

Trailer Sway Control Methods – Explained and Compared

The danger of trailer sway is a condition that most drivers who tow trailers have either experienced or may experience in the future. The causes of trailer sway fall into two categories: 1) environmental causes and 2) trailer/vehicle causes. The driver *has little or no control* over the environmental causes of sway, such as: high lateral winds, gusting winds, passing vehicles, evasive maneuvers to avoid road hazards or poor road conditions. The driver *does have control* over the trailer/vehicle causes of trailer sway, such as: improper weight distribution, underinflated trailer tires, overloading the trailer, excessive towing speeds, light tongue load and improper trailer pitch. Some of these conditions may not be realized until the trailer/vehicle reach highway speeds. This article is not intended to address the causes of trailer sway but rather to explain the various **trailer mounted sway control devices** and methods currently on the market today.

Before discussing the different trailer mounted sway control devices, realize that most of the newer pick-up trucks come with a **“Trailer Sway Control”** (TSC) feature built into the truck’s **“Electronic Stability Control”** (ESC) system. The obvious question becomes: “If my truck has TSC built-in, why would I need any additional sway control device on my trailer?” In order to answer that question we must start with a brief explanation of how the truck’s TSC operates. As the truck and trailer are moving down the highway and the trailer begins to sway, the vehicle’s yaw motion sensors detect an outside force moving the truck from side to side. Upon detecting the sway movement, the system works to apply individual truck brakes (asymmetrically) in order to counter the lateral forces being applied on the truck by the trailer. In addition, the system may also reduce engine power (cut the throttle) to force the driver to slow down in order to regain control of the trailer. Forcing the driver to slow down eliminates a possible errant decision by the driver to speed up in an attempt to reduce the sway. Speeding up will only add more energy to the sway and make things worse. The truck’s TSC system is designed to prevent an accident caused by a large amount of trailer sway that moves the truck around enough to trigger TSC intervention. It does not activate on the smaller trailer sways but only after the sway is large enough to apply the necessary force on the truck. Additionally, if a heavy truck is paired with a light trailer and the light trailer begins to sway it may not cause enough movement on the heavy truck to trigger the TSC, therefore the truck’s sway control would not activate. As compared to the TSC sway control system, **trailer mounted sway control systems** may provide earlier sway correction (since the sway sensor is on the trailer) and stronger sway correction (especially when the trailer is much heavier than the tow vehicle).

The availability of several different **trailer mounted sway control devices** can cause confusion with consumers as to how they work and how their performances compare in protecting and preventing a dangerous trailer sway condition. The three (3) main types of trailer mounted sway control systems are: 1) hitch mounted mechanical friction sway control, 2) symmetric trailer brake sway control and 3) asymmetric trailer brake sway control.

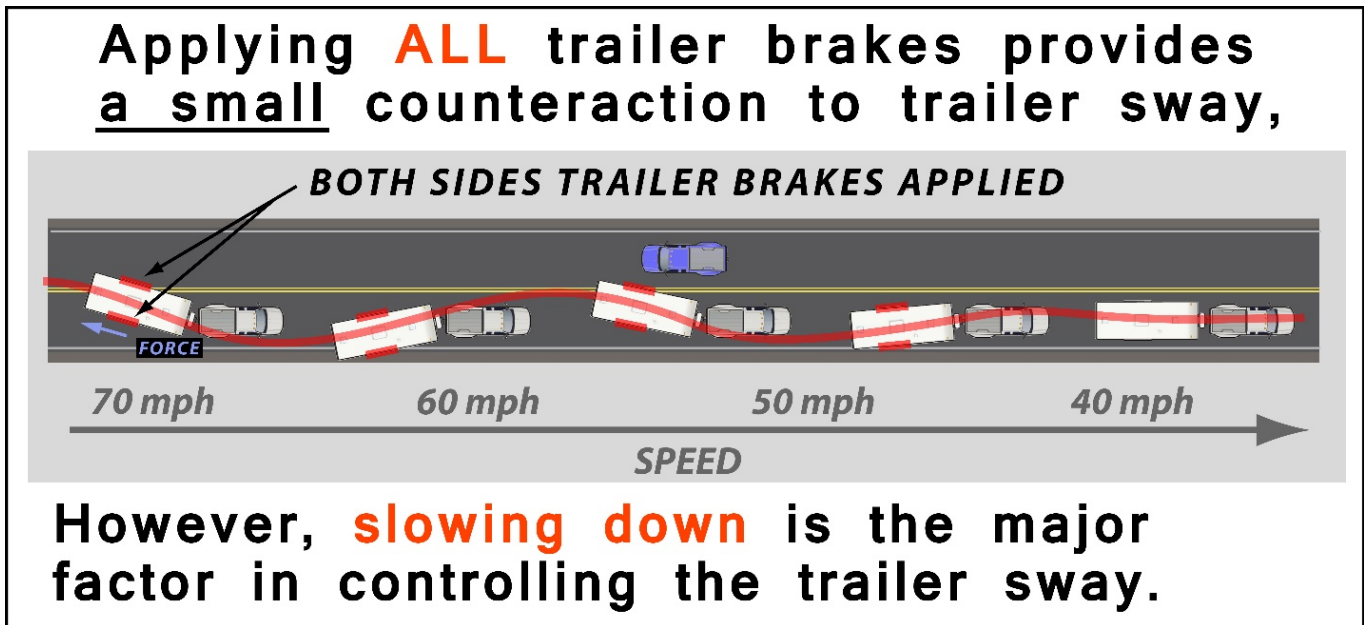
Hitch Mounted Mechanical Friction Sway Control

The hitch mounted mechanical friction sway controls operate by increasing the trailers articulation stiffness thereby damping the lateral trailer sway movement through friction on the hitch ball as well as adjustable friction points on the trailer frame. These hitches make it mechanically harder for the trailer to move from side to side. This method works well in smoothing out the smaller sways and preventing some from increasing for a more comfortable trailering experience. There are limitations on the amount of sway that these hitches can control and as trailer sway intensity increases; the sway control effectiveness is diminished. On **friction sway control hitches**, the sway resistance is independent of trailer weight and sway articulation angle. **Friction weight distribution hitches** provide less control with lighter trailer tongue weight and the sway control remains constant regardless of the sway articulation angle. These mechanical sway hitches need to be installed each time the trailer is connected to the tow vehicle. Since they operate using mechanical friction, they do experience wear and require adjustment to perform properly. With some hitches it can be hard to tell if it is adjusted for best performance. The “friction elements” contact can be noisy (squeaky) at low speeds and some devices need to be disconnected when backing up the trailer. These devices provide a constant amount of sway control and do not increase proportionally as the sway increases.

Symmetric Trailer Brake Sway Control (STBSC)

Symmetric trailer brake sway control systems use the trailer brakes to act much like the truck TSC when it “cuts the throttle” after detecting sway in order to force the driver to slow down. The STBSC systems have a module that mounts on the trailer that constantly

monitors the lateral trailer movement (trailer yaw/sway). The module is wired into the trailer's braking system and no further adjustments are needed after installation. When trailer sway exceeds pre-set thresholds, the module **applies ALL of the trailer brakes (symmetrically)** at the same time until the truck and trailer speed is reduced to a level where the trailer sway is brought back into control. The application of ALL trailer brakes (both sides) during a sway event does not directly provide a stabilizing torque to reduce the sway since the braking torque on both sides counteract each other. Applying ALL the brakes does help somewhat by tightening the connection between the truck and trailer (like taking slack out of a loose rope) however; the major improvement in sway control comes from speed reduction. The following diagram shows the action of an STBSC system:

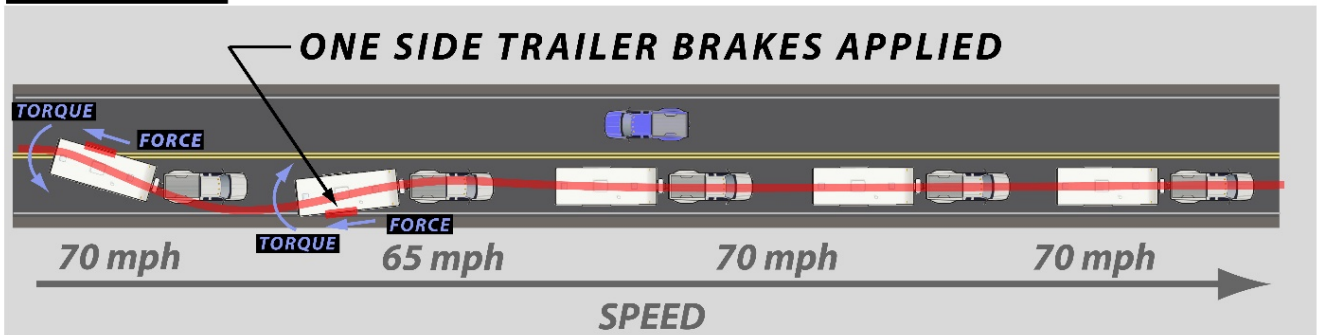


When a light trailer is paired with a heavy truck, the effectiveness of the trailer brakes in slowing everything down is reduced thereby also reducing sway control effectiveness. Applying ALL the brakes in a heavy manner to control large sways can result in locking the brakes, creating long skid marks and possibly flat-spotting the trailer tires. The symmetric systems can provide proportional braking where brake force is increased as sway increases. Some symmetric systems recommend that the driver unplug the module before going off-road in order to avoid nuisance trailer braking on rough terrain.

Asymmetric Trailer Brake Sway Control (ATBSC)

Asymmetric trailer brake sway control also has a module that mounts on the trailer to detect trailer sway. No additional adjustments are needed after installation. The big difference between the ATBSC and the STBSC is that when the ATBSC detects trailer sway, it **applies only one side of the trailer brakes (asymmetrically)** to directly counteract the sway velocity and aggressively control it without having to rely on speed reduction for control. The brake application transitions from side to side until the trailer sway is brought under control. The following diagram shows the action of an ATBSC system:

Applying **ONE SIDE** of the trailer brakes directly counteracts trailer sway.



Trailer sway is directly reduced for faster control with minimal speed reduction.

The opposing sway torque created by the asymmetric system also transfers to the tow vehicle helping to straighten it out. The sway control is proportional so the braking level increases as the sway articulation angle increases. There is no danger of trailer tire flat-spotting since the brakes are never activated for more than $\frac{3}{4}$ of a second on each side thereby resulting in less brake wear than the symmetric sway systems. The asymmetric system also has an "automatic brake adjustment" feature that monitors the braking signals and compares it to the sway levels. If the sway is not decreasing, the system increases the braking level (up to maximum if needed) to reduce the sway. If the braking level becomes too aggressive, the module can determine that by monitoring the sway curve and back off the braking level. This feature is excellent for taking into account the various conditions of trailer brakes and is able to self-adjust for maximum sway control performance. The asymmetric system has an "off road" feature that automatically disables the sway braking when rough terrain is detected and re-enables it when back on smooth road surfaces.

Summary

The *Hitch Mounted Mechanical Friction Sway Control* systems work well in controlling small sways and attempt to prevent them from growing larger. However, as the sways grow their effectiveness is reduced to the point where they are unable to provide sway protection.

The symmetric trailer sway controllers (STBSC) do provide a small amount of sway control through applying ALL of the trailer brakes but the main method of control is achieved by slowing down.

The asymmetric trailer sway controller (ATBSC) provides direct and immediate sway control by applying ONE SIDE of the trailer brakes at a time thereby creating opposing torque that counteracts the sway without relying on slowing down.

NOTE: Both the STBSC and the ATBSC require an electronic module to be wired into the trailer's electric brake system. Check the installation manual of the selected electronic trailer sway controller to be sure the voltage applied by the module to the "blue" brake wire does not interfere with the operation of the in-cab brake controller supplied with the truck. If it is not mentioned, consult with the manufacturer of the electronic trailer sway controller to be sure it is compatible with the model year of the truck.

Written by:


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Alan J. Hoogenakker
Consulting Engineer (Tuson Corporation)
Trailer Product Development