

## Annular Throw-out Bearing Conversion

by Colin Pillar



*A Tilton Hydraulic Release Bearing*

From the time I purchased my 1973 TR6, seven years ago, the clutch has been tricky to respond around the friction point. It had to be carefully feathered, and sometimes it shuddered. These characteristics were not unique to my car and were also reported by other Triumph owners – TR4, TR250, TR6 and Stag. This is not surprising as all of these models used almost identical mechanicals with respect to the clutch release operation.

In my search for driveability, I wanted the clutch to behave predictably and certainly not pose a safety issue, say in the middle of a left hand turn. During an upgrade to install a Laycock J-type overdrive unit, I noticed the forks in the clutch assembly were cracked. Apparently, this is a common condition. While the transmission was out of the car, it seemed logical to replace the forks, so I did. At this point, I also had the flywheel lightly skimmed on a lathe because some hot spots were evident on the surface.

The end result of my research led me to conclude that a hydraulically operated annular throw-out bearing conversion was the best solution. This conversion was an important step towards my vision for the car's driveability. I also wanted my wife, Chris, to be comfortable driving the car. There are kits available for the TR6 and other Triumph roadster models from the likes of Racetorations' ([racetorations.co.uk](http://racetorations.co.uk)) and Revington's ([revingtontr.com](http://revingtontr.com)) in the

UK and Herman van den Akker in California ([hvdaconversions.com](http://hvdaconversions.com)) but I am not aware of a kit specifically made for the Stag.

Using an annular clutch release mechanism dispenses with the original hydraulic cylinder, push rod, cross shaft, fork, bearing and carrier completely. With all the original linkage parts removed the new assembly is bolted directly to the front of the gearbox and has just one moving part, the annular hydraulic cylinder which pushes the release bearing on to the clutch diaphragm



*Kits are available for the TR6 and other TR roadsters but not the Stag*

directly.

In the end, I decided against purchasing a kit and sourced all of the required components myself. Consequently, it should be possible for a Stag owner to successfully replicate the same process that I followed on my TR6.

My reason for going it alone was that I considered the kits to be pricey, at around CAN\$1,200 (in 2014), and I thought it would be fun to fabricate the adaptor plate myself. The Tilton 4100-Series release bearing ([tiltonracing.com](http://tiltonracing.com)) came in at \$225, complete with



*A hardwood block was used to mimic the intrusion of the clutch fingers into the bell housing - Image: Sean Doherty*

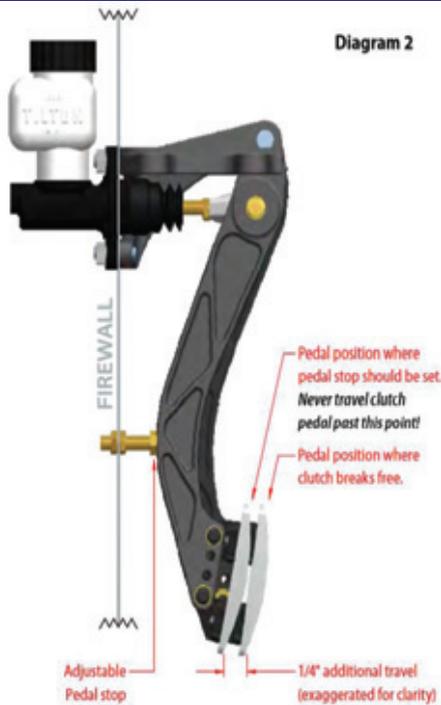
braided hydraulic cables and I made the adaptor plate from ¼ inch thick aluminum stock and tinkered with that for probably a good six hours to get it where I wanted it.

The steps needed to complete the job comprised the following sequence:

- Remove the transmission,
- Remove front cover from existing clutch, cut and discard the tube,
- Measure distance from clutch fingers to mating surface of engine block,
- Make a hardwood block precisely this size. This will be used to mimic the intrusion of the clutch fingers into the bell housing and assist with adjusting the clearance for the bearing,
- Using spacers, calculate distance from bearing mounting plate to edge of transmission bell housing,
- Check distance to specifications in the instructions that came with the bearing parts or kit. Proper shims are included to achieve this.
- The bearing must be perfectly centered on the shaft. To do this, I used equal sized drill bits, dropped into the shaft splines, so that a tight fit is achieved. Then, I could position and drill the adaptor plate.
- Bolt the bearing in, fit the hydraulic lines and start reassembling.

It is necessary to prevent the over-throw of the bearing once installed

## Aligning a Clutch by Dave Goult



*It is necessary to prevent the overthrow of the bearing once installed - this is done by adjusting the stop point on the clutch pedal*

- this is done by adjusting the stop point on the clutch pedal itself (refer diagram above). The only remaining job is to connect the hydraulic line to the fluid reservoir.

How would I rate the difficulty of this modification? It is probably best to consider two ratings and on a scale of 1 to 10 - for the purpose built kits, I would rate around 5 for the average enthusiast. The way I did it, fabricating the plate myself, I would rate as an 8, or at the upper end of what that same enthusiast is able to do. I enjoyed tinkering with it until I had it fitting exactly the way I wanted, so convenience wasn't a factor. I have been very pleased with the end result. The clutch action is very smooth, with none of the shuddering or feathering issues I had previously experienced.

**SN**

*[Colin Pillar resides in Mississauga, Ontario and is one of three TR6 model specialists for the Toronto Triumph Club. Although Colin is a TR6 aficionado, he is also very familiar with the workings of the Stag as he has helped out your Editor with almost all of the major repairs on his Stag. Colin admits that he has to 'work his TR6' to keep up with my BW35 Stag - Ed.]*

I have recently completed some work on my Stag which I have owned nigh on 30 years - rebuilding the engine, new differential, etc. but I have had a lot of problems with the clutch which has been "heavy" ever since I bought the car.

I used to lubricate the pressure plate fingers, which works for a while; actually I've been doing that all along. I rebuilt the engine recently and upon refitting found the clutch to be totally unusable. It was so heavy and sticking that it was nearly impossible to drive.

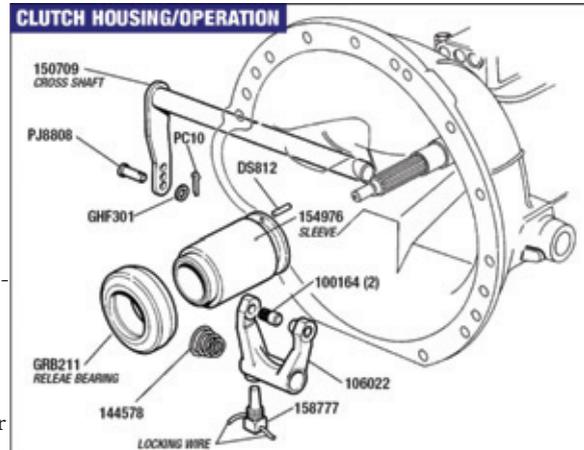
I spent some time researching the operation of the clutch and the cause of the problem which is a misalignment between the gearbox and the engine. My car had been fitted with a 7/8 inch bore slave cylinder instead of the correct 1 inch bore. I originally thought that this was why the clutch was heavy. The master cylinder will deliver enough liquid for a 1 inch bore to travel 15mm (0.59in.) whereas the 7/8 inch bore will travel 19mm (0.748in.) Due to misalignment the larger bore lost 3mm (0.118in.) of travel due to the extra pressure required. This is not enough to release the clutch. The previous owner had used a 7/8 inch bore to increase the travel and overcome this problem.

So how do you align the gearbox to the engine? The workshop manual is a waste of time and the on-line forums will tell you to use two lining up bolts in the bell housing. There are two bolt holes in the bell housing that are slightly larger than all the other holes so I made some oversize dowels to fit these holes but that didn't work [these two holes, at roughly ten past seven, are designed to accommodate metal dowels for proper alignment of the bell housing. Over time, they may have been lost by a previous owner - Ed.]

I figured that the only way is to let the gearbox and engine find their own alignment. To accomplish this, firstly secure the car, jack one side up and chock it. Don't rely on a jack, hydraulic or mechanical, unless you can bench press 1 1/4 tons. Loosen all the bell housing bolts to 'just loose'. Getting access to the firewall bolts is the hardest part of the job. If you're by yourself find a block of wood and engage the clutch by wedging the wood between the pedal and one of the steering column brackets.

Start your engine and leave it running while you pop under the car and tighten at least three bolts at opposite sides of the housing. Try the clutch; if it isn't free then maybe the bolts weren't quite loose enough. If it is free, turn your engine off and spend the rest of the day getting all the bolts tightened up on the bell housing.

This method worked a treat for me and was easier than it sounds. My clutch is now the smoothest it has ever been and I now



*The Stag's Clutch Housing Parts*

*Image: Rimmer's catalogue*

have the correct slave cylinder fitted. **SN**

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