15. Pitch torque tube

The pitch torque tube, which runs transversely behind the seat backs of the cockpit module, transfers inputs from either control column to the tailplane via a single central output. See figure 1. Refer also to the exploded diagram at the end of Chapter 13.

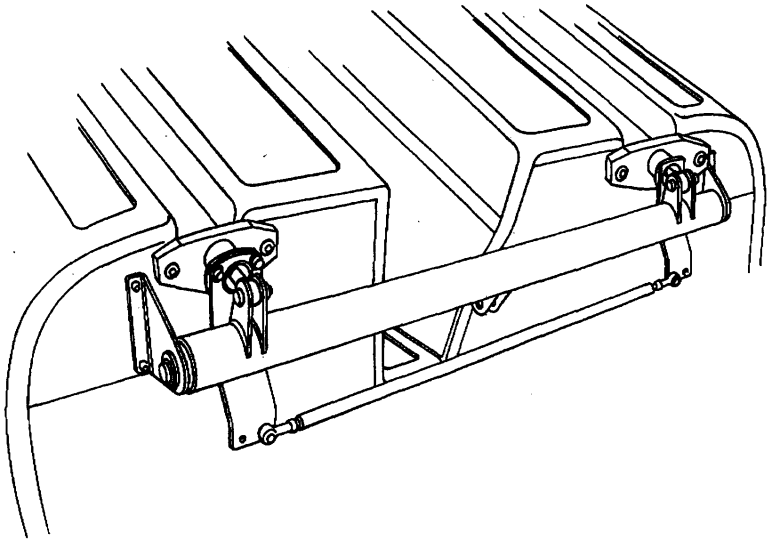

Fig 1. Installed arrangement of pitch torque tube

Step 1

End caps

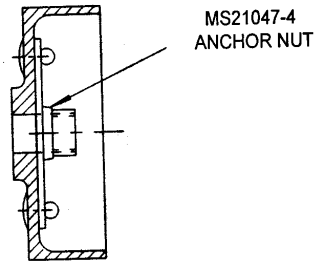

Fig 2. End cap with anchor nut.

To enable the pitch torque tube CS10 to be supported and pivot, end caps CS10C/2 are installed with pop-rivets in each end. Before installing them, though, rivet on the back of the end cap an MS21047-4 anchor nut. See figure 2.

Hold the anchor nut in place by engaging an AN4-10A bolt just finger tight and drill through the lugs, increasing the hole diameter, and the end cap, with a 3.3 mm drill for the rivets. Use two TLPD424BS rivets to fasten each anchor nut then remove the bolt.

Insert the end cap with the anchor nut attached into the end of CS10 with rapid epoxy between the mating surfaces. The two end caps must be as square as possible to each other to minimise misalignment of the pivot bolts. Any remaining misalignment will be accommodated for by the self-aligning bearings that will be mounted to the support brackets. The rapid epoxy is used as a liquid shim only in this application.

After the adhesive has cured, mark and drill four 3.3 mm holes through both CS10 and the end cap for pop-rivets as shown in figure 3, then install TLPD424BS rivets in all of the holes. Pull the rivets progressively, going from one to another in two or three stages before the final pull.

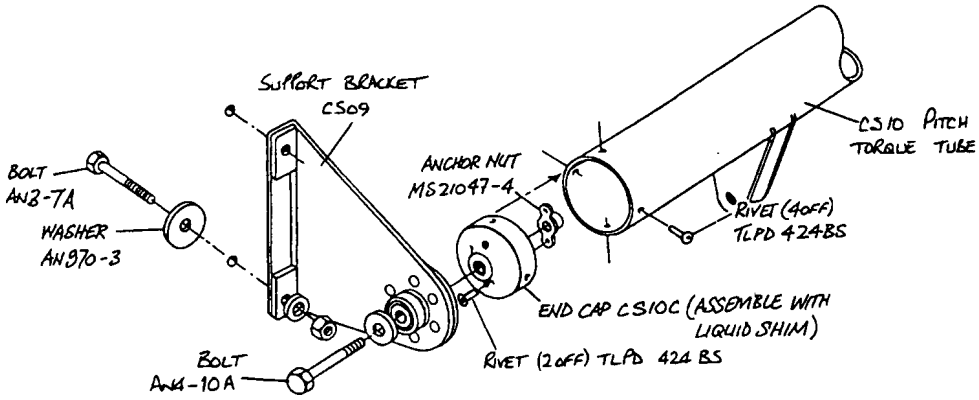

Fig 3. End cap installed in torque tube.

If you intend to protect the inside of the tube with a corrosion inhibitor, carry out the protection process after capping one end, not forgetting to plug the bolt hole first to prevent soaking your boots.

Step 2

Support brackets

The two brackets CS09, which will support the pitch torque-tube, require a CS09B self-aligning bellcrank bearing assembly to be riveted to them. The bearing should be attached to the outside of the bracket as shown in figure 4 using six AN470AD4-7 or TLPD435BS rivets.

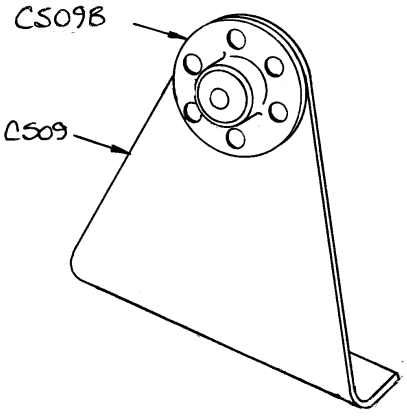

Fig 4. CS09 bracket with CS09B bellcrank assembly.

In order to enable the attachment bolts to sit close to the bracket's main flange, thus reducing the offset effect of the loads on the bolts, and to spread the loads over a wider area, cuddle plates are used which must be bonded to the bracket's attachment flange over each attachment hole. See figure 5

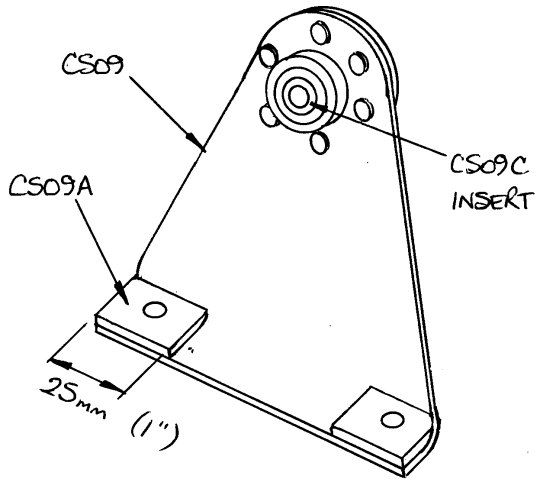

Fig 5. CS09A cuddle plates bonded to CS09 bracket.

Make four of these cuddle plates CS09A from the blank EUR010, filing one edge to form a radius (approximately 10 mm -3/8") to fit the inside radius of CS09. Scuff sand the bonding surfaces and bond a cuddle plate over each mounting hole with Araldite 420, drilling a 4.8 mm hole through after cure, using the existing holes as guides.

Step 3

Installation

Bolt the brackets to the torque tube via the bearing's hole using AN4-10A bolts, ensuring that the CS09C sleeve is still in place in the bearing, and that a EUR001 washer is used under the bolt head, then mark the bolt head and the bracket CS09 with a painted line to help identify any loosening of the bolt during service.

Attach the pitch push-rods CS11, running through the aileron torque tubes, to the outer pairs of lugs on CS10 with AN5-11A bolts with an AN960-516 thick washer under its head, an AN960-516L washer each side of the rod-end and an MS21042-5 nut with one or two AN960-516L washers under it to prevent the nut becoming thread bound. See figure 6.

Note: *The bolt shank only, not thread, must be in the lug adjacent to the nut.*

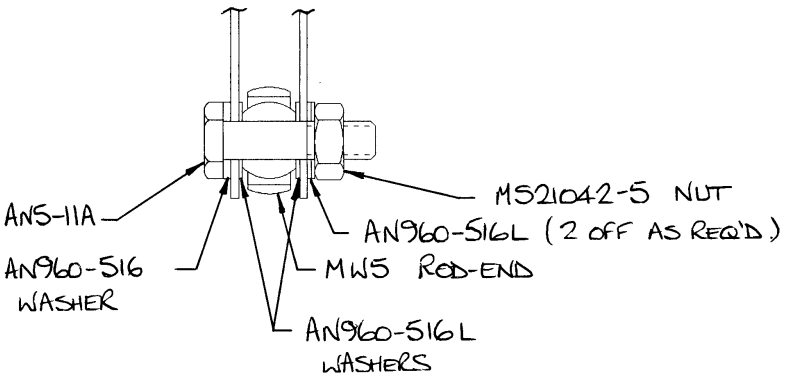

Fig 6. Typical section of rod-end attachment.

It will be easier to attach the MW5 rod end to the central lugs at this stage than to do it with the cockpit module permanently installed. Use the same attachment method as with the outer lugs.

Note: *An important point to consider is that, to ensure maximum available movement of the ball in the rod ends when moving the control column from side to side, both rod ends of the push-rod must be aligned with each other.*

With the pitch push-rod adjusted to its shortest length, lift the pitch torque-tube assembly and place a small shim into each aileron torque tube to maintain a distance of 4.0 mm (0.16") between the push rod and the inside of the torque-tube. See figure 7.

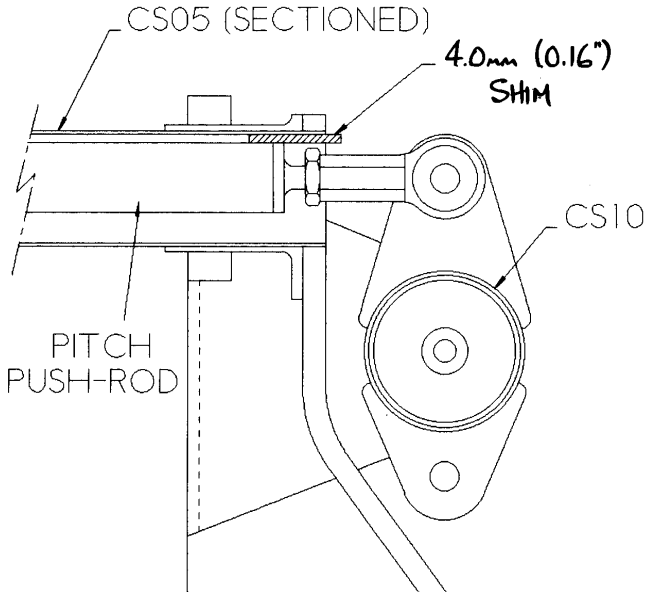

Fig 7. Pitch push-rod to cross-tube assembly.

Check that the pitch push-rods are central within the aileron torque-tubes to ensure maximum clearance all around.

The reason for this setting up is to ensure that the push-rods have maximum clearance, above and below, in the aileron torque-tube.

Clamp the brackets CS09 in position and drill through the cockpit module with a 4.8 mm drill, using the bracket's mounting holes as guides.

Remove the shims and, bolting from the seat back rearwards, attach the brackets in place with AN3-7A bolts with AN970-3 large area washers under their heads and MS21042-3 nuts with AN960-10L washers.

Note: *If the surface that the brackets are sitting on is not entirely even, sand off excess resin bumps first and bed them on flox if necessary.*