THE CARAVAN CLUB

Technical Information

East Grinstead House
East Grinstead, West Sussex RH19 1UA
Telephone: 01342 326944
Fax: 01342 410258
www.caravanclub.co.uk

CHOICE OF TOWCAR

This leaflet is prepared as a Club service. The contents are believed correct at the date of publication but please raise any queries with the Club's Information office.

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Caravanning should be fun, and part of that fun should be the journey, and not just the destination. Choosing the right towcar will go a long way to ensuring that your towing experience is enjoyable and relaxed, as well as being safe and legal, of course. Caravanners can create problems for themselves and attract the hostility of other road users in two main ways: by being or appearing unsafe, or by holding up other traffic. The first results from an outfit badly matched for weight, with a caravan too heavy for the towcar to handle safely (outfit weight ratio) and the second from a towcar with inadequate power to pull almost twice its own weight (power to weight ratio). Given unlimited funds neither would occur, for you would choose a heavy, powerful car which avoids both problems. In reality, most of us need an economical, generally light car for most of the year and just an occasional towcar - it can therefore be a difficult compromise in finding one that fits both bills.

1. OUTFIT WEIGHT RATIO

Leaving aside other considerations for a moment, for optimum towing performance, the principle must be to have the heaviest practical towcar for a given caravan, for otherwise the chances of a swaying trailer becoming an uncontrollably snaking trailer are very real. Aim for a towed load of no more than 85% of the car's kerb weight (KW) and never exceed 100%. Remember that the towed weight is the actual laden weight (ALW) that the car is asked to pull (empty weight of caravan plus what you add), not the theoretical maximum technically permissible laden mass (MTPLM). When you have established your caravan's ALW, multiply it by 1.2 as a guide to the kerb weight of car to aim for.

Remember that all the above are rules of thumb, not of law. Relating the unladen weight of the car to the laden weight of the caravan is an example of a simple formula, and the variable loading of the car is the reason why the car's laden weight is not suggested. Of course the more you can load in the car without unbalancing it or exceeding the manufacturer's stated axle loads and the less in the caravan, the more secure you will be on the road.

Note that when The Club or a caravan dealer does an outfit match assessment for you, this is usually based on a 'worst case scenario' of the car's kerb weight (ie the lightest the car can be) and the caravan's MTPLM (ie the heaviest the caravan can be). We do not know exactly how much payload you are going to put in the car or in the caravan, so a check in these terms makes sure we can be confident you will be OK.

2. WEIGHT LIMITS

The car's kerb weight will normally be found in the handbook - if not consult your dealer. The maximum allowable weights of the car, each axle, and the total train (car and trailer) weights are shown on a plate on the car - usually under the bonnet, or on one of the door pillars.

We are often asked, 'why 85%', rather than 90% or 75%, say? The connection between weight ratio and stability has been proven through The Club's own testing of cars and caravans, the wealth of member feedback we receive, and not least the scientific research we have sponsored. We picked 85% as the highest ratio we were comfortable using for universal recommendations, thus allowing the widest choice of compatible cars and caravans, while being confident that owners should find their outfit safe and comfortable to tow.

We have, in fact, increased the ratio recommendation over the years, as car and caravan technology has improved, and more research has been carried out. When this advice was offered in the 1960s, the recommended maximum weight ratio was 70%. This increased to 80% in the 1970s, and to 85% in the 1980s. It is not likely that we will increase the recommendation further for the foreseeable future, though. The maximum permitted caravan speed limit has also increased over this period (starting at just 40mph), and the combination of high permitted speeds and higher weight ratios is not ideal.

For all modern caravans built by NCC members the MTPLM should be on a plate (usually near the door or on the A-frame), and also included in the handbook. Consult your caravan dealer if in doubt. It is important you are aware of and comply with all these limits to avoid trouble with the law.

3. POWER TO WEIGHT RATIO

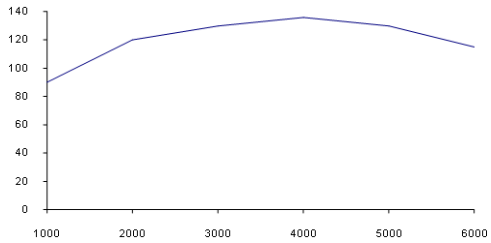
Power to weight ratio is almost as important as the weight relationship of car to caravan. This became much more confusing when diesel engines gained popularity, as they traditionally produced less brake horse power (bhp) for a given capacity engine, yet often still managed to be good towcars. Recent diesels challenge their petrol equivalents in terms of power output, however, perhaps making things a little easier again! Although quite a simplistic assessment (as it ignores factors such as gearing, torque characteristics and aerodynamics, of instance), power to weight ratio can be a useful measure, especially when comparing two broadly similar cars, or perhaps when looking at a number of variants of the same basic model.

For many of today's cars, one basic body shell has to cover a very wide range of engine sizes, from the economy model to the top of the range luxury version. Performance, flexibility and economy varies enormously, and the power to weight (sometimes measured as *bhp per tonne*) can be a useful indicator of this. For

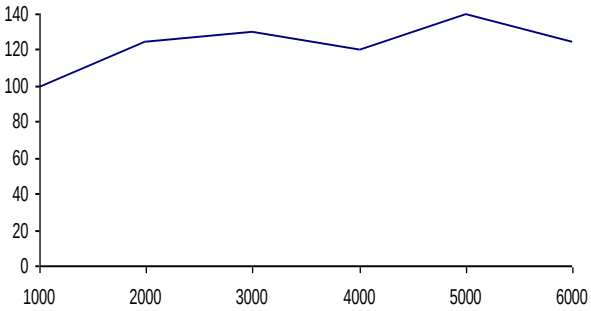
instance, a 2008 Ford Mondeo Hatchback can have between 70 and 137 bhp/tonne, depending on which engine, body style and trim level is chosen. Hook a caravan on the back and the power to weight ratio is often nearly halved. One rule of thumb to aim for here is 40 bhp/tonne of the train weight, ie everything in the outfit that the engine has to pull - laden car and laden caravan. This is a minimum target figure for allowing reasonable performance, not delaying other traffic and having sufficient power for overtaking. Note: this rule does not necessarily apply to older, diesel-engined cars, where good, low-end torque and relatively large engine capacity will often make up for any loss of bhp. However, the latest generation of diesels are tending to have both power output and power delivery characteristics which are more like those of petrol engines.

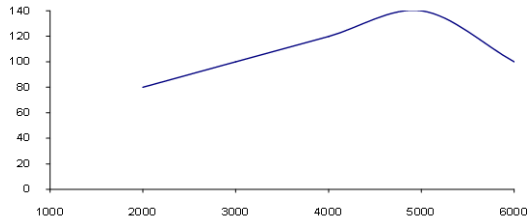
Torque is a measure of engine performance which is difficult to visualise or explain. It is the turning power generated by an engine. Good torque at low engine speeds will allow easy pulling away, and towing with a minimum of gear changing. Manufacturers generally only quote maximum torque and the speed at which it is produced. However many engines nowadays produce 90%+ of maximum torque from 2500 to 4000 rpm, so a quoted maximum at 4500-5000 rpm need not *necessarily* be bad for towing. Even a high engine speed maximum torque can be tolerable if first gear is low enough to pull away, the gearchange is light and you do not object to more frequent changes. Alternatively, you can choose an automatic gearbox whose torque converter usually solves the problem. Ask if the car salesman can show you the torque/rpm graph for the car you are considering. Manufacturers used to regularly include graphs of power and torque characteristics in their promotional literature, but this seems much less common for recent models. If you do find such information, however, it can be useful for predicting the towing performance. Some examples of torque curves:

a 'flat' torque curve,
max torque 135 NM @ 3,500 revs
(good for towing)



curve with 'twin peaks' - so the max
figure of 141 NM @ 5,200 is deceptive
(may cause problems at some speeds)





Curve with sharp peak at high revs - less suitable for towing. Max torque 140 NM @ 5,200 revs

4. PETROL, DIESEL OR TURBO?

The issue of 'turbo or not turbo' at least has become somewhat easier in recent years, and almost all cars with engine capacities under, say, 2.5l tend to be turbocharged. Larger-engined models also tend to be if they are diesels. The decision between petrol and diesel used to be very clear cut – diesels were comparatively sluggish, noisy, and generally only chosen by people who needed to do very high mileages or who needed an exceptionally torquey engine for off road work or heavy-duty towing. This has completely changed over the past 10-15 years. Modern diesels are lively and refined, yet retain their inherent characteristics of good fuel economy and good torque delivery. If you have not tried one recently, do not make your final decision on a new car before doing so – you could well be very surprised. Do check carefully the manufacturer's towing limit before buying a diesel, though, as (very occasionally) it may be less than on petrol versions.

Selected models from the Citroen C5 Hatchback range (2007) give an opportunity to compare some of the options available. (manufacturer's figures)

Cc	**Petrol 4 cyl 5sp Man 1749**	**Petrol 4 cyl 5sp Man 1997**	**Diesel 4 cyl HDi 5sp Man 1997**	**Diesel 4 cyl HDi 6sp Man 2179**	**Petrol V6 6sp Auto 2946**
Bhp/revs	125/6000	143/6000	138/4000	173/4000	210/6000
Torque/revs	125/3750	148/4000	236/2000	273/1500	215/3750
Max speed mph	125	131	127	138	143
0-62mph (secs)	10.0	9.1	9.8	9.3	8.6
Towing limit kg	1500	1500	1700	1800	1600
Mpg*	37.27*	35.3*	47.1*	46.3*	28.2*

** These **solo** fuel consumption figures are based on government tests simulating a 'typical' mixture of urban and open road driving.*

On the basis of the figures above, for what is a fairly typical modern car, a few conclusions can be drawn:

- Even the 'base' model petrol engine is surprisingly powerful and fast – it is about as quick as a 1970s Jaguar 4.2l saloon, for instance, yet has less than half the engine capacity, and better than twice the fuel economy.
- In practical terms, there is relatively little difference in outright top speed or acceleration across the range. Any of these cars is going to be more than adequate in everyday use.
- The bhp outputs of the diesels are broadly comparable to those of the similar capacity petrol models, but peak power is produced at significantly lower revs.
- The torque outputs of the diesels are much better than those of similar capacity diesel models.
- The fuel economy of the diesels is much better than the petrols, with perhaps the most striking comparison being the 2.2 diesel, which despite having performance which is very similar to the 3.0l petrol, is some 60% more fuel efficient on the Government combined fuel consumption test cycle.

It is no wonder when looking at these figures that most of the recent Towcar of the Year winners (and class winners) have been diesels, and not surprising that some 70% of Club members choose a diesel car.

5. GEARING

Gearing will also affect towing performance. All likely towcars now have at least five gears in manual gearboxes and probably at least four, if not five or more, in automatics. More gears give improved ability to match the engine to the road speed in an optimum way, giving better fuel economy, better emissions performance and quieter high speed cruising.

A partial guide to a car's towability is the road speed at which maximum torque is produced for every 1000 rpm in top gear. If the figure quoted is 21 mph (in top gear) and maximum torque is quoted at 3000 rpm, then multiply 3 (thousand) by 21 = 63 mph. This suggests that at about the maximum legal towing speed on a UK motorway, such a car would be 'pulling' at its strongest - this should mean it will be able to maintain a steady speed in spite of moderate hills, for instance. Too high a figure for this calculation and the car will 'run out of breath' very easily in top year, forcing you to change down at the slightest up slope. It is also said that a vehicle showing good midrange acceleration times (normally 50-70 mph) should be a good towcar. Modern cars will regularly achieve times of under 7s for this measure, but those which do so in 4th or higher gears are likely to be best for towing – watch out for figures which only show good performance when in 3rd, since this could be an indication of a 'peaky', inflexible engine.

6. AUTOMATICS

One way to bypass problems created by less than ideal torque is to choose an automatic gearbox rather than a manual. An automatic is ideally suited for caravan towing, and with its torque converter allows crawling pace where a manual's clutch would slip and wear. Also when starting off from rest the action of the torque converter gives a torque magnification factor approaching 2:1, ie when the converter output is at rest or turning slowly the torque is maximum and the output torque exceeds the input torque - ideal when towing.

Other benefits are less wear and tear on the transmission, easy re-starts on hills and reversing to hitch up (not having to cope with three pedals and only two feet!), and perfectly adequate gear control with the selector. As the mood takes you, the gearbox will do all the work if left in Drive, or you take control of changing up and down. With all these advantages there must also be disadvantages! One penalty with older three speed automatics, but less for those with four-speeds or more was higher fuel consumption. Another was slight loss of performance over the manual equivalent and increased heat production. Later generations of five, six, seven and soon eight(!) speed automatics have virtually eliminated any significant fuel consumption penalty in most cases and generally deliver performance effectively equal to their manual counterparts. As there are occasional exceptions to this, it is still worth checking the manufacturer's fuel consumption data, though. Occasionally, the manufacturer's towing limit is lower with automatic transmissions – be sure to check (see information leaflet 'Automatic Transmission for Towing'). Over 20% of Club members choose an automatic.

One annoyance when choosing a new model is that diesel automatics remain comparatively rare. This seems strange, since the ability of a diesel to perform well at low revs should make it ideally suited to use with an auto 'box. The combination of a

modern diesel engine and a modern automatic gearbox is generally a delight, and some of the best towcars around fall into this category.

7. FRONT, REAR OR FOUR WHEEL DRIVE?

Is a caravan best towed by a car with all wheels driven or whose driven wheels are at the front or the rear? The majority of cars under 3 litres are front wheel drive (fwd), although there are still rear wheel drive (rwd) types available, such as BMWs and some Mercedes. It has been said that rwd is preferable because no amount of loading and caravan noseweight can lift the driven wheels off the road. However most fwd cars tow very competently providing the car manufacturer's noseweight limit and rear axle limits are observed, and most experts would say they offer significant advantages, due to inherently safer handling characteristics. Areas where fwd performance can be compromised while towing are on hill starts, or on wet grass/mud, where it is not uncommon for the front wheels to scrabble for grip. However, the majority of more recent cars likely to be chosen as towcars now have traction control systems which largely address these problems.

> Traction control is great, but there is usually a button to turn it off. That is because it operates by reducing engine power to prevent wheelspin. But in some circumstances (deep mud, or a slippery hill start, perhaps), you need the wheels to spin to let the engine rev high enough to produce enough power to get you moving.

For caravanning purposes, 4x4 vehicles can be divided into three main categories: the true all-terrain vehicles (Range Rover, Discovery, Shogun, Trooper, Landcruiser etc), the 'lifestyle' off roaders, which are lighter and smaller-engined (Suzuki Vitara, Nissan X-Trail, Toyota RAV4, etc), and high-performance road going passenger cars (Audi, Subaru etc).

Four wheel drive can either be selectable, just for slippery off-road moments, or permanent, leading to enhanced acceleration and cornering due to improved traction. Ever increasing sophistication of the control systems for such transmissions means that many models now have multiple modes of operation, and variable degrees of automatic selection of which wheels power is directed towards. These are one class of vehicle where you really do need to spend some time reading the handbook, if you want to get the best out of the car! Thankfully, though, the days of being confused over which of the three gear sticks in your new off roader you need at any particular time have largely disappeared, with most of the selection now being electronically controlled.

Many caravanners see a 4x4 as the 'ultimate' towcar. Certainly, if you need a heavy car to match appropriately to a large caravan, then this may be your only option, although some larger estates and MPVs may be viable as well. A large 4x4 will almost certainly deliver excellent pulling performance, great hill start ability, and a confidence of always being able to get off a muddy field after a weekend's rain! Be aware that some of the smaller models are less competent, though, and may not have especially high kerbweights, towing limits or noseweight capabilities. There are some penalties of choosing a 4x4 too. High running costs (including high fuel consumption) are almost certain, while sadly, reliability and refinement cannot always be taken as read for what are usually premium price vehicles. Interior space can sometimes be compromised by a need to leave room for all the heavy-duty mechanical bits and pieces, and turning circle is often limited too, making parking more of a challenge than normal. The sheer size of some of the 'proper' off roaders can be a mixed blessing – while many owners like the feeling of safety and security that results from this, you may find you can not get your new car in your garage.

Are you allowed to tow with a 4x4? If you passed your driving test from 1 January 1997 onwards, you can only tow an outfit with a combined maximum allowable mass of 3500kg unless you take an additional driving test. Many 4x4 will exceed this limit with almost any caravan. See The Club's Information Leaflet 'Driving Licences in a Nutshell'

Some caravan manufacturers say their warranty may be invalidated by towing with an all-terrain vehicle, so check this point first, either in the caravan manual, or by contacting the manufacturer direct. Al-Ko Kober, the most popular caravan chassis manufacturer, issued advice some years ago about towing with an off-road leisure vehicle. This was to the effect that, in general terms, UK-market caravans are expected to be towed primarily on prepared roads, with a small amount of manoeuvring likely on softer ground such as caravan sites. In these circumstances, the use of leisure type four wheel drive vehicles (those with car-like suspension) is acceptable, given usual careful driving.

4x4 versions of conventional passenger cars tend to be relatively heavy compared to their two wheel drive variants, so may be good matches for medium to heavy caravans, if not ideal for the very largest ones. They will have many of the advantages of bigger 4x4s (improved traction for slippery roads and hill starts), but seldom the real off road ability of a true all terrain vehicle, mainly due to limited ground clearance and 'road' rather than 'off road' tyres.

8. BODY STYLE

A long rear overhang is less desirable in a tow car - ie. the distance from the rear axle to the towball, making some large saloons less than ideal. In extreme cases, this can lead to a depressed rear end requiring suspension aids and a tendency towards pitching or swaying - a case of the 'tail wagging the dog'. Many estate variants have uprated, adjustable or even self-levelling suspension to cope with their enhanced load-carrying capacity, and this can also benefit their towing ability. Self levelling suspension is a great boon, but often a costly option or only found on the higher models. Citroen have been a notably exception to the rule in this regard, and their success over the years at Towcar of the Year must in some part be due to this. The need to add rear suspension aids (see our leaflet on the subject, 'Rear Suspension

Aids' for more details) is rare these days. The choice between saloon, hatchback or estate will often come down to practicality – if you need to carry more luggage, especially odd shaped items like awning poles, deck chairs and all the other 'essentials' we find we need when going on holiday, then generally a hatchback will swallow more than a saloon, and an estate will take more than a hatchback.

'Multi Purpose Vehicles' (MPVs or 'people carriers') are now very popular. These often have a relatively high kerb weight and short rear overhang, which are advantageous for towing. The high seating positions and flexible seating and luggage arrangement normally possible are also bonuses while touring or in normal use. Note, however, that some models are quite low-powered for the size of vehicle, and hence will not be especially lively when loaded or towing. Also, some manufacturers may consider that the high internal load capacity (often 7 people plus luggage) means that a relatively low towing limit and/or noseweight limit is appropriate for the car. Others quote variable limits – ie you can carry lots of payload in the car, or tow a heavy caravan, but not do both at once. As always, check in the car handbook before buying.

And now for something completely different….Why not tow with a convertible? Or a high performance saloon? Or a pick-up truck? As long as a vehicle has an adequate towing limit specified by its manufacturer, you should be able to tow with it. While this usually rules out things like Ferraris, it wouldn't necessarily exclude a BMW convertible, a Subaru Impreza WRX or a Mitsubishi L200. Your towcar does not have to be boring!

9. NOSEWEIGHT

In general, the higher the noseweight, the better the stability of the combination. Experience has shown that a noseweight in the region of 5% to 7% of the actual laden weight of the caravan is normally a practical limit. However, the maximum noseweight will always be limited by the lowest of the car, towbar or caravan coupling vertical load limits.

For more information on this subject please see The Club's separate 'Noseweight' leaflet, which includes lists of car noseweight limits.

10. TOWBARS

Still at the car's rear end, consider carefully the mechanical connection of your caravan, the towbar. Today's fuel-efficient cars are quite lightly-built and have metal panels designed to crumple in an accident. Attaching a rigid towbar to such a structure, to accept the considerable vertical and horizontal forces from the caravan is now a very exact science. The car manufacturer will specify precisely at what points the attachment must be made, and often provide pre-drilled and threaded points for the bolts. From 1 August 1998 most new cars have to be fitted with a towbar meeting European Directive 94/20/EC, which should guarantee the towbar's performance. For older cars, though, it is not wise to save a few pounds buying the cheapest possible towbar, which most likely does not attach to all the recommended points - insist on one which states that the design has been tested to the British (BS AU114) or similar International (ISO3853) Standard. Any claim that a towbar is 'designed to' or 'meets'

the Standard is bogus - it must have been *tested* to the Standard. The noseweight limit marked on the bracket may sometimes be higher than the noseweight limit for that particular model of car (since the same towbar may be used on a range of vehicle models). Check in the car handbook, and work to the lower of any specified values. (See also The Club's leaflet, 'Choice of Towbar').

11. CLEAN LEAN AND GREEN

With ever-increasing fuel costs and concerns for the environment it is necessary to recognise that it is not always practical to choose the best possible towcar, when this vehicle may well spend most of its time operating solo.

- If you choose a large, heavy caravan, do not compromise unduly on your choice of towcar, as your safety and legality may be affected. If you only tow a modest mileage a year, would an older, secondhand 4x4 be a better option (low purchase price, possibly outside of the scope of emissions-based Vehicle Excise Duty (VED, or Road Tax), restricted mileage insurance policy possible), if you used it only for holidays and occasional other trips, instead of buying a theoretically greener and more efficient new 4x4 but used it all the time? You would perhaps need a small, efficient hatchback for everyday use, as well, though. Far better – if possible – is to choose a lighter caravan, of course, but even then, it is unwise to match it to too small, light or low-powered a towcar.

- As a general rule, the more modern a car is, the better its emissions performance and fuel economy will be. Manufacturers are giving more and more attention to these issues now, and tomorrow's cars will be better still.

- Alternative fuels may be worth considering. Sales of petrol/LPG capable cars peaked in 2003 (at about 3000 new registrations), but LPG remains a cost-effective way of running a larger-engined car, as the fuel is still currently cheaper. If you can find an already-converted secondhand petrol 4x4, it could be a good buy, even for limited mileage use. If you wanted to have a car converted, however, you will probably need to be doing a high annual mileage to offset the cost of conversion. Most common petrol/electric hybrids (eg Toyota Prius, Honda Civic Hybrid) are not approved for towing, but a few are suitable (eg Lexus RX400h), and are potentially very effective towcars. Their characteristic of lots of torque from an electric motor at low speed is ideally suited to hill starts or pulling away on a slippery field, for instance. Expect to see more new models in this sector in years to come. Current electric-only cars tend to be far too small and have too limited a range to be viable for towing, but that may change in years to come.

- Increasing engine efficiency means that having a large engine is no longer a necessity for an effective towcar. Models such as the VW Golf GT Sport with just a 1.4l petrol engine, but produces 140 or 170 bhp (depending on specification) and 162 or 177lb ft of torque at 1750 or 1500rpm. That is the kind of output which would have been obtained from a 2.5l engine only a few years ago, yet this example will return around 40mpg and CO_2 emissions of around 170g/km. Modern diesels of around 2l capacity or perhaps a little less are capable of even better figures. Staying with the Golf GT Sport, the diesel

version has a 2l engine, again produces either 140 or 170bhp (depending on specification), and 236 or 258 lb ft of torque at 1750 or 2000rpm. Better still, fuel consumption is around 50mpg, and CO_2 emissions are around 150g/km.

- Want to find the relevant figures for a particular car? Try the following:

    - The car handbook or brochure or manufacturer's website should have all the information, but some are much clearer in this respect than others.
    - For new cars, there should be an environment label (much like those used on fridges and washing machines0 which rates the car from 'A' (most green) to 'G' (most polluting), and which gives other facts and figures too. These should be displayed on cars in the showroom, and are often reproduced in promotional brochures and sometimes websites.
    - The Government's 'Act on CO_2' website (www.dft.gov.uk/ActOnCO2/) includes details of the emissions performance of all new cars, as well as tips ion choosing and using a car efficiently.
    - The Vehicle Certification Agency's website (www.vacarfueldata.org.uk/) has a sophisticated search facility covering new cars to enable you to find fuel efficient and/or green vehicles, and also those which fall into specific VED bands etc.
    - For older cars, the Society of Motor Manufacturers and Traders has a database of cars from 1997 onwards giving CO_2 figures (www.smmtco2.uk/).
    - An interesting project currently being evaluated by The Club is the 'Ecotest' study run jointly by the German auto club ADAC and the FIA Foundation. See www.ecotest.eu for details. This attempts to evaluate a range of efficiency and environmental factors, and to combine them to give a simple 5-star rating assessment to that used for vehicle safety in the Euro-NCAP test programme.

- Remember that whichever car you buy, and whatever its economy and environmental capabilities, it is at least as important how you drive it as how it is designed. The Act on CO_2 campaign suggests the following advice:

- Check and adjust your tyre pressures regularly, as under-inflated tyres create more resistance when your car is moving, which means your engine has to work harder, so more fuel is used and more CO_2 emissions are produced.

- Clutter in your boot is extra weight your engine has to lug around. By removing it, you could reduce your engine's workload. This will burn less fuel and cut your CO_2 emissions, so unload any items you will not need for your journey before you set out. Similarly, failing to remove a roof rack which is not being used causes unnecessary inefficiency.

- Every time you stop then start again in a traffic queue, the engine uses more fuel and therefore produces more CO_2. Keep an eye on the traffic ahead and slow down early by gently lifting your foot off the accelerator while keeping the car in gear. In this way, the traffic may have started moving again by the time you approach the vehicle in front, so you can then change gear and be on your way.

- Modern car engines are designed to be efficient from the moment they are switched on, so revving up like a Formula 1 car in pole position only wastes fuel and increases engine wear. Using your gears wisely by changing up a gear a little earlier can also reduce revs. If you drive a diesel car try changing up a gear when the rev counter reaches 2000rpm. For a petrol car try changing up at 2500rpm.

- When the engine is idling you are wasting fuel and adding CO_2 emissions. If you are likely to be at a standstill for more than 3 minutes, simply switch off the engine.

- Try to avoid using your car for short journeys – use public transport, ride a bicycle or walk.

- Plan ahead – choose uncongested routes, combine trips, car share.

- Cold starts – drive off as soon as possible after starting, as it is more efficient to let the engine warm up while driving than on your driveway.

- Drive smoothly and efficiently – harsh acceleration and heavy braking have a very significant effect on fuel consumption. Driving more smoothly saves fuel.

- Slow down – driving at high speeds significantly increases fuel consumption.

- Use higher gears as soon as traffic conditions allow.

- Regular servicing helps keep the engine at best efficiency.

- Check your fuel consumption – it will help you get the most from the car. Changes in overall fuel consumption may indicate a fault.

- Use air-conditioning sparingly – running air-conditioning continuously will increase fuel consumption significantly.

12. MISCELLANEOUS

Watch out for:

- Low-mounted number plates which may force you to choose a more expensive detachable towbar, or risk prosecution if your towball obscures the plate.

- Tailgate mounted spare wheels on 4x4s, which make it awkward to hitch and unhitch (especially with a ball-acting stabiliser).

- Large and low tailgates which might be obstructed by the caravan hitch – especially side-hinged ones which are occasionally seen on 4x4s.

- Cars fitted with high intensity gas discharge headlamps – can the beam be readily adjusted for continental use by the owner, or will this mean expensive trips to the dealer for every holiday. Some are very easy, others are not!

It is hoped these factors will help you choose a towcar suited to your needs, but for any further information, contact The Club's Information Department.

Photocopies of various tried and tested reports, and new car tests featured in the Caravan Club Magazine are available to members.

If you would like to receive a towcar report or one of the information leaflets mentioned, please send a large (A4) stamped addressed envelope.

Useful Conversions

POWER	1bhp =	1.0139 PS (= German Pferde Starke or Horse Power)
	1 KW =	1.341 bhp or 1.36 PS
TORQUE	1 Nm =	0.737 lb/ft
	1 lb/ft =	1.357 Nm
	1 Kgm =	7.227 lb/ft
	1 Kgm =	9.806 Nm

FUEL CONSUMPTION Litres per 100 km = $\frac{282.47}{\text{mpg}}$ 1 litre = 0.22 gal

Mpg = $\frac{282.47}{\text{1/100km}}$ 50 litres = 11 gal

SPEEDOMETER CHECK 1 Km, or 10 marker posts on a motorway, should take 55.9 seconds at 40 mph, 44.7 seconds at 50 mph and 37.3 seconds at 60 mph. Preferably measure over a longer distance.

MILEOMETER CHECK 1 Km (10 marker posts) equals 0.6214 miles. At least 10 Km is needed for any reasonable verification.

To help you with your selection the list below suggests a target minimum engine power to aim for in relation to train weight. The first column shows car kerbweights, the second a caravan weighing 85% of that kerbweight, and the third the bhp of a car's engine that will be needed to produce 40 bhp/tonne of train weight. Obviously a heavier caravan affects these figures.

Power to Weight Ratio Calculations

Car Kerbweight kg (cwt)	**Caravan 85% KW kg (cwt)**	**Minimum quoted engine bhp required**
900 (17.7)	765 (15.0)	64
1000 (19.7)	850 (16.7)	73
1100 (21.6)	935 (18.4)	80
1200 (23.6)	1020 (20.0)	87
1300 (25.6)	1105 (21.8)	95
1400 (27.6)	1190 (23.4)	102
1500 (29.6)	1275 (25.0)	109
1600 (31.5)	1360 (26.8)	117
1700 (33.5)	1445 (28.4)	124
1800 (35.4)	1530 (30.1)	131
1900 (37.4)	1615 (31.8)	138
2000 (39.4)	1700 (33.5)	146
2100 (41.3)	1785 (35.1)	153
2200 (43.3)	1870 (36.8)	160
2300 (45.3)	1955 (38.5)	168
2400 (47.2)	2040 (40.1)	175
2500 (49.2)	2125 (41.8)	182
2600 (51.2)	2210 (43.5)	189
2700 (53.1)	2295 (45.2)	197

Remember, you will usually be using the car in a loaded condition and you should take this into account when working out bhp requirements. However, when considering two or more cars for their suitability, a simplistic comparison using just the car's kerb weight, as shown above, is valid to help you make the best choice.

Weight Guide using Ford/Land Rover 2007 Vehicles spec as examples

	Kerbweight Kg (cwt)
Fiesta 1.4i 3 door	1102 (21.7)
Focus 1.8i 5 door	1307 (25.7)
Mondeo 2.0TDCi 5 door	1559 (30.7)
S-Max 2.0TDCi 5 door (MPV)	1724 (33.9)
Galaxy 2.0TDCi 5 door (MPV)	1799 (35.4)
Freelander2 2.2 TD4 (4x4)	1770 (34.8)
Discovery3 2.7 TDV6 (4x4)	2494 (49.1)
Range Rover 3.6 TDV8 (4x4)	2710 (53.3)

Definitions of Terms Used

The Caravan

Ex Works Weight (Unladen Weight)	The weight of the caravan as new with standard fixtures and fittings as stated by the caravan manufacturer. (**NB**: Because of the differences in the weight of materials supplied for construction of caravans, and moisture retention, variations of ± 5% of the manufacturer's figure can be expected, usually "+").
Actual Laden Weight (ALW)	The total weight of the caravan and its contents when being towed.
Maximum Authorised Weight (MAW) (Maximum Gross Weight)	The maximum weight for which the caravan is designed for normal use when being towed on a road laden and this must never be exceeded.
Maximum Technically Permissible Laden Mass (MTPLM)	As stated by the vehicle manufacturer. This mass takes into account specific operating conditions including factors such as the strength of materials, loading capacity of the tyres etc.
Mass in Running Order (MIRO)	Mass of the caravan equipped to the manufacturer's standard specification.
User Payload	The difference between the Maximum Technically Permissible Laden Mass and the Mass in Running Order. For most existing caravans payload includes essential habitation equipment, personal effects and optional equipment. It is anticipated that EHE will soon be moved from being part of user payload to being part of MIRO . Check the specification details for new caravans carefully
Essential Habitation Equipment (EHE)	Those items and fluids required for the safe and proper functioning of the equipment for habitation as defined by the manufacturer of the caravan.
Personal Effects	Those items which a user can choose to carry in a caravan and which are not included as essential habitation equipment or optional equipment.
Optional Equipment	Items made available by the manufacturer over and above the standard specification for the caravan.
Noseweight	Static vertical load. That part of the weight of the caravan supported by the rear of the towing vehicle.

The Towing Vehicle

Kerb Weight

There are two definitions for towing vehicle kerbweight. These are:

1. As defined in the Road Vehicle (Construction and Use Regulations 1986:

The weight of the towing vehicle as it leaves the manufacturer with a full tank of fuel, adequate fluids for normal operation (lubricants, oils, water etc) and its standard set of tools and equipment. It does not include the weight of the driver, occupants or load.

2. As defined by EU Directive 95/48/EC (issued in September 1995):

The weight of the vehicle as it leaves the manufacturer with its fuel tank 90% full, all the necessary fluids for normal operation (lubricants, oils, water etc), a nominal driver weight of 68kg and 7kg of luggage.

Vehicle manufacturers will tend to use the second definition in official documentation, since this is the one required by the regulations they have to meet to sell the vehicle Europewide. In publicity material and handbooks, however, either definition may be found, although the first one is expected to gradually disappear.

Towing Limit

A statement by the manufacturer giving the (braked trailer) maximum weight of braked trailer the car will tow, when restarting on a gradient of, usually, 1 in 8.

Gross Vehicle Weight (GVW)

The weight of the vehicle laden to its maximum, as defined by the vehicle manufacturer.

Gross Train Weight (GTW)

Often the Gross Vehicle Weight plus the Towing Limit, but check the vehicle handbook.

VIN Plate / MTPLM	**Only applicable to post-August 1998 vehicles** This calculation is based on the Gross Train Weight of your vehicle. If the Gross Vehicle Weight plus the MAW/MTPLM of your caravan exceeds the Gross Train Weight shown on the VIN Plate of your car, you could be breaking the law. The Gross Train Weight of a vehicle should be the Gross Vehicle Weight plus the vehicle's maximum towing weight. However, some manufacturers have set their Gross Train Weights below that figure and this will restrict the towing limit of these vehicles.
Outfit Weight Ratio	The Actual Laden Weight expressed as a percentage of the Kerb Weight, ie: $\frac{ALW}{KW} \times 100$

Conversion

Kilograms divided by 50.8	= cwt
Kilograms multiplied by 2.2046	=lbs

TOWCAR OF THE YEAR COMPETITION RESULTS 1998-2010 *Returning Champion

YEAR	OVERALL WINNER	CARS UNDER £16,000	£16,000 TO £20,000	£20,000 TO £25,000	£25,000 TO £32,000	OVER £32,000	ALL-WHEEL DRIVE UNDER 1800KG	ALL WHEEL DRIVE OVER 1800KG
2011	**Skoda Superb Estate Elegance 2.0 TDI CR**	Skoda Fabia Elegance 1.6 TDI CR	Fiat Doblo 2.0 multijet Eleganza	Volkswagen Golf Match 2.0 tdi 140*	Skoda Superb Estate Elegance 2.0 tdi cr	Mercedes-Benz E350 cdi BlueEffiency Avantgarde Estate	Mitsubishi Outlander 2.2 DI-D Juro SST	Range Rover Sport TDV6 HSE
2010	**Volkswagen Golf SE 2.0 TDI**	Kia Soul Shaker 1.6 crdi	Volkswagen Golf SE 2.0 TDI	Mazda6 2.2D Estate TS²	Volvo XC60 D5 SE AWD	Land Rover Discovery 4 TDV6 HSE	Skoda Superb Elegance 3.6 V6 4x4 DSG	Land Rover Discovery 4 TDV6 HSE
2009	**Skoda Superb 2.0 tdi**	Citroen Berlingo Multispace xtr 1.6 hdi	Hyundai i800 style	Skoda Superb 2.0 tdi	Ford Mondeo Titanium x 2.5t estate	Mercedes-Benz C320 cdi estate sport	Volkswagen Tiguan SE 2.0 tdi 4motion auto	Volvo V70 d5 awd SE
2008	**Ford Mondeo Titanium x Estate**	Skoda Roomster Scout 1.9 tdi	Ford Mondeo Zetec	Skoda Octavia Scout tdi	Ford Mondeo Titanium x Estate	Land Rover Freelander 2	Skoda Octavia Scout tdi	Kia Sorento 2.5 crdi XS

YEAR	OVERALL WINNER	CARS UNDER £13,500	£13,501 TO £16,500	£16,501 TO £20,000	£20,001 TO £25,000	£2,001 TO £33,000	OVER £33,000	ALL-WHEEL DRIVE UNDER 1800KG
2007	**Volvo V50 d5 Sport**	Kia Rio 1.5 crdi	Fiat Sedici 1.9 Multijet Eleganza	Mazda6 diesel estate TS2 (143ps) manual	Subaru Impreza WRX2.5	Volvo V50 D5 Sport	Mercedes-Benz E320 cdi estate	Subaru Impreza WRX2.5
2007 (contd)		**ALL-WHEEL DRIVE OVER 1800KG**						
		Kia Sorento 2.5 crdi XE manual						
2006	**Kia Sorento 2.5 crdi XE**	Kia Cerato 1.5 crdi GS	Citroen C4 vtr+ 1.6hdi	Kia Sorento 2.5 crdi XE	Subaru Forester 2.5XT	Volvo V70 D5 AWD	Volvo XC70 D5 SE Lux	Volvo XC70 D5 SE Lux
2006 (contd)		**ALL-WHEEL DRIVE OVER 1800KG**						
		Kia Sorento 2.5 crdi XE manual						

YEAR	OVERALL WINNER	BUDGET CAR	SMALL FAMILY CAR	FAMILY CAR	ESTATE CAR	MPV	COMPACT 4x4	FULL SIZE 4x4
2005	**Mazda6 2.0-D Estate TS2 (136ps)**	Citroen Berlingo Multispace desire	Toyota Corolla T3 2.0 D-4D*	Vauxhall Vectra Elite 3.0 cdti auto	Mazda6 2.0 –D estate TS2 (136ps)	Renault Grand Espace 3.0 dci initiale*	Subaru Forester 2.0 XT*	Vw Touareg V10 TDI*
2005 (contd)		**EXECUTIVE & LUXURY CAR**	**UTILITY CAR**	**MIDI MPV**				
		BMW 525d SE Touring	Isuzu Rodeo Denver	Seat Altea 2.0 tdi sport				

YEAR	OVERALL WINNER	BUDGET CAR	SMALL FAMILY CAR	FAMILY CAR	ESTATE CAR	MPV	COMPACT 4x4	FULL SIZE 4x4
2004	**Subaru Forester 2.0 XT**	Mitsubishi Space Star 1.9 DI-D S	Toyota Corolla T Spirit 2.0 D4-D	BMW 330d SE saloon	BMW 330d sport touring	Renault Grand Espace 3.0 dCi V6 Privilège auto	Subaru Forester 2.0 XT	VW Touareg V10 TDI

YEAR	OVERALL WINNER	CLASS WINNER	CLASS WINNER	CLASS WINNER	CLASS WINNER	CLASS WINNER	ALL-WHEEL-DRIVE CATEGORY
2003	**Skoda Superb 2.5 V6 TDI Elegance**	Fiat Doblo 1.9 JTD ELX	Toyota Corolla 2.0 D-4D T Spirit	Toyota RAV4 2.0 D-4D GX	Skoda Superb 2.5 V6 TDI Elegance	Renault Vel Satis 3.0 V6 dCi Initiale	Toyota RAV4 2.0 D-4D GX (under 1800kgs) Mercedes-Benz ML500 (over 1800kgs)
2002	**Peugeot 406 2.2 GTX Hdi Estate**	Citroen Xsara 2.0 Hdi LX	Skoda Octavia Estate 4X4	Citroen C5 2.0 Hdi LX Estate	Volvo S60 2.0TS	Subaru Legacy Outback H6-3.0	Subaru Legacy Outback H6-3.0

YEAR	OVERALL WINNER	CLASS WINNER	CLASS WINNER	CLASS WINNER	CLASS WINNER	ALTERNATIVE FUEL CLASS	ALL TERRAIN	MPV CLASS
2001	**Volkswagen Golf V6 4MOTION**	Volkswagen Polo S TDI PD	Vauxhall Astra Coupe 2.2i	Volkswagen Golf GT TDI PD	Volkswagen Golf V6 4MOTION		Mitsubishi Shogun 3.5 GDI SWB	Fiat Multipla JTD 105 ELX
2000	**SEAT Toledo V5**	Citroen Xsara 2.0 HDi SX	SEAT Toledo V5	Volkswagen Bora V5	Vauxhall Omega 3.0 V6 MV6 Estate		Chevrolet Blazer 4.3 V6	Renault Grand Espace V6 RXE
1999	**Audi A6 Avant 2.5 TDi**	Volkswagen Polo CL TDi ESTATE	Volkswagen Golf GT TDi	Renault Laguna RTi V6	Audi A6 Avant 2.5 TDi		Isuzu Trooper 3.5 Citation LWB (AUTO)	Ford Galaxy Ghia