Light Aircraft Association	**Standard Modification** Issue 4 25th April 2022	Mod No. SM15833 Page **1** of **7** Compiled : A Draper Approved : F Donaldson

TITLE : Door Latch Shoot-Bolt Stop

APPLICABILITY : **All Europa variants**
Mod Type : **Retro-fit**

1. Introduction

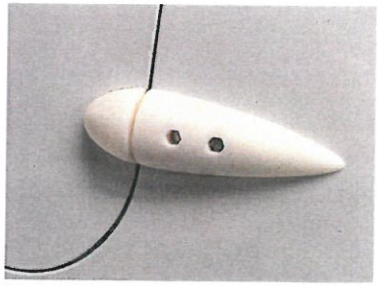
Over the years, there have been several incidents of Europas having one of its gull-wing doors come open at differing stages of flight, from during the take-off roll to during the cruise, some resulting in the window breaking but with most cases resulting in the loss of the door due to the hinges failing in overload due to the rapidly opening door and detachment of the gas strut.

Following the first incident which happened during a demonstration flight with a Europa Company demonstrator aircraft, it was surmised that the most likely cause was due to the pilot having snagged the door latch handle with his shirt sleeve, opening the latch inadvertently. This resulted in the issue of Europa Mod 35 – Door handle guard, which was issued as a mandatory mod and was immediately incorporated into the standard kit. However, in subsequent years, inadvertent door openings and losses continued to be reported. Thankfully, pilots also reported that the aircraft continued to be easily controllable and that no other damage to the airframe was suffered. It was concluded that the cause of these door opening/loss events was due to the door's rear shoot-bolt not having engaged into its socket in the door surround when the door latch was closed, despite the front one having engaged properly.

When the door is open on the ground, it is supported by a single gas strut mounted at its rear which results in the rear of the door being pushed outwards slightly, relative to the front, while it is being closed. As the latch is closed and the shoot-bolts extend front and back from the door, the front one readily engages into its socket but the rear one would sometimes miss its socket and then slide along the outside skin of the fuselage. To the unwary, the door might seem properly latched and secure, even when being checked by pushing against it from the inside. In flight, the suction force generated by airflow over the curved window pulls against the door and the rear of it would then flex outwards, eventually enough for the front shoot-bolt to disengage from its socket.

A number of Europa owners, aware of this door mis-latching problem, have fitted a micro-switch that is operated by the rear shoot-bolt to operate a light on the instrument panel. While a useful safety initiative, it has nevertheless been known for pilots not to notice a door unsafe warning light and this has led to the conclusion that it would be safer for a device to be introduced that prevented the door latch from being fully operated unless both shoot-bolts were properly engaged in their respective sockets in the door surround. The installation of shoot-bolt stops does not alleviate the pilot's responsibility to confirm that the doors are properly latched. Various devices were designed and tried by LAA Engineering but most were found to be too complex or unreliable. The door latch shoot-bolt stop turned out to be the simplest and most reliable design and is the subject of this modification.

The shoot-bolt stop is comprised of two main parts which together form an aerodynamically shaped protuberance that is attached to the fuselage outside surface. The 'working' part of it is mounted where the rear shoot-bolt will contact it, should it fail to engage in its socket when the door latch is operated towards the closed position, preventing the latch lever from fully closing. The forward part of the assembly, attached to the door itself, is simply an aerodynamic fairing.



The stop and fairing are available from LAA as SLA 3D-printed plastic parts. Although white in colour to help match most Europa colour schemes, they may be painted in acrylic paint. Alternatively, they can be self-manufactured from a suitably resilient material such as wood.

2. Parts List

Qty	Part No.	Description	Source
2 sets	DLSBS	Shoot-bolt Stop, Front Fairing, hexagonal bolt-hole infills.	Contact The Europa Club
4	M3 bolt x 10mm long.	Installation hardware	Hardware retailers
4	M3 nut.		
4	M3 wide area washer.		
2	Csk screw – fine thread		

OR

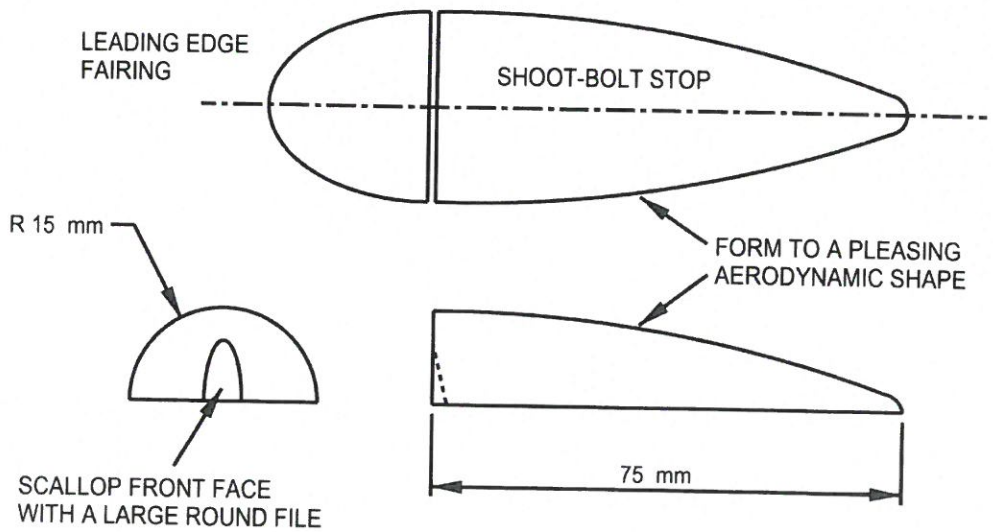
2	N/A	Self-manufactured shoot-bolt stop and front fairing, self-tapping screws and wide-area washers or structural adhesive made using flox stiffened Araldite 420, Ampreg 30, Scheuffler L285/H286, Aeropoxy PR2032/PH3660 or West Systems 105/205.	General hardware outlets

List of related documents

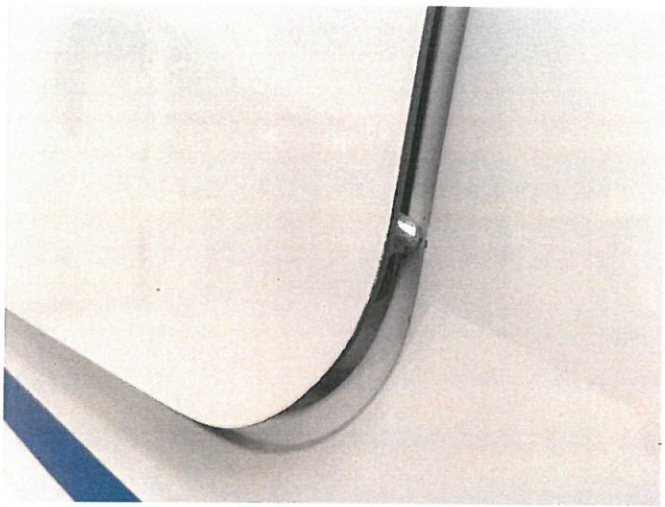
Title	Revision
LAA Airworthiness Information Leaflet **MOD/247/012**	1

3. Action

3.1 If it is decided to self-manufacture the shoot-bolt stops; from a suitable type of wood, such as that used for a broom handle, make two stops and front fairings according to the drawing.



3.2 Open the door and close the door latch to extend the shoot-bolts and clean off excess grease from the rear one.

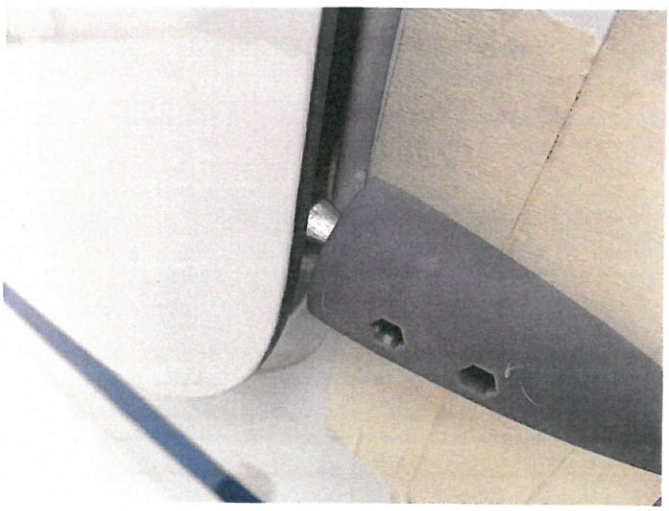


3.3 Open the door latch then lower the door into its recess, then progressively close the door latch enough so that the forward shoot-bolt enters its socket in the door surround but at the same time carefully pull the rear end of the door outwards enough so that the rear shoot-bolt does not engage into its socket but instead starts to run along the outside edge of the door surround.

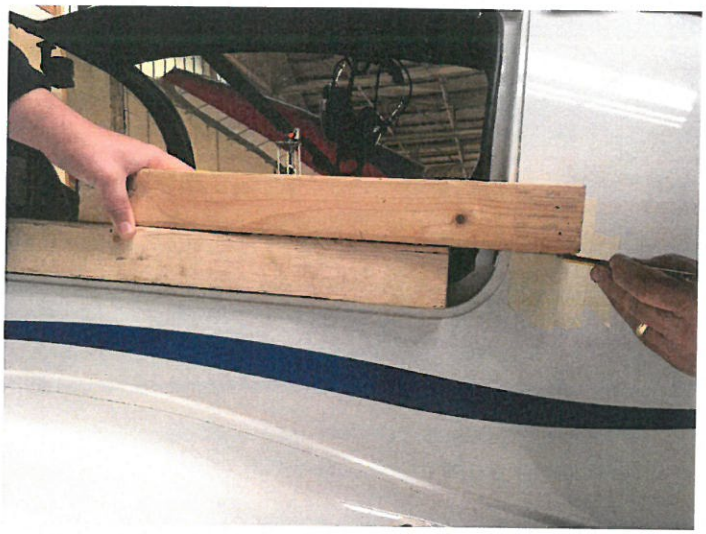
3.4 Close the door latch only enough until the rear shoot-bolt's tip aligns a couple of mm aft of the rearmost edge of the recess for the door. The door latch handle should be approximately half way closed.

3.5 Having identified where the shoot-bolt stop will be installed, apply masking tape to the fuselage side to protect the paintwork.

3.6 Position the stop so that the scallop in its forward face is centrally aligned and in contact with the tip of the shoot-bolt. Maintaining this arrangement, adjust the latch as necessary until the stop's forward face is aligned with the door recess.



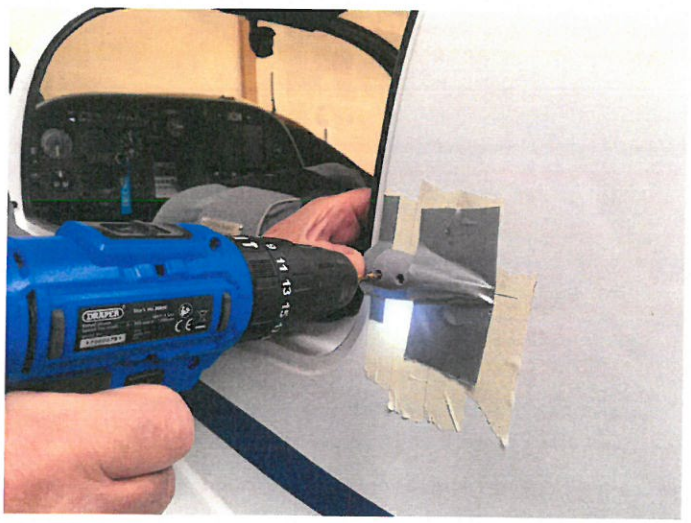
3.7 Without disturbing the door or the latch, withdraw the stop then draw a reference line on the masking tape to indicate the tip of the shoot-bolt then draw a 100mm (4") line back from this point that is parallel with the door surround's lower sill. The method shown in the photo is one way of doing this.



3.8 Re-position the stop against the shoot-bolt as before and align it with the reference line then secure it in position with duct tape or similar.

3.9 Checking that nothing inside the fuselage will be damaged, with the 3D-printed stop, drill a 3mm hole through the fuselage side using the stop's front bolt hole as a guide. Insert an M3 hex head bolt to maintain the stop's position – the bolt head is a tight fit in the stop and will need pushing fully in with a narrow object such as a small screwdriver. Checking that the stop remains aligned properly, drill the 2nd 3mm hole through the fuselage and install an M3 bolt in this hole too.

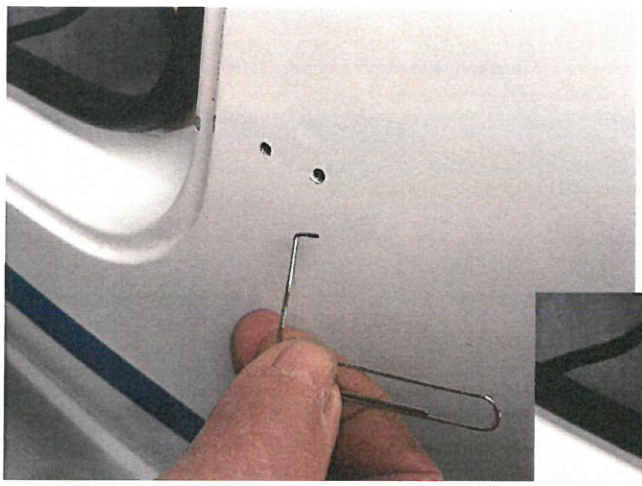
3.10 For the wood stop, drill two 2mm diameter holes for self-tapping screws from the inside, 15-20mm apart, into the stop's base then open up the holes through the fuselage skin to 3mm.

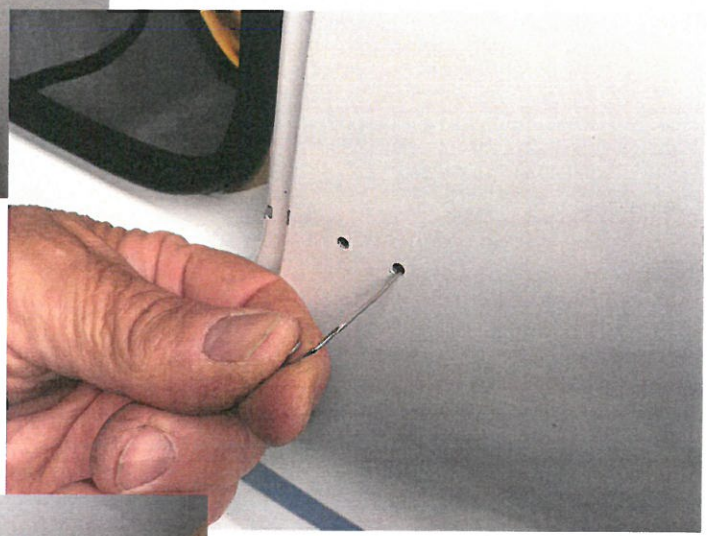


Where custom fitted equipment inside the fuselage precludes the drilling of holes for the bolts or screws, the wood stops may be bonded directly in place using structural adhesive Araldite 420, or laminating resins including Ampreg 30, Scheuffler L285/H286, Aeropoxy PR2032/PH3660 or West Systems 105/205, flox stiffened as required, following thorough surface preparation and cleaning of all bonding surfaces beforehand. As there is no experience of how effective it would be to bond the 3D-printed parts, it would be necessary to first fit a wood base-plate to the stop, attaching it with countersunk self-tapping screws into the bolt holes.

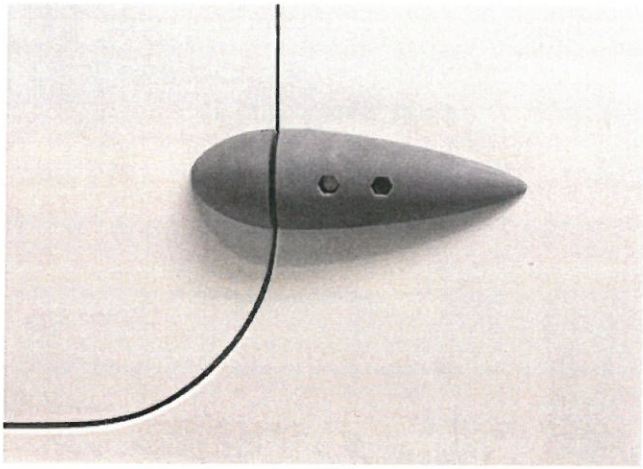
3.11 Noting that when closing the door it is likely that the door's rear flange will sit on the stop, carry out a careful trial door closure attempt while allowing the rear shoot-bolt to contact the stop rather than enter its socket. The door latch lever should be prevented from closing much more than half way but don't apply more than a light force at this stage to avoid damage to the bolt holes which will need to be reinforced.

3.12 Remove the stop and using a piece of stiff wire, such as a paper-clip, with a 6 or 7mm long leg bent to 90 degrees at the end, hook out or scrape away 3 or 4mm of the foam core at the two holes between the inner and outer skins of the fuselage. Fill the resulting gap between the skins using rapid araldite, allow to cure then re-drill through with your 3mm drill bit.





3.13 Remove the protective tape from the fuselage side then install the stop; the wood one using self-tapping screws and wide-area washers under the heads to spread the load to avoid crushing the fuselage skin or, for the 3D-printed stops, install the M3 bolts and secure them each with an M3 Nyloc nut (a 5.5mm or 7/32" socket should work) with a wide-area washer under it – don't over-tighten the nuts - then fit the hexagon shaped bolt-hole caps; the longer one at the front and with the tiny arrow on its top pointing forwards, securing them with rapid araldite or super glue.

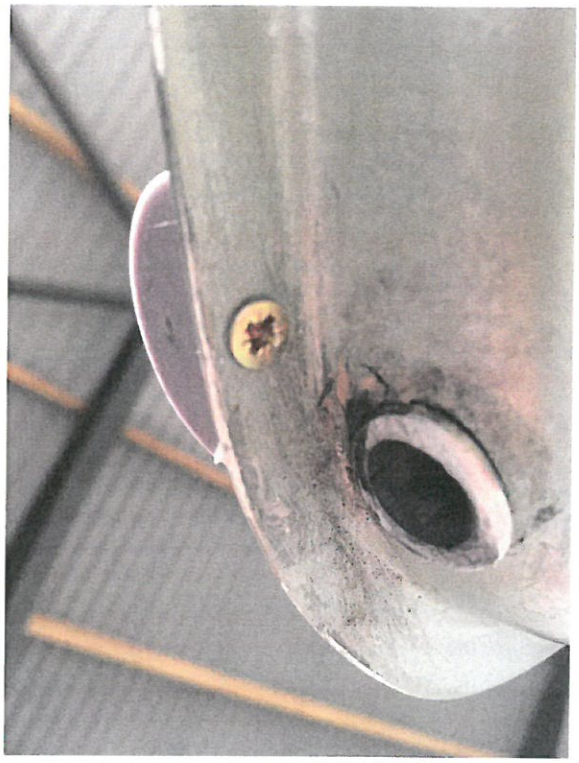


3.14 Carry out a final check of the stop for effectiveness in preventing the door latch from being fully closed. The springiness felt when trying to force the latch to close when the rear shoot-bolt is being baulked is due to the long push-rod to the rear shoot-bolt bending. Be careful not to apply excessive force and bend the push-rod.

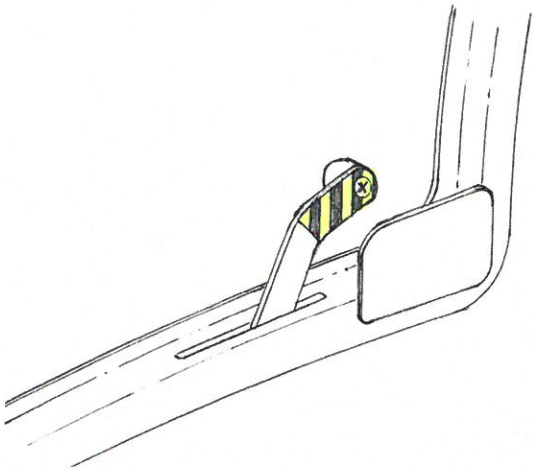
3.15 Next try closing the door properly, applying forward pressure to the door so that it aligns with the door surround. There should be no need to pull the back of the door inwards as seems to be the natural instinct. If pulling the door inwards is found necessary, it would be sensible to consider replacing the rubber seal with a slightly smaller profile version.

3.16 With the door closed, apply a bead of rapid araldite epoxy to the inside edge of the front fairing and apply it to the door (appropriately cleaned beforehand) directly in front of the stop part, its rear face aligned with the rear edge of the door – there will be a small gap between the two parts. Clean off any epoxy that has oozed out, hold the fairing in place with tape and allow the epoxy to cure.

3.17 With the door open again, drill a small hole through the door's flange from the inside into the front fairing, counter-sink the hole with a larger drill bit between your fingers (don't use a power drill as it may snatch the glass fibre and go too deep or right through even), then fit a small self-tapping screw to retain it securely.



3.18 To make it more obvious to those not familiar with the door latch operation, apply black and yellow warning stripes to the inside forward end of the door latch lever. These warning stripes will be hidden behind the lever guard when the latch is fully closed.



3.19 Re-grease the rear shoot-bolt and ensure that the latch mechanism is not stiff but snaps closed under spring-force when the lever passes the half-way closed position.

3.20 From the seated position, carry out a final check that the door can be closed and latched without difficulty, remembering to push the door forwards so that it centres with the door surround, rather than pulling it inwards.

4. Weight and Balance

	Weight (lb/kg)	CG (in/mm)	Moment
Existing A/C			
Weight Added	NEGLIGIBLE		
Post Mod A/C			
The change in weight due to the shoot-bolt stop's installation is negligible. If other significant changes to the aircraft are made a full weight and balance may be necessary.			

5. Flight Test and Special Instructions

1) No flight testing is required, but before next flight a logbook entry will need to be made for the work done and includes the Mod reference SM15833, or to refer to a worksheet that describes it. An LAA inspector must check that the installation complies with the installation instructions and, if satisfied that it works as intended, the inspector must sign the logbook entry/worksheet and a Permit Maintenance Release (PMR).
2) Complete a form **LAA-MOD 1**, which your inspector must sign, then send a copy to LAA Engineering – a scan of the signed Mod 1, sent to engineering@laa.uk.com will be acceptable.

Checked:	A Draper EngTech Design Engineer	Signed	
Approved:	F Donaldson B.Tech C.Eng FRAeS Consultant Engineer	Signed	