

RVs & Trailers: From a Suspension Point of View (Part 1 of 3)

By Martin Bouchard, Vice-President at Pro Torsion

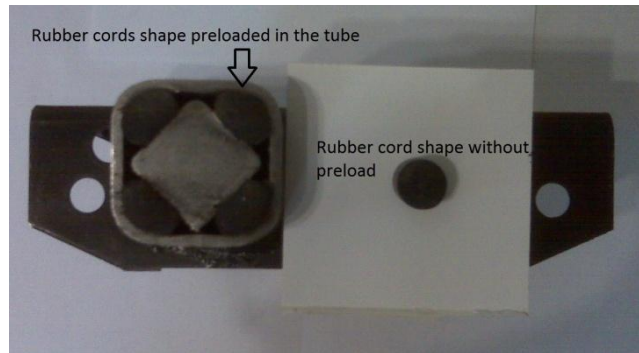
Over the past twenty-five years, Pro Torsion founder, Yves Larivière has had his share of towing experiences, some good and some he'll never forget. An avid snowmobile enthusiast, for years he has towed many a trailer on weekends in the winter months. Having to deal with trailer suspension problems and dissatisfied with the current products on the market, he decided to develop a new torsion suspension concept five years ago.

Based on his own personal experience and after meeting with hundreds of trailer and RV manufacturers, dealers, repair shops, frame manufacturers, parts distributors, axle manufacturers, as well as a multitude of end users, he ran some internal tests, confirming his theory, so in 2008 he officially started Pro Torsion with several other partners. This white paper summarizes years of intensive work on axle and suspension issues in the trailer and RV industry.

Torsion Axle Manufacturing

Many people that Yves and I have had the opportunity to talk to are familiar with how torsion axles are made. Rubber cords that shrink in diameter, due to a cryogenic freezing process, are placed around a square pin and inserted into a steel tube. After a couple of seconds, the rubber cords

expand in an attempt to return to their original shape but instead become compressed against the tube sidewalls. The result is as follows :



The rotation of a crank arm, welded to the end of the inner square bar, changes the shape of the rubber cords which act as a dampener.

In the industry, most people recognize the superior quality of a torsion axle over leaf spring. Noiseless and maintenance-free are probably the most interesting features of this type of suspension. Another feature generally associated with a torsion axle is the quality of the ride: torsion axles provide a smoother ride than leaf spring. When discussing the subject with trailer manufacturers, it became quite evident that this feature did not apply to trailers, especially if they were empty. It would seem that empty trailers bounce a lot and the problem worsens with lightweight empty trailers, such as the aluminium models. However, RV manufacturers maintain that the "smooth-ride" feature remains intact. Why ?

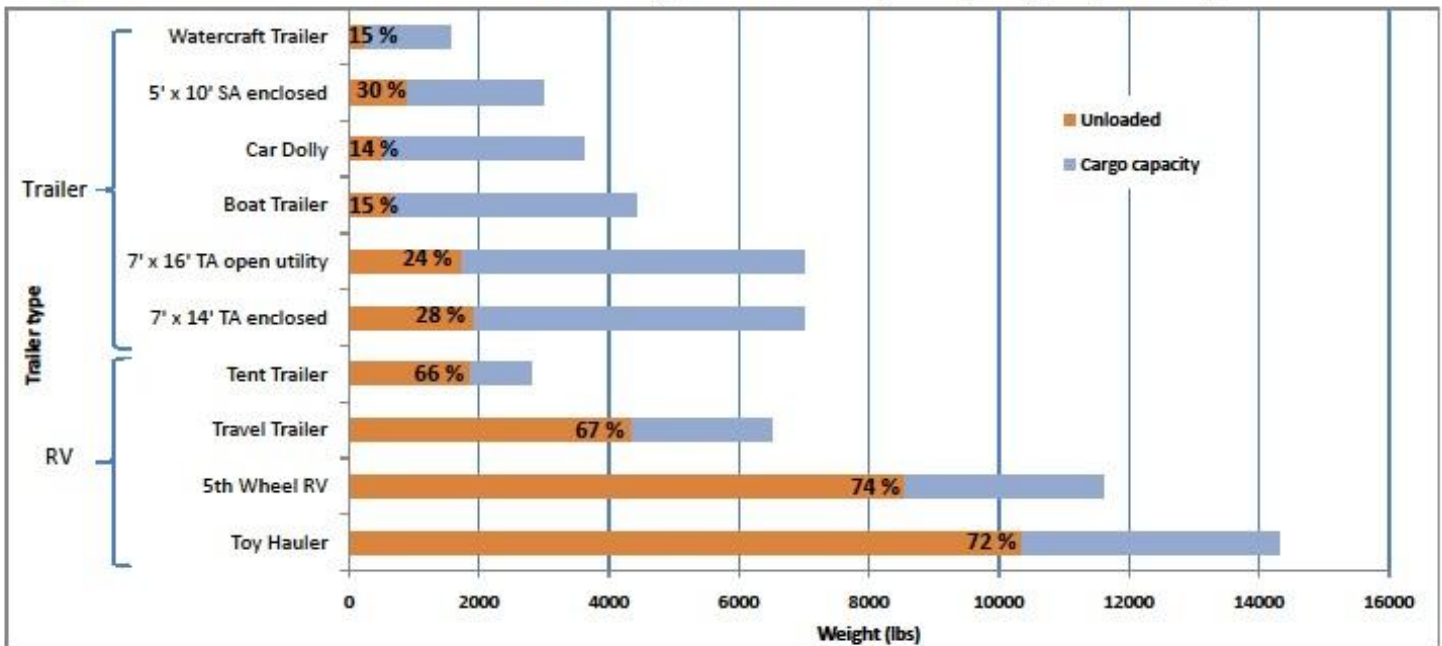
Are RVs and Trailers Different ?

In order to clarify the different perspectives of RV and trailer manufacturers on the smooth-ride issue, we compared unloaded vehicle weight to the gross vehicle weight ratings (GVWR) of hundreds of models of trailers and RVs. Summarized data can be found in the graph below.

manufacture unloaded trailers weighing 15% to 28% of axle capacity only know how much an empty trailer weighs and what its axle capacity is. Trailers may be unloaded or fully loaded (watercraft and boat) or partially loaded (open bed, enclosed) at different levels. The load varies during the lifespan of the trailer and it can sometimes be less than 50% of the axle capacity.



Ratio of Unloaded Weight vs Full Loaded (GVWR) weight by trailer type



Trailer and RV manufacturers used the same components for lights, tires, wheels, jacks, 4 or 7-way connectors, couplers and axles. Our internal tests confirm that torsion axles show significant displacement of the crank arm at 50% of the axle capacity. RV manufacturers producing unloaded vehicles weighing around 66% of the axle capacity confirm the smooth ride of the torsion axle because the vehicle is always loaded to over 50% of its total capacity. Trailer manufacturers (open bed, enclosed, watercraft and boat trailers) who

Myth Buster: No Smooth Ride When No Load

Everyone we've met agrees that a trailer with a torsion axle bounces significantly when empty. To illustrate this point, have you ever considered buying a car with a half-ton truck suspension? Two different uses, two different vehicles deserve two different suspensions. From a suspension and axle point of view, RVs and trailers have distinct requirements and are radically different.

The "Preload" Effect

As seen before on a standard torsion axle assembly, rubber cords are preloaded. Preload refers to the tension applied to suspension components before external loads, such as trailer or cargo weights, are applied. With standard torsion axles, the preload is supplied through the manufacturing process itself. A preloaded suspension is stiffer when there is no load in the trailer. This accounts for why empty trailers, weighing less than 50% of axle capacity, always bounce around so much. Another way to explain the preload is by looking at your car's suspension. When your mechanic hoists your car on a lift, you've probably seen how the suspension extends to its full displacement and then afterwards the wheels lift off the ground. With an empty trailer, the wheels will immediately leave the ground. There is no significant displacement. The distance between the fenders and the wheels remains approximately the same. When you have no displacement, you know you have a preloaded suspension.

The Widening Gap

Steel price increases have forced trailer manufacturers to rethink trailer designs and streamline them in order to stay competitive. Over the years, trailers have become lighter and lighter. This situation reinforces the urgency to act on the issue

of bounce in empty trailers. Also, gas price increases are affecting consumer habits when the time comes to choose a vehicle. Buyers have begun looking for an alternative to big pick-up trucks so they can avoid hauling around an unnecessary "dead-load" all year long, since they might only use its cargo capacity a few times a year. The tendency towards smaller lightweight trailers hit the industry a few years ago in response to consumer demand for a light trailer that could be towed by a passenger car, SUV or minivan. A variety of lightweight trailers have since been developed to meet this growing market segment.

The Series

[Part 2](#) and 3 of this article will continue to discuss suspension systems in the RV and trailer industries. Please visit our web site or send us an e-mail at newsletter@protorsion.com in order to be advised of the release of the Parts 2 and 3. You can forward your comments regarding this article to info@protorsion.com.

The Author

Martin Bouchard has worked for five years in the trailer and trailer-parts distribution industry. Prior to that, he worked seven years in the marine industry. Now serving as Vice-President at [Pro Torsion](#), he can be reached at martin@protorsion.com.

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