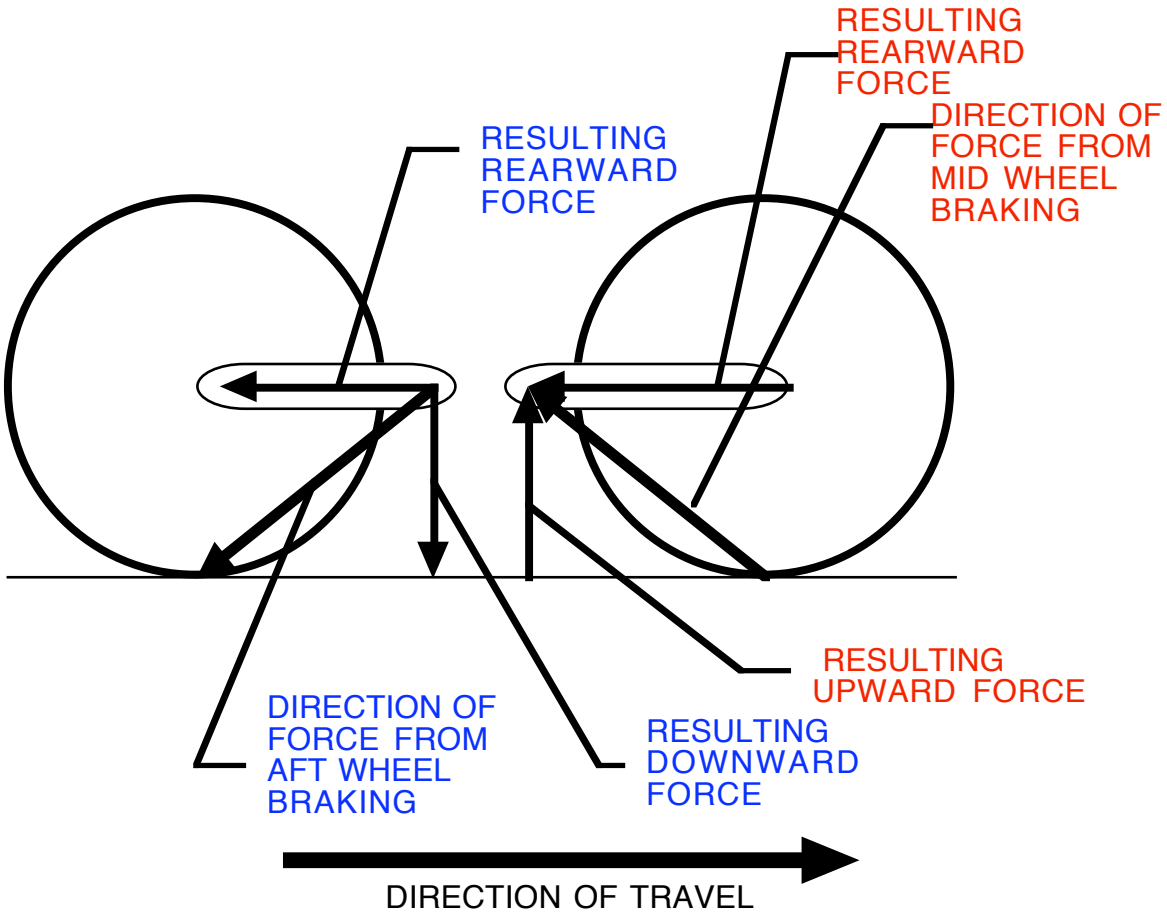
THE LEAST BANG FOR YOUR BUCK

By Chuck Aulgur

As the title indicates, the following discussion pertains to how you can modify your GMC rear brakes to give you much improved braking and the best chance of preventing serious damage (less bang) to your coach and/or possible loss of life if you are involved in a serious accident due to not being able to stop in time.

When you apply force to the brake pedal, the pressure in the brake system increases proportionally, causing the brake caliper pistons to apply force to the brake pads. The brake pads squeeze the brake disc which causes friction between the disc and pads that generates a finite amount of torque resisting the wheel rotation. The weight on the tire at the road surface generates an equal and opposite torque causing friction between the tire surface and the road surface. When the brake friction increases to the point where it can no longer be balanced by the tire/road resistance, the tire starts to slide.

The rear brakes on the GMC act totally different from other vehicles as to how the braking energy is transferred to the vehicle. The braking torque on the rear wheels is reacted to the vehicle frame via the suspension swing arms. Thus, all the braking energy that is resisting the tire rotation is transferred thru the brakes directly to the outer end of the suspension arm generating a torque around the wheel spindle that is trying to rotate the suspension arm in a clockwise direction. The net affect on the vehicle is the tire/road braking resistance is creating



FORCES ACTING ON THE REAR SWING ARM SUSPENSION PINS DURING BRAKING

a force vector going from the tire/road contact area pointing directly upward toward the suspension arm rotation pin, as shown in the above drawing. The angle between the direction of this force vector and the road surface swings through 45 degrees as the rear suspension raises. If you recall your high school trigonometry, you should remember that a 45 degree right triangle has equal length sides. Thus, the force pushing horizontally on the suspension pin is the same as the force pushing vertically on the suspension pin. In other words, 1/2 of the braking forces from the mid axle are being dissipated in slowing the forward motion of the vehicle and 1/2 is being dissipated in lifting the rear of the coach. As the braking forces increase, the rear suspension is lifted to the point where the shock absorber is totally compressed and limits the upward suspension travel. At this point, most of the weight that was carried by the rear tires has been transferred to the mid axle tires, and you have a vehicle with 4-wheels during all the braking, all of which are loaded beyond their rated capacity. By installing the rear brake reaction arm modification, the braking torque that was being reacted by trying to rotate the suspension arm is transferred directly to the vehicle frame via the reaction arm and 1/2 of the braking energy that was being wasted in lifting the rear of the coach is now being dissipated by helping slow the vehicle and is no longer transferring weight from the rear tires to the mid axle tires and the mid axle wheel capability of slowing your coach is doubled.

Rear wheel braking capability is where you gain the most by installing the brake torque reaction arm system. During a panic stop they provide very little braking capability because they get unloaded in a fraction of a second by the mid axle wheels. The resisting brake torque also wants to rotate the rear suspension arm in a clockwise direction, which puts a downward force on the suspension arm rotation pin as shown in blue. Whereas the mid axle braking action adds more weight to itself and can sustain a higher braking load, the rear wheels act in opposite fashion; for each pound they push downward on their bogie pin, they reduce the weight on the rear wheels an equal amount. When the tire-to-road resistance decreases to the point where it can no longer balance the opposite brake torque, the tires start to slide. Therefore, by adding the reaction bar system on the rear wheels, the self lifting action is eliminated and both sets of rear wheels will have similar braking capability as the front wheels and the rear wheel brakes actually reduce the weight on the front wheels because you have more force pulling aft and down on the vehicle center of gravity (c.g.).

In summery, you get the following advantages when installing the rear brake torque reaction system:

1. The stopping distance during maximum braking is reduced by approximately 40%.
2. During normal type driving conditions, you only need to apply approximately 1/2 as much pedal pressure for similar response as OEM brakes.
3. Brake pad life is is greatly extended because of the lower brake pressure required during normal driving conditions.
4. Front wheel brakes run considerably cooler during mountain driving due to the increased braking capability of the rear brakes.
5. Flat-spotting of the rear set of tires is elimated because they are no longer lifted by the mid-wheel brakes.
6. All disc brakes eliminates any need for rear wheel brake adjustment.
7. The mid axle and the front wheel tires are not overloaded during hard braking.