

Fitting the PACE Dry Sump System to a Caterham K Series Engine

by Mick Smith

Introduction

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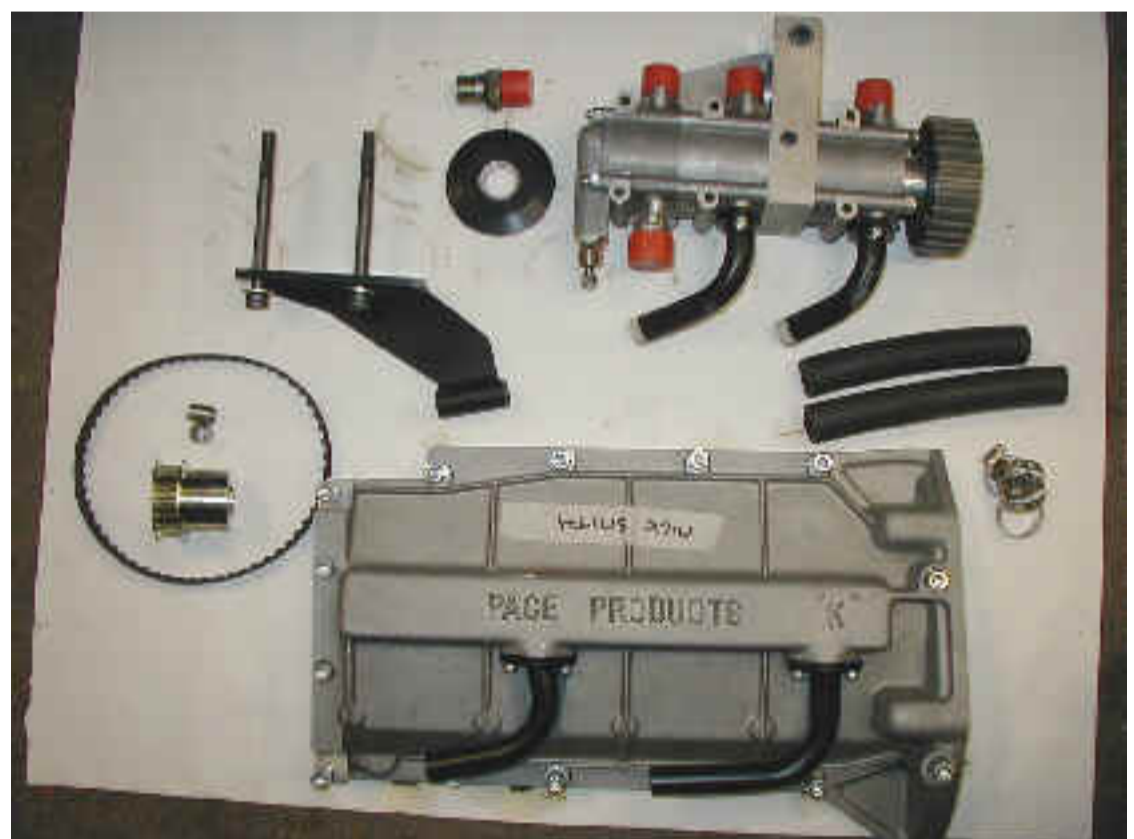
Pace Products Kit

The following instructions detail the fitting of the PACE dry sump system to a Rover K Series engine installed in a Caterham. Some of the pictures are taken with the engine out of the car for clarity, but the installation of the system does not require removal of the engine.

These instructions assume a reasonable familiarity with the Rover K Series engine and availability of an appropriate engine manual. The author accepts no responsibility for any problems encountered through following these instructions, and if you are unsure of your ability to successfully complete the installation, you should leave the installation to an experienced fitter.

In addition to the PACE dry sump kit, this installation uses a custom made tank from Brise Fabrications, a Laminova heat exchanger for control of the oil temperature, and a special filter housing and hose set from Think Automotive.

Components Required



PACE Kit

The pic above shows:-

the sump

new O/S engine bracket with dowels

the 3 stage pump with hose and clips to the sump and drive belt

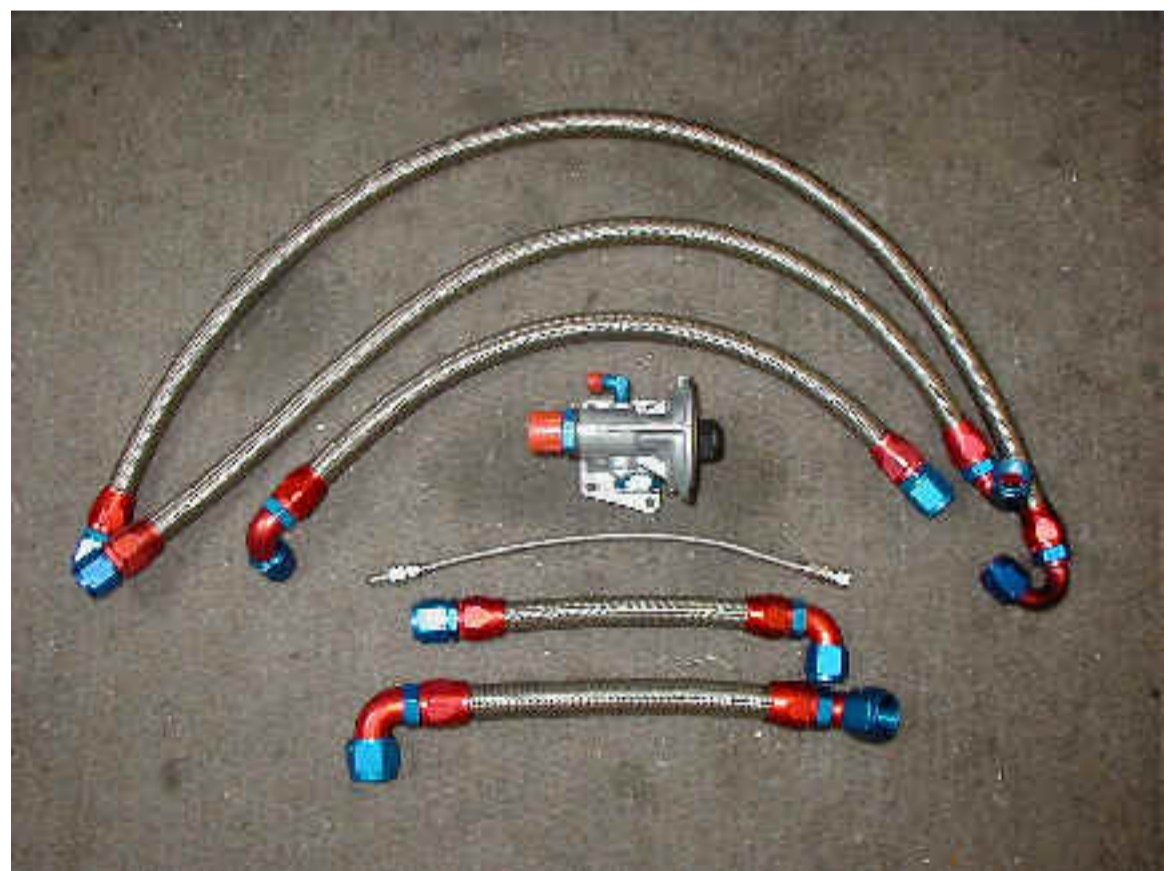
new crankshaft pulley, toothed pump drive

Circular oil feed disc and hose connector (replaces standard filter)



Brise tank

The tank used for this installation was custom built by Brise Fabrications to fit in front of the engine. It has two inputs to match the twin scavenge stages on the PACE pump, and will hold over 6 Litres of oil. A fitting is provided for a standard K Series temperature sensor.



Hose Kit from Think Automotive

The hose kit from Think Automotive is shown above and includes a new filter housing and hose to feed a remote pressure sensor arrangement.

From the top we have:-

- Pressure pump out to filter in
- Scavenge pump to Laminova
- Laminova to tank in
- Oil filter housing with feed connection and pressure take off (allows use of the standard filter) part no. FH6
- Pressure reading hose
- Scavenge pump 1 to tank in
- Tank out to pressure pump

Removing Existing Oil Pump

To remove the existing oil pump it is necessary to remove the crank pulley and sprocket as follows:

1. Set the crank timing to the 90 degree position then remove the front timing belt cover and ensure the camshaft sprocket timing marks are correctly aligned.
2. Lock the engine by putting the car in high gear and applying the brakes, and undo the crank pulley bolt (this will be very tight).
3. Remove the bolt and crank pulley, then remove the lower timing belt cover.
4. If you have a camshaft locking tool then lock the camshaft sprockets, then slacken the timing belt tensioner pulley and remove the belt.
5. Remove the crankshaft Sprocket.
6. The pump can now be removed by undoing the 2 bolts securing the engine loom to it, then removing the 9 bolts securing the pump to the block (note the position of the odd length bolt).

The pump can then be carefully prised from the block. Note: a new gasket and possibly a new oil seal will probably be required when refitting the pump.

Fitting Instructions

Modifications to Existing Oil Pump



By removing the two Torx screws on the rear of the pump, the two halves can be split revealing the rotors as shown in the accompanying picture. You can remove either both of the rotors or just the centre one to disable the pump. By leaving the outer rotor in place, a greater surface is provided to seal the channel feeding oil to the head, as the wall gets fairly thin where it passes the rotor.



If required sealant can be applied to the area marked in black on the accompanying picture to minimise loss of pressurised oil from the outer gallery, to the disused pump galleries.

The pump can now be reassembled and if necessary a new crank seal fitted. If required fit a new gasket, and carefully ease the pump over the end of the crank and bolt to the block. Don't forget to reattach the engine loom.



New Crank Pulley and Modification of the existing Pulley

cut here h

The existing pulley needs to have the redundant outer pulley removed. This can be achieved with a hacksaw, but ensure you cut at the position shown in the picture above

The sprocket, pulleys, covers, timing belt, etc. can now be reassembled replacing the large crank bolt washer with the new pulley in the PACE kit. The crank bolt should have threadlock applied and be torqued to 150 ft lb. When refitting the belt, make sure that the cam timing is correctly set, particularly if you did not have a cam locking tool as the cams may have moved..

It is quite tight fitting the pump and hoses with the engine in situ, and it may be worth removing the plenum/throttle bodies to improve access. If the kit is being fitted to a VVC engine then the coil pack will need to be re-sited to make room for the pump.

1. Support the engine using a piece of wood and jack under the sump, and remove the right hand engine mount bracket.
2. Remove the dipstick holder and replace with the blanking plate supplied in the PACE kit.
3. Insert the two steel sleeves in the holes on the block that the mount bolted onto. They may be quite tight and can be either tapped in with a hammer if there is room, or pressed in using an appropriate bolt.
4. Remove the upper rear hose fitting from the pump to allow access to the rear mounting bolt.
5. Offer the pump up to the block and locate it on the steel sleeves, then insert the rear mounting bolt.
6. Position the new engine mount bracket on the side of the pump and bolt to the block, remembering to reattach the earth lead.
7. Bolt the engine mount bracket to the rubber chassis mounting block.

Pump and Engine Mounting

8. Re-attach the upper rear hose fitting.

Fit the belt by locating the teeth on the crank pulley and carefully easing it onto the pump pulley.

1. Drain the oil and remove the existing sump.
2. Remove the gasket, oil pickup pipe, baffle plate, and foam baffle, then reattach the two 10mm nuts that retain the oil rail.
3. Clean the sump mounting face on the bottom of the engine.
4. Sparingly apply a bead of silicone sealant to the new sump mating face and bolt the sump to the engine using the recommended tightening sequence.

Sump Pan



Fit the two hoses between the sump and the pump (see picture above).



To mount the Brise tank it is necessary to relocate the water header tank to the right-hand side of the car, and if still in place, remove the redundant transverse engine mounting from the front of the engine. **Tank**

For the old style header tank a bracket can be made up from two strips of aluminium as shown in the picture.

An aluminium blanking plate can be made to fit the hole left in the front cam cover by the old transverse engine mounting and Appendix A provides a template to produce this. Beware that you may need experiment with resizing it to get the fit correct.

The dry sump tank is mounted using the threaded chassis hole that held the support bolt for the header tank. A hole will need to be drilled in the correct position in the tank's bracket. At the lower end the tank can either be tie wrapped to the chassis using the holes provided, or for greater security, the holes can be elongated and hose clips used. A layer of rubber or foam on the base of the tank will help isolate it from the chassis.



Hoses

The following pictures show how the hoses need to be connected using a mock-up outside of the car. If the Laminova is not being used, then the hose feeding it from the pump will feed directly to the tank, and the additional hose from the Laminova to the tank will not be required.



If you have problems tightening the hose unions to the pump in situ, then mark the orientation of the hoses and remove the pump to allow the hoses to be tightened.

When tightening the hose unions onto the scavenge inputs to the tank, ensure that the tank fittings are supported with a spanner as the pipe connections on the tank can be easily damaged.



Remote Oil Pressure Sensor and Switch

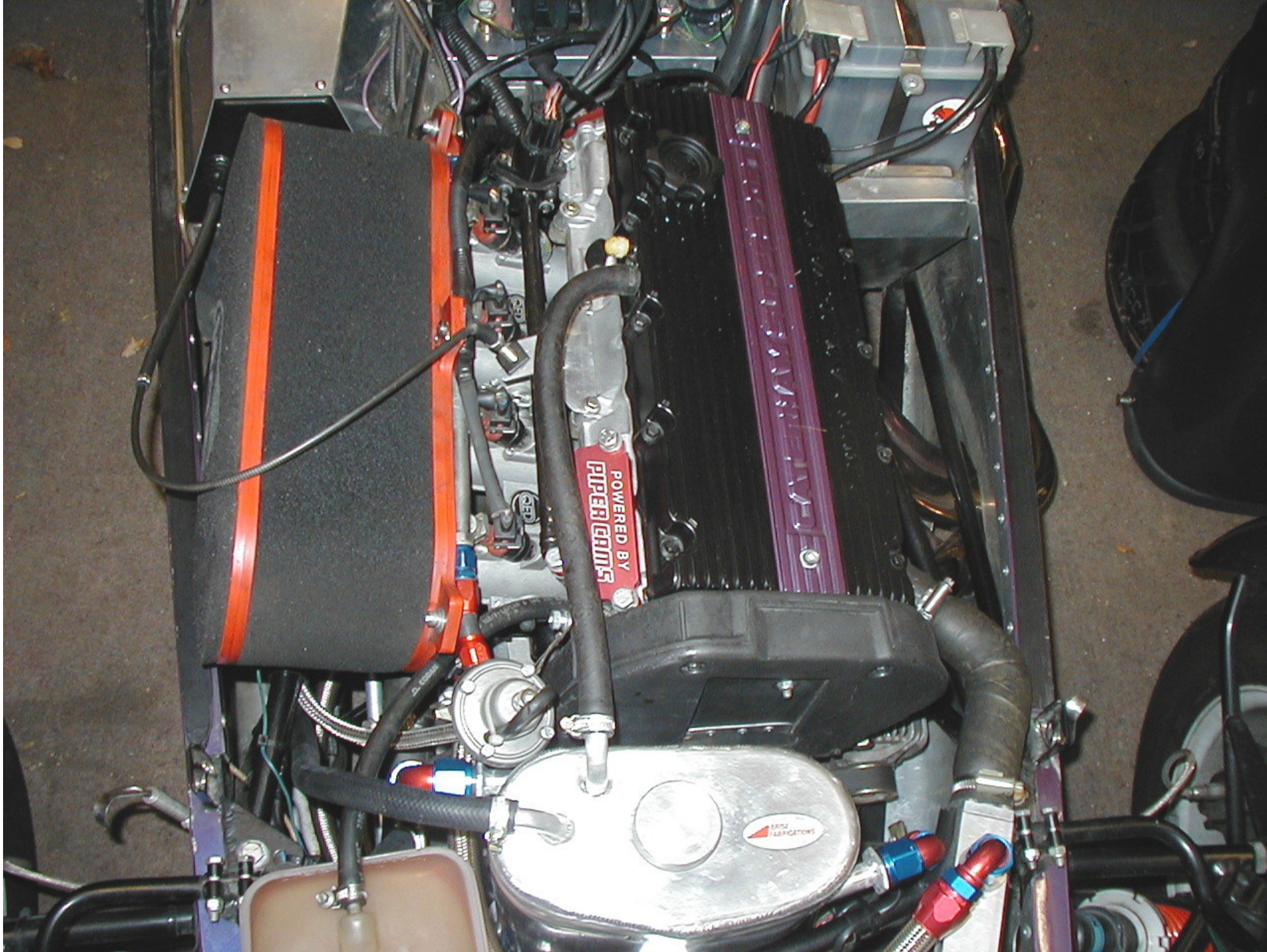


The hose kit includes a take off from the filter housing and a hose to feed a remote tee piece for the standard pressure sensor and high pressure switch. This will fit the standard Caterham arrangement, but if you do not already have this then Think Automotive can provide a tee piece and adjustable switch as part of the kit. An oil pressure warning light with the switch set to around 30 psi is highly recommended with this set-up to give instant warning in the event of any problems such as a belt breakage. The tee piece should be fixed to a convenient point on the chassis, either using tie wraps or more permanently if required. The Caterham loom should already have a Black/Yellow wire in place that appears at the front of the car and is tied into the loom under the dashboard.



Prior to initial start up **Setup**

Make sure you tighten the locking nut on the pressure adjusting screw (you need to guess the initial setting and adjust for the correct pressure once up and running), else you can get some leakage where the screw emerges.



Finished Product

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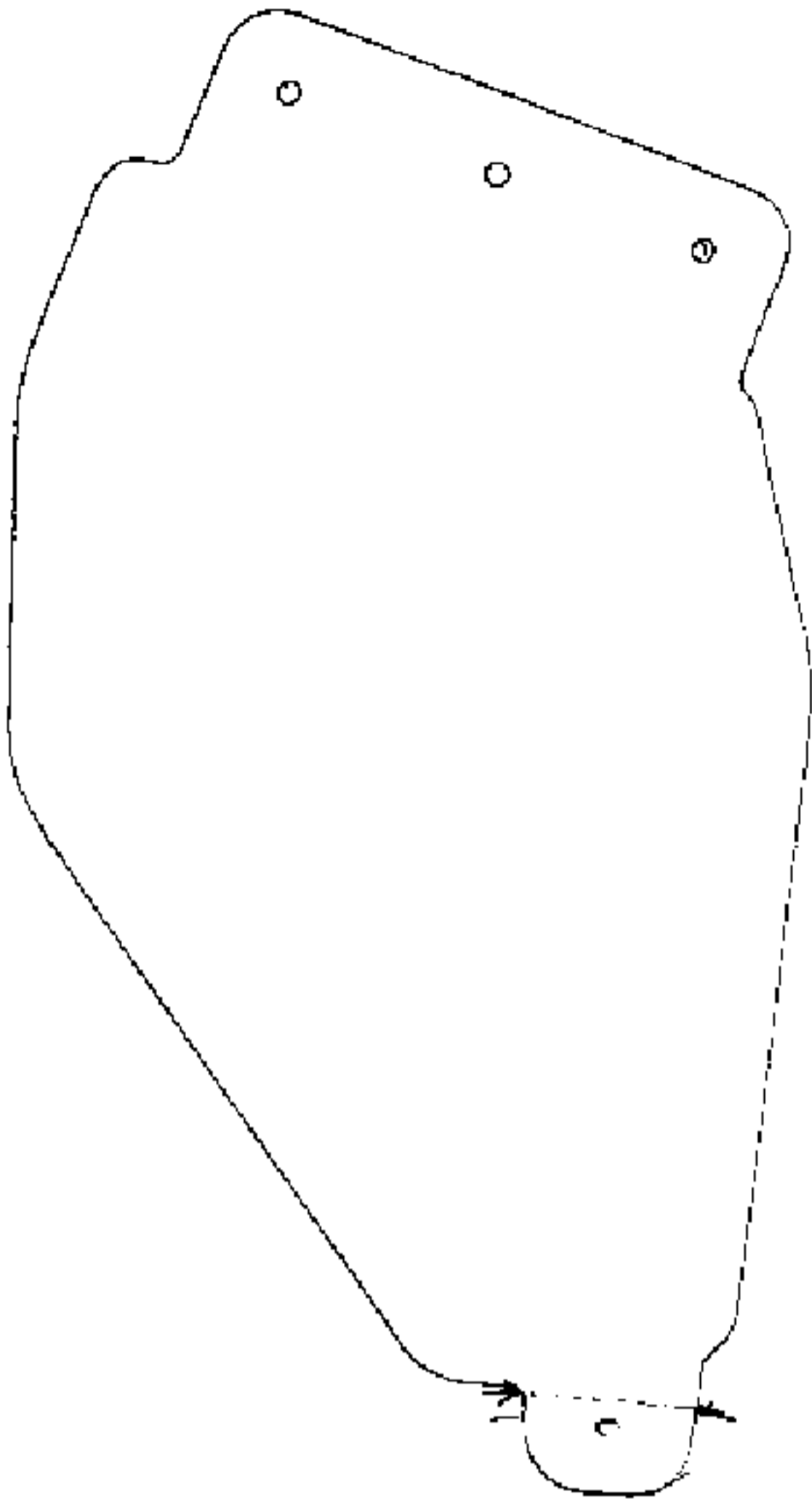
Contacts

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Appendix A

Template for blanking off hole left when rover engine mount is removed

this can also be purchased from Caterham Cars part number



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