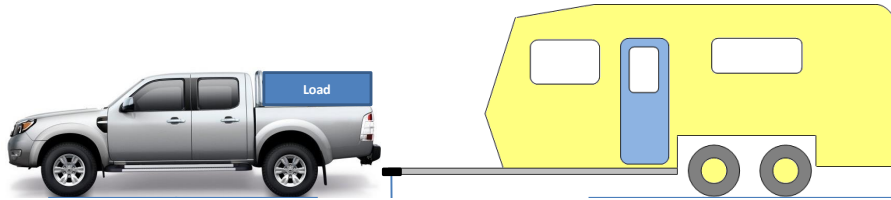




Vehicle Towing – Are you Overweight?

Towing a caravan is not just about the trip but ensuring your complete rig is safe and correctly configured for the trip you have planned. The loading the rig and vehicle, the number of people and equipment you plan to take can easily put you over the recommended limits! Police checks have found that in many cases the configuration of the rig, along with the vehicle loads not only exceeds the manufacturer's ratings and the physical capabilities of the vehicle but runs a high risk of denial of insurance coverage should anything unexpected happen.



Guessing and just assuming everything looks right (just avoid trailer hitch sag) is a disaster waiting to happen especially when you may need to brake suddenly or swerve to miss an animal or another vehicle. So where do you start?

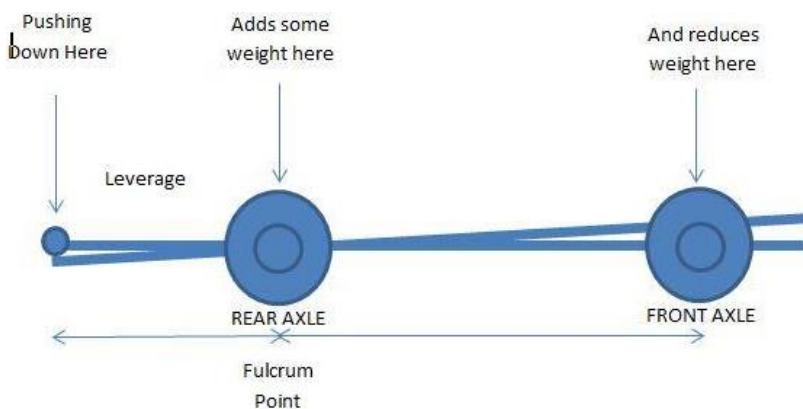
I have found this source of a very comprehensive and simple analysis tool to allow you to make judgements and assess the impacts you may wish to avoid when loading your rig and vehicle with your most valuable resources – You and your family!

John Halford from the [Australian Caravan & Towing](#) Facebook group has made some excellent resources available free of charge if you join the group. John has kindly agreed that we can include his current versions for our members but recommends you join this group so as to be kept up to date as he enhances the tools over time. John has also added other great articles including some very interesting references to some videos covering use of airbags versus weight distribution hitches.

[Weight - Caravan Towing Calculator](#) and [Weight - Caravan Towing Calculator User Manual](#).

The "Caravan Towing Calculator User Manual" is a must read as it explains the terms, values and units necessary to de-mystify the complex and confusing use of names when trying to make sense of this topic. Manufacturers like to put their own products in the best light, sometimes tailoring their understandings to make it appear better than it may really is.

Other than the main vehicle and trailer mass ratings, the distribution of weight contributes to the overall setup of a good configuration. First, we need to explain some basic rules of physics.



Effect of BALL WEIGHT

This simple diagram (by Michael Carter) shows that adding weight onto the vehicle tow ball changes the weight distribution across the axles of the vehicle.

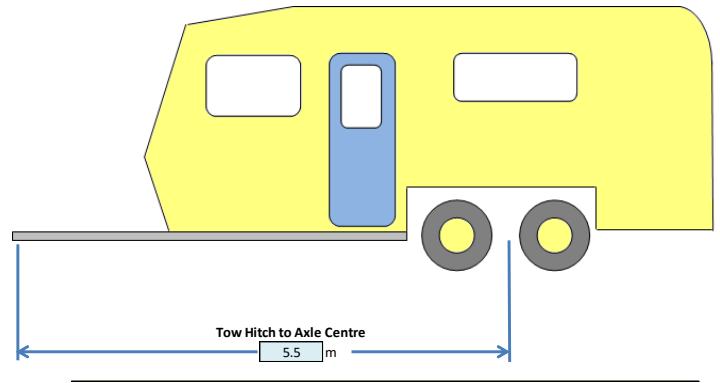
Using a Weight Distribution Hitch (WDH) helps transfer some of the towbar download from off the rear axle and back onto the front axle. This also has

the effect of levelling the vehicle with the front tyres having maximum traction on the road. Airbags (fitted onto the rear axle) can help level the vehicle but all the towbar download remains directly over the rear axle with no transfer to the front axle, which can result in excessive loadings on the axle especially when considering trailers (at 3500Kg) could exert a ball weight download of 350Kg in addition to the vehicle gross mass.



Vehicle Towing – Are you Overweight?

Looking at the caravan side of the equation, the ball weight will be based on the caravans TARE WEIGHT plus loading. Obviously, where the loading weigh is placed with relationship to the axles (centre of) will affect the ball weight download. If you load the caravan forward of the axle, the ball weight will increase whereas loading to the rear of the axle, reduces the ball weight.



CARAVAN WEIGHTS and LOADS

Using the calculator's CARAVAN sheet, you insert the basic compliance plate figures supplied by the manufacturer and then add you own loading data to come up the expected ball weight download. Of course, you can just take your fully load to the local weighbridge (uncoupled and on the jockey wheel) and by using the calculator's BALL WEIGHT sheet, compute your relative ball weight download. If you are lucky enough to have a Ball-Weight Measure, you can determine this calculation directly.

Next, you need to define all the locations within your caravan that you intend to store items and understand their relative distance (forward and aft) with respect to centre of the wheels. Forward locations are positive distances whereas aft locations are negative. John has provided a good starting point of locations that you can modify, add or remove to reflect your particular van and measurements from the centre of wheels.

Caravan

Manufacturer	Jurgens Australia
Model	J2403
Year	2014

Instructions

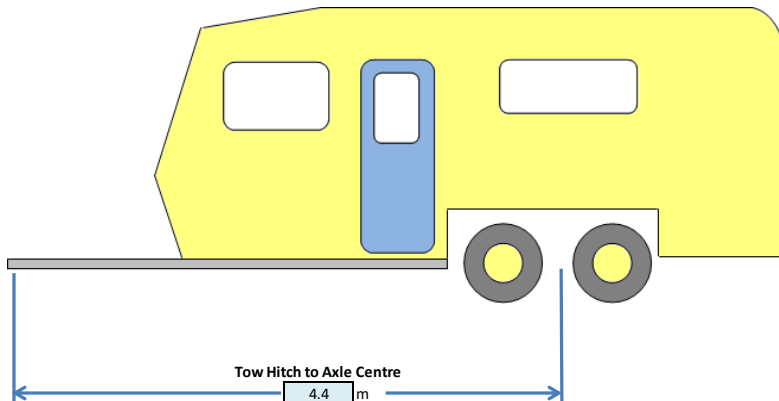
1. Enter "Descriptions" in the Position Table .
2. Measure the distance from the centre of the axles to each position and record the value in the Position Table. Values to the rear of the axle centre need to be entered as negative values.

Compliance Plate Values	
Tare Weight	1767 kg
Ball Weight at Tare	144 kg
Maximum Ball Weight	220 kg
GTM	2023 kg
ATM	2167 kg
Measured Tare Weights	
Measured Tare Weight	1767 kg
Measured Ball Weight at Tare	160 kg

Calculated Caravan Weights with Load	
Calculated Ball Weight	210 kg
Calculated ATM	2143 kg
Calculated GTM	1933 kg
Load Allowance at Tare	400 kg
Current Load	376 kg
Load Remaining	24 kg

9.80% of ATM
 Total Weight of Caravan (Disconnected from the Tow Vehicle)
 Calculated ATM - Calculated Ball Weight

Allow for water and gas when measuring Tare and Ball Weight at Tare. These measured values are used as base values in the calculations. Measure the Tare values with empty water tanks and deduct the calculated weight of the gas from the measured Ball Weight at Tare value.



Position Table				
Description	Distance m	Ratio	Weight kg	Nett kg
Hitch	4.40	1.00	10.5	10.5
Gas Bottles	4.45	1.01	0.0	0.0
Front Overhead Cupboards	3.40	0.77	0.0	0.0
Tunnel Boot	3.40	0.77	51.5	39.8



Vehicle Towing – Are you Overweight?

To calculate the total ball weight in accordance to how you have loaded your caravan, use the calculator's CARAVAN LOAD sheet to reflect what items you might want to take with you and their storage location within the van (using pulldown list compiled in previous step). John again has provided a good starting point of items that you can modify to reflect your particular needs. At least by putting them down, you get an appreciation for all the items you may be taking and maybe you should be asking do you really need it?

My van was chosen specifically (as most off-road models are excessively heavy!) to suit our vehicle's maximum towing limit. On my first attempt in using this calculator, it showed that I had exceeded the maximum loading for my van but after re-reading the User's Guide I realised I had made a few miscalculations. I made these adjustments and finally managed to stay under the maximum allowances. (I have recently added an extra 50KG of bike racks to rear of the van – Maybe I have over-engineered them a bit and they could have been made lighter! ☺)

I entered in my own measurements but still need to verify them as I may have guessed a few! [John has now included in his latest version the ability to have optional items included allowing you to try different combinations and see the impact.] Obviously, I ultimately need to put my loaded van over the weighbridge to verify all of my assumptions and calculations.

VEHICLE WEIGHTS and LOADS

Next, we enter the vehicle details into the calculator's VEHICLE sheet, similar in concept to that you have done with the caravan.

Vehicle (weights when not towing)

Manufacturer	Mitsubishi Pajero
Model	NS VRX Diesel 4x4
Year	2008

Note:
Ball Weight will be taken into consideration in the Towing section.
The Caravan Ball Weight will be added to the Load of the Tow Vehicle.

Front Axle Load	1330
	0
Rear Axle Load	1780
	0
VEHICLE LOAD	3030
Load	637
	378
GVM	3030
	2771
	0

Legend	
Manufacturers Specification	
Calculated Value	
Measured Value	

Calculated Load	
Current Load	378
Load Remaining	259

Weights	Manufacturer	Calculated	Measured	
Base Weight (Full Tank Fuel)			2393	kg
GVM (Gross Vehicle Mass)	3030	2771		kg
Maximum Towing Mass	2500			kg
Maximum Ball Weight	250			kg
GCM (Gross Combined mass)	5530			kg
Front Axle Load	1330			kg
Rear Axle Load	1780			kg
Load	637	378		kg

The Manufacturers Kerb Weight can be entered as the Base Weight (Full Tank Fuel) value but a measured value would be more accurate.

Item	Description	Weight (kg)
1	Occupants - 2 people	176.00
2	WDH (Weight Distribution Hitch)	16.50
3	Towbar	15.00
4	Roof Rack	30.00
5	Rear Boot Bits and Pieces	60.00
6	7 Seat (Removed)	-20.00
7	Fridge	50.00
8	Toolbox	50.00
9		
10		
11		
12		

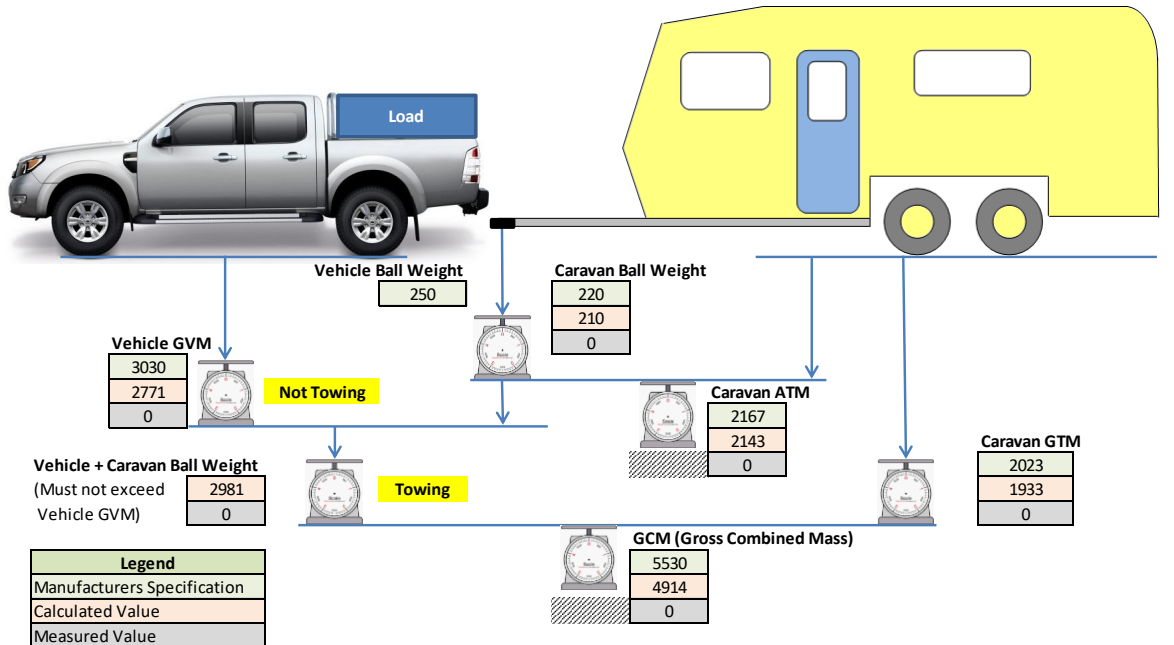
Comment: I have only allowed for 2 people. Put 4 burly blokes into this 4WD, the odd slab or two in the back, a fridge to keep them cold and a roof rack of tents and swags, not forgetting a few extra jerry cans of fuel or water and **you would easily overload this vehicle!!**.

Vehicle Towing – Are you Overweight?

TOWING CONFIGURATION

After entering all the data I could muster, this was my results:

Towing



Vehicle	Manufacturer	Calculated	Measured	
Base Weight (Full Tank Fuel)			2393	kg
GVM (Gross Vehicle Mass)	3030	2771		kg
Vehicle + Ball Weight		2981		kg
Maximum Towing Mass	2500			kg
Ball Weight	250	210	0	kg
GCM (Gross Combined mass)	5530	4914		kg
Front Axle Load	1330			kg
Rear Axle Load	1780			kg
Load	637	378		kg

Caravan	Manufacturer	Calculated	Measured	
Measured Tare Weight			1767	kg
Measured Ball Weight at Tare			160	kg
Ball Weight	220	210		kg
GTM	2023	1933		kg
ATM	2167	2143		kg

I should say that this was not my first result which had red everywhere!! It looked like I was in real trouble, with some 70KG over my GROSS COMBINED MASS. I thought I was well under (given my lightweight van) and so my first options were:

- (a) Buy another bigger 4WD [Sorry wife says no!]
- (b) Prune back on the contents [But these are the basics, right!]
- (c) Check my calculations (measure at weighbridge) [Cannot trust those darn spreadsheets!]
- (d) Just hope I never get pulled up over weighbridge [Not with my luck, right!]

However, I looked closer at the data and realised I had left a measured value in GCM which was not correct and some of the other "measured" values that I had left blank but they really need to be completed. (Vehicle - BASE WEIGHT). When you look at the data as presented (very easy to follow), it is easy to find out what was driving the weird results.

Doing this exercise was worthwhile as it make you think about my total vehicle and van physical configurations and towing needs. Of course, we generally could all lose the odd kilo or two (Wife said she is not going to help me!) so if I can reduce my overall loads, I will save fuel, have a better riding rig and by safer on the road even if a few things have to be sacrificed.

Or I could just say its all too hard, put my head in the sand and assume it will be alright! ☺

[By Chris Sieben]