



With Malcolm McBride
Airworthiness Engineer

FORCED LANDINGS & DEPARTING DOORS

While we focus on the causes of the forced landings, it's also important to learn from how the pilots concerned dealt with the situations



Hello again and, of course, welcome to Safety Spot. I'm taking note that I've just started to see condensation on the car window first thing in the morning so, sadly, my unbroken summer of using the bike to come to work looks like it might come to an end soon; well, I've got some maintenance work to do on her in any event (nothing too horrific, just new sprockets and chain). Hats off to a great summer though. Hip hip hooray! Fingers crossed for the approaching winter!

Actually, the fact that we've had a good run of summer weather has been very helpful when it comes to transporting me to my desk here at LAA HQ every morning. I live in what used to be a village, but now feels more like a service stop on a motorway, near Oxford. Every way you look there are new housing developments going

Here's a picture taken by a friend of Jonathan on another flight showing the field (strip) that ended up being used as a landing site when the engine started to misbehave on his Super Cub on the way back from a trip to the Isle of Wight. You can see that landing sites are a bit thin on the ground in this area and good judgement is required to pull off a safe landing. (Photo: Jonathan Morton)

up... new housing means new access roads, new access roads mean new traffic junctions which, and I expect you can see where I'm going, mean more traffic delays in the mornings. Hence my sadness at having to use four wheels as the inherent lack of agility can double my journey

time to work and, perhaps as importantly, is nothing like as much fun. Perhaps I should get some heated gloves and just brave the weather? I can hear my inner voice loudly comment, as I write this last suggestion, "Don't be so silly, boy". My inner voice, by the way, still thinks I haven't grown facial hair yet which, when you think about it, is quite a nice attribute... at least in an inner voice!

Anyway, let's get started with this month's fare, time marches on and the Editor, Brian Hope, is looking for copy this evening! Here's a story where the in-flight engine failure was handled absolutely fantastically by the pilot, LAA'er Jonathan Morton. Because he kept his head and remembered the golden rule in such circumstances: Fly the Aircraft First. The aircraft was landed without a scratch in what could be described as hostile territory. Intrigued? Read on.



White Waltham flyer, Jonathan Morton, looking pleased with himself after pulling off a good emergency landing into a difficult field. In fact, the strip was part of the live firing ranges around Sandhurst, and Jonathan and his passenger found themselves stuck inside a barbed wire perimeter fence, but commented that both the MPs and the Surrey civvies were very kind and understanding. The aircraft was later de-rigged and trailered back to base by road. (Photo: Jonathan Morton)

Piper PA18 Super Cub – In-flight Engine Failure

Whenever we get a report that one of our aircraft has been involved in an 'event' our (well normally, my) first task is to check up on the aeroplane's history, especially its time in the PFA/LAA, which are fully detailed in our records. This may seem rather wasteful: 'Isn't one Cub just like another?' Well, as an LAA'er, you will know that there's no such thing as a 'series' type in the LAA Permit system. Our system treats each aircraft as an individual, hence the need for a quick swot amongst the records.

This PA 18-95 Super Cub is actually quite an unusual aircraft. Later Super Cubs are fitted with bigger engines and have flaps, and have not generally been allowed to transfer onto the LAA system. Surely this machine should be designated an L-18C (L, as Jonathan later pointed out, standing for Liaison ... in other words a military designator, which would explain why it hadn't been forced down the C of A route). I delved a little deeper and discovered that this, now group-owned aircraft was first admitted onto the LAA fleet in 1986. The aircraft was actually built in 1953 as a trainer for the Italian Air Force, without flaps, pretty much to the earliest 1949 Super Cub spec with the smaller Continental C90 engine. Digging further I discovered that there were quite a few aircraft built for the US military in this configuration. Apparently, this particular example went to Italy as part of a NATO initiative.

Whilst this sort of background may be important, in this case, as this aircraft had experienced an unexplained engine stoppage, the main reason for delving into the history was that I was looking for some kind of maintenance history for the engine. The LAA operates many engines that could be described as running in the 'autumn of their lives' but we try hard to ensure that this is not allowed to impact on their reliability – the idea is not to let old engines continue in service until they fail, but rather to take whatever actions are needed to keep them in good shape. Hence it's all the more important to find out what's actually gone wrong when one fails, not just to dismiss it as an old engine that's given up the ghost. Naturally, even when every check possible is made, we occasionally still get failures due, frankly, to old age, that's the increased risk we all take when operating vintage equipment. However, usually there's some other causal factor at the heart of the matter and a lesson to be passed on.

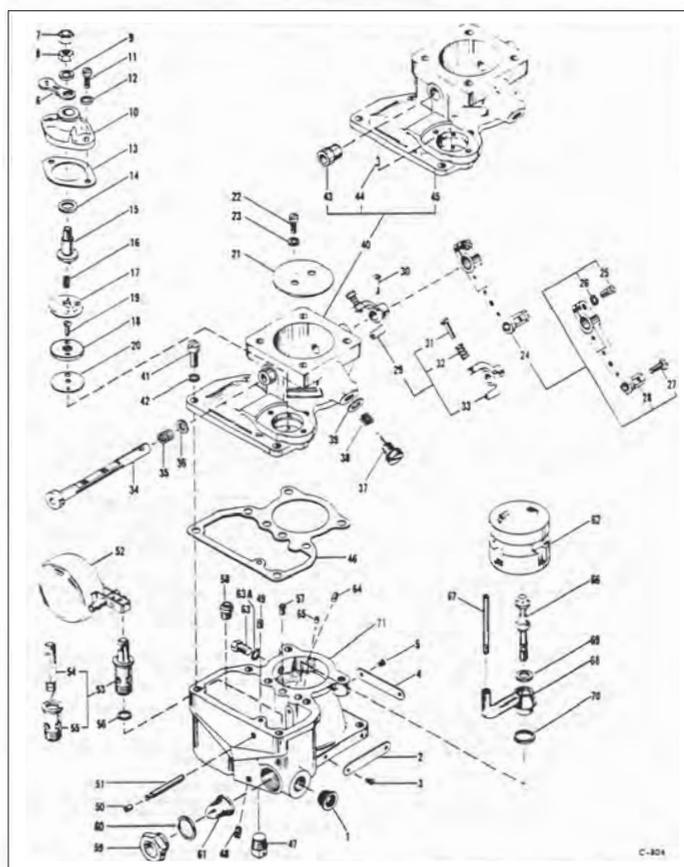


Figure 2-4. Exploded View of Stromberg NA-33A1 Float Carburettor

Carburettors are essentially devices for mixing fuel with air in the correct proportions to ensure complete combustion in the cylinder during the firing stroke. I hope that you can see from this exploded view of a Stromberg carburettor that this, on the surface quite simple job, takes quite a few components to achieve. The first part of the metering process is very much affected by the fuel level in the carburettor's internal store of fuel, the float chamber (bottom of the diagram). You can see the components that keep the fuel level correct in this chamber. Item 52 is the float which sits on top of the fuel, opening and closing the valve (54) against its seat (55). The valve seat is first set in its correct position using shims then, when correct, the seat is torqued down and then wire-locked. It was found, during the later investigation, that the overhauling engineer hadn't wire-locked the seat into place and vibration had caused it to come undone, blocking off the fuel supply. (Illustration: Stromberg Parts Manual)

For fairly obvious reasons, it's important to establish a mechanical history before working up a future maintenance plan. Sometimes, with aircraft operating on a Permit to Fly, an engine's history can be rather hard (even to the point of being impossible) to pin down, especially its pre-PFA/LAA history! Not in this case however, for interestingly, this Super Cub (or whatever we decide to call it!) turned out to be still operating with the same engine it had when first imported. A note in our database suggests that this power unit may have been a 1965 replacement - presumably whilst still in service in Italy.

By piecing together logbook entries and worksheets, this engine looks like it has completed something like two-and-a-half thousand hours. We know that the engine was rebuilt (note I haven't used the word overhauled) in 1995 because of a reported low oil pressure, 700 hours ago, which would have tidily coincided with the C90's TBO of 1,800 hours – so far so good. Subsequently, it has had a new top-end (pistons and cylinders) fitted 350 hours later. The only other maintenance activity recorded is that the Stromberg carburettor was professionally overhauled in 2011 as part of Jonathan's ongoing programmed maintenance plan. This year the

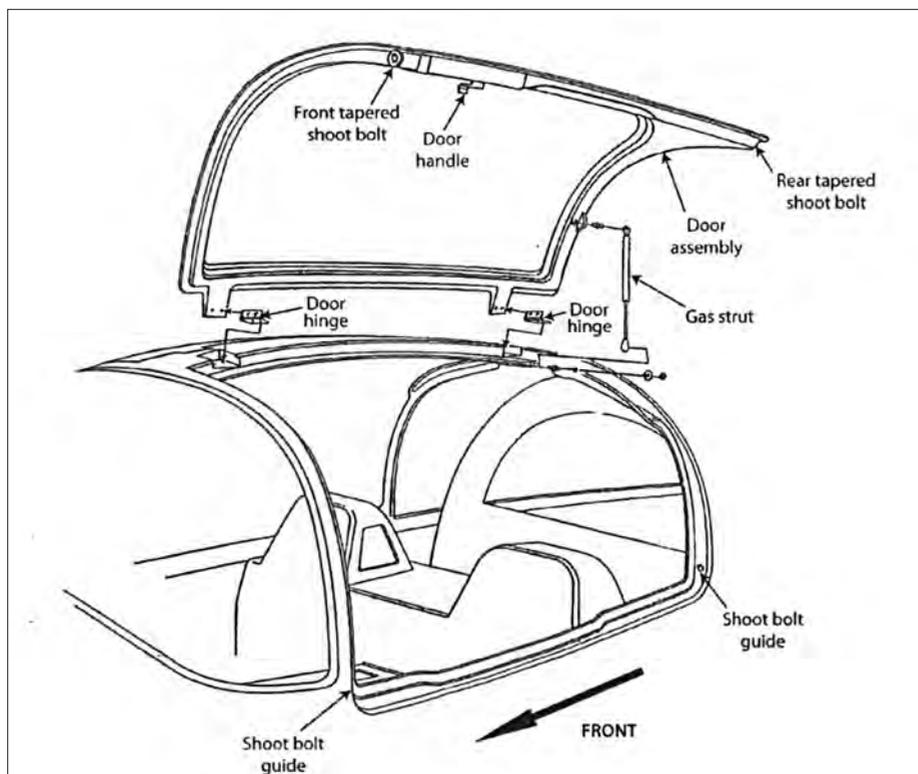
magnetos are going to the repair shop.

Confused? OK, me too to some extent, but I hope that you get the same feeling as I did when looking through the maintenance record that this aircraft is being well cared for in her old age and, part by part, components are being kept in a good condition. So what went wrong?

Jonathan explained that he's grown partial to taking lunch in a beach-side restaurant at Sandown on the Isle of Wight, which goes by the appropriate name of *Strollers*. Actually, I know this rather laidback establishment rather well but, personally, prefer the pub halfway up the hill (overlooking the pier), I think it's called 'Flanagans' – as much as you can eat and reasonable prices!

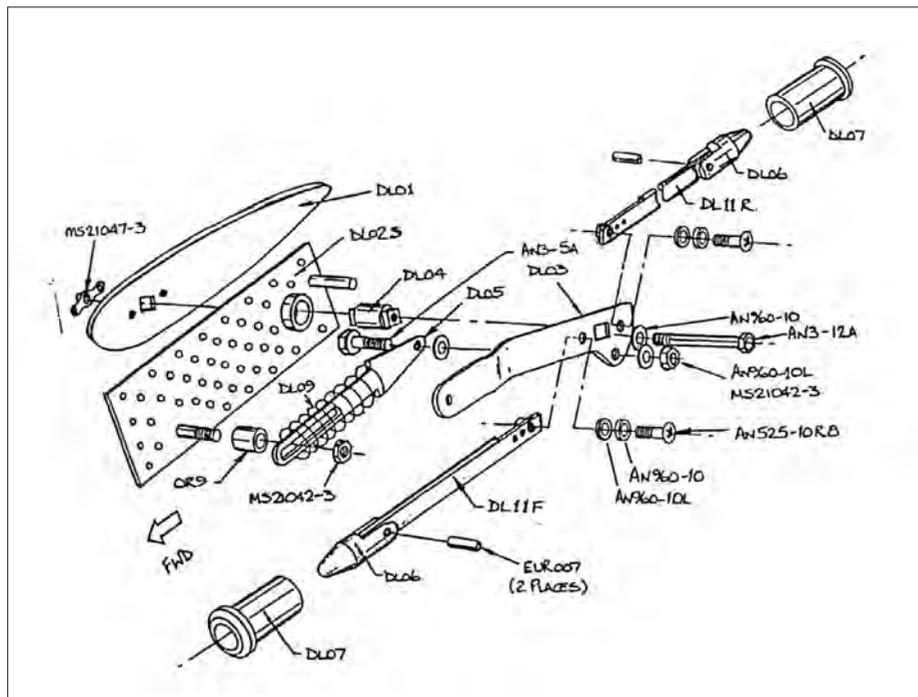
Anyway, those of you who travel occasionally down to the island will know that airspace issues can push you out towards the east somewhat; Jonathan explained that he prefers to go via Farnborough – if you know the area, Sandhurst, Crowthorne, that sort of zone. Jonathan's passenger was fellow pilot and, for that matter, group member, Kev Morgan. Anyway, after a pleasant lunch at *Strollers*, Jonathan and Kevin headed for home in very nice weather. Clearance through the Farnborough zone was requested

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This sketch showing the general arrangement of the gull wing doors as fitted to the Europa. Note that there are two shoot bolt guides, one at the front and one at the back. After closing, it's easy to see whether the front pin has entered the guide but the rear guide sits behind the pilot's shoulders and is more difficult to see. Because the door is actually quite stiff, pushing on it during the normal 'Hatches and Harnesses' pre-take-off checks are clearly not a reliable way of determining whether the rear pin has engaged in its matching recess or not.

(Image: Europa Manual)



If you are a regular follower of Safety Spot you will know that we've seen Europa doors fail before. This picture shows the relatively complex mechanism involved in pushing the locking pins (shoot bolts) into their guides. Because in the event described in the text the pilot was sure he had shut the door fully, at first we thought that the wear in the mechanism might be preventing the bolts from going fully home.

(Image: Europa Manual)

and duly given, 2,000ft via Crowthorne. Jonathan explained that they were just passing over Broadmoor hospital when the engine quietly died. "The first thing that I noticed was when the engine lost power," explained Jonathan. "I thought that Kevin had pulled the power back and, after asking why he would do such a thing, I realised that Kevin was thinking the same thing of me. At this stage, we were coming down quite gently but, looking around, landing sites were very thin on the ground." Nevertheless, as it turned out, he made a sound choice and a good landing was made.

Hostile territory? Take a look at the picture on page 48. The track formed part of a Ministry of Defence live-round training ground. As it turned out the MPs, who soon arrived on the scene, were an understanding bunch and, well, it didn't take too long to get let out of jankers! I jest of course. Jonathan's mate took a picture of his landing site a few days later.

One thing that's worth passing on was that it was only after the immediate priorities had been dealt with that Jonathan put out a Mayday. In other words, the aircraft was first set up at best speed, wind direction established, a landing site identified and a mental image of the circuit formed and understood. When he did call up, the controller acknowledged the Mayday and then advised Jonathan that Blackbushe aerodrome was 4nm east of their current position. Jonathan explained that he assimilated the information but found this suggestion a bit of distraction. "You can't help feel a nagging doubt that this might be a better option, coming from 'authority', so to speak. The fact that I didn't have a hope of reaching Blackbushe and, more importantly, I'd already committed to my plan, meant that I just ignored this advice."

More distracting still, whilst on the base leg to the forced landing, the controller suggested contacting London on 121.5 and squawking 7770. I don't need to say that this direction was not complied with either; being very much the moment for aviating and navigating rather than communicating, as the old mantra goes.

Well done to Jonathan for getting his machine down safely in an emergency. To reiterate, in an engine failure situation, first fly the aircraft. Then, if you've got time, try to find out what's gone wrong - the passenger may simply have inadvertently knocked the throttle closed or shut the fuel on/off valve with his knee. If there's still plenty of time, a Mayday call's a good idea as this will start the process of getting the emergency services to you quickly after you're back on the ground. First of all though, concentrate on getting your aircraft down safely.

Oh, and what caused the engine stoppage? Well, I mentioned earlier that, as part of Jonathan's ongoing maintenance plan, the carburettor had been sent off to a CAA approved workshop about 200 hours previous to the stoppage. The LAA Inspector, Alan Turney, who's known this aircraft for many years, soon realised that the engine had stopped because it wasn't getting any fuel. The carburettor was removed and the fault was soon discovered. When it was overhauled, the person who re-assembled it clearly didn't wire-lock an internal component so, after a couple of hundred flying hours of continuous vibration, it unwound (probably quite quickly once it became loose), essentially shutting off the fuel supply and stopping the engine. There could have been no sign of this externally so both the aircraft's day-to-day management and the age of its engine were exonerated.



Here's a picture of the failed hinge on the Europa that's lost its door during a check flight. You can see that the aerodynamic loads trying to pull the door open are substantial enough to break the fibreglass structure. (Photo: Stephen Tucker)



This picture, showing the rear shoot bolt guide, shows clearly from the witness/wear mark left behind that when the aircraft took off the rear shoot bolt wasn't engaged. The fact that the door wasn't closed properly wouldn't necessarily be noticed by the crew until the airspeed passed a critical point, in this case, 110kt. (Photo: Stephen Tucker)

Europa XS – Door Torn off In Flight

Do you ever get that feeling of déjà vu, it's a sort of Groundhog Day thing? You might, looking at the title of this chapter in Safety Spot – but no, we're not regurgitating old copy, this is an old problem that's come back to haunt us.

I expect that you've noticed that I've been pushing the 'First, Fly the Aircraft' rule pretty hard of late. I don't make any apologies for the obvious repetition, you don't need to be a statistician to work out that too many people are still hurt by not following this rule so, at least in my book, it's a mantra that still needs pressing home. Let's face it, it's not good for any of us when people get hurt in aircraft accidents and incidents. When horrible things happens though, and they inevitably do sometimes, it's important that we establish what's gone wrong and, if possible, all the many reasons behind it. Accidents are almost always caused by a combination of, quite often, unrelated happenings. Happenstance if you like. But when you look behind the curtain, well...

Some things you can do something about. If a part is found to be too weak and its failure has caused an accident, well, once identified, it can be replaced... easy. Accidents caused by human failings, both individual and systemic, are sometimes more difficult, both to identify and once identified, to disseminate the solutions. What do I mean by 'individual' and 'systemic' failings, and why should it be difficult to identify the human factors involved in an incident? Surely that should be easy? Well, sometimes it is easy to establish the individual failing... too fast, too slow, not enough this or that but real improvements to safety come from establishing the systemic issue lurking. To repeat the metaphor, behind the curtain. Why too fast or slow, or why this or that wasn't done properly? Is the reason a simple mistake by the pilot or could it be something to do with their training or post-training supervision. What about the aircraft itself? Is there a subtle inherent fault with it? If so, why wasn't it picked-up during initial testing? A lot to think about!

Earlier today I received an email from a chap in Italy who'd just lost his best friend in an ultralight accident. Naturally he was very upset and was looking, quite understandably, for a reason for his loss. He explained that, 'Here they just treat these accidents like a minor car crash, nobody seems interested in the reasons why I've lost my friend, and that just doesn't seem right.' The reason for his email, or at least the question embedded within it, was to find out what we did

in the UK under similar circumstances. I was pleased to be able to tell him that we always treat aircraft incidents and accidents very seriously, and that we always try to establish cause. In our view it's only by establishing cause that relatives and friends can hope to come to terms with the event and that changes can be made, hopefully anyway, to prevent repeat mishaps.

This example, where a door came off in flight, offers an opportunity to look at some of the factors involved in the foreground and, perhaps more interestingly, a couple of the subtle, rather spectral, background issues.

(Photo: Stephen Tucker)

So, what happened? Well, the aircraft was at a repair station having some maintenance done to the propeller. For some reason the variable pitch propeller was 'hunting' (wouldn't settle at an appropriate RPM) and the reason for this was proving difficult to identify. As it turned out, after all sorts of mechanical changes, the fault was tracked to an over-excitabile feedback response in the electrical controller but, by the time the fault was eventually found, the aircraft's Certificate of Validity had run out, so a Permit renewal inspection was necessary before the aircraft could fly. The owner, who was fairly new to the type, asked the company who'd fixed the propeller fault to carry out the Permit renewal work, which it duly did. The aircraft was in very good condition and, after some ground running to check that the propeller was working OK, the aircraft was made ready for a check flight, both to check the prop and for the annual renewal.

The engineer/inspector involved, an experienced LAA'er, although not particularly experienced with Europa aircraft, decided that he needed a more experienced pilot to carry out the



check flight. What's more, because of insurance limitations on the aircraft, any pilot, other than the owner, would have to be a Qualified Flying Instructor (QFI).

As you will probably know, especially if you are the owner of an LAA Permit aircraft, to carry out a check flight on an LAA machine you need a minimum of 100 hours P1 and at least 10 hours on type (or very similar type). We think that type familiarity is important in these checks.

The QFI pilot chosen had no real experience with the Europa but had thousands of hours test flying experience on a huge range of light aircraft of all types, so this chap's individual experience wouldn't be questioned, especially when sensibly backed up by the engineer, also a qualified pilot, acting as check flight observer. So what on earth could go wrong?

With legal boxes ticked, the check-crew took-off to fly the LAA schedule. All was going well until, whilst flying at about 100kt, the port door ripped itself off the hinges and disappeared rearwards. Naturally, the check flight was abandoned and the aircraft returned home for a precautionary landing. After the incident both the pilot and the observer were adamant that they had checked that the doors were closed before departure and the observer, whose door had departed, added that there was no flapping or draught to suggest that the door had not been properly closed.

This is where déjà vu comes in of course and why type familiarity is so important. Regular readers (and, of course, Europa owners) will know that, primarily because we'd had a spate of doors failing in flight, there was a Safety Spot dedicated to the subject (See

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March 2013). Certainly it's very easy to think the Europa door is closed without the rear shoot-bolt having gone home and, as many will know, a quick push on the door won't establish whether this has happened or not. As you can see from the photos, this crew may have been very lucky. The departing door hit the tailplane, causing substantial damage, which has added impetus to the ongoing search for a solution to this re-occurring issue. It has also opened up another discussion point: why, in the view of an insurance company, should a minimum qualification to fly an aircraft, if you're not the owner, be a flying instructor's rating? Surely experience on type is more important?

Pietenpol Air Camper – Undercarriage Failure

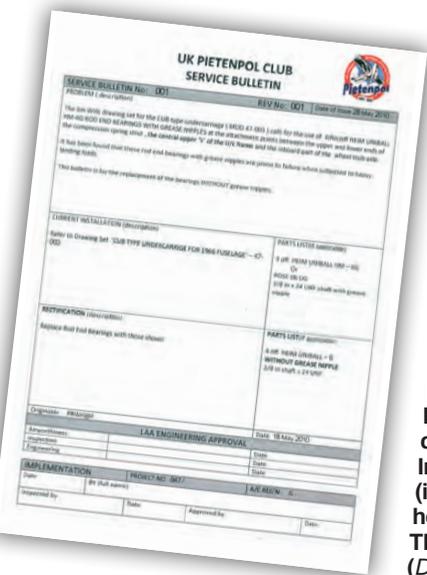
I received a telephone call from one of our colleagues at the Air Accident Investigation Branch asking if we knew anything about an incident involving a Pietenpol Air Camper at Cranfield. I checked my database and explained that we had received notification from them that there had been an accident involving a landing gear collapse a couple of days before, and that I'd spoken to the pilot briefly to make sure he, and as it turned out, his passenger were OK. We were waiting for the pilot to send us a few pictures and hadn't done much more than this at that stage. I knew that the pilot, LAA'er Sqd Ldr Neil Constantine, had secured the aircraft back to the hangar and I was looking forward to receiving his report.

The investigator asked that, when we have more details, could we pass them over "As soon as". I agreed to do this, of course, and asked

why the extra concern. "Well," he explained, "you won't know this yet, but earlier today we had a report of another Pietenpol losing its undercarriage, not so far away from you. No, nobody injured, fortunately - but are we seeing a pattern?"

I decided to give Neil another call and push the incident up the priority list.

As it turns out, the only common feature between the two incidents was the name Pietenpol, so the pressure for answers dropped quite quickly. We probably weren't seeing the first in a rush of failures. The first incident involved a collapse of the Cub-type welded steel tube undercarriage during a normal touch-and-go; the second resulted in the failure of a quite different one-off wooden-legged undercarriage where the landing hadn't been quite so controlled. We're still in the middle of the investigation into the second event, which we'll discuss in the next



After the last Pietenpol rod end failure, The Pietenpol Club issued a Service Bulletin advising owners to replace any in-service rod ends with a stronger type of rod ends without nipples, which was a change endorsed by LAA. At the time, it was thought that the hole for the grease nipple was creating a stress raiser which was leading to failure. It's likely that this was the case but, now we've had a failure of a non-grease nipples bearing, albeit one of questionable quality, LAA Engineering is looking at requiring fitment of stronger bearings altogether and the introduction of a component life.

Interestingly, in this recent failure, the safety strap mod (info available from the Pietenpol club) wouldn't have helped as the undercarriage folded inwards when it failed. The strap only prevents collapse in an outward direction. (Diagram: Pietenpol Club)



It is absolutely essential when a part fails in an engine that all the 'remains' are found before the engine is put back into service. Alan found part of the broken valve in the induction air-box – it must have passed backwards through the induction system, just don't ask me how!

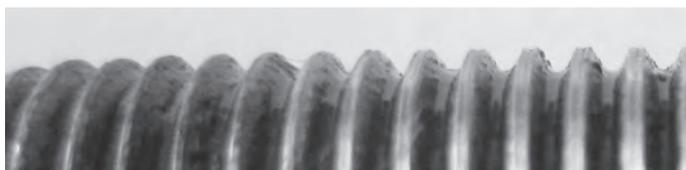
(Photo: Malcolm McBride)



Have you seen this picture before? I know that you won't have done because this picture showing a failed Pietenpol undercarriage is hot off the press. The last time a rod end failed on a Pietenpol, back in 2010, we featured a very similar shot. You know what they say, 'What goes around, comes around'. (Photo: Neil Constantine)



This rod end bearing has failed in tension, as you can no doubt see. We know from the aircraft's maintenance records that the rod end was replaced in 2010 after a similar failure during taxiing. At the time of replacement the aircraft had accumulated 162 hours. This replacement rod end failed at 230 hours so, by deduction, we can assume that it has been in service for just 68 hours. The current owner has logged 57 hours and 209 landings. We're not sure of the number of landings before this. We do note, however, that this Aurora MM6 bearing is not a part designed for heavy duty operation and the Heim heavy duty bearings are showing better service. (Photo: Malcolm McBride)



Here's a closer view of the Aurora rod end's threaded part, that's the section that screws into the actual strut. I hope that you can see that this bearing has been wearing within the strut – note the flats on the threads. All undercarriages work very hard for their living, had these bearings been removed during the last 25 hours, it is likely that they would have been replaced because of this obvious wear. (Photo: Malcolm McBride)

Safety Spot because there are quite a few safety lessons to learn.

The first incident is rather more straightforward. Neil explained:

"My pal, also an experienced taildragger pilot, and I were enjoying a flight in good weather around the local area. After about 20 minutes we decided to fly a few touch-and-go landings. I think we'd done about three, maybe four... anyway, just as we touched down I noticed, rather felt, something 'go' in the undercarriage. I applied full power and converted the landing into another touch-and-go. Looking over the starboard side it was clear that there was something wrong as the undercarriage leg was swinging about in the breeze".

I can remember, years ago, a tyre bursting once on a taildragger I was flying and I remember the horrible scenarios my mind was concocting on my final approach: this must have

been similarly scary. Neil continued:

"We had plenty of time to make a plan. First, we contacted the tower to let them know the problem, then we decided to go for a dead stick landing so we rehearsed our various roles: the pilot in the front cockpit landed the aircraft and the one in the rear looked after the valves and switches."

As it turned out, the two-man team landed the aircraft without incident and very little damage, a good job very well done. You can review what failed in the attached pictures, and yes, we've seen this type of failure before, back in 2010. Suffice to say that LAA Engineering will shortly be issuing further advice to Pietenpol owners about the inspection and replacement requirements of the rod end bearings used in this type of undercarriage.

Ah well, the evening beckons... I'm hoping to get out on the water tomorrow. Fair Winds. ■

When the valve broke, its remains virtually destroyed everything in their path; here's a picture showing one of the sparking plugs. When removed they gave the first indication where the problem lay, the only other external sign was a complete loss of compression.

(Photo: Malcolm McBride)



(Left) This picture shows some of the piston in the oil filter screen.

(Photo: Malcolm McBride)

(Right) As it turned out, Adrian was able to source another engine, in fact, whilst I was on my lunchtime walk yesterday, I watched him take-off and cautiously fly a circuit. Everything looked (and sounded) fine, and I saw him depart after final engine checks later in the afternoon. This picture shows one of the exhaust valves from one of the other cylinders of the duff engine. The area shown is where most valve failures actually occur, this is because it's the area that takes the most punishment. Note the transition from a smooth surface, under the mushroomed head, to a pitted surface in the shank. This engine had completed about 650 hours after an LAA rebuild, but the records weren't concise enough to work out how old the valves were. *(Photo: Malcolm McBride)*



(Above) LAA'er Adrian Lines was flying his Aeronca 7AC back to Leicester after a great day out at Popham when, as he was passing between Fimmere and Turweston his engine lost most of its power. Given the choice of landing spots he opted for Turweston. Well done to Adrian for getting his lovely aircraft back on the ground safely. Here's the engine as it was removed from the airframe under the watchful eye of LAA inspector, Alan Turney. I expect that you can see what's happened... yes, an exhaust valve has failed. Because the detritus from this failure was sent around the engine, most of the compression was lost in the remaining cylinders, hence the virtually complete loss of power.

(Photo: Malcolm McBride)



LAA ENGINEERING SCALE OF CHARGES – PLEASE NOTE NEW PERMIT FEES HAVE APPLIED SINCE 1 MARCH 2014

LAA Project Registration

Kit Built Aircraft	£300
Plans Built Aircraft	£50
Issue of a Permit to Test Fly	
Non-LAA approved design only	£40
Initial Permit issue	
Up to 390kg	£320
391 - 499kg	£425
500kg and above	£565
Three seats and above	£630
Permit renewal	
Up to 390kg	£115
391 - 499kg	£155
500kg and above	£210
Three seats and above	£230
Modification application	
Prototype modification	£45

Repeat modification	£22.50
Transfer	
(from CofA to Permit or CAA Permit to LAA Permit)	
Up to 499kg	£135
500kg and above	£250
Three seats and above	£350
Four-seat aircraft	
Manufacturer's/agent's type acceptance fee	£2,000
Project registration royalty	£50
Category change	
Group A to microlight	£135
Microlight to Group A	£135
Change of G-Registration fee	
Issue of Permit Documents following G-Reg change	£45
Replacement Documents	
Lost, stolen etc (fee is per document)	£20
<i>Latest SPARS - No. 15 April 2009</i>	