



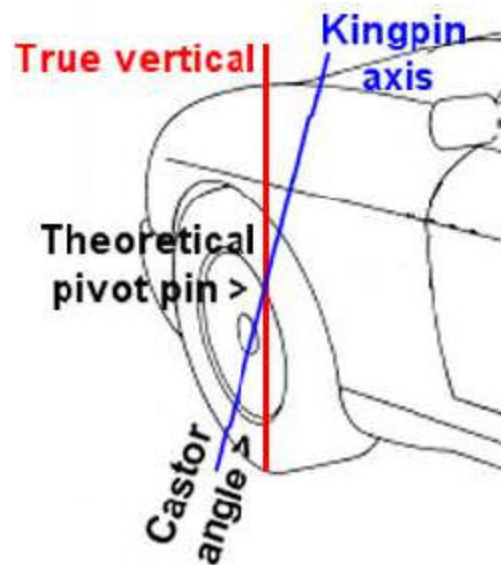
How's Your Castor Rolling?

by Jim Lunson

I got in on an interesting discussion last summer during a tech session during the MG 2008 in Valley Forge, Pa. The session was about different methods for lowering rubber bumper MGBs and installing roll bars, but the talk ventured onto a subject about castor angle. This was a subject I knew little about and had never paid any attention to. This angle concerns the suspension and steering and works like this. The front steering for MGs work around a large vertical pin (called the king pin) that is the pivot for the turning of each front tire and hub assembly as the steering wheel is rotated from left to right. This king pin location is framed by the front cross member and shock absorber. It is set not quite precisely vertical with the top end sloping slightly toward the rear of the car. This angle of slope is called the castor angle and on the B is about 8° from vertical.

This angle was fixed during the design of the MGB (which copied the earlier A and TF systems) and has no adjustment. It was set with the layout of the front cross member. From the discussion we had at this session, including several renowned MG experts, one of the major factors that went into setting this angle on the car was the use of bias ply (non radial) tires which were the norm of the day. Due to the physics of the wheel assembly, the greater the castor angle, the more resistance to turning there is in the steering system and a greater tendency of the car to return to the straight ahead position.

According to the discussion, the old bias ply type tires when put into a turn, tended to stay in that turned position. This turned position set was much stronger than that exerted by the steel belted radial tires used today. So the king pin castor angle was tipped back to induce counter resistance so the force on the turned steering wheel was able to overcome the tire tendency. Otherwise, you would have hardly been able to straighten the steering wheel after entering a turn. The fallout from this counter force was that the steering was more difficult to put into a turn. This angle was tried and tested during the MG design; the optimal angle was



determined and then fixed into all the parts that go with it, including the hub, shock absorber, and cross member. End of story, no adjustment provided, and handling was set forever.

Today, with the switch to radial tires that occurred during the late 1970s to 80s, this design is no longer optimal. Modern cars, designed around radial tire usage need a castor angle of only about 2-3°. Our discussion during the tech session turned to a new option that has been developed which allows for the reduction of this angle on the MGs. This angle reduction is accomplished by the use of two long shim plates under the four large bolts that connect the front cross member to the frame. These shim plates are about 1/2" thick on the front and taper to about 1/16" on the other end. When inserted between the frame and the cross member on both sides of the car, these shims tip the entire front cross member slightly rearward. This tilt then reduces the castor angle of the king pin by about half in relation to absolute vertical; a new approach to adjust the castor angle to modern radial tires.

Two guys in this tech session had added these shims to their cars and they both said you could not believe the difference in steering effort required in the B. They said it was like power steering, with the steering wheel able to be turned all the way to the end using barely one finger. Handling and cornering were tremendous. They really raved at the improvement. I was not able to get up with either of them later to test drive and see for myself, but they swore the difference was phenomenal. So, if you are interested in upgrading the handling of the MG to take full advantage of modern radial tire design, these shims may be the way to go. Moss has them as well as several other shops.

When the MGRV-8 was made back around 1994, part of the upgrade made to that car then was a completely redesigned front cross member, including tube shocks, new steering rack, and also this reduced castor angle. These assemblies are apparently available today in the UK, fit right onto the old MGB frame, and also greatly improve the steering, but are very pricy (over \$4,000). The idea of using shims under the front cross member is a new idea and will do the job for less than \$100. Interesting, and apparently they work. Perhaps a nice upgrade to the MG?

One note of caution is critical if you add these shims. For safety reasons, it is imperative that on all MGs, there must be precise alignment between the upper steering column and the pinion shaft from the steering rack unit. Failure to maintain this alignment can cause stress in either the universal joint where the two shafts are connected or to the brackets on the front cross member that anchor the steering rack. Inducing this stress could lead to fracture and failure of either of these parts. This would result in total loss of steering control of the car, something you do not

wish to occur while driving along. You must pay attention to this alignment as there is very little float in either piece. I don't know the sequence of how the MG was assembled in the factory, but somewhere during the process, every steering rack was adjusted with small plate shims pop riveted to the cross member as necessary to provide this proper alignment. There was even a special tool, (BL# 18G 1140) made to accomplish this alignment. Adding the castor reducing shims noted above between the cross member and the frame to change the castor angle alters this alignment so a readjustment of the steering rack is required. Don't overlook this important safety step if you add these shims; very critical.

Adding these shims is not for everyone as the steering handling of the MG, especially the B is not bad as it is; part of its longevity perhaps. And, in high speed racing applications, the stiffer steering and strong tendency to return to the straight ahead position are still desirable, but for the normal daily and recreational driver where going around street corners is a common occurrence, this modification is something to consider. Again, no first-hand experience yet, but according to the guys at the convention, it really makes a difference in driving ease and pleasure. It brings the MG design up to the standards used with the modern radial tires now found on all our cars. Happy castoring.

(Editor's note: The Castor Reduction Kit from Brown & Gammons (B&G) includes six packing shims for the steering rack in order to maintain proper column alignment. Also please note that British Motor Heritage cross members already incorporate castor reduction into their design and should NOT be fitted with a castor reduction kit.)