The latest LAA Engineering topics and investigations. By **Malcolm McBride**

Safety Spot

Malcolm discusses Stampe propeller failures, Jabiru control surface hinges and airspeed indicator problems

Welcome to this February edition of *Safety Spot*, I do hope that you and those close to you remain well. I'm happy to report that yours-truly, despite current circumstances which, going against the grain rather, I don't propose to mention, I remain in good order. Regular readers will know that I'm a bit of a walker, I left jogging behind in my early twenties – it used to be called cross-country running then, and we used to run in plimsolls and baggy shorts, not trainers and colourful Lycra!

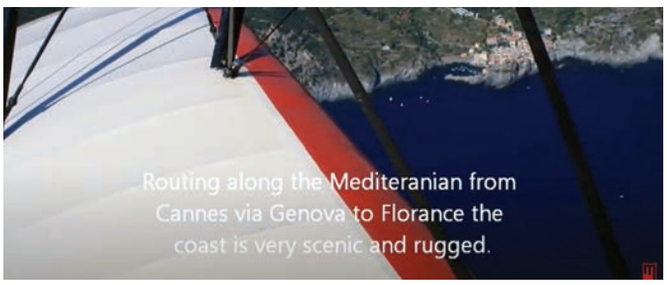
Anyway, our new canine housemate, Sam, demands more and more mileage as the months pass; even though he's short on leg (though long on hair), there's no stopping him. He has an infectious smile, which reminds me that life is always special and, even though circumstances might make this difficult sometimes, must be cherished almost whatever the situation.

Thanks to all of you that have written back with suggestions as to how we might improve, and in some cases, correct, the TADS documents. Thanks also for not being too hard on me for finger-wagging a bit in the January *Safety Spot*, when it came to my encouragement(s) towards accuracy when you submit your FWR/1 Permit Revalidation form to us. Naturally, under the present 'unmentionable' circumstances, we haven't received that many renewals over the last weeks, so we don't know whether the minor educational campaign had any results in overall performance! Treat the FWR/1 form like you might treat a component you are making from expensive material, measure twice (check the form), cut once (use the correct stamp)!

If you haven't got a clue what I'm talking about, then it's likely that you haven't read the January edition of *Safety Spot* yet – which gives me the opportunity to let you know that all past *Safety Spots* are available to read on your computer. Just take a browse through the LAA's website, you'll find a link to the *Safety Spot* area where past *Spots* are indexed year by year. I'm amazed sometimes, when a member asks a question about 'how to do' this or that on their aircraft, to hear that they weren't aware of the Technical Leaflet library where you'll find the answers to most day-to-day questions about operating an aircraft under an LAA administered Permit to Fly.

Now that you have to review the TADS document before applying to revalidate your Permit, which means that you'll have to enter the labyrinth, on your journey take a flask of coffee and a sandwich and explore awhile. Spend time in the engineering section, there's lots to discover; I promise, there are no demons lurking in the shadows.

Even though there's not been much leisure flying going on because of the 'unmentionable' circumstances that surround us all at the moment, I remain pretty busy. This, in part at least, is due to a time lag between an event occurring, and it being reported.



Above I'm pretty sure that most pilots of single-engine sports aircraft go out of their way to avoid flying over territory that doesn't offer a good opportunity for carrying out a safe emergency landing, but sometimes it's unavoidable to get from A to B. The south coast of France is one of those areas where, if you do have an emergency, the only safe place to go is the water. **Photos: Mark Jeffries**

A lesson I learned a long time ago is that a reader needs to be very wary of taking too much notice of a rapidly produced report – 'the exclusive' – as it is probably not going to be that accurate. That is one of the dangers of web-based news items.

An event, after all, provides the feedstock for the continuing airworthiness engineer's job list. Of course, if an incident happens because a part has failed, then information about this failure needs to get to other 'users' of the part as quickly as possible, we try hard to do this. But, knowing that an event never involves a single factor, a better diagnosis takes a bit longer to put together a longer-lasting cure.

Mind you, this first story, where a propeller failure led to an LAA flyer ditching in the Mediterranean, has taken rather a long time to hit the headlines. That said, the reasons, note the plural, for it are as important to recognise today as when the event happened (in 2009).

Stampe SV 4 – In-flight loss of propeller

Thanks to Angus Buchanan, secretary of the Stampe Club, for sending us a copy of a DGAC (the French Aviation Authority) Airworthiness Directive (AD). This, rather unusual AD requires owners of Stampe aircraft to check the attachment of the propeller on their aircraft for tightness and security. As is normal practice, we sent a copy of this AD to all members operating Stampe aircraft under an LAA administered Permit to Fly, some 27 aircraft, with the following email:

Dear Stampe owner,

Please find attached a copy of an Airworthiness Directive that will affect operations of your aircraft. This AD (F-2020-006), issued by the French DGAC just before Christmas, essentially, requires that an owner checks that the propeller fastening bolts have been correctly torqued and the locking tab washers, when fitted, are not re-used. Further instructions held within, require that you check your maintenance schedule to ensure that the frequency of checking the propeller torque in the maintenance schedule for the aircraft, at least aligns with the instructions given by the propeller manufacturer.

As is the case with all continuing airworthiness safety information we receive, we have investigated the root cause of this incident and believe it to have been issued as a result of a propeller loss in 2009, where, after the propeller departed the aircraft, the pilot was forced to ditch in the Mediterranean Sea.

The reason for the propeller's failure was not established completely, though loosening of the propeller clearly led to friction heating of the wood. I have attached a picture showing the failed propeller.

Of course, although this Directive relates directly to the Stampe aircraft, the importance of ensuring that all wooden propellers remain correctly torqued cannot be over-emphasised. This is especially true after a period of long lay-up. For this reason, we'll discuss this AD, and the incident that led to its issuance, in the February Safety Spot.

Very kindly, Angus did some preliminary digging to find out more about the incident that led to the AD's creation and it seems that it related to, as you will have read above, to an incident that occurred in 2009 during a post-maintenance delivery flight. The aircraft was being piloted by our very own Mark Jeffries and, after the dust, perhaps rather water splash, had settled, Mark created a short video about the incident which you'll be able to find on YouTube, if you want to.

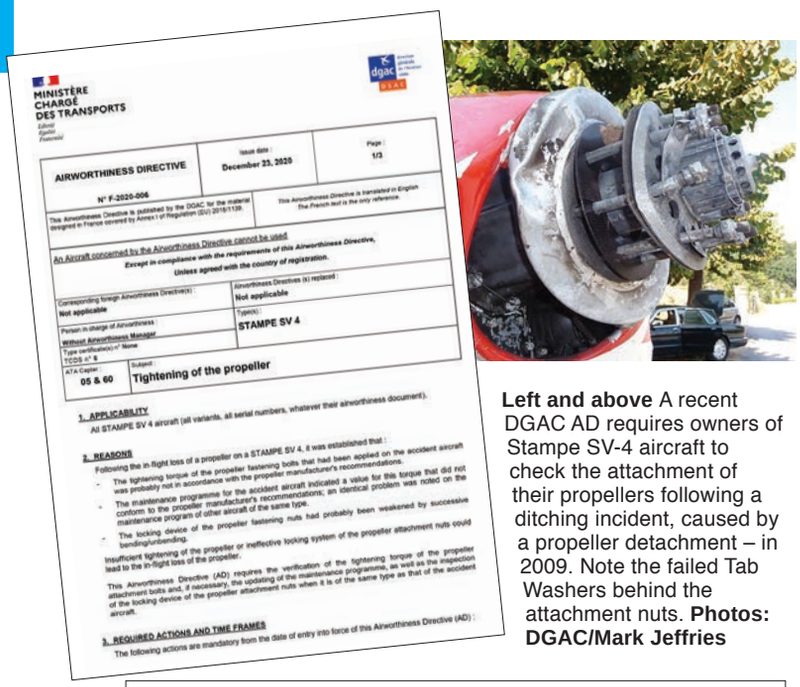
While Angus was sleuthing, I was digging into our records to see if we'd seen a similar propeller loss incident with a Stampe and, as it turns out, there had been another very similar issue affecting a Stampe in July 2001, this time forcing the aircraft into a field, rather than the water. This aircraft was then operating under a Certificate of Airworthiness, though I'm pleased to say that it is now with us and flying under a Permit.

Naturally, I chatted to Mark, who was rather surprised that this AD was so long in the brewing. He thought that this might be due to various arguments about who was responsible for the incident, after all, the aircraft had just been serviced and it is well known that the attachment of wooden propellers needs to be checked regularly, especially around seasonal changes when ambient humidity and average temperature change. I know that LAA Inspector, Andy McCluskie, knows a thing or two about Stampes, and I wondered if he had a maintenance schedule handy to see what this says about checking the propeller.

Andy found the appropriate section which, to be honest, was a bit on the thin side – but it did state that the propeller must be removed annually to check for cracking in the hub and to ensure that the propeller is correctly torqued-up. Part of the AD, which you can download via an 'Alert' that you'll find in the Engineering section of our website (remember to take that flask), warned against the re-use of metal tab washers. These, if you haven't seen them, are single use metal washers or, as in this case, plates, which have tabs which can be bent over a nut to stop it working loose – an alternative to wire-locking or split-pinning. The problem for me, after I checked the drawing of the assembly, where tab washers aren't shown, was why they were there in the first place.

Another LAA Inspector, who I know has many years of Stampe experience, and still owns one, is Tony Bianchi – so I dropped him a line asking if he could help. Tony kindly responded:

Good Morning Malcolm, that's a nasty experience with the Stampe. I think the propeller looks a rogue, homemade of some sort, I'd like to know what it was? As requested, here's how the assembly of the hub goes: The hub main nut is externally serrated at its leading edge outer circumference. The locking tube is internally serrated and slides inside the hub and locks the nut.



MINISTÈRE CHARGÉ DES TRANSPORTS

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AIRWORTHINESS DIRECTIVE

Issue date: December 23, 2020

Page: 1/3

N° F-2020-006

This Airworthiness Directive is published by the DGAC for the material designed in France covered by Annex I of Regulation (EU) 2018/1139.

This Airworthiness Directive is translated in English. The French text is the only reference.

An Aircraft concerned by the Airworthiness Directive cannot be used
Except in compliance with the requirements of this Airworthiness Directive,
Unless agreed with the country of registration.

Corresponding foreign Airworthiness Directive(s): Not applicable

Airworthiness Directives (s) replaced: Not applicable

Person in charge of Airworthiness: Without Airworthiness Manager

Type(s): STAMPE SV 4

Type certificate(s) n°: None

TCDS n° §

ATA Chapter: 05 & 60

Subject: Tightening of the propeller

1. APPLICABILITY

All STAMPE SV 4 aircraft (all variants, all serial numbers, whatever their airworthiness document).

2. REASONS

Following the in-flight loss of a propeller on a STAMPE SV 4, it was established that :

- The tightening torque of the propeller fastening bolts that had been applied on the accident aircraft was probably not in accordance with the propeller manufacturer's recommendations.
- The maintenance programme for the accident aircraft indicated a value for this torque that did not conform to the propeller manufacturer's recommendations; an identical problem was noted on the maintenance program of other aircraft of the same type.
- The locking device of the propeller fastening nuts had probably been weakened by successive bending/unbending.

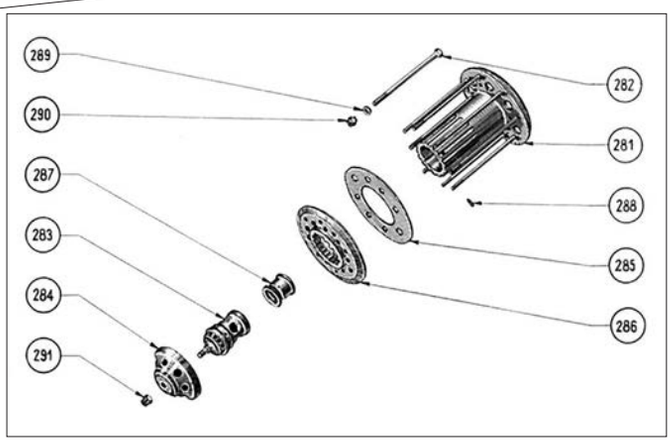
Insufficient tightening of the propeller or ineffective locking system of the propeller attachment nuts could lead to the in-flight loss of the propeller.

This Airworthiness Directive (AD) requires the verification of the tightening torque of the propeller attachment bolts and, if necessary, the updating of the maintenance programme, as well as the inspection of the locking device of the propeller attachment nuts when it is of the same type as that of the accident aircraft.

3. REQUIRED ACTIONS AND TIME FRAMES

The following actions are mandatory from the date of entry into force of this Airworthiness Directive (AD) :

Left and above A recent DGAC AD requires owners of Stampe SV-4 aircraft to check the attachment of their propellers following a ditching incident, caused by a propeller detachment – in 2009. Note the failed Tab Washers behind the attachment nuts. **Photos: DGAC/Mark Jeffries**



Above Here's an exploded diagram showing the correct (original) method of attachment of the propeller to the propeller drive flange (engine's crankshaft). Here's how the system works: the hub's main nut (287) is externally serrated at its leading edge outer circumference. The locking tube (283) is internally serrated and slides inside the hub and locks the nut. The locking tube is then secured by four grub screws (288), that are attached and wire locked after the front hub plate is installed. Finally, the cone (284) is fitted, this locks all the propeller nuts. It stays in place with a centre attachment stud that is on the locking tube, it has a castellated nut and is split pinned. **Photo: Andy McCluskie.**

Left Overheating and burning of wooden propellers is a common indication of loss of torque in the mounting system. If the propeller bolts become loose, friction is lost and the relative movement between the two surfaces causes friction, heating and eventual failure. **Photo: Mark Jeffries** ▶

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That's as the maker intended. But some people have ditched the locking cone because the centre stud on the tube has been sheared or damaged, or the nut left loose or various other reasons. They then have to use tab washers to lock the nuts. The original way works perfectly well, but requires a sensible person to fit it correctly.

By the way, I'm not surprised that you haven't been able to find a torque setting for these attachment nuts. For this sort of attachment, quite often seen on vintage types, we never use a torque wrench on a wooden propeller, once the fitters arm has been calibrated through experience, a good feel for the correct tension works best.

So, well done to Mark for getting the aircraft down safely after the propeller departed, even if he can only just remember the experience! Whatever the real reason for this AD, it does serve as a timely reminder to all wooden propeller operators that constant vigilance is required – wooden propellers are definitely not a 'fit and forget item'… not that much is in a sports aircraft… but you get my drift, I hope.

Tony Bianchi continues: *I have, over the years, seen issues that have had similar results to the Stampe that ditched in the Mediterranean. I'm 90% sure that the incident was due to shrinkage and drying out of the propeller, not the bolts coming loose. In the case of the few that we had here at Personal Plane Services (Booker), with client Renault Stampes using Merville or Legere propellers, one incident comes to mind. This occurred in 1990; it was a client-owned aircraft that landed due to the smell of smoke and vibration. As the aircraft came to a stop the remains of the propeller, now alight, flew off and set the grass on the airstrip on fire. It was a Merville propeller.*

Wood is a fantastic material for making propellers, just ask the boss of Hercules Propellers, Rupert Wasey, he uses beech laminates. My personal experience is with mahogany, though this is becoming difficult to source, I'm fairly sure that Merville propellers used white ash. Wood was once alive, and because of the complex forces imposed on the living plant by its environment, each piece of wood will have different mechanical properties. But, to varying degrees, all woods share the same two problems when used as a precision engineering material.

One, it will grow and shrink as water content increases and decreases, for example, mahogany shrinks about 4% across the grains from saturated to kiln dried, ash is something like 9%. Two, the strength of wood, particularly 'crushing' strength, can vary by as much as 40% within the same limits, and is much weaker when wet.

As an LAA Inspector, I've often come across wooden parts, not just propellers, that have been affected by these seasonal/environmental material changes – during a dry summer, the part's attachment bolts become loose because the part has shrunk a bit. As the weather turns wetter, the part absorbs water and the part grows, when this happens the attaching bolts become far too tight and this, coupled with a slight weakening in compression strength, forces the bolt (or nut and washer) into the material. During the next 'dry-out' the bolt becomes loose again and is again tightened – a ratchet effect that will eventually lead to the part's becoming more and more crushed and eventually, failing.

Back last year, a member complained that a wooden propeller he'd bought wouldn't fit the flange. He thought that the propeller had been mis-drilled but, after questioning, he explained that he'd bought the propeller with the kit a few years ago and, to keep it safe, he's stored it under his bed (in a centrally heated house). Wood grows and shrinks as it's water content changes at a different rate along the grain as opposed to across it. That's why the jig drilled bolt holes went from round to oval!

This 'unmentionable' situation we find ourselves in will soon be past, when it is, and you get back to your aircraft, remember to check the attachment of your wooden propeller, if you are lucky enough to own one – I have a few dotted around the house, but sadly none on a living aircraft. My favourite, one of the very first made for a microlight, has a barometer in the hub, the propeller, definitely a prototype, never worked very well. Those were the days of trial and error, but it looks lovely in my hall.

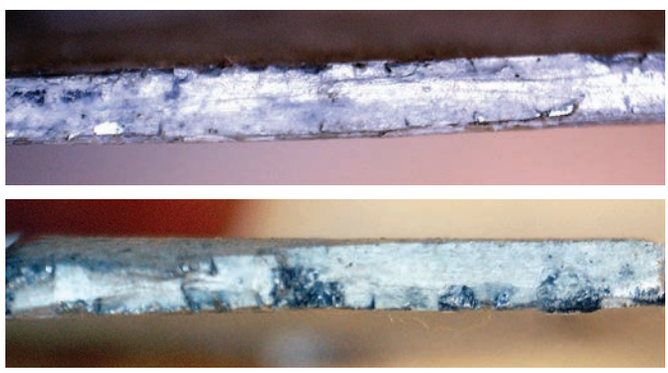
Jabiru Aircraft – Control surface hinge inspection

Surely, when choosing a candidate to sit at the top of any list of things a pilot doesn't want to happen during a flight, losing a flight control has to be a powerful contender for the top spot. Of course, that's why, during a pre-flight inspection, a sensible pilot will thoroughly check each flight control system in turn. This check isn't just a waggle of the ailerons so that you can tick the box on the checklist, he or she will be looking for any sign that the system isn't working perfectly.

Jabiru Aircraft has recently issued a Service Bulletin (JSB-044) requiring owners of Jabiru aircraft which are more than five years old, to check the control surface piano hinges on their aircraft, 'before further flight'. The reason for this Bulletin is that an owner of a Jabiru SP4 had reported that they had suffered a hinge failure which was, fortunately, spotted during a pre-flight inspection.

We call the SP4 the SP470, it's a group 'A' aircraft, well, not a microlight… whatever that means in these strange times… and combines the longer fuselage of UL 450 with Jabiru 2200 engine and the short-span wings of the SK variant. We look after eight of these aircraft in the LAA system but, in the case of the Jabiru range of aircraft, specific type matters not, they all use piano hinges to attach their control surfaces, so this Bulletin affects all Jabiru models.

Piano hinges are a very common way to affect a simple and inexpensive hinge, and many aircraft designers use them. Generally, when fitted well, they are relatively trouble-free devices, but nevertheless there can be problems with them, and they definitely deserve a close look rather than a perfunctory 'waggle'. The Jabiru's



Above Following the recent discovery of a failed hinge, thankfully during a pre-flight inspection, Jabiru Aircraft has issued a Service Bulletin (JSB-044) reminding the Jabiru community of the importance of checking the control surface piano hinges on their aircraft. Left shows one half of the failed hinge in position, the two pictures on the right show the fracture face using different filters. The top picture shows clear evidence of fatigue, note the four beach lines, suggesting that the hinge hadn't been moving freely. The lower shot shows evidence of inter-granular corrosion, weakening the hinge progressively as the oxidation ate into the hinge material.
Photo: Jabiru Aircraft

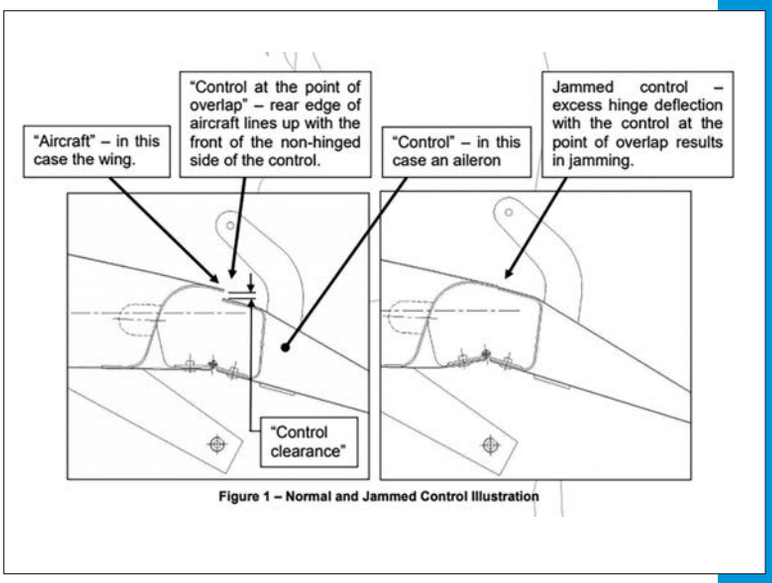


Figure 1 – Normal and Jammed Control Illustration

Above The importance of checking the control surfaces and their attachments regularly on all aircraft cannot be over emphasised. Back in 2008, following a couple of in-flight control surface jam events, Jabiru issued a Service Bulletin (JSB-019) requiring owners to ensure that there was sufficient clearance between the control surface and the supporting structure. The LAA followed this up by mandating the SB using an Airworthiness Information Leaflet (AIL). **Photos: Gary Cotterill/Jabiru Aircraft**

aileron and rudder are secured using an aluminium hinge fitted with a plated steel pin, the elevator hinges use a beefier stainless steel hinge with a stainless steel pin.

Certainly, close contact between steel and aluminium can create an electrical potential that, as we know, drives an oxidation process. When this corrosion occurs, the hinge itself can become stiff, though this can be difficult to 'feel' among all the other small resistances in the system. As you can see from the photographs showing the failed hinge, it looks like corrosion has stiffened the hinge and, because the leaves of the hinge are having to work much harder during each movement to overcome the increased stiffness, the leaf has broken due to fatigue.

The Bulletin asks that the leaves of the hinge are inspected for corrosion and cracking, and the pin's securing screw is removed, and the pin is manipulated to ensure that it's free to move.

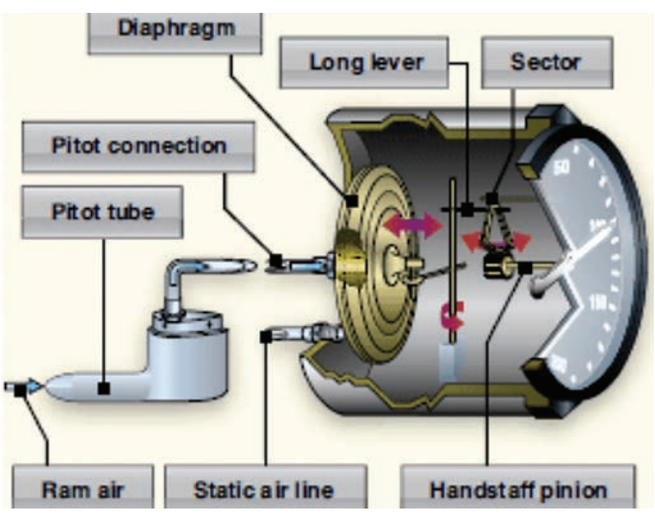
It's very likely that your aircraft may not have operated much over the last year or more, so a close look at the piano hinges before you next fly is a must and, frankly, this applies to whatever type you own. Personally, I won't fly any aircraft until I'm absolutely sure that, whatever the flight entails, the control surfaces are not going to stop doing what they're designed to do during the flight – that is, keep me pointing in the right direction.

Airspeed Indicator – Checking the plumbing

I received an email from LAA Inspector, Dr Bill Brooks, in the autumn suggesting that I should run a Christmas quiz – he sent a 'what's the matter with this' picture in with the email which, to be honest, got me scratching my head a bit (it's the picture of the Aeronca pitot/static tubes). Bill's email reminded me why I decided long ago not to run Christmas quizzes! In the end, thankfully from a credibility viewpoint, I guessed the right answer, the static tube (the lower of the two) was acting as a pitot because the plug had fallen out.

But, I also pointed out the strange angle of the tube and, because I hate the stuff, the corroded nature of the tube – remember the 'zero tolerance for corrosion' rule LAA Inspectors are encouraged to promote. Anyway, well done to Bill for bringing this to the attention of the owner during the annual inspection who, it turns out, had struggled with suspicious airspeed readings 'for some years'. The system was refurbished and then calibrated, using the GPS method described in the ASI calibration sheets that you will find, as you peruse the Engineering section of our website – it's in the 'Flight Testing' section!

Bill's Christmas quiz suggestion reminded me of another ASI-related problem suffered by Jabiru J430 owner, Mike Williamson, back last summer (when we were allowed to fly). Here's Mike's email:



Above Three pictures to go with the two stories about problems with incorrectly reading ASIs. The first shows a simplified sketch of the mechanism inside a mechanical ASI; though they're precision instruments, in their simplest form their mode of operation is pretty straightforward. When flying sports aircraft of any class, the ASI is the most important measuring device on the instrument panel if you're going to keep safe, especially during the approach and landing phase. The picture in the middle is Bill's Christmas quiz picture and the one on the right shows why Mike had problems! **Photos: StudyFlying.com/Bill Brooks/Mike Williamson**

Hi Malcolm, I thought I would run something by you that happened last week. I have a Jabiru UL430 which I have owned for the last two years. It is 17-years-old now and has done approximately 850 hours. I wheeled the aircraft out of the hangar, did the usual pre-flight checks, all OK. Started up, T&P's all OK, taxied out for take-off, full throttle down the runway, looked at ASI, 40kts, ready to rotate, take-off absolutely fine, looked at ASI, still 40kt!

Dropped the nose to increase speed, still 40kt. Decided to quickly land again, made sure I was fast enough to minimise chance of stalling and landed safely. ASI still showing 40kt! Taxied in and by the time I reached the hangar the ASI had returned to zero.

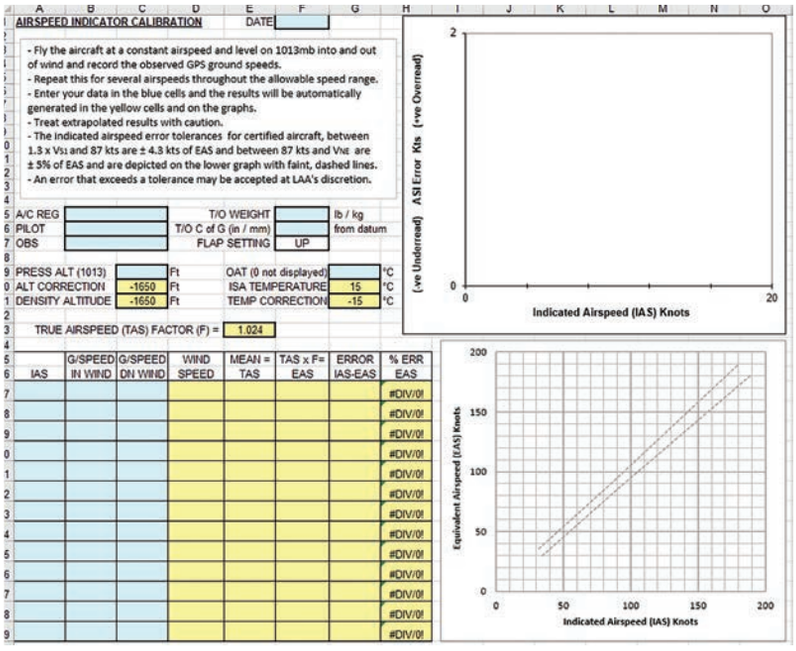
Thinking that something had gotten into the pitot, I disconnected the clear plastic tube that appears out at the bottom of the lift strut, tried blowing through but almost impossible to do. Thinking again, that something had got into the tube, I took a closer look at the tubing as it comes out of the strut, gave it a tug and it came free. Eventually, about an extra metre of tubing had been fed back into the strut with a loop at the end… the loop had developed into a permanent kink, which was obstructing the air flow.

I think the recent hot weather had caused the tubing to soften, causing an initial crease, which became permanent when it cooled. I trimmed the extra metre off, reconnected and carried out a test flight, all perfect again. The fix, in the end, was simple, but the cause was 17 years in the making and, in other circumstances could have caused much more serious problems.

Thank you, Mike, for your tale, another example, though rather an odd one, where problems happen because the aircraft had been sitting about unused for quite a time – aircraft owners, in these 'unmentionable' times, take heed.

Just a couple of points to note. An ASI failure can happen at any time so, a bit like practicing a forced landing, it's worth learning how to fly an aircraft without an ASI – learn the attitude and power settings required for en route climb and descent, level flight and, most importantly, normal approach. With a safety pilot, try to shoot an approach with the ASI out of your sight, remember attitude and power equals airspeed.

I shouldn't go without mentioning that it's frowned upon checking a pitot system by blowing into it… it's really easy to damage instruments this way and your breath carries with it quite a lot of water. If you want



AIRSPEED INDICATOR CALIBRATION DATE

- Fly the aircraft at a constant airspeed and level on 1013mb into and out of wind and record the observed GPS ground speeds.
- Repeat this for several airspeeds throughout the allowable speed range.
- Enter your data in the blue cells and the results will be automatically generated in the yellow cells and on the graphs.
- Treat extrapolated results with caution.
- The indicated airspeed error tolerances for certified aircraft, between 1.3 x V_{S1} and 87 kts are ± 4.3 kts of EAS and between 87 kts and V_{NE} are ± 5% of EAS and are depicted on the lower graph with faint, dashed lines.
- An error that exceeds a tolerance may be accepted at LAA's discretion.

A/C REG		T/O WEIGHT		lb / kg	
PILOT		T/O C of G (in / mm)		from datum	
OBS		FLAP SETTING	UP		
PRESS ALT (1013)		Ft	OAT (0 not displayed)		°C
ALT CORRECTION	-1650	Ft	ISA TEMPERATURE	15	°C
DENSITY ALTITUDE	-1650	Ft	TEMP CORRECTION	-15	°C

TRUE AIRSPEED (TAS) FACTOR (F) = 1.024

IAS	G/SPEED IN WIND	G/SPEED DN WIND	WIND SPEED	MEAN = TAS	TAS x F= EAS	ERROR IAS-EAS	% ERR EAS
							#DIV/0!

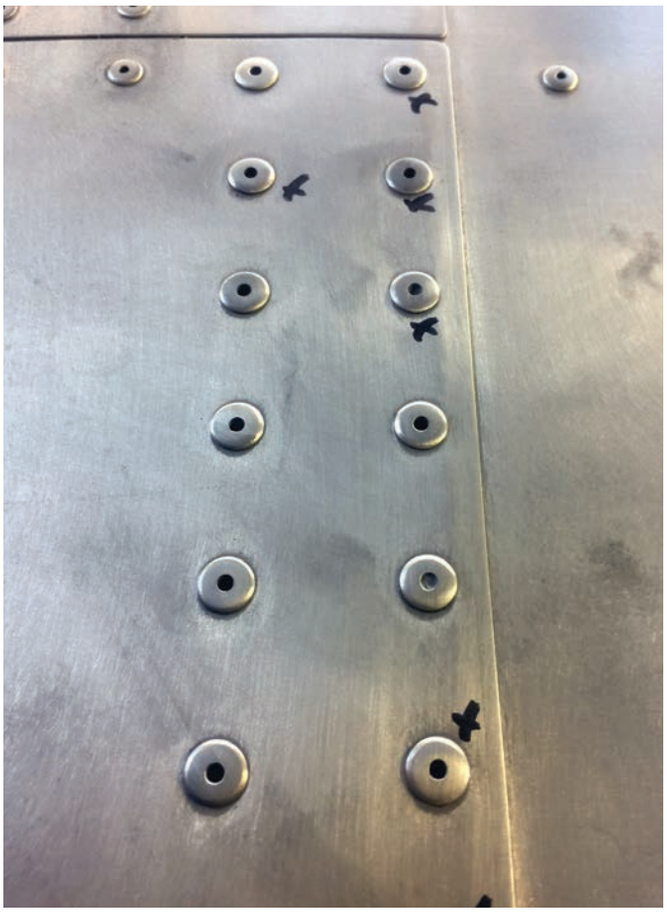
Above and right It's important to ensure that the ASI is showing an accurate representation of airspeed. Both the LAA and our colleagues in the BMAA publish guidelines as to how to do this – right is a screenshot of the LAA's online spreadsheet and right shows the graph drawn from results obtained by Bill, once he'd sorted out the plumbing 'pickle' he discovered during an inspection of an Aeronca Champ – what should be and what was look pretty close to me!
Photos: LAA Engineering/Bill Brooks

your system ground-checked, perhaps because, like our Aeronca owner, you're a bit suspicious of the accuracy of the instruments, most aircraft maintenance workshops will have a calibration kit, a check won't take long and won't break the bank.

In the field, if you do have to uncouple the system and blow into an open end to try to chase down a leak or blockage, like Mike did, be very sure you know whether you are blowing into the sensitive instrument side or the end that leads to the pitot head or static port. It's all too easy to ruin an expensive ASI, altimeter or ROC indicator by blowing into it. If a blockage seems to clear, be aware that you may just have blown trapped water around a bend in the pipework and it will soon find its way back to where it was before, and the problem will come back.

The slow-moving warm front that has caused so much havoc over the last few days, heavy snow in Scotland and parts of the North of England and Wales, and continuous rain elsewhere, has just passed through.

Sunshine, the first for ages, is making Sam a bit frisky, I can hear him fiddling with the lock on the stair gate. Now where are those walking boots? Fair Winds. ■



Above and right LAA Inspector, Nick Stone, came across a problem on a Bristell that was being prepared for respray recently, and got in touch. As you can see, especially when looking at the picture above, the Avex (pulled) rivets, have lost quite a bit of their head during the pre-primer preparation process. In a few cases, so much material has been lost that, in Nick's view, the aircraft's structure had been compromised. Both wings were returned to the aircraft's manufacturer for repair, an expensive exercise as quite a few rivets, and the fuel tanks, needed replacing. Happily, the wings have been returned to the owner and have been refitted to the fuselage. **Photos: Nick Stone.**

LAA engineering charges

LAA Project Registration	
Kit Built Aircraft	£300
Plans Built Aircraft	£50
Issue of a Permit to Test Fly	
Non-LAA approved design only	£40
Initial Permit issue	
Up to 450kg	£450
451-999kg	£550
1,000kg and above	£650
Permit Renewal (can now be paid online via LAA Shop)	
Up to 450kg	£155
451-999kg	£200
1,000kg and above	£230
Factory-built gyroplanes (all weights)	£250
Note: if the last Renewal wasn't administered by the LAA an extra fee of £125 applies	
Modification application	
Prototype modification	minimum £60
Repeat modification	minimum £30

Transfer	
(from C of A to Permit or CAA Permit to LAA Permit)	
Up to 450kg	£150
451 to 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 17 April 2018	

PLEASE NOTE: When you're submitting documents using an A4-sized envelope, a First Class stamp is insufficient postage.