

# ***Towing Ratings***

What do all these initials (GVWR, GCWR, TW, GTW, CW, RGAWR, etc.) mean? Are they important to me? How do I know I have a **safe** towing set-up? How do I prevent sway and what should I do if my rig starts to sway? What tow vehicle should I purchase to handle the trailer I want? What size trailer can I tow with my current vehicle? How do I check my rig to be sure it is safe?

## **THE RATINGS**

The ‘G’ stands for gross or the total. When the initials end with ‘R’ it stands for rating. No ‘R’ means you are looking at the real number. ‘V’ is the vehicle that can be the Tow Vehicle (TV) or the Trailer. We are going to use ‘T’ to represent the trailer. So:

1. **GVW** is the gross tow vehicle weight, which means **everything** in the tow vehicle including you and any passengers.
2. **GTW** means the gross trailer weight, which means **everything** in the trailer including fluids, propane, etc.

Once we have determined the gross weight of our tow vehicles and the gross weight of the trailer we can add them together and determine the gross combined weight of our rig, GCW. We compare this number to the maximum allowed by the tow vehicle manufacturer, **GCWR**. This weight includes everything in the rig including you and your passengers.

Some manufacturers provide a maximum **Trailer tow capacity rating** by subtracting the TV gross rating from the combined rating and stating: “This is the heaviest trailer this vehicle can tow”. This number should never be exceeded; however, it is usually much higher than the real capacity of your TV.

Sometimes there are ratings for the rear axle, ‘A’ (**GAWR**) and the front axle. If you have this rating enter it into the Calculation Chart, so it can be compared to the actual weight on the axle.

What usually determines these 'R' ratings is the weakest component. For example, the spindle, bearings, tires, springs, suspension, shocks, etc. could determine the front axle rating. Each Manufacturer could have a different component that has the lowest weight rating.

There is a lot of misinformation that floats around some of which can be dangerous.

**1. The weight ratings provided by the Vehicle Manufacturer are purposely lowered because of liability concerns.**

Let us examine this from a logical point of view. A Manufacturer wants to sell as many cars as possible. Why would he take a TV that can be rated at 10,000 lbs. and **reduce** the advertised rating to 8000 lbs. This is not going to improve sales and makes no logical sense.

**2. The correct tire pressure for your tow vehicle, motor home or trailer, should be the number imprinted on the side of the tire.**

The number on the sidewall of the tire has the word maximum next to it. Every tire company provides a chart, which lists the proper tire pressure as a function of the weight it has to carry. This clearly says that the proper pressure is based upon the weight it has to support and the number on the tire is indeed just the maximum that should not be exceeded. I will not mention the number of times I have had to argue with Service Managers or technicians over this.

**3. The tongue weight is the number provided by the trailer manufacturer in his specification list and nothing else counts.**

This one can be quite dangerous if you believe the above. Why do you think most of the articles on hitches have elaborate directions on how to measure the real tongue weight? For stability and safe towing, it should be between 10% to 15% (closer to the high end for minimum sway) of the gross trailer weight (GTW). Part of this weight is transferred to the front axle with the load distribution hitch in order to have a stable rig and minimize sway. You can do a reasonable calculation to determine what your tongue weight will be. **Tongue weight means everything that is on the ball i.e.:**

**The Trailer Manufacturers stated loaded tongue weight + the hitch weight + all the stuff in your tow vehicle that is located behind the rear axle = Tongue Weight**

Be sure the manufacturers tongue weight is not just the empty trailer but includes the filled propane tanks and any other trailer equipment that will add to the weight on the ball.

This calculation is usually the one that causes the most problems in getting the proper size hitch and setting it correctly.

I remember when a member contacted me and asked why when he had been towing for several years with virtually no sway and a very stable rig, this year he had all kinds of scary problems. I remembered he had contacted me to determine the best set-up for adding a generator so he could boondock with air conditioning. It turns out he had added a 3000 watt, 145 lb. generator and rearranged his truck so that the new four drawer toolbox was also at the tail gate. His Tongue Weight had significantly increased and his hitch bars could no longer transfer enough weight.

Determining the actual weight of the Tow Vehicle and the actual weight of the trailer will give us the total rig weight, which is the gross combined weight (GCW). This includes you and all of the passengers for a total weight that has to be less than the **GCWR** rating of your TV.

In order to determine what size trailer we can safely tow we need to determine.

1. The actual tow vehicle gross weight
2. The actual trailer gross weight
3. The actual Tongue Weight (total weight on the ball).

We can then compare these weights to the TV ratings provided by the manufacturer and see if the trailer we want to buy can be safely towed with our existing vehicle. Alternatively, now we know what tow capability is needed in order to purchase a safe TV.

In order to buy the proper hitch we also need to determine or measure the real tongue weight so we can distribute the weight to the front of the TV and have a

stable rig. Not exactly rocket science. You do not have to weigh everything but 100 pounds is a reasonable resolution level.

## **WHAT IF I EXCEED THE RATINGS?**

A car's **gross vehicle weight rating (GVWR)**, also referred to as the truck towing capacity or vehicle towing capacity, is serious business. A towing capacity rating is based on the maximum **gross vehicle weight (GVW)** (the weight of the fully loaded vehicle or trailer, including cargo and passengers) the vehicle is designed to carry. Exceeding it cannot only damage your vehicle, but it also puts your life and the lives of others in jeopardy.

Understanding (and heeding) your truck's towing capacity -- specifically its GCWR, which adds the gross trailer weight to the tow vehicle gross weight -- is one of the most important things you need to do before heading to the great outdoors.

Towing is no small feat and often requires a special beast to get the job done properly. Among other things, tow vehicles need stronger frames, suspension systems, engines and axles to handle larger loads. Transmissions need special cooling systems. Brakes have to handle the emergency stopping you will be required to make on every camping trip. Mountains on hot summer days will stress everything in the tow vehicle.

Just because your pickup might be able to manage the extra, weight of the boat for a quick trip does not mean it is OK to do. Driving to Florida in the winter will minimize the stress but would you want to have to worry about the whether or not you will be over stressing your rig.

Vehicles are designed to handle only a certain amount of force, and the way they are constructed reflects that. That is why commercial trucks that regularly haul tons of cargo across the country have significantly bigger wheels, more powerful engines, stronger braking and suspension systems than do passenger cars.

When you ask your truck to pull more than it was meant to -- exceeding its towing capacity-- a number of things can start to happen: the brakes begin to fade, the added weight contributes to tire failure, and the extra work required of your

engine causes it to overheat, which, in turn, overloads the drivetrain and shortens the life of your transmission.

Although you may not see the effects of exceeding towing capacity at first, the gradual wear and tear will lead to eventual failure. The best-case scenario is repeated trips to the repair shop; the worst is a major wreck.

Of course, if you insist on pulling an overweight load, you may not even live to see the effects of this wear and tear. That is because the extra weight pulling on the back of your vehicle significantly hampers your braking ability and steering control. When the back of your truck is loaded down, the front tires come up, causing them to lose some traction with the road. Without those front tires firmly on the ground, you will definitely see a negative impact on your stability and handling. Your brakes, which were designed to stop a limited amount of weight, will either take much longer to slow the vehicle down in an emergency or they simply will not work at all. You may actually boil your transmission fluid and reduce its ability to function properly.

The answer I shudder to hear **“I been doing this for 25 years and never had a problem”**. This from the camper towing his 25 foot Airstream with a Volkswagen.

I towed my first trailer (25-foot Holiday Rambler) with a Suburban SUV that had the special tow package with heavy duty everything including an extra transmission cooler. On two separate trips, my brakes faded coming down mountains. After a couple of years, I burned out my transmission. A year and a half later, on another other trip, I burned out my second transmission. I finally found out what the white smoke coming out of the TV was (transmission fluid). This also explained the little oil spots on the front of my trailer I had to clean off on occasion. I never understood all of these GV's and GC's etc. so I just ignored them and eventually paid the price (thank goodness, it was only money).

## **CALCULATIONS WITH EXISTING TV**

So how do we determine if we are meeting the ratings?

Travel Trailer Weight Calculator: <http://changingears.com/rv-sec-calc-trailer-weight-tt.shtml>

Changing Gears has put together an excellent Weight Calculator just for the purpose of helping us out and making this an easy exercise. Further, it will allow us to vary the placement of stuff so we can better balance loads to improve stability and performance.

So let us get started and assume we have a Ford F150 that we purchased in 2013. Every manufacturer provides extensive ratings information in their manuals and/or sales literature. This has been conveniently gathered for you by Changing Gears in the menu on the left side, 'Truck Ratings' or:

Tow Vehicle Ratings: <http://changingears.com/rv-sec-tow-vehicles-ratings.shtml>

The Ford Towing Guide listing goes back to 1999. So select 2013 and download it. These guides include all classes of towing from just a ball mount to weight distribution hitch ratings.

Download the info for your TV and check the towing guide table of contents, which indicates that the ratings we want are on pages 15-21. The GCWR for our V8 regular cab and 3.31 axle ratio is 12,900 lbs. and the maximum loaded trailer weight is 7,900 lbs. From page 9, we get a GVWR of 8200 lbs., which allows a maximum cargo weight of 2687 lbs. with our V8 engine.

There are also ratings for trailer towing packages, SUV ratings, Van/Wagon and passenger cars. Page 26 illustrates a truck safety compliance certification label which gives the GVWR, and the GAWR (axle rating) for both the front and rear axles. These provide checks to make sure the axle ratings are not exceeded especially with load leveling hitches.

Therefore, here are our TV rating numbers:

GVWR = 8,200

GCWR = 12,900

Maximum TV Cargo = 2687

Maximum loaded trailer weight = 7900

Maximum Tongue Load (Hitch Receiver) = 1130 Base

Curb Weight Rating = 5513 (GVWR – Max Cargo)

Now we can calculate the actual tow vehicle GVW:

**GVW = Curb Weight + Cargo + Passengers**

Let us assume we have 1500 lbs. of cargo including fuel, hitch, tools, stuff, generator, etc. and there are two passengers averaging 150 pounds. The GVW would be:

$GVW = 5513 + 1500 + 300 = 7313 \text{ lbs.}$

This provides a reasonable margin when compared to the GVWR. Enter the numbers as shown in Figure (1) Weight Calculator. We leave the trailer numbers blank because we are trying to determine the size unit that can be safely towed.

Item	Qty	Units	Weight (lb)*	Weight (kg)
<b>Tow vehicle GVWR</b>				
Enter Gross Vehicle Weight Rating as provided by tow vehicle manufacturer.				
	8200	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle GCWR</b>				
Enter Gross Combination Weight Rating as provided by tow vehicle manufacturer.				
	12900	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle maximum loaded trailer weight rating</b>				
Enter rating as provided by vehicle manufacturer.				
	7900	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle maximum tongue weight rating</b>				
Enter rating as provided by vehicle or hitch manufacturer, whichever is less.				
	1130	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle RGAWR</b>				
Enter Rear Gross Axle Weight Rating as provided by tow vehicle manufacturer.				
		<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle GVW</b>				
Enter <u>actual</u> weight (Gross Vehicle Weight) of tow vehicle.				
	7313	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Trailer GVW (or GTW)</b>				
Enter <u>actual</u> weight (Gross Vehicle Weight or Gross Trailer Weight) of trailer.				
		<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Trailer tongue weight</b>				
Enter <u>actual</u> tongue weight of trailer.				
		<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Safety margin</b>				
Enter a percentage (1 to 50) of the tow vehicle's maximum ratings you wish to leave as a safety margin. Recommended margin is 20%.				
	20			
<b>Trailer tongue weight percentage override</b>				
Leave this box empty for the calculator to use the recommended 15% maximum as the tongue weight. Enter a percentage (1 to 50) to use as tongue weight instead. Recommended range is 10% - 15%.				
	12			
<input type="button" value="Calculate"/> <a href="#">Reset Form</a>				
<small>* The results of this calculator are <b>approximate</b>. Results may be slightly inaccurate due to conversion and rounding. Weight of liquids vary slightly with temperature, altitude, chemical composition, etc.</small>				

Figure (1) Weight Calculator TV

Next select 'Calculate' and Figure (2) Calculation Results will give you the maximum trailer weight and tongue weight. We selected a safety margin of 20%.



Calculation Results	Weight (lb) *	Weight (kg) *
<b>Maximum Trailer Weight</b> This is the maximum trailer weight based on the most restrictive tow vehicle ratings provided (GCWR - GVW).	<b>5,587 lb</b>	<b>2,534 kg</b>
<b>Maximum Trailer Weight with Margin</b> This is the maximum trailer weight based on the most restrictive tow vehicle ratings provided, reduced by a safety margin of 20%.	<b>4,470 lb</b>	<b>2,027 kg</b>
<b>Maximum Tongue Weight</b> This is the recommended maximum tongue weight, based on 12% of the calculated Maximum Trailer Weight.	<b>670 lb</b>	<b>304 kg</b>
<b>Maximum Tongue Weight with Margin</b> This is the recommended maximum tongue weight, based on 12% of the calculated Maximum Trailer Weight with Margin.	<b>536 lb</b>	<b>243 kg</b>

Calculate [Reset Form](#)

\* The results of this calculator are approximate. Results may be slightly inaccurate due to conversion and rounding. Weight of liquids vary slightly with temperature, altitude, chemical composition, etc.

Figure (2) Calculation Results F-150

Now let us pick out a used 2010 trailer that interests us. Figure (3) illustrates an Airstream 2010 specification summary sheet. Our calculated GTWR with the 20% safety factor is 4470 lbs. Simply checking the unit base weight, (UBW) (dry unit with no fluids and no payload) limits us to less than 19 feet. Since we wanted at least a 25-foot trailer, our basic F150 Truck is not going to work. In fact, the more years we spend with our RV's the larger they seem to grow.

If you are going to purchase a new tow vehicle, it is a good idea to plan for growth in the size and weight of your future trailer. Once the RV camping bug captures you, the trailers seem to grow over the years.

### CALCULATIONS WITH A NEW TRAILER

Now let us select a new 2015 trailer and determine what we need for a TV. For a Classic 30 which is just over 31 feet in length:

Gross Trailer Weight Rating = 10,000

Unit Base Weight = 7365 (w/Propane tanks, and no options, water & cargo)

Fresh water 54 gal, Black water 39 gal, Gray water 37 gal

Hitch Weight = 773 (w/Propane tanks, and no options, water & cargo)



AIRSTREAM													2010		Summary Sheet	
MODEL	GVWR	UBW	NCC	Tongue Weight W/Propane	Fresh/wr tank	Water #	Fuel	Fuel #	Height W/AC	Gray	Black	LP				
<b>Sport</b>																
16 Sport	3,500	2897	603	446	20	217			8' 11"	24	18	20 # (2)				
17 Sport	3,500	30,043	457	300	20	217			8' 11"	24	18	20 # (2)				
22 FB Sport	4,500	3,594	906	393	20	217			8' 11"	24	18	20 # (2)				
<b>Flying Cloud</b>																
19 Flying Cloud	4,500	3,792	708	550	23	242			9'5"	21	18	30# (2)				
20 Flying Cloud	5,000	4,211	789	631	23	242			9'5"	21	18	30# (2)				
23 Flying Cloud Corner Double	6,000	4,708	1,292	779	30	300			9'5"	21	18	30# (2)				
25 FB "B" Flying Cloud	6,000	4,746	1,254	467	39	378			9'5"	30	18	30# (2)				
25 FB "B" and Twin Flying Cloud	7,300	5,443	1,857	837	39	378			9'7"	37	39	30# (2)				
27 FB queen J and Twin	7,600	5,806	1,792	791	39	378			9'7"	37	39	30# (2)				
28 Flying Cloud	7,300	5,919	1,381	976	39	378			9'7"	37	35	30# (2)				
30 Flying Cloud-Optional Recliners	8,800	6,322	2,478	880	54	504			9'7"	38	38	30# (2)				
<b>International Signature Series</b>																
16 International	4,300	3,261	1,039	459	23	242			9' 4"	21	20# (2)					
19 International	4,500	3,763	737	550	23	242			9'5"	21	18	30# (2)				
19 Victorinox	4,500	3,800	700	583	23	242			9'5"	21	18	30# (2)				
23 D International	6,000	4,701	1,299	720	30	300			9'5"	21	18	30# (2)				
25 FB Intl Queen (B)Ocean Breeze	7,300	5,552	1,748	833	39	378			9'7"	37	39	30# (2)				
27 FB Intl Queen (J)Ocean Breeze	7,600	5,764	1,836	770	39	378			9'7"	37	39	30# (2)				
28 International	7,300	5,853	1,447	950	39	378			9'7"	37	35	30# (2)				
<b>International Ocean Breeze</b>																
16 Intl Serenity	4,300	3,261	1039	459	23	242			9' 4"	21	20# (2)					
19 Intl Serenity	4,500	3,763	737	550	23	242			9'5"	21	18	30# (2)				
23 D Intl Serenity	6,000	4,701	1,299	720	30	300			9'5"	21	18	30# (2)				
25 FB Intl Queen (B)Serenity	7,300	5,552	1,748	833	39	378			9'7"	37	39	30# (2)				
27 FB Intl Queen (J)Serenity	7,600	5,764	1,836	770	39	378			9'7"	37	39	30# (2)				
28 Intl Serenity	7,300	5,853	1,447	950	39	378			9'7"	37	35	30# (2)				
<b>Classic</b>																
27 FB queen J and Twin	9,000	6,582	2,408	792	54	504			9'7.5"	37	39	30# (2)				
30 Classic queen J and Twin	10,000	7,285	7,215	773	54	504			9'7.5"	37	39	30# (2)				
31 Dinetta "W"	10,000	7,174	2,826	805	54	504			9'7.5"	37	39	30# (2)				
<b>Pan America</b>																
34 Pan America	11,500	7,288	4,212	1260	54	504			9' 7.5"	37	39	30# (2)				
<b>3500 Interstate</b>																
Interstate Rear Sofa	11,030	8,056	2,974	5000/500	26	266	26.4	176	9'7"	27	16	14 GAL				
Interstate Twin	11,030	7,976	3,054	5000/500	26	266	26.4	176	9'7"	27	16	14 GAL				

TRAILER UBW ( UNIT BASE WEIGHT ) is the dry weight of the base unit with bedroom group and w/o options or fluids  
 MOTOR HOME UBW ( UNIT BASE WEIGHT ) is dry weight of base unit with full fuel tank and w/o options or fluids.  
 14 GALLON CARRYING CAPACITY is GVWR - UBW  
 Water Weight is: 8.33 lbs per gallon of water and includes water capacity of water heater  
 Fuel weight is: 5.75 lbs. per gallon Gasoline / 6.67 lbs. per gallon Diesel fuel / 4.50 lbs per gallon LP  
 Propane: approximately 8.0 on both the trailers and motor homes.  
 All trailers use 5/8" tongue and groove plywood With W/PB type glue  
 Tank heating: The 20 and 23 Flying Cloud use heating pads. All others use direct heat from the furnace.  
 Exterior metal thickness: Trailer sidewalls/End shell are .040 and roofs are .030 White metal

**STEPS**

<b>Flying Cloud</b> Single step 19 Double Step -20,21,23FB,25FB,27FB,28 & 30	<b>International</b> Single Step 16, 19 Double Step 22,25FB,27FB, & 28
<b>Pan America</b> Traditional Aluminum Airstream Double Step	<b>Classic Limited</b> Traditional Airstream aluminum double step

**Windows**  
 Sport: Heat windows- Optional Airstream Panoramic Windows  
 Flying Cloud: Airstream Manufactured Windows  
 Classic Limited: Airstream manufactured windows  
 International: Airstream manufactured windows  
 White Roof: This will help keep the trailer 10 degrees cooler during the summer months.



Airstreams® have the water tanks placed between the axles distributing the weight evenly adding to the low center of gravity for smooth towing.  
 \*16 & 19 and Sport trailers have fresh water tanks installed above the floor.

Figure (3) Airstream 2010 Trailer Specifications

The first step is to estimate the gross trailer weight, GTW:

**GTW = base unit weight + options + hitch + fluids + kitchen + food + clothes + stuff**  
**Fluids Weight: Fuel weight (gas 6.2 lbs/gal, diesel 7.0 lbs/gal)**  
**Fresh water (8.35 lbs/gal) Propane (4.22 lbs/gal)**

The weight of a Hensley or Pro Pride hitch is around 195 lbs. Eaz-lift and Reese, with sway control, are around 100 lbs. Yes! The hitch counts particularly with the tongue weight since it becomes part of the load distribution weight.

$$\text{GTW} = 7365 + 500 + 100 + 500 + 100 + 75 + 75 + 100 = 8815$$

Assuming 500 lbs. of options, a 100 lb. hitch, a full water tank and partial black water, 100 lbs. of kitchen appliances, 75 lbs. of food, 75 lbs. of clothes and 100 lbs.

of miscellaneous stuff. Since our GTWR is 12,500 lbs., we are well within this rating.

**Tongue Weight = Trailer with Propane + hitch + weight behind rear axle of TV**

$$\text{Tongue weight} = 773 + 100 + 150 = 1023 \text{ lbs.}$$

This is about 12 % of the GTW and should provide a stable towing environment. With a 20% margin our TV has to be able to handle about 10500 lbs. of GTW. Staying with a Ford Truck, we will need an F250, which can handle a 12,300 lbs. GTWR trailer, and a GCWR of 19000 lbs. The GVWR is 10000 lbs.

$$\text{GVW} = \text{Curb Weight} + \text{Cargo} + \text{Passengers} \quad \text{GVW} = 7057 + 1500 + 300 = 8857$$

Let us plug these ratings into our Calculator:

Figure (4) illustrates the data entry form that results from starting with a 2015 trailer and using a 2013 Ford F-250 TV. Ratings were not available for the axles; however these usually are on the TV Specification sticker. Figure (5) provides the results using a 12% safety margin. Since this calculation is for a 2015, 31 foot trailer this margin is more should be quite adequate.

Item	Qty	Units	Weight (lb)*	Weight (kg)
<b>Tow vehicle GVWR</b>				
Enter Gross Vehicle Weight Rating as provided by tow vehicle manufacturer.				
	<input type="text" value="10000"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>10,000 lb</b>	<b>4,536 kg</b>
<b>Tow vehicle GCWR</b>				
Enter Gross Combination Weight Rating as provided by tow vehicle manufacturer.				
	<input type="text" value="19000"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>19,000 lb</b>	<b>8,618 kg</b>
<b>Tow vehicle maximum loaded trailer weight rating</b>				
Enter rating as provided by vehicle manufacturer.				
	<input type="text" value="12300"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>12,300 lb</b>	<b>5,579 kg</b>
<b>Tow vehicle maximum tongue weight rating</b>				
Enter rating as provided by vehicle or hitch manufacturer, whichever is less.				
	<input type="text" value="1200"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>1,200 lb</b>	<b>544 kg</b>
<b>Tow vehicle RGAWR</b>				
Enter Rear Gross Axle Weight Rating as provided by tow vehicle manufacturer.				
	<input type="text"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Tow vehicle GVW</b>				
Enter <u>actual</u> weight (Gross Vehicle Weight) of tow vehicle.				
	<input type="text" value="8857"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>8,857 lb</b>	<b>4,017 kg</b>
<b>Tow vehicle RGAW</b>				
Enter <u>actual</u> weight of tow vehicle's rear axle (Rear Gross Axle Weight), <u>without</u> trailer attached.				
	<input type="text"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg		
<b>Trailer GVW (or GTW)</b>				
Enter <u>actual</u> weight (Gross Vehicle Weight or Gross Trailer Weight) of trailer.				
	<input type="text" value="8815"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>8,815 lb</b>	<b>3,998 kg</b>
<b>Trailer tongue weight</b>				
Enter <u>actual</u> tongue weight of trailer.				
	<input type="text" value="1023"/>	<input checked="" type="radio"/> lb <input type="radio"/> kg	<b>1,023 lb</b>	<b>464 kg</b>
<b>Safety margin</b>				
Enter a percentage (1 to 50) of the tow vehicle's maximum ratings you wish to leave as a safety margin. Recommended margin is 20%.				
	<input type="text" value="10"/>			
<b>Trailer tongue weight percentage override</b>				
Leave this box empty for the calculator to use the recommended 15% maximum as the tongue weight. Enter a percentage (1 to 50) to use as tongue weight instead. Recommended range is 10% - 15%.				
	<input type="text" value="12"/>			

Figure (4) Data Entry Using F250/Classic 31

Calculation Results	Weight (lb) *	Weight (kg) *
<b>Maximum Trailer Weight</b> This is the maximum trailer weight based on the most restrictive tow vehicle ratings provided (GVWR - GVW remainder for tongue weight at 12% of trailer weight).	<b>9,525 lb</b>	<b>4,320 kg</b>
<b>Maximum Trailer Weight with Margin</b> This is the maximum trailer weight based on the most restrictive tow vehicle ratings provided, reduced by a safety margin of 10%.	<b>8,572 lb</b>	<b>3,888 kg</b>
<b>Maximum Tongue Weight</b> This is the recommended maximum tongue weight, based on 12% of the calculated Maximum Trailer Weight.	<b>1,143 lb</b>	<b>518 kg</b>
<b>Maximum Tongue Weight with Margin</b> This is the recommended maximum tongue weight, based on 12% of the calculated Maximum Trailer Weight with Margin.	<b>1,029 lb</b>	<b>467 kg</b>

[Reset Form](#)

\* The results of this calculator are approximate. Results may be slightly inaccurate due to conversion and rounding. Weight of liquids vary slightly with temperature, altitude, chemical composition, etc.

Figure (5) Calculation Results F-250/Classic 31

Now we can configure our load distribution hitch. We need a class IV hitch with at least a 1200 lb. capability.

Weight distribution systems use spring bars to help combat the problems that often occur with standard hitch systems. Adding spring bars to your towing setup applies leverage to either side of your system, which transfers the load that is pushing down on the rear of your vehicle to all of the axles on both your tow vehicle and your trailer. This even distribution of weight results in a smooth, level ride, as well as the ability to tow at the maximum capacity of your hitch.

Spring bars are responsible for transferring the load that pushes down on the rear of your vehicle when you are towing to the axles on both your tow vehicle and trailer. By applying leverage to your towing setup, these bars are responsible for distributing the weight in a complete weight-distribution setup. Typically, there are two types of spring bars - round and trunnion. Some manufacturers have specialized spring bars for their hitch.

If you do not use a load distribution hitch, your rig may look like the before in Figure (6). For a stable rig with minimum sway, both the TV and trailer must be level. Your hitch must be sized properly and adjusted correctly to distribute the tongue weight.

Figure (6) Leveling the Rig

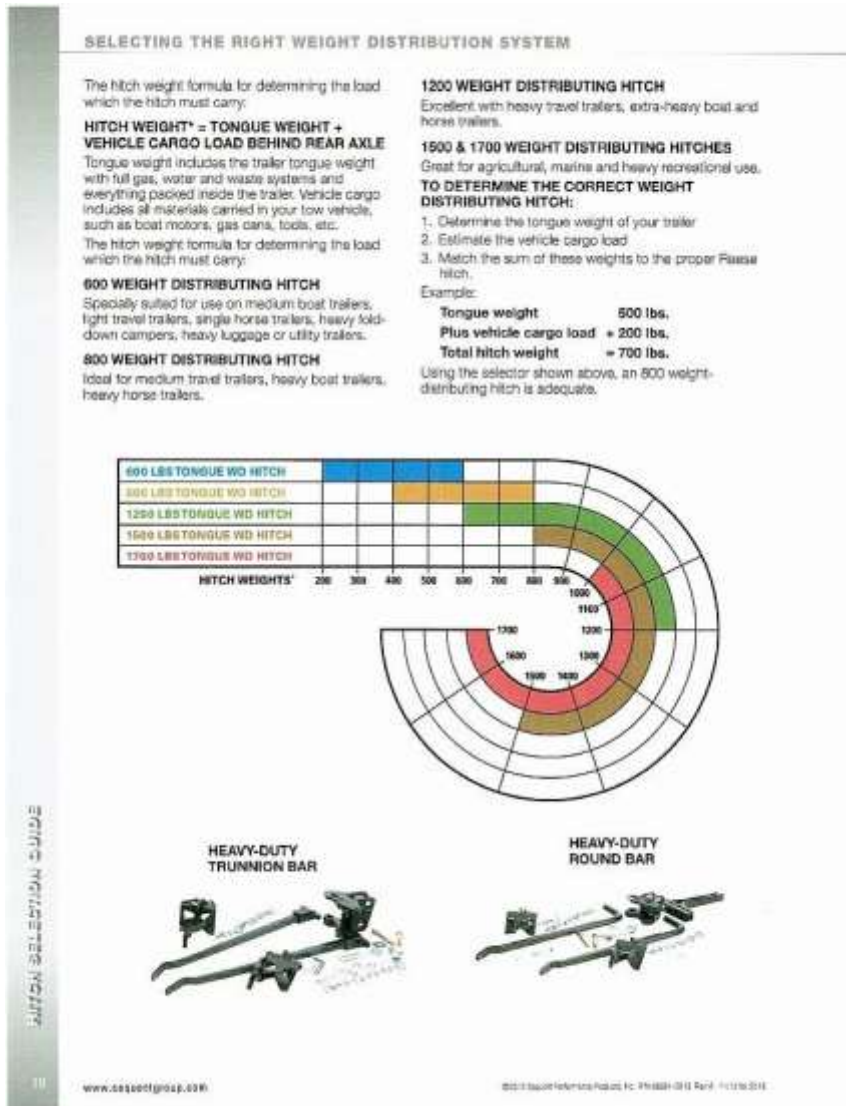


Figure (7) Reese Hitch Bars

Once you do a few rigs with the Changing Gear Weight Calculator, you can use it to adjust your cargo locations in the trailer and/or TV. If you need more tongue weight (minimum 10%) move heavy stuff behind your rear axle. If the weight is too high, move the generator or toolbox in front of the rear axle.

To assist in determining the actual GVW and/or GTS you can use:

<http://changingears.com/rv-sec-calc-adjust-gvw.shtml>

This is an Adjust GVW or GTW Calculator and it allows you to change the TV or trailer configuration. In this calculator, you can vary all of the fluid levels, change the number of people or their weight, change cargo and adjust tongue weight. This is also handy when you actually weigh the trailer or TV and you have to adjust fluid levels to your typical traveling levels. You can use positive or negative weights.

After you do a few calculations and try several different rated TV's you will be able to help your new Unit member to buy the right tow vehicle and hitch so he can have a safe and stable rig.

The definitive weight determination for your rig is to have it weighed. The RV Safety organization provides this service for a nominal cost (\$60). Here is there web site and schedule for 2015.

<http://www.rvsafety.com/weighing/weighing-schedule>

They will put a scale under each tire, measure tongue weight and provide axle weights to compare with your GAWR ratings. They will check the tires for maximum load and proper air pressure.

<http://rvsafety.com/images/pdf/TowForm.pdf>

This is well worth doing and has resulted in many campers finding out why they have towing problems with their rigs.

Many years ago, I owned a Classic Motor Home with which I towed a Range Rover. Besides rear dual tire axles, Classic had a tag axle that I thought provided the extra weight capability to easily tow the Rover. I did not feel comfortable when I had my towed on the Motor Home. One year in Florida, I had the entire rig weighed. It turned out that I was 800 lbs. over the rear axle GAWR without the Rover. The tag axle had about 15 lbs. on the curbside tire and about 75 lbs. on the driver side tire. Needless to say, I gave up towing any car, particularly in the mountains.

My recommendation is to use the above Calculator's to decide what you need for a TV or to decide what your current vehicle can handle before you buy your trailer.

The weight rating of all Airstream Products from 1954 thru 2013 is available in Reference (3). It lists the dry weight (do not forget the Propane), hitch weight and GTWR.

When the opportunity presents itself get the rig weighed. I have used several of the Truck weigh stations when they are not busy. With the motor home, I weighed the RV and front and rear axles. With a trailer, you can do the TV and trailer separately as well as the tongue weight.

## **CONTROLLING SWAY**

This is one of the best articles I have seen on how to prevent and handle sway problems.

### **Causes of poor tow-vehicle/travel-trailer handling may seem elusive, but remedies can be simple.**

**By Bill Estes**

Were it not for the tendency of many travel trailers to sway at least occasionally, the fifth-wheel trailer may not have grown so popular. Certainly, fifth wheels have strong attributes. Travel trailers do, too, but the fifth wheel does not, indeed, cannot sway.

The travel trailer's Achilles' heel is the way it's hitched to the tow vehicle - at a point often four or five feet behind the axle. Thus, the trailer has the necessary leverage to move the tow vehicle's rear to one side or the other, which has the effect of steering the tow vehicle. This steering effect can go into oscillations, which are fondly known as fishtailing - another name for sway.

By contrast, the fifth-wheel hitch pin is centered over the axle, unable to move laterally, which makes the fifth wheel trailer virtually immune to this motion.

While many tow vehicle/travel trailer combinations handle quite well, and their owners greatly enjoy their travels, sway may occur in a substantial number of



others, creating uneasiness, white-knuckle experiences or even accidents. The trauma is unnecessary because sway can be tightly controlled in most cases. Many owners of swaying travel trailers figure sway is the "nature of the beast" and just live with the reduced enjoyment of that it produces. But, travel trailers can and should handle well. The causes of sway often are not analyzed correctly, if at all.

The step-by-step procedure described here can be the key to safe, enjoyable towing.

### **Weight and Balance**

Sway is a fishtailing motion of the trailer, caused by external forces that set the trailer's mass into lateral motion with the trailer's wheels serving as the axis or pivot point. The motion is a sideways seesaw. All conventionally hitched travel trailers will sway slightly in response to crosswinds or the bow wave of an 18wheeler overtaking from the rear. The good ones will need little correction by the driver and will quickly re-stabilize. Only poorly set-up trailers will continue to sway after the force that caused the instability has ceased. In fact, in poorly balanced trailers, the sway motion may increase until control is lost. Unfortunately, most evaluations of sway problems focus on the hitch or the tow vehicle, but the trailer's weight distribution often is the primary cause.

Following are points on how to tell a well-behaved travel trailer from a poor one, and how to correct a problem in a trailer that you may already own.

### **Trailer Checkup**

A trailer's inherent stability is part of its design, based on the amount of weight in front of the axles vs. the amount of weight behind. The difference between these two weight masses is the amount of weight on the trailers hitch, which is called the hitch weight or tongue weight.

Trailers with insufficient hitch weight have two deficiencies: The percentage of weight (mass) behind the axle(s) is too high, so when set in motion it acts as a pendulum; and the distance between the hitch ball and the trailer axles is insufficient.

Simply stated, trailers with a high proportion of hitch weight to gross weight usually have more of their length ahead of the axles, and they handle better. The generally accepted industry standard is that hitch weight should be approximately 10 percent of gross weight. In fact, that is a bare minimum, and some trailers with 10 percent hitch weight do not handle well. Hitch weights of 12 percent or higher (up to the weight limits of the hitch and vehicle beings used) assure proper handling.

In marginal situations, the owner's ability to handle an unstable trailer will depend on the inherent stability of the tow vehicle, which is yet another variable. A truck or van with a long wheelbase, a relatively short rear overhang and stiff springs often will at least partially make up for a trailer's lack of inherent stability, whereas if the trailer is towed by a softly sprung vehicle with a long overhang, the trailer's shortcomings will be more obvious.

### **How a Trailer Should Handle**

Many campers become accustomed to being uncomfortable or even frightened by trailer sway when they encounter strong crosswinds, trucks overtaking from the rear, or mountainous roads. They think it is normal - the way all trailer's handle. Not so! Properly designed, well-matched tow vehicles and trailers have positive control and good road manners and are fun to drive.

Strong crosswinds may tend to push the tow vehicle/trailer combination laterally, and it may end up wandering out of the traffic lane a bit if the driver isn't paying close attention. But, steering should be predictable, and the driver should be able to use corrective steering measures without fear of sway. Likewise, it should be possible to drive a mountain road aggressively while being able to keep the tow vehicle in the proper position on curves.

Speeding 18-wheelers present hazards to conventionally hitched trailers that don't handle well, particularly while descending mountain grades. A tow vehicle/trailer rig is most susceptible to destabilizing forces while descending a grade at highway speeds, and such conditions are the true test of inherent stability. It's natural for the bow wave (air pressure) of a speeding 18-wheeler to have an effect on a tow vehicle and trailer - an effect that requires steering correction. But, the effect

should not be destabilization that makes the tow vehicle feel like steering control is minimal and therefore unpredictable.

However, it is always necessary to monitor one's rearview mirror and anticipate the effects on an 18-wheeler overtaking from the rear. Drivers of marginally stable vehicles who are caught napping usually are the drivers who have control problems.

The four important keys to good road manners while towing a travel trailer are:

1. Proper trailer-weight distribution;
2. Proper hitch adjustment;
3. Use of effective sway-control equipment;
4. Anticipation of adverse driving conditions.

### **Weight Evaluation**

If you notice significant trailer sway during normal driving and an occasional uncomfortable situation, your rig is not set up properly, and that should be corrected. The first step in evaluating a trailer for correction of stability is a trip to the scales.

Commercial scales are accessible in most communities at rental yards, moving and storage firms, and grain elevators. Gross weight and hitch weight should be recorded with the trailer loaded for travel. Gross weight is recorded with the trailer unhitched on the scale.

Hitch weight is determined by recording two trailer weights. For the first, weigh the trailer, unhitched, on the scale. For the second, position the tongue jack off the scale (trailer unhitched and tongue height same as when towing) to weigh only the trailer wheels. Subtract the two figures for hitch weight. Weighing the trailer wheels with the trailer hitched and spring bars in use will give a false hitch weight reading.

If hitch-weight percentage is down around 10 percent or less, it can cause unstable trailer behavior. If hitch weight is 10 to 12 percent, towing stability still could be a

problem if the tow vehicle is marginally stable. If hitch weight is 12 to 15 percent, the trailer should handle well and should not be a contributor to any instability problem.

It is important that hitch weight not exceed the rating of the equipment. Ratings of conventional hitches typically range between 800 and 1000 pounds, although they are available up to 2000 pounds. Ratings are stamped on hitch components.

Let us examine a couple of examples of trailers that have very different weight distribution:

### **Example 1**

Total trailer weight 5400 pounds

Hitch weight 650 pounds

Hitch weight percentage:  $650 / 5400 = 12\%$

In this example, hitch weight is a good margin of total weight. This trailer should handle well.

### **Example 2**

Total trailer weight 6200 pounds

Hitch weight 560 pounds

Hitch weight percentage:  $560 / 6200 = 9\%$

This example involves a trailer that clearly has insufficient hitch weight, and it undoubtedly is prone to sway. The only solution is to move weight forward. This may be accomplished by moving some supplies or a rear-mounted spare tire.

The worst place for a tire, or anything else that's relatively heavy, is on the back of a travel trailer that has marginal hitch weight. Carry it in the tow vehicle unless it can be mounted on the trailer's A-frame (in front). Another possibility is the battery; if carried in the rear, it should be relocated forward to the trailer A-frame.

The freshwater tank should not be located behind the trailer axles. This does occur, however, whenever designers don't pay proper attention to roadworthiness. If a rear water tank can be replaced by one of a different shape that will fit under a

sofa in the forward section of the trailer, for example, the positive effect on stability will be dramatic. Ideally, the water tank should be located over the axles, so it's varying content does not affect hitch weight significantly. Of course, it's wise to empty holding tanks before traveling, to minimize weight in the rear.

A trailer with insufficient hitch weight can be towed successfully by combining a very stable tow vehicle with very conservative driving habits, but such a rig can get out of control in an emergency.