Long Range fuel tank (Monowheel)

Introduction

The Long Range fuel tank is an auxiliary tank which is fully portable and can be installed in or removed from the Europa in less than a minute. The tank, which fits into the baggage bay, can provide an extra 35 litres of useable fuel. Total weight of the tank with full fuel is approximately 30 kg (66 lb).

The fuel from the Long Range tank is transferred to the reserve (starboard) side of the Europa's main tank via special fittings using syphon action so there is no need for a new fuel valve or an extra electric transfer pump.

The Long Range fuel tank sits in the starboard side cavity of the baggage bay and suits all mono-wheel aircraft.

The cut away shape in the front face of the tank is there to enable fitment into aircraft fitted with the wing rear socket tie-bar.

A schematic diagram of the tank installation is shown in figure 1.

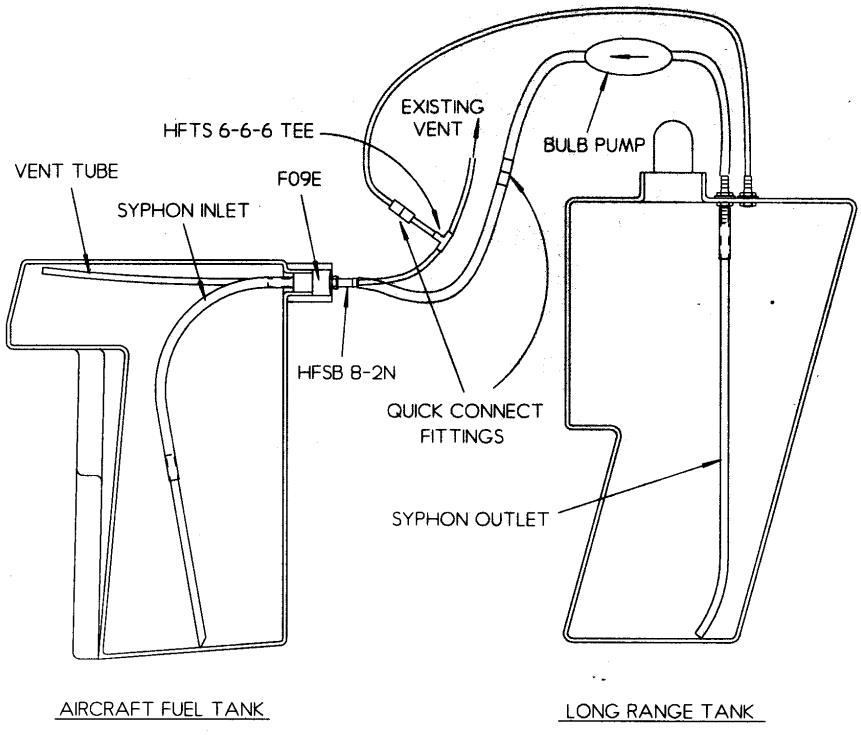


Fig 1. Schematic diagram of installation.

Installation

Main tank vent/fuel inlet fitting

The original vent fitting F09B in the rear of the fuel tank is to be replaced by a new fitting F09E which allows both a vent and a fuel inlet from the Long Range tank. In similar fashion to the original vent fitting a 1/4" diameter aluminium tube is installed to enable the air from the front corner of the tank to be expelled whilst filling with fuel. In addition, an 8mm (5/16") tube is installed in the same fitting which provides the fuel inlet to the main fuel tank.

Screw the fitting F09E firmly into the fitting HFSB 8-2N. The tapered thread should not require any sealant on it.

With the assembly orientated with the 1/4" vent tube so that it would be outboard of the 8mm tube, curve it so that the end will be at the top front corner of the tank without it touching. A bit of trial and error may be needed here. A gentle curve over its full length rather than a bend at the end will help installation.

To form the fuel inlet syphon tube cut a piece of the E-95633-03 tubing to about 250 mm (10") long and push a 200 mm (8") long piece of the 8mm aluminium tubing into one end. Now push the other end on to the short 8mm tube in the F09E fitting arranging it so that it bends downwards. See fig 2.

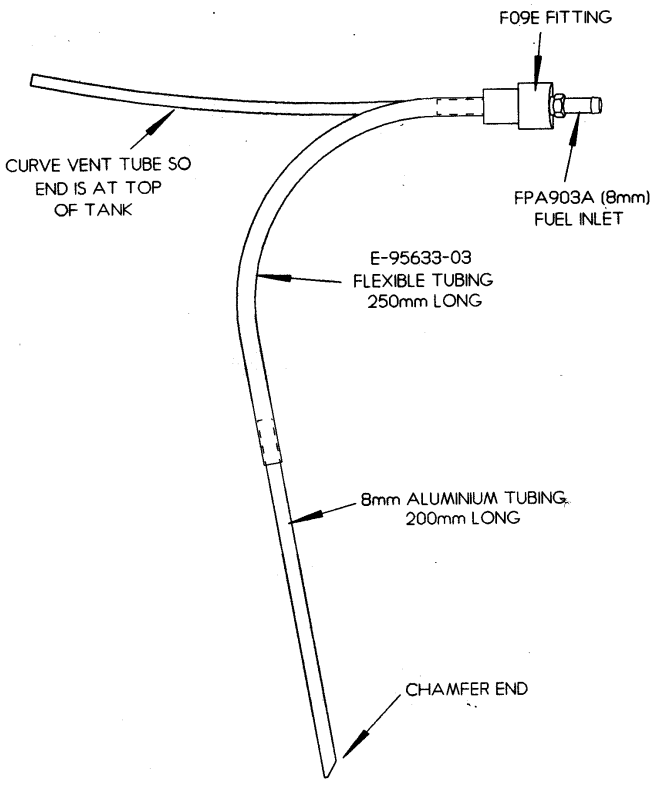


Fig 2. Syphon tube arrangement in vent fitting F09E.

Substituting fittings

Checking first that the fuel level in the main tank is well below the fuel filler hose level, blow down the vent tube to clear any fuel from it. Remove the original vent fitting F09B and disconnect it from the vent tubing.

Insert the new F09E fitting ensuring that the syphon tube goes to the bottom of the tank and doesn't get caught on the fuel tank shelf. Remove the filler tube so that you can look inside the tank to confirm this. *If the syphon tube does not go to the bottom of the main tank, the system will not work properly*. Orientate the fitting so that the vent tube end is at its highest point and tighten the hose clips to seal it.

Long Range tank fittings

A syphon tube and an air vent are to be installed in the top of the Long Range tank.

Two bulkhead fittings HFBP 6-6 are used and therefore two 1/2" holes are required in the top of the tank. As the bulkhead fitting's nut is to be on the inside of the tank, the 1/2" holes need to be fairly close to the filler neck.

First open up the filler neck hole as required using a 54 mm (2-1/8") hole saw.

The positions of the two 1/2" holes, shown in figure 3, ensure that the hoses will not be in the way when filling the tank with fuel when it's installed in the aircraft. Drill the holes with either a 1/2" hole saw or conventional drill bit.

You will inevitably cause swarf to enter the tank so, now that all cutting is done, wash out the tank using water, making sure that you get rid of all the swarf. Take the time to dry out the tank afterwards.

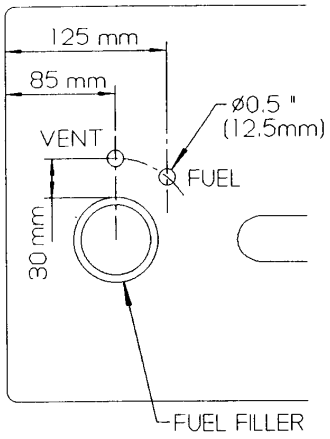


Fig 3. Position of bulkhead fitting holes. View from above.

Vent fitting

To enable the maximum amount of fuel in the tank, the vent fitting opening inside the tank should be as high as possible. On one of the HFBP 6-6 bulkhead fittings, cut off the barbed tube at the end of the threaded portion. Holding the metal nut inside the tank, aligned with the vent hole, put the bulkhead fitting, with an FS05 seal around the threaded portion, through the hole and spin up the nut.

To tighten the fittings you'll need to use two 5/8" open ended spanners (16 mm spanners should work also). Tie a cord to one spanner, tying the other end to the tank handle so that you won't lose it in the tank then drop the spanner into the tank. Pull the spanner up and position it onto the nut. Tighten the fitting using the other spanner. Don't over tighten the fitting such that you squeeze the seal out, just a firm tightening is all that is required.

Fuel syphon outlet fitting

The other HFBP 6-6 bulkhead fitting is to have a syphon tube added to it. This is made up of a 430 mm (17") long piece of the 8mm aluminium tube which is to be fastened to the bottom of the bulkhead fitting with a 50 mm (2") length of the yellow Tygon tubing (E-95633-03). See figure 4.

Firstly though, bend the lower end of the metal tube through about 30º which will ensure that the opening is just above the tank's bottom and is angled to provide good access for the fuel.

Now attach the straight end of the 8mm tube to the barbed end of the bulkhead fitting on the threaded side using the Tygon tubing.

Fit the syphon tube into the tank in the same manner as the vent, checking that the tube end is within 3 - 6 mm (1/8" - 1/4") of the bottom.

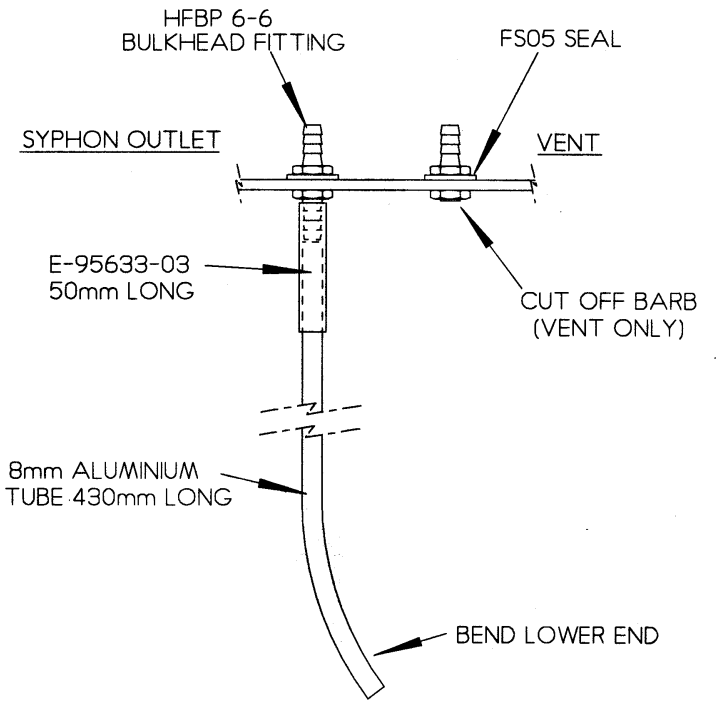
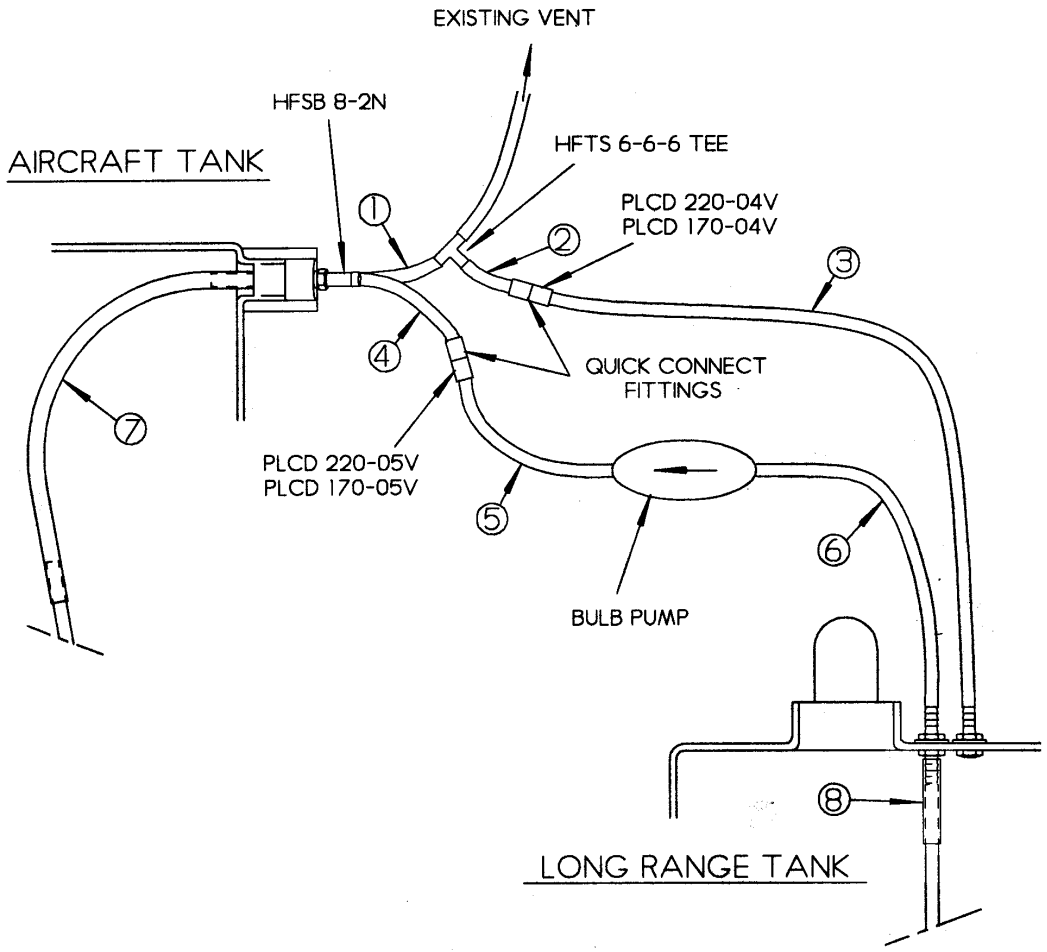


Fig 4. Fuel outlet and vent arrangement in Long Range tank.

Connections

Referring to the schematic diagram in figure 5, cut to length and attach the hoses, quick-connect fittings and bulb pump.



SUGGESTED TUBING LENGTHS (mm)

TU23RM (10x6mm POLYPROPELENE)		8mm FUEL HOSE		E-95633-03	
TUBE No.	LENGTH	TUBE No.	LENGTH	TUBE No.	LENGTH
1	50	4	400	7	250
2	50	5	150	8	50
3	*300	6	400		

*FOR AIRCRAFT WITH PORT SIDE VENTS
TUBE No.3 SHOULD BE 700mm LONG.

Fig5. Flexible tubing lengths.

Note that the quick-connect fittings with the larger barb ends are used in the fuel lines. Arrange the quick-connect fittings such that a male and a female remain attached to the tank so that they, and the pair remaining with the aircraft, can be joined together ensuring no fuel leakage when the Long Range tank is not used. Also, it is advisable to position the quick-connect fittings such that the hoses which remain in the fuselage are kept quite short so they don't get in the way when not in use. The advised lengths have been found to work quite well.

Note that the bulb pump must be installed such that the flow will be out of the Long Range tank. An arrow is moulded into the bulb which indicates flow direction.

Secure all tubing with the appropriately sized hose clamps supplied.

Tank Securing Strap

To ensure that the fuel tank will not leave its intended location in the event of a sudden stop or teeth rattling turbulence a single strap is to be installed. The strap, made from two separate pieces is to pass through the handle so it can't slip off one way or the other.

End fittings for the strap are to be secured to the cockpit module, one to the side of the passenger side head rest, the other to the baggage bay rear bulkhead. To provide sufficient bearing strength to the structure where the end fittings are secured, large area AN970-4 washers are to be bonded in place.

Strap front fitting

On the inboard side of the starboard headrest mark out and drill a ¼" hole in the position indicated in figure 6.

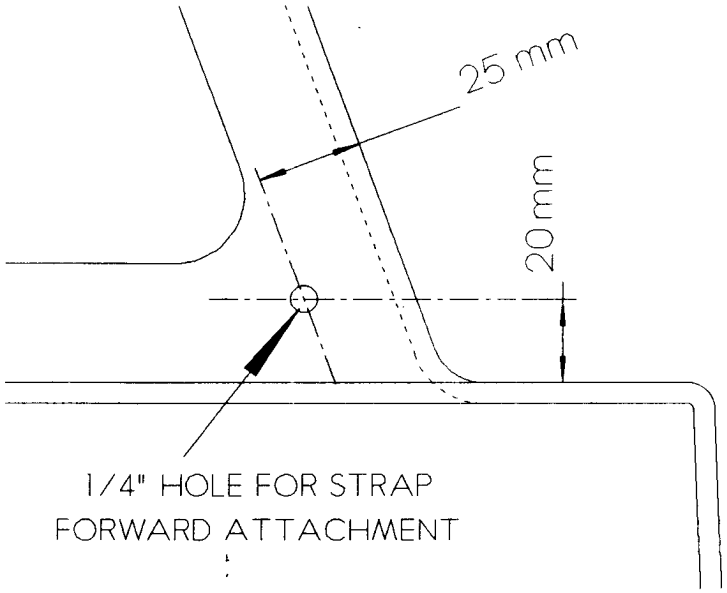


Fig 6. View of starboard side headrest looking outboard.

Strap rear fitting

Mark a reference line on the baggage bay rear bulkhead to indicate the starboard edge of the tank adjacent to where the bolt hole will be.

Ensuring that the end fitting of the strap will not contact the tank and that the hole centre will not be closer than 50 mm to the baggage bay shelf (XS baggage bay only) mark and drill a ¼" hole through the rear bulkhead as indicated in figure 7.

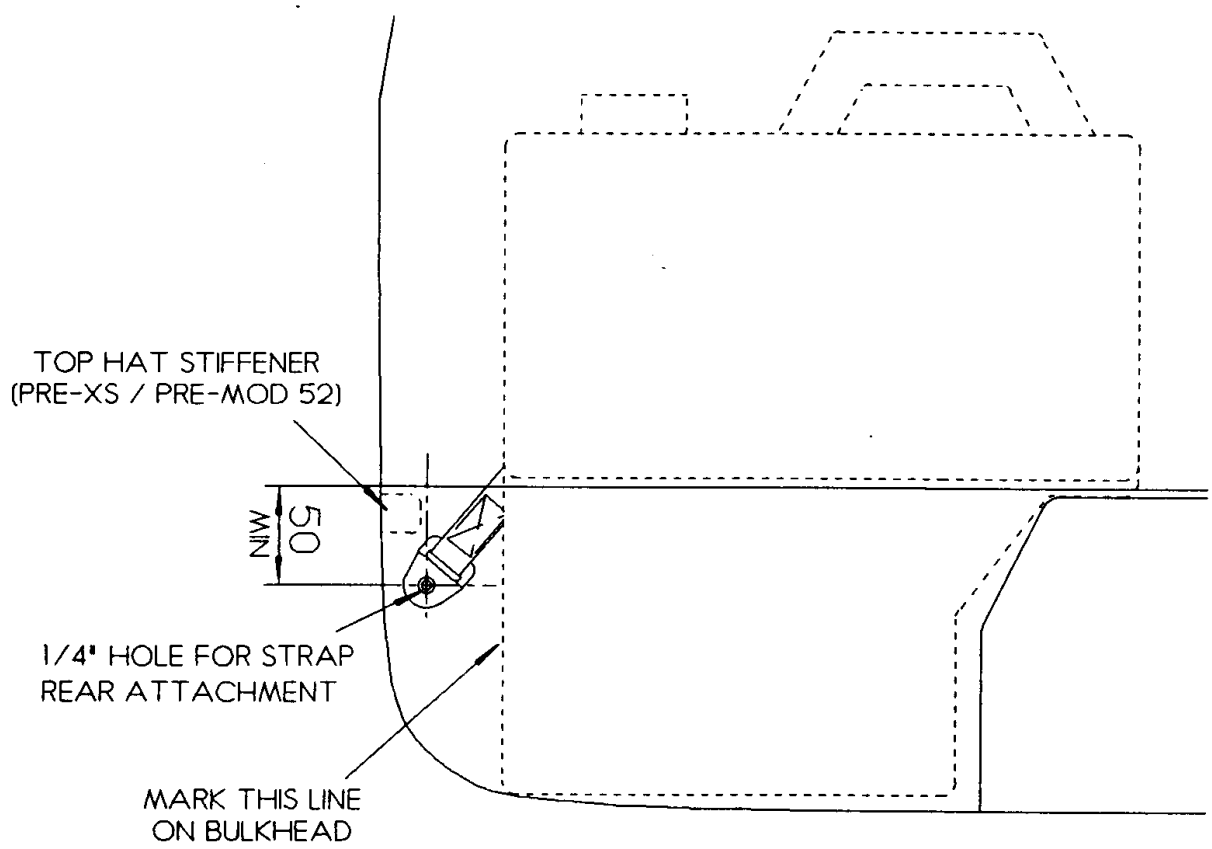


Fig 7. Looking back at starboard side of baggage bay rear bulkhead.

Scuff sand around both the holes in preparation for bonding and also both sides of two of the AN970-4 washers. Using Ampreg 20 epoxy mixed with flox, bond the washers in place on the moulded side (the side you see in the cockpit) of the cockpit module then cover with a 2 ply layup of 'bid' 8 x 8 cm (3" x 3") covering with peel ply afterwards.

Strap

After cure, remove the peel ply and drill open the hole, then attach the strap end fittings with the AN4-7A bolts and MS21042-4 nuts with a AN970-4 washer under the nut and another washer under the bolt head. A spacer FS08 fills the hole in the strap end fitting. Aim the end fittings with the strap in place before final full tightening of these bolts.

One strap part is fitted with a cam buckle on one end. Attach this strap to the rear fitting hole and, on installation of the tank, pass this end through the tank handle before threading the other part of the strap to it. The other, shorter strap part is to be secured to the headrest attachment hole. To secure the strap, the short strap end should pass into the buckle from its underside whilst holding the spring loaded catch open. Pull the strap tight ensuring that there is no slackness anywhere. To release the strap, push open the catch and pull the free end.

Operation

The fuel in the Long Range tank is transferred to the reserve (starboard) side of the aircraft's main fuel tank by syphon action which is initiated by a few squeezes of the bulb pump. Once the fuel has filled the syphon tubes and hoses completely, syphoning will commence provided that the fuel level in the Long Range tank is higher than that of the reserve side of the aircraft's fuel tank.

If the level in the Long Range tank is below that of the main fuel tank, provided that the syphoning system has been primed, syphoning will start once the main tank level has dropped below that of the Long Range tank. Syphoning will not operate in the opposite direction as there is a non-return valve in the bulb pump.

Because the standard fuel system incorporates a return line which replenishes the starboard side of the main tank, and the Long Range tank also replenishes this side, some fuel will remain in the Long Range tank when the 'main' fuel is exhausted. This quantity remaining should be established during ground testing, but will be of the order of 5 or 6 litres. Only by using the 'reserve' fuel will this remaining fuel in the Long Range tank be accessible.

If you wish to stop the syphon after it has been started, disconnect the fuel line quick-connector. Re-connection should automatically re-start the syphon action. Valves in the quick connect fittings will prevent air from entering the hoses. If you wish to break the syphon such that it will not automatically re-start on re-connection of the quick connect couplings, disconnect both fuel and vent couplings and join the fuel and vent lines of the Long Range tank together. This will introduce air into the circuit, allowing the fuel in the syphon line to drop back into the tank. Reconnection of the fuel and vent lines will not cause syphoning to re start.

When not connected to the aircraft's fuel system, the shut-off valves in the quick connect fittings will seal the Long Range tank. Temperature and pressure changes will therefore cause the tank to expand or contract which could permanently damage the tank, so make sure that it can vent by keeping the cap loose.

System Check

Prior to using the Long Range tank in flight it is essential that you are sure that the system is operating correctly. With the aircraft level, select the reserve (starboard) side of the main tank and drain this side by removing the fuel hose at the tee piece between the two carburettors and using the electric pump. Fill the Long Range tank then start the syphon action and check that the tank has emptied about half of its contents then re-commence draining the main tank's reserve side. Repeat this until no more fuel syphons from the Long Range tank. Fuel remaining is considered non-useable.