



SAFETY SPOT

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I have just received a telephone call reminding me about Valentine's day. "What," says I, not being known for my abilities in the Greeting Card department. "February 14th, don't forget." Still mystified and shifting a little uneasily on my seat I ask. "Who's this again?" Things became a little clearer when the answer came back "Brian Hope, don't forget that the deadline for next month's

Safety Spot is Valentine's day, and while I'm on....." I drift off a little and ponder the uneasy fact that indeed another month has passed since I penned the last literary equivalent of an air crash; reality drifted back, "... and this month I want to" Well, last month *Safety Spot* started with me musing about the weather, how should I ... "so that's that then, is Francis there"?

Over the Winter period there is not normally much flying, which equates to not many Occurrence Reports, which equates to a lean period for *Safety Spot* authors; well normally! In this *Safety Spot* I have got lots to talk about and not much space to squeeze it all into, so let's set heading immediately ... we'll worry about the navigation later.

MCR-01 - GROUNDED

First, the bad news; those of you that follow such things will note that there has been an MPD (Mandatory Permit Directive), issued by the Civil Aviation Authority, grounding all MCR-01 aircraft. The grounding affects all variants (i.e. including the Club and ULC); the LAA administers Permits for 27 of these aircraft and is working hard to help resolve the problems affecting the type. The grounding is in response to a serious accident that happened just before Christmas; the accident occurred because the tailplane attachments failed and the tailplane detached itself from the aircraft whilst on an approach. The two lads that were in the machine, both experienced pilots, were seriously injured in the crash. I am sure that I speak for everybody when I wish them a speedy recovery.

This accident is still being investigated by the AAIB and therefore I am not allowed to tell you much about it. Actually, this sounds as if I know 'extra special' secrets (information is power!), which I don't, reality is that until the actual AAIB report is published it makes sense to keep it confidential. During an investigation there is much head scratching which is always better done in private. I am authorised to tell you that



Did lack of lubrication cause this bearing failure?

the failure of the attachment bracket looks to have been caused by stress corrosion. This sort of corrosion is very difficult, and in some cases impossible, to spot from the 'outside'. In other words, you don't know you've got it until the part fails; hence the grounding. The object of any 'fix' will be to prevent a similar incident from occurring again.

One thing that was noted by the AAIB was the fact that there was little or no lubrication in the ball-end type spherical bearing and that the ball was nearly seized in its casing. This may or may not have been a contributory factor in the

bracket failure, this has yet to be decided but one thing is for sure, if a bearing seizes it stops being a bearing. The bearing may be introducing loads into the structure that the structure may not have been designed to take. Because the movement in the structure may only be slight it may be overlooked but, each time the control is operated, the structure, wherever it is, is being worked ... this can, after a time, change the material's structure often causing hardening, reducing ductility and leading to cracks. I can almost hear you thinking, "Calm down Lad!" Check out the picture of the

► Shadow hang bracket if you want to see the results of work hardening, I will be talking about this later in the article. Remember, cracks don't appear by magic but often the cause is so obscure that it seems like they do.

It's a good idea to get into the habit of checking drive rod-ends at each pre-flight – check that the rod-end bearing is free to rotate, hold the body of the rod-end and apply a small load to the control surface first up, then down – you are checking here for wear. Move the control surface through full deflection – what's the ball-end doing? Make sure that the body of the ball-end doesn't foul the control surface drive bracket and don't be scared to get the oil can out I know that there may be a chance of spoiling the lovely paint work with an oil streak but your aircraft is a machine and most machines treat oil as nectar from the Gods!

ROTAX OIL COOLER CRACK



Rotax 912 Oil Cooler

While we are on the subject of cracking; Conrad Beale of Conair Sports sent me a great picture of an oil cooler from a Rotax 912 ULS that developed a small leak. The leak was noticed quickly and there was no drama, which is always good news. What happened here is that the nut holding the oil cooler to the engine mount bracket became loose; the owner tightened it up and, without further thought, went off to enjoy the delights of flight. Unfortunately, whilst the nut was loose vibration did its job and the bracket sawed through the oil cooler inlet. There is a lesson here somewhere!

Vibration is a massive wear 'inducer', take a look at the picture of the trim tab found by one of our inspectors, Tony Kay, last season. There are a couple of points that I want to mention about this; firstly this aircraft should never have been flying with this amount of wear in one of the control surfaces, the fact that it was only on a trim/anti-balance tab does not make it less important, it makes it more



Trim Tab drive arm wear

important. Remember a trim tab is a small surface applying a load to a big surface, vibration in a tab will stimulate vibration in the principal control surface, this will lead to premature wear somewhere else on the airframe Note the use of the word will rather than my usual may! Under some circumstances it may (!) even stimulate a flutter condition, definitely not good.

Second point, take a close look at the design of this part, note that there is no bearing, essentially the connection is a hole through an aluminium alloy plate. This, by the way, is not a criticism; there are lots of good reasons for this type of design, cost and weight being two of the biggest, but don't forget, simple light structures/mechanisms require extra vigilance. The owner of this aircraft, who shall remain nameless (and the type ... type less!), was overheard moaning about the fact that he was suffering a lot of propeller vibration I hope that the renewal of the tab drive arm solved the problem.

SHADOW HANG BRACKET

I promised earlier to talk about Shadow hang brackets so here goes; I ought to say firstly that I think the Shadow is a fantastic aircraft and that my hat comes off to David Cook the designer, for bringing such a device into the World. I wrote earlier about simple design standards and their relevance and I suppose this aircraft falls into the category of 'special and continual' inspections, do not wait for the annual, know your aircraft every last bit, keep an eye on wear and do not let it become excessive. Anyway, I digress. The bracket in the picture was sent in by another Inspector David Bremner, thanks David. He is rebuilding a Shadow that suffered a heavy landing and required the boom to be changed; he noted the broken bracket and put the break down to the heavy landing, quite naturally. David remembered that there is a PFA

Airworthiness Information Leaflet (PFA/MOD/161/001) requiring a thorough check of this bracket at each Permit Renewal and took a closer look at it.

I try my hardest to 'chase down' as much information as I can when confronted with a new Occurrence Report and, in this case I was lucky enough to speak to all the relevant Shadow expertise. Special thanks go to Dave Cook, Danny Crosbie, Raymond Proost and of-course, David Bremner for their individual inputs. There is some evidence in this bracket that it had been subjected to loads which has caused work hardening of the material's structure. It was suggested that the upgraded Crosbie undercarriage might be stiffer than the original CFM design and therefore less able to absorb landing loads, particularly in rough field operation. Investigations have reveals that the Crosbie type of undercarriage is not stiffer, but it is quite a bit stronger. It may be that this re-directs any failure point away from the undercarriage to some other point on the airframe, in this case the Hang bracket. Personally, and I think that most with experience of the Shadow aircraft would agree, it's not a rough field aircraft. However, after a very heavy landing (code for controlled crash!) in any type of aircraft it is essential to have a thorough check, and this includes taking panels off if necessary, to look around spar attachments. Do not forget things like engine mounts or exhaust supports; pay particular attention to support structures holding heavy items, things like fire extinguishers and batteries are often forgotten.

Shadow hang bracket



The above discussion does not address the work hardening issue with this bracket and, in all truthfulness, I cannot say that we've actually cracked the problem. If you've ever flown a Shadow you will know that cross-wind landings put a fairly large, i.e. noticeable, twisting moment through the airframe; David Cook told me that he was able to turn with a sort of 'lurching' manoeuvre through 360 degrees without using bank. To reduce this fuselage twist CFM introduced a mod which stabilised these two front hang brackets, it consisted of a plywood gusset set between the two brackets. It is possible that movement in this bracket over the years has caused the work hardening; one thing for sure is that it is this bracket that holds the body of the aircraft to the fuselage boom and I would not want it to break when I was flying the aircraft. The aircraft that the broken bracket came from had not been fitted with the recommended gusset.

I shall be writing to all LAA Shadow operators reminding them of the annual requirement to check this bracket and requiring them to incorporate CFM metal fax Mod Number 9, which is the plywood gusset.

CONTROL SURFACE CLEARANCES

Much of this month's article has been focussed on the need to do regular, and thorough, pre-flight inspections. The gradual shift from the conventional GA types, like the PA28 and the C150, operated by established FTO's, towards homebuilt aircraft, built to design standards laid out in BCAR section 'S' or CS-VLA, has meant that there is far more emphasis on the responsibility of the pilot with regards to pre-flight planning. By this I mean that there may not be a CFI around to ask if the weather's 'alright' or; "Do you reckon it will be ok to squeeze that bloke in the back"? Things that used to be up to the Air Traffic Controller, like grass length, water logged runways, visibility, even wind, have to be assessed by the pilot it's up to you, the captain of the aircraft, to decide whether it's OK to commit to aviation.

All the above are meat and potatoes to the experienced pilot but, and I accept that some will not agree with this, there has never been a greater need for regular, and I shall say it again, *thorough*, pre-flight inspections. Do not ever take anything for granted, if you are



J400 Aileron Jam – a close thing

not sure Check. This is a good example of why.

As is often the case with home built kit aircraft the final inspection and test flying responsibility was given to the aircraft's kit supplier. In this case ST Aviation Services based at Southery airstrip in Norfolk, the aircraft in this case being the high performance Jabiru J400. As is usual, the completed kit was thoroughly inspected by engineers and it was noticed that the rudder was slightly fouling the fin; this was remedied and a number of slight adjustments were made. An application was made for a Permit Flight Release Certificate (PFRC) to the LAA which was duly granted and the aircraft was made ready for flight testing. As you may know a new aircraft is required to do five hours of flying before a full Permit to Fly can be issued; in this 'test' period one flight of two hours must have been accomplished and the aircraft must have completed 15 landings.

This aircraft had actually done over five hours and was being flown around the envelope by one of ST Aviation's test pilots, Gary Cotterell, Gary is a very experienced light aircraft test pilot with many hours on the J400 series aircraft, I shall let him explain what happened.

"The aircraft was returning after refuelling from Fenland Airfield at 1000 ft. During a co-ordinated 60 degree right hand turn, the control column jammed which resulted in the aircraft continuing to roll to the right. Full left rudder was applied and the power was reduced in (an) attempt to stabilize the roll. In (an) attempt to centralise the controls, a

small application of right aileron eventually removed the restriction and the aircraft recovered to normal flight."

I spoke to Gary about this a couple of days later and, still thanking his lucky stars, explained that the aircraft was at about 90 degrees before roll authority was regained. It is clear that this was a pretty close thing when you remember that the Jabiru is not an aerobatic type and you don't have the option of continuing the roll through 360/720 etc. etc. whilst you sorted out what was going on It doesn't bear thinking about really!

Anyway, well done to Gary for his quick thinking when he applied in-turn aileron.

On the ground, the inspector rechecked the gaps and clearances and found that by applying an up load to the aileron, and moving it through full deflection, the jam case could be simulated. Check out the photo. Kevin and Roger of ST Aviation and ST Aviation Services respectively have moved with creditable speed to alert all the relevant people and have issued a Service Letter advising all concerned about minimum distances between control surfaces and wings/tailplanes and fins. The LAA has created an Airworthiness Information Leaflet to alert all UK Permit holders. I think that this is a good example of 'never taking anything for granted' as discussed earlier; probably the aircraft and it's pilot were lucky to survive the incident and, most likely, the actual cause of the crash would never have been found. – *Fair Winds* ■