Safety Spot
By Malcolm McBride

SEASONAL CHANGES, CUB RUDDERS, SENSENICH HUBS, EUROFOX TUG PEDALS & ROTAX VALVE PUSHRODS

The latest LAA Engineering topics and investigations

Hello again, and a big welcome to *Safety Spot*. Well, it's just about autumn already, where did that marvellous summer go? Wherever it's gone, it travelled there pretty quickly – let's hope the oncoming winter goes equally speedily. As always, I'm hoping that all's well with your good self and that, whatever life's thrown at you since the last time we found ourselves on the same page, you're in-charge of the situation and things are going well for you and those close to you.

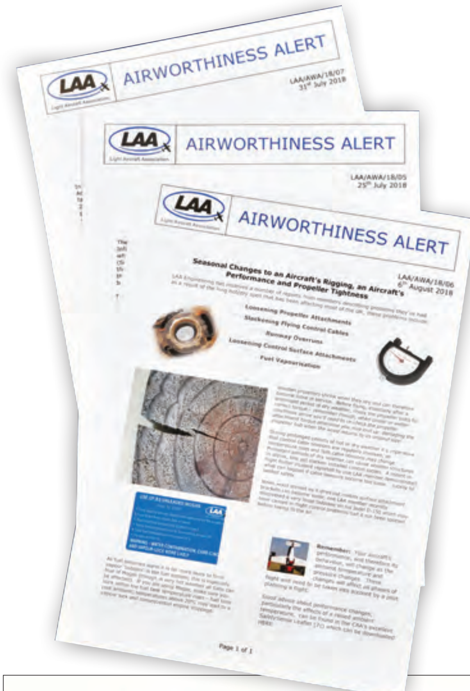
This flying season has been a busy one from the continuing airworthiness point of view, so it's been 'afterburners on' here at LAA Engineering HQ at Turweston. Personally, I appear to have survived another season and even managed to squeeze in a couple of sailing breaks on my old tub, *Vita Nova*.

Things were a bit fraught in her direction during the spring as, over the winter, I had to replace the engine, and what in theory looked like a straightforward job turned into a bit of an engineering epic. Taking into account my job, which includes offering advice to members about their projects, I guess I shouldn't have been surprised – jobs that look simple often don't turn out to be. That said, everything's running fine now – in fact, the old girl has lost quite a bit of weight, not just because of the lighter engine but also the removal of sixty-odd years of wiring, much of it now redundant.

Still, everything needs a refurbish now and again and it's worth considering introducing a fresh start, re-order or whatever you want to call it into your Tailored Maintenance Schedule – after all, big tasks need sensible planning.

I know that many members sending in Permit renewal applications have been receiving letters from my colleague and fellow Airworthiness Engineer, Jerry Parr, about the very long time since your aircraft has been formally weighed. Jerry has taken over the responsibility of managing the annual Permit Renewal process and, as part of an initiative driven by our Chief Engineer, Francis Donaldson, we're looking more closely at the age of each aircraft's Weight and Balance Schedule. If, during the LAA Engineering assessment part of the Permit Renewal process, Jerry finds that a Weight and Balance schedule is over ten years old, you could be hearing from him.

How much has your aircraft grown in weight over the years? You may be surprised when you get the scales out. LAA Engineering recommends that an aircraft is re-weighed every ten years, not just because they, perhaps like people, tend to put on a bit as they age, but also to give an owner the



(Left) **LAA Engineering has recently issued a number of *Airworthiness Alerts* which we feel are important to LAA members. Airworthiness Alerts primarily serve as an access-point to further, often more specific, information. The three most recently published *Alerts* offer links to published CAA advice, LAA mandatory Information Leaflets and manufacturer's guidance material. All members flying LAA-administered *Permit to Fly* machines should be regular visitors to the Engineering section of the LAA's website – links to many areas of this online resource can be found there, including all the back issues of *Safety Spot*. So, if you have a question about a specific LAA type, the LAA's Engineering Library should be your first port of call.** *(Photo: Malcolm McBride)*

(Above & above right) **Two of the *Alerts* cover non-aircraft specific topics and the first, *Safety Harness Integrity*, is a joint CAA/LAA initiative designed to bring the issues surrounding the quality management of the many different types of safety harness fitted to *Permit to Fly* types to the surface. This initiative was mounted in response to a recommendation from the Air Accident Investigation Branch (AAIB), following an incident where one pilot died and the other was seriously injured after seat belts failed during a forced landing.**

The second *Alert* concerns the effects of seasonal change on both airframes and aircraft performance, and was driven by field reports from LAA Inspectors about slackening control cables and loosening propellers. The picture above, copied from an old RSA mag from the LAA's growing Library, shows a 'victime du flutter' – possibly the result of flying with slack control cables. *(Photos: RSA/Courtesy of UK AAIB)*

(Above) **Wooden propellers, like this impressive scimitar example, seen recently on a French Jodel at the RSA Rally at Brienne-le-Château, are susceptible to dimensional shifts as their moisture content changes with the seasons. It's imperative that owners ensure the prop bolt torques are checked seasonally, to make sure that looseness (leading to potential departure!) or over-tightness (leading to crushing) doesn't occur.** *(Photo: Brian Hope)*

chance to brush-up on their weight and balance calculation skills.

Now, to clarify, you aren't breaking the rules if your Weight and Balance Schedule is more than ten years old – so don't panic (or pick up the phone) if you get a letter about it. However, do give the matter some thought before you discount the idea of a re-weigh out of hand. Do you, for example, know how to work out a weight and balance sum? If you're a pilot then you have a duty to ensure that the aircraft you fly is being flown within its weight and centre of gravity limits. If you don't know how to work out the sums, or you're working with a 'shaky' weight schedule, you might find yourself in unexpected hot water someday.

So, what of the content of this September edition of *Safety Spot*? Well, as always, space is limited and there's far more to fit into it than there's room, but there are a few things which we must pass across your decks. Firstly, I need to let you know about three *Airworthiness Alerts* which have been published by LAA Engineering and, perhaps, remind you that these documents even exist!

The first *Alert*, published as the season changes from the unusually dry and hot period enjoyed here in the UK over the last three or four months to the more usual changeable British climate, is probably a good place to start…

AIRCRAFT/PILOT-AFFECTING SEASONAL CHANGES

Many thanks to members for letting us know that they'd come across issues with their aircraft caused by the prolonged period of hot weather. We felt that it would be worth writing about this in *Safety Spot*. Of course, by the time you're reading this the effects suffered by some aircraft during the long, hot spell will most likely have started to go into reverse. But when you think about it, perhaps that's just the point – it isn't really about long, hot summers, rather each material's natural adaption to changes in the environment. So as we enter autumn, expect just that – change.

The first reports we received concerned loosening wooden propellers, and consisted of 'What should we do?' type questions. The answer, naturally, is to re-torque the propeller to the hub – don't fly with an incorrectly tightened prop. The reason the propeller loosens is because as wood dries it shrinks. But be warned, if you've tightened your propeller during this long, dry spell, make sure that you don't leave it to become extra tight as the wood returns to its original size – what shrinks as moisture leaves swells when it returns. This growth can generate enormous pressures in attachments and crushed wood can result.

If you aren't going to fly during this seasonal change, and you have needed to re-torque your propeller because of shrinkage through the summer, then it wouldn't hurt to slacken the prop bolts off for a few days, to give it a chance to recover, and then re-torque 'by the book'. Naturally, if you do this, mark the aircraft with a 'DO NOT FLY' label while the bolts are loosened. You wouldn't want to see a prop coming off during the climb out, which, incidentally, actually happened to one group-owned machine, so labelling the aircraft as being unairworthy isn't a daft suggestion.

Reports of loosening control attachments, especially tailplane attachments, came a close second to propeller reports – for similar reasons, the same level of care is needed to manage the situation. Engineers quite often come across locally crushed wooden structure caused by the multi-season 'ratchet' effect of well-meaning but misguided progressive tightening of loose attachment fittings.

The third issue highlighted concerns changing control cable tensions, which especially affect aircraft with wooden fuselages and wings. Aircraft cables, being metal, expand as temperatures rise but, in contrast, wooden structures tend to get smaller, owing to inter-cell shrinkage due to reducing water content. The result of this can be very slack control cables after a period of hot weather.

We received a number of reports about this from owners and the advice was the same: don't fly with an incorrectly adjusted control cable. One member did fly without checking the control cables beforehand and regretted it when he suffered – fortunately, low-amplitude – flutter in-flight.

It should be noted that this isn't a new issue – many aircraft types depend on the › damping effect of the flight control system to stop their unbalanced control surfaces from fluttering. Jodel owners will know that because of flutter problems in the past – there's a French *Airworthiness Directive* (*63-11-20*) which requires owners to check their control cable tensions each fifty hours of flight, or every three months, or after any change in climatic conditions. This sixties issue hasn't gone away, reminding us that it's essential to make time to learn the service history of a type and, as part of your maintenance schedule, include advice issued in past times.

So, as we move into the cooler, damper conditions of autumn, keep your eyes on your airframe and engine – especially, but not only, if wood's part of the design equation. Think about where you store your aircraft and whether it's really suitable for your beloved in all environmental conditions. A wooden airframe stored in a black-painted and unventilated, corrugated iron shack through the heat of summer might be ruined quite quickly – shrinkage cracks can quickly write-off wooden spars and other major components, rendering the aircraft beyond economic repair.

Three quick points: one, if control cable adjustments are needed, don't forget that initial and duplicate inspections are required before you fly, and this will include a log book entry (PMR required). Two, if you've had to refit your propeller you'll need to get the work signed off by an LAA Inspector (again, PMR required), and three, don't forget to take a look at the *Airworthiness Alert* on this subject, it has a link to the CAA's *Safety Sense* leaflet which talks about performance changes affecting aircraft as the seasons shift – it's worth a read.

PIPER J3 CUB: IN-FLIGHT RUDDER DETACHMENT

Engineers at the CAA's General Aviation Unit flagged up an issue to us which, though it didn't end up in a serious accident, could have easily done so. The incident involved the partial loss of a rudder on a Piper J3 Cub, which was worrisome, not just because of the loss of directional control, but also as the partially-detached control surface ended up restricting elevator travel.

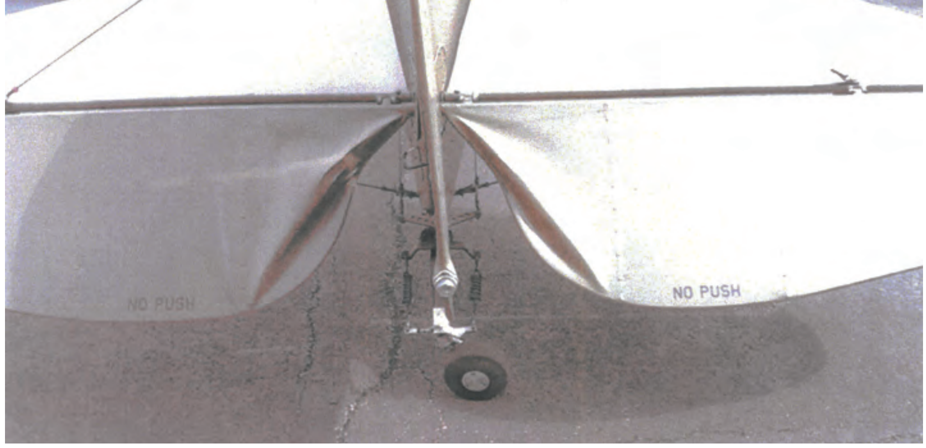
The aircraft itself isn't an LAA-administered machine and so we haven't yet seen the full maintenance history for the aircraft, but what happened is shown in the photos.

To start, here's the extract from the initial *Mandatory Occurrence Report* (*MOR*), which was filed shortly after the incident:

'While crossing the M62 near Eggborough Power station, en-route from EGNE [Retford Gamston] to EGCM [Leeds East Airport], a vibration was felt in the rudder pedals, shortly followed by a bang and the aircraft pitched nose down.

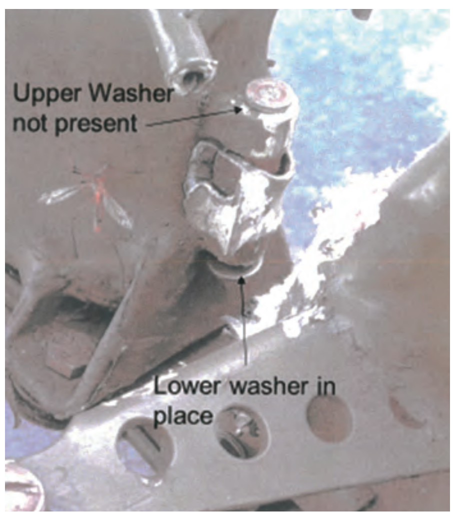
'The throttle was closed and with heavy stick forces the aircraft recovered to level flight. This happened several times in close succession, until the air speed was reduced to 50/55 mph. Looking back, it could be seen that the top rudder hinge pin had come adrift and rudder was displaced to the right.

'The flight continued to EGCM as there was a tailwind and it was closer. Leeds East was informed by radio of the problem and the aircraft positioned for RW24 as the wind was 180 at 4kt and R16 had vehicles in the undershoot. The landing was uneventful, and the aircraft taxied clear and shut down.



(Above & left) **While flying in the vicinity of Leeds East Airport, the pilot of a J3 Piper Cub started to feel a vibration through his rudder pedals, which was shortly followed by a bang and the aircraft pitching nose down. The throttle was closed and, with heavy stick forces, the aircraft was recovered back to level flight.**

The Cub landed safely soon after, and these two pictures show the reason for the loss of control incident. As you can see, the rudder's top hinge assembly has come to pieces. That, in turn, allowed the top half of the rudder to oscillate violently in the oncoming airstream – the initial vibration felt through the pilot's feet – notice the side-to-side damage in the elevator. *(Photos: Courtesy of UK AAIB)*



(Left) **Although the incident with the Cub didn't involve an LAA-administered aircraft, the subsequent Mandatory Occurrence Report (MOR) led to an AAIB investigation and, noting that the LAA has over 170 Piper types (with similar rudder attachments), the CAA got in touch. This picture above comes from the developing AAIB report and points out that there's no washer under the top of the head of the hinge pin, which seemed an obvious safety feature to the Investigator in charge. Further investigations revealed though that the manufacturers themselves don't call up for a washer here on the J3, though checking the parts manual for a number of types we did find it 'called-up' on the PA-18 Super Cub (the L18-C in the LAA's fleet).**
(Photo: Courtesy of UK AAIB)

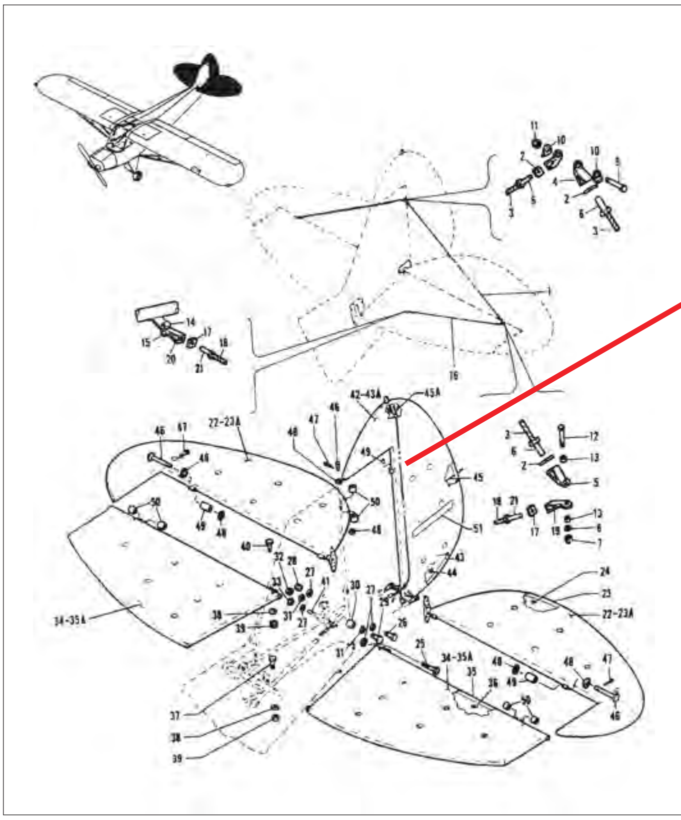
'On inspection it was found that the top hinge pin and bearings were missing and that the lower hinge had failed under load, so the rudder was only held on the aircraft by the control cables. Both elevators were damaged on their inboard edges but had remained attached to the aircraft.'

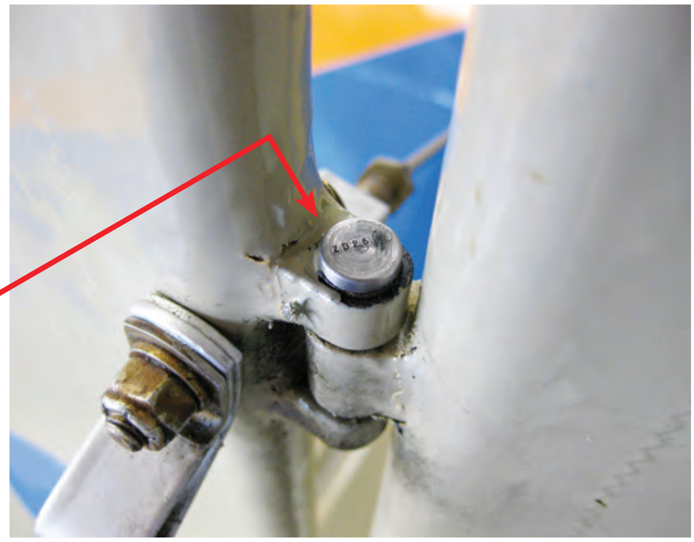
In my personal experience, this is the first time I've come across an incident where one of these hinge pins has completely failed, although it isn't unusual to find examples which have become worn and need replacing during an Annual Inspection. Sometimes, this joint refurbish will require completely re-bushing. Certainly, just because I've never seen this happen before doesn't mean there isn't a 'gotcha' laying in wait for the unwary.

Looking at the photos herein, you'll notice that, in this incident, the hinge pin and its bushes appear to have slid out of their housings and simply dropped out. The diameter of the AN Clevis Pin's head is very close dimensionally to that of the outside bushing. Therefore, should there be wear in the bush's support, the AN Clevi Pin's head could potentially slip through the tube. However, I'd be surprised if this has happened in short order – in other words, if the hinge pin and bushes have been sliding down through the hinge then there should've been a chance to spot this this before the situation developed into an incident.

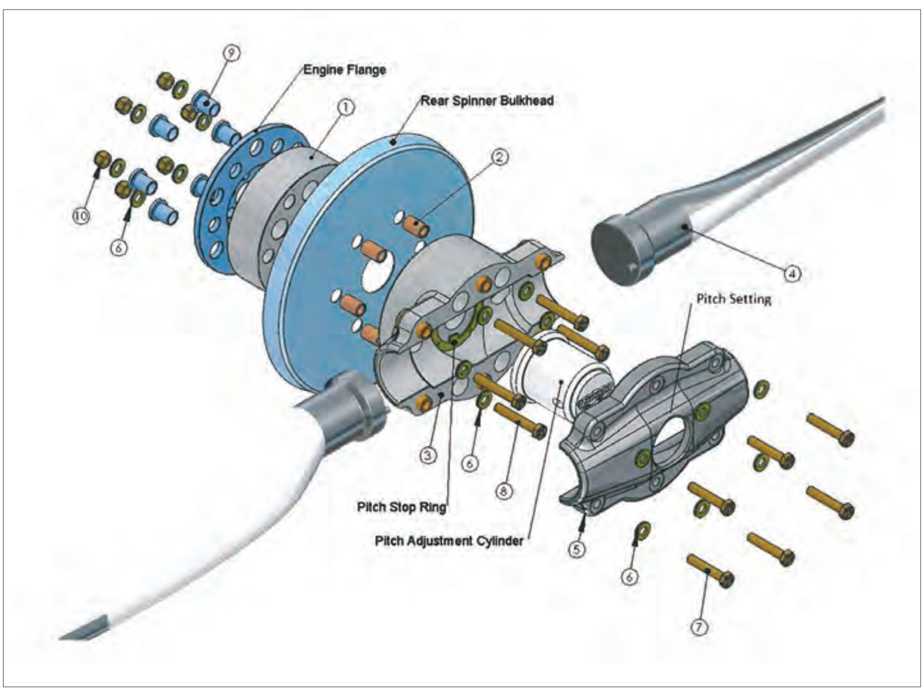
When we have the full facts about this incident, especially with regard to the Cub's maintenance history, we'll publish some inspection advice to LAA members with similar machines. One possibility to prevent a future occurrence like this, suggested by the UK AAIB Investigator involved, is to incorporate a washer under the AN Clevis Pin's head – a similar idea to the 'penny' washer used very frequently to prevent a complete control loss after the failure of a ball-end fitting.

Again, it does seem strange that the looseness in this joint wasn't spotted by the pilot during his or her extensive ›





(Left & above) **The rudder hinge pins on the Piper Cub series are generally quite straightforward mechanical types using an AN Clevis Pin. To avoid play, the pin is supported by bronze bushings, which are an interference fit in the hinge's supporting metal tube structure. The issue noted by the AAIB Inspector was that the outside diameter of the head of the AN Clevis Pin was dimensionally very close to that of the bushings. In other words, if interference-fit was lost for any reason in the bushes, the pin, with the bushes, could simply fall through the supporting tubes.** *(Photos: Piper Aircraft Corporation/Malcolm McBride)*



(Left) **This picture shows the general arrangement of the two-blade, ground-adjustable Sensenich propeller. This type of prop is fitted to a number of aircraft in the LAA's fleet, including the Bristell NG5 Speed Wing, Van's RV-12, Groppo Trail, Europa, Jabiru J400 and CZAW SportCruiser.**

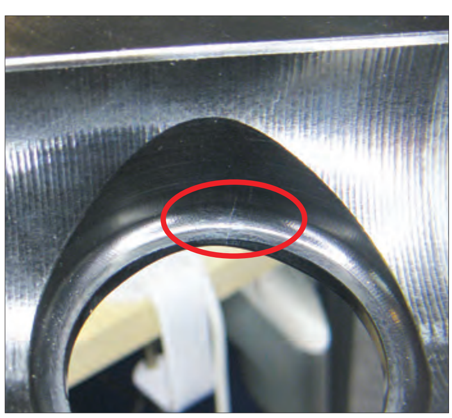
A recent problem, highlighted by the manufacturer via a *Service Bulletin*, relates to cracking in the front half of the hub (item 5 in the picture) after a relatively low number of hours in service.

The LAA has issued an *Airworthiness Information Leaflet* (*AIL*), mandating the manufacturer's *Service Bulletin*, which required the hub to be dismantled and inspected for cracks before further flight, and thence after each fifty hours of flight (or annually, whichever comes first). This *AIL* can be accessed via the concurrently issued *Alert*, which is in the Engineering section of the LAA website. *(Photo: Sensenich Propellers)*

'first flight of the day' pre-flight inspections. Control ranges of movement and security of controls should, after all, figure large in this check. Doubtless, there's more to follow on this subject.

SENSENICH, TWO-BLADE, GROUND-ADJUSTABLE PROPELLERS: HUB CRACKING

The propeller is an often-overlooked part of an aircraft during regular inspections – from my experience a distinction shared with an aircraft's undercarriage! But, when you think about it, these two distant cousins probably do more work than the rest of the parts which go to make an aircraft. Because of



(Left) **LAA Flyer, Chris Knight, who owns a Bristell NG5 Speed Wing, carried out checks on the Sensenich propeller fitted to his aircraft after receiving a copy of the *AIL* through the post. Chris' aircraft had completed 104 hours since build and this picture shows the 'very difficult to spot' crack (marked). It's necessary to completely dismantle the propeller assembly to inspect this rather safety-critical part. If a crack is found, Sensenich will replace the item free of charge, though the required checks remain in place until an upgraded component (now available, but at a cost) is fitted.** *(Photo: Malcolm McBride)*

that workload, and the potentially disastrous consequences surrounding failure in one of these areas, regular checks need to be made, even if it does mean getting your trousers dirty – perish the thought.

Earlier, we looked at the possibility of the loosening of a wooden propeller because of material's shrinkage due to prolonged high temperatures. For that, and other reasons, wooden propellers need to be checked by the pilot carefully before every flight. Wood, on the whole, is a very resilient building material. It's internal, and to some extent its surface, structure deals well with the day-to-day knocks and bashes it encounters in normal service. Provided that the attachment's good, the surface protective finish is maintained and minor leading-edge chips dealt with quickly, a wooden propeller will give many years – certainly, decades – of trouble-free service.

Fixed-pitch metal propellers, to some extent, are also very resilient – after all, on the whole, they're a simple forged then machined aluminium structure designed to easily take the forces they encounter in flight. Again, care is needed to ensure that any leading-edge chip is 'dressed'-out carefully (noting the manufacturer's limits) and the surface finish is maintained to prevent corrosion.

As a pilot and an aircraft owner, you have to wear an inspecting engineer's hat quite often. When you're considering what might go wrong with any part it's essential that you first think about the actual forces working on it. Understanding load/wear paths is the key to good inspection practice, though it's often forgotten.

When you're thinking about propellers, there are a number of different forces at play. There are centrifugal forces created by the rotating mass itself, and aerodynamic forces created as the blades do their work. In any rotating component designers like to arrange things so that the loads remain balanced to keep these forces in check. To some extent this aim is reached but, like all things, perfection is hard to achieve – tiny changes in a blade profile, even just a chip in the leading-edge, will cause changes in aerodynamic loading which are small but still there. And tiny weight differences between blades will add an oscillating force into the system.

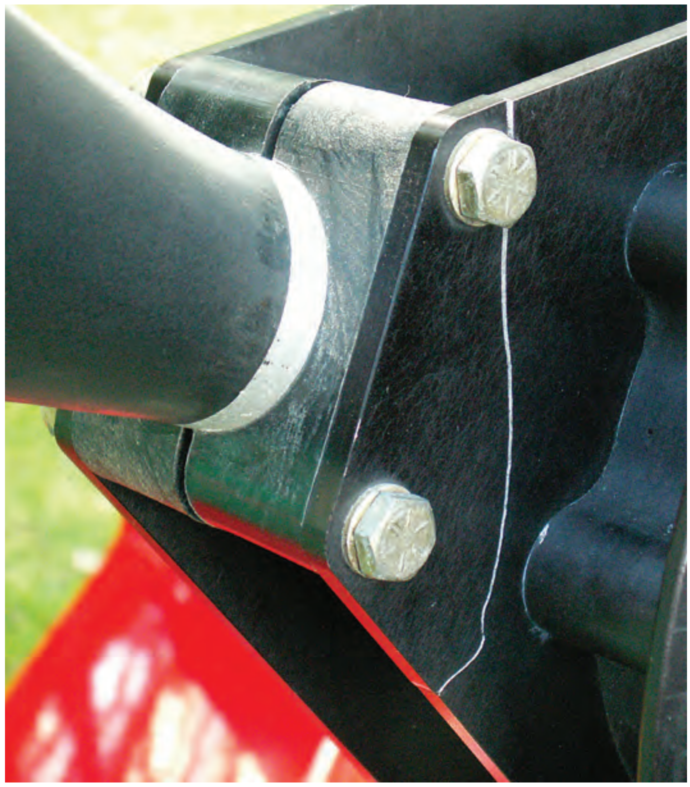
One big force which exists in propellers, in varying amounts throughout its operating range, is often overlooked, but it's one of the big reasons for materials failure: torsional or twisting force. Propeller manufacturers like to work out and balance the couple created between these aerodynamic forces and their centripetal counterpart – it's these opposing forces which, when not perfectly balanced, cause a resultant twisting force in the blade. This force has to be resisted by the material at the blade's root and the propeller's attachment at the hub. In a solid propeller these forces are straightforward to contain, though a chunky hub is needed.

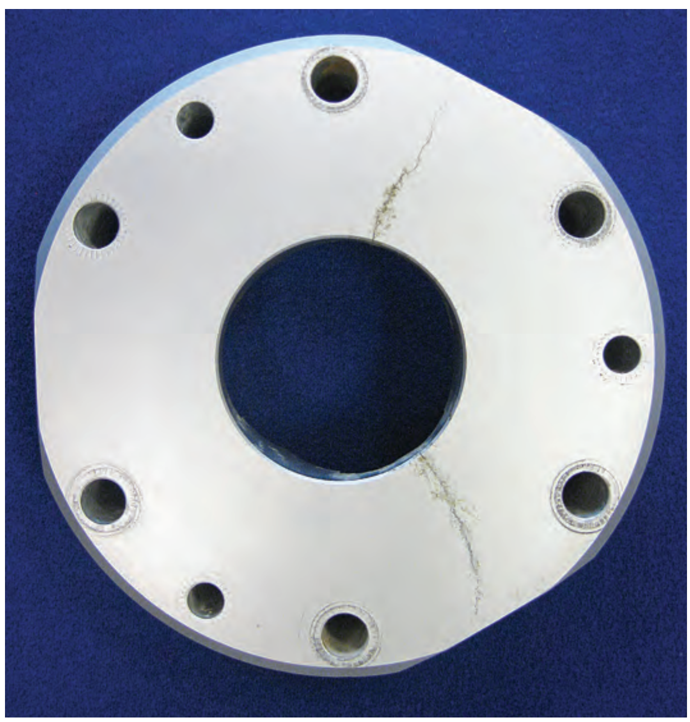
However, with lightweight propellers, these forces are restrained by often quite lightweight machined or cast parts and those need inspecting regularly.

The recent *Airworthiness Information Leaflet* affecting owners using the Sensenich ground-adjustable propeller requires all affected owners to inspect their prop hubs before further flight. That's because the manufacturer has received reports of hubs cracking in service. Mostly, the cracking has been occurring on props on direct-drive engines, such as the Jabiru 3300, although some geared powerplants, like the Rotax 9 series, have also shown signs of trouble.

The cracking seen thus far is at an early stage but is very difficult to spot which is why the manufacturer is calling for the propeller to be dismantled. At the time of writing, we've had reports of two cracked hubs, both on aircraft fitted with the Jabiru engine, though I have little doubt that we'll see more.

Perhaps this is a timely reminder that it's essential to remove the spinner and to check the hard-working part of your propeller at regular intervals – for example, after each fifty hours of operation. That is especially true if you're using a lightweight propeller type.





(Left & below) **It's absolutely essential that propellers are regularly checked, preferably before every flight – after all, they're working pretty hard most of the time while you're enjoying the joys of flight! Variable-pitch propeller hubs do suffer from problems, which are generally associated with high-cycle fatigue. That's particularly the case if a prop is unbalanced, either aerodynamically, because the blades are incorrectly set, or mechanically, due to differences in blade mass.**

These pictures illustrate two problems that involve differently designed propeller hubs seen by LAA members over recent years, either of which undoubtedly would've led to an in-flight blade loss, had the failed part continued in service. *(Photos: David North/Malcolm McBride)*

EUROFOX GLIDER TUG: RUDDER PEDAL FAILURE

I trust that, before turning to this text, you've taken a look at the pictures of the failed rudder pedal shown opposite – if you haven't, please do so. When confronted with a failure like this, the engineer needs to establish clearly what 'kind' it is before throwing the broken part away and fitting a new bit. Often, this assessment and the reasons for the failure are reasonably straightforward but sometimes it's a bit of a mystery. However, it's essential for safety that an accurate assessment as to the reasons for any failure is made and that,

(Above) **Scottish LAA Inspector Hamish Hamilton first alerted us that the EuroFOX glider tug operated by the Scottish Gliding Centre at Portmoak had suffered a rudder pedal failure during taxying. Now, it has to be said that this four-year-old aircraft has had a pretty hard life, having accrued over 850hr in the short time since build. Perhaps more importantly, because Portmoak is situated on a ridge, many of these flights can be very short indeed – calculations made by the Tugmaster revealed that there had been 5,767 flights at the time of the rudder pedal failure. Yes, calculators out, that's just under nine minutes per flight!**

Because many of these EuroFOX tugs have such a demanding existence, LAA Engineering is afforded a great opportunity to watch airframe and engine behaviour in this class of aircraft because of usage (take-offs, landings and hours flown, especially) rather than the more normal issues of ageing (or, perhaps, low-usage). Thus far, the EuroFOX has put a shot across the bows of the many critics who felt that a small, simple, LAA Permit type wouldn't be anything like robust enough for this sort of job.

These three pictures show the rudder pedal assembly as fitted into a locally-based EuroFOX and a close-up of the failed rudder pedal as delivered to LAA Engineering HQ here at Turweston. The failed pedal is obvious but, as a secondary issue, the wear point in the torque tube is a feature in the removed component which wasn't expected, and something to look out for during checks on other EuroFOX aircraft.

Although this aircraft has flown a lot more than the average LAA machine of the same vintage, we're fairly sure that this failure isn't the result of low-cycle fatigue, understrength design or a poorly-welded joint during manufacture – you'll have to read the full text if you want to know why we think this part failed! *(Photos: Malcolm McBride)*

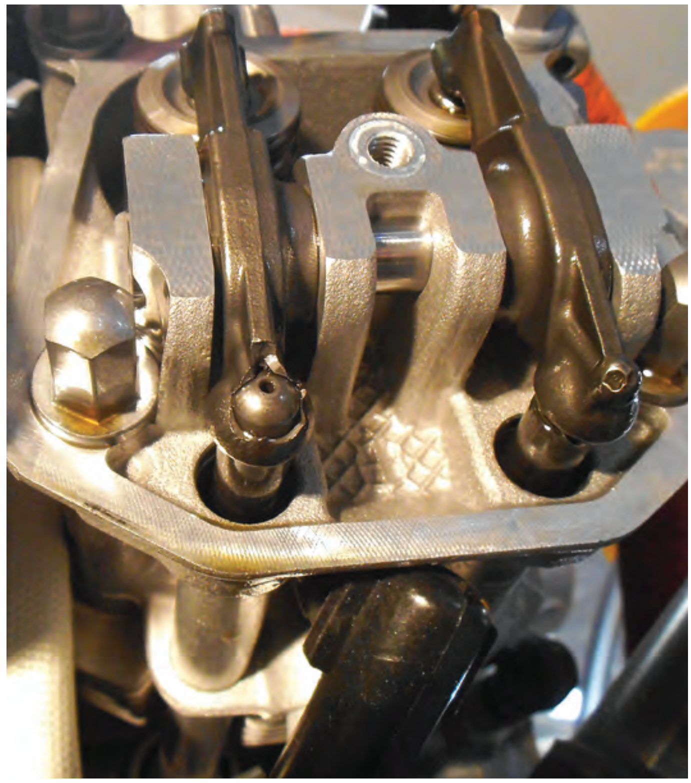
ROTAX VALVE PUSHRODS PROBLEM

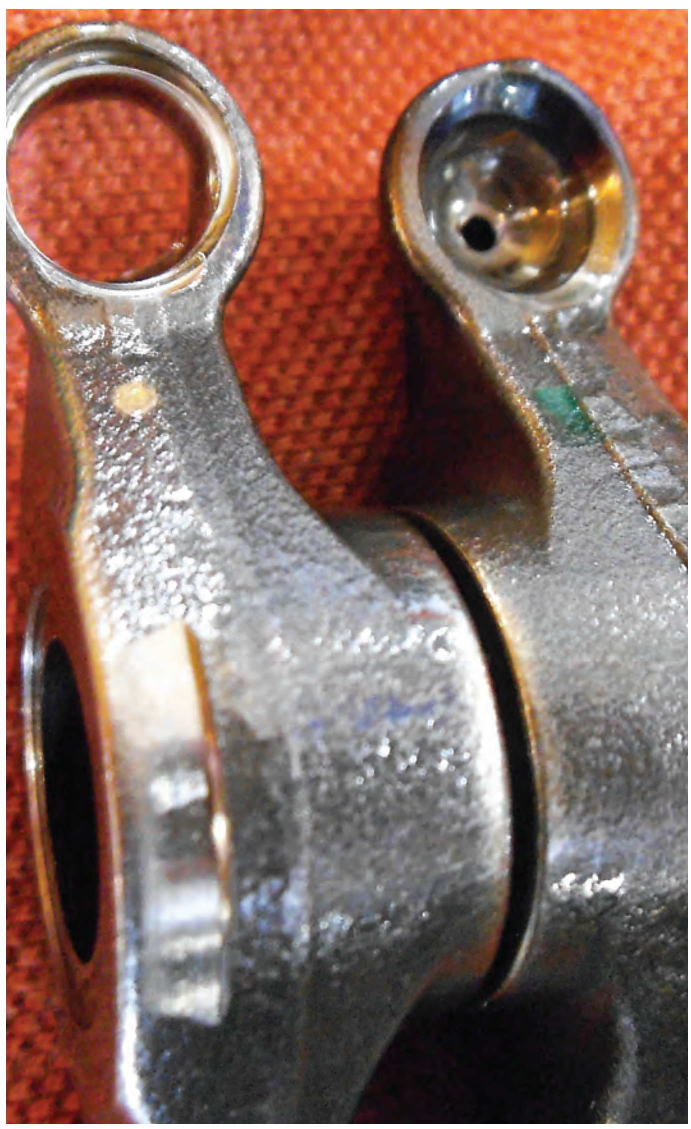
In October 2017, Rotax Engines issued a mandatory *Service Bulletin* (*SB*) alerting owners of 912 and 914 engines within a specific serial number range that their engines may have been fitted with incorrectly-manufactured valve pushrods. LAA Engineering was made aware of this issue by the UK Rotax agent at the time and were assured that, as far as possible, all affected engines had been identified and pushrod replacement for them was underway.

The problem, identified quickly by the manufacturer, was that a batch of pushrods had been made with an incorrect surface finish which, if left in service, could wear rapidly. The manufacturer's *SB* on the subject was subsequently mandated, with an EASA AD, which was quickly followed by a *Mandatory Permit Directive* (*MPD*) issued by the UK CAA. The LAA issued an *Alert* offering access to these documents and discussed the issue in *Safety Spot* (*LA*, May 2018). With all this publicity, you'd imagine that anybody who was even only slightly associated with the 912/914 engine would've heard about the issue – well, apparently not!

These three pictures show the sequence of failures, caused because of faulty pushrods, which led to LAA Eurofox flyer, Eddie Scougall, and his wife having to divert back into Le Touquet-Côte d'Opale Airport after noticing falling oil pressure. Naturally, Eddie and his wife were thankful that there was a dry place to land nearby – after all, a couple of days earlier they'd flown across the Channel.

Initially, we thought that the failed pushrod wore quickly through the rocker itself. We aren't sure what actually punched a hole in the rocker cover – it could've been bits from the failed components or, more likely in my view, the end of the pushrod itself impacting the inside of the cover. *(Photos: Eddie Scougall)*





once it's established, any lessons learnt are shared with other aviators, whatever their role.

Therefore, the first job is to understand why the part failed so let's use this rudder as an example. Firstly, study the part, and understand how it was made as that may offer clues. Essentially, the rudder pedal assembly is made from pre-drawn tubes welded to form a pair of contained mechanical levers – note that the material failure runs along the weld boundary. Had the welding process been carried out correctly? Are there any obvious areas of thinning at the boundary? Could hydrogen embrittlement have played a role by changing the mechanical properties of the metal along the weld boundary? In other words, is this a failure in design or manufacture of the part – should you suggest more regular checks or possibly modifications to the design?

What about signs in the fracture face itself? Does the fracture surface show obvious signs of fatigue? Is this failure related to one event or, as is often the case, has this part been going for some time and the total collapse is just the final act in a long performance? An important clue can be gleaned from past events so do some research to find out whether this part has got a previous history of failure.

After dissecting the part and studying the fracture face, carefully measuring the weld depth along the weld boundary, and generally inspecting the assembly for quality, no clue could be seen as to the reason for failure in this rudder pedal. In all appearance, this looked like a pure overload failure. It's true to say that anything can be broken by an excessive force, though after many thousand operations we struggled to see when (or why) it might've been applied. Certainly, the pilot in command at the time of the failure wasn't doing anything unusual – 'Honest, guv, it just came off in me 'ands', or perhaps in this case, '…me feet.'

Then we heard about an event which had occurred six days earlier, one that struck us as rather coincidental. Here's the report from the pilot involved in this previous incident, which saw a glider being towed get wildly out of position and the tug pilot becoming concerned about his safety – a bit of an understatement!

'It was the eighth tow of my afternoon session. We were towing from the north field, runway 10R. The wind was 070/15G25. I had experienced minor/moderate turbulence from Kinneston Crags (south side of Bishop Hill) on earlier tows but with no significant control difficulties, as reported by earlier pilots.

'The incident glider was a Mosquito with a belly hook. The glider pilot looked familiar to me and I recognised him as someone who may well have handling problems. The aerotow commenced as normal. In the mirror, shortly after starting the ground run, I observed that the glider pilot had dropped a wing slightly, but he recovered within a few seconds. As the combination increased speed and the tug became unstuck there was minor turbulence which was easily controllable. During the first 150ft or so, I observed by close attention in the mirror, that the glider pilot was having significant difficulties keeping the wings level and was also having difficulties in pitch control.

'He was below the slipstream and then back in normal tow position in a few seconds and repeated that cycle in another few seconds. He then seemed to be stable above the slipstream for another few seconds and I formed the view that he'd got to grips with controlling the glider.

'We were about 200ft and approaching the field boundary at the east end of 10R. However, the glider pilot again disappeared downwards out of view in the mirror for a few seconds. I then felt a deceleration of the tug as I saw in the mirror a bottom plan view of the glider "winch-launching" out of control.

'From approximately 250ft the tug was pitched approx 60° nose down and I released the tow rope. I kept the nose-down attitude for a few seconds, in an attempt to regain speed, and managed to pull out of the dive at about 60kt. I estimated the ground clearance as less than 50ft. I continued to fly straightahead, thinking that the glider would be somewhere close behind and would be landing straightahead. I completed a short circuit and landed 'long' near the club house. As I landed, I saw that the glider had, in fact, turned back and had landed into wind in the centre strip.'

So, could this be the 'smoking gun' incident that led to an eventual failure? Well, possibly. Certainly this was a close shave for the pilot of the tug and it would be very unusual for a pilot in these circumstances not to react physically. It does seem strange that the aircraft had operated successfully a further nineteen or so hours between the airborne incident and the eventual parts failure. Incidentally, those nineteen hours total represents 119 further launches, which is a measure of just how much work is being done by these little craft.

Of course, part of any failure analysis has to be a conclusion, which should always offer advice geared towards the prevention of future incidents. It's quite likely that the pilot in the aerotow event braced hard against the pedal when he realised that a ground impact was possible and, therefore, a material overstress is also quite likely. It'd seem this overstress wasn't sufficient to actually completely break the part, although it became sufficiently weakened that, during further operation, it slowly failed as a cyclic overload. Perhaps a lesson here is that, after any extraordinary event, a full inspection of the aircraft should be made, rather like a heavy landing check or an over-speed inspection.

Certainly, the pilot initiated an investigation into why this glider pilot found himself in so much trouble during the launch. Like many events, there are multiple pathways leading towards a final outcome. In this case, firstly, the weather which, in the view of the pilot's report, was 'challenging'. Then there's the ignored 'hairs on the back of the neck' moment felt by the tug pilot – something reminded him that care might be needed with this tow but he didn't follow up that visceral warning.

Later, after a British Gliding Association investigation initiated by the tug pilot, it was discovered that the glider pilot involved was having his first aerotow flight on type and had only performed two aerotows on any type in the preceeding eighteen months. Add in a squirrelly glider type which only has a winch-launch belly hook and, well, you get the picture.

So, lots of pointers in towards safer flying in this month's *Safety Spot*, I hope you enjoyed the read – see you at the LAA Rally! Fair Winds. ■