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Part 2 of 9





Welcome to Get To Know Your 7. This is a download copy of a series of articles looking at the essentials of routine maintenance for your Seven. These first appeared in the Lotus 7 Club magazine 'Lowflying' between August 2010 and May 2011.

Each article will be a separate download and below is a table of contents as to which articles are in this series. The article you are currently looking at will appear in bold in the table of contents.

#### Contents

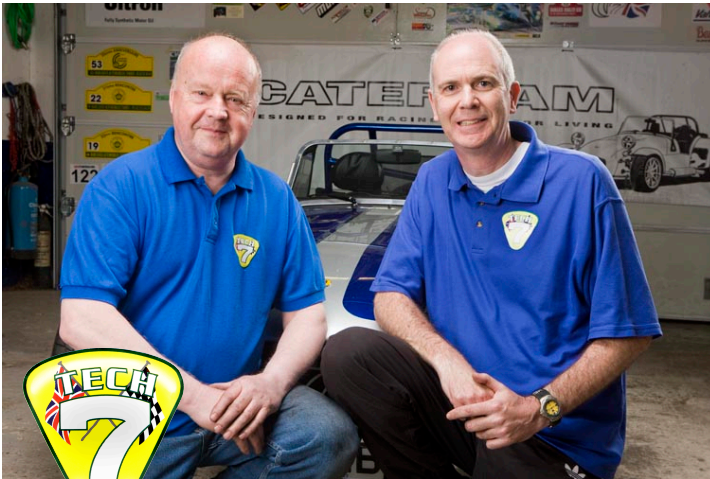
- 1 Introduction; Working safely with the car raised off the ground
- 2 **Oil and filter changes; *plus a few words about wet and dry sump systems***
- 3 Transmission lubricants
- 4 Front wheel bearings
- 5 Brake pads and discs, tyres and wheel nuts
- 6 Spark plugs and distributor; steering and driveshaft gaiters; steering column clamp; exhaust condition
- 7 Suspension; prop shaft; air filter; fluid levels; fuel system; carburettors
- 8 Auxiliary drive belt; bulbs and switches; battery condition; seat belts; general security of fasteners and mountings
- 9 Windscreen wipers, and washers; headlamp alignment

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In This issue we begin a major series looking at the essentials of maintaining your Seven. Even if you don't want to become a home mechanic, we hope this will encourage you to learn a little more about your car.

The notes for this series are prepared by **Andy Belcher, Rob Davis** and **Michael Calvert**, and the photographs are by **Jamie Jones**. *So, let us begin...*



Road & Track  
Engineering Solutions

*Andy Belcher (left) and Rob Davis*

## Introduction

**Owning a Seven** can bring you a wide range of experiences; one of these is the opportunity to carry out the servicing of the car yourself. Although many prefer to entrust the maintenance of their 'pride and joy' to one of the many specialist garages available, carrying out your own servicing can save you money, provide immense satisfaction and bring you a step closer to understanding the running of your car.

Over the coming months, this series of articles will build upon the theme of the Get to Know Your Seven (GTKY7) experience days which have been regularly organised through the Club, and extend into providing an overview of the basic tasks and procedures required to maintain your Seven.

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### **During this series, we'll be looking at the following:**

Raising and lowering the car

- including front and rear axle stand positions and trolley jack lifting points

Engine and transmission oil

- oil change for dry sump and wet sumps,
- oil filter removal and re-fitting,
- checking and topping-up gearbox oil,
- changing gearbox oil (specific models),
- checking and topping-up differential oil,

Front wheel bearings

- checking bearings for excessive play

Wheel and tyres

- checking tyre condition and tread depth,
- wheel nut re-tightening torques

Brakes

- checking condition of discs,
- checking brake pad thickness,
- changing brake pads,
- handbrake operation

Suspension

- general suspension security checks,
- lubricating trunnions (where appropriate),
- A-frame bush

Prop-shaft

- greasing universal joints on prop shaft (Series 3 and SV)

Fuel system

- checking fuel lines for security and leaks
- changing fuel filter
- carburettor balance and idle settings

Fluids

- checking coolant, brake and clutch fluid

Air filter

- checking and changing air filters

General inspection items

- exhaust condition, lights and bulbs,
- CV gaiters, hose condition and security,
- drive belts, headlight alignment,
- battery condition, engine mounts,
- wiper condition, seatbelts

Steering

- steering wheel alignment and play in steering rack

Vehicle underside condition

We begin the issue, with something straight forward but fundamental: Changing the Oil and Oil Filter. We will also have a few words about dry sumps.

## Part 2: Oil and Filter Changes



Regularly changing your Seven's engine oil and oil filter is one of the most important maintenance tasks to keep your car running well. Over time, engine oil breaks down through contamination from the combustion process, and the oil filter then becomes clogged with these contaminants.

The recommended regularity of oil changes will depend on the type of use to which the car is put, with cars put to heavy track use benefiting most from regular attention. However, with the low cost and relative ease of an oil change, attention at least annually is a good insurance policy to ensure the longevity of all engines, even those lightly used.

What is more, with the savings that you will make by doing this work yourself, you can afford to change the oil more frequently.

### CSR models with dry sump

This first section is applicable to the dry sump fitted to the csr: vehicles with wet sumps are covered later.

Note: the oil drain plugs on the CSR's dry sump and swirl tower base are best undone using a 31mm spanner; but, as the larger sizes of spanners usually range in even increments, i.e. 30, 32mm etc, they are virtually unheard of in that size.

It is not advisable to use an adjustable spanner, as the swirl tower drain plug sits within a recessed section of the casing. And as the nut is made from aluminum, rounding the edges of the nut may result from using a 32mm or adjustable spanner, especially if it is tight. Additionally, access to the swirl tower drain plug is restricted partially by the adjacent frame, making use

### Safety Points:

Used engine oil is considered to be carcinogenic— therefore, always wear latex gloves when undertaking an oil change and avoid skin contact wherever possible.

In addition, if the engine has been run the oil can be very hot – so take great care when draining.

### Equipment and parts required:

#### Tools:

- Jack and axle stands
- 31mm spanner for CSR\* (this unusual size is discussed in the text)
- Socket set
- Oil drain pan
- Inspection lamp
- Oil filter wrench
- Oil funnel.

#### Parts:

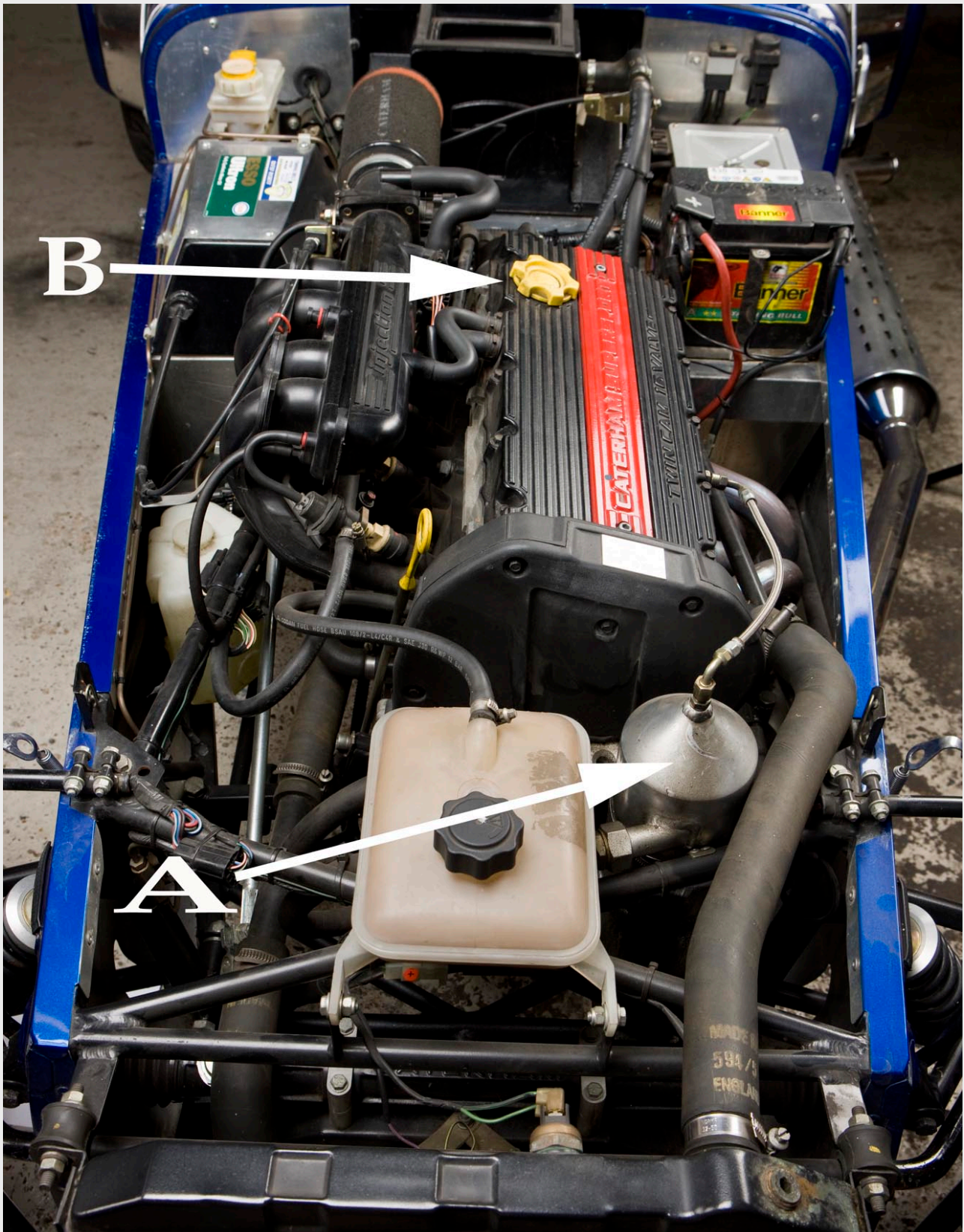
- Appropriate quantity and type of engine oil
- Oil Filter
- Sump plug washer (if fitted)

#### Note:

Spanners for 31mm size are available, but are rather obscure; they appear, for example, in the power industry, where they are typically heavily insulated which makes them rather bulky. See author's suggestions in the the text. Ed.



**Fig 1:** CSR engine bay; items referred to in the text include the black swirl-tower (arrowed A) for the dry-sump oil system on the centre-line of the car, behind the cylinder head, and the catch-tank on the near side edge of the scuttle. Right, (arrowed B).



**Fig 2:** Typical K-series installation in S3-type chassis; note this car has the so-called ‘Apollo’ oil/air separator tank (arrowed A) which also serves to increase overall oil capacity. This helps improve lubrication but should not be confused with a dry-sump system which is briefly explained overleaf. The oil filler is the yellow cap, (arrowed B), on the cam cover.

of a socket difficult. To overcome this problem it's possible to modify a 30 mm open-ended spanner with an anglegrinder, increasing its jaw width to 31mm.

Place the oil drain pan under the dry sump. Firstly, release the large diameter bolt on the passenger side, furthest forward. This bolt's location is shown in **Fig3**. Behind the bolt is a finger-sized gauze filter. Remove and clean any debris from this before refitting. The smaller bolt shown in the centre of the picture **Fig 1** may also be released if desired.

If the engine has been recently run, most of the oil will have been pumped into the swirl tower, so do not be alarmed if only a small quantity of oil is drained from the dry sump.

Allow the oil to drain from the dry sump then retighten the bolt(s); do not over tighten.

The swirl tower drain bolt is on the opposite side, towards the base of the casing as shown in **Fig4**. This bolt is the same size as the dry sump's (31mm) and care should be taken not to slip and round-off the soft aluminum material.

Have the oil drain pan to hand as approximately 6.5 litres of oil will drain once the bolt has been removed. There is a gauze filter behind this: remove, clean and refit once all the oil has drained from the tower. Refit and tighten the bolt.

The oil filter itself is also visible in **Fig3**. This might be released by hand although a filter wrench is likely to be required. Have the oil drain pan to hand as residual oil will drain from the engine once released.

Remove the filter and visually inspect and clean the metal seat on the engine with a soft cloth. Smear a small quantity of new oil onto the rubber seal of the new oil filter before fitting. Tighten the new filter all the way onto the thread by hand and then by about half a turn to ensure a good seal. Do not use the oil filter wrench to do this.

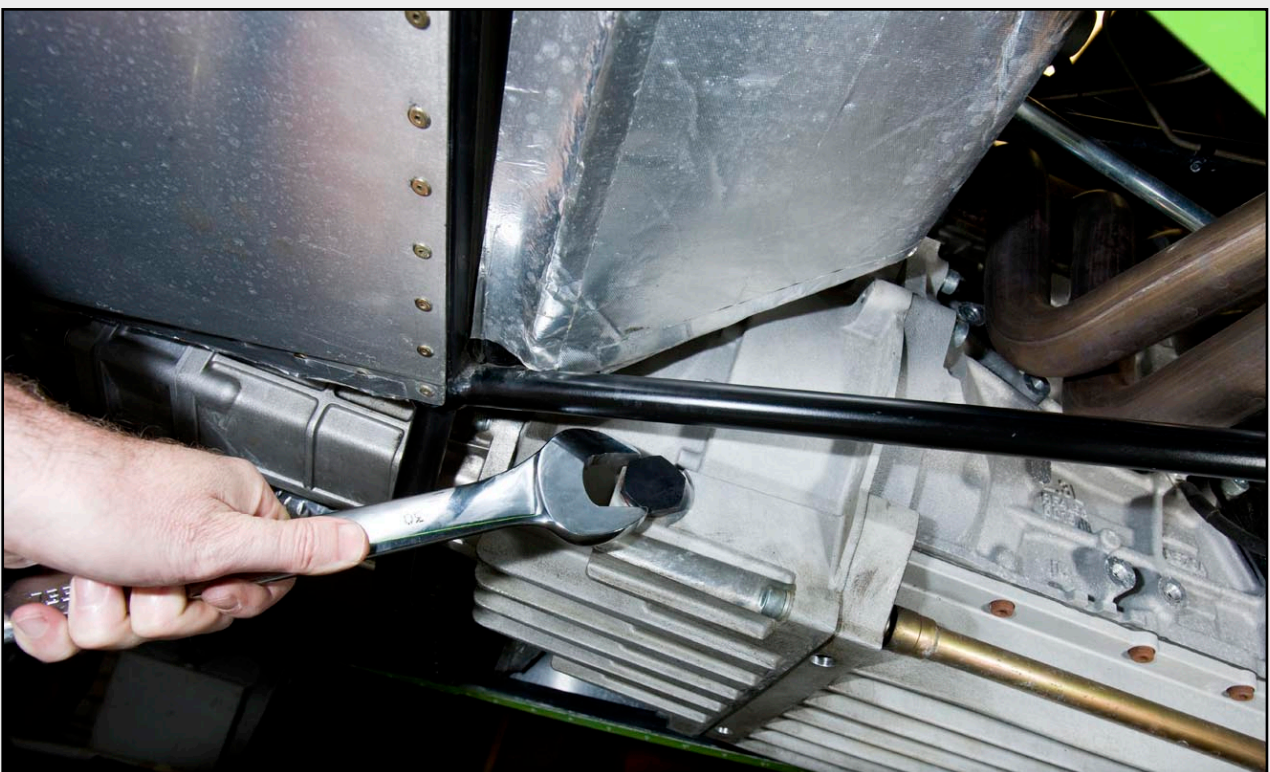
Using the correct grade of oil (5w-50 fully synthetic), pour the oil through the cap shown in **Fig3**; you may find a funnel helpful here. The csr's engine capacity is 6.5 litres and it is recommended that, as you approach this limit, the engine is run and checked on the dipstick as shown in **Figs4-5**. CSR's are particular about their oil level so follow the final oil top-up procedure by adding about a quarter of a litre at a time, run the engine until the level is reached on the dipstick.

Don't worry too much about overfilling the engine, as excess oil will be overflowed into the catch tank (uk models). On completion, run the engine and check for leaks from the sump and swirl tower bolts and oil filter.

It is worthwhile emptying the catch-tank before the final filling operation. This can be achieved by removing the two black fill/overflow hoses and sliding the plastic catch-tank upwards to release. Drain any oil into the oil drain pan; don't re-cycle it into the engine.

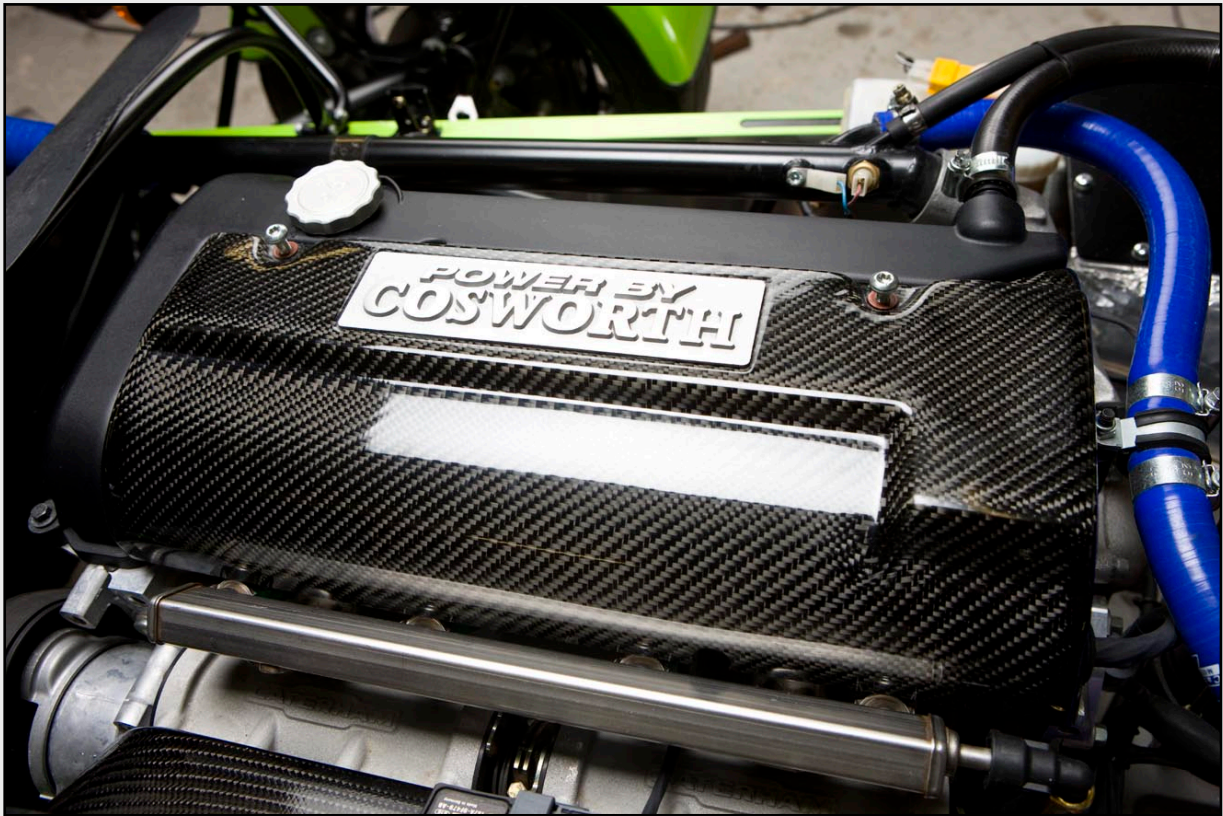


**Fig 3:** CSR, using a spanner on the drain plug of the dry sump pan; a gauze filter is behind this plug; (main oil filter is arrowed)

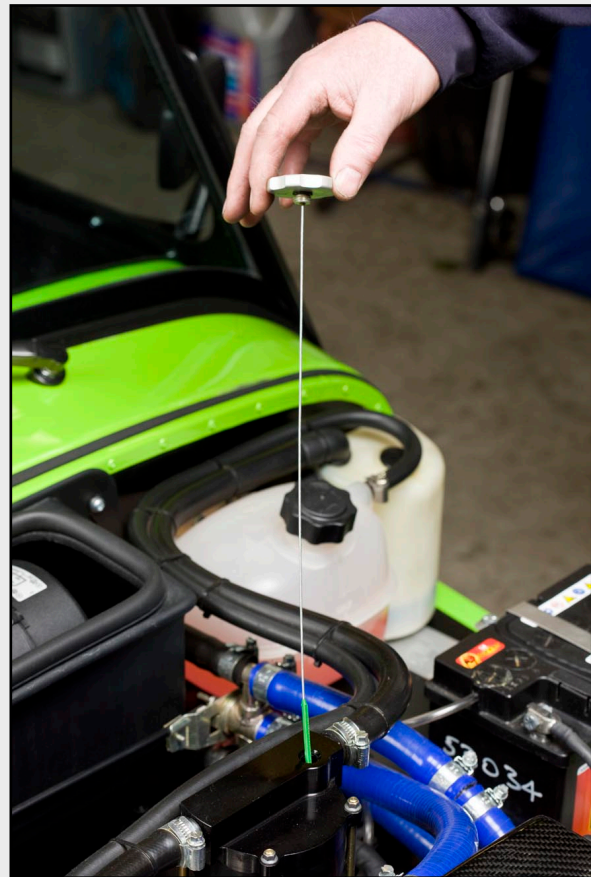


**Fig 4:** CSR, drain plug for the swirl tower





**Fig 3:** CSR, cam-cover with oil filler cap at top left



**Figs 4&5:** CSR, dipstick fitting in the dry sump system swirl-tower

## A few words about dry sumps

For those who are not familiar with the 'dry sump' concept, this is simply an arrangement where the main reservoir for engine oil is a tank remote from the engine itself rather than the pan at the bottom of the block, below the crank.

So the sump is not, strictly speaking, 'dry' but the oil is 'passing through' the sump pan rather than residing there.

This requires slightly more complicated pumping, but can bring a number of advantages: oil distribution, pressure and surge can be more effectively managed so that lubrication can be more consistent under extreme conditions and g-forces; the crank does not encounter the drag of all the oil in the wet-sump pan – and, since the pan itself can be shallower, the car can (if the sump is lowest point) be run lower for the same minimum ground-clearance.

Shortly after the K-series engine was first offered in Sevens, Caterham introduced the racing car style 'dry sump bell-housing' set up, where the oil tank is inside the bell-housing (the casting that joins the engine and gearbox) – a neat solution that's well-suited to the Seven's confined engine-bay. Ed.

## S3 and SV Sevens and K-series engines

### S3/SV, generic wet sump

Firstly, run the engine to warm up the oil then switch off. The engine should be hot enough for the oil to run freely, but not so hot that you burn yourself during the operation.

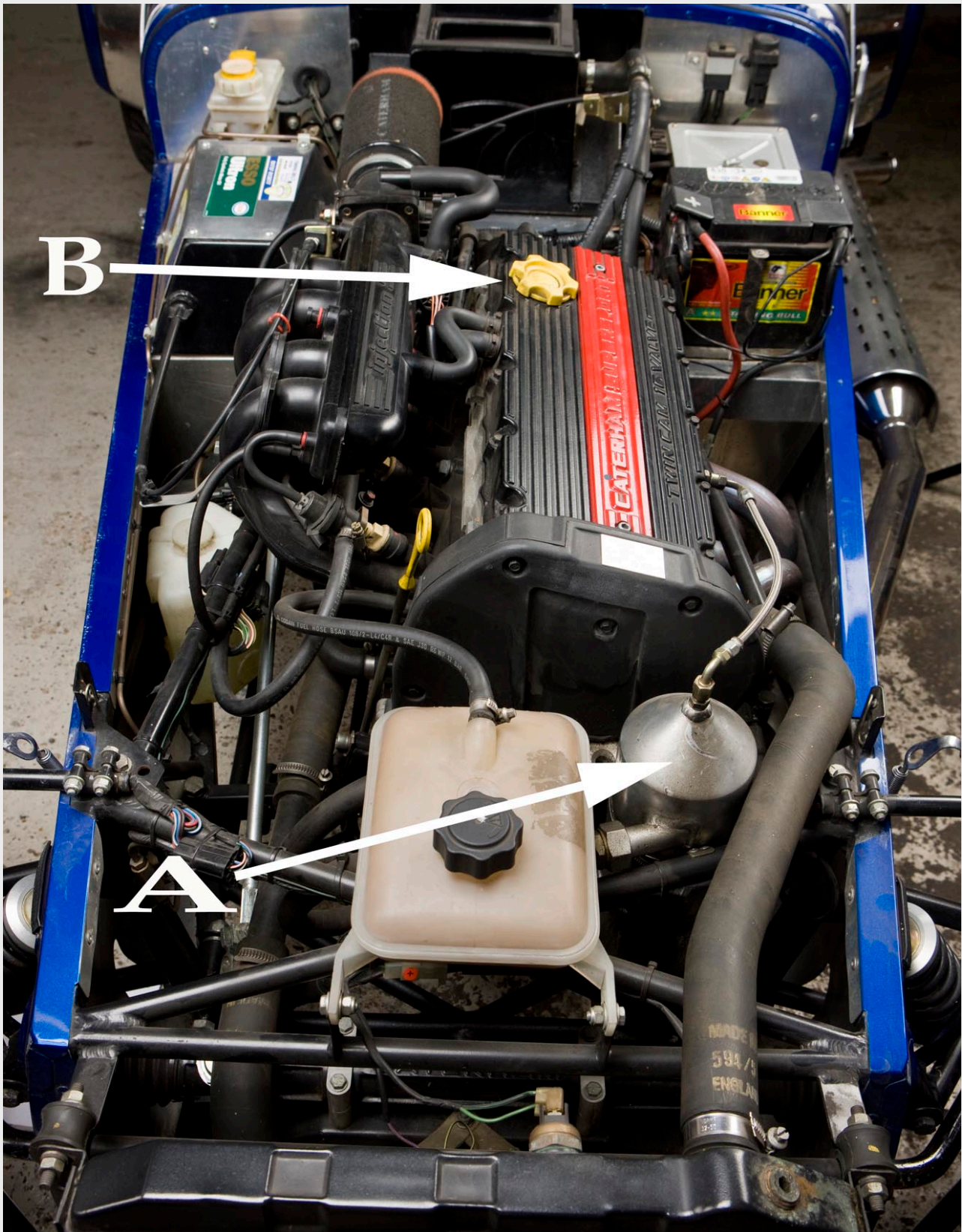
Raise the front of the car onto axle stands (this operation was been covered in the previous article). Place an oil catch tray of suitable capacity under the car and drain the oil. Depending on the specific engine type, draining the oil is achieved by undoing the sump bolt, **Fig 6**. Note if the sump plug has a washer fitted—and be careful not to let it drop unintentionally into the drain pan.

Once the oil has fully drained, refit the sump bolt and washer (if fitted) and tighten appropriately. Do not over tighten as the parent material is soft and may result in damage to the threads. It is often prudent to fit a new washer to avoid leaks from the plug.

### Oil filter

The oil filter is removed by unscrewing it from the engine; an filter wrench may be necessary if tight, see **Fig 7**.

Visually inspect and clean the metal seat on the engine with a soft cloth. Smear the filter's rubber gasket with new engine oil; this will enable a good seal to be achieved and reduce possible damage to it when tightening. Wind the new filter onto the thread by hand, then screw on to first contact with the engine face and tighten by hand approximately another half-turn until hand tight.



**Fig 2:** Typical K-series installation in S3-type chassis; note this car has the so-called ‘Apollo’ oil/air separator tank (arrowed A) which also serves to increase overall oil capacity. This helps improve lubrication but should not be confused with a dry-sump system which is briefly explained overleaf. The oil filler is the yellow cap, (arrowed B), on the cam cover.

## Refilling

Refill the engine with new oil of the correct type and quantity; check in your owner's handbook for details. This is done through the oil filler cap on the top of the engine as indicated in **Fig 2**.

When the appropriate level of oil is approached, the final levels can be checked on the dipstick as shown in **Fig 8**. Once this is completed, refit the filler cap and final levels can be checked by starting the engine and running for half a minute to allow the oil to fill into the filter. Switch off the engine and top up the oil measuring on the dipstick. Start the engine and check for leaks from the filter or sump bolt; the procedure is now complete.

## K-series engine, wet sump

Checking of the final oil level in the K-series is done with the engine still running.

Two models of dipstick have been supplied by Caterham, the original Rover one is all yellow plastic and was modified by Caterham with a notch cut on it; the oil should be at the level of the notch. The new Caterham-specific dipstick has a yellow plastic 'hatched' section on the end of a metal dipstick; the oil level should be at the top of the hatched section when measured in this way.

## K-series engine, dry sump

*(with oil tank in bell-housing)*

To drain the oil from this engine type, in addition to draining oil via the sump plug, locate and remove the four bolts which hold the blue anodised plate below the bell housing. This plate may need to be prised off with a screwdriver to break the sealant with which it will have been applied.

When refitting this, carefully clean the mating surfaces of both the bell-housing and the plate. Run a bead of anaerobic sealant (such as Loctite 574) around the plate, and refit using the four bolts.

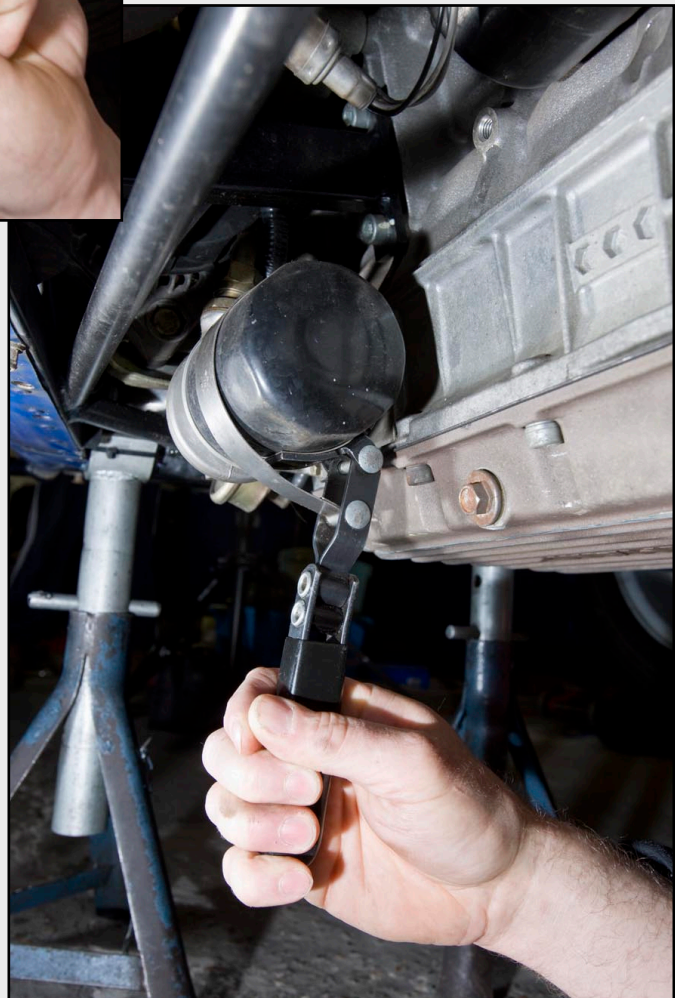
To refill the oil, remove the six cap-head bolts in the top of the 'conning tower' (above the bell-housing), to allow the plate below the dipstick handle to be withdrawn. Add approximately four litres of oil into the dry sump tank via the conning tower, and refit the plate and bolts. Pour an additional one litre of oil in via the oil filler cap in the cam cover.

To check the oil level, run the engine to normal operating temperature. Switch off, and quickly check the level on the dipstick. If the oil level reached is insufficient, top up via the cam cover oil filler cap and repeat the level check.

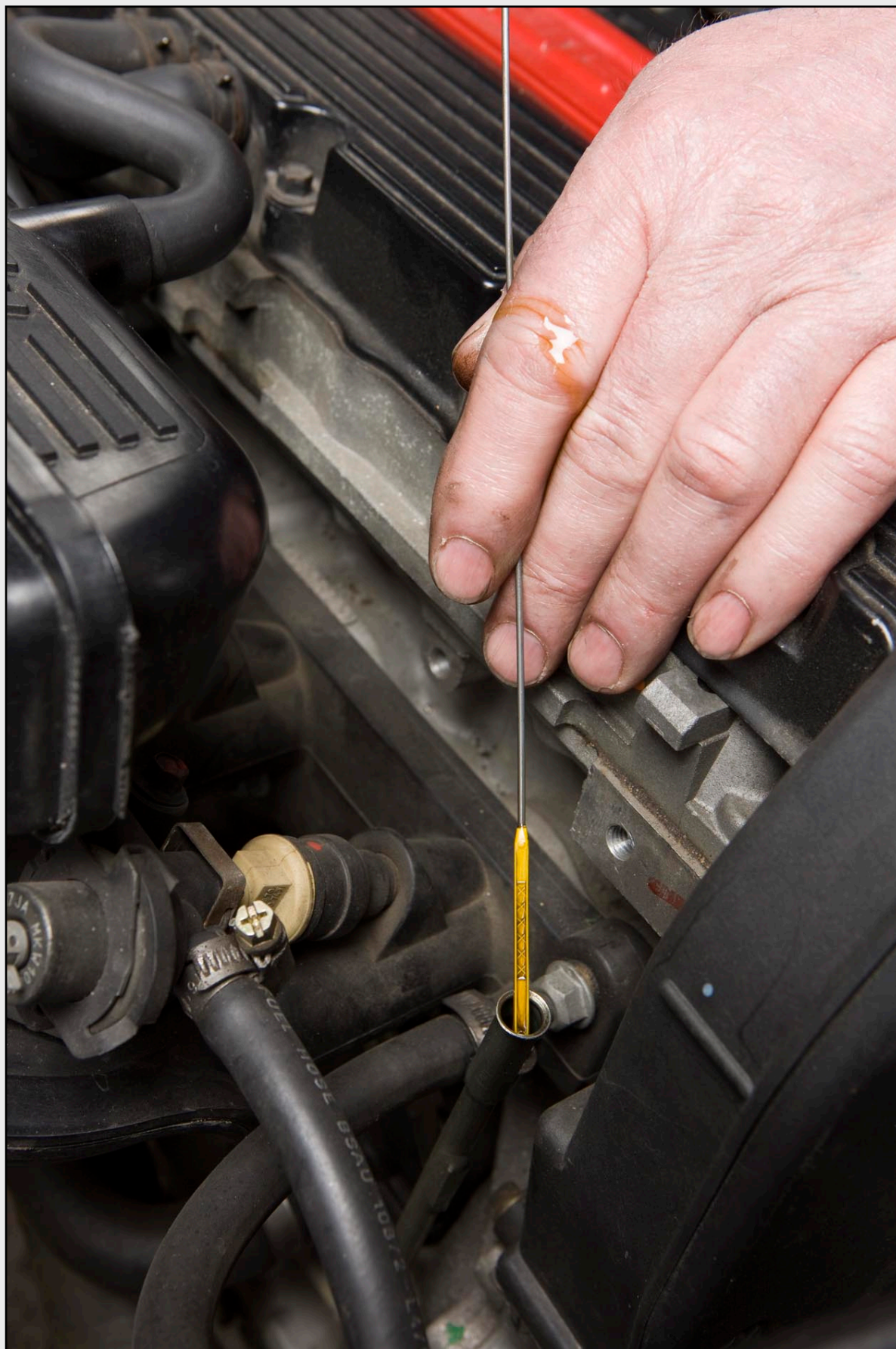
**Warning:** *Please note that specifications on cars are subject to change and you should always check that these instructions apply to your car.*



**Fig 6:** (*left*) S3 or SV, K-series engine, loosening the drain plug for the sump pan (left-hand side of car; oil filter is the black can above it)



**Fig 7:** (*Right*) S3 or SV, K-series engine, strap-type filter wrench used to loosen the oil filter.



**Fig 8:** S3 or SV, K-series wet sump engine, checking the oil level with the dipstick

**NOTES:**

In issue 3, we'll be considering  
gearbox and differential oils.

