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# Electric flap drive - conventional taildragger

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<b>Classification</b>	Optional
<b>Applicability</b>	Conventional taildragger Europas
<b>Compliance</b>	N/A

## Introduction

The standard flap drive mechanism on the monowheel Europas is a mechanical drive combined with the undercarriage retraction mechanism. Conventional taildragger Europas, being fixed wheel aircraft, can have an electric drive for flap operation, similar to that used on tri-gear Europas.

## Action

Remove the items in the drive train between the undercarriage lever and the flap cross shaft which affect solely the flap drive - these are FL19, FL20, FL21 and their associated fasteners.

Remove all parts of the outrigger mechanism attached to the wing and the flap, leaving it bare to the wing plate W18 and the flap hinge plate FL3.

Reassemble the wing/flap outboard fittings according to figure 7 at the end of this leaflet.

The slots in the fuselage side for the flap drive cross tube will have been cut to suit a maximum flap angle of 27°. Check that, with the electric actuator fitted, the slot is still long enough.

## Actuator installation

The flap actuator is mounted at the motor end to its mounting bracket FL26 which is fastened to the fuselage floor. The floor will require a local plywood hard point and glass fibre reinforcement to be added. The rod-end is bolted to the lugs which are welded to the flap actuating cross-tube.

## Floor reinforcement

### Preparation

Mark out the area on the inside fuselage floor for the position of the 3 mm plywood hard point according to figure 1.

Taking care not to cut through the outside skin, cut out the inner skin and foam core within the marked out area. Cut the piece of 3mm plywood to fit in place of the removed foam. allow about 2 - 3 mm (1/8") clearance all round.



## Hard point installation

Scuff sand the fuselage skin surrounding the cut out area to a border of approximately 5 -6 cm (2 - 2½"). Cut out 4 plies of 'bid' at  $\pm 45^\circ$  25 cm x 18 cm (10" x 7") and lay-up two plies into the cavity, lapping onto the inside skin. Apply flox around the edges of the cavity to avoid air bubbles forming.

Apply a skim of flox to both sides of the plywood insert and squidge it in place, removing any excess flox which oozes out before applying the two remaining plies of 'bid' over the top. Peel ply all over and allow to cure.

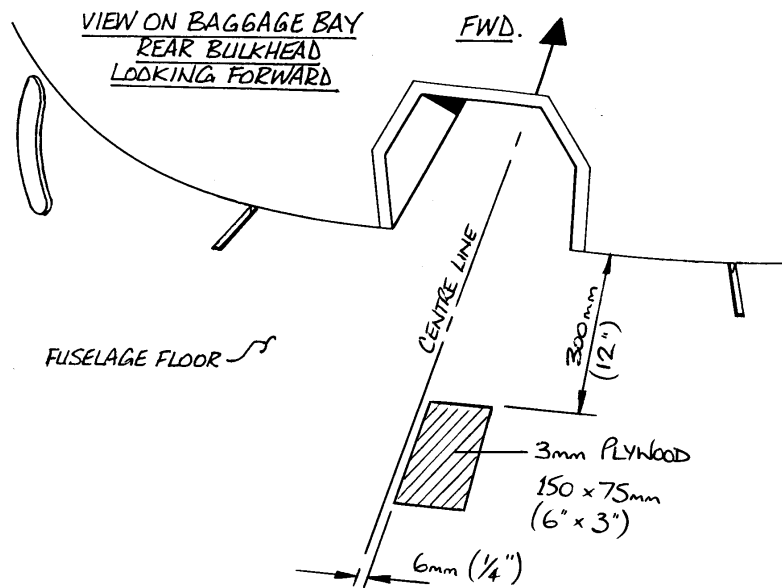


Fig 1. Flap drive reinforcement position.

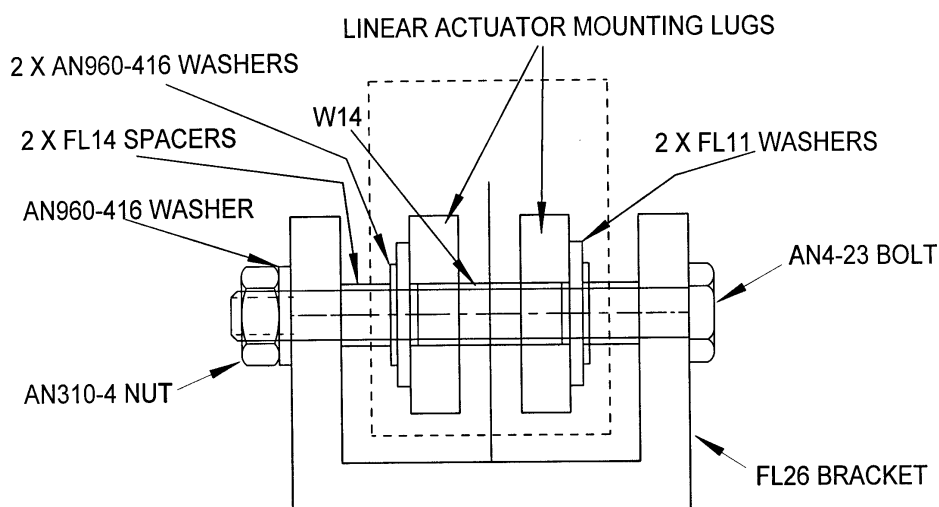
## Linear actuator preparation

Drill out the two mounting lugs from 8mm to 5/16" - there will be very little material to remove. Fit a spacer W14 across these two lugs using Loctite 638.

Fit the adaptor FL30 to the hole in the end of the plastic piston, again opening out the hole to 5/16" if necessary. Fit FL14 spacers to the cross hole in the piston, and locate the adaptor and spacers in place with an AN4-12A bolt, MS21042-4 stiffnut and AN960-416 washer.

## Mounting brackets

Figure 2 shows the attachment arrangement of the linear actuator. The mounting bracket FL26 will be bonded and bolted to the floor through the hard point.



*Fig 2. Actuator mounting assembly.*

A photo of the actuator assembled to the mounting bracket is shown in figure 3.



*Fig 3. Actuator assembled to mounting bracket.*

## **Installation**

Using a 12 volt battery run the motor of the actuator to fully extend the push-rod. Next, scuff sand the base of the actuator mounting bracket FL26 and then attach it to the motor end of the actuator; the motor should be orientated as shown in figure 3. With the wings rigged to the fuselage and the flaps in their retracted position, fasten the flap actuator by its rod-end to the lugs on the flap cross-tube according to figure 4.

**Note:** *Ensure that the rod end has at least one and a half diameters thread engagement.*

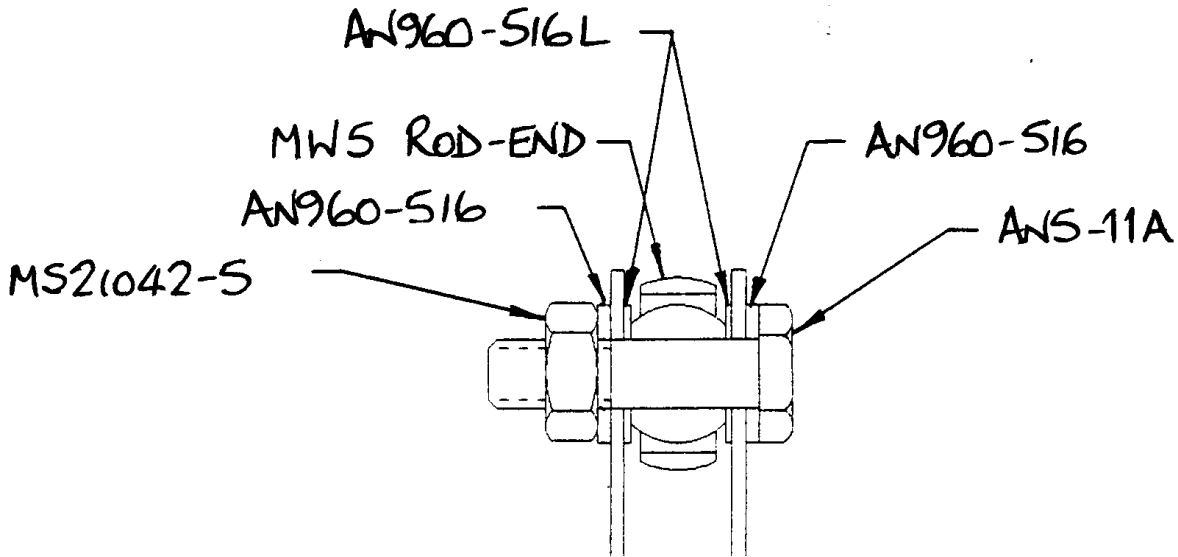


Fig 4. Section of bolt and washer arrangement for rod-end.

Ensuring that the actuator is at 90° to the flap cross-tube rest the bracket on the fuselage floor, which should lie on the hard point. Mark its position on the fuselage floor as a reference then apply a skim of Araldite420 and flox to its base. Reposition the bracket to the reference point and remove any excess adhesive before allowing to cure undisturbed. Double check that nothing has moved before leaving it.

After cure remove the actuator from the mounting bracket and drill through the bracket and right through the fuselage floor with a 4.8mm drill using the existing holes as a guide.

Install AN525-10R12 bolts from the outside, with AN970-3 washers under their heads, and secure them with MS21042-3 nuts.

### Flap operating switch

A toggle switch is used to operate the flaps, as a rocker switch may cause confusion between pitch trim and flaps. A suggested position for this switch is shown in figure 5.

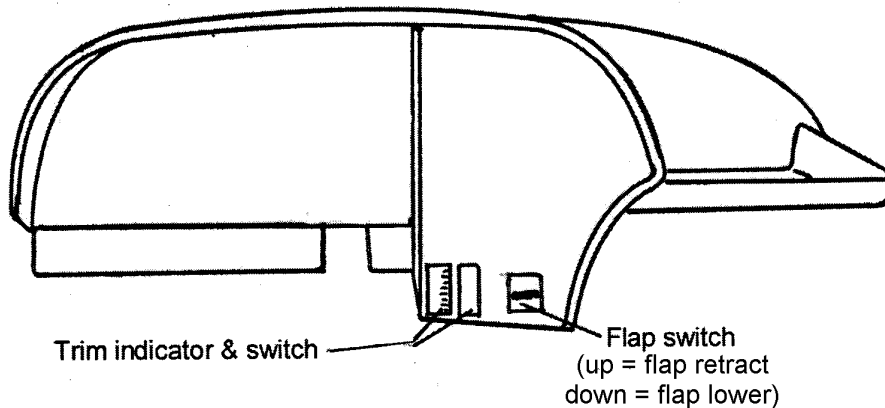


Fig 5. Flap switch circuit diagram.

The switch is a double pole, double throw (DPDT) type switch and it is spring loaded off in its centre position. Although the switch is marked “AC only” it is suitable for the use with the low current drain through it to operate the actuator.

Figure 6 shows the electrical circuit that should be used, in conjunction with the main circuit diagram in the Electrical Chapter of the Europa Build Manual..

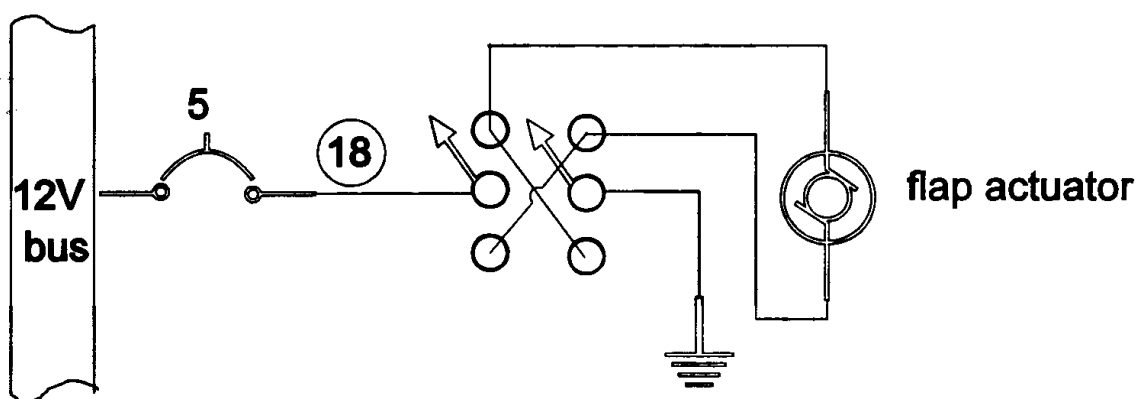


Fig 6. Flap switch circuit diagram.

## System check

Operate the system to check that it operates freely and that full flap movement is achieved (the linear motor incorporates electrical stops at each end of its travel). Check also that there is no binding of the flap cross tube in the fuselage slots.

## Flap position indicator

As the selection of flap angle is dependant on the length of time the switch is operated, some means of checking the flap angle is required. Adhesive decals (FL29) are supplied to provide markings to the port side flap upper surface and wing. With the flaps retracted the 0° mark and the mark on the wing trailing edge should line up with the pilot’s line of sight. The majority of the other markings will be hidden under the wing’s flap close out flange.

While the flap extends, the markings on the flap are exposed allowing the pilot to select the desired flap angle accurately.

## Application

The solution to the puzzle of applying the flap indicator decal (FL29) is described below:-

With the flaps retracted, mark a line on the flap 55cm (21.5”) inboard from the flap tip end as indicated on the decal.



From the right hand side of the decal, cut along the sloping top line, stopping near the 0° mark. Again from the right hand side, cut along the bottom, stopping in line with the left hand vertical border line. Next, cut from the bottom, along the right hand side of the single, wing trailing edge decal until you meet the cut along the bottom of the flap decal. You can cut off the excess along the right hand side of the and round off the corners at this stage.

Clean the port flap and wing where the decals will be applied, then retract the flaps fully. Slide the flap decal over the flap but under the wing, leaving the wing decal over the wing skin. Line the decals up with the wing trailing edge and the mark on the flap using the alignment marks.

Next, using adhesive backed tape, secure the flap decal along the edge next to the 0° marking and, with a separate piece of tape, secure the wing decal along the short end that is furthest inboard. Now separate the two decals by continuing the cut along the bottom of the main decal.

Hinging the wing decal up, cut around the three free edges. Peel back half of the backing, cutting it off before carefully pressing it back down onto the wing surface, ensuring that it remains aligned with the 0° marking on the flap decal. Remove the securing tape, cut the remaining part of the decal out and stick it down onto the wing.

Extend the flaps, hinge the decal up and peel off a couple of centimetres (about 1") of backing so that the edge nearest the 30° marking can be stuck down. With the decal now secured at one edge, remove the adhesive tape, cut the remaining excess off, then stick the rest of the decal down onto the flap.

Retract the flaps and confirm that, when viewed from the cockpit, the wing mark aligns with the 0° mark on the flap.

### **Pilot's Operating Notes**

Take off and landing with full flap can be safely carried out, as would be done with the monowheel aircraft. However, reducing the take off flap to 18°, although increasing the take-off run slightly, will reduce the total trim change during flap retraction.

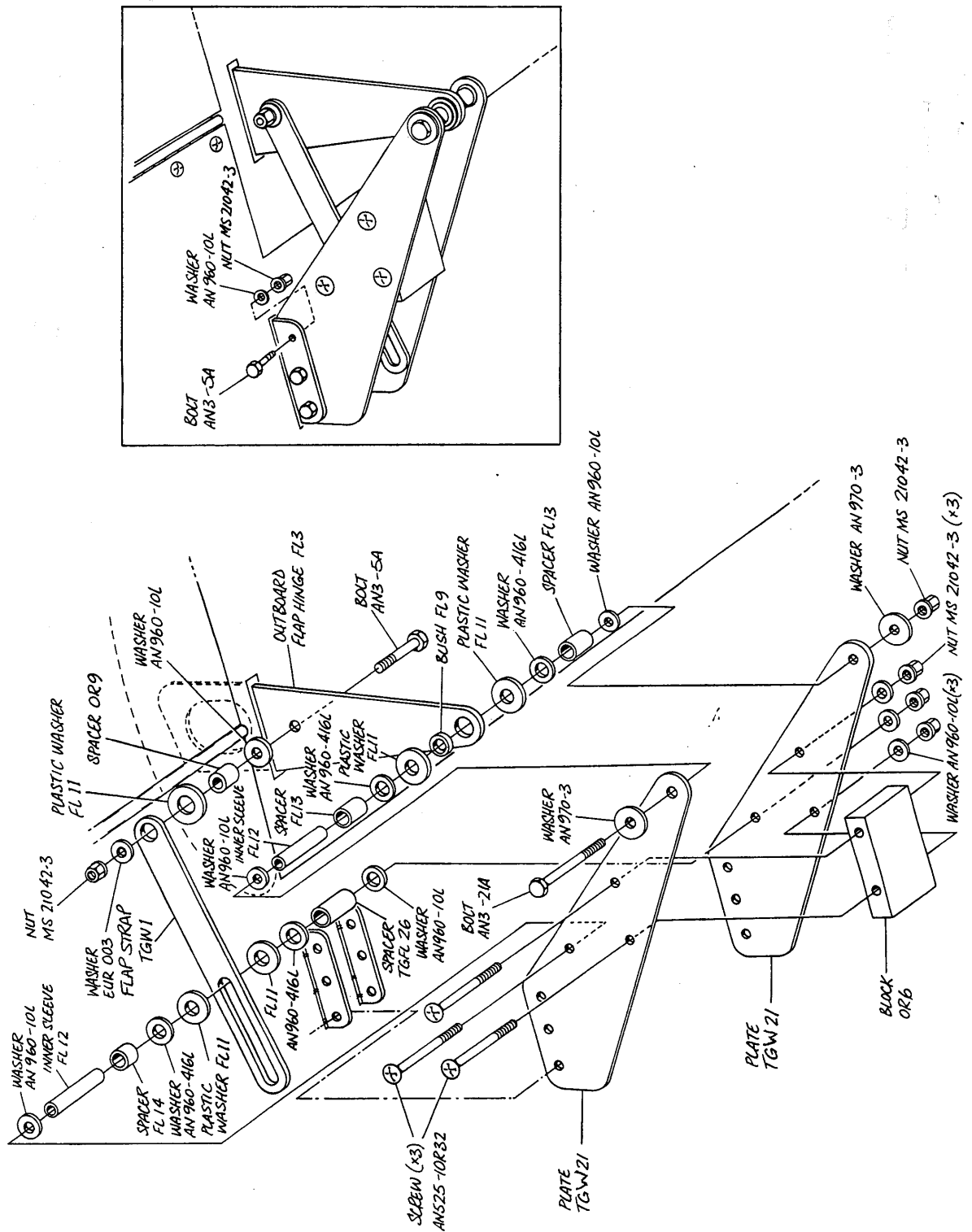


Fig 7. Flap outboard hinge assembly.



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