2CV GEARBOX OUTPUT HUBS

By Graeme Dennes

Revision 2

Purpose

This article describes the procedure to replace the oil seals, and optionally, the bearings, in the 2CV gearbox output hubs. The critical items associated with the procedure are described. The article commences with background information and an overview of the procedure.

Background

The 2CV gearbox is fitted with two output hubs which deliver the motive power to the front wheels, providing the 2CV's legendary "Oh, my gosh" performance! The output hubs are fitted on the sides of the gearbox and held by studs. They are effectively hidden from sight by the front brake components so are rarely seen. 'Allo 'Allo, what is zis zing 'ere?

The main components in each output hub are the output hub shaft (Citroen calls it a differential shaft), an oil seal and a sealed bearing. The inner end of the shaft is splined and engages with and is driven by the gearbox differential gearing, while the outer end of the shaft is fitted with a flared metal flange which attaches to and drives the front wheel drive shafts.

This article had its genesis when the writer needed to replace the oil seals in the output hubs of his orange 2CV. Both oil seals had started leaking, allowing gearbox oil to slowly escape through the oil drain holes in the output hub mounting flanges. The oil seals had been replaced only three years earlier, but on their removal from the hubs, it was found that the rubber in the seals had lost its resilience, feeling quite hard to the touch and so reducing the sealing effectiveness. Oil leaks resulting from the failure of these seals is usually the time most 2CV owners first become acquainted with the gearbox output hubs!

To set the context, before the writer took his 1974 2CV to New Zealand for RAID 2018, the writer had supplanted the original DOT drum brake system with an LHM disc brake system. (Citroen did not fit disc brakes to the 2CV until 1981.) The task to change from front drum brakes to disc brakes created much merriment(!) due to some issues experienced, which were resolved only a few hours before the car had to be driven to Melbourne docks for its sea voyage to New Zealand. The 2CV brake saga is the subject of another article by the writer.

The tightening torque figures provided here are drawn from either the Citroen 2CV Repair Manual or the Citroen 2CV Overhaul Manual, both official 2CV maintenance manuals produced by Citroen.

Critical item: Check for correctly fitted output hubs.
This check is done with the brake calipers and discs removed. One output hub is designed for fitting to the left side of the gearbox and the other is designed for fitting to the right side. When the output hubs are *correctly* orientated and on their *correct sides of the gearbox,* two checks confirm all is good. Firstly, there is a small oil drain hole on the *bottom* edge of each output hub mounting flange which points *directly downwards* (check by temporarily inserting a drill into each oil drain hole).

Secondly, the oil drain holes are placed near the *rear-most* end of the mounting flanges. This confirms the output hubs are correctly fitted and is how Citroen fitted the hubs at the factory. The location of the oil drain holes is the tell-tale indicator.

Hubs swapped over?
If the output hubs have been swapped over, i.e. each fitted to the opposite side, this error will need to be corrected urgently because the gearbox preload and backlash settings will be wrong! **This means a major gearbox disaster is waiting to happen somewhere near you!**

AN OVERVIEW OF THE PROCEDURE

An overview of the procedure is given first, discussing the critical issues.

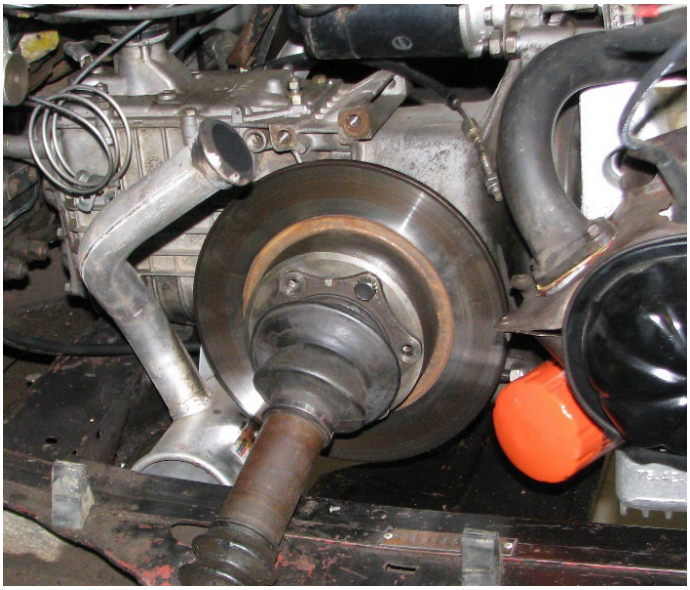

Photo 1: Firstly, remove both front guards. Disconnect all cables from the battery **negative** terminal. Remove the air tubes. Disconnect the heater cables from the exhaust system heat exchangers. Remove the heat exchangers. Disconnect the handbrake cables from the brake calipers. Remove the brake pads and the brake calipers, including the *very important* thin metal shim fitted on the two caliper mounting bolts and fitted between the inner caliper halves and the gearbox. One shim should be fitted on each side of the gearbox. No more, no less! Watch out for it.

Next, the CV-joint mounting plate on the inner end of each front wheel drive shaft is unbolted from the gearbox output hub drive flange by removing the six bolts and washers shown in the centre of the photo. This allows the CV-joint mounting plate and the brake disc to be separated from the output hub, exposing the output hub. The brake disc is sandwiched between the CV-joint plate and the output hub drive flange. Lift the driveshaft rearward, out of the way.

Photo 2: Crikey. Looks like I got to this job just in time! (Only joking. That single bolt was fitted for the photo!)

A closer view of the inner CV-joint plate and brake disc still bolted to the drive flange on the output hub (the hub is still hidden behind the disc).

You may observe a small bent metal clip situated between the two upper bolt positions. There are three of these clips positioned on the CV-joint plate and they hold in place what is essentially a shaped metal gasket.

The metal gasket fits between the CV-joint plate and the outer face of the brake disc. The metal gasket normally won't be loose and fall off, but ensure it is properly fitted and secured before the CV-joint plate and brake disc are later refitted to the output hub with the six bolts.

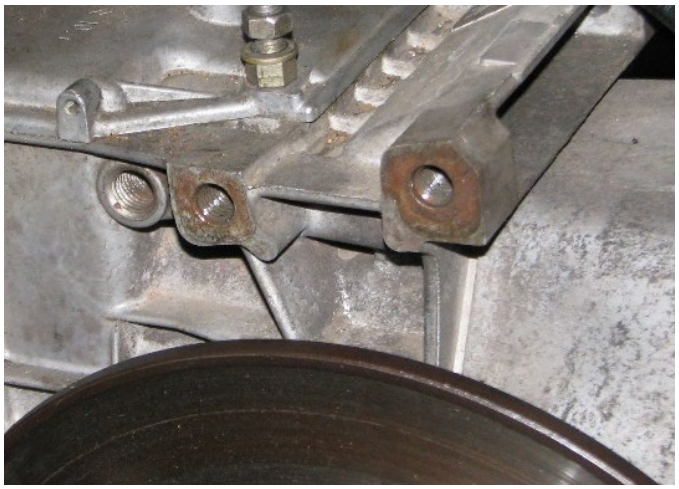

Photo 3: Shows the attachment points for the brake caliper bolts on the right side of the gearbox. The caliper bolts hold the thin metal shim and the brake calipers in place.

An item of interest. Should you plan to replace your DOT drum brake system with an LHM disc brake system, ensure your gearbox has these two attachment points for the caliper bolts, otherwise the changeover cannot be done!

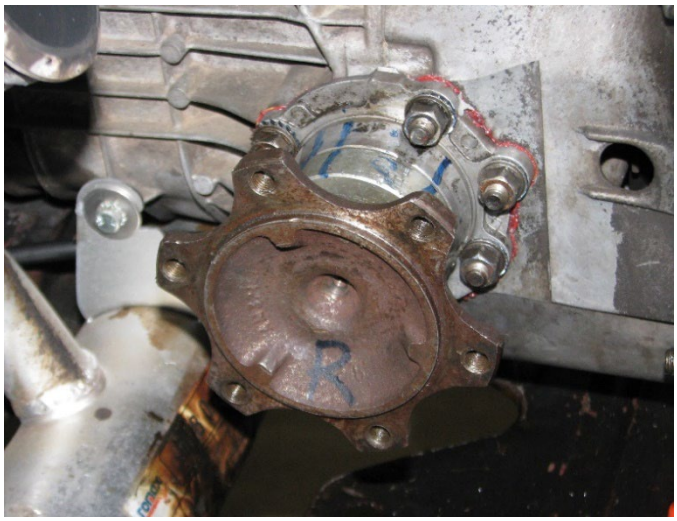

Photo 4: Ladies and gentlemen. Please take your seats. After the CV-joint plate and brake disc are removed from the output hub drive flange, the output hub is exposed in all its glory! The photo shows the flared drive flange on the output hub with its six bolt attachment points. Note the blue "R" (for the right side). Yes, many 2CV owners never get to see the output hubs because they are highly-reliable, long-lasting components which are mostly hidden from sight by the brake components of the 2CV.

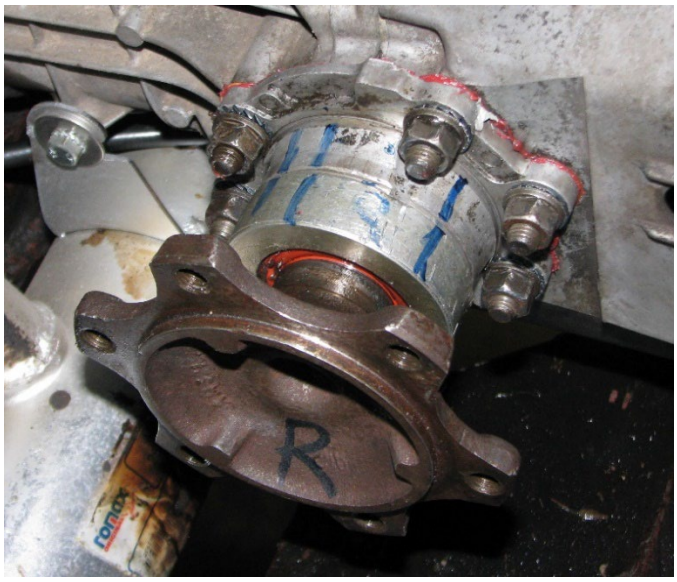

Photo 5: Another view of the gearbox output hub, showing the hub and its mounting flange which is held on the gearbox by six studs, nuts and star washers. A thin paper gasket (with gasket sealant on *both* sides) fits between the hub mounting flange and the gearbox face. The excess gasket sealant is shown in orange at the upper part of the photo.

Critical item: If gasket sealant is not applied, the joint will leak!

Note: The orange colour at the centre of the photo is part of the face of the sealed *outer* shaft bearing, mostly hidden by the ring nut. (The *inner* shaft bearing is inside the gearbox.) Note: Citroen refers to the ring nut as a bush nut. The output hub shaft extends outwards from the hub and is flared to form the metal drive flange which holds the six bolts for attaching the brake disc and the CV-joint plate fitted to the front wheel drive shaft.

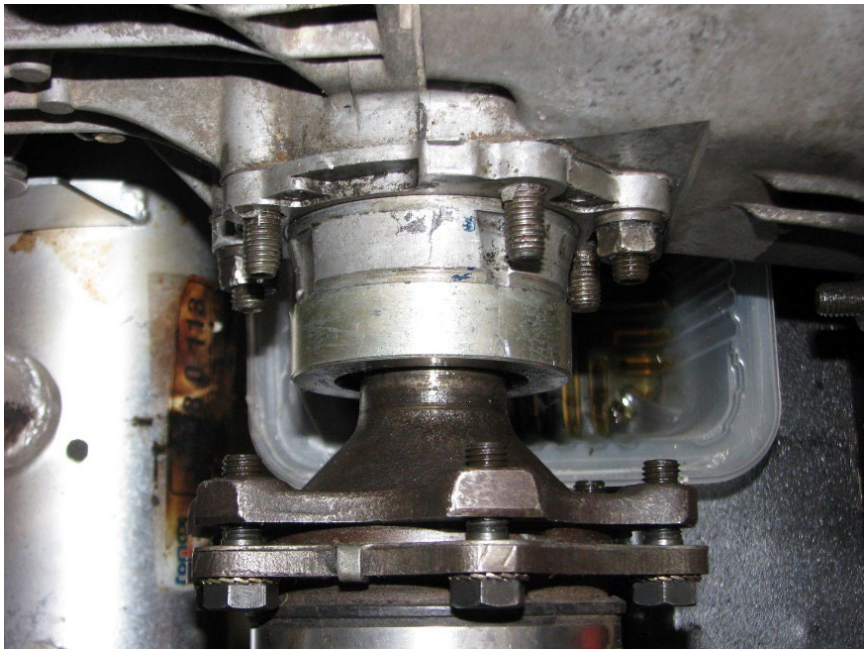

Photo 6: A view of the (temporarily-refitted) output hub on the right side of the gearbox, taken directly from above. This photo was taken after the brake disc was removed for clarity and the CV-joint plate temporarily reattached to the output hub drive flange with several of the bolts.

The output hub drive shaft, driven by the gearbox differential gearing, exits the hub at the ring nut and is flared to form the output hub drive flange which attaches to the CV-joint plate, with the brake disc held between them.

Critical Information

Don't attempt to remove the ring nuts and hubs until you have completely finished reading this overview section which provides the key details to help the reader gain familiarity with the procedure and the sequence of steps. The procedure is presented in detail at the end of this overview.

After the front drive shaft and the brake disc have been separated from the gearbox output hub, the next step will be to loosen and *almost* remove, repeat, *almost* remove, the ring nut from the hub **while the hub remains fitted to the gearbox.** The ring nut is removed by turning it *counter-clockwise to unscrew it.*

A strap spanner will be used to unscrew the ring nut from the hub. Should it be firmly held in place, a cold chisel and hammer will be called on to assist the process. Much more follows.

Photo 7: Strap spanner. Used for unscrewing the ring nut from the hub body. It is also used for tightening the ring nut during reassembly of the hub.

This particular tool is made by Ridgid and uses a resin-impregnated nylon strap about 30 mm wide. It is *very* strong!

As noted, should the strap spanner be unable to loosen the ring nut and unscrew it, a cold chisel and hammer will be required to firstly cut a notch in the ring nut and then to drive the ring nut counter-clockwise to unscrew it.

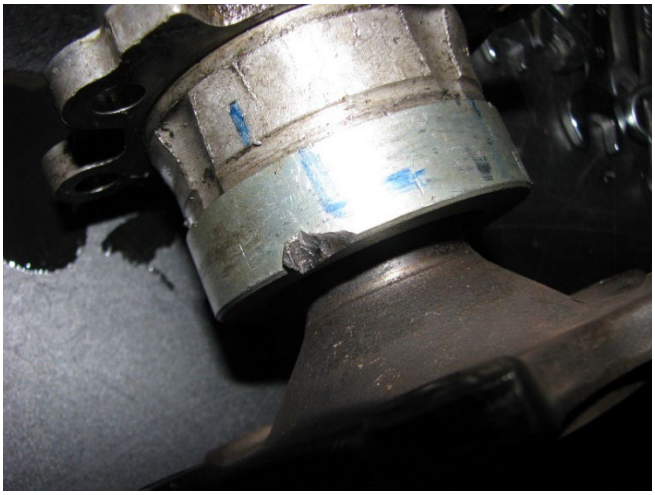

Photo 8: Shows the notch cut into the outer edge of the ring nut to take the tip of a cold chisel which is struck by a hammer, should it be necessary, to open the peening and loosen the ring nut so it may be unscrewed from the output hub with a strap spanner.

You may feel very uneasy about cutting a notch in the ring nut with a hammer and cold chisel in such a seemingly brutal manner to loosen the ring nut. However, it does the job perfectly and efficiently. If you know of a better way to remove a stubborn ring nut, please let the writer know.

Photo 9: This "thousand words" photo shows the unscrewed ring nut and the mating threads on the hub body. *The ring nut is a threaded cap which holds the output hub shaft and the bearing captive in the hub body.*

Note the small notch cut into the outside edge of the ring nut with a cold chisel as already mentioned. **With the output hub still attached to the gearbox casing,** start with a *sharpened* cold chisel and a hammer to cut a small notch at around 11.30 on the ring nut. The cold chisel needs some amount of angle to firstly bite into the ring nut to cut the notch but it then has to be able to start it turning until it loosens. The cold chisel will open the peening in the ring nut and allow the ring nut to start turning counter-clockwise. There's not much room to swing the hammer. A short-handled heavy hammer works best. Once the notch is cut, use a *less-sharp* cold chisel so it *pushes* on the metal of the shoulder of the notch rather than cutting deeper into it. You will need to use your best judgement at every step with this task as it is too hard to specify.

Note: Don't destroy the shoulder or you'll need to cut another notch! If the ring nut is still quite tight, you may need to cut a second notch to keep the ring nut turning further until it loosens enough for the strap spanner to remove it. If the ring nut won't budge at all, some heat may be applied directly to the ring nut (but nowhere else!), immediately followed by the cold chisel and hammer. The peening does not interfere with the threads on the hub body or the ring nut.

A point of interest in Photo 9 is that this particular output shaft drive flange has been fitted with double-ended studs. In theory, this should give a longer life to the drive flange threads because the usual six bolts are not being repeatedly tightened into the drive flange, so should a thread ever be damaged, it is a simple job to replace a stud while extending the life of the drive flange. (Photo 9 courtesy of Peter Fosselius).

Critical item: Sitting behind the inner end of each hub is a set of shims. These are to be carefully removed and **kept as a set.** They will be later returned as a set to the *same gearbox side* during the refitting of the hubs to the gearbox. Keep the two shim sets well separated and marked!

OK, LET'S DO IT!

THE PROCEDURE – PART 1

Loosen the Ring Nut and Remove The Hub

1. Place a tray under the gearbox to catch the oil when the hubs are removed.
2. With the output hub still firmly secured to the gearbox, apply a *sharpened* cold chisel and hammer to create a notch in the edge of the ring nut at around 11.30.
3. Using a *less-sharp* cold chisel, strike it with the hammer to start the ring nut turning counter-clockwise to unscrew it. Turn it as much as you can in the space available – perhaps a quarter of a turn. The initial part may be a little tight because the peening of the ring nut has to be opened.
   Note: If the cold chisel is unable move the ring nut, apply some heat directly to the ring nut – nowhere else, then try the cold chisel again until the ring nut starts to move.
4. Use the strap spanner to try to turn the ring nut further. If you are able to turn it with the strap spanner, **STOP!** Move on to step 5. If you are unable to turn it with the strap spanner, repeat from step 2 to cut a second notch in the edge of the ring nut and move it another quarter turn. Repeat steps 2 to 4 until the strap spanner can move the ring nut.
5. At this point, the ring nut should be able to be turned with the strap spanner. **STOP!**
6. Using a small universal joint to prevent damage to the nuts, *three-quarters* loosen the six nuts holding the output hub on the gearbox to give the hub some "wriggle room" on the studs.
7. Tap the output hub drive flange at two or three points on the gearbox side, sufficient to move the hub outwards and away from the gearbox face so the gasket seal bond is broken.
8. Use the strap spanner to continue loosening the ring nut to the point where it is moving freely but **is still fitted to the hub threads.** The ring nut holds the hub shaft and bearing in the hub body, protecting them for now.
9. Remove the six nuts and washers.
10. Carefully withdraw the hub body from the gearbox. Take your time as the hub is a close fit in the gearbox. Gently tap the hub drive flange if necessary until the hub separates. Keep an eye out for any round steel shims which may drop out as the hub is removed.
11. With the hub separated from the gearbox, although the ring nut should now be able to be unscrewed, probably by hand, *leave the ring nut attached to the hub body and set the hub aside for now.* **The ring nut removal and hub disassembly will be done later.**

Gearbox Shims

When each output hub is removed from the gearbox, one or more flat circular steel shims will be found positioned between the *inner* end of the hub and the *outer* face of the bearing shown in Photo 10. (The shims may have already fallen out when the hub separated from the gearbox as already noted.) The shims are nominally the same diameter as the output hub. The shims may be pressing up against the bearing face. *Carefully remove all the shims (their order is unimportant but their total thickness is exceedingly important) and set aside with the output hub for later refit, i.e. noting whether they came from the left side or the right side of the gearbox! Ensure the hubs and shim sets are returned to the sides from whence they came!*

Critical item: The total thickness of the shims fitted on each side of the gearbox is individually set by Citroen during the gearbox preload and backlash adjustments during the gearbox assembly in the Citroen factory. These are critical, whole-of-life settings for the gearbox. Don't disturb Citroen's settings!

Critical item: Should a hub on the gearbox need to be replaced with another hub, **for any reason whatsoever,** the *mandatory next step is the adjustment of the gearbox preload and backlash settings which are dependent on the physical measurements of the* ***two*** *fitted hubs! There is no way to avoid this step!* This requires the gearbox to be removed from the vehicle and placed on the work bench for these adjustments to be done.

Mark the individual items which make up each hub with a coloured marker so that when they are disassembled and then later reassembled and refitted, the set of parts on each side remains exactly as they were when fitted by Citroen way back when.

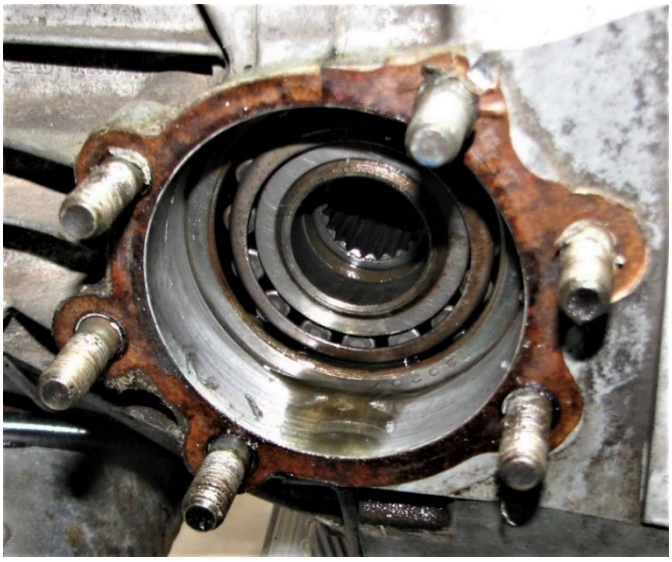

Photo 10: The side face of the gearbox after the output hub has been removed. Again, rarely seen! The output hub shaft is supported by two bearings. One is inside the gearbox (shown here at the inside of the opening), while the other is located in the output hub.

Shows the six mounting studs which hold the output hub. There's three studs at the front-most end and three studs at the rear-most end. The hubs are mounted at a small angle on the gearbox, with the *three studs at the front-most end being a little higher.* This photo shows the **right-side** hub mounting position, confirmed by the **slightly higher studs on the right** being at the **front-most end of the hub**, i.e. in the direction towards the front of the vehicle. A photo of the left hub mounting position is the mirror image.

Note: the old paper gasket is still fitted. This was later removed before replacement with a new gasket such as the Burton item A1.8748.

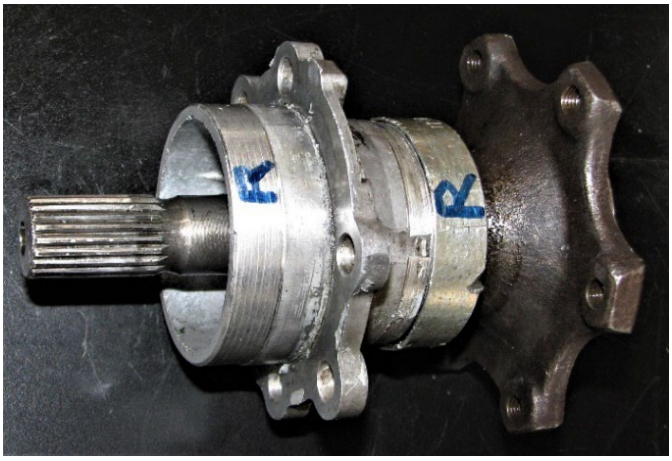

Photo 11 above: The gearbox output hub assembly after its removal from the gearbox. The splined end on the left is driven by the differential gearing. The metal flange on the right drives the CV-joint plate which drives the front wheel drive shafts which drives the front wheels! The brake disc is sandwiched between the drive shaft flange and the CV-joint plate. The left "R" is on the hub body and the right "R" is on the ring nut. A notch is visible on the ring nut, just below the "R". There is a third "R" needed...

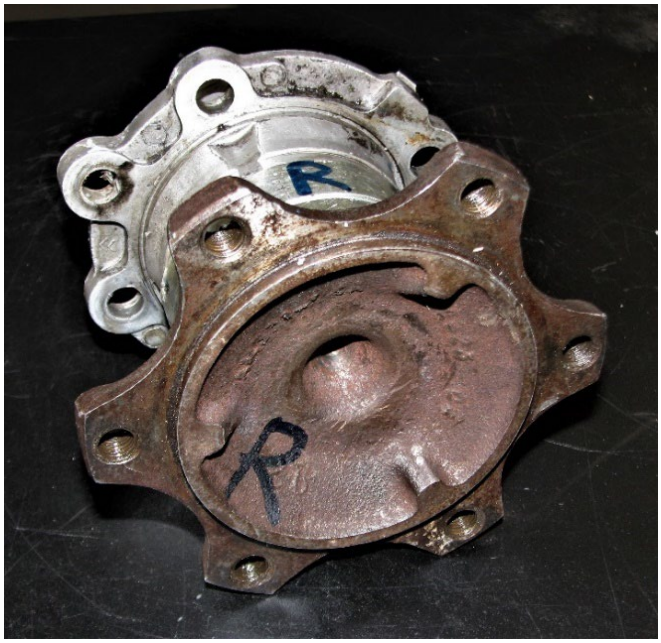

Photo 12: Ah, found it! Another view of the output hub, showing the third "R" on the drive flange of the output hub shaft.

To repeat, keep the three items marked with an "R" and the steel shims as a matched set, in this case, for the right side. Do the same for the left-side items. This is vital.

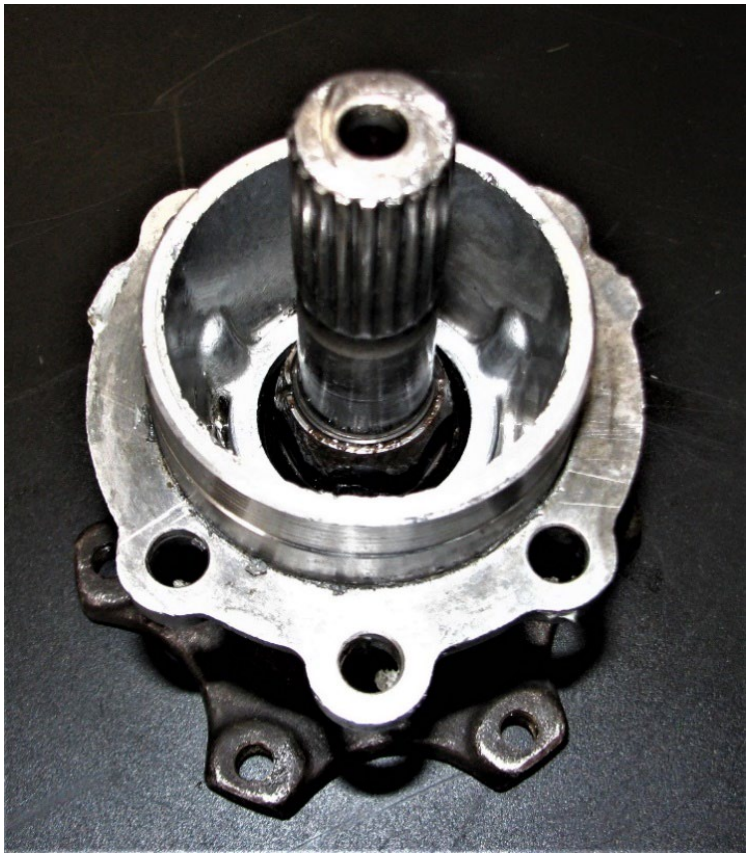

Photo 13: Shows the inside of the hub and the splined shaft which engages with the differential gearing.

Shows the lock nut which locks the *outer* bearing and steel spacer in place on the shaft. It can just be seen at the bottom of the shaft as a hex nut. The lock nut is tightened to **75 foot-pounds.** Add some copper grease first. Note the nut has been peened at its 9 o'clock position to ensure it does not loosen.

The writer experienced the consequences of this nut loosening in the left-side output hub during **RAID 2016**. The lock nut unscrewed completely, allowing the output hub shaft to slowly move outwards, sliding through the (tight) fit of the hub bearing until eventually the splines disengaged from the differential gearing, at which moment the vehicle failed to proceed while travelling along a red-dust road in Northern Territory somewhere near **Lajamanu**. (Note: the car had drum brakes at the front at that stage, so the drum was able to move outwards.)

Thanks to the swift diagnosis and repair effort by Stephane Laguna and Elliot Beniada, the output hub was removed from the gearbox and the **recalcitrant** lock nut fitted, tightened and peened. We were back on the road in two and a half hours. A truly magnificent effort by these gentlemen in a situation well away from the comforts and tools of a workshop and in exceptionally difficult, dusty and dirty conditions on the side of the road. Thank you both once again! That was the day the writer was formally introduced to the 2CV gearbox output hubs!

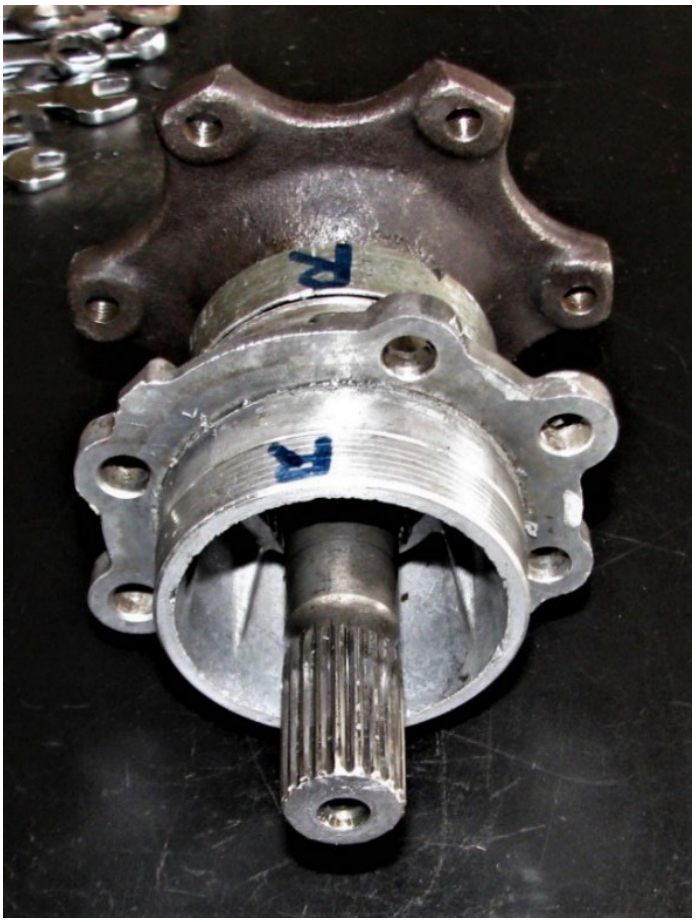

Photo 14: Another view of the output hub.

THE PROCEDURE – PART 2

Remove the ring nut and disassemble the hub

The ring nut may now be fully unscrewed from the hub body. After the ring nut is unscrewed, the shaft and bearing assembly should separate easily from the hub body by tapping on the splined end of the shaft with a rubber mallet. Do not damage the splines, the hub body or the bearing when doing this. The bearing has a close, sliding fit in the hub body.

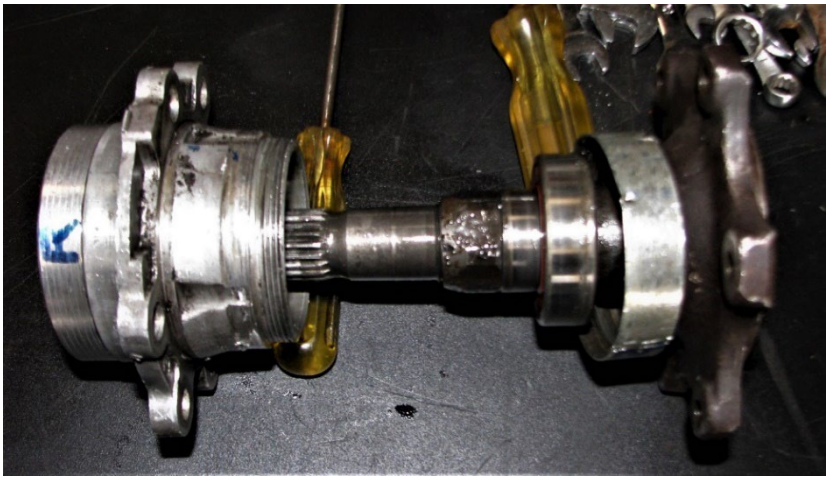

Photo 15: Shows the output hub shaft and components after being almost separated from the hub body after the ring nut is unscrewed. More follows.

From left to right, the components are: output hub, output hub shaft, shaft lock nut, shaft steel spacer, shaft outer bearing, ring nut and output shaft drive flange.

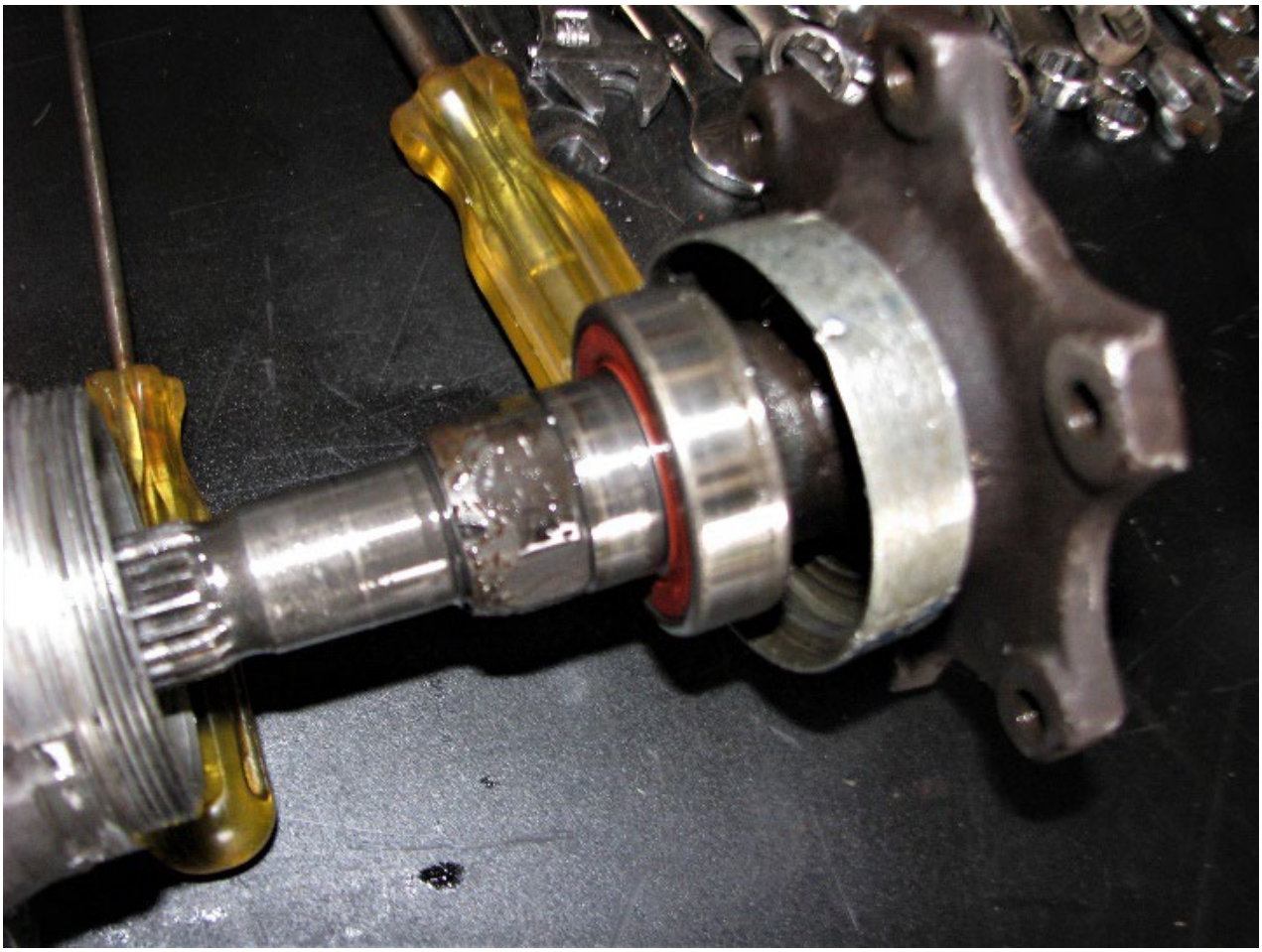

Photo 16 above: A closer view of the output hub shaft assembly showing the output hub, the hub shaft, the shaft lock nut, the spacer, the bearing, the ring nut and the output shaft drive flange. Should the ring nut need to be replaced, the lock nut and steel spacer will need to be removed from the shaft, then the bearing extracted from the shaft with a bearing puller, after which the ring nut may be removed from the shaft.

The purpose of the lock nut is to lock the bearing and the steel spacer in position on the shaft. The purpose of the ring nut is to hold the output hub shaft and bearing in position in the hub.

Don't damage the steel spacer. The oil seal runs against its polished face and any marring of its surface will result in the oil seal having an exceedingly short life and you will get the chance to repeat the entire procedure all over again, *after the steel spacer is replaced!* Aaaagggggghhhh!!!!

Apologies for the poor focus in Photo 16. A photo of so many closely-positioned curved surfaces of different radii proved to be too much of a challenge for the camera's auto-focus mechanism! (Yeah, but the benchtop and screwdrivers are in focus!)

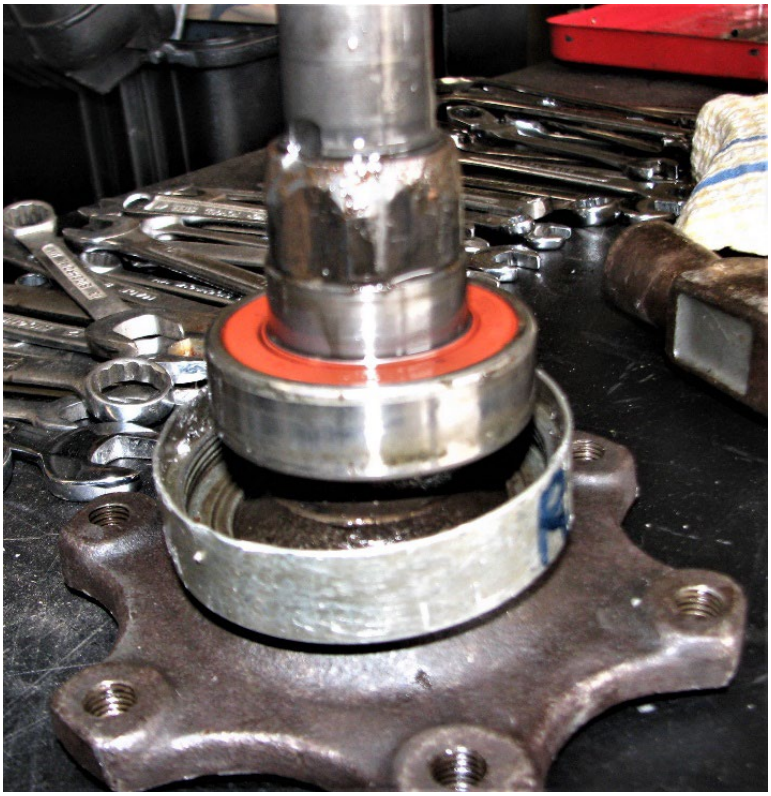

Photo 17: The output hub shaft assembly after being withdrawn from the hub. Shows the shaft, the lock nut, the steel spacer, the sealed bearing, the unscrewed ring nut and the output shaft drive flange.

The bearing, which is pressed onto the shaft, is size **25x52x15 mm** and is a lifetime sealed type.

Once again, apologies for the poor focus caused by the several curved surfaces. (Yeah, I know, I know. I need to get a better camera!)

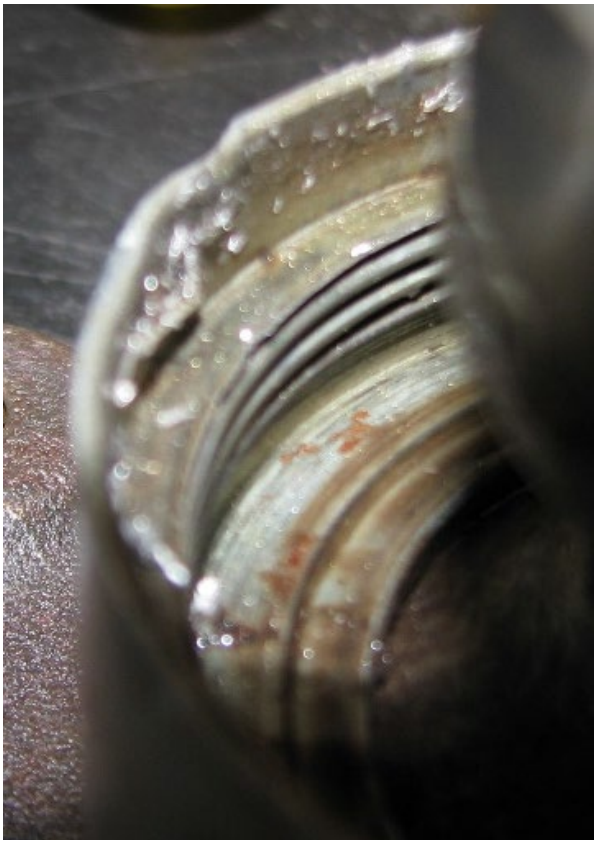

Photo 18: A close-up of the inside threads in the ring nut.

Photo 19: Shows the output hub oil seal of size **31x42x8 mm**. Fitted from the outer end of the hub (upper-most opening in the photo). The open side of the seal (with the rubber lip and spring) faces downwards in the photo, i.e. **towards** the gearbox.

Remove the old oil seal and clean the hub thoroughly. Apply rubber grease to **all** metal surfaces of the hub which will come into contact with the new oil seal.

Apply rubber grease to all surfaces of the new oil seal and fit the seal into position in the hub.

Use nothing less than the highest quality seals and bearings on the planet!

Photo 20: The inside of the hub. The upper-most section in the photo is inserted into the gearbox opening, along with the splined shaft end. The shaft seal is shown at the bottom.

In the photo, there are three hub mounting holes on the left side of the photo (one hidden at top-left) and three on the right side (one hidden at top right). The oil drain hole in the edge of the hub mounting flange can just be seen, shown by the red arrow.

Q. Is this the left-side hub or the right-side hub? A. It's the left hub. Q. How can you tell?

Photo 21 above left shows the oil drain hole located at the **bottom** of the hub bearing housing.

Any oil escaping past the shaft oil seal (shown in the centre of the hub) passes down through the oil drain hole and exits the hub from the oil drain hole located at the lower rear edge of the hub mounting flange as shown in **Photo 22 above right.** Photo 22 also shows one of the hub body peening detents for peening the edge of the ring nut.
(Both photos courtesy of Peter Fosselius).

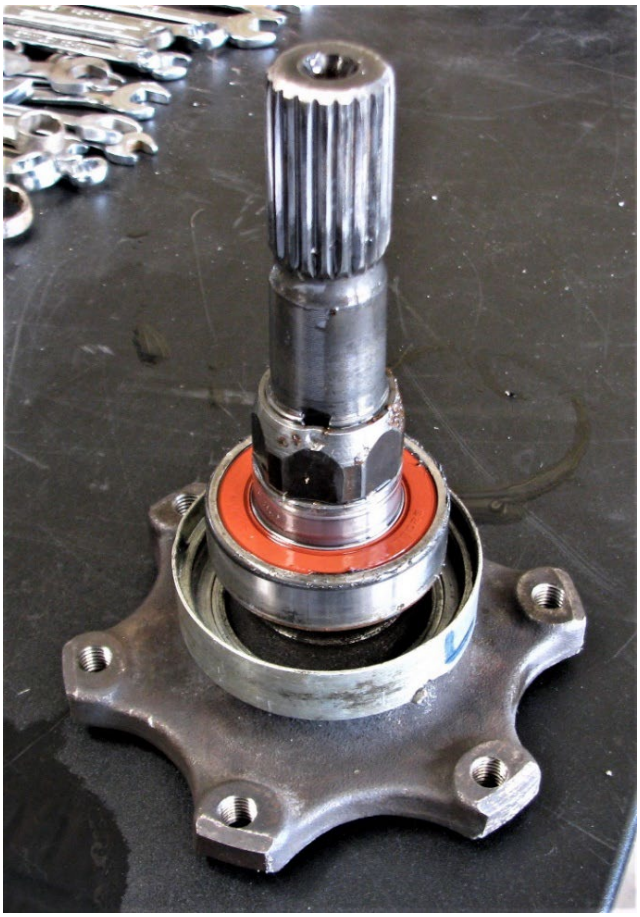

Photo 23: Shows the output hub shaft assembly after separation from the hub body after the ring nut is unscrewed. The lock nut is seen in the centre of the photo. The peening is also (just) visible at the top edge of the nut.

On reassembly of the hub parts, ensure all parts are *scrupulously* clean.

If the bearings were not replaced recently, replace them at the same time as the seals are done. It is very cheap and very convenient insurance for a long running life!

To replace the bearings, remove the lock nut and steel spacer, then use a bearing puller to remove the bearing from the shaft. Don't damage the shaft or the steel spacer! Use a press and steel tube to fit the new bearing, followed by the steel spacer and the lock nut, torqued as below.

Photo 24: The lock nuts on the output hub shafts. These are tightened to **75 foot-pounds**. Add some copper grease first. The upper edge of each nut is peened into the opening in the shaft before the hub is finally reassembled and returned to the vehicle. The previous peening points are shown on the nuts. Ensure everything is spotlessly clean.

If the lock nuts need to be removed, swap them over between the two hubs so the peening points will (very likely) be in different positions on the nuts.

Lock Nuts

The writer understands these nuts have never been manufactured by after-market sources. The reason for this is highly likely to be metallurgical in nature. These are indeed small nuts with very thin walls and very fine threads for nuts requiring such a high tightening torque. This means the only spare nuts available on the planet are second-hand nuts, originally manufactured by Citroen and later removed from pulled-down gearboxes. Look after them carefully. They can only be (properly) peened so many times! This is why the writer suggested fitting the best quality output shaft bearings you can buy to maximise their life and minimise the need to remove the nuts. (The nuts only need to be removed when replacing the bearings.)

Clean the Hub and Ring Nut Threads

While the shaft assembly is separated from the hub body, thoroughly clean the ring nut threads on the hub body and within the ring nut. These threads need to be *very* clean!

THE PROCEDURE – PART 3

Reassemble and refit the hub
It is assumed the oil seals have now been replaced (as well as bearings, if required). Apply rubber grease to the polished surface of the steel spacer on the hub shaft and over the lock nut faces, then wipe some grease to the inside faces of the bearing housing in the hub body where the bearing will be seated. Then **very carefully** insert the splined shaft centrally into the oil seal and the hub body, ensuring the splined shaft **does not touch** the new oil seal, then very gently allow the bearing to be seated into its position in the hub body. The bearing should be a smooth sliding fit into the hub. If it binds a little, tap the drive flange with a rubber mallet. Rotate the drive shaft flange several times to spread the rubber grease evenly.

Refit the Ring Nut
Carefully holding the hub, with the shaft and bearing already in place, add some copper grease all around the threads on the hub body.

Fit the ring nut onto the hub body and screw clockwise by hand to ensure the threads are properly engaged. Continue turning clockwise by hand until it tightens.

Gently refit the hub *temporarily* into the gearbox opening and onto the six studs (don't fit the shims or the gasket yet), ensuring the hub mounting flange is positioned flush against the gearbox face. Use a rubber mallet to assist if necessary. Fit the **six** securing nuts and nip them up sufficiently tight to ensure the hub *cannot* move on the studs.

Use the strap spanner to tighten the ring nut. Finally, give the ring nut a tap with the cold chisel and hammer to confirm it won't tighten any further. If the notch in the ring nut is on the bottom, the hub could be removed and temporarily rotated 180 degrees so the notch is uppermost, then tap with the hammer and cold chisel to tighten. The ring nut is tightened to **50 foot-pounds**.

Remove the hub from the gearbox and peen the edge of the ring nut into one of the hub body detents so the ring nut does not loosen. It only needs peening at one point. The peening does not interfere with the threads on the hub body or the ring nut.

DO NOT use a thread locking compound on the ring nut threads. Copper grease only!

Refit The Gasket, Shims and Hub to the Gearbox

1. Carefully remove the old hub gasket from the gearbox and ensure the gearbox face is clean and smooth. Thoroughly wipe the inside of the hub opening with a clean cloth.
2. After wiping clean each shim for this hub, insert the shims into the hub opening, using a little grease if needed to keep them upright and resting in place against the bearing.
3. Apply gasket sealant to all four mating faces of the gearbox, the gasket and the hub.
4. Fit the gasket over the six studs and gently push the gasket fully against the gearbox face.
5. With the output hub being held by hand such that the **oil drain hole** on the edge of the mounting flange is (1) **positioned at the bottom of the mounting flange,** (2) **pointing directly downwards** (after checking with the drill) and (3) **located at the rear-most end of the flange,** insert the splined end of the hub shaft into the hub opening of the gearbox and in through the bearing opening, ensuring the splines properly and easily engage with the differential gearing, rotating the output hub drive flange a little by hand if required. At the same time, ensure the hub is aligned and positioned on the six mounting studs. Recheck the oil hole is correctly located – just to be sure.

6. Push the hub fully home by hand until the hub mounting flange is fully seated on the studs. If the hub binds a little, tap the drive flange with a rubber mallet until the hub mounting flange is fully seated up against the gasket and the gearbox face.
7. Add a little copper grease to each stud then fit the star washers and nuts to the six studs using a universal joint for a better angle, tightening each one a little at a time in sequence, until the six nuts have been torqued to **30 foot-pounds**.
8. This completes the refitting of the output hub.

THE PROCEDURE – PART 4

Refit the CV-Joint Plate and Brake Disc to the Output Hub

Firstly, ensure the output hub drive flange, the brake disc mounting faces (both sides) and the CV-joint plate are **thoroughly clean of all dirt and grease**. If these are not clean, you will experience brake disc runout problems.

The front wheel CV-joint plate and the brake disc are then jointly fitted to the output hub drive flange using the six bolts and star washers. These bolts are torqued to **35 foot-pounds.** Add some copper grease to the bolt threads first.

Brake disc runout

Check that the runout on each brake disc is within specifications. If it's not, try removing the six bolts and rotating the disc by one bolt position, refit the bolts and recheck the runout. You may find there is one position which gives less runout than the others. Using that position will minimise unwanted loading and stresses on the calipers and discs, as well as minimising the wear on the caliper piston seals and brake pads.

Driveshaft rubber boots

Now is a good opportunity to replace all six rubber boots (gaiters). Use good neoprene rubber types. Ensure the outer end of the middle boots can slide freely on the driveshaft. Repack the inner and outer CV-joints with grease at the same time. The writer also used the opportunity to replace the grease nipple on each drive shaft housing.

The Last Items

Refit the disc brake calipers and brake pads, always replacing the small LHM rubber seals in the two caliper halves. Don't forget to fit the thin shim between the gearbox and the inner caliper half on each side. Torque the brake caliper mounting bolts to **35 foot-pounds**. Add some copper grease to the threads first.

Reconnect the brake lines using new LHM rubber seals. **Never** reuse old seals!

Bleed the disc brakes.

Refit and adjust the handbrake cables so the handbrake withdraws five clicks.

Top up the gearbox oil.

Refit the heat exchangers, heater cables, air tubes, battery cables and front guards. All done!

A Special Thank-You

The writer wishes to extend a special thank-you to Peter Fosselius for the advice and guidance provided during the preparation for the oil seal replacement task and for providing the highly instructive photos 9, 21 and 22. The writer had no previous experience with removing the ring nuts and replacing the output hub oil seals and Peter's advice and vast experience enabled the writer to perform the procedure confidently and successfully the first time. Thank you Peter!

In conclusion, there are many critical aspects associated with this task which need to be understood and managed to ensure success. Hopefully, these aspects have been captured in this document and you will be able to use the document to assist you when you need to replace the oil seals (and optionally, the bearings) in your 2CV gearbox output hubs.

After you've done this task once, it will be so much easier on the next occasion.

This document may be updated in the future and assigned a new revision number.

The writer would appreciate your advice of errors or suggestions for improvements. Please forward to:
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