Classic Austin-Healey/MG upgrade – installing a Mazda MX 5 gearbox in a Sprite or Midget

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Fitting a five speed Mazda MX-5 Gearbox into a Sprite or Midget..

Hylton Reid explains how he did it.

Kim adds: “For many owners of classic cars, including Sprites and Midgets, and especially those examples used often for long distances (in normal times!) the installation of a five speed gearbox (incorporating an ‘overdrive’ ratio top gear) provides major benefits in terms of lower engine rpm at high road speeds, with consequential improved fuel consumption,

less engine wear when cruising, and a more relaxing drive. In addition, if a relatively modern gearbox is used, it is likely that it will have synchromesh on all forward gears, by contrast with the original transmission which lacks synchromesh on first gear.

Grateful thanks to Hylton Reid for his detailed account of this job, which should help other owners contemplating this upgrade; all photographs and text/captions by him.

The general principles of Hylton's conversion could be applied, with suitable modifications, to other BMC rear wheel drive cars powered by 'A' Series engines…"

Hylton explains… There was an article some time ago about fitting 5 speed gearboxes into Midgets and Sprites. The original popular choice was the Toyota T50 gearbox, for which Frontline provided a replacement bell housing to match them together. This has now become almost impossible because of the lack of supply of Toyota gearboxes, and Frontline no longer provides the bell housing.

Other choices are the Datsun gearbox or the Ford Type 9 gearbox. I don't know anything about the Datsun box, but the Ford box is heavy, being cast iron cased, and is a saloon car gearbox.

Another alternative is the Getrag gearbox from a BMW. These are relatively easily available at sensible prices. However the Getrag box has a number of disadvantages. It is also a saloon gearbox, which means that first gear has a very low ratio of 3.764:1, (the Ford is 3.65:1) whereas the standard Sprite is 3.2:1. The Getrag is quite short, however, and light, but it uses an electronic speedometer and not a cable drive. To fit a speedometer would require a new instrument and some sensing system and wiring.

Whilst pondering all of these options it occurred to me that a suitable gearbox might just be from a Mazda MX 5. This is a sports car gearbox, with a decent first gear ratio (3.163:1), with good intermediate ratios and a 0.81:1 fifth gear. It is light, with an aluminium alloy case, but is quite long, being over 7 inches longer than the Sprite box. Hence the gear lever is appropriately 7 inches further back than in the Sprite. It doesn't have a removable

bellhousing, but making an adaptor plate to fit the engine to the gearbox proved to be fairly straightforward.

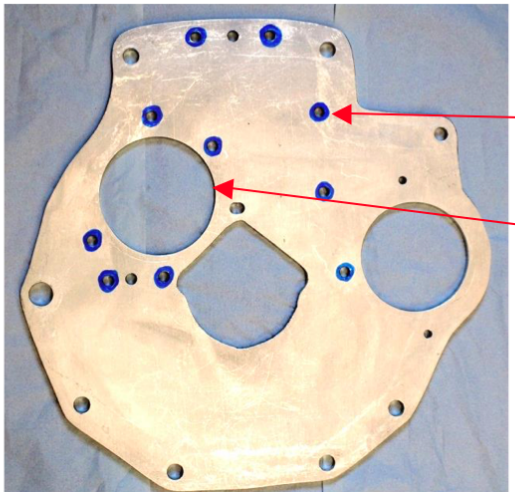
This article is a description of how the MX 5 gearbox was fitted to my Sprite. Starting from the front of the gearbox and finishing at the propeller shaft, I propose to show how it was done and include pictures at each stage.

The MX 5 gearbox has two large protuberances on the right hand side, used to locate 2 large beams which fix to the differential. They take up space in side the gearbox tunnel and need to be removed.

The Engine Backplate

Since the gearbox does not have a removable bellhousing, you will need to make a new backplate to match the engine to the existing bellhousing. This isn't as difficult as it sounds.

You need to find a sheet of aluminium about 10mm thick and an original Sprite/Midget backplate with its locating holes. Make it about 2 inches larger in all directions, this gives sufficient extra material to match it to the MX-5 gearbox bellhousing. Drill out the block fixing holes and crankshaft, starter and oil pump holes. Note the oil pump hole is slightly recessed to take the lip of the oil pump cover. Please see Plate 1, below:



This is the engine backplate looking towards the engine.

The holes marked in blue are for the original Sprite/Midget bolts to fasten the backplate onto the rear of the engine.

Note that the furthest large hole is for the oil pump and needs to have a small recess machined on the other side to accommodate the lip on the oil pump cover.

The Bellhousing

The bellhousing needs some small modifications before it can be offered up to the backplate. Some of the original fixing bolts slightly foul the casing, which needs to be relieved. Remove the areas shown in blue by about 6mm.

See Plates 2 and 3

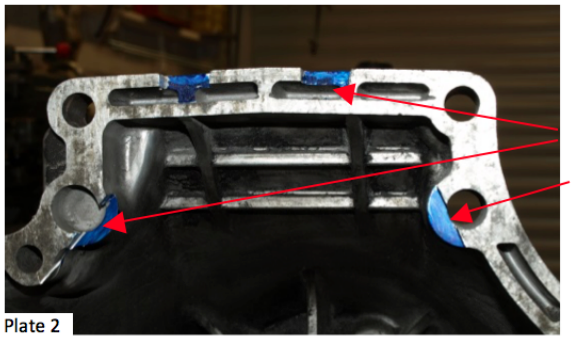


Plate 2

Remove, in order to clear fixing bolts on engine backplate

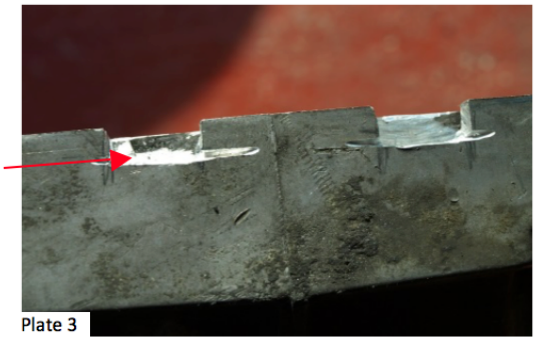


Plate 3

The Rear Crankshaft Bearing

The rear of the crankshaft needs to be fitted with an "oilite" bearing to support the nose of the gearbox first motion shaft. This needs to have a metric bore, since the MX 5 gearbox is metric. The bearing needs a 15mm bore, 15mm long but with an outside diameter of 7/8 inch (0.875) to fit the crankshaft, which is Imperial. Use a standard bearing of 30x30x15mm, shorten it to 15mm and machine the outside diameter to 0.875 inch. Check the diameter of the first locating hole in the rear of the crank and make certain it is a push fit.

Note that this is not in the normal position for the bearing, which is deeper. It matches up with the gearbox first motion shaft and bellhousing without any further modifications being necessary.
See Plate 4

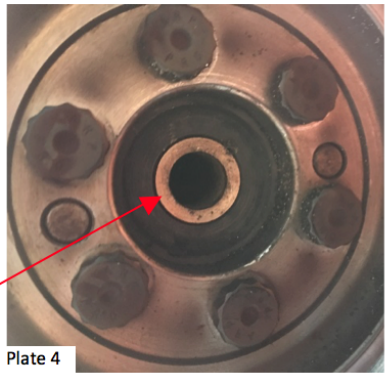


Plate 4

The Clutch

Because I was proposing to use an engine of substantially more horsepower, I decided to fit a steel flywheel and a 190mm (7.5 inch) clutch.

My engine is fitted with a BMW K1200 twin cam cylinder head, which is taller than standard. To accommodate it under the bonnet I needed to lower the engine by about 30mm.
This resulted in further difficulties!

See Plate 5

You will need to obtain a special clutch driven plate to fit the MX 5 input splines and the 190mm flywheel. I obtained mine from Helix, their part number 70-2361/03.

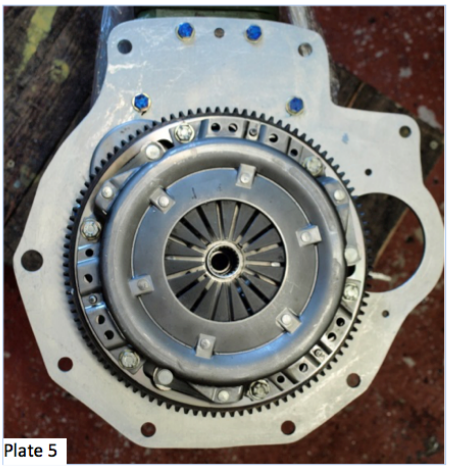


Plate 5

Hylton's Sprite features a BMW twin cam cylinder head… necessitating lowering the engine by 30 mm; please see detail photo captions.

The Clutch Release Mechanism

Plate 6

When the gearbox was fitted in its lowered position I found that the input sleeve fouled on the clutch levers and I could not use a conventional clutch release lever because it fouled the chassis. This was overcome by fitting a concentric slave cylinder. The one used is by Tilton, type 6000.

See Plate 6

This will not be necessary if you fit the gearbox to a standard engine, without lowering.

The large, threaded adaptor is fixed over the gearbox input cover extension and secured with Loctite.

The whole assembly needs to be shortened to 2.5 inches so that it does not foul the clutch release fingers.

See Plate 7

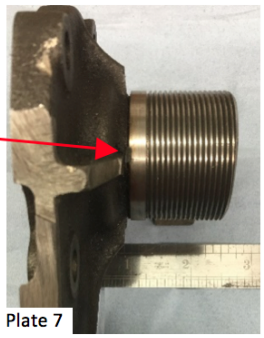


Plate 7

It should be possible to use the original MX5 clutch release lever and slave cylinder.
You will have an Imperial thread on the clutch master cylinder and a Metric thread on the slave cylinder. Just select the fittings to suit.
You may need to shorten the fulcrum post. See Plate 8.

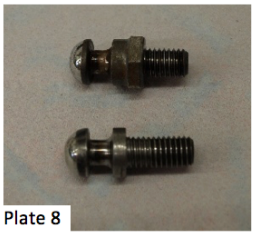


Plate 8

Clutch Adjustment

Plate 9

The concentric slave cylinder is rotated along the thread until the correct clearance to the clutch is obtained.

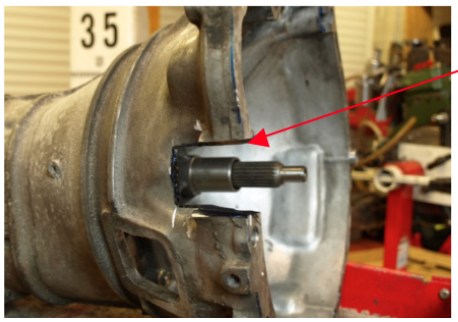
See Plate 9

Remember that as the clutch wears the release fingers will move **backwards**.

The hydraulic pipes prevent any further rotation, once installed.

The Tilton installation instructions say that you need a clutch stop to prevent over-extension of the piston. This is not really necessary in a Sprite, because the clutch pedal reaches the floor before this can happen.

The Starter Bendix



I originally cut this notch in the side of the bellhousing to accommodate the pinion and shaft of the normal starter motor.

If you use a modern, lightweight, pre-engaged starter motor, such as a WOSP, this is not necessary. Its shaft doesn't extend that far back.

Plate 10, left.

Moving the Gear Lever Forwards

Moving the gear lever further forwards is the most difficult job. The MX 5 Series 1 & 2 gearboxes all have a remote control gear levers which sit 7 inches further back than the Sprite lever.

See Plate 11

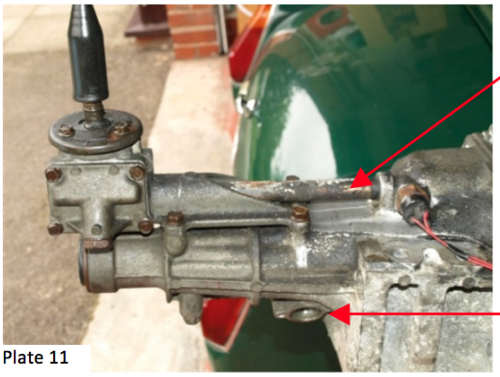


Plate 11

It uses a single rod connecting the gear lever to the selector forks. This is contained inside a tube designed to keep oil inside the gearbox.

See Plate 11

Remove the speedometer drive.

To remove the rear extension of the gearbox, together with the gear lever and remote control, undo the 8 bolts as shown in red in Plate 12. Remove the speedometer drive from the rear and carefully draw the whole rear extension from the gearbox main casing.

The third motion shaft will protrude from the gearbox, so take care

Remove these 8 bolts to separate the rear gearbox extension from the main box.

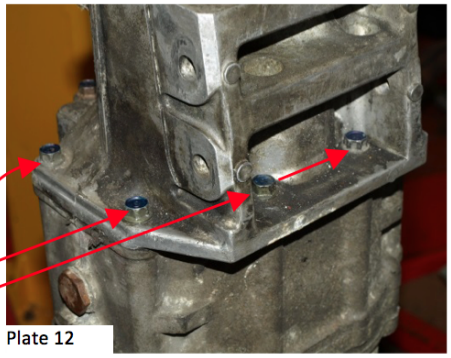


Plate 12

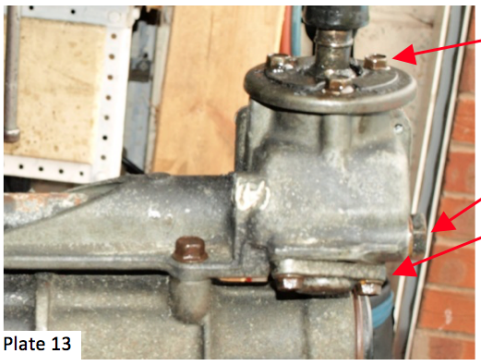


Plate 13

Remove the gear lever from the top by removing the 3 bolts from the locating flange. Pull the lever clear of the yoke.

You will also need to remove the rear securing nut, with spring and ball and
the left hand side cover, together with the spring and ball.

Take note of how they are located because you will need them again.

See Plate 13

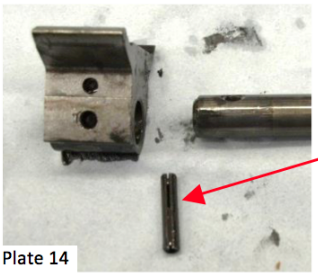


Plate 14

To separate the yoke from the operating rod you need to remove the right hand side panel.

Then knock out the scroll pin which holds the yoke onto the rod.

The rod can then be drawn out from the inside of the gearbox, and the yoke removed from the gearlever casing.

See Plates 14 & 15

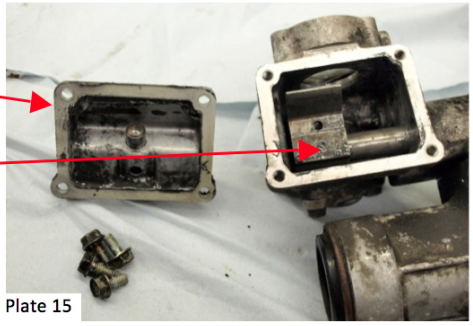


Plate 15

The gearlever casing is removed from the rear extension by removing the 4 bolts and lifting it clear of the 2 dowels.

The tube will also need to be removed at the same time.

It should then look like Plates 16 and 17.

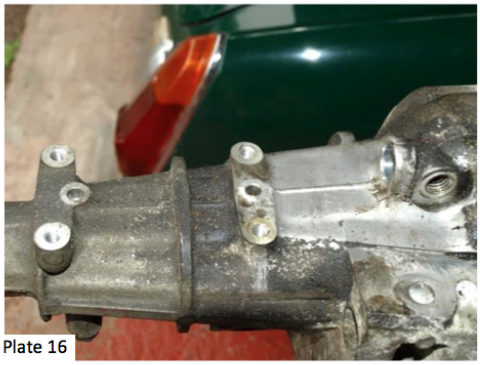


Plate 16

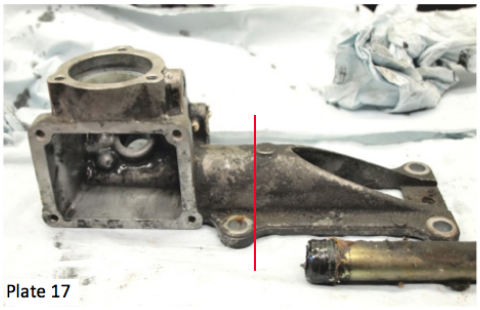


Plate 17

The gearlever casing now needs to be shortened. Cut it squarely at the red line in Plate 17, so that the rearmost bolt holes now are right at the very front.
See Plate 18

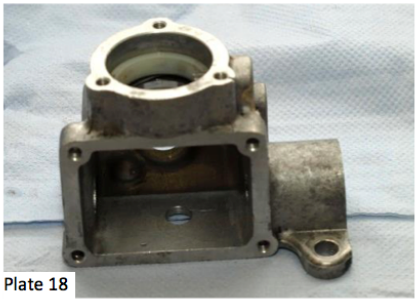


Plate 18

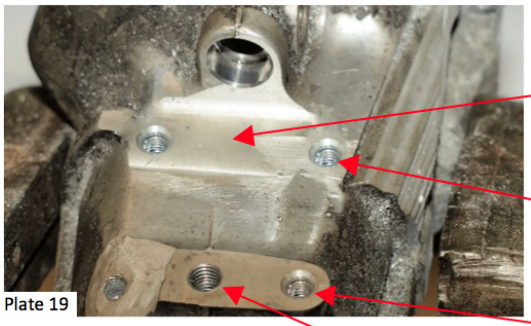


Plate 19

On this rear extension I have machined off the 2 large protuberances from the right hand side, to give me more clearance inside the gearbox tunnel.

The gearbox rear extension now needs to be modified to take the shortened gearlever casing.

The front part of the rear extension needs to be filed flat or machined flat, just behind the operating rod hole, level with the front mounting holes for the gearlever case.

Two M8 coarse thread holes are then made right through, in a position to locate with the front holes of the now shortened gearlever case.

Both of the original left and right hand mounting holes need to be chamfered back to give clearance for the left and right gearlever side covers.

Tap the front dowel hole to M10 to provide for a rear fixing.

See Plate 19.

Using the operating rod as a guide, locate the shortened case onto the rear extension, use shims if necessary to achieve a sliding fit of the operating rod.

In the centre of the case drill an M10 hole and countersink this, to permit a countersunk bolt to be fitted through this hole and into the M10 hole previously tapped in the dowel position. This gives the case a 3-point fixing and also clears the gearlever yoke.

See Plate 20

You will need to fit spacing washers underneath this central hole to make the case level. Check, and adjust if necessary, to achieve a free sliding fit of the operating rod.

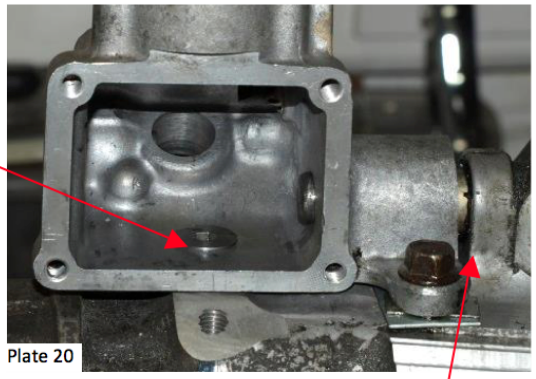


Plate 20

Use silicone to secure the shortened outer tube in position.

Bearings for Gear Lever Rod

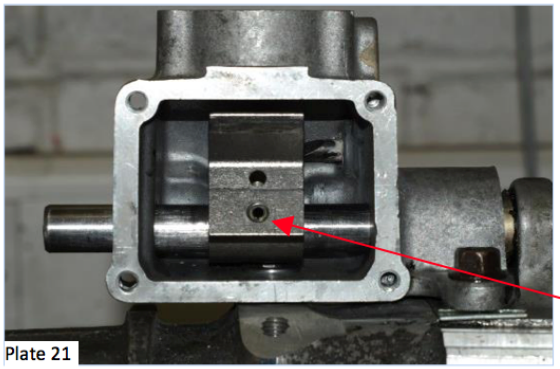


Plate 21

With the shortened gearlever case, the rod support bearings are now very close together.

To give additional support to the operating rod, I drilled a 14mm diameter hole in the rear of the gearlever case to give it some additional support. Shorten the rod to suit.

The operating rod now protrudes through the rear of the casing.

Carefully drill the shaft and re-fit the scroll pin. It is absolutely necessary to drill the hole in the same position as the original one otherwise the gears won't work.

See Plate 21

The Speedometer Drive

The drive for the speedometer cable is different on the MX 5 gearbox. I obtained a special 90 degree adaptor from Speedy Cables to match the MX 5 drive to a standard BMC speedo cable.

See Plate 22

Note: The bright, machined surface is the result of machining off the 2 large protuberances from the sides of the gearbox, to give clearance inside the transmission tunnel.

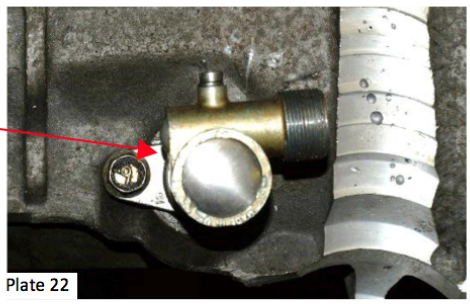


Plate 22

Chassis Modifications

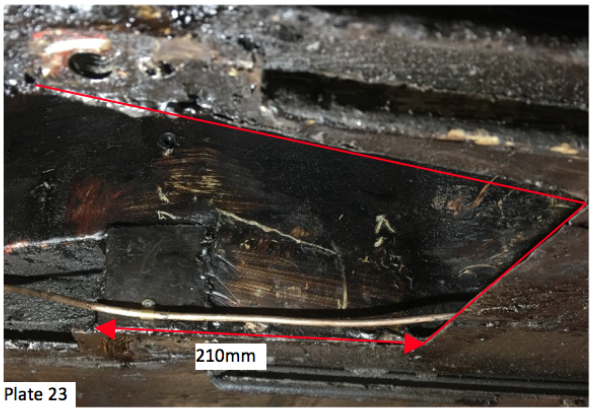


Plate 23

Not easy to see on the pictures because it is all black.

You have to remove the floor plate between the gearbox tunnel sides. I cut out 210mm from the front of the cross-brace to the rear. It is not too critical. If you don't remove enough you can't get the rear of the gearbox to fit.
See Plate 23
This means that you have to cut through the cross-bracing box section, which sits just in front of the seats. This is a strengthening section, so it needs to be replaced.
I fitted a pair of seat belt re-enforcing plates inside the box section, giving it a light tack weld to hold them firm.
Into this I made and fitted a cross brace, which goes behind the rear of the gearbox and bolts into these at each end.

The cross-brace. I used a piece of 4mm plate.
The holes are to suit a seatbelt mounting bolt.


Plate 24

The Rear Gearbox Mounting

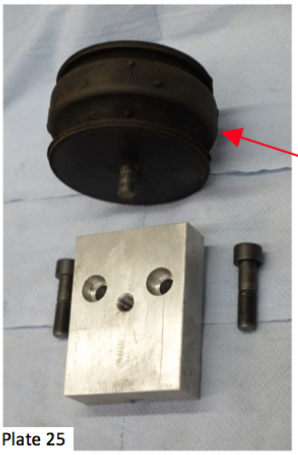


Plate 25

The rear mounting for the gearbox consisted of making an adaptor plate to suit the original mounting holes, using Allen bolts, with an M10 threaded hole to accept the flexible mount.

Use a Ford Transit engine mount, which is both substantial, cheap, and available in different heights if required. Its lower mounting merely fits into a hole in the transmission tunnel floor, re-enforced with a steel plate.

See Plates 25 & 26

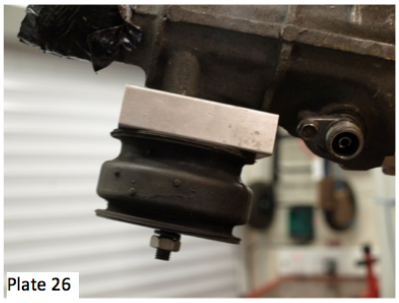


Plate 26

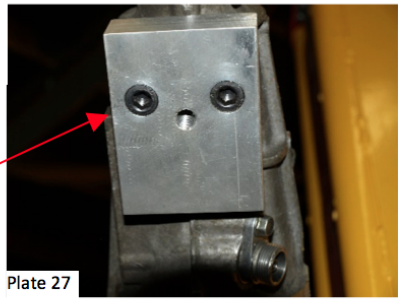


Plate 27

The rear mounting adaptor plate showing it in position.
See Plate 27

If you wanted to you could probably use a single engine mount and offset the chassis hole.

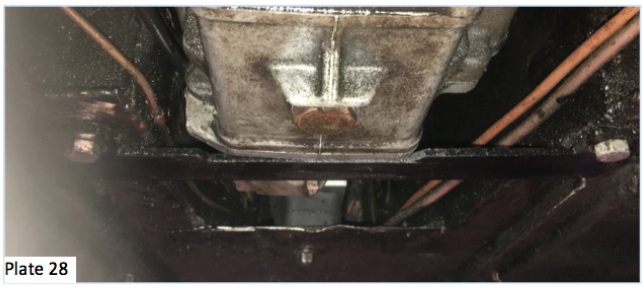


Plate 28

The rear mounting showing it, and the cross brace, in position.
See Plate 28

You will notice that I had to relieve the cross brace a little to clear the rear of the gearbox. I am fairly certain that, if you didn't lower the gearbox as much as I had to the cross brace would fit underneath.

The Reversing Light Switch

There is no need for the neutral detection switch on top of the gearlever extension, so I blocked mine off.

The reversing light switch protrudes significantly from the top/side of the gearbox and won't fit inside the transmission tunnel without substantial modifications.

I blocked up the threaded hole in the gearbox case with a threaded plug and made a simple bracket to support a microswitch next to the gear lever.

See Plate 29

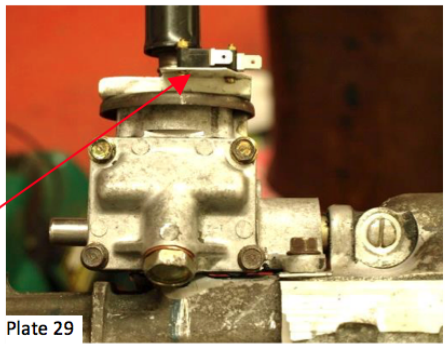


Plate 29

The Propshaft

This was the easiest part of the conversion. Measure the overall length from the back of the gearbox to the differential flange, once the gearbox is fitted in the vehicle.

Take this to your local, friendly, propshaft maker and ask for the correct length of shaft with Mazda MX5 splines on the front end and a Sprite square flange on the rear. Job done.