

गठकथा

Part 5 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.

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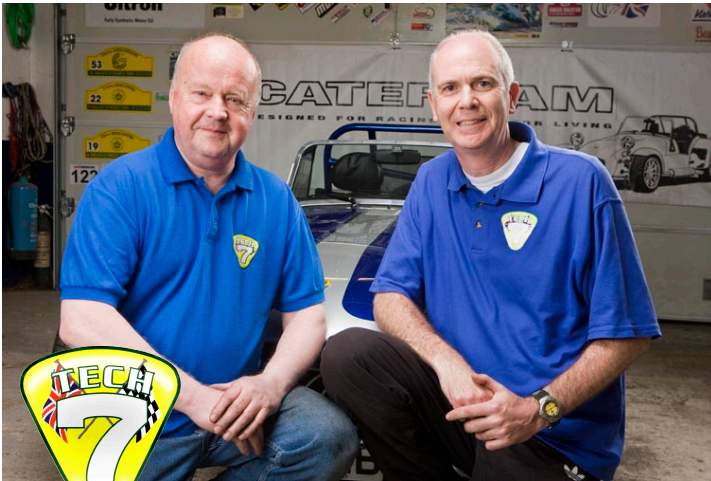
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In This issue we begin a major series looking at the essentials of maintaining your Seven. Even if you don't want to become a home mechanic, we hope this will encourage you to learn a little more about your car.

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



Safety is a very important issue when working on the car, so you must take the appropriate precautions; specific examples of this will be emphasised as part of this series. It goes without saying that no work on any safety related area should be undertaken unless the person undertaking that work is fully confident in being able to complete the tasks to the required standard. Certain more complex jobs, outside of routine servicing, should only be tackled by a competent professional, or at least with experienced help. If in doubt, a request for help on BlatChat or at your local Club meeting is more likely than not to result in the offer of assistance.

The CSR benefitted from many technical developments over Caterham's more traditional variants, including inboard front suspension, independent rear suspension (and a Cosworth-developed engine); the csr presents certain particular servicing considerations over the more familiar Series 3 cars. But as far as possible this series is targeted at the broad spectrum of Caterham owners across Series 3, SV and CSR variants.

Undertaking a yearly service will require you to have a basic knowledge of the workings of the car—however it does not require you to be a mechanic or expert. This series of articles will take you through the service procedure, identifying any specific tools and parts required. Relevant pictures will add to the understanding of the steps, along with particular safety instructions. For owners who have not undertaken such tasks before, or maybe are not confident at this stage, we hope to provide encouragement in understanding the workings of the Seven and a better understanding of what a garage would do on your behalf as part of the service regime.

We begin with a resumé of the main chassis types of the various Caterham cars—as those differences in configuration can dictate some differences of procedure.

The essential differences...

The Caterham Seven has many different chassis and engine variants, so it is not possible to comprehensively cover every type here in great detail. Therefore, we will discuss general procedures and checks which should be applicable to most cars, highlighting where they are relevant only to certain cars. The most important thing to understand initially, therefore, is which car chassis and engine type you have...

The Series 3 chassis has traditionally been the main version supplied by Caterham, but many designations have been used for different models within the Series 3 range, based on combinations of engine, major components and interior—these include the model names such as Supersprint, hpc, Classic, Supersport and Superlight.

The basic dimensions of Series 3 chassis can trace their origins to the Lotus Seven Series 3, although improvements such as the option of a 'Long cockpit' chassis from 1982, to improve comfort for the taller driver, and the introduction of the 'de Dion' rear suspension from 1985 in place of the 'live axle' were just some of the changes implemented by Caterham over the years.

Engines offered with the Series 3 chassis have been many and varied, but most popular over time have been Ford Crossflow (or 'Xflow'), Vauxhall 16v and 8v, Rover K-series, and most recently Ford Sigma.

The SV ('Series 5') chassis, whilst sharing similar external proportions to the Series 3, has increased length and width to provide added cockpit and storage space. These cars also use the de Dion rear suspension and are powered by Rover K-series and Ford Sigma or Duratec engines.

The CSR represents the latest chassis development (apart from subsequent detail changes to the s3) introduced in 2005 and is of different construction to the Series 3 or SV, with fully independent rear suspension and inboard, push-rod type, front suspension. The engine fitted to this car in the uk is the 2.3 litre Ford Cosworth Duratec; internationally, the 2.0 litre is now also available in eu4 variant.

We begin the series, with something straight forward but fundamental: Brake pads, discs, tyres and wheel nuts

Part 5: Brake pads, discs, tyres and wheel nuts



In this instalment we explain the procedure for checking the condition of brake pads and brake discs. Please note that there are several different types of brake calipers fitted to different Caterham models, and that the instructions here can only cover the most common variants. The principal points of checking and changing parts should be similar to all types, but please consult an expert should there be any uncertainty.

Brake disc condition

Checking the brake disc (sometimes, typically in the us, referred to as rotors rather than discs) for excessive wear is a straightforward procedure. Excessive wear of the discs can manifest itself in one of two ways: distortion of the disc, or simply wearing away of the disc thickness. These two conditions are generic to both solid discs and ventilated discs –albeit distortion is more common with ventilated discs. Distortion of the disc may be been evident from vibration at the steering wheel under heavy braking.

Distortion of the disc can be checked visually, with the wheel removed, by examining the metal surface of the disc. Using clean gloves or a cloth rotate the disc by hand and look for excessive radial or circumferential grooving or ribbing on the outer and inner surface, as in **Fig 1**. By focusing on the position where the disc passes the pad, disc ‘run-out’ can also be checked; this position for this view is shown in **Fig 2**.

The usual way to measure the thickness of the brake disc would be using a micrometer and comparing this to the manufacturers specification. As the majority of owners will not possess a micrometer, there is an alternative, and simple, visual check.

Safety Points:

Safety:

This operation is undertaken with the car raised and secured on axle stands; safe procedures for this were covered in Part 1 of this series.

Take care!

Equipment required:

Tools:

- Pin punch –2mm
- Hammer
- Long-nosed pliers

Parts:

- Clean gloves or cloth



Front right-hand hub, brake disc and four-piston caliper, seen here on a CSR model.

Excessive thinning of the disc results in a 'lip' build up at the outside edge, in the position indicated in **Fig 3**. If a lip of more than 2mm is evident, it may be prudent to change the disc. If this is necessary, always change the pair (either front or rear) to maintain even braking loads and stability.

Brake pad condition

The next section outlines the procedure for checking the wear of the brake pads front and rear on the typical brake components of the disc-braked s3, the sv and csr.

CSR:

First, we look at the the typical arrangement for the csr.

With the wheels removed, the thickness of the front brake pad thickness can be visually checked: the outer pad is shown in **Fig 1**, but also examine the inner pad as this usually wears ahead of the outer pad.

Should you need to remove the pads to examine their braking surface, this is done by punching through the two retaining pins, as shown in **Fig 3**. Note that the pins have a retaining expansion clip on the inboard ends (see **Fig 4**). Once the two pins have been removed the

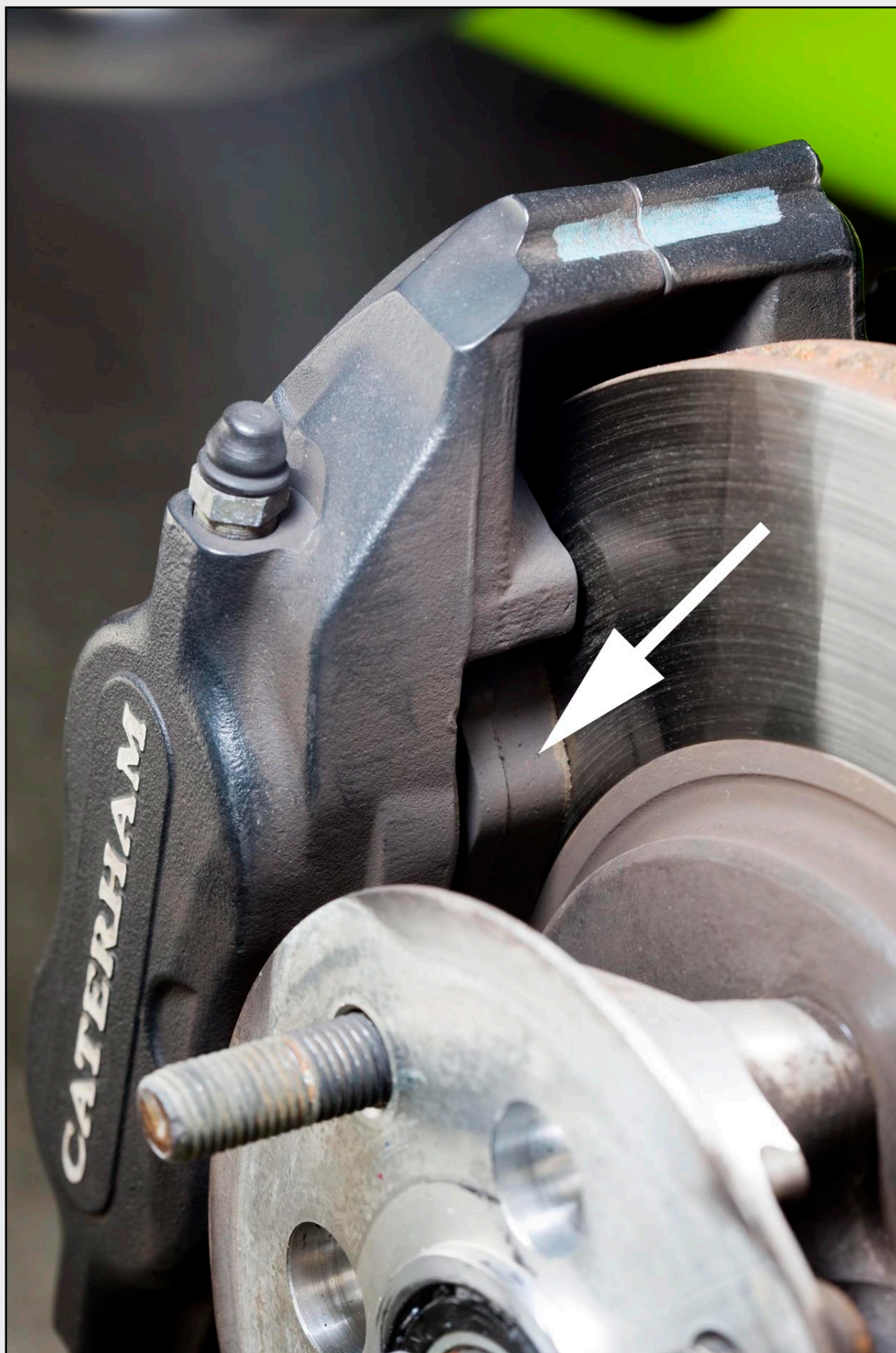


Fig 1: front wheel removed to make a visual check of pad and disc wear; outer pad of right-hand caliper is visible here (arrowed).

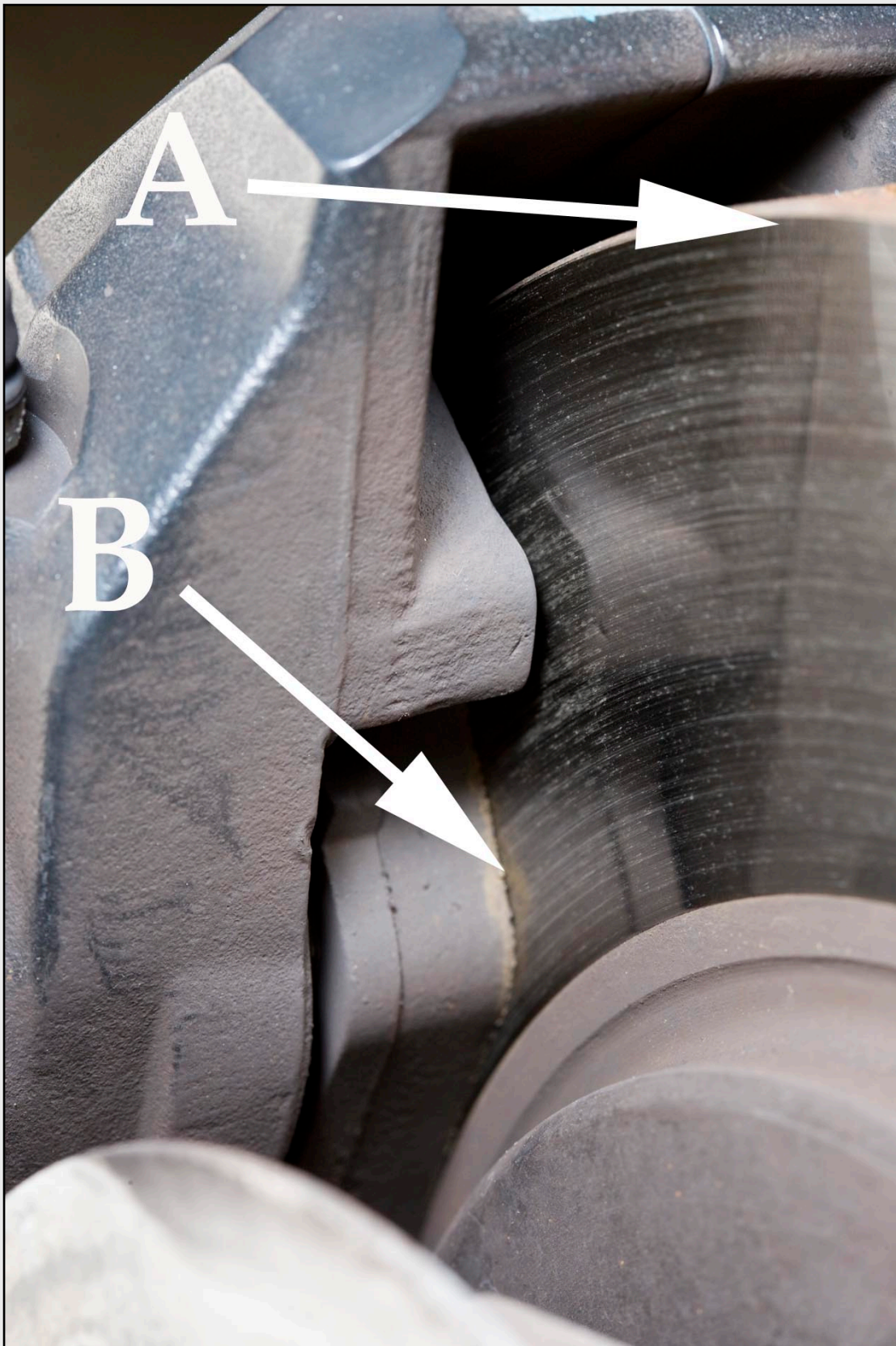


Fig 2, top: checking for distortion or wear of the disc.

A: 'lip' may form at the edge of the disc as the swept area of the disc is worn away in use (see text).

B: Turning the disc and observing where it passes the pad can help you detect any distortion or 'run-out'.

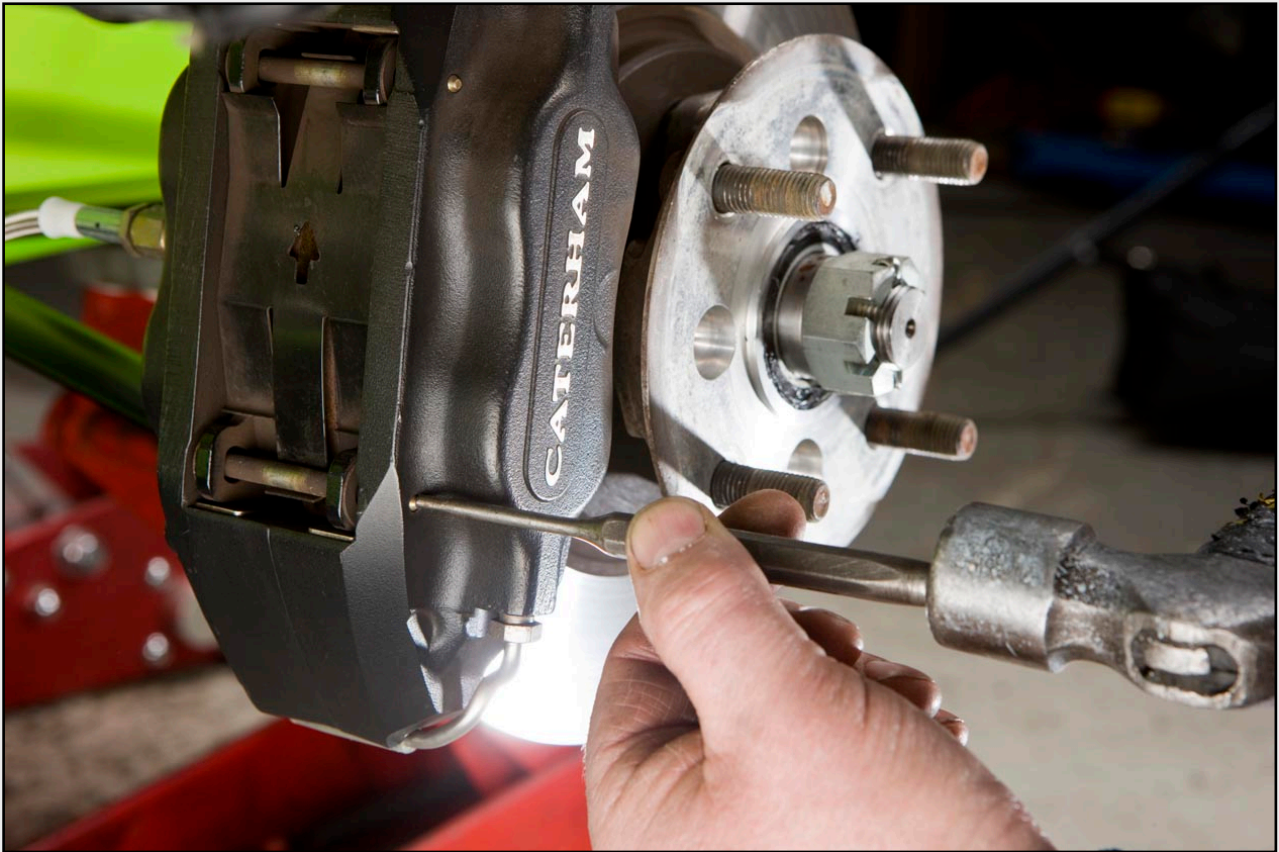


Fig 3: removing the pins that retain the pads.



Fig 4: each pin has a retaining clip (see text).



Fig 5: with the retaining pins removed, the shields can be sprung out...



Fig 6: ...and the brake pads pulled out from the back of the caliper.



Fig 7: ... single-piston rear caliper; this is the right hand side and the outer brake pad is arrowed.

inner and outer pads can be removed using pliers, as shown in **Figs 5 & 6**, overleaf. Reassemble the pads into the caliper and tap the retaining pins into position. Take care to fit the pin with its expansion clip in the correct direction.

New pads vary in thickness depending upon the manufacturer, but are typically in the region of 8mm thick. Due to the lightness of the Seven, brake pads do not wear at a high rate on normal road use; however under track conditions this is not necessarily the case. If the material on the inner or outer pad is less than, say, 3mm thick, it may be worth changing them – especially if at the start of the driving season.

If the pads require changing, the dual pistons on the csr's calipers will need to be retracted. This operation is best achieved by removing the caliper from the disc housing and using a proprietary piston retraction tool.

This procedure is not covered here in detail and it's recommended this be undertaken by an experienced person.

The csr's rear pads are checked in a similar way. Unlike front calipers which are of a 'dual pot' (two-piston) design, the rear brakes are single-piston actuated; see **Fig 7**, overleaf.

With the wheel removed, visually check the thickness of the inner and outer pad material. (The outer pad is marked in **Fig 7**.)

As the car's handbrake also operates the rear disc caliper, if new pads are fitted, the piston will require a specific wind-back tool as the piston is on a thread.

If the pad material is less than 3mm thick, it is recommended that they are changed by an experienced person – unless you are competent to undertake the operation yourself.

S3 and SV:

We'll now look at the typical arrangement found on the s3 and sv.

Although the components fitted to the car may differ slightly, the process of checking the discs for wear and distortion, and checking the pads for wear, is essentially as described earlier for the csr.

With the front wheels removed, the thickness of the brake pads can be easily seen, as shown in Fig 8. If the surface of the pad needs to be examined for condition, first remove the 'r' clips from each of the two retaining pins as shown in Fig 9; the pads can then be withdrawn from the caliper and examined as shown in **Fig 10**. Reassemble the pads into the caliper and tap the retaining pins into position.

Take care to fit the pin and retaining 'r' clip in correct position (see **Fig 9** and inset).



Front right-hand hub, brake disc and two-piston caliper: the typical standard 'S3' Caterham set-up.

If the pads require changing, the pistons will need to be retracted. This operation is best achieved by removing the caliper from the disc and using a proprietary piston retraction tool. Again, this procedure is not covered here in detail and it's recommended this be undertaken by an experienced person.

The s3's rear caliper (for later discs-allround models, that is) is shown in **Figs 11 & 12**, and the thickness of the inner and outer pads can be visually checked for wear. If the pads require changing, it is recommended that this is done by an experienced person. The vehicle operates its handbrake mechanism on the rear disc and a specific piston wind-back tool will be required to retract the piston to allow the new pads to be fitted.

Tyre condition and wheelnut torque:

Whilst the wheels are off the car it is a good opportunity to check the condition of the tyres.

First, check that the wear is even across the tread surface; uneven wear can indicate the something simple like over- or under- inflation (pressure) or the need to have the suspension geometry and alignment checked professionally.

The legal requirements for tyres can be found on the transportoffice.gov.uk website.

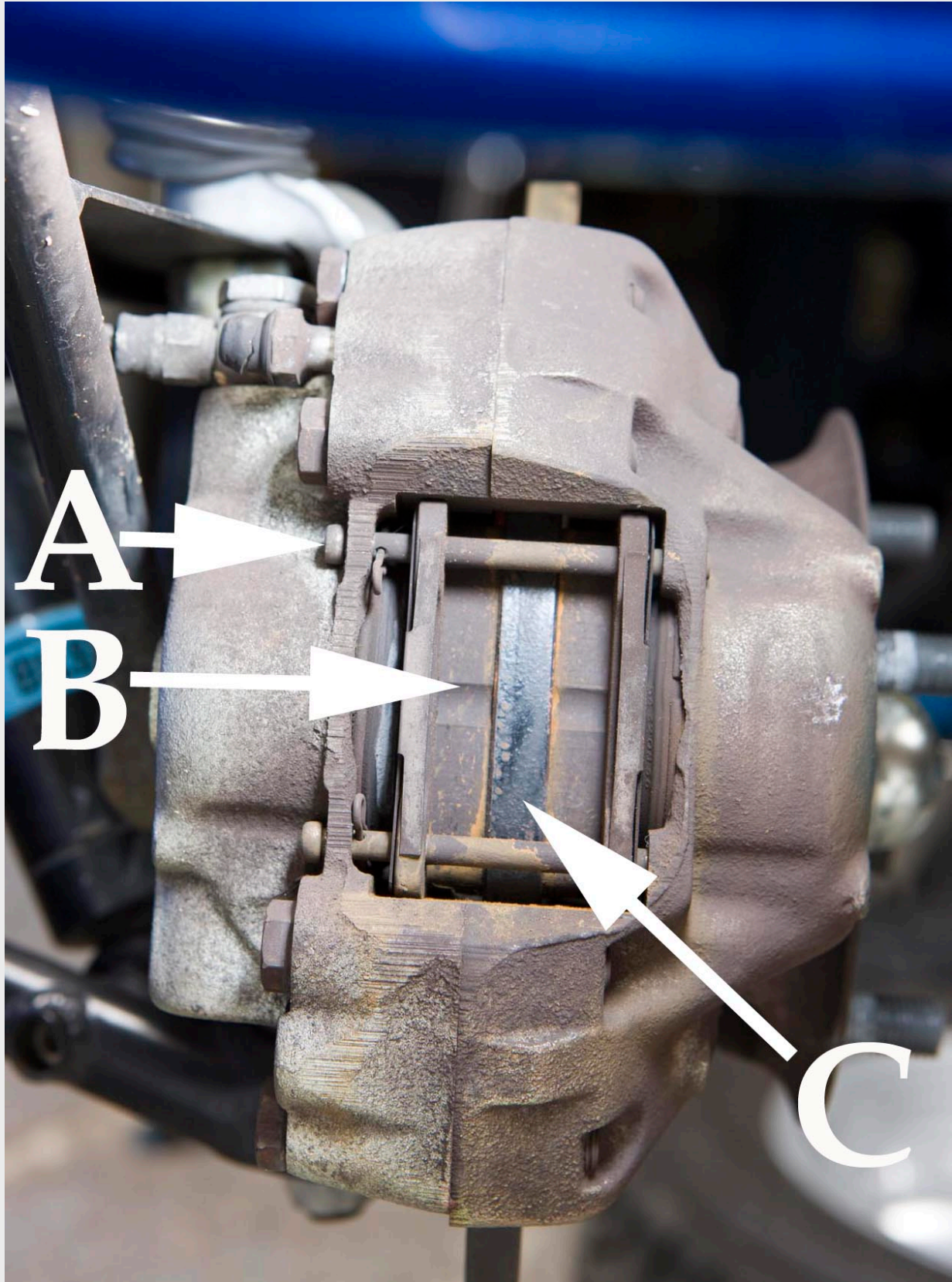


Fig 8: 2-piston front caliper (this is right-hand side) seen from rear; metal shield, which slips beneath the pad-retaining pins has been removed; here pad wear can be assessed (arrowed).

A: Pad-retaining pins

B: Inner and outer brake pads

C: Brake disc



Fig 9: removing the 'R' clips from the pad-retaining pins and sliding the pins from the caliper.



Fig 10, top: withdrawing the pads from the back of the caliper. Note the pads here have a thin metal shim slotted between pad and piston; sometimes called an 'anti-squeal shims', they also stop the pads rattling (note how these fit before you pull them out).



Above: pad-retaining pins and 'R' clips removed from calipers.

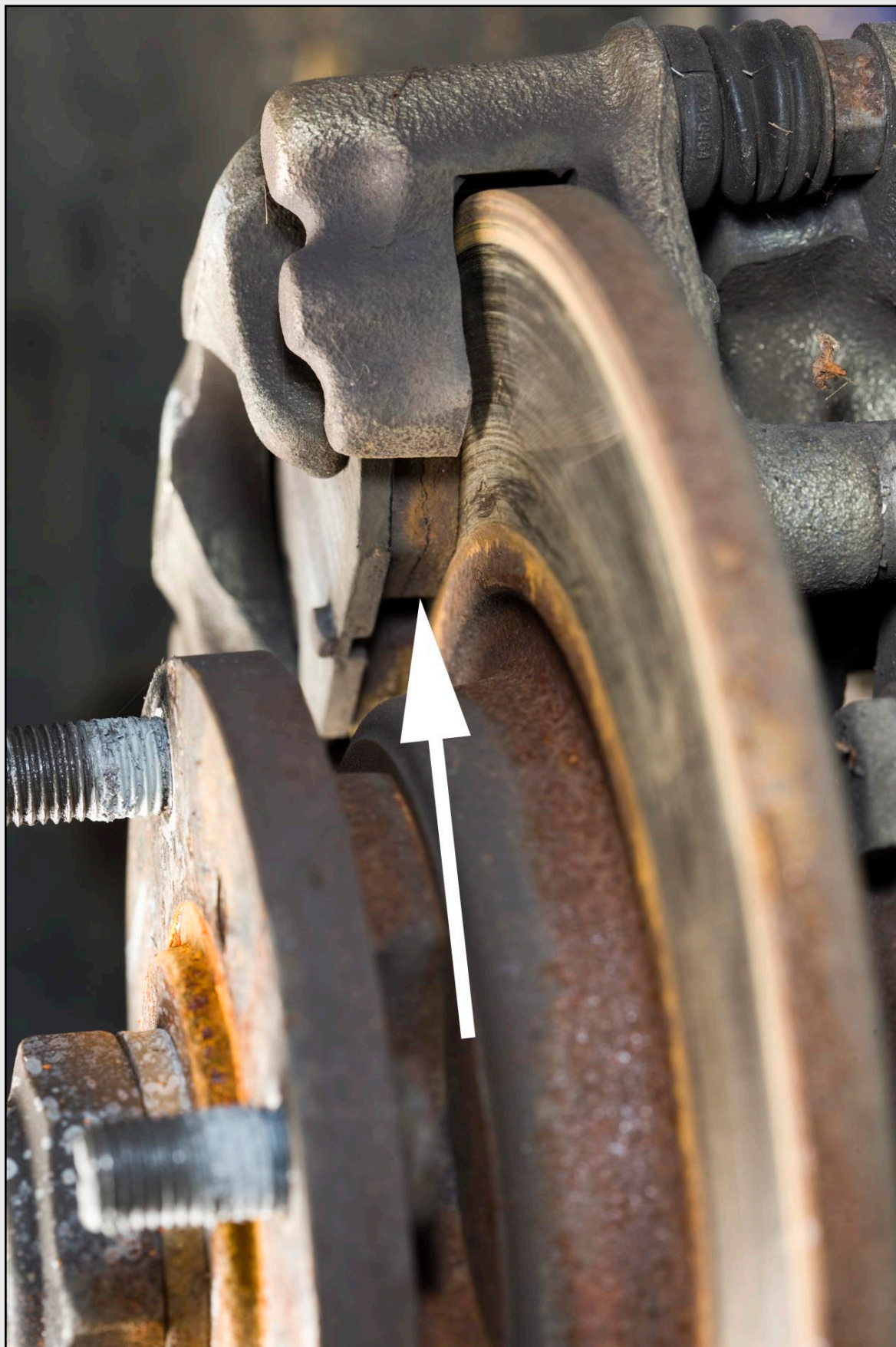


Fig 12: rear caliper and disc. Wear on the outer pad (arrowed) can be checked visually here; seeing to see the inner pad is trickier, but worth the effort since the two can wear unequally.



Fig 11: the standard single-piston, 'Ford Sierra-type' caliper used at the rear grips the brake disc at the top; this the right-hand side. (The coiled spring at top right and the cable running forward are for hand brake actuation.)

One important check is tread depth: the legal minimum is 1.6mm across the central three-quarters of the breadth of the tread and around the entire circumference. It is recommended, and good common sense, that tyres are changed well before this limit is reached.

Check also that there are no significant cuts or bulges in the tread or sidewalls of the tyre. If in doubt over this, change the tyre.

Finally, check that the tyre pressures are correct, the details of which should be found in your owner's handbook.

Once the wheels are back on and the car is back on the ground, remember to tighten the wheel nuts to the appropriate torque setting: 55 lb/ft for s3, sv or csr types, or 45 lb/ft for live-axle cars.

Notes:

In issue 6, Spark plugs and distributor; steering and driveshaft gaiters; steering column clamp; exhaust

