

## SAFETY SPOT



With Malcolm McBride  
Airworthiness Engineer

# ON TOP FORM

THE ARRIVAL OF THE FLYING SEASON MEANS IT'S TIME FOR SOME THOROUGH CHECKS TO MAKE SURE YOUR AIRCRAFT IS ON TOP FORM



Thanks to all of you who wrote in with airworthiness concerns about the fitment of this mini-camera onto the pitot head of this un-named aircraft; many of you asked whether this fitment was covered by an LAA Modification and I can answer this easily, no. LAA Inspector, Robin Morton, summarised many of your concerns with three main comments: One, the Pitot Head and its attachment is not designed to cope with the weight and airloads imposed by the video camera. Two, the camera and its attachment bracket will cause a disturbance of the airflow at the pitot intake which may affect ASI indications and three, the installation would require a Modification. Robin, in his letter, asks, "Am I being too fussy?" Answer? Definitely not Robin... we all stay safe because we're all keeping our eyes open for gotchas like this. One thing that nobody noticed is that this is a heated pitot head... I wonder how the plastic would cope with the increased local temperatures.

**W**elcome to Safety Spot. I hope that you are well and enjoying the warmer (even if a bit wetter and windier) weather. This last winter certainly seems to have lasted for longer than normal. The delayed start of spring, judged in my case by the fact that I've only just started to cut the grass, has put everything back by a month or so. Mind you, if a recent (very bumpy) flight in a mate's ARV is anything to go by, the early seasonal thermals are working well... bring it on!

I quite like cutting grass. Actually, I quite like anything where there's an engine or a few levers attached somewhere or other, so I didn't mind when I was asked by a couple of locals to give them a hand in our local churchyard. One big advantage of mowing over watching TV, additional to the increased thinking time (I always 'think' better when I'm busy with some mundane task), is that it burns off a few calories and it's much cheaper than joining a gym.

I've noticed that as I approach middle age (yes, I use this abstract median loosely here... and I'm going to live to well over a hundred!) it's important to keep an eye on the old body and try to keep the weight down... every kilo round the middle is, after all, a kilo that you cannot put into the fuel tank. Certainly, at the beginning

of the season, most of the pilot's focus is on getting his or her aircraft up to scratch but, in the usual frenzy of 'spanners and grease' it's definitely worth not forgetting the status of the most important component in any aeroplane: you. How long is it since you last flew? When did you last practice an engine failure? Would it be a good idea to get a check flight?

Whilst I think about health matters, thanks to all of you who wished me a speedy recovery from flu, I'm fully recovered now. This short exploration into illness reminds me how much performance is affected when you're not well; the lesson here is that if you're not on top form you shouldn't fly. I heard a recent tale of a chap who nearly came to grief because he went flying straight after a stand-up row with somebody on the airfield; he explained that he was in such a poor mental state that almost everything he did in the cockpit went wrong. At the time, he couldn't understand why he narrowly avoided screwing-up the landing after a generally unrewarding flight. I suppose that this might be the aviation version of road rag. Remember, you cannot see a decent horizon when you are looking through a red mist!

So, what's been happening in the LAA continuing airworthiness world? Well, first I

need to leap back to a picture featured in Mountain Woes, the March 'Breaking the Chain' feature that discussed a horrible accident where a pilot, for reasons we will never completely know, ended up getting caught in rotor downwind of a mountain peak. Much of the event was captured on the memory chip of a cockpit-placed mini-camera; I've re-posted the picture that caused the general critique from LAA members with some comments about the airworthiness implications of such a camera 'fit'... thanks to all of you who wrote in about it, I will blame the flu for not mentioning it in last month's 'Safety Spot'.

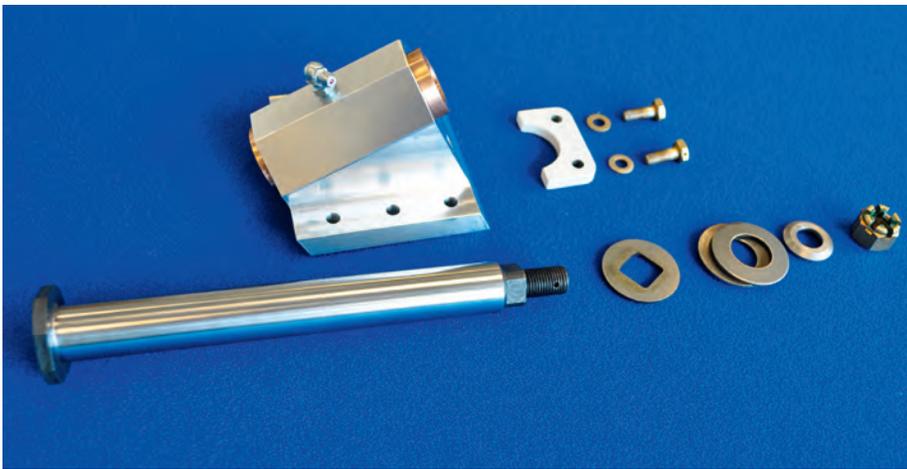
Interestingly, there's some excellent evidence about that suggests that the chances of having an accident are increased whilst carrying a passenger, especially if you're normally solo. Perhaps a camera, in some psychologically vague way, could be considered a passenger; so watch out, fitting a camera might have some unplanned effects on your performance.

### CZAW SPORTCRUISER NOSE-LEG SPINDLES

In last month's 'Safety Spot', I suggested that LAA Engineering was about to



Here's a picture of the Airspeed option assembled; notice that there's a grease nipple in both the top and bottom housings. One of the lessons reinforced by the failure of the CZAW spindle assembly is that regular strip, clean and re-lubricate 'inspections' are required to ensure that there's nothing sinister going on behind the scenes; our modern age could be described as the age of 'fit and forget', especially when it's applied to motor cars... this sort of ideology doesn't work with small aeroplanes. After the initial failure checks were required on the SportCruiser fleet, a large percentage were found to have corrosion in their spindles when they were disassembled. (Photo: Derek Taylor.)



This picture shows the primary components in Airspeed Aviation's SportCruiser replacement nosewheel spindle assembly. The spindle itself is manufactured from very high strength 4340 steel which requires special heat treatment and Magnaflux (magnetic particle NDT inspection) testing before release. To prevent shimmy, the system is preloaded through Bellville washers (Photo: Malcolm McBride).

'withdraw' the CZAW nosewheel spindle assembly from service because of serious airworthiness concerns; this withdrawal has now been effected by the issuance of an LAA Airworthiness Information Leaflet (AIL) requiring a component change. At the time of writing, quite a few SportCruisers have been grounded whilst approved alternatives come on stream. CSA, the manufacturer of the ready-built (Light Sport) version of this machine is able to supply acceptable alternative 'Pipersport' nose legs, but these are relatively expensive and many owners are waiting for a cheaper, locally produced alternative.

It is worth mentioning here that the problems encountered on the SportCruiser airframe and, more importantly in my view, the local ability to find solutions, demonstrates the strength of our Association.

In the case of the SportCruiser, the aircraft was originally available as a kit and builder support came from local LAA Inspector Graham Smith and his team at Sprite Aviation. In the early days, Graham was well supported by the aircraft's manufacturers, CZAW; sadly, this company ran into difficulty and, in its present form, can only offer limited 'product support' and no longer offers the

aircraft in kit form. The LAA's fleet of home-built SportCruisers has effectively become orphaned and, as airworthiness issues surface, local support will be needed.

In this case, two different LAA modifications have been approved for use on the applicant's individual aircraft and the upgrading of these modifications to Standard Modification status, needed for fleet application, is well underway, as is the batch production of the components needed. Take a look at the attached pictures, which discuss the different design solutions in a little more detail.

If I'm being honest, I don't think I would have predicted the problems with the CZAW spindle design, it certainly looks a substantial part; it just goes to show you that, on an aircraft structure, you can never check for developing problems too closely. The following tale explains why it's very necessary to take a very close look right round an airframe after even a small incident.

#### PITTS SPECIAL S1 S AILERON DAMAGE IN LANDING

I think that everybody remembers his or her first take off in a Pitts Special. Don't believe anybody who tells you that they didn't have



Graham Smith, the proprietor of Sprite Aviation, is the person responsible for bringing in the CZAW SportCruiser into the UK. The LAA is now treating this airframe as 'orphaned', hence the need for a home-grown design to replace the un-inspectable CZAW units. This is a picture of the Sprite replacement option which has the advantage of being cheaper than the Airspeed option but requires more work from the builder to fit... Graham intends to make drawings available to members should they wish to manufacture their own components... this option, at the time of writing, is undergoing final load tests of the attachment fitting, having been successfully test flown, before final approval. (Photo: Graham Smith)

butterflies just before the event. The secret is, I think, to fully commit, just as you have to when flying a hang-glider off a cliff; there's no such thing as half doing it! Once you've sorted the aircraft out, it flies, just like any brilliantly designed machine, beautifully. One thing that makes the aircraft so manoeuvrable is that there's not much distance from the centre of gravity to the flying surfaces; this is called 'short-coupling'.

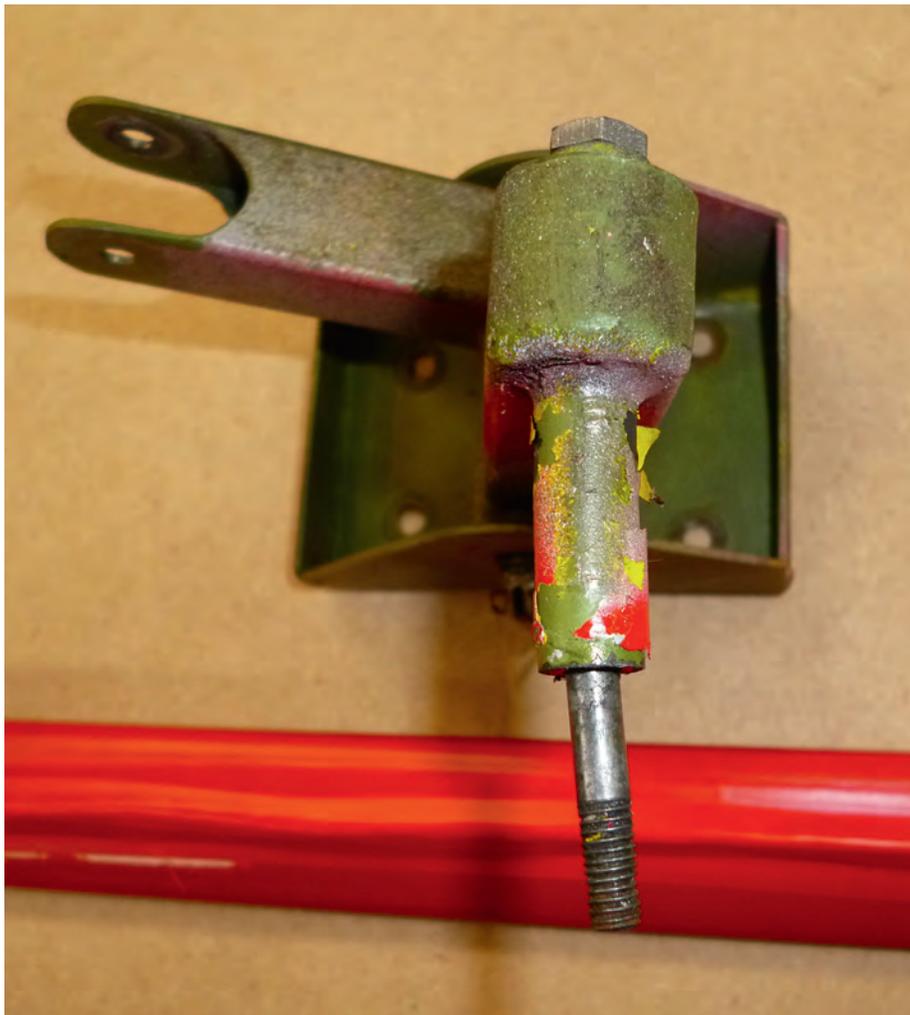
Another feature of this machine is that there's not much distance between the bottom of the wing surface and the ground and, as in the case of this aircraft, if aileron spades are fitted, this small distance is still further reduced. I've never flown an aircraft with spades and was therefore very interested to hear whether the owner of this subject machine felt that they made much difference when I called him to find out how he had managed to knock off the left spade on a landing here at Turweston recently. The principle reason for aileron spades is to reduce the stick-force required to apply aileron, especially full aileron at high speed.

When I managed to get in touch with Phil Jones, the owner of the Pitts S1, he explained that the aircraft was, in his view, perfectly balanced and "stayed where you put it!" >

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This picture makes me want to leap up and go flying... oh well, back to the keyboard! You can see that in this photograph that the spade is still attached to the left aileron. You might notice, although this takes a bit of mental gymnastics, that the spade would be very close to the ground if you were to land on one wheel. This particular machine was originally G-REAP and is an LAA homebuilt version of the type, built in 1992. (Photo: Peter Lamb)



The Pitts S1-S, as a design, is the competition aerobatic version of the S1-C. Changes include a more symmetrical wing section (the 1-C had a flat bottom wing) and ailerons on both wings. The aileron system works through push/pull rods which are connected using male-threaded Rod End Bearings, the bottom aileron acts as a master for the top aileron via a 'slave' strut. The photo above shows how impact loads resolve through a flexible structure. Notice that the threaded portion is also badly corroded which could have significantly weakened this primary control.

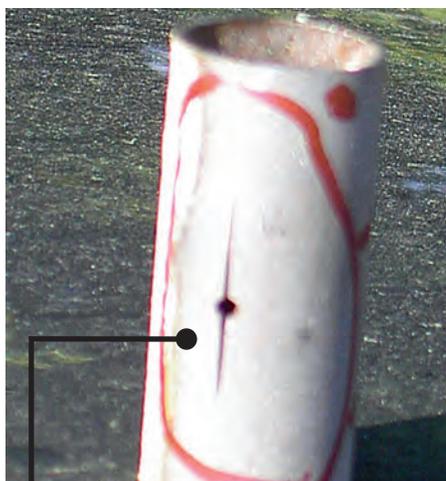
(Photo: Ian Ross)

(Below) This picture shows that the shaft of the rod end is bent. The LAA Inspector comments that the quality of the rod ends was poor (commercial items) and that the threads were cut rather than rolled. He substituted these important components with aircraft quality parts which use only rolled threads.

(Photo: Ian Ross)



(Above) Here's another bent component from the Pitts S1-S that lost an aileron spade when accidentally landing in longer-than-expected grass; even after the slightest knock it is important to check around the whole airframe for damage. (Photo: Ian Ross)



Here's another interesting picture from LAA Inspector Miles McCallum showing problems he's found in tubular airframes during inspections. This picture shows a compression crack in a top longeron (just behind the canopy) caused, to use Miles' actual words, by a hole wot should not have been there. (Photo: Miles McCallum)

When I asked about the reason behind the loss of the spade, Phil said, "I'd just had a great flight down to Turweston from Brighton (in the East Riding of Yorkshire) and positioned myself for a landing on the easterly grass runway at Turweston. For some reason, I thought that the grass runway was right next to the hard but, sadly for me, I ended up flaring into the rough between the two runways."

I can attest that this is an easy mistake to make, especially this time of the year when the grass hasn't been cut. Phil continued, "Just after landing, I heard a thud which was probably a tuft of extra long grass bashing into the left aileron spade... or should that be the other way round."

Phil taxied to the hangar and shut down; on inspection, the damage initially looked to be limited to a missing spade. The attachment arm looked fine and, apart from a little stiffness, the system itself checked out. Phil got an engineer to inspect the system externally and, some days later, he was cleared to fly the machine back to his HQ at Brighton for a more thorough check. Phil checked the machine into the capable hands of LAA Inspector Ian Ross, the Chief Engineer at the Real Aeroplane Company. I spoke to Ian on the telephone after he sent me down some pictures showing what he found when he disassembled the aileron. Ian explains, "I'm normally kept pretty occupied with running a busy M3 facility so I don't get too involved with repairs to privately-owned aircraft. Having said that, the Pitts in question was an exception, it's a resident here at Brighton and its owner is a deserving case so I took pity on him."

Ian continued, "I initially considered the incident to be quite minor and was expecting the damage to be superficial. When I got into the job it was clear that the wing structure itself was undamaged (thankfully) but this was not so for the control circuit components."

Ian listed out the damage and I've featured Ian's photos as you can see. Ian explains, "For what it's worth, the lesson I would take from this is that any impact, no matter how gentle it may have felt, can cause some quite significant damage." I certainly



Here is a picture looking forward, if you can imagine it, from just behind the seat slightly off centre (to the left); the Oleo attachment bolt (marked) may better orientate you as I've marked it on the parts drawing overleaf. The large upwards curve in the fuselage structure to the left of it shouldn't be there and it is an indication that the structure has been overloaded at some point in the past. It wasn't spotted sooner because this area is hidden beneath carpet under the seat and the damage only came to light during a complete refurbishment of the aircraft by the owner. (Photo: Mile Griffiths)

wouldn't argue with that observation. Thanks to both Ian and Phil for their time and pictures.

#### LUSCOMBE 8E (SILVAIRE DELUX)

Part of my role here within LAA Engineering is to check through the Annual Permit Renewal applications from a continuing airworthiness standpoint. I'm the end point in the process, as the actual forms pass through various ports before reaching my desk, as I'm sure you will imagine. We take the renewal process very seriously and each application is scrupulously checked before a new Certificate of Validity can be issued. Many renewals are, naturally, straightforward, when it is clear from the report submitted by the LAA Field Inspector that, apart from the annual maintenance check, nothing significant has occurred (from an engineering point of view) during the year.

I like to think of the renewal inspection as the time to clear down any 'deferred' defects that have accumulated during the year – a sort of fresh start. Sometimes, the renewal process takes a bit longer, perhaps because there has been some significant engine work, perhaps work done to repair damage. From my point of view this, when it occurs, normally requires a letter clarifying this or that and often a chat or two with the owner or aircraft's inspector; this is one of the most interesting tasks in my job.

Quite often I receive a renewal for an aircraft that has been out of Permit for some time and, unless the application includes really good worksheets describing the work done to bring the aircraft back up to flying state, I always write to the owner asking for them. This was the case with an application I received from LAA-er Mike Griffiths. Mike supplied some really good worksheets detailing very well the restoration work he'd been doing on his aircraft over the last few years, and I could see that Mike had brought the aircraft back to *concours d'élégance* quality. One thing caught my eye though that related to... well, here's the entry in Mike's worksheet: *Carpet and Trim removed for inspection (so far so good). Floor around U/C box section found to be distorted and rivets pulled.*

I checked our database and couldn't see an ongoing repair application so I was naturally

interested in the extent of the damage, how it may have occurred and how the damage was repaired. I'm allowed to sign off simple repairs using standard aviation practice and even quite large repair jobs when manufacturer's replacement parts are used but, if there's ever a design 'element' in the repair, then I pass the application to the Design Office so that they can look closely at the repair proposal and, if OK, authorise the repair. I picked up the telephone and gave Mike a call.

"Well," Mike said, "the aircraft's been undergoing a complete refurbishment and the damage to the undercarriage support was found when we lifted the carpet to service the undercarriage. I was really surprised because, after the groundloop, we had a really good look round the aircraft for damage and she looked perfect." Groundloop? "Yes, I hadn't flown for a while and needed to get myself revalidated; I've been flying the aircraft for years and know it well but, well, I let the instructor have a go at a landing and he let his feet get the better of him and we ended up groundlooping."

I asked Mike whether he'd checked the operation of the centre-mounted undercarriage oleo, as I had heard that this can stiffen up if the oil transfer holes in the piston get blocked. I've been told that this is a root cause of many of the groundloops reported on this type. Mike explained, "No, this was purely a problem caused through lack of experience with this type of machine, the Luscombe needs careful handling after landing, once you start 'paddling the pedals' (an interesting phrase) you're in trouble." Mike said that both he and the instructor checked round the aircraft very carefully and couldn't find anything amiss so they carried on flying the aircraft.

Mike, when he later discovered the damage, had to remove the engine and the undercarriage so that the bent frame and, as was later discovered, a complete doorpost could be replaced with off the shelf frames. It's amazing that these components are still available when you think about it! He got Steve Moon of Aviation Panels

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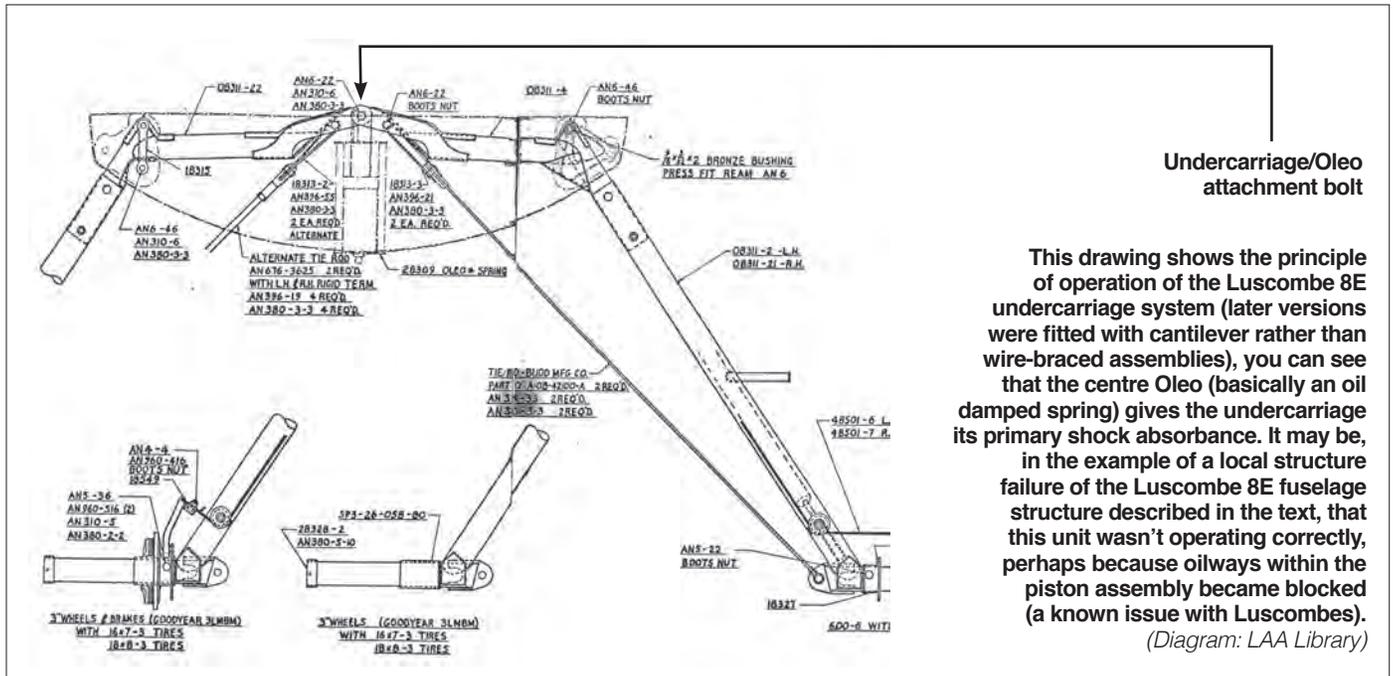
to complete the metalwork and, once I'd received worksheets from him, I was happy to issue a Permit Flight Release Certificate so that the aircraft could be test flown.

Aircraft structures are designed to take normal flight and ground loads; generally a component will be able to do this because it is part of a structural system. A normal load will actually be resisted through many of the components within the structure and sometimes this 'resistance' path isn't very obvious. That's why it's very important to check an airframe very thoroughly if it's been involved in an incident where unusual loads may have been imparted into the structure. A groundloop, where the aircraft is whipped round its normal axis, sometimes violently, is a good case in point but even a small bash on a wingtip can cause significant damage to a wing fitting even if the load imparted just causes a scratch at the impact point.

OK, the Editor has just been on the telephone telling me that I've run out of time, so that's it for this month. I hope that as you are reading this all's well with you and those close to you. I know, I know, but grass always needs cutting. Fair winds! ■



Continuing the Safety Spot theme that it's really necessary to build 'deep inspections' into your Tailored Maintenance Schedule, here's a picture of the tail area of a Starduster recently presented to LAA-er repairer Paul Grellier at Airweld; you can see that the tailwheel attachment plate has nearly completely separated from the fuselage rear longerons. You will note the failure along the edge of the weld and areas of corrosion, you may not spot that the tailplane lower brace wire attachment has been fitted to the top of the bottom longeron and therefore not to drawing; this means that the tailplane's security is completely reliant on a welded joint in tension; naturally, this was put back to standard before being released to service. (Photo: Paul Grellier)



## LAA ENGINEERING SCALE OF CHARGES

LAA Project Registration		Repeat modification	£22.50
Kit Built Aircraft	£300	Transfer	
Plans Built Aircraft	£50	(from CofA to Permit or CAA Permit to LAA Permit)	
Issue of a Permit to Test Fly		Up to 499kg	£135
Non-LAA approved design only	£40	500 kg and above	£250
Initial Permit issue		Three seats and above	£350
Up to 390kg	£320	Four-seat aircraft	
391 - 499kg	£425	Manufacturer's/agent's type acceptance fee	£2,000
500kg and above	£565	Project registration royalty	£50
Three seats and above	£630	Category change	
Permit renewal		Group A to microlight	£135
Up to 390kg	£105	Microlight to Group A	£135
391 - 499kg	£140	Change of G-Registration fee	
500kg and above	£190	Issue of Permit Documents following G-Reg change	£45
Three seats and above	£210	Replacement Documents	
Modification application		Lost, stolen etc (fee is per document)	£20
Prototype modification	£45	Latest SPARS - No. 15 April 2009	