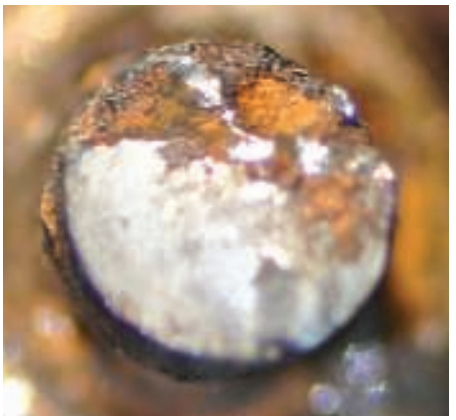
After chatting to Tony, who I must say was rather hot under the collar about the whole sorry story, I realised that Tony's letter was really telling us a portion of the final chapter of the overall event. So, to avoid the inevitable madness created by loss of one's bearings in time and space, let's start from the beginning.

After waving Tony goodbye, I picked up the telephone and spoke to the owner of the subject aircraft. As it turns out, he, that's LAA'er David Hurn, was on the top of a building somewhere on the Isle of Wight, repairing the old building's lead-work, this being his trade. For safety's sake (his, not mine!), it was a brief chat, but David promised to phone back with a detailed resume of the incidents surrounding the engine failures and yes, the aircraft is now running fine.

In the end, I had quite a few chats with David, he's an easy and interesting bloke to chat with; I realised that he was quite besotted with his Wassmer, and who could blame him for that. David explained that his aircraft was built in 1971 and had accumulated a couple of thousand flying hours up to the point when it was imported officially into the UK in 2009 but had been flying in the UK, under a German flag, for the previous six or seven years. The aircraft, effectively an orphan, received its first LAA Permit to Fly in 2009 and has been in continual service, under David's care, ever since.

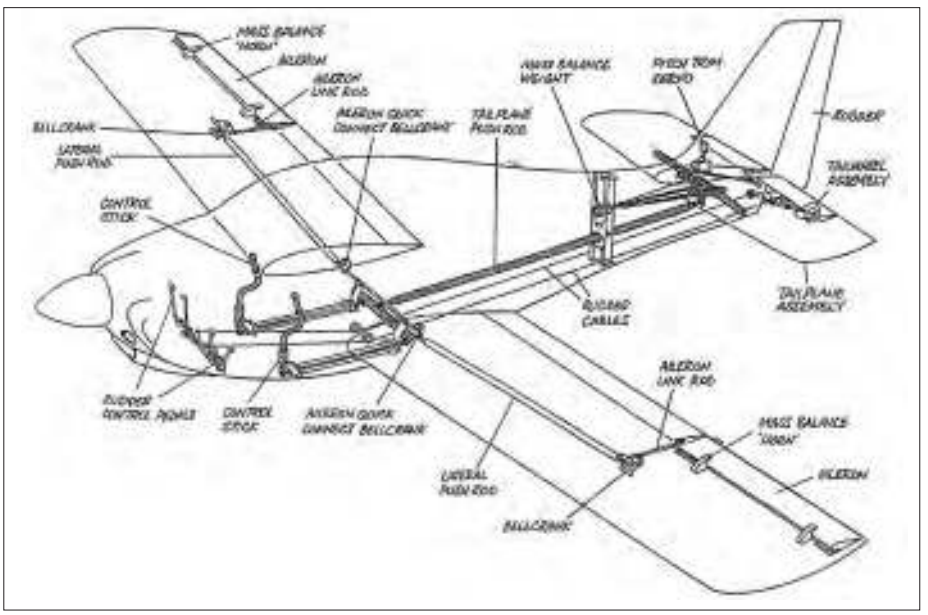
David explained, "This all started when I began to notice that the engine was running less smoothly than normal on a flight from Sandown, my base, to Popham."

I asked David what he meant by 'less smoothly' and he continued, "Well, it started with an unusual vibration, I could get rid of it



When the LAA Inspector tried to undo the turnbuckles on this Europa rudder cable so that it could be replaced the shaft of the 'eye' of the turnbuckle failed in overload, the left hand picture shows the state of the removed cable and the picture on the right shows the extent of the corrosion within the shaft; it can be clearly seen that nearly 50% of the effective diameter of the material has been lost to oxidation.
(Photo: Peter Montgomery/Malcolm McBride)

There are many reasons for corrosion; some of the specific reasons in this case, where a cable has been found in service in a very dangerous condition, is discussed in the text. This picture, showing the control 'runs' in the Europa aircraft, shows how difficult it can be to ensure that a cable is inspected fully throughout its whole length. Of course, corrosion and wear are much more likely at connections or where the cable direction changes around a fairlead or pulley, so these are the areas that need inspecting on an annual basis, but it is essential that your Tailored Maintenance Schedule includes, at the three or six yearly 'node', a complete inspection of the control cables. This inspection can, if possible, be done in-situ or, if this is not possible, the cables must be removed and the inspection carried out outside the airframe.
(Photo: Europa Build Manual)



initially by taking a bit of power off, then the vibration became worse and I noticed that I was losing power. Naturally, as I was over the Solent at the time and the Southampton Zone ahead, I decided on an immediate landing so I throttled back, trimmed for 80kt and set heading for the runway at Lee-on-Solent. I made it without any further issue and, after landing and completing the booking-in formalities, gave my inspector, Tony Baron a call."

Well done to David for handling this emergency well and getting the aircraft back on the ground as soon as possible after establishing that the engine wasn't performing to its full potential. Airmen in general are very sensitive to changes in engine timbre, I've noticed that the sensitivity to any change in the engine's 'note' is indirectly proportional to the quality of the terrain below the aircraft; the Solent, whilst close to habitation and quite flat is, as you will appreciate, made from water! David did everything right. First, set yourself up for a forced landing and try to identify the symptoms. Check the gauges and ask yourself whether the feeling that something's wrong is showing itself in other ways; has there, for example, been an uncommanded rpm drop? What are the temperatures and pressures like? Next, see if you can do anything about the problem – change fuel tanks, turn on the auxiliary fuel pump… No change? Apply carburettor heat (or alternate air on some injected engines). A well-practiced pilot should be able to do all these actions in under a minute.

In David's case, however, the problem was soon found to be lack of compression in number four cylinder and, listening to the noise from the exhaust when pulling the engine through, confirmed that an exhaust valve had either become stuck in the open position or, as it turned out, was not there at all.

Here's where the story gets a little political, and the events surrounding this aircraft's eventual repair become rather confused and complicated. I began to understand why the LAA Inspector, Tony Baron, was, as described earlier, rather hot under the collar. Hot enough, as it happens, for him to report the whole affair to the CAA as an engineering occurrence report.

The first thing that seems to have gone wrong is that when Tony arrived to meet David at the airfield, he was instructed, we're not sure by whom, that he wasn't allowed to do any work on the aircraft on the airfield and that the repairs needed to the engine must be carried out by the local repair agent. This was arranged and the number four cylinder was removed and a new cylinder fitted. Of course, because this is an LAA machine, the final sign-off for any work like this must be done by the LAA Inspector, as he or she is the only person qualified to sign a Permit Maintenance Release (PMR). Now, and I've been asked to stress this point by the engineers at the CAA, although it would be reasonable as an LAA Inspector to accept work done by a CAA Licensed Engineer or, as in this case, a CAA Approved facility, no checks were made to establish whether the facility at Lee-on-Solent held this status. In fact, after a bit of research by the CAA, they were found not to be approved.

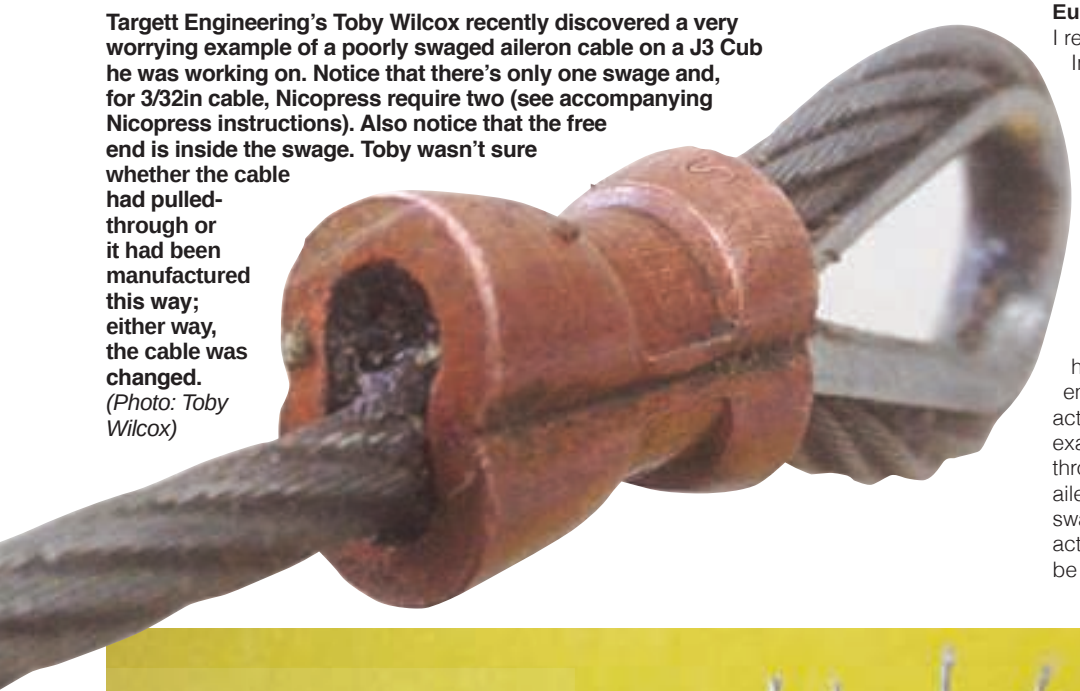
Tony naturally questioned the engineer involved in the cylinder change and asked specifically to see the remains of the broken valve. The engineer explained that, despite an extensive search, the remains of the valve weren't found and must have gone out the exhaust. After Tony issued a PMR, David climbed aboard his machine for the short flight back to Sandown. Climbing out over the Solent, at about 500ft, the engine started to misfire badly. David lowered the nose quickly and the misfire immediately stopped. With his heart rate slowly dropping back to normal, he carried on to Sandown putting the misfire down to an oily plug or some such thing.

To cut quite a long story a little shorter, David suffered a number of misfire events over the following months. Tony travelled to the Island a couple of times, changing first the plug leads, then the magnetos. However, the occasional misfire events still happened and, rather uneasily, David arranged to fly the aircraft back to Lee-on-Solent for their engineers to establish what was going on. It was on this flight that disaster struck and, again, just as he passed abeam Cowes, the engine began losing power rapidly and started to vibrate wildly. David managed to get the aircraft back into Sandown without much spare height and, once safely on terra firma, asked Tony to come down again to the island to see what was going on.

When Tony arrived it was clear that a quite large piece of metal, obviously ›

the remains of the original valve (and now an expensive key-ring) had been moving around the induction side of the engine. Very occasionally I think that the metal fragment lodged itself under a valve and this is what was causing the occasional misfire. Then, once the fragment had been 'forged' small enough by the actions of the piston, it entered one cylinder under the valve, probably number four, and started to cause the damage you can see in the attached pictures. Then, still smaller, it passed through the system, into number two cylinder where it eventually jammed a valve completely, hence the loss of power.

It's easy to criticise decisions made in the heat of an issue in the temperate regions after the event. LAA inspectors have to use their judgement about what to accept and what not to accept all the time. I'm sure that I would have accepted the original claim that the debris from the original exhaust failure had gone overboard but, to be frank, I'm amazed that after the first bout of misfiring, the decision wasn't made to pull the cylinders to see what was going on, presuming that there might be a third party involvement in the affair, namely the ignition system, is a bit 'Hercule Poirot' and proved to be an expensive distraction. Another point worth making perhaps, although rather obvious, is that if you are in any way unsure of your engine, don't fly the aircraft until you've established that there is absolutely nothing wrong with it, even if it means stripping it down completely. An engine failure in flight, even under the safest of hands, is a dangerous situation to be in. Both David and I agree that, despite being out-of-pocket, he's a lucky chap… well, I suppose he must be, he owns a lovely aircraft.



Targett Engineering's Toby Wilcox recently discovered a very worrying example of a poorly swaged aileron cable on a J3 Cub he was working on. Notice that there's only one swage and, for 3/32in cable, Nicopress require two (see accompanying Nicopress instructions). Also notice that the free end is inside the swage. Toby wasn't sure whether the cable had pulled-through or it had been manufactured this way; either way, the cable was changed. *(Photo: Toby Wilcox)*

Europa Classic – Rudder Cable Corrosion

I received an interesting email from LAA Inspector Peter Montgomery, he'd been asked by an owner to inspect his aircraft for its annual Permit renewal and, although he hadn't seen the machine before, was very happy to do this work. You have probably passed your eyes over the pictures on page 49 of the very bad corrosion on the cable ends and turnbuckles so I'm sure I don't need to emphasise just how serious this event is. You will also see an example of a very poorly made cable end *(left and below)* sent in to us by LAA'er Toby Wilcox, hence the focus of attention on the swaged ends made using the Nicopress process. In actual fact, I think that the ferrule used on the example shown, where the cable was pulling through the swage slowly (incidentally a J3 aileron cable end), was actually a Talurit ferrule swaged using a Nicopress tool: but, without the actual components for evaluation, this cannot be absolutely established.

Here's a picture of the galvanised 3/32in cable as fitted to the Europa discussed in the text. Note that it is more usual to use solid (non-electroplated) ferrules with galvanised cable although, as you can see, because of the galvanising, there's not a sign of electrolytic corrosion in this joint. This picture shows well how the control cable is woven – the main cable is a right-hand lay of seven strands, these strands are made up of individual steel wire laid left-hand. Note that, whilst modern cable is either 7x7 or 7x19, this cable only contains 14 individual strands (7x14). The possible reason for this is explained in the accompanying text. *(Photo: Malcolm McBride)*

Back to the Europa Rudder cable; here's Peter's well-written email which, if you'll excuse my laziness, tells the story very well and saves my fingers a little at the same time.

Dear Malcolm,

I thought you might be interested in these pictures of some rudder cables/turnbuckles as found on a recent Permit inspection. The offending aircraft is a Europa Classic. As you probably are well aware, the Europa has a FSB (LAA 247 FSB-005) which calls for inspection of the entire length of the rudder cables on Europas (or is the plural Europi?) at every Permit inspection. These turnbuckle sections are the easiest part to see being in plain sight in the fuselage just aft of the cockpit.

The owner recalls the aircraft getting very wet returning from a flight one time, being left outside and standing for a few days before 'drying out'. This could well have been the catalyst for this corrosion to start but I think you would agree that this kind of degradation takes some considerable time.

Needless to say, we have replaced the entire turnbuckle assemblies and the rotten sections of cable. On attempting to undo one of the turnbuckle ends it actually sheared and did not take much force to do so. I have included a picture as close up as I could get of the sheared end (p49) and you clearly see that there is a corrosion crack propagating 1/3 of the way through this vital stressed part! A classic Europa with a rudder cable snap on landing or take-off would be somewhat of a mess. I have all the bits here, just shout if you would like them for closer inspection yourself.

As for what can be done about this issue, there is already an FSB covering this very issue to be complied with at every Permit inspection so that should really have covered it. Regardless of that, any control cable in any aircraft is vital and should be inspected with diligence at least at every Permit inspection.

The water collecting issue is interesting. I have yet to consult the plans but there don't appear to be any drain holes on this aircraft to drain water from the belly in this area. Despite the VFR only restriction on Permit aircraft, this does not stop them being left outside in the rain and accumulating water.

Also of note with these specific cables is that the wrong Nicopress swages were used at manufacture. Oddly the forward cable sections were found to be stainless and the aft sections galvanised. Galvanised cable should use plain copper swages whereas stainless cables have tin-plated swages to prevent dissimilar metal corrosion. Unless the tin plating has all been completely dissolved, the swages on the stainless steel cables are clearly plain copper and there is lots of corrosion evident between the swage and the cable. The cable ends on the rudder (galvanised cable) were made using tin-plated swages (plating still completely covering them) and these are in very good condition with no sign of corrosion. I have read somewhere (but cannot find it now) that tin-plated swages can be used on galvanised cable as well as stainless, and this does make sense as I believe zinc (ie galvanised) does not have dissimilar metal issues with tin. I might have made that up though… Like I say, there was no corrosion at all evident on the tin swages on the galvanised cables. They have been replaced anyway as the entire aft cables have been replaced.

Let me know if you want any further information.

Peter Montgomery

There are quite a few points interesting points that are well-made by Peter and, as space is getting short, I'll expand on just a few. Firstly, Peter was clearly worried that this aircraft hadn't been getting inspected properly, at least for the last few inspections; surely it takes longer than a year to get corrosion to get this bad. It turned out that the annual inspections had been carried out thoroughly, in fact during the previous year's inspection, the inspector had asked the owner to wash out some fungal growth he'd spotted on the floor of the fuselage, right by the corroded turnbuckles. Peter mentioned the water ingress in his email.

Well, the owner bought some spray-on fungicide and duly set-about its destruction as he promised he would. After checking the ingredients on the spray applicator it seems that the fungicide is actually bleach; the only problem was that he didn't wash off the fungicide thoroughly after its application and, well you can see the results in the pictures attached. An obvious lesson here which I won't bother you with further.

Incidentally, the reason for the fitment of the unusual galvanised cable appears to go back to the aircraft's first build. I checked and at that time (2002) only stainless steel cables were supplied with the Europa Kits. A close look at the cable end showed that the galvanised cable was actually W series cable, a type withdrawn from use on aircraft shortly after the second war. This type of cable was (and may be still) in service on many early gliders and, yes you've guessed it, this particular Europa was built in a shed alongside a glider repairer. It looks like there may have been a bit of component migration during the build.

With regard to tin-plated swages on galvanised cable, I will make the following comment: when assembling anything it's best to stick to the manufacturer's instructions. I think that the pull tests done at the time of the swaging systems approval would have been done with plain copper ferrules, so these must be used to stay within the manufacturer's rules. It may be that tin-plated ferrules, whilst fine when it comes to their electrolytic corrosion protection function, may not have the same grip during testing. Remember, one of the important properties of galvanised cable is that it is far more flexible than its stainless equivalent because the galvanising actually add lubricity to the strands. It may be this very lubricity would change the frictional characteristics of the ferrule. Thanks Peter for your report.

LAA'er, Flt Lt Peter Barker, uses his Davis DA-2 occasionally to commute from his operational base here in the south of England to his home near Huddersfield. During a recent trip back to work one Sunday afternoon, he had to make an emergency landing at East Midlands because the aircraft suddenly started to vibrate and the engine developed a noticeable 'buzz'. When he landed, the reason for the change in engine timbre was rather obvious, as you can see; the leading edge protection strip, bonded to the wooden propeller, had become partially detached. *(Photo: Peter Barker)*

Davis DA-2 – Newton Propeller Failure

Thanks to LAA'er, Flt Lt Peter Barker, for his brief report on a recent propeller failure which delayed his return to work a short while ago.

Having taken my usual Friday afternoon trip north to Huddersfield, my aircraft was left outside in the Yorkshire rain over the weekend. As forecast, however, the Sunday evening cleared up nicely for my trip south again. During this journey, approximately 8nm north of the Trent VOR, I experienced a sudden change of engine noise and drop in rpm; the engine was making a buzzing sound and slight cockpit vibrations were apparent.

All instruments were showing normal ›

readings so I suspected carburettor icing. However, application of the carb heat made no difference. I was also unable to increase engine speed to anything greater than 2,300rpm so I briefed the passenger to prepare for a possible field landing should an engine failure occur. Still unsure of the issue, I decided to squawk 7700, select 121.5MHz, transmitted a pan to the D&D controller at Swanwick and requested a diversion to the nearest airfield. The military controller gave me a steer for East Midlands and liaised with the radar controller to facilitate a priority approach. I maintained height until I was overhead East Midlands to facilitate a left-hand spiral descent to RW27 and then landed safely.

On inspection of the aircraft I was able to identify the problem immediately; approximately 20cm of the composite-material leading edge had detached itself from the main body of one of the wooden propeller blades. This caused both flutter and significant drag to the propeller which would explain the engine vibrations and reduced availability of rpm.

Most likely explanation: *Moisture entering the wood causing the joint to weaken.*

Contributing factors: *Degradation of the varnish exposing small areas of bare wood and lack of prop covers exposing wood to the rain over the weekend.*

Lessons learned: *Thoroughly check all areas of the propeller for nicks and potential signs of failure, especially after being exposed to moisture.*

> *"Thoroughly check all areas of the propeller for nicks and potential signs of failure, especially after being exposed to moisture"*

Thanks Peter and well done for handling a potentially life-threatening situation calmly. Good decisions all round. When you say that moisture entering causing the joint to weaken, I think that, whilst this is true, the real problem of wood is that it expands when wet and, during this expansion, huge local forces within a structure actually break glued joints. I spoke to Alan Haseldine, the engineer who has taken over Newton Propellers from Alan Newton, about this failure. Alan confirmed that water had indeed entered the joint between the leading edge protection strip through a stone chip.

So, that's it for another month, I hope that you've enjoyed the read: don't forget, this section of our magazine relies of you sending me in your stories. I'll write to Eric Clutton letting him know that he's 'made the mag' and I won't forget to let you know his advice about avoiding corrosion in metal fittings attached to wood – that will be next month's focus if my in-tray's anything to go by. Fair Winds. ■

When LAA'er, Trevor Dean took a look behind the instrument panel of his MW-6 aircraft to try to find out why his airspeed indicator had stopped working he discovered, as you can see, a rodent had taken a fancy to the pitot pipe. Trevor asks, "How often do owners check behind their instrument panels?" A good question. *(Photo: Malcolm McBride)*

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	
Up to 450kg	**£155**
451-999kg	**£200**
1.000kg and above	**£230**
Modification application	
Prototype modification	minimum £60
Repeat modification	minimum £60

Transfer	
(from CofA to Permit or CAA Permit to LAA Permit)	
Up to 450kg	£150
451-999kg	£250
1,000kg and above	£350
Four-seat aircraft	
Manufacturer's/agent's type acceptance fee	£2,000
Project registration royalty	£50
Category change	
Group A to microlight	£135
Microlight to Group A	£135
Change of G-Registration fee	
Issue of Permit Documents following G-Reg change	£45
Replacement Documents	
Lost, stolen etc (fee is per document)	£20

Latest SPARS - No.16 February 2015