Five Onto Kent Will Go!!

.....or the fitting of a Ford 5 speed gearbox onto the 'Kent 1600cc engine is possible.

by Mike Pullen

These items should be found at your local breakers yard:

BELL HOUSING — 71BB 7505 AC
CLUTCH ARM — 71 BB 7541 KA
ENGINE PLATE — 73 HM 6A 372 DA
ENGINE PLATE — 691 M 6A 372 BA
5 SPEED GEARBOX — 839T ED

The clutch arm will probably be with the 'AC' bell housing when found, as will the 'DA' engine plate - probably! KEEP ALL BOLTS. The gearbox would be better purchased new if you can; but at around £300 plus a secondhand one looks very attractive.

There are a good number of new items to be purchased - around £250; and a rather drastic chassis modification which seems a lot worse than it really is; details later.

The gearbox input shaft diameter should be - 0.6″ for the crankshaft spigot; 1″ spline diameter and 1,325″ for the thrust race trumpet. Output spline diameter is 1.075″.

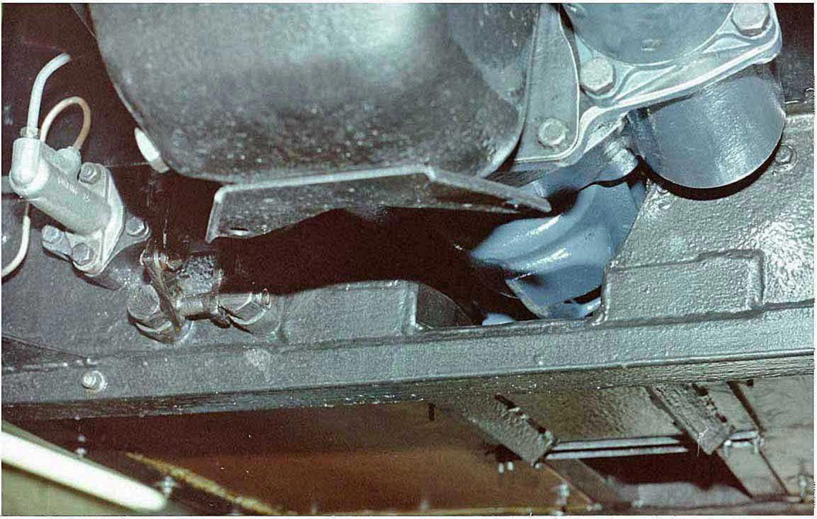
Following on from my short article in the August issue, the information that follows forms the first part of the method I used to fit a 5 speed gearbox into my Morgan. At this point I must underline the fact that I am describing the adaption as needed to suit my own Morgan; it is possible that your car has some slight differences. So, be prepared for some hurdles and approach them with care, patience and logic.

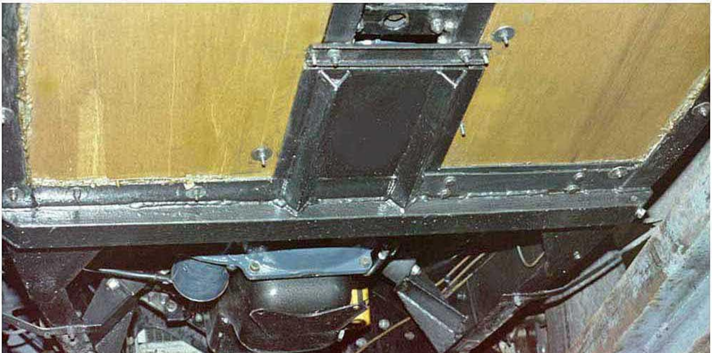
THE CAR

My own vehicle is a 4/4 4 seater, 1971, with chassis number B2450. It is fitted with a '711 M' 1600 Kent engine and **was** fitted with a single rail 4 speed gearbox; the differential ratio is 41/10 or 4.1:1. Most will realise these details are quite common for a car of the period; however, there were some deviations from the norm inside the bell housing. Most Morgans (4/4 1600) are fitted with a 190 m.m. dia. clutch which requires pressure plate fixing holes on a 222,25 m.m. PCD; my car was built with a clutch of 215 m.m. dia., and with pressure plate fixing holes on a 246,25 m.m. PCD. Do not despair; suitable clutch parts are available for both sizes, Also, my car had the direct rod operated clutch actuation - this had to be changed to the cable operation as on current Morgan 4/4s.

GENERAL APPRAISAL

To fit the gearbox to the Kent engine requires the use of a 2 litre 'Pinto' bell housing; Sierra clutch and pressure plate together with the 'Pinto' clutch arm and shallow thrust race as fitted to the Mexico and many other Fords. I could not find an engine plate (sandwich plate between engine and bell housing) to fulfill the need and so used the original '4 speed' plate together with the later Sierra one. The use of two plates also increased the clearance inside the bell housing. The prop. shaft must either be fitted with the Sierra splined yoke or changed completely for the current XR3 engined Morgan prop. shaft. I bought the new shaft from the factory.

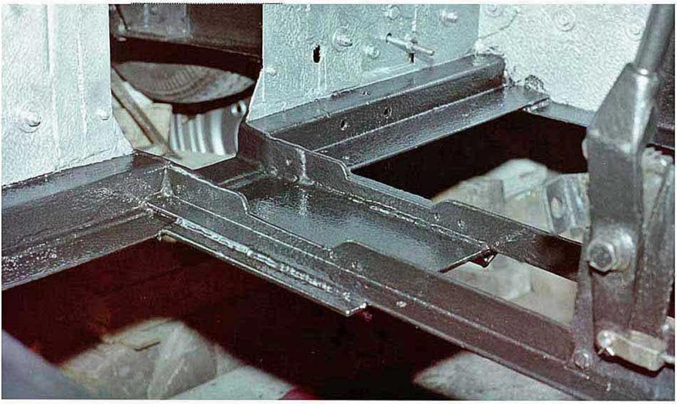




Once the engine and box have been mated, attention must turn to the chassis. As the car I was working with was a 4 seater (i.e. with higher bonnet line), it could be argued that raising the engine would have alleviated the need to modify the chassis. And, it is in my estimation, never a good idea to raise a sports car's centre of gravity. By lowering the gearbox I would 'straighten' the prop. shaft UJ angle as well as make it possible to use the existing gearbox tunnel. Consequently the decision was made to cut and modify the front cross member in order to clear the extra depth of the 5 speed box. Whilst doing this it was found necessary to remove some metal from the gearbox support angles; these were then strengthened with a plate welded underneath. I have already mentioned the need to use a cable clutch; this is because the clutch arm aperture in the bell housing is lower down and so will not line up with the old rod operation.

The information above will give you an idea of the work involved and the method I used to fit the 5 speed box. It is quite possible that there are successful ways of deviating from my solution - I can only pass on what I did!

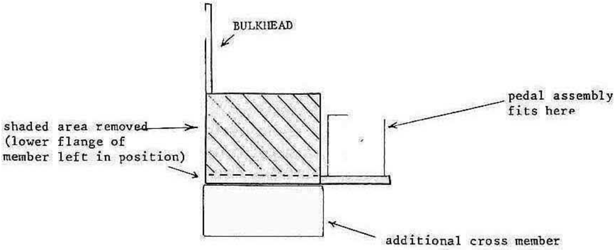
I will now move on to describe in detail, with part numbers, costs, dimensions, etc., etc., the 'nitty gritty' of this modification.



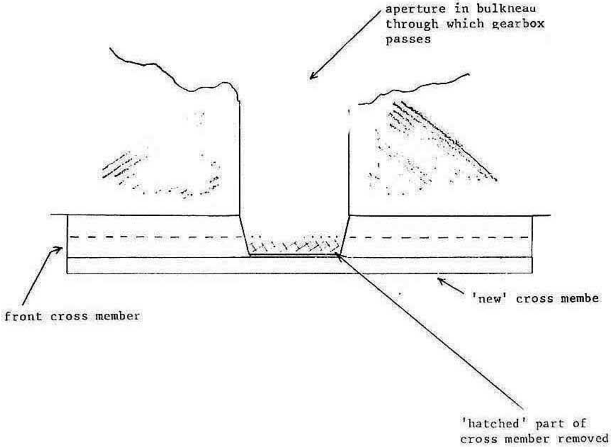
THE CHASSIS

Bonnets, engine, gearbox and prop. shaft removed. Extra clearance was needed where the gearbox crosses over the front cross member and also some metal was removed from the gearbox support angles. The cross member was first strengthened by welding a piece of 2" x 1" x 36" RHS (Rolled Hollow Section) underneath; it was positioned 1/16" proud of the front cross member edge and this then just clears the pedal assembly bolts which go through the cross member flange. Before welding the ends were boxed in and it was drilled to allow filling with Waxoyl. The new member was welded along all edges (USE AN EXPERIENCED WELDER). Having secured the new member, the old one was attacked with a hacksaw and the 'top hat' section was removed across the full width between the gearbox support angles. See sketch. Also at this stage a 10 SWG plate of steel 8" x 8½" was welded underneath the support angles and butted up to the 'RHS'; two strengthening ribs were welded underneath. The open ends of the old cross members were boxed in and all was made tidy. REMEMBER — a neat weld is a good weld!! If it does not look good, have it ground off and done again.

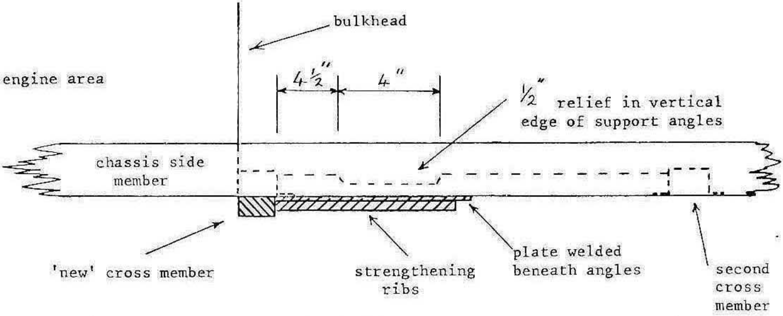
The sketches that follow are not to scale.


BULKHEAD
pedal assembly fits here
shaded area removed (lower flange of member left in position)
additional cross member

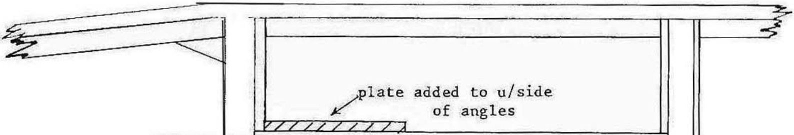
SECTION THROUGH CROSS MEMBER SHOWING METAL REMOVED
(gearbox support angles not shown)

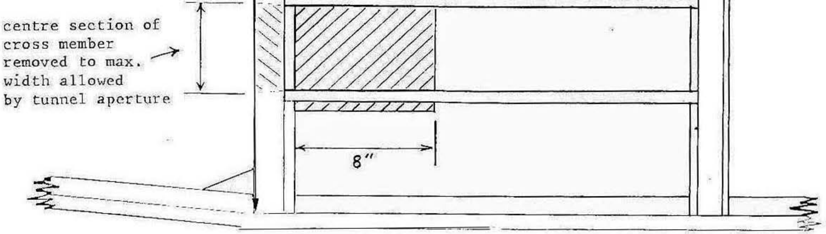

aperture in bulkhead through which gearbox passes
front cross member
'new' cross membe
'hatched' part of cross member removed

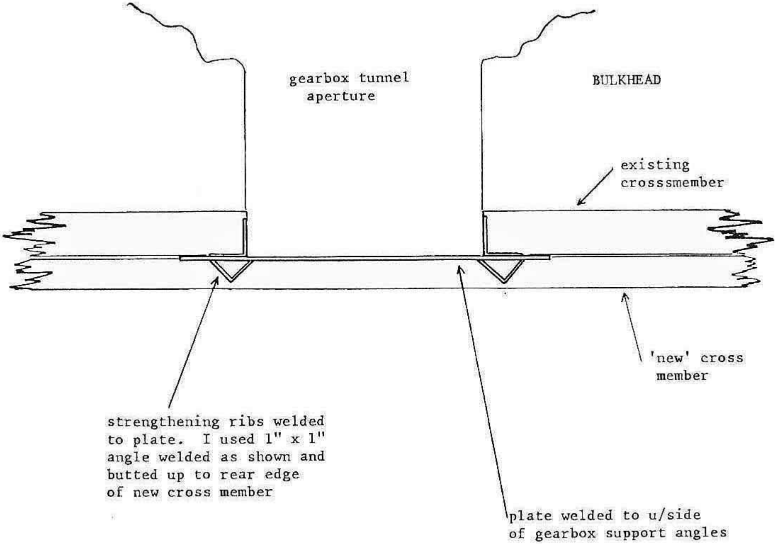
FRONT CROSS MEMBER VIEWED FROM ENGINE COMPARTMENT



PLAN VIEW OF CHASSIS SHOWING MODIFICATIONS TO CROSS MEMB




centre section of cross member removed to max. width allowed by tunnel aperture
8"


gearbox tunnel aperture
BULKHEAD
existing crosssmember
'new' cross member
strengthening ribs welded to plate. I used 1" x 1" angle welded as shown and butted up to rear edge of new cross member
plate welded to u/side of gearbox support angles

VIEW OF MODIFIED FRONT CROSS MEMBER FROM INSIDE OF CAR

The piece of RHS should not cost more than a few pounds (if that), and the welding cost me £20 - very good value for the work involved. The other bits and pieces came from a scrap bin. When all the 'heavy work' has been completed, all areas were cleaned, degreased and painted; the new and old cross members were filled with Waxoyl. With the engine and gearbox out, attention was also paid to tidying up and repainting the engine compartment plus any other areas that needed it.

To facilitate good access, the front of my car was raised some 2' 6"; this is to be recommended.

This concludes part one of this modification and next month should see the details of mating engine to gearbox with information on all the final 'little' bits that so often became the worst hurdle. To whet the appetite of those considering this modification I give details of the final results when shown as performance figures.

Ratio of R.P.M. to Road Speed (when using 4.1:1 differential with normal 82% aspect ratio tyres which nominally have an 82 inch circumference).

	1000 r.p.m.	2000 r.p.m.	3000 r.p.m.	4000 r.p.m.
4th gear (1:1)	— 18,9 m.p.h.	— 37,9 m.p.h.	— 56,8 m.p.h.	— 75,8 m.p.h.
5th gear (1:0,83)	— 22,8 m.p.h.	— 45,6 m.p.h.	— 68,5 m.p.h.	— 91,3 m.p.h.

The fourth gear details would compare with the existing 4 speed gearbox top gear.

PART 2

In part 1 the modifications that I made to the chassis were covered in some detail; this continuation covers the engine to gearbox engineering and the final details. The modifications that I made to the chassis were, in my opinion, necessary to maintain the ideal drive alignment from the engine, through the gearbox and onto the prop. shaft. I feel that it would be possible to accommodate the deeper casing of the 5 speed box by adjusting the height of the engine/gearbox mounts; but for the above reason, I chose to modify. Also, as my car is still on its original chassis (1971) and outwardly in excellent condition; it seemed a useful opportunity to check on the internal condition of a cross member - it was quite rusty!!

All prices quoted are excl. VAT and correct at June '86.

THE GEARBOX

Basically all the parts required are available from your local Ford Dealer, breakers yard or from the Morgan Factory.

The gearbox is part number 839 T ED from, I understand, a 2.0 litre or 1.8 litre Sierra; and before even thinking about mounting it, attention must be paid to the speedometer gearing. To do this the tail shaft housing must be stripped off; and, the helical gear pressed onto the tail shaft must be changed for a 7t gear. You may be lucky and find that your gearbox has the 7t gear already, it can only be either a 7 or 8 tooth and Murphy's law meant I had the 8!! For stripping down the tailshaft housing I used a Haynes workshop manual covering the relevant Sierra; this is by far the safest way of making this change. The driven pinion used had 24t and this can be fitted after the box has been installed; this pinion is retained by a 'top hat' retainer with a small oil seal on the cable side. The 7t and 24t gears are correct for a 4:1 differential (as in my car); if your diff. ratio is different I can only suggest you have a word with your Ford dealer. I feel confident that the 7t gear will be correct for any Morgan with 15" wheels; so, as the 24t pinion is easily fitted later, trial and error could be the only solution.

Ford 'FINIS' code numbers:
7t gear — 6095065 (839 T 17285 BA) £6.57
24t pinion — 6011058 (72 BT 17322 CA) £3.20
Oil seal — 1579860 £1.06
Retainer — 1425662 40p

Do not forget to use new gaskets when reassembling the gearbox - there are 2 of them. There is also a gasket needed for the bell housing to g/box joint; part number 71 BB 7A 619 AB (or AA)

THE BELL HOUSING AND CLUTCH

The bell housing needed has the part number 71 BB 7505 AC and this number will be found cast into the rear face; this item came from my local breakers yard and was together with the clutch arm; part number 71 BB 7641 KA.

Check that both items are in good condition and try to keep all the bolts. Expect to pay around £10 to £15 for these items. The small amount of wear on the clutch arm fulcrum shoulder in the bell housing was ground off with an angle grinder - the locating pin will drift out easily from the outside rear face.

The big problem with straightforward mating of engine to gearbox is that the 'Kent' flywheel is 9 mm further from the engine block than on the 'Pinto' engine. This means that the required measurement for clutch operation is **reduced** by 9 mm; consequently every available mm must be preserved. To this end I ground 3 mm off the clutch arm fulcrum, 3 mm off the rear edges of the clutch arm (see sketch) and 3 mm from the end of the trumpet (the part the release bearing slides on). Further, and for two reasons, I used 2 engine plates (plate between engine and bell housing); this gained another mm and saved the need to make a special. The original '4 speed' engine plate was lined up on the new '5 speed' engine plate and certain unwanted bits of each plate were removed. The starter motor area of the '5 speed' plate is wanted - so remove the '4 speed' starter motor bit etc., etc. If you approach this with care it will soon become evident which bits to modify; a pair of full size drawings of the two plates are lodged with Chas Smith and for a small charge (for the Register) a copy will be forwarded. The '4 speed' engine plate has part number 691 M 6A 372 BA (FINIS code not known) and the '5 speed' plate number is 73 HM 6A 372 DA with FINIS number 1545267 @ £11.85.

Turning now to the flywheel and clutch; the first thing to discover is whether you have a 190mm plate or 215mm diameter plate. This can be ascertained by measuring the PCD of the pressure plate fixing holes; 225.25mm for a 190mm Ø plate and 246mm for a 215mm Ø plate.
Pressure Plate - 83 BB 7563 AA (or BA)
Clutch Plate - 83 BB 7550 DA (or EA)
For 215mm Ø plate;
Pressure Plate - 83 BB 7563 CA (or DA)
CLutch Plate - 83 BB 7550 FA (or JA)
My car had a 215mm Ø plate and so the items used were as follows.
Pressure Plate - 83 BB 7563 DA - FINIS CODE - 6107852
Clutch Plate - 83 BB 7550 FA - FINIS CODE - 6107845
Note: The 'FA' plate has been given an alternative FINIS number of 1637191.
The pressure plate cost £37.53 and the clutch plate £23.40 - both were genuine Ford parts.
The release bearing used was a particularly shallow one and had the part number;
83 BB 7548 AA FINIS code 6124270 @ £11.30,
and a further number of ECB 113.

When assembling all these items, lubricate all bearings and use new spring washers on the Pressure Plate bolts; it is also a good idea to replace the 6 flywheel fixing bolts. Check that there is a recess in your flywheel to clear the clutch plate hub; it should be 130mm dia. and 2-3mm deep.

Why not have your flywheel lightened while you are at this stage?

Now a trial assembly can be attempted; take note that the bolts on your old '4 speed' bell housing will probably be ⅜" UNC as mine were; whereas the new bell housing is metric (10mm dia). I used M10 x 30mm high tensile bolts for this and the original UNC bolts where bolting into the 'Kent' block.

If all looks good after assembly and you have 5-7mm clearance behind the clutch arm when it is resting on the Pressure Plate diaphram fingers - BOLT UP TIGHT and go for a pint, it is close to installation time!

THE INSTALLATION

If your car has the older method of clutch operation and uses a rod directly connected to the pedal; this must be changed to a cable operation. All the parts are available from the Morgan Factory but there are two lengths of pivot bolt. The correct ones for an early car are longer; perhaps the best solution is to buy the early ones and cut to length if too long. Alternatively measure your cross member width and advise the factory stores dept. accordingly. To describe the fittment of a cable clutch pivot assembly is probably unecessary when the best solution is to have a good look at a later car that already has it. The various parts of the pivot assembly cost only a few pounds (less than £10) with the cable available from the factory or your Ford dealer on part number 74 EB 7K553 HB.

Now comes the installation. Depending on the amount stripped off your car at this stage you may be able to install engine and gearbox as one item or have to separate them. You can use the same gearbox mounting but will have to reposition the support bracket; whilst doing this I reduced the height of this bracket to about 1¼" to obtain a better operating angle on the front universal joint. The propeller shaft used was the current item as fitted to the XR3 engined 4/4; alternatively you could possibly modify your existing one with the larger gearbox splined yoke - your choice! I used the new shaft and put the original into stock; the new shaft cost around £110 from the factory.

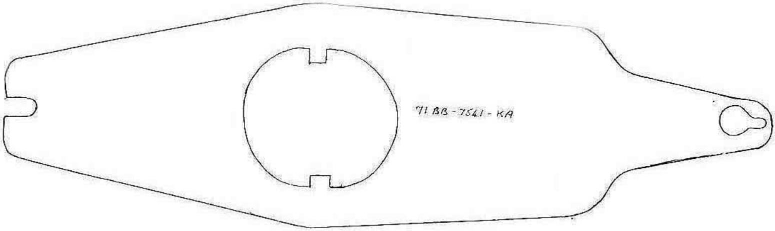
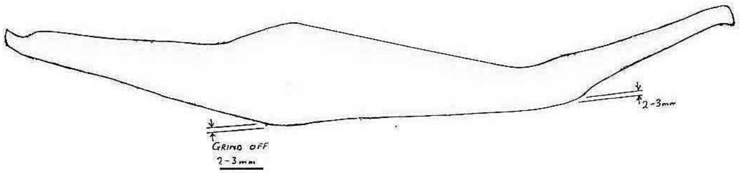
If all as gone as well as it did for me; all that is left now is to fit the gear lever and connect the speedometer cable. Following that it should be just a case of refitting the tunnels, front floorboards (if you removed them) and making ready for a road test.

The current method of attaching the speedo cable is to bring it straight into the drivers footwell. However, on most (if not all) of the Kent engined cars a Smiths right angle drive unit was used to enable the cable to lay along the gearbox and then up to the dashboard through the bulkhead. It was at this stage that God smiled on this project!! I tried fitting the right angle drive onto the new box and it fitted exactly; all that was needed was to reshape the forked bracket and drill out the blind cast hole nearby for a fixing bolt. The use of the original cable ensured that no problems were encountered in trying to fit a new cable to the older type of speedometer.

When fitting the gear lever, I found that the length of the standard lever was too long. I removed 1½" and re-threaded it (10mm) to suit the gear knob. The rear tunnel will go on as before but the front tunnel either can be pulled out on the nearside to clear a bulbous part of the gearbox or re-shaped to accommodate the wider part of the box; it should be a simple 'tin bashing' job not needing explanation here. The next stage is to run a close check on everything that has been done and then fit all the ancilliary items back on ready for a road test - do not forget the gearbox oil. Whilst on the subject of oil. I was advised by an experienced Ford mechanic to use EP 90 and not the thinner oil specified for the 5 speed box; this was because the layshaft bearings last a lot longer on this.

The details that I have given are as accurate as my notes and memory allow but please do not hold me to any inaccuracies; the basic guidelines are correct as are the part numbers and the proof is sitting in my garage with over 2,000 miles covered faultlessly.

I must give credit for assistance given freely by several people during the execution of this project:

Geoff Margetts } Morgan Factory
Bill Beck
Dave Young — a 3 wheeler owner with access to the 'experts' at Ford Transmissions who offered invaluable assistance.
Karen — my wife - patience and assistance plus many cups of coffee.