With Malcolm McBride
Airworthiness Engineer

LOSSES, RESTRICTIONS AND FAILURES

A selection of incidents and accidents that demonstrate the importance of knowing and looking after your aircraft

This picture shows the Practavia Sprite canopy in place before the fateful flight where the canopy was lost. This type of canopy was never designed to be opened in flight, with the curved shape producing significant lifting forces peaking just behind the locking handle. When this canopy is closed and latched, the canopy itself sits under the top of the windscreen frame holding it in place. When it's opened, there's not much holding it down. *(Photo: Tony Barber)*

Welcome to this December issue of Safety Spot. I'm sure that you don't need reminding that there's only a few more shopping days until the big day. In actual fact, writing this in the midst of the November gloom, I'm quite busy looking for (and hopefully recruiting) various musical talents to play at a number of Christmas events; I've drawn the short straw in the 'who's organising it this year' lottery for a number of village Christmas spectaculars. Maybe it's just me, but folk seem less interested in participating in group events these days. I suppose it's less effort sitting in front of their numerous electronic gizmos than it is practicing something in the real world. Times are changing, but of course, there's nothing new in that – change is, after all, the most constant of constants.

As you will no doubt know, the LAA is re-jigging itself to fit in with the very many national and international changes to regulations that are occurring in the sports aviation world. This year we've been preparing to transfer to a new, more formalised CAA approval for us all here at our Turweston HQ, under British Civil Airworthiness Requirements (BCAR) A8-26 – *Approval of Organisations Supporting Recreational Aviation*. This is a completely new BCAR issued by the CAA but its purpose is exactly what previous systems aimed to achieve, safe flying for aircraft operated under the airworthiness systems of sporting organisations. We're in the final stages of re-writing our exposition and other procedural documents, while also re-jigging LAA Engineering to include a new Quality Management system to demonstrate compliance against this new set of rules.

Fortunately for us all, our Association has an envied engineering support facility and the new BCAR was written largely to encapsulate the existing working practices of LAA and BMAA, so we already meet, in fact exceed, most of the requirements laid out in the new approval, so the process hasn't really been that challenging from the technical point of view. We do need to adopt some of the formal safety management processes used by our commercial cousins, as the CAA will take less of an audit role than they used to, but from the aircraft owners' point of view we won't really be doing anything under the new system that we weren't doing under the old.

What our move to an A8-26 approval has done though, and in my view this is a very good thing, is that it has forced us to re-evaluate all of our internal (and external) processes and systems from the bottom up. Our new Chairperson, Brian Davies, is keen to question everything; I think his favourite questions are "Why are we doing this?" and "Should we be doing that?" On a personal level, I've always loved change, it keeps me interested and engaged in what's going on around me (and, out of mischief)!

One aspect of my job that I really enjoy is the wide variety of member problems or issues I have to deal with in any normal day; the Airworthiness Engineer often sits as 'piggy in the middle' between different specialities. I like to think that I've got quite reasonable judgement when it comes to sports aviation safety matters but as I'm surrounded by a very expert membership, the judgements I have to make are really often obvious to all. When it comes down to it, whatever this or that issue might relate to, the answer to a problem becomes clear when it is measured against the question, 'does what's happening here make it more safe or less safe?'.

This is especially true when one considers that any change is unlikely to maintain the status quo, much as some might like to imagine that it might. If the answer is the first, more safe, then there's nothing to discuss; if it's the second, we need to ask ourselves whether we can really afford the drop in safety. If we decide that we can afford a reduction in safety, we need to make sure that we identify who will eventually be paying the bill.

Certainly one thing that the LAA Engineering Department will continue to do is fight to avoid anything that joins the 'rush to the bottom' that some other support organisations have suffered in this recent era. As aviators, we know that we should never take safety for granted; sport flying is as safe as it is now because of an accumulation of tiny safety initiatives adopted over time. The attitude best described as 'why bovver?', often seen amongst beginners with a couple of hundred hours under their belt, rapidly disappears after their first really near miss! When it comes

(Left) **The simple mechanism that holds down the Bulldog canopy; clearly, if the canopy was opened in flight (by sliding it backwards), the securing pin would cease to hold the canopy down and it would leave the airframe because of the lifting forces generated by its shape. In actual fact, because of the RAF requirement for easy exit in case of emergency, the Bulldog canopy contains quick release mechanisms making it a quite complex assembly, but that's another story. The picture below is G-BZME, owned by LAA'ers Terry Spandley and Hugh Tyrell.**
(Photo: Malcolm McBride)

(Far right) **The de Havilland Chipmunk has a different sort of mechanism holding the canopy in place; notice that it is securely fixed in a runner. Although not shown, the canopy can be opened and locked in place in flight. As with all designs, this type of system has its drawbacks – in an emergency it cannot be easily ejected. If this canopy jams for any reason, in an emergency the port side windows can be ejected. Mind you, I think that you'd have to be pretty slim to get through the hole! The smaller photo, showing off the open canopy in flight, is of Dennis Neville's beautiful aircraft; it couldn't have been in 2015, the aircraft is pictured against a blue sky!**
(Photo: Brian Mathews/Malcolm McBride)

down to it, staying safe in sport flying is much less about regulation and more about sharing knowledge – at the heart of the LAA's excellent safety systems, evolved since WWII, is our ability to share knowledge freely and pass on advice, both at a local and a national level.

So, as always, let's take a look at a few events that feature LAA members and their aircraft where safety lessons can be shared. Thanks to all of you who have participated in Safety Spot during 2015; I know that it's far easier to brush a bit of embarrassment under the carpet – been there, done that – but embarrassment is a transient emotion, a good safety lesson lasts forever.

PRACTAVIA SPRITE SERIES 2 – IN-FLIGHT CANOPY LOSS

It's often said that there's no such thing as a 100% safe activity, there's some sort of gotcha, metaphorically speaking, lurking in the undergrowth, in everything that we do, however mundane the individual task might appear to be. As humans, the early part of our journey through life requires us to develop a risk evaluation tool, we wouldn't last long without it so it's probably one of the most important, but often completely overlooked tools, in our personal toolbox.

Psychologists, in my experience, rather like to complicate matters by suggesting that there's no such thing as one risk avoidance system, and perhaps they're right, but as an aviator, I like to put my 'risk evaluator' quite firmly at the centre of things. The awareness of risk is an essential element in safe aviation practice, both in the air and on the ground; whatever the adverts say, it's better, as a baseline, to accept from the outset that flying is a dangerous business.

When you really think about it, during the course of a normal day, despite using the risk-evaluator tool nearly continuously, we normally take the ability to stay relatively safe completely for granted. Sometimes though, it's fun to push the boundaries; how would we know where the limit actually is without testing it? When exploring boundaries though, it's essential that we take account that the risk of a 'negative to safety' event happening is more likely and therefore, during the exploration, strategies must be put in place to bail the extra-risk- taker out if, or perhaps better when, things go wrong. The problem is, when exploring the unknown, it's difficult to predict where the gotchas lie in wait.

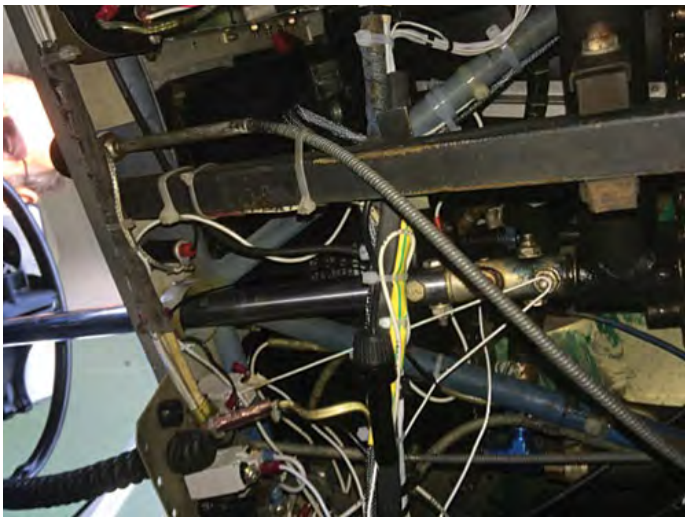
Here's an event where an extremely competent, cautious, current and experienced pilot did absolutely everything possible to ensure the safe arrival of his aircraft but still, after all his efforts, got wacked by the unexpected.

This pilot had recently purchased the Practavia Sprite as a flyable aircraft that would make a good renovation project. The Sprite was a British designed two-seat, low-wing, tricycle undercarriage aeroplane marketed as a set of plans and a limited number of components in the 1970s and, in the age before RVs, was one of very few all-metal designs and was quite sophisticated compared to most of the competing hardware. To be frank, this example had seen better days and was not in the best of condition: quite sensibly, when he was calculating the risks attached to flying the aircraft at all, he called the office for advice. Specifically, he was worried that the 'numbers' in the previous flight test reports didn't match what he was getting on the ground during engine ground runs, and wasn't sure how much faith he should put in previously reported annual flight test results. Eventually, somewhat reassured by the aircraft's previous inspector, and after a detailed inspection, he decided to risk a flight back to his home base to begin the renovation. Here's his report into what happened.

I visited the aircraft several times to carry out checks and ground maintenance, including engine ground runs, oil top up, oil quality check, fuel line checks, full panel off checks and inspection etc. No rectification work was carried out. When I was satisfied that the aircraft was fit for a flight, I carried out a test circuit. During this circuit I noted that the engine quickly heated up beyond 100°C and the oil pressure was around 20-25psi, which concerned me a little.

I spoke with the previous owner who told me the normal operating parameters were 25psi and 105°. While this pressure seemed a little low, I was willing to accept it. His view was that this had been the normal state for many years and it had never changed.

The engine was also a little low on oil ›



(Above) **Anybody who is used to working with rope will tell you, if it can snag, it will snag. Sometimes a snag is just plain annoying but, as in this case where the pitch control was severely restricted, snags could prove to be very dangerous. Notice that the wire loom top-centre in the picture is neat and well secured, unlike the spaghetti-like wiring bottom-centre.** *(Photo: Roger Gillett)*

(Right **LAA Inspector Phil Trangmar sent this Neuform propeller hub to us, it came off a BMAA Ikarus C-42. Notice the two radial cracks running outwards from the centre of the hub; they would be difficult to miss even with the most cursory of inspections. This is the first time that we've seen cracking like this on this type of propeller design and we were so worried about it that we immediately wrote to all LAA Neuform users (all on Ikarus C-42 aircraft). So far no other cracks have been reported. At the time of writing this, we're waiting on comments from the German manufacturers to see what they think about this serious failure. You can see that the top quarter of this hub is about to let go and, if it did, it's quite possible that a blade would have been lost, possibly quickly followed by the engine.** *(Photo: Malcolm McBride)*

(around 6.5 quarts), which may have further exacerbated the cooling issue.

Given all of this data, I considered that it would be OK to ferry-fly a one-hour flight back to my base before a full rebuild. This flight was planned for the 31 June. The day was quite warm with ambient temps around 26°C but this is not exceptional.

My plan was to climb high and keep the revs low in the cruise. The route was planned to dog-leg over a number of diversion airfields and avoid crossing built up areas. After taking off, I climbed to 1,500ft with a route planned via Bruntingthorpe to Sywell (to land refuel and check engine). At this point the oil temperature was already at 100°C so I levelled-off and hoped for improved cooling. After a few more miles, it became apparent that the engine Ts and Ps were not stabilising; the temperature was climbing and the pressure was slowly dropping. At this point, I was just over midway between the departure airfield and Bruntingthorpe, so I made the decision to land at Bruntingthorpe as a precaution.

Around Hinkley, the portable carbon monoxide (CO) detector I had brought along started alarming: I still had about seven miles to run to Bruntingthorpe so I decided to slide back the canopy slightly to allow some fresh air in. As I went to close the canopy (it was only open a few inches), it detached and flew off.

I landed safely at Bruntingthorpe with the oil pressure reading around 10psi and the oil temperature around 120°C.

So, here's a pilot who did an excellent pre-flight risk analysis and, as far as possible, covered all the bases when it came to planning the flight. Because the aircraft type was new to him, he wasn't aware that the Sprite canopy isn't designed to be opened in flight.

Mind you, understanding the rapid debilitating effects on the body by breathing large amounts of carbon monoxide, perhaps, just perhaps, losing the canopy was the best thing that could have happened. Luckily it didn't clobber anybody on the ground after going AWOL.

This event led to a full investigation by the Chief Inspector to establish how the aircraft could have been granted a Certificate of Validity whilst clearly in very poor overall condition. After the aircraft was recovered by road to its new home, the engine was removed and examined by experts, whereupon it was found to have an extensive crack in its crankcase.

Though the Sprite wasn't a particular success as a type, it's really good that this one is going to be brought back to tip top flying condition; flying in a well maintained 100% serviceable aircraft is one way of avoiding the 'gotchas' after all, but it's also important to understand any aircraft's limitations and how it is designed to be operated.

PA-22 PIPER CARIBBEAN – SEVERE CONTROL RESTRICTION.

I know, I know, we haven't got the Piper Tri-Pacer in our fleet yet or, for that matter, sadly, its smaller siblings, the PA-20 Pacer and PA-22 Tri-pacer. I think that all concerned feel that the LAA would be the natural home for these, now vintage, machines. I remember getting a ride in a Tri-Pacer as a lad; because I was a pretty small chap in those days, the owner of the machine decided to squeeze me in the boot behind the rear seat. I remember my legs dangling in the breeze; perhaps it was this flight that gave me the appetite for hang-gliding quite a few years later?

In any event, especially bearing in mind Safety Spot's recent discussions into problems associated with electrical equipment, it is worth remembering that it's not just the Volts and Amps that we need to worry about with regard to our electrical systems, we mustn't overlook the mechanical aspects surrounding the wiring loom itself. This issue, where an electrical wire has caused a mechanical control jam, is a good case in point; thanks to Roger Gillet, one of the owners of this machine, for letting me use the attached picture. Incidentally, the group that own and fly this lovely aircraft go by the name of 'Pilots of the Caribbean'… just right. Here's Roger's report, originally written for the Vintage Piper Club.

An incident occurred today where the 'holes' nearly lined up and could have caused a loss of control had this not occurred when it did, whilst carrying out the final full and free check at the hold. When I deflected full right aileron and full back elevator, I could not push the yoke forwards again, it seemed that it had snagged on something. Needless to say, the flight was aborted. It's worthy of note that nothing untoward was found either on pre-flight checks or the full and free check carried out before then.

If you check the photo, it can clearly be seen that a nut on the universal joint for the control column has fouled an electrical cable in the wiring loom. This cable feeds a circuit breaker for the intercom, which had also popped. As you can see the wires had been routed very close to the column and this was an incident waiting to happen.

The snag had chaffed the insulation exposing the wire's core, which created a short-circuit and caused the circuit breaker to pop. One would not have automatically associated one fault with the other.

Thanks again to Roger for taking the time to report this event. The wire snagging the control didn't cause an accident, but it could easily have done so. Incidentally, for those not fully initiated into 'pilot-speak', when Roger talks about the 'holes lining up' he's referring to an imaginary block of Swiss cheese which, unlike the stuff I buy from the supermarket, is full of randomly placed holes. Every now and again these holes line up and, when they do, you can see from one side of the block to the other.

Very few failure events, be they incidents or accidents, have a single cause; most have many separate 'happenings' which, individually, like holes in cheese, don't lead to a catastrophe, it's only when the 'happenings' join forces that serious problems may occur.

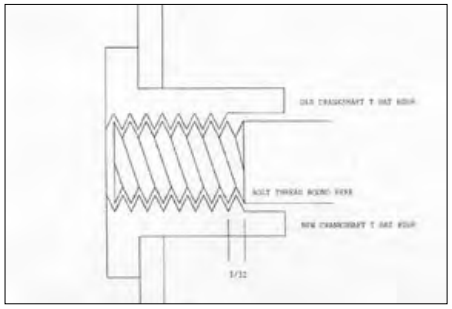
NEUFORM PROPELLER – HUB CRACKS

We received a report from LAA Inspector Phil Trangmar that set alarm bells ringing here at LAA HQ. Phil was inspecting a BMAA Ikarus C42 aircraft at Deanland airfield recently when he noticed, after removing the aircraft's spinner, that the hub was dangerously cracked. A

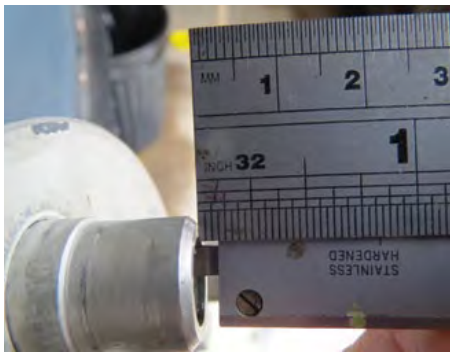
(Above) **Here's a close-up of the crack found on the Neuform; notice the corrosion products on the surface, particularly near the crack's origin (left in this picture). I suspect that this crack has been growing for some time. Clearly, as part of any sensible Tailored Maintenance Schedule, the annual check should include the removal of all panels, spats and, pertinent to this failure, the spinner; with the spinner removed, this crack would have been easily seen.**
(Photo: Malcolm McBride)

(Left) **We asked the LAA's Neuform Propeller owners to remove their spinners to check for hub cracking before further flight; so far, all the responders (six from eight) haven't found cracks. This example, sent in by Keith Meridith, is from 2002, and over the last 13 years, has accumulated over 1,600 hours of trouble-free service.**
(Photo: Keith Meridith)

(Left) **Van's RV-3 owner and keen LAA'er, Rob Hatwell, was worried about a slight vibration from his powerplant during an air test to check-out a newly-fitted Hercules propeller; the vibration was most noticeable at about 1,700rpm. Back on the ground he decided to check torque the propeller's attachment bolts – they torqued-up fine. Still not satisfied, he decided to pull the attachment bolts and, to his great surprise, noticed that the bolts, whilst they appeared to be doing their job, had actually bottomed out in their threaded fittings. This picture shows the evidence of the thread bottoming before the bolt has reached its correct tension.**
(Photo: Rob Hatwell)



(Left) **This sketch shows better how the bolt has become thread-bound**
(Illustration: Rob Hatwell)



(Right) **This close-up shows the threaded ferrule that both attaches the propeller to the spacer and provides a path for the torsional power from the engine to the propeller. The new ferrules, supplied with the new crankshaft, were subtly different in that the thread started 3/32in further forward in the ferrule which allowed the bolt to become thread-bound**.
(Photo: Rob Hatwell)

subsequent logbook check revealed that this machine had completed about 400 hours. Naturally, this aircraft was grounded straight away and the propeller removed and stripped.

Worryingly, the radial cracks that could be seen on the front face of the hub went right through the hub itself; one crack is so extensive that the hub was close to letting go. Phil noticed that there was another C42 on site which was also fitted with a Neuform propeller and decided, after checking with the owner, to take a closer look. This second propeller hub was also cracked so he let us and the BMAA Engineering Department know that he may have stumbled upon a serious defect that might affect the whole fleet. A logbook check revealed that this second machine had completed just over 600 hours.

Phil, as both an LAA and a BMAA inspector, knew that this type is common to both organisations - the LAA machines of course are all home-built examples whilst the BMAA machines are factory built.

We've got 38 C-42 aircraft on our books, but only eight of them operate using the Neuform propeller. In fact, the Neuform isn't currently used on any other LAA machine.

A further check of our database revealed that the average hours flown by the Neuform/C42 aircraft was just under 900 hours, well in excess of the 500 hour average flown by the cracked examples. I wrote the following email to all these owners straight away, alerting them that there might be a serious issue lurking inside their spinner:

I am writing to you today because you own an Ikarus C42 which is fitted with a Neuform 3 bladed propeller.

Earlier today we were given a propeller hub from a Neuform three-bladed propeller as fitted to a BMAA Ikarus C42 which was very near to a catastrophic failure because of serious radial cracks in the hub's structure. As you can see from the attached pictures, the cracking is quite extensive and the two principal cracks have nearly traversed the complete radius of the outer hub. Some cracking was starting in the inner hub (not shown) but this wasn't so extensive. You will also note that there is some considerable corrosion along the face of these cracks, suggesting that this cracking had been going on for some time.

Naturally, we're very concerned about this so we're sending you this email alerting you to the issue and asking that before you next fly, you remove the spinner and take a close look at the front part of the hub assembly. Of course, if there's any sign of cracking, don't fly the aircraft, remove the propeller and take a picture of the crack – naturally, we'd like to see the picture. The propeller that this crack was found on had completed a little over 600 hours.

May I ask that you acknowledge this email by letting me know when you've checked your propeller?

At the time of writing this December Safety Spot, seven of the eight owners have checked their propellers and have responded; none of their propeller hubs are cracked, thank goodness. Take a look at the pictures of the hub and, if you've got this or a similar style of ground adjustable propeller (and there are many in service), ask yourself when you last removed the spinner on your aircraft. If it was quite a while ago then it might just be worth checking to see that the hub's still in good condition.

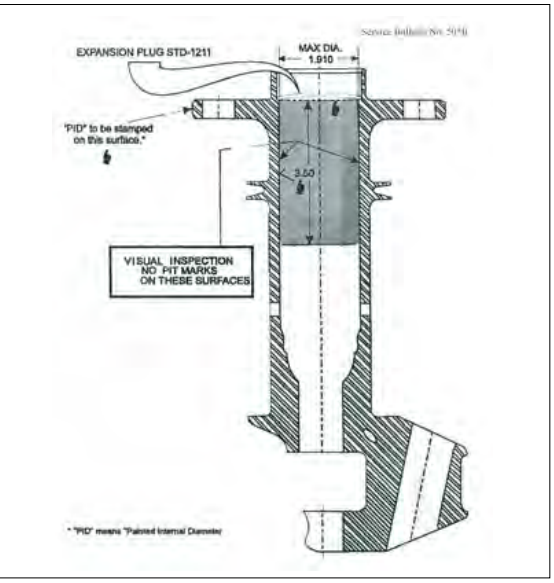
Remember, whatever maintenance schedule you are following, an LAA annual inspection for the renewal of the Certificate of Validity requires you to remove all the panels and removable covers from your aircraft, regardless of flying hours completed in the previous year. We strongly suggest that included under this description should be wheel spats and, clearly not done in the case of both these aircraft, the spinner.

VANS RV-3 – LYCOMING O-235 – HERCULES PROPELLER

LAA'er Rob Hatwell gave me a call a few weeks ago to let me know that he'd nearly been the victim of a gotcha. Rob's been building an RV-8 for some time but, because he's a busy chap earning a living ›

(Above) **The propeller extension as fitted to Rob's RV-3 (to the left is the starter ring gear). The ferrules, colloquially called 'Top Hats', act as a both a nut and to provide a positive location of the propeller.** *(Photo: Rob Hatwell)*

(Above) **This picture shows the extent of the corrosion still remaining after cleaning and polishing the internal bore of the crankshaft on Rob Hatwell's RV-3 engine. Clearly, this crank isn't serviceable.** *(Photo: Rob Hatwell)*



as an engineer working in the North Sea oil business and renovating his Norfolk home, it's been a slow process. To keep himself in the air he purchased a 'very neat' RV-3 which, during our conversation, it became quite clear that he'd fallen head over heels in love with. I don't blame him, if I had some spare cash I'd get a 'three' tomorrow.

Love affairs aside, another thing became clear whilst we spoke - we weren't just talking about one engineering safety issue, there were two. Rob's experience, both as an engineer and a pilot, has taught him that if you're not sure about something then check it out. Rob's LAA inspector, Nick Seymour, whilst reviewing the engine logbook for his Lycoming O-235 engine, noticed a remark in the 'pink pages' which suggested that the crankshaft must be checked for corrosion internally every ten years - this is an unusual check on the O-235 as it's normally only applicable to the Lycoming O-320's and the O-360's.

Incidentally, the pink pages in an aircraft engine logbook refer to modifications embodied into the engine and to any specific technical instructions, most importantly, any repetitive instructions. This is a good example, where the aircraft had fairly recently changed hands, of the importance of keeping a good logbook record of engineering activity as it happens.

Nick and Rob discussed whether it would be necessary to complete this inspection, perhaps the previous owner had made a mistake including it in the 'Repetitive' section?

'If you're not sure – check' won the day and the propeller was removed and the oil retaining plug removed. The level of corrosion they encountered was quite a shock and, after discussing the state of the crank with engine expert Richard Isenberg, they decided to scrap it. Here's Rob's letter explaining the other issue he's dealing with:

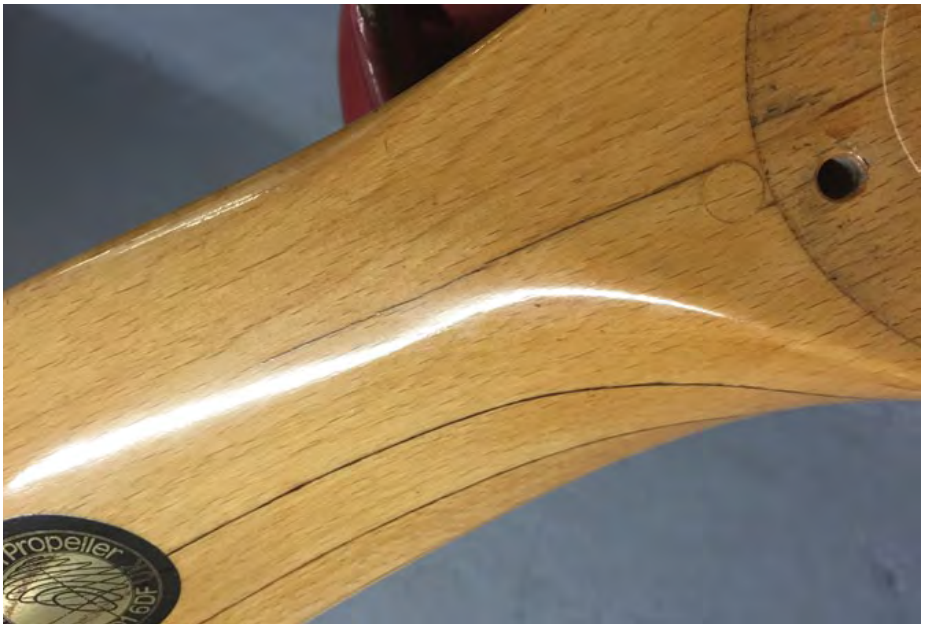
Engine is a 125hp Lycoming O-235-F2B. Engine was rebuilt due to inspection failure of corrosion of the crankshaft bore.

The engine was completely overhauled with new crankshaft, camshaft, cylinders etc.

This engine is installed in my Van's RV-3.

Like a lot of wooden propeller RV's, the propeller is mounted on an extension that is bolted to the crankshaft flange and the propeller is mounted on the front of the extension. After overhaul, the engine was re-installed, the propeller extension refitted to the crankshaft, bolts correctly torqued and wire locked. A new Hercules propeller was fitted, torqued and wire locked (the propeller was changed for performance reasons).

On test flying it was found that there was a very small vibration, most notable at



(Above) **During a pre-flight inspection, LAA Inspector Matt Pettit noticed this deep crack emanating from the plugged balance weight on this Newton 54in propeller, as fitted to a Jodel D9. Records indicate that this propeller had completed about 400 hours and in all other respects appeared in first-class condition. Sadly, this propeller was effectively scrap, although I expect it will end up as a barometer mount affixed to a study wall. Well done to Matt for picking this up; remember that the pre-flight inspection is, from a pilot's perspective, most probably the most important inspection he or she will do, and it's certainly worth the extra effort required to do the job properly.** *(Photo: Matt Pettit)*

(Left) **This cutaway shows the front end of a hollow Lycoming crankshaft (the propeller attachment flange is at the top of the picture). Because this crank is the primary oilway for main and big-end bearing lubrication, any water in the oil will cause corrosion in the inner face. There are a number of Airworthiness Directives around concerning this problem of crankshaft corrosion, the main one to look out for is FAA AD 92-02-08. This requires inspection of hollow crankshafts on certain O-320 and O-360 models, although a later Bulletin issued by Lycoming in 2004 which suggests the application of an anti-corrosion coating, includes the O-235. The main problem with corrosion in this highly stressed area is the formation of corrosion pits that extend into the structure of the component; these act as stress-raisers and will lead to eventual crankshaft failure.** *(Photo: Textron Lycoming)*

(Above) **These two pictures show the partial detachment of the resin leading edge from the wooden body of two separate Newton Propellers. Two separate failure events like this are worrisome and it may be something going on in the moulding process. We think though, bearing in mind the vast numbers in LAA and BMAA service of this design of propeller, that the occurrence of two failures in one season might be coincidental. The left failure was featured in the August Safety Spot, where we felt that water ingestion had led to the joint separation; the right failure occurred in flight on LAA'er David Lawry's Jabiru SK, the propeller having completed about 130 hours.** *(Photos: Top Peter Barker, Bottom David Lawry)*

1,700rpm when the engine was unloaded during the let-down. This vibration was, I repeat, very slight and one that I suspect could be easily overlooked unless you were familiar with aircraft. This vibration was put down to the rebuilt engine/new propeller combination and inquiries were made on propeller balancing.

Before getting the propeller balanced, it was decided to remove the propeller and extension in case there were any trapped foreign object between the various faces which would make the extension run untrue. I had been particularly careful on the cleanliness of these faces, but it was a simple job to check and the first step in a methodical approach to finding the source of the vibration.

On removing the bolts that held the spacer to the crankshaft, I found that the bolts had become thread-bound, i.e. the bolts had run out of thread, therefore the spacer was not torqued properly to the crankshaft. On inspection it was found that the thread in the top hat bushes was 3/32in further forward on the new crankshaft compared with the old.

The danger here is that if the correct bolt length is not checked on an engine rebuild, the propeller or, as in this case, the propeller extension will be tight for visual inspection but not under flying loads.

On discovery of this I informed my inspector and the engine shop, who were most grateful as they had not come across this before.

An aircraft in the LAA fleet has recently suffered a crankshaft structure failure – no harm done, the pilot was able to land safely – so I'm going to save for now a discussion about the problems associated with corrosion in highly stressed components. I will also save a full discussion about this Lycoming crankshaft check until the New Year. Certainly, checking that a bolt is in every way correct for its application is basic engineering practice but, as we have discussed, gotchas lurk everywhere. This one was quite small, only 3/32in but the lack of correct bolt tension could very easily have led to the bolts breaking and the propeller coming off, if it weren't for Rob's diligence.

May I wish you, and those close to you, a splendid Christmas, wherever you are. Let's also hope for a peaceful New Year.

Fair Winds. ■

(Right) **Newton Propellers is now owned and operated by keen LAA'er Alan Haseldine; here's a picture of him pulling his newly built Hummel Bird out of the hangar by the propeller as a demonstration to show how these leading edges might be becoming damaged. Alan tells me, "The leading edges are actually moulded using a liquid resin directly onto the propeller. Great care is taken to ensure that the recessed bonding face is absolutely clean and that temperatures and humidity values are within the bonding limits." If you own a propeller with a bonded leading edge, and there are a number of manufacturers using this system, if you absolutely must pull the aircraft by its propeller (never a very good idea, for several reasons), don't press on the leading edge as it might well cause a minute separation of the glue joint locally underneath. This could allow water to seep into the joint by capillary action, after which it will only be a matter of time before swelling of the wood leads to complete joint failure.** *(Photo: Alan Haseldine)*

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