Please note. The author of the following article is not a mechanic, and indeed, far from it. I am merely an amateur enthusiast. What follows arose from the surprisingly large numbers of issues I encountered in fitting a late MGB engine to my MGA 1600 Mk II. This lead me, during and after the conversion, to read around the subject.
I thought formally laying out the majority of issues I've come across in an orderly fashion might possibly make the process of fitting an 1800 B-series engine to an MGA easier for others who may be considering taking this step.

Transplanting an 1800 B series engine into an MGA

This is an often considered, and quite frequently executed upgrade for MGA owners looking for a bit more power for their car.
The MGB engine of course has a larger capacity, and in the Australian assembled vehicles, the MGB engine has a higher compression ratio as well (MGA 8.3: 1 vs MGB 8.8:1).
The capacity gains by substituting a standard bore 1800 B series (1798cc) engine over a standard bore MGA engine are, (approximately):
MGA 1500: 20%
MGA 1600: 12.5%
MGA Mk II: 11%
Generally, anything greater than a 10% increase is likely to yield a discernible gain by the "seat of the pants dynamometer".
Additionally the B series engines seem to respond well to a higher compression ratio in power output. Raising the compression ratio can create a crisply responsive engine. (The serious engine tuners take these engines up to 9.8:1 for road use, and higher still, 11.5:1 and more for track engines).

Superficially an 1800 transplant into an MGA seems like it should be a straightforward easy upgrade, with the benefit of enabling the recipient MGA, at a cursory glance, to still retain an unmolested original appearance under the bonnet. Engine mounting points line up. The same inlet and exhaust manifolds will bolt up to the heads in all varieties of the B series engines.
However, as with most things in life, unfortunately such a conversion often proves in practice to be neither as simple, or as cheap, as one might first imagine.

The usually chosen engines for the purpose in Australia are from the MGB and from the Austin 1800.
I'll cover the MGB engines first.
The MGB engines essentially came in four different versions, although running changes throughout the life of these engines can cause issues with component compatibility and require careful inspection. There are for example three different dip sticks, three different dip stick tubes, two different sumps, and, as a result, two quite widely differing oil capacities amongst the MGB engines.
Starter motor locations vary, from the early "low starter" MGA position to "high starter" MGA, and then change again with the MGB Mk II. There are therefore two different MGA engine back plates, and there are three different MGB backplates (3 bearing MGB), 5 bearing MGB Mk I (now incorporating a rear crankshaft seal) and MGB Mk II (altered starter motor location). Then there are other potential donor 1800 B series engines to consider, such as the Moris Marina, with a different back plate again, and the Austin 1800

“Land Crab”, which has no back plate at all. Careful thought, inspection, comparison and measurements therefore will be needed even in the choice of the rear engine back plate to be used in the conversion.

The four main variations in the MGB engines are:
1) 3 main bearing 18G and 18GA (early “pull door handle” cars, and first of the “push button” cars, roughly to March 1965 for Australian production, October/November 1964 for UK built cars).
2) 18GB (Essentially the 5 main bearing MGB Mk I cars).
3) 18GD, GF, GH, GJ and GK (From the introduction of the MGB MK II).
4) 18V Roughly from the middle of the Australian BL (black recessed grille) series MGB onwards.

18 G/18GA (3 Main Bearing)

The easiest of the 1800 transplants to execute, by a large margin, is fitting the 3 main bearing early MGB engine.
Some will claim that the 3 bearing MGB is inherently weak in the bottom end. While the 5 bearing design is undeniably more robust and smoother, the 3 bearing engine is still durable, and is actually a more responsive, “rev happy” engine than the later 5 bearing varieties. It may possibly be a little more powerful too, as a result of reduced rotational friction from the smaller main bearing surface area. Remember, even after the introduction of the 5 bearing engines, the Abingdon Competitions department preferred to continue using the 3 bearing engine in their race cars, so they can't have been as weak in the bottom end as some maintain.
The disadvantages of the 3 bearing engines are the lack of a rear crankshaft seal, relying on a scroll like the MGA, and the fact that parts are more scarce, and generally more expensive than for the later 5 bearing engines.
The conversion however is literally “plug in and go”. This early series MGB engine retains the cable driven mechanical tachometer of the MGA.

Starter/Back Plate:
With the early 1500 “low starter” cars it is easier to use the original MGA rear plate. It will usually be necessary to grind a little off the block to clear the starter.

Clutch:
The MGB clutch mounts differently to the MGB flywheel compared to the MGA clutch to its flywheel. (The MGB clutch mounts with three spigots to the flywheel, the MGA with two). This would be a good opportunity to consider a change to the more modern MGB diaphragm type of pressure plate. The MGB clutch is less prone to slip, for no increase in pedal operating pressure. The changeover however, yet again, is not as simple as one might first imagine. The MGB diaphragm pressure plate is thinner (shorter from front to back, as mounted) than the MGA pressure plate. Consequently the throw out fork pivots from a point further forward. The changeover will require obtaining two items. The first is an MGB clutch fork. (These are now available again new). The second item, which will take a little hunting to find, is a 3 synchro MGB gearbox front cover. (The casting number on the correct cover is: MOWOG 22B55 AB). I've seen these for sale on eBay several times.

Flywheel:
The later MGA (mid-Mk II to end of MGA production) flywheel is the same as the 3 bearing MGB flywheel apart from the 2 vs 3 clutch pressure plate locating pins.
If the earlier (and 8lb heavier) MGA flywheel is to be used, it will need to be combined with the MGA engine backplate, with its countersunk bolt holes to avoid the flywheel contacting the backplate locating bolt heads. (The late MGA and 3 main MGB have a recess machined in the front face to clear the bolt heads).
Performance incidentally is thought to better with the later, lighter MGA Mk II and earlier MGB 20lb flywheels, (making a somewhat more responsive engine), so given the choice, the later lighter flywheel is generally considered the better option.

Rear main seal?:
It would be a good opportunity as well to consider at this time machining the MGA or 3 bearing MGB back plate to accept a rear seal, similar to that used in the later 5 main bearing MGB engines. This would once and for all get rid of the irritating, and socially embarrassing perpetual tendency of these engines to weep and drip oil from here.
Fitting such a seal however is somewhat involved. Possible methods of fitting a suitable Viton seal to the back plate, and the associated modification to the rear main bearing end cap are very well described in Barney Gaylord's wonderful “MGA Guru” web site.
http://mgaguru.com/mgtech/engine/cs202a.htm

Gearbox compatibility:
The 3 bearing MGB engine retained the same pilot bush diameter as the preceding MGA. The 3 bearing engine will therefore mate with the MGA gearbox without modification.

MGB 18GB

This transplant is a little more involved. The advantages however include the provision in the engine backplate of a formal rear main bearing seal which is usually completely effective.

Tachometer:
This series of engines no longer has the cast in boss at the left rear of the engine block for the mechanical cable tachometer drive, and a conversion to an appropriate Smiths electric tachometer is the common solution. Fortunately these still show up on eBay, especially if you add “worldwide” to the search parameters. Another option is to have your original Jaeger mechanical tachometer converted to electronic function. (I had this done by a UK company to suit my own MGA 1800 18V conversion, but I was not entirely comfortable with my dealings with the firm).
It has also now been demonstrated that with considerable care, more than a modicum of engineering expertise, and the use of spacers to compensate for the absence of the relevant boss cast into the rear of the block, it is possible to adapt a later (5 bearing) B series block to fit a mechanical tachometer drive. Details are shown on the ever remarkable “MGA Guru” web site. http://mgaguru.com/mgtech/power/pp201d.htm

Gearbox and flywheel:
The gearbox input shaft spigot was increased in diameter with the introduction of the 5

bearing B-series engine. The 5 bearing MGB engine therefore will need a modified (smaller) bronze pilot bush fitted to the rear of the crankshaft to fit the MGA gearbox. The flywheel retains the MGA diameter.

Other modifications are as for the 3 bearing MGB transplant.

MGB 18GD-18GK

It is from this point that things start to become more complicated still.

Flywheel:
From this time the flywheel became a larger diameter with of course a ring gear to match. The flywheel is thinner as well, and has a small central “nose” which brings the flywheel and ring gear to the correct location.
Since the fixing of the flywheel to the crankshaft is significantly altered in the MGB from the earlier MGA arrangement, it is not possible to use the MGA flywheel. Either an 18GB flywheel needs to be obtained, or alternatively, the 18V flywheel needs to be modified to fit. This involves having the 18V flywheel machined down to the MGA flywheel's diameter. An MGA/MGB 18GB ring gear can then be fitted. Surprisingly, even after being turned down, the 18V MGB flywheel remains marginally heavier, by 8oz, than the later MGA Mk II and the 18 G, GA and GB engine series MGB flywheels. (The MGA flywheel was lightened by 8lb midway through production of the MGA Mk II).

Engine Back Plate:
Commencing with the introduction of the MGB Mk II the starter motor altered to a pre-engaged type, and its location changed.
The aperture for the starter motor in the MGB Mk II backplate is therefore not correct for the MGA. This aperture needs to be cut out eccentrically to accommodate the original MGA starter in its original position. Alternatively the MGA back plate can be used, but it will need to be modified if a rear main seal is desired. Another option is to source an 18GB backplate.

MGB 18V

Water pump and pulley:
The 18V engine had a modified (shorter nosed) water pump and a different fan pulley. The MGA and earlier MGB pulley fitted to this water pump won't line up with the ancillary pulleys.
Either fit an 18GB water pump, or the MGA pulley can be modified to suit the shorter 18V water pump (cut out 0.375” in the length of its body and TIG weld it back together), or a custom made pulley to bring the fan belt run into line can be ordered from an appropriate engineering works..

Later MGB 18V (Rubber bumper MGB)

Engine mounts/front engine plate:
These cars had different engine mounts (round instead of rectangular, and allegedly more fracture prone). To fit one of these later engines to an MGA, the earlier type of front engine plate will need to be substituted to allow the use of the MGA engine mounts.

Austin 1800 Engine

This is a commonly employed engine for the purposes of an 1800 MGA conversion in Australia. The Austin 1800 was quite a large selling model in Australia in its time, but is not highly sought after today by collectors. Hence Austin 1800 engines are plentiful and cheap. However the work required to adapt a (front wheel drive) Austin 1800 sourced engine to an MGA is considerable, far more involved than with an MGB derived engine. Expert engineering assistance is likely to be required in modifying the engine to make it suitable for use in a rear wheel drive MGA.
Additionally one needs to be aware that the Austin 1800 crankshaft was cast and not forged and the camshaft is ground with a milder valve timing and will need to be changed for an MGB camshaft.

The great majority of the following information relating to using the Austin 1800 engine was supplied to me by Ian Cowan, Gold Coast, Queensland.

Inlet and Exhaust Manifolds:
These are of course completely different, and the MGA items will need to be substituted.

Camshaft:
Apart from the valve timing being different to the MGA/B in the Austin 1800, the Austin also has a lobe near its rear end to drive the Austin's mechanical fuel pump. Simply substitute an MGB camshaft.

Fuel Pump:
The MGA and MGB utilise a remote electric fuel pump. The mechanical fuel pump on the Austin 1800 will foul the exhaust. The pump and its actuating pushrod needs to be removed, and its hole in the block blanked off.

Left Front Engine Mount:
On the Austin block, the left front engine mount support bracket has provision for only two rather than three mounting bolts. To drill and tap for a third bolt carries serious risk of entering the nearby oil gallery. The safer option is to use just the two bolts and to modify the bracket by cutting off the redundant part.

Dip Stick:
The engine oil dip stick is in the wrong place to suit the MG sump. A new angled hole has to be drilled through the side of the crank case and the old hole has to be blocked off.

Sump:
The front wheel drive Austin 1800 had its transmission bolted to the flange of the underside of the block. This flange is more substantial in the Austin for this reason, and also has larger bolt holes. Either the MG sump bolt holes will need to be enlarged to the larger size bolts, or the Austin engine bolt holes will need to be helicoiled to take the MG size bolts.

Oil Galleries:
Two 5/8” steel plugs will require placement at the rear of the engine block to close off the

open oil galleries at this site.

Engine Back Plate:
If you thought things were fiddly so far, “you ain't seen nothing' yet”!
The Austin 1800 does not employ a back plate. There are several MG back plates depending on the model. It would probably be easiest, if using an Austin 1800 donor engine, to use the original back plate for your MGA. The machining of the back plate to fit the MGB seal needs to be very accurately performed, probably best performed by a suitable engineering works. But even after this there are potential pitfalls. If the backplate and seal are not accurately centred on the crankshaft centreline the seal will certainly leak. The back of the Austin block lacks the locating dowels of the MGB block making such accurate location of the plate and seal difficult.
Ian Cowan suggests the following to centralise the plate to the engine: Have a collar turned up with its O/D equalling the O/D of the seal`s hole in the engine plate.
The I/D then has to be a neat fit on the crank shaft where the seal runs.
With the collar in place--seal up the oil joint between the plate and the engine block, to prevent any oil leaks.
The rear plates bolted up position to the engine block can be preserved, by drilling 3 holes through the plate and into a suitable location at the back of the engine. These holes must be perfectly true.
Suitable sized roll pins can be inserted into the deep holes. These will serve to locate the plate in the correct position, so assisting its accurate re-positioning, when it is removed next time.

Therefore employing for this purpose an initially cheaply sourced Austin 1800 engine can ultimately lead to a more expensive engine for the transplant because of the necessary re-engineering expenses involved, not to mention the headaches and frustration for those not well equipped for the task.

So, is an MGA 1800 transplant worth it?

Possibly not. One can obtain a considerable improvement in an MGA's performance by much simpler and therefore cheaper means than with an 1800 engine transplant.
Changing the MGA pistons for flat top high compression items to get the compression up and with the addition of some cylinder head work to improve the porting of the 15-series heads fitted to the 1500 and 1600 MGA models can yield a very palpable performance upgrade for a fraction of the cost of an engine changeover. The engine doesn't even have to come out of the car.
But, if you are willing to spend more money, (quite a lot more), and you are not absolutely obsessive about originality, want an oil tight engine (at last, yay!), and subscribe to the “there ain't no substitute for cubic inches” school, then a transplant is certainly feasible, as many have demonstrated.
Personally I'd suggest hanging on to your original engine too. They're not worth much to sell, and should you ever wish to sell your MGA, having the original engine and components to go with the car would be extremely desirable at the time.

For those seriously contemplating expenditure of the magnitude that an 1800 transplant involves, another option to consider is supercharging.
Hans Pedersen in Melbourne (http://www.hi-flow.com/default.htm)
and Moss Motors
(http://www.mossmotors.com/Shop/ViewProducts.aspx?PlateIndexID=112259)
both offer supercharger kits that will result in superior performance to a conventional 1800 transplant, for not a great deal more expenditure. And to return the vehicle to standard specification would be easier than an MGA with an 1800 transplant.
Come to think of it, why not an overbored (1950cc) MGB engine with a supercharger? Dammit, how about a Honda S2000 transplant with five speed conversion, Hoyle fully independent adjustable suspension, four wheel disc brake conversion, Mazda rotary, or a V8 or even a V12 transplant (Don't laugh, they've all been done!)