SAFETY SPOT

With Malcolm McBride
Airworthiness Engineer

# HOT AND BOTHERED

## Whether it's training to take on an airfield fire, practising for an engine failure or caring for your aircraft, this month's 'Safety Spot' shows you can never be too careful

**"Come on you two, pull your finger out – can't you see that there's a bit of concrete on fire here?" The LAA's Design Engineer, Andy Draper and I have recently been 'signed up' to become airfield firemen and here's a picture of us getting ourselves tied up in knots trying to unroll the fire hose during the last fire drill… what a shambles (but then we've only just started our training)! Read on to find out how I made a complete twit out of myself… I know, I know, not a difficult thing to do!** *(Photo: Malcolm McBride)*

Welcome again to 'Safety Spot', thanks for looking in. Phew, I'm a bit hot and bothered and my heart rate is up a bit as I have just returned from a morning's Fireman Sam practice. Yes, I can hear your thoughts… 'bloomin 'eck, they must be desperate'… but I'll ignore them and get on with writing this month's delve into matters airworthiness. The truth is that if you had told me this time last year that in six months I'd be an apprentice airfield fireman I wouldn't have believed you; that just goes to show that you never quite know what's around the corner.

You will, I expect, know that for an airfield to be licensed by the CAA – and it needs to be licensed to conduct commercial training – the airfield must have a trained fire crew. Andy Draper, our Design Engineer, and I were signed-up as trainees when the team here at Turweston found itself short of a couple of bods after the Cirrus agent, Caseright Engineering, moved off the airfield and a couple of regulars moved away. I must say that, although rather unexpected, I've found this reversion to 'erk' an interesting and, once or twice, rather challenging experience. Certainly the instructor works hard to push the team out of its comfort zone and it's been an excellent reminder of the importance of regular rehearsal before you actually need to perform a complex task… like flying an aeroplane and dealing with an emergency… more of that later!

A fire 'crew' here at Turweston basically comprises three firemen, each with a different role. First, there's the boss; he's the chap who conducts the Dynamic Risk Assessment (oh yes, I'm learning the language) and directs where the fire engine should be positioned relative to the fire and how the fire should be tackled. Then there's the Driver/Pump-man, naturally he drives the vehicle and, when in place, starts and operates the pump; the third member of the team is called the Branch-man; he's the bloke that directs the media (oh, yes) which, hopefully, extinguishes the fire. During a training session each member of the team plays each one of these roles during different scenarios.

During the last session, the first exercise was a fire in a small building on the airfield, Andy was IC, I was the Driver and another chap (an experienced fireman) was the Branch-man. Without getting into too much detail, we put the fire out pretty quickly and I think that we felt that we'd done a pretty good job. Of course, this wasn't the case and each of us has messed up one way or another. "Mr Draper" (IC, as you remember), "You've just killed your complete crew… didn't you notice the butane cylinders?" Andy confessed that he hadn't even seen them; I kept quiet because I hadn't seen them either. OK, it's a training exercise, and you're here to learn. I was delegated as IC for the next event and the team stood down.

"Right Mr. McBride, your job is to extinguish a fire on an aircraft that has just landed short of the main runway and save 'saveable' life. Now, don't make the mistake of being too focussed on one thing, as IC you'll need to think carefully about the overall picture and, above everything, look after your men." Remembering that Andy had got us all killed earlier in the morning and determined not to make a similar mistake, I set about briefing my two colleagues as to their respective roles and awaited the 'shout' which, rather inevitably, came a few minutes later.

When we arrived at the scene there was one hell of a fire blazing, my crew were fantastic and I made a great show of directing this way and that. I checked very carefully that there were no hazards and, when, just as the blaze was nearly out, I discovered that the baggage area contained a toxic chemical; I dutifully pulled my men (oh yes) back to safety. It was quite a difficult fire and I was sure that we were going to get top marks.

"OK Mr. McBride, how do you think you're team did?" Not wishing to appear big-headed (always a bad thing to do around firemen) I said that the men did an excellent job and didn't think that I'd missed anything too important. "What about the pilot?" I nearly asked 'what pilot' but thought, thankfully, better of it. At that point I noticed a pair of legs moving under a carefully-staged fencing panel and, to make matters worse, I heard the inevitable moan; I had noticed that Andy was missing but…

What was that the instructor said about not being too focussed in an emergency?

### AERONCA 7AC CHAMPION PROPELLER FAILURE

Certainly, one emergency all pilots practise is the engine failure; the reason for this practice

**You can see that approximately 30% of the blade has disappeared from this ten-year-old mahogany propeller during the cruise. The pilot was able to switch the engine off almost straight away and it looks like there's no further damage to the engine/airframe attachment. This sort of materials failure is fortunately very rare and we're looking forward to receiving the prop here at HQ so that we can take a close look at the wood grain structure in the area of the failure. You will notice that the spinner is missing; of course it's possible that the spinner came off in flight and struck the leading edge which could have caused a local over-stress but both the owner and the engineers here don't think that this is likely.** *(Photo: James Day)*

is that if the pilot gets a real problem with the engine they will be able to deal with the emergency in an almost automatic way, this 'automaticity' frees the brain and allows the pilot to concentrate on other pertinent tasks (field choice, what's gone wrong, etc) and avoids the narrow focus that pilots often have in the early stages of their training or when confronted with a problem that they haven't previously seen.

One thing that always seems to catch pilots out is the very rapid descent rate exhibited by some types when the engine actually stops. Most practise, quite rightly, is done with the engine idling or set at an estimated 'zero thrust/drag' rpm, but the actual differences in the behaviour of an aircraft between a stopped or windmilling propeller can be quite considerable.

If you take a look at the picture of LAA member James Day's Aeronca you will notice that quite a chunk is missing from one blade of his propeller; we haven't yet taken a close look at the failure to establish why this may have happened, but as I write the propeller is in the post to us for analysis. This sort of catastrophic failure is worrisome and it's important that we find out why the mahogany has 'let go' like this – this propeller is about ten years old. Here's James' report:

*I had been in the air about 30 minutes and had been trundling low (700ft) and slow (75mph) over Hamford water. I climbed out towards Mersea and had levelled at 1,000ft for about 30 seconds and throttled back from climb to cruise power. I had just settled for the en route 'sightseeing' when there was a tremendous bang, best described as a hammer on a car bonnet.*

*I saw something irregularly shaped and coloured black depart upward and to the left over the cockpit followed all in the same instant by strong vibration, akin to driving on cobbles with no tyres. I throttled back to idle almost instantly and in so doing saw that the propeller disc didn't look right. My hunch (which turned out to be exactly right), was that I had lost part of the propeller.*

*As a result of the vibration I cut the mags to stop the engine, looked for a field, and trimmed to take out the stick load. Although in retrospect it seemed a long time, I doubt this took more than five or six seconds, and even less for it to dawn on me that this time it was 'for real'.*

*What I hadn't experienced before was just how fast 'XG came down without a trickle of idle power, and how little time you have to do anything at 1,000ft. Forwards and slightly to the left I saw a large field which was much less green than the surrounding standing crops, and was being irrigated with a boom irrigator to one side. Again I played a hunch that it was a stubble field, (which was the second thing I got right), and I put 'XG safely down into that without damage, parallel to the lines of the old drilled crop. I came over the hedge fast, perhaps 70mph, mainly gravity assisted because of the sink rate, and partly by my determination that it was that field I was going into.*

*I held off in the longest float ever until she settled on. Fortunately the field was flat and more than 800yd long, of 2in grass stubble, having been mown for silage only on Monday. For a Champ it was like Heathrow. It was actually one of my better landings, smooth and otherwise uneventful, and my first on flat ground this year! (My home base at Nayland is on a hill and is at least as steep as the alpine altiports.)*

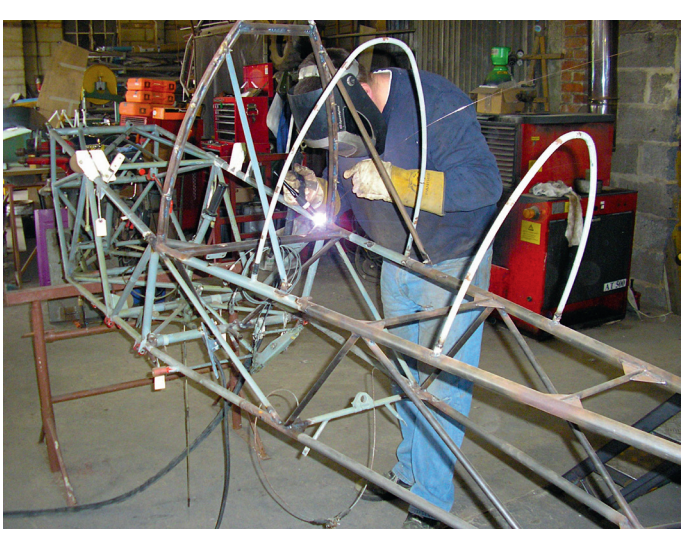
*In retrospect I aviated rather than communicated. I had no time for a Mayday at all, and reckon the time from 'bang' to touchdown was not much more than 50 seconds. I didn't even get time to turn the fuel off. I landed downwind, because I had no time to fly the 'circuit' element of the training – I was going down quickly, and more or less straight ahead. Looking back I didn't bother to look at the instruments, I was totally focussed outside on the field and took my clues from the sound of the airflow and the crispness of the controls that I wasn't too slow. (My time with gliders at Lasham in my teens paid off!)*

*On getting out, I saw for the first time that the spinner was missing. I didn't see that go and I don't know if the spinner detached and went through the prop, or shook free after the prop went asymmetric. I am inclined towards the latter view because the shaking was strong.*

*My syndicate colleagues lost a spinner once before and it caused only the slightest of grazes near the hub, so I am inclined to think the catastrophic tip loss was as a result of stresses on the change of power loading. I also think that the black object departing was the black painted back of the prop tip. I can't actually remember if the prop windmilled, but I wasn't conscious of it, only that the severe shaking had stopped. There was no* ›

**The US Investigation team begins their investigation into the mid-air structural failure of this Avions Fairey Tipsy Nipper; the LAA keeps a close eye on failures overseas which affect aircraft types that our members fly here in the UK. This particular machine was exported to the US recently after being sold by the UK owner. This factory built (Belgium) example was over 50 years old and there were concerns that the wing failure may have been due to 'age related decrepitude' – which was fortunately not so, as the cause was eventually discovered to be a bird strike.**


**Here's a picture of the actual aircraft in happier times. This image was taken on the way back from the Isle of Bute on a beautiful day over the Clyde estuary. The Nipper fuselage comprises a steel-welded frame and the one-piece wing is made from wood; both structures are fabric covered. Note that this example has an all-flying one-piece fin/rudder – others had a more conventional fixed fin and movable rudder.**
*(Photo: Larry Johnson)*



**Airweld, the Hampshire based aircraft welding company, hope to soon be able to offer Nipper kits into the marketplace… being honest, I could be tempted. This picture shows a welder putting the final touches to a Nipper fuselage.**
*(Photo: Paul Grellier)*

*evidence of birdstrike, but clear evidence of a longitudinal fracturing of one side of the prop for considerably more of the length than was lost. The task now is to find what caused the weakening that led this to happen.*

*I hasten to add that I did a good pre-flight walk round inspection before I set off and remember checking the prop visually (and by running my hands over both sides); I always check the spinner for security (twice, once when on walkround and again by pushing gently on it just before swinging the prop), all without any cause for concern. There is no other visible damage at all, so I was so very fortunate to pick a good field and get into it.*

Fortune James, favours the brave, and very well done for getting the aircraft down in one piece. Switching the mags off was exactly the right thing to do in my opinion because the asymmetric forces generated by an unbalanced propeller could quite easily rip an engine out of its frame… but I know, switching the engine off takes guts… well done. It's clear that James knows his aircraft well and was able to maintain airspeed by the 'sound of the airflow and the crispness of the controls' but, without the engine running I would expect everything to be a little different, especially the sound and feel of the aircraft and this may have led to the high airspeed on the way down. Experience tells us that it's better to trust the instruments in circumstances like this and a glance at the ASI may have been sensible.

Mind you, regular readers of 'Safety Spot' will know that it's always better to be a little fast 'over the hedge' than a little slow… well done again and I'll keep you all posted about what we find when we look closely at the failure.

## AVIONS FAIREY TIPSY NIPPER WING FAILURE

We received word from members of the LAA's 'Nipper' community that there had been a nasty accident in the USA involving a ex-LAA Tipsy Nipper and naturally, because we help to look after 35 examples of the type here in the UK, we were very interested to find out what may have happened. It didn't take long before the US NTSB posted their initial report letting everybody know the basic circumstances of the incident:

- *NTSB Identification: WPR13FA123*
- *14 CFR Part 91: General Aviation*
- *Accident occurred Wednesday, February 13, 2013 in Winters, CA*
- *Aircraft: AVIONS FAIREY TIPSY NIPPER T-66*
- *Registration: N1959N, Injuries: 1 Fatal.*

*This is preliminary information, subject to change, and may contain errors. Any errors in this report will be corrected when the final report has been completed. NTSB investigators either travelled in support of this investigation or conducted a significant amount of investigative work without any travel, and used data obtained from various sources to prepare this aircraft accident report.*

*On February 13, 2013, about 1615 Pacific Standard Time, an Avions Fairey Tipsy Nipper T-66, N1959N, was substantially damaged following impact with terrain near Winters, California. The commercial pilot was fatally injured. The pilot/owner was operating the airplane under the provisions of 14 Code of Federal Regulations Part 91. Visual meteorological conditions prevailed for the personal cross-country flight, which had originated from Yolo County Airport, Davis/*

*Winters, California, approximately 15 minutes before the accident. A flight plan had not been filed, but friends of the pilot said that his destination was Nut Tree Airport, Vacaville, California. Several witnesses reported hearing a loud bang/pop, and observed the airplane fluttering down in pieces. There was no post-impact fire.*

I've always been a fan of the Nipper – though for goodness sake don't ask me why, the aircraft is hardly a stunning looker. I like the idea that it's a very cheap aircraft to own and operate. This particular example was fitted with a Jabiru 2200, as are quite a few of the LAA machines, although a number of engines have been used throughout this airframe type's long history, including the Stark Stamo VW conversion and a variety of other VW conversions.

The original design was the brainchild of Avions Fairey designer Ernest Tipps, apparently the name Nipper was the nickname of his grandchild, and was originally conceived as both a factory-built or home/kit-built aeroplane. One problem that the homebuilder was faced with was where to build the one-piece 20ft span wooden wing! The incident aircraft was a factory-built example originally manufactured in 1959, serial number 15, making it over fifty years old; I checked the archive here and, when the it left our shores, it had about 900 hours on the clock.

Wing failures are, fortunately, very rare, especially in one-piece wings and our initial thoughts centred around possible problems with the wing-to-fuselage connection or previously unseen issues with the material within the main spar, possibly through natural ageing.

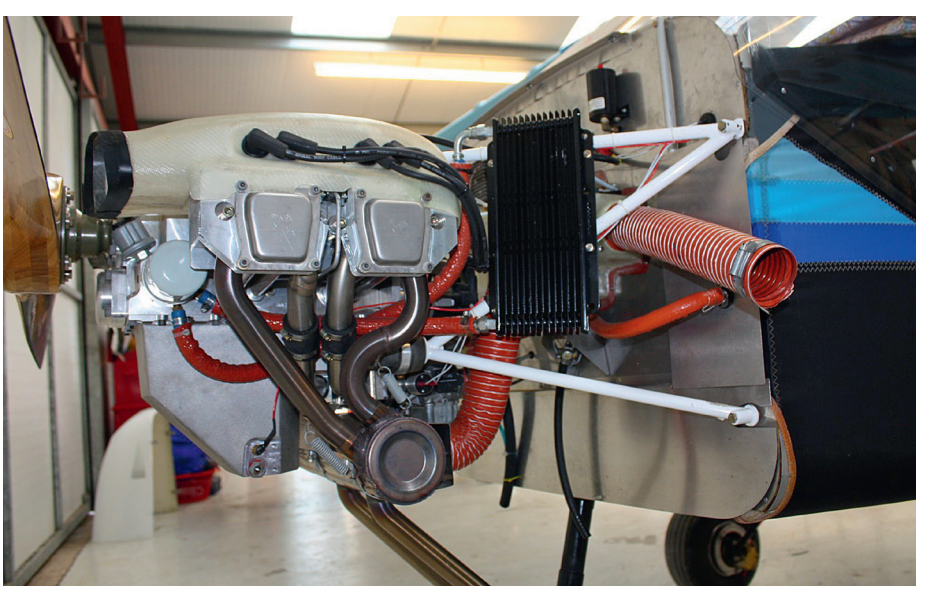
The Nipper wing is bolted to the fuselage using extraordinarily long, specially-made bolts and after discussing the failure with the previous owner, we knew that these bolts had been renewed by the new US owner when he assembled the aircraft in the US. Bearing this in mind, we thought that a more likely cause was a wing structure failure possibly through overload and possibly because of issues with the material within the main spar; we, and the Nipper community, anxiously awaited the results of the NTSB investigation.

The formal report into this crash has not yet been published but I have permission to reveal that the cause of this wing failure has been determined as a bird-strike. DNA analysis has established that the actual bird was a turkey vulture, common in the southern United States, and the point of impact was about four feet from the wingtip. The turkey vulture is a very large bird; adults can weigh up to about 2.5kg and often have two-metre wingspans. I spoke to the US investigator in charge, Jim Struhsaker, and he explained that the US Highways Department had actually found the bird, a protected species, but it took a while to match up the separate tragedies; the DNA analysis work was completed by the Smithsonian Museum in mid-May.

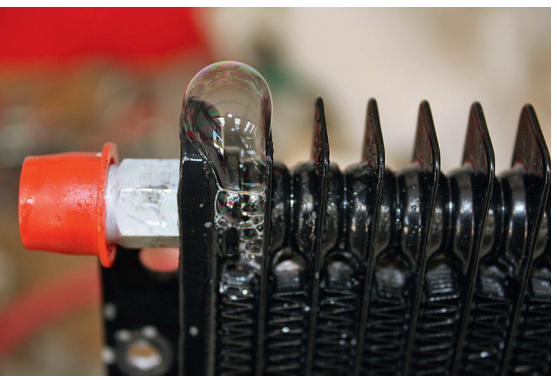
In some ways it's good to know that this incident wasn't the result of the age of the airframe, we were definitely worried about that. But even though it wasn't connected with this, the incident should act as a reminder that many of the aircraft that we fly are pretty old now; this fact should be considered when creating our Tailored Maintenance Schedules especially if you own a geriatric craft. ›

**LAA Inspector and glider rebuild aficionado Roger Targett sent me a picture of a tab he'd found on the beach in Devon, I didn't recognise the tab but was curious as to why Roger was on a beach. "Are you on holiday?" I asked. "No," he exclaimed, "I'm self employed, what's a holiday?" Roger explained that he'd been brought in by an insurance company to remove a Schleicher ASW 20 that had beached itself after ditching – in the end they had to use a helicopter… but, during the exercise he'd found the mystery tab *(see below)*. Incidentally, I read the pilot's report into the incident… he managed to swim to shore after ditching. The pilot reported that his tail hit the water first and he flipped over and went in to the water upside down. He allowed the cabin to fill with water before he hit the release button. This allowed him to float to the surface. The pilot had a lifejacket.** *(Photo: Roger Targett)*


**Here's the mystery trim tab… anybody recognise it? My guess is that it comes from an UAV, but that's just my guess – you may know differently!** *(Photo: Roger Targett)*



**Here's a picture of the Jabiru 2200 engine installation as fitted to the Rans S6–ES that's just been completed by the Stroud Build-A-Plane project… and very well done to them. The initial shake down flying, done by LAA-er Toby Wilcox, went very well and, apart from the addition of a rudder trim tab and the fitment of a better fuel valve, the test flying has gone without too many teething problems. After the first flight Toby noticed a small weep from the oil cooler so he removed it… sure enough, there was a small crack near the oil inlet pipe's attachment and Toby, thinking that the pipe may have been over tightened by one of the student builders, ordered a new cooler. The new cooler, manufactured by Goodrich, soon arrived and the test flying continued. After about 4.5 hours he landed and the engine cowl was completely covered with oil; you can see why by referring to the picture overleaf, yes, there's that crack again. I haven't had any reports before of problems with this type of oil cooler and the agent, Skycraft, tells me that this is the first (well, second) reported failure. If you've had problems with this type of oil cooler can you let us know about it here at Engineering HQ?** *(Photo: Toby Wilcox)*

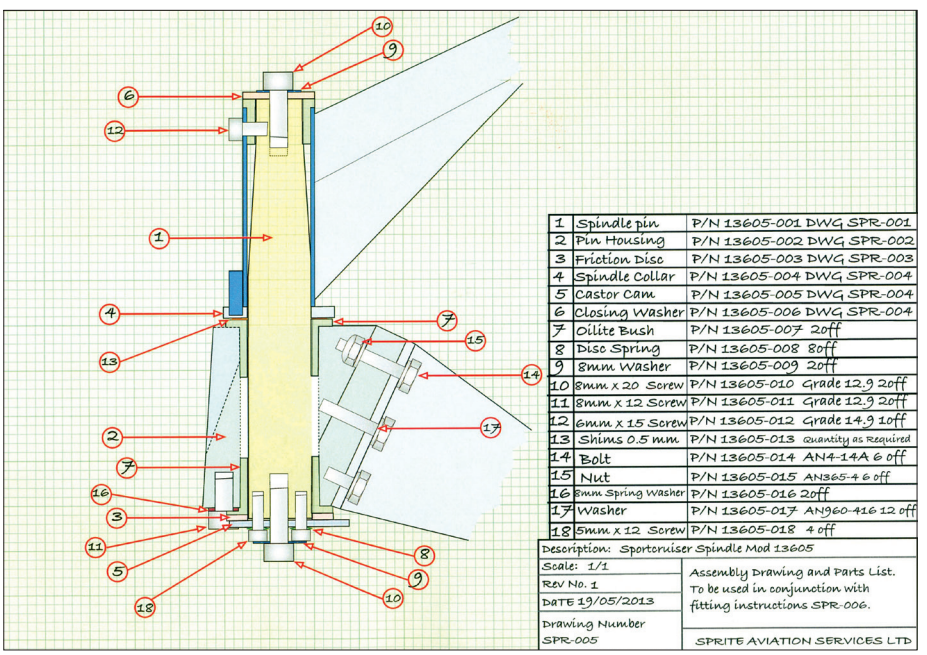


***I'm forever blowing bubbles.* This is a picture of the 'soap test' on the replacement oil cooler; initially it was thought that the inlet pipe had been over tightened, cracking the thin material in the cooler's structure, but the engineer that fitted the second cooler was sure that this was not the case. When Toby called to ask what we thought might be going on, it was suggested that the pipework leading to the cooler was quite long and appeared, looking at the photo supplied, not to be very well supported. Toby has repositioned the pipework and given it more support and we hope this will solve the problem.** *(Photo: Toby Wilcox)*

Remember also that geriatric is a relative term – many microlight aircraft built in the 90s weren't constructed with the expectation that they would be still operating in the second decade of the new century!

Incidentally, as you will see in the accompanying pictures, Nipper kits will soon be available again as Paul Grellier, proprietor of Hampshire based Airweld, now owns the rights for design, manufacture and supply… we wish him luck with the project.

OK, time, tide and Brian Hope, the editor of Light Aviation, wait for no man and, because of the May Bank holiday, the presses are waiting for the June 'Safety Spot' so, as always, Fair Winds! ■




**SPORTCRUISER NOSE LEG – UPDATE: I am sure that all Safety Spot readers, especially LAA members who own SportCruiser aircraft fitted with the CZAW nosewheel spindle assemblies, were happy to hear the news that both the 'Derby' mod and the 'Dover' mod (see May Safety Spot available on the LAA website, go to the Briefing Room) have now been approved as Standard Modifications and can be fitted to LAA aircraft. I should imagine that by the time you're reading this, most, if not all, of the SportCruisers affected by this issue will be back in the air. Congratulations to the two teams who went to such extraordinary lengths to bring these design solutions to approval – truly impressive, well done. A list of Standard Mods for LAA aircraft can be found on the LAA's website listed under type (go to LAA Aircraft > Standard Mods); these two mods are listed under SportCruiser SM 13550 (Derby option) & SM13605 (Dover option).** *(Photo: Graham Smith)*

**Correction:** In Richard Mole's article *Pieces of Eight* on page 32 of the May issue, the formulae were incorrect due to a printing error that omitted the superscripts. The correct formulae are shown below. Apologies for any inconvenience caused.

- Fitting today's power plant to the Tipsy S might raise the cruise to say $61 \times (0.82 \times 0.75 \times 23 \div 18)^{1/3} = 68$kt
- Tipsy S has a drag area of about $(18 \times .75 \times 550) \div (0.5 \times 0.00238 \times (70 \times 1.69)^3) = 3.8\text{ft}^2$
- Luciole has a drag area of about $(23 \times .82 \times 550) \div (0.5 \times 0.00238 \times (103 \times 1.69)^3) = 1.8\text{ft}^2$
- RF4D has a value of about $(36 \times .8 \times 550) \div (0.5 \times 0.00238 \times (100 \times 1.69)^3) = 2.8\text{ft}^2$
- MC-15 has a value of about $(30 \times .8 \times 550) \div (0.5 \times 0.00238 \times (119 \times 1.69)^3) = 1.4\text{ft}^2$
- To see the importance of these numbers, assume that the RF4D were required to fly instead at 119kt. Then the power required would be about $36 \times (119 \div 100)^3 = 61$ hp.
- These conditions were jointly satisfied by mauw = $(140 \times P)^{2/3}$kg for power P hp.
- Authorised mauw for an engine producing P= 45 hp when fitted with the appropriate propeller, was increased from 320kg to $(140 \times 45)^{2/3} = 341$kg or 752lb.

## LAA ENGINEERING SCALE OF 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 390kg | £320 |
| 391 - 499kg | £425 |
| 500kg and above | £565 |
| Three seats and above | £630 |
| **Permit renewal** | |
| Up to 390kg | £105 |
| 391 - 499kg | £140 |
| 500kg and above | £190 |
| Three seats and above | £210 |
| **Modification application** | |
| Prototype modification | £45 |
| Repeat modification | £22.50 |
| **Transfer** | |
| (from CofA to Permit or CAA Permit to LAA Permit) | |
| Up to 499kg | £135 |
| 500 kg 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 |

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