

	Standard Modification Issue 1	Mod No. SM11545
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		Compiled : A Draper
		Approved : F Donaldson

TITLE : Alternative Undercarriage Springs.

APPLICABILITY : Fournier RF-3 and RF-4D aircraft
Mod Type : Retro-fit

1. Introduction

This modification involves the installation of a pair of compression spring assemblies into the main wheel undercarriage as an alternative to the bungee cord suspension of the original design using the Bauer (Scherer) Suspension System kit. See to the original document for the photographs referred to.

2. Parts List

This LBA certified system, now manufactured by Alfred Scherer, is for use on Fournier RF3 (green & blue springs) and RF4 (blue & blue springs) aircraft. The spring colours denote different rates for different max all up weights, it is therefore important to only install the correct springs to the correct aircraft.

Qty	Description	Source
2	Spring (Colour coded)	Bauer (Scherer) Suspension System kit. (Photo 1).
2	Strap (Flat plates 27x120mm, drilled 12mm one end)	
1	Bolt (M10x180mm)	
1	Bolt (M10x185mm)	
2	Castle nut (M10)	
4	Washer (M10)	
2	Split pin	
1	Spacer tube* (10mm id x 2mm wall x 100mm long)	Not included in the kit but required for LAA aircraft



Photo 1. The Kit.

*This spacer stops the straps moving toward the centre of the bolt and imparting a bending load onto the bolt during use. Modify the original Fournier part by cutting off the ends flush with the flanges.

3. Action

The following instructions to install the alternative springs to the undercarriage of the Fournier RF-3 or RF-4D aircraft are based on the original German language document supplied with the Bauer (Scherer) Suspension System kit and the experience gained in its installation on G-AWLZ.

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3.1 Preparation

The kit assembles in much the same way as the original assembly (Photo 2) but due to the longer length of the springs compared to the bungees and the fact that, unlike the bungees, they are not under load during fitting you have to drill your own 10mm holes for the centre link bolt. The exact position and hence distance between hole centres is dictated by the wear on your aircrafts stops. To do this the aircraft must be jacked up with the wheel down and locked, about an inch clear of the ground.

(See Appendix for details of jacking and bungee removal.)

Having removed the original suspension system put the drilled end of the strap onto the upper mount and loosely do up the nut.

Next attach one end of the spring to the mount point on the fork casting and, with the casting against its stop, put the other end of the spring against the strap. With both pulled straight, as if under load, mark the position of the spring retaining bolt on the centreline of the straps and remove both from the aircraft.

Photo 2. Assembled (Spot the error! Note that the upper bushes are the wrong way around.).



To allow for a little play during fitting, the centre of the hole to be drilled for the bolt should be adjusted 1mm closer to the end of the strap than the positions just marked. (However to avoid problems with the material shearing under load, the edge of the hole must be no nearer the end of the strap than that of the pre-drilled hole.) Then centre punch and with a 12mm bolt through the other holes, clamp the two straps together and drill a 10mm hole where marked.

(By drilling this way the holes will be identically located.)

The corners can then be rounded off while the straps are clamped together before being primed and painted to prevent corrosion. Once dry, the components can be assembled ready for fitting to the aircraft.

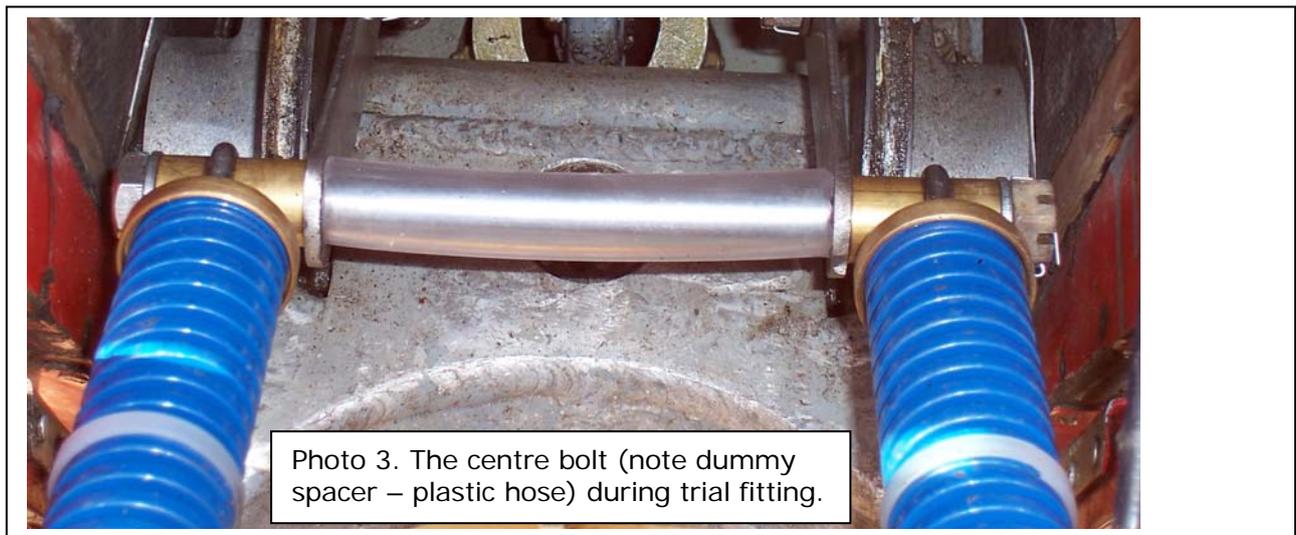
3.2 Assembly

The brass bushes on the springs are not symmetrical, one side is quite noticeably longer than the other, this is important as it prevents the springs jamming on the casting when you connect them to the fork. The longer bush **MUST** go inboard – note that the upper bushes in the assembly shown in photo 2 are the wrong way around.

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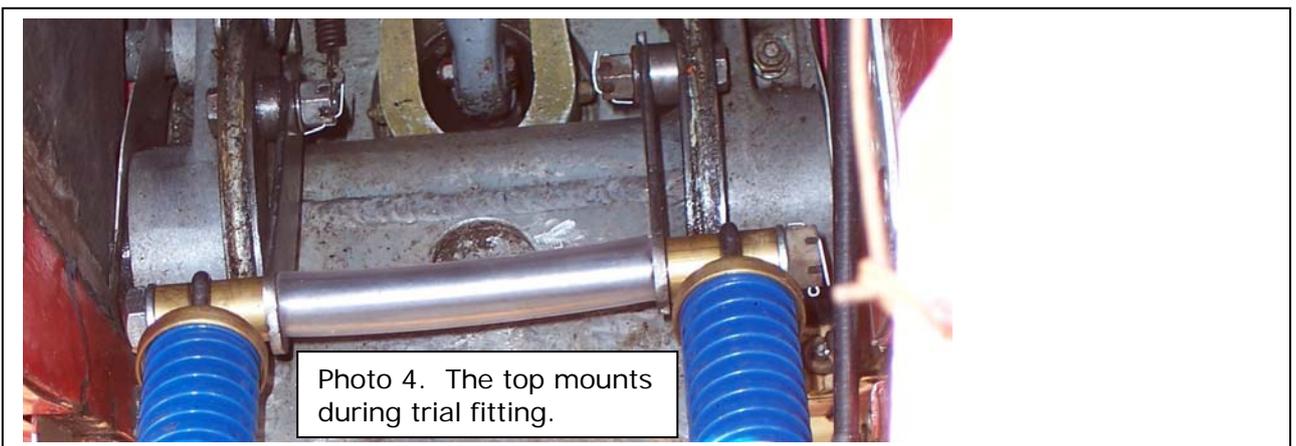
Take the 180mm long bolt, put a washer under the head and grease the shank. Slide the brass bushing of the spring onto the bolt with the short side against the washer, next slide on one of the straps then the spacer tube, the other strap followed by the spring, (large side to the strap) washer and nut.

Do not over tighten the nut as the springs need to be free to move on the bolt. When there is no lateral movement on the bolt but the springs can move freely lock the nut with a split pin. (Photo 3)



Next fit the straps to the top mounts. (Photo 4)

The easiest method is to remove the 'top hat' bushes and withdraw the bolts into the casting. One side at a time and with a little grease, put the bushes into the straps such that the bush will be between the casting and the strap and offer up to the casting, push the bolt back through the bush, fit the nut and tighten until snug then split pin. Do this for both sides.



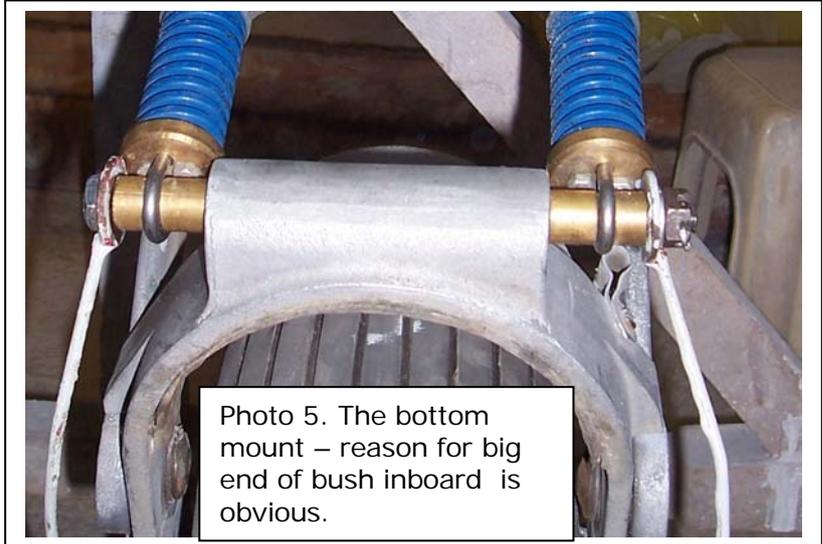
Next take the 185mm long bolt, grease the shank and with the door guide, spring bush (longer side to the casting, smaller to door guide) and fork casting aligned slide the bolt through into the casting.

Line up the other spring bush (longer side to the casting) and door guide with the casting and push the bolt through those too.

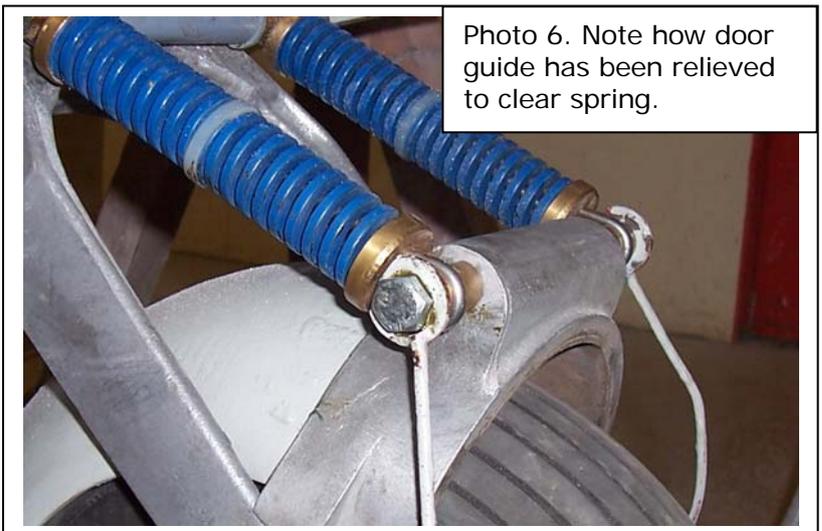
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To make the point again, it is important that the large side of the spring bushing is against the fork casting on both sides to prevent jamming.

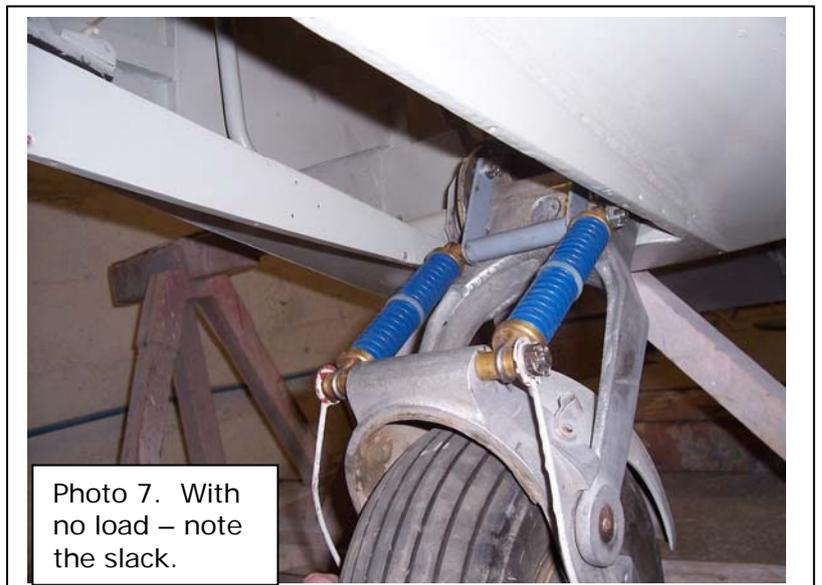
Tighten the nut until there is no lateral movement of the bolt but it is free to turn, then secure with a split pin. (Photo 5)



Note that you may have to relieve the door guide washer to clear the spring. (Photo 6)



Unlike the bungees which were under tension and which pulled the fork casting hard against the stops on the other casting (causing the bang, bang, bang when taxiing) the new springs will sag a little with no weight on them due to that extra 1mm added when drilling the straps. (Photos 7)



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4. Weight and balance

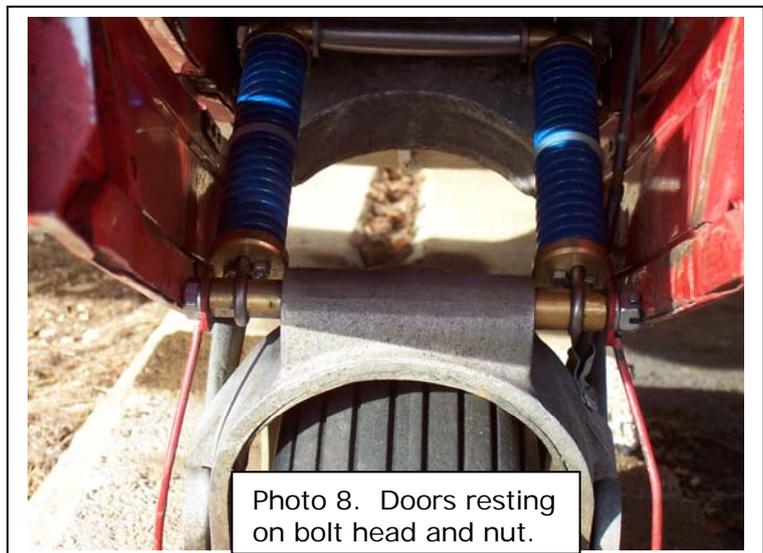
The change in weight following removal of the original bungee cords and the installation of the undercarriage springs adds approximately 0.8kg (1.8lb) in weight. Amend the aircraft weight and balance schedule accordingly.

5. Flight Test and Special Inspections

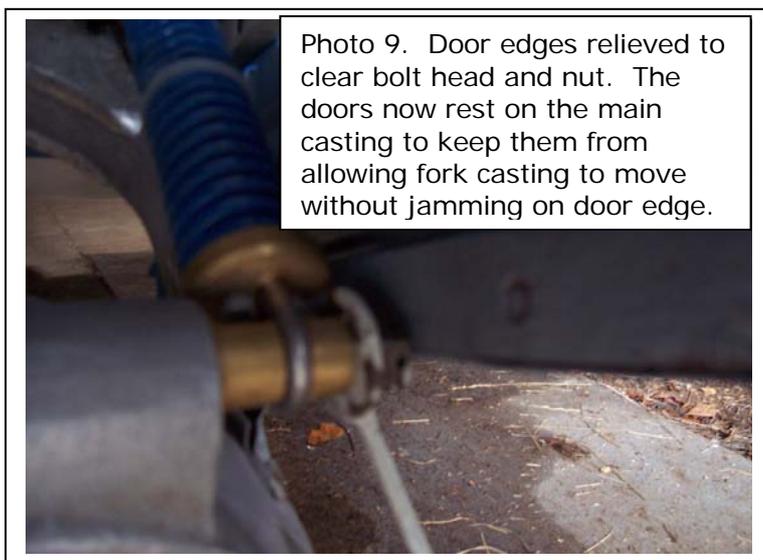
You are now ready for retraction tests. With the aircraft properly supported, carry out an undercarriage retraction and extension check. Check clearances with other parts of the airframe.

As Fournier undercarriage door arrangements differ you will have to experiment and check for clearances on the bolts.

In the normal position on G-AWLZ (the first UK example to be modified), the nut and bolt head on the fork casting are above the door edge and hold the doors open. (Photo 8) This is wrong; the door edges should rub on the main casting and not this bolt to hold the doors open. Experimentation showed that extension of the springs (as would be experienced during taxiing on a rough surface or landing) would cause the nut and bolt head to drop below the door edge and then return to jam on the door edges. This would then prevent retraction of the wheel.



Relieving the door edge as shown (Photo 9) rectified this potential problem on 'LZ'. Because the doors on different aircraft have been found to have varying amounts of clearance on either side it may be beneficial to swap the 185mm bolt end for end to achieve the least interference with the doors.



6. Certification

Before the modified aircraft may be flown a suitable LAA inspector must check the undercarriage springs' installation and, if satisfied, make an appropriate logbook entry, including reference to CFI-Fau 09/2003 and SM11545 and sign a Permit Maintenance Release (PMR).

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Appendix

Jacking of RF-3 and RF-4 and Bungee Removal

Note: The following describes only one method as other methods of jacking exist.

Tools and Equipment

Trestles. (Three about 3ft high, one about 2ft high)

Trolley jack. (2 ton)

Weight. (A couple of car batteries with handles or heavy tool box - about 40 lbs total)

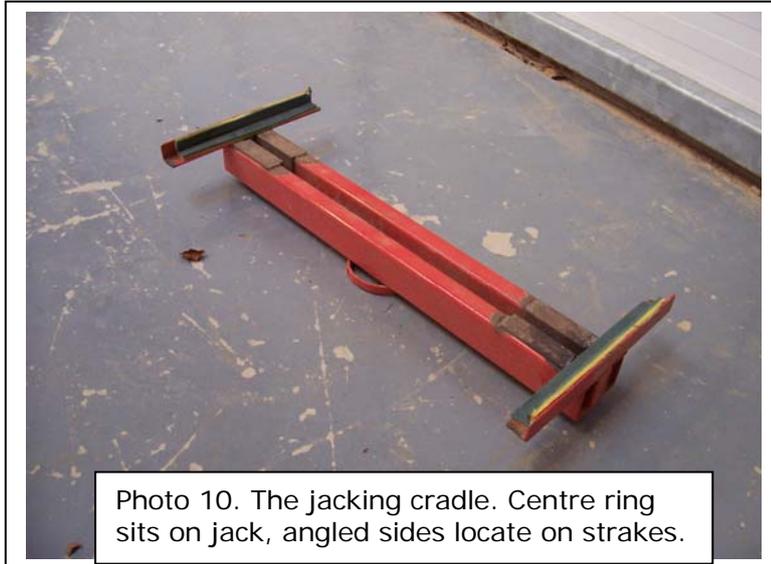
A length of rope.

Jacking cradle. (Photo 10)

Spring extender (Photo 11, reversed spring compressor)

Side cutters.

Metric spanners.



Jacking

The ideal place is in a hangar; failing that flat firm ground in a sheltered location.

Identify the location of the tailplane mounting bulkhead in the fuselage, marked by the 3 bolts on either side, and lift the tail onto the low trestle at this point.

(IF YOU MISS THE BULKHEAD YOU WILL SPLIT THE SKIN.)

Next level the wings with a trestle under each tip.

Return to the tail and tie the weight to your lifting handles. (Photo 12). This is necessary to stop the aircraft tipping forward as you lift it.

Locate the trolley jack and cradle under the strakes and slowly raise the jack until the cradle contacts the strakes, check that it is located correctly then continue to jack up the aircraft. Keep an eye on the tail lifting off the trestle, add more weight if needed.

Once the wheel is clear of the ground put the remaining trestle under the propeller hub. (There should be no weight on this, it is purely a safety measure should the worst happen, better hurt the crankshaft than you!).



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Photo 12. Jacked up; note weight (toolbox) hanging from lifting handles.

Bungee Removal

WARNING, the bungees are under tension and dangerous. DO NOT TRY TO CUT THEM OFF

Remove the split pin and nut from the bolt holding the bungees to the casting.

Using a reversed coil spring compressor as an extender (or tool made for the job) placed between the fork casting and the centre linking bar, stretch the bungees until the load on the bolt is such that it can be withdrawn with fingers. (Or mole grip.)

Then slowly take the load off the bungees and remove the extender tool.

Next remove the split pins and nuts from the top mounts and withdraw the bolts into the casting, the old system can then be removed from the aircraft.

After following the fitting procedure for the new system, lowering the aircraft is the reverse of raising it.