With Malcolm McBride
Airworthiness Engineer

DEVELOPING A GOOD SAFETY CULTURE IS ABSOLUTELY ESSENTIAL

Delegates meet at LAA HQ to understand and discuss how to bring a new aircraft type onto the fleet

'If the devil were to cast his net' … he wouldn't find any victims in this crowd! Well, hopefully anyway. This is the line-up of the delegates who attended the recent Agents' Seminar … missing quite a few notables who rushed off at the end so that they could remain day VFR for their flights home. The object of the day was to better explain the process of bringing a new aircraft type onto the LAA's books and to offer a space for a discussion forum where better ways to make this complex process operate were discussed. We think the day was a success and the LAA intends to put on more seminars in the future.
(Photo Malcolm McBride)

Ahoy there. Welcome again to Safety Spot. I hope, as always, that all's well with you and those close to you. If you're anything like me (generally a bit seized-up after the winter break), in this period of lengthening days, you'll be finding yourself with too much to do and too little time to do it … the grass will be growing next and yes, my lawnmower still needs fixing! Of course we mustn't moan, it's always good to get a bit of sun on the bod and you know what they say about idle hands.

We've all been pretty busy here at LAA HQ one way or another; late last month we hosted the LAA's first Kit-Suppliers/Agents' Seminar which, I'm happy to say, turned out to be a very useful event: I hope, from both sides of the table.

Actually, the phrase, 'both sides' doesn't really apply quite so powerfully in our Association as in some others. We at HQ Engineering are well aware that much of the Association's expertise lies in the wider membership and much of what we do requires well-oiled partnerships; long may this remain, strength in numbers and all that! The forum ended up being worthy of this title, with many of the delegates taking the opportunity to express and expand on issues presented during the various talks: much was learnt by all.

Primarily, the day was cast so that HQ Engineering could explain the process of getting a new aircraft type into the LAA system and for a commercial type sold through a UK agent, what is expected of the agent when it comes to supporting the people who choose to build and fly it. This required the engineering staff to put together individual presentations explaining the simplified systems we use to keep things as safe as possible, but at a fraction of the cost of the certificated regime.

To some extent, trying to explain this task in itself reveals the problems associated with managing the initial and continuing airworthiness issues of such a large and varied fleet of aircraft… it's difficult to define the un-definable! There's an old adage which explains that an aircraft cannot fly unless the weight of the paperwork exceeds the weight of the aircraft; that's certainly not true within the LAA's certification and approval systems at the moment and, in my view anyway, it would be foolish to move towards a system that increases administrative burden, but we need to be both reactive to problems when presented and proactive in spotting areas where problems might surface.

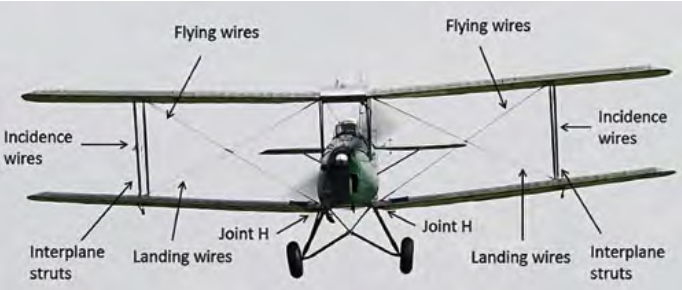
A policy of 'one size fits all' might work well if you're managing a chain of supermarkets but, perhaps as is being discovered as we peak behind the curtain of the European experiment, centralisation doesn't provide much of an environment for diversity. I have to say, perhaps exposing my colours when it comes to the European debate, that I'm sat right on the fence. I love the idea but won't wear the straightjacket created by the silly concept of ever closer union. There are a lot of aircraft out there that would be best served by joining the LAA's Permit to Fly system model but this greater integration dogma stops them stone dead. One thing that's becoming obvious is that apparent de-regulation, driven primarily by financial reasons, doesn't automatically lead to greater freedom and centralisation certainly doesn't always mean greater overall efficiency.

During my few minutes in the spotlight at the seminar, I used my time to explain why the development and maintenance of a good Safety Culture within our Association is such an important component of a good overall safety outcome. Personally, I think that one of the reasons behind the obvious success of sports

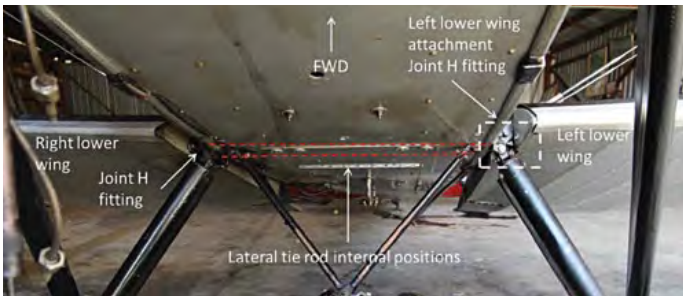
When it comes to identifying the key elements of the PFA/LAA's success over the last 70 years one element, the continual drive to make our sport safer, stands head and shoulders above the rest; it's powered by our combined understanding that if we want to keep the freedoms to enjoy our various air-sports, we must keep things as safe as it's possible to be, especially when it comes to second and third parties.

During the recent Agents' Seminar, I spoke about the continuing airworthiness processes I'm involved with on a day by day basis; this PowerPoint slide, left, entitled 'Good Feedback is Essential' shows the various ways we get information about our fleet. Incidentally, the thickness of the arrows reflects my view of the number of inputs and their relative importance.

We've had two nasty accidents recently where, on reflection, a quiet word in an appropriate direction may have led to a different outcome. It's impossible to turn back the clock but good feedback might just stop something nasty happening further down the line. *(Image: Malcolm McBride)*



The Tiger Moth has two tie rods which form a tension couple between the wings (effectively between the two Joint Hs marked). This picture allows the observer to picture the forces through Joint Hs during flight. Remember that a lateral lifting force will act perpendicular to the wing's surface and that, if the structure is to hold together, all the forces must resolve themselves! *(Photo de Havilland Support Ltd. Modified by ATSB)*



Here the position of the two Lateral Tie Rods, which sit inside the fuselage, is shown by the dotted red line; ground loads, which place this part of the structure in compression, are resolved through a tubular strut (shown in another picture). Note that much of the force generated by the undercarriage into the fuselage is distributed through the Joint H fitting though the lower lower landing gear attachment. *(Photo ATSB)*

aviation generally in the UK, is that the Safety Culture, primarily developed by the post-war generation, and especially within the different sporting organisations, is first-class; in some ways despite perennial changes in the rule-based safety systems struggling around the edges to gain the upper hand. We sit on the broad shoulders of previous experience; best not to forget it.

I'm just looking at the pile of folders I've sorted out for this month's Safety Spot; now, what's on there to share?

Well, there's a good picture of the participants at the Agents' Seminar; I'll put that in. Then I had a great chat a couple of days ago with a member who was injured badly during a prop swinging accident; that's a story worth telling. Last but not least, the final report into the horrible crash involving a Tiger Moth during a pleasure flight back in 2013 has now been published. I know that this incident is bound to have an effect on the future operation of Tiger Moth aircraft, and perhaps other vintage types in the UK; perhaps this is the best place to start.

DE HAVILLAND DH82A TIGER MOTH – IN-FLIGHT BREAK UP

On 16 December 2013, at approximately 1215 Eastern Standard Time, a de Havilland DH82A (Tiger Moth) aircraft, registered VH-TSG, took off from the operator's airstrip at Pimpama, Queensland with a pilot and passenger on board. The purpose of the flight was to conduct a commercial joy flight in the Gold Coast area. The operator reported that, as part of such joy flights, aerobatics were conducted above the South Stradbroke Island area at about 3,500ft above mean sea level.

Video footage obtained from a fixed, on-board camera showed that about eight minutes after take-off, the aircraft commenced aerobatic manoeuvres. About one minute later, during an aerobatic manoeuvre, the left wings failed.

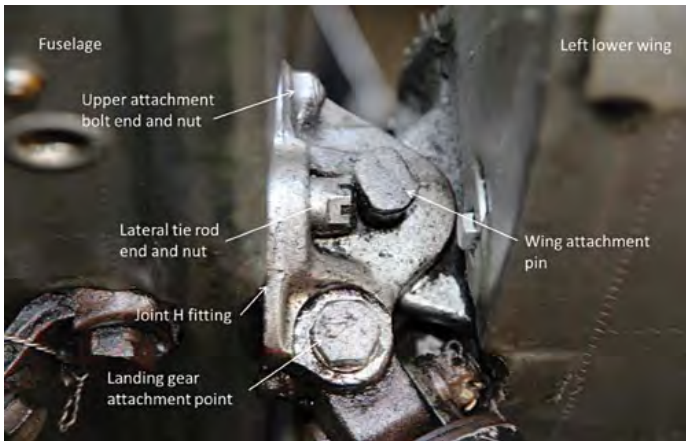
The aircraft was destroyed and the two occupants were fatally injured.

The organisation charged with the responsibility for investigating this accident was the Australian Transport Safety Bureau (ATSB). It was a complex investigation because the aircraft was badly damaged when it impacted the water and, initially, it was difficult to work out the most likely airframe failure sequence. The ATSB were ably assisted in their investigations by the Type Responsibility Agreement holder, de Havilland Support Ltd.

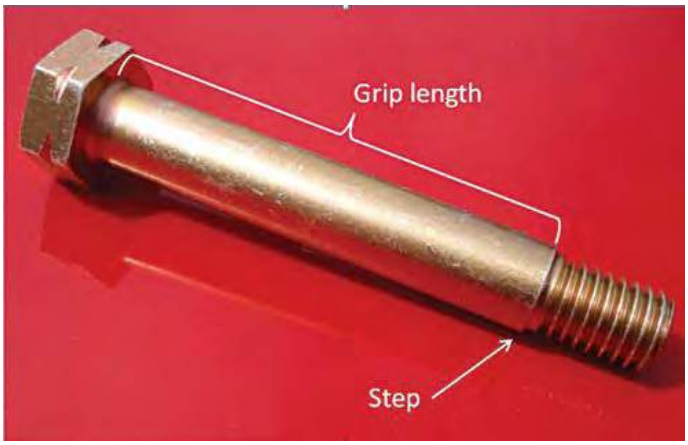
Early on in the investigation it became clear that both the forward and aft lateral tie rods had fractured through the threaded section at the left lower wing's attachment point. This generated an Emergency CAA Airworthiness Directive (G-2014-0001-E). The EAD explained that the failed tie rods had been manufactured under an Australian Parts Manufacturing Approval (PMA) and that they were worried that some aircraft on the UK register may have embodied these, at that time, suspect parts. The EAD required the removal from service of the tie-rods and nuts manufactured under the PMA and prohibited aerobatics in each individual Tiger Moth aircraft until the provenance of the lateral tie rods had been established.

We wrote to all the owners of LAA Tiger Moths explaining that, whilst there are specific concerns about the suitability of tie rods manufactured under the PMA by the Australian company J & R.Aerospace, this AD didn't limit itself to a requirement to check that this suspect tie rod wasn't fitted to an aircraft. The actual wording of the AD also required that the provenance of this component was established and, in full understanding of the risk of sounding pedantic and taking this word at face value, LAA Engineering interpreted that provenance refers to an object's 'history of ownership'.

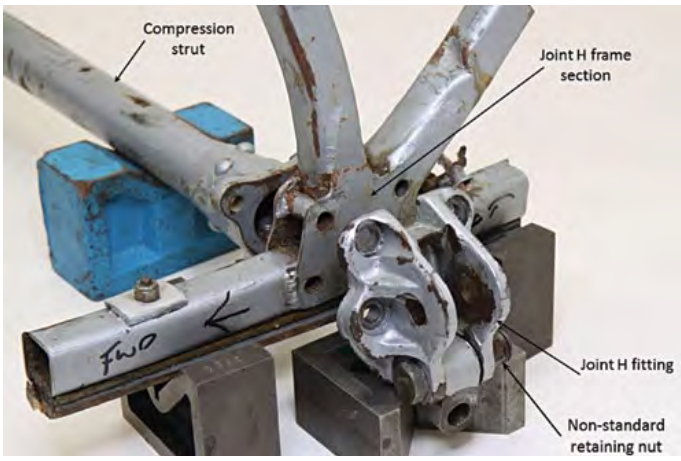
The AD required an owner to determine, as far as possible, the origin of their aircraft's tie rods, the original date of fitment and number of hours accumulated on them since. Naturally, for some this was easy, where a log book entry or other technical records yielded this information, ideally specifying the components by part number and with an identifiable batch number. For others, the actual determination of the provenance of the parts proved more difficult and quite a few suspect tie rods were changed in the LAA's fleet simply because their provenance was unclear. ›



This picture shows a close-up of the Joint H fitting itself. During the investigation it was found this assembly had been assembled using incorrect bolts which could have affected the way the connection behaved during normal operation. *(Photo: ATSB)*

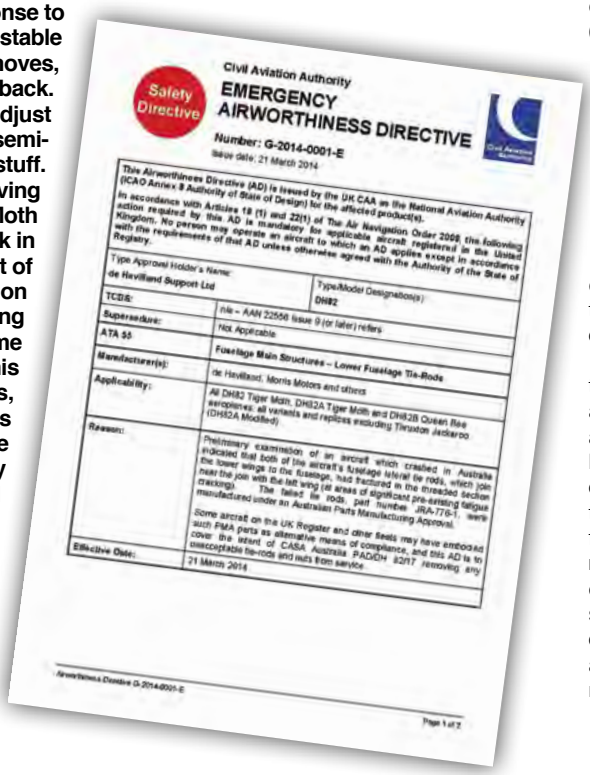


This picture shows a genuine Joint H attachment bolt. Note the grip length and step down to a smaller-diameter thread. The step in the bolts is necessary for correct assembly. Substitution of bolts with a reduced grip length may cause excessive shear loads to be reacted by the tie rods.
(Photo: de Havilland Support Ltd. (Modified ATSB)



*(Left)***This picture shows the 'working parts' of Joint H, note the substantial compression strut and the non-standard retaining nut holding the undercarriage attachment swivel.** *(Photo: ATSB)*

(Right) **Quite a chunk of this month's Safety Spot has been connected with feedback. Many, perhaps most, of the rules that govern us are a result of an injury of one sort or another. The object of feedback in a system is to return it, whatever it might be, to a stable condition. Something displaces the stability - this displacement generates feedback and the feedback drives a response to bring the situation back to a stable condition which, in turn, removes, or at least normalises, the feedback. Systems engineers modify and adjust feedback loops to control most semi-autonomous systems. All clever stuff. The in-flight break-up involving a de Havilland DH82a Tiger Moth in Queensland, Australia back in December 2013 generated a lot of feedback which included a focus on the control systems surrounding this accident themselves. Some of the lessons learnt from this tragedy are really old ones, some are putting recent changes to safety systems under the microscope. This Emergency Airworthiness Directive, published by the UK CAA in response to concerns about the suitability of a replacement fuselage tie rod manufactured in Australia requires UK owners to check the provenance of the tie rods fitted to their aircraft.** *(Photo: UK CAA)*



Safety Directive

Civil Aviation Authority

EMERGENCY AIRWORTHINESS DIRECTIVE

Number: G-2014-0001-E

Issue date: 21 March 2014

This Airworthiness Directive (AD) is issued by the UK CAA as the National Aviation Authority (ICAO Annex 8 Authority of State of Design) for the affected product(s).
In accordance with Articles 18 (1) and 22(1) of The Air Navigation Order 2009, the following action required by this AD is mandatory for applicable aircraft registered in the United Kingdom. No person may operate an aircraft to which an AD applies except in accordance with the requirements of that AD unless otherwise agreed with the Authority of the State of Registry.

Type Approval Holder's Name:	Type/Model Designation(s):
de Havilland Support Ltd	DH82
TCDS:	n/a – AAN 22556 Issue 9 (or later) refers
Supersedure:	Not Applicable
ATA 55	Fuselage Main Structures – Lower Fuselage Tie-Rods
Manufacturer(s):	de Havilland, Morris Motors and others
Applicability:	All DH82 Tiger Moth, DH82A Tiger Moth and DH82B Queen Bee aeroplanes; all variants and replicas excluding Thruxton Jackaroo (DH82A Modified)
Reason:	Preliminary examination of an aircraft which crashed in Australia indicated that both of the aircraft's fuselage lateral tie rods, which join the lower wings to the fuselage, had fractured in the threaded section near the join with the left wing (at areas of significant pre-existing fatigue cracking). The failed tie rods, part number JRA-778-1, were manufactured under an Australian Parts Manufacturing Approval. Some aircraft on the UK Register and other fleets may have embodied such PMA parts as alternative means of compliance, and this AD is to cover the intent of CASA Australia PADOH 82/17 resolving any unacceptable tie-rods and nuts from service.
Effective Date:	21 March 2014

AirworthinessDirective G-2014-0001-E

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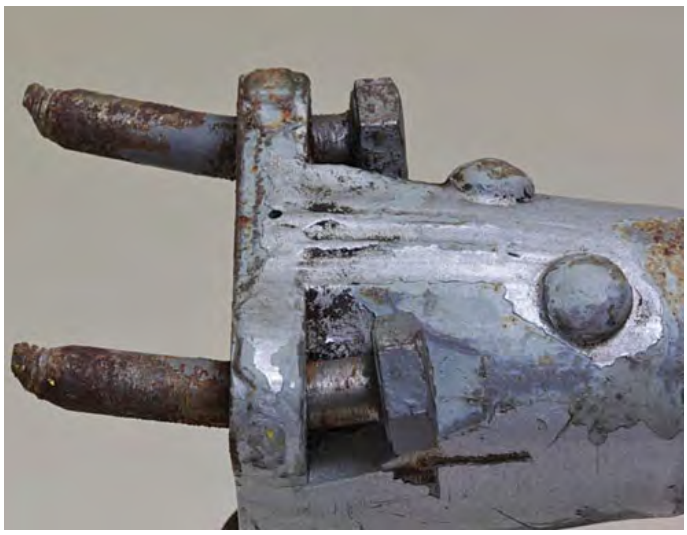
One example, not long imported from Australia, was found to be fitted with the J+R Aerospace tie rods – these of course were also changed.

The tie rod's life is limited on the Tiger Moth to a service life of 2000hrs (or 18 years) by de Havilland Support's Technical News Sheet (TNS) No. 29. We wrote to all of our Moth owners asking them to be careful not to be misled by previous logbook entries; there can sometimes be confusion between a logbook entry stating that the TNS has been complied with (ie, the life has been checked and found to be in limits at that point) and a logbook entry stating that the tie rods have been changed at that point in accordance with the TNS. Some owners have found that, on deeper investigation, their tie rods were older than they thought and, in more than one case, out of life altogether.

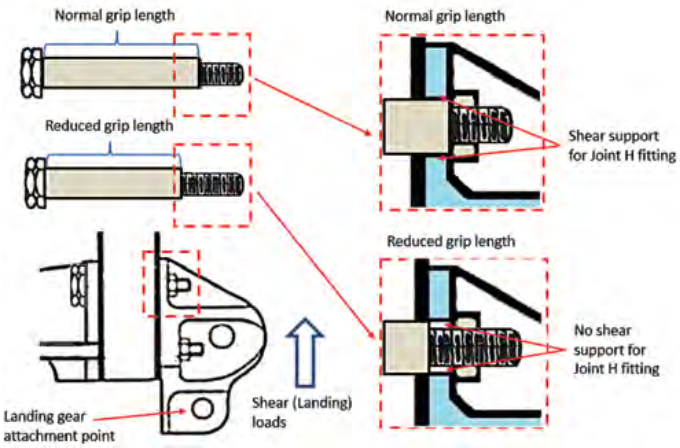
It was clear from the on-board video footage that, after approximately one minute of aerobatic manoeuvres and while pulling out at the bottom of a loop, the left lower wing began to fail in an area forward and outside of the camera's view. A very short time later, the upper left wing failed and both left wings folded back towards the fuselage. There was much speculation at the time about the obvious chicken or egg situation: had the wing failed structurally in some way thus leading to an overload and subsequent failure of the tie rod at the lower fuselage connection, or had the tie rod failed which then effectively disconnected



(Left) **This picture shows the failed Joint H upper attachment bolts still attached to the compression strut. The DH82a should be fitted with four special upper attachment bolts (de Havilland part number H37868). Three of the four bolts were recovered from the accident site, the fourth bolt, from the left side, forward position, was not recovered. It was not determined if the missing bolt was present at the time of the accident. The three recovered bolts had all fractured through the threaded area in a manner consistent with ductile overstress. The H37868 drawing specified a high-tensile steel, shouldered bolt with a 0.28 inch grip diameter and a step down to a 0.25 inch BSF (British Standard Fine) thread. The grip length of the bolt was specified as 1.45 inches (36.8 mm), with an overall bolt length of 1.8 inches (45.7 mm).**

The recovered bolts were non-standard and their origin was not recorded in the aircraft logbooks.

The hardness of the bolt material was consistent with high tensile steel and in line with the original design part drawing specification. However it was evident that the bolts had been machined down from larger bolt stock and re-threaded to suit the application. The bolts displayed non-standard bolt head markings and had one flank ground down to fit against the compression strut. During investigations in Australia two other aircraft were discovered to be flying with 'home-made' joint H attachment bolts and, subsequently, checks in the UK have revealed three more examples. *(Photo: ATSB)*



(Left) **This graphic, supplied by the ATSB, shows the importance of fitting the correct components in critical assemblies. You can see here that, because of the reduced shear support to the joint H fitting itself, the joint wouldn't have been working 'as designed'. Debate continues about the relative consequences of this major assembly defect and I wouldn't want to be the person that has to make a decision about this in the inevitable court case following the accident.** *(Photo: de Havilland Support Ltd.Modified by ATSB)*

the flying wires allowing the wing to fold up?

The evidence has now been teased-out by investigators and it is well presented in the ATSB's Occurrence Investigation Report. I've added a link to this report in a Safety Alert on the subject which you can find on the LAA's website. If you take the time to read this report, and I think that you'll find it worth the effort, you'll see that there are a number of issues that are worth exploring.

Certainly, as time passes, some purpose-made aircraft parts become harder and harder to source. Systems like the Australian PMA system help provide new 'substitute' replacement parts but this can be more difficult than you might imagine, especially with regard to critical manufacturing processes which were routine for the original manufacturer but were not necessarily specified clearly on the original manufacturing drawings.

Add to this, the natural loss of specific type expertise and manufacturing process and test equipment, and you will see that we're entering a time where it might become difficult to keep some types flying.

Much of the report discusses the failure of the tie rod itself but, whilst it was clear from the metallurgical evidence that both tie rods failed due to high-cycle fatigue, it is less clear as to the reasons why this should have been the case. Certainly, the manufacturer of the tie rods appears to have been acting in accordance with the operating procedures of the extant Australian PMA system but it seems to have been missed that the standard parts are subject to a fatigue life, and that the fatigue performance of the replacement parts was therefore critical.

Two other factors affected the failure of this tie rod, one unquestionably connected, the other, arguably, less so. The debatable issue concerns the actual operation of the aircraft. The suggestion, made in the ATSB report, is that the aircraft was being operated well outside the operational norms for the type when it was designed. Certainly, using this vintage machine as a cheap thrill-seeking carriage isn't sensible and, anecdotally, the pilot involved appeared to demonstrate little finesse in the looping manoeuvre generally.

It may be, because of this, that experts will decide to put a limit on the extent of aerobatics these machines can perform. Personally, whilst I hate to fall into line with authoritarian restrictions, this incident shows that some pilots don't understand the dangers of not respecting an aircraft's structure, so restrictions may need to be introduced.

The unquestionable connection, with regard to the fatigue issue, is that the Joint H top attachment bolts were not of the correct design. The top attachment bolts are special stepped bolts sized to provide a reliable shear connection between the fittings and the fuselage sides. Instead, bolts had been fitted which had the incorrect shank length, preventing these bolts carrying shear effectively. This meant that punishing vertical shear forces from the landing gear were almost certainly transferred to the lateral tie rods, which are not designed to fulfil this function. You can see the importance of this connection, which has to resolve aerodynamic lifting loads, wing weight and a variety of forces generated by the undercarriage, in the attached pictures. I hope I'm not being disrespectful to the original de Havilland design team when I say that I don't think a designer would configure this connection in this way now!

In any event, because LAA Inspectors are checking both tie rod provenance and the Joint H bolt itself, we've already had three reports where incorrect Joint H bolts were used on our aircraft: one during a Permit renewal just last week. In other words, this is a **now** issue. Scarily, in this last case, the bolt wasn't just a home-made bolt, the whole assembly was moving about because it wasn't correctly tightened-up… a loose connection here will certainly affect the fatigue life of the tie rods which, quite sensibly in my view, were both changed.

As I explained earlier, the type experts at DHSL, along with engineers from the CAA are looking at what can be done to prevent another tragedy like this one. We know and respect the people involved in this decision-making process and we're not expecting a knee-jerk type of reaction, although it will be tempting for regulators to take this easy path. It's likely that the issuance of the final report into this accident really reflects a point closer to the ›

beginning of this story rather than a point near its conclusion.

The two big engineering points that have come out of this investigation is the great importance of the lateral tie rods in the structure of Moth aircraft and the equal importance of using the correct Joint H attachment bolts.

The first point has been dealt with although, after a comprehensive design survey of these components, I'm sure that we'll see some reduction in their fatigue life. The second point, still being addressed, highlights the problems that can happen when somebody without specific design knowledge decides to substitute one part for another. As things develop, LAA HQ engineering will keep owners up-to-date with any changes to the rules.

MINICAB (JB01 STANDARD) – PROPELLER STRIKE ON START-UP

In all fairness, this isn't a Garden Minicab story, though it's worth letting you know, if you're not familiar with the type, that I'm quickly getting a bit of a crush on this lovely little two-seater. We've got 22 Minicabs on our books, six of them projects and a few under rebuild, one of which, incidentally, is being overhauled by our esteemed former CEO, Phil Hall and his wife. I say this, not to embarrass them but to explain the developing crush. The Halls' aircraft was completely stripped here in the hangar at Turweston which gave the opportunity to take a good look round the airframe before it was re-covered and, as it turned out, given an amazing finish with exterior house paint… but that's a different story.

The Minicab is one of the first of the post second war aircraft in the sports aviation home-builder class. Designed in the mid-1940s, the prototype first flew in 1949. The aircraft that's involved in this toe-curling incident was built in France in 1959 and arrived on our shores as an early PFA machine in 1976. Looking at the paperwork, this particular aircraft has completed 2,300 airframe hours so, in its 57-year life thus far it has averaged more than 40 flying hours per year, quite a feat when you think about it.

Now, because there was a serious injury in which the pilot, LAA'er Duncan Cotter, lost part of his left arm, the AAIB took charge of the investigation into what might have happened; so, I might as well let their short report tell the story. The incident itself happened at Fenland Airfield in April 2015, the full report can be accessed from the AAIB's website:

The aircraft was not fitted with a starter motor and the pilot was attempting to start the engine by hand-swinging the propeller from the front – the cockpit was unoccupied. He believed he had followed his normal procedure, which included applying the parking brake, chocking the aircraft and setting the throttle to the marked start position (about 1in open). However, when the engine fired the pilot was immediately aware that the rpm was too high. He attempted to move round the aircraft, to the left side of the cockpit, to shut the engine down but, as he did so, the aircraft tipped forward and he was struck repeatedly on the forearm by the propeller. The aircraft continued to tip over and the propeller was shattered as it struck the ground. This also stopped the engine.

The pilot reported that he had, almost exclusively, operated aircraft which required hand-starting. He estimated that he had conducted hundreds of hand-starts, mainly without any other person being present. [He also explained that], in order to start the engine, it was necessary to use the acceleration jet of the carburettor. This required the throttle to be pumped, then left in the fully open position while the propeller was pulled through.

The throttle would then be retarded to the start position, before the magnetos were selected on and the propeller was hand-swung to start the engine.

He considered it most likely that, immediately before the accident, he had omitted to retard the throttle from the fully open position before attempting to swing the propeller.

I didn't speak to Duncan at the time of the incident as the investigation was being managed by the AAIB but, as soon as their report had been published I got hold of him for a chat; and what an uplifting experience that was. Duncan, in a previous life, was a medical doctor who specialised in orthopaedics – uncannily he was, for a while, in charge of the prosthetics department dealing with Yorkshire. He's been a keen flyer for ages having started life, like many of us, as an air cadet. His first machine was a VP.1 but his medical career

This picture shows the position of the Gardan Minicab's throttle after the incident so there can be no question that it hadn't been correctly set before the hand start. Most aspects of aircraft operation require drills and checklists. Naturally, if a task is on a checklist then it must be important but, when it comes to checking mag switches before touching a propeller, or ensuring that everything is set correctly before hand-starting an engine, I'm in the habit of checking twice. *(Photo: Fenland Aero Club. Courtesy of AAIB)*

This picture of the Gardan Minicab, taken by LAA'er Richard Keech using a long lens, shows what can happen if an engine is hand-started with the throttle set to maximum power. Naturally, the propeller is a write-off and the engine, a Continental C90 will be lucky if it passes the shock-load inspection: both these issues pale into insignificance when you consider that the pilot lost the lower part of his left arm when it was struck by the propeller as the aircraft nosed-over. *(Photo: Richard Keech)*

then took control of his life and a forced 37-year lay-off ensued!

As soon as possible (on his retirement) he bought the Minicab and got himself back in the air. Whilst in hospital recovering from his injury, he actually bought another aircraft, a Jodel 117, not because he had fallen-out with the Minicab but because he wanted an aircraft with an electrical starter. I wouldn't dare criticise him for that! The Minicab's engine is very likely to need some extensive engine work in any event.

Duncan, with his expertise in prosthetic-design, has made himself an attachment that slots over the control stick in his new Jodel so, when he's flying, he's virtually permanently affixed to the airframe… which, apart from removing the plastic hand-grip needed no modification. Duncan hasn't got a picture of this device but he knew a bloke who did – well, not quite knew. "It was one of the chaps who flies the Grob in the AeroSPARX night air display team," Duncan explained.

One of the LAA's inspectors, Grob expert, Tim Dews, is one of the pilots in this team… so I gave him a call. "That'll be Guy, he's camera mad," was Tim's response, "but he's in the USA until Monday."

Now Duncan was very keen to show off his new arm-aircraft connection so I dropped Guy an email, he responded quickly explaining that he hoped to be back in the UK on Monday and would try his hardest to get the picture to me later that day. The magazine is being printed Monday evening so, if the picture's 'in' you'll know that we've been successful, if it's not, I promise to squeeze it into the April Safety Spot.

Anyway, back to the story. I spoke to Richard Keech, who's the Vintage Piper Aircraft Club's (VPAC) Safety Officer, primarily to get permission to use his photo in the mag which ended up as another uplifting conversation. Richard explained that he witnessed the whole thing and was mightily impressed by everybody concerned: the often forgotten ground crew immediately got first aid underway and stabilised Duncan. The pilots flying at Fenland that day behaved themselves, keeping well clear of the ambulance helicopter landing area as they departed back to their home airfields… even the Condor owner who had to land back at Fenland rather promptly after forgetting to latch his canopy door, didn't get in the way!

Richard explained that he wrote some guidelines for the VPAC in his Flight Safety Corner and I've just about got enough space to fit his advice in… thanks Richard, good job.

HERE ARE MY RULES:

1 Initial

Before even touching the aircraft use the "Three M's" check: "Mixture-Mags-Master." Use the "mixture" check to remind you to check that all the fuel controls are off/lean, the "mags" check to remind you to check that they're OFF and the 'master" check to ensure that any electrical power selections are OFF.

2 Positioning

The aircraft should be positioned into the wind on an obstacle-free level surface, chocked and with the stick tied back. If it is fitted with a parking brake this should be set, but a brake is not a substitute for the chocks that are ALWAYS absolutely essential.

3 Preparation and Priming

Before going near the prop my other little verbal (I say it out loud to myself) safety check now comes into play and that is: "Fuel On, Brakes on, Throttle closed, Switches (Mag switches) OFF." Of course "brakes" covers chocks as well and I reckon that these checks MUST be done before the priming and "sucking-in" is done.

4 Starting

Once the engine is primed and ready for starting the drill is to say, "Throttle Set, Switches On, (ignition switches) and then it's "Contact/Clear Prop" and, hopefully, that first swing will do the job and the engine will putter into life and settle into a slow idle. If the aircraft has a throttle friction control this should be used to ensure that the throttle stays in its set position.

5 Post Start

Once the engine is capable of running at idle, the throttle should be fully closed, set throttle friction (if fitted) to ensure that it stays closed and then remove the chocks and climb aboard. The chocks should always be approached from the rear of the aircraft and I recommend that the chocks' cords be arranged as shown in the photo such that when the cords are pulled to the rear they rotate around the outer *edge of the tyres and can therefore be pulled to the rear thus keeping the pilot, chocks and cords well clear of the rotating propeller.*

6 Problems

When engines don't start as normal, this is when stress levels begin to rise and the natural human tendency is to rush and cut corners. When dealing with live props this must not be allowed to occur and a deliberate policy of rigidly sticking to the drills MUST be adopted. The first action must be to say the drills that were used immediately before the attempted start-up and to do them in reverse. ie "Throttle Set" and in this instance it should be closed, then "Switches" and the magneto switches must be turned off. If the engine is to be re-primed and sucked-in again this should be safe to do, but before swinging that prop for a second start sequence then the drills at Para 4 above begun again. If it still won't start then it's time to give up, take a rest and have a think, but before putting that kettle on the initial safety checks must be performed once again, i.e. "Mixture –Mags- Master" (mixture/fuel Off, Mags Off, electrical master Off) and then it's all definitely safe!

Just before I finish on this topic I must mention that particularly dangerous case when the engine has been over-primed and needs "blowing-out" by turning it backwards with the throttle fully open. After such an operation the swinger is definitely hot and bothered. The great danger is that the engine is swung to start still with the throttle fully open; it has happened many times! Adherence to the drills above will take care of the potential danger, but at this stage a nice cup of tea is definitely the preferred option. Above all, whatever drills are used for hand-swung starts, at the very least, these must never be attempted without the stick being tied back and the aircraft securely chocked.

Also, following a "blowing –out" procedure BEWARE!

Thanks Richard for taking the time to share this useful advice. We've had a few nasty incidents over the last few years involving LAA aircraft; many caused by a moment's inattention to detail. As always, thank you for your support, sharing your experiences makes Safety Spot as good as it is. Keep it up.
Fair Winds. ■

LAA ENGINEERING CHARGES – PLEASE NOTE NEW FEES HAVE APPLIED SINCE 1 APRIL 2015

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	
Up to 450kg	**£155**
451-999kg	**£200**
1.000kg and above	**£230**
Modification application	
Prototype modification	minimum £60
Repeat modification	minimum £60

Transfer	
(from CofA to Permit or CAA Permit to LAA Permit)	
Up to 450kg	£150
451-999kg	£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

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