

The Art of "Rail Riding"  
By Jay Wiles  
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The Beginning

Since the start of the Pinewood Derby® in 1953 both common sense and the laws of physics have told us that to get the fastest car possible you need to get the car to go perfectly straight without ever touching the center guide strip. This would be the fastest way possible if we lived in a perfect world. Unfortunately we don't, and even if a "perfectly aligned" car could be achieved, and ran on a "perfectly level" track it would take a very small misalignment (a couple thousands of an inch) in staging to cause this "perfect car" to hit the guide strip. Not only will this "perfect car" hit the guide strip, it will do it numerous times during the course of the run, each time losing precious energy and fractions of a second.

The laws of physics tell us that for every action, there is an equal and opposite reaction. As this "Perfectly aligned" car hits the center strip these laws cause it to change direction thus causing it to hit the guide rail on the other side. This back and forth motion will usually continue through out the run causing numerous impacts with the center strip.

These impacts cause a braking effect where, just like tapping the brakes in your car, it slows the Pinewood Derby® car as well. Not only does this eat up precious energy we could use to propel the car towards the finish line, it causes the car to go into a back and forth motion bouncing from side to side off of the guide strip. This effectively lengthens the traveled path of the car thus making the track seem longer than it is. The longer the traveled path, the more time it takes to travel this distance. This is the problem Pinewood Derby® racers have been trying to overcome for the past 55 years!

When I started helping my son with his first Pinewood Derby® in 2001 I did as most in the modern era have done and turned to the internet for as much information as I could get on the techniques of making a fast car. I studied every web-site, article and forum I could find. Bought numerous web books and we studied them all. We did well our first year coming in 2<sup>nd</sup> in Pack and 8<sup>th</sup> in District races. We had so much fun researching information and building the car we started right away on next year's car.

We purchased a test track, made several cars and started testing all the basic theories. It was during this testing that we found "Rail Riding!" We noticed that we could build identical cars, put the same wheels and axles on them, align them to go perfectly straight but there would be a huge difference in time between them. The fastest cars were always the most steady (no side to side oscillation) but some were markedly faster than others. Set on getting to get to the bottom of this I started watching the cars from the finish end of the track, and from behind the track at the starting gate. I noticed the fastest cars didn't go straight, but went to the center rail with the dominant front wheel (the one touching the track on a 3 wheeler, or the one carrying the most weight in a four wheel touching configuration) soon after the start gate dropped. The slower cars always did this with the non-dominant front (raised wheel) and would either oscillate back and forth, or stay there and run really slow, sometimes even making a "squealing" noise.

Thus began the "Rail Riding" era in Pinewood Derby® racing.

Through more testing we found “Rail Riding” was by far the fastest way to set-up a car, and could be easily duplicated from one car to the next. This set-up allowed my son to go undefeated for the next 4 years in Cub Scouts (from pack through state races) and helped to win the “WIRL National Stock class Championship” and overall “Builder of the Year” in 2005.

This is how “Rail Riding/Rail Hugging” was invented, and we believe it is the single biggest change to Pinewood Derby® since the start of it 55 years ago!!!

A short description follows on how to set one up along with a couple of tips on making it effective.

### The Rail-Riding Method

This method makes for a straight, fast, easy to align car, especially for those without a test track.

First, drill the body with a Pro Body Tool, straighten your axles with a Pro Axle Press and polish them. Mark the axle @ .350" from the head and put a dot at 12:00 on head with a sharpie.

Then install the axle into the Pro Axle Press at the .350" mark with the dot on the head down and slightly bend the axle with a light hammer tap. Another way to achieve this is to mount a spare wheel (one not going to be used in competition) on the axle before inserting it in the Pro Axle press (wheel against axle head) and gently push up on this wheel to achieve the required bend. I use a digital caliper to measure from the head of the axle to the work bench to verify my bend. On the rear axles we like to start with a .020" bend and .014" on the front axle.

Then install the rear axles with the dot up at 12:00 as well as the front axle (dominant wheel).

The car should roll forward and backwards with the rear wheels staying on the axle heads. If not, rotate the rear axles slightly fore and aft until both are perfect and do not migrate. Use slight rotation fore or aft of the front axle (dominant side) to steer the car into the rail. The amount of “steer” or “drift” needed will vary from track to track and with different set-up (weight placement, condition of wheels etc.) but 2" drift towards the non-dominant (raised) front wheel over a 4' test roll will give you a good starting point that should be fairly competitive at most levels of racing.

It is also recommended that the front “dominant” side of car be narrowed 1/16 of an inch in relation to the same side rear wheel. This slight “offset” of the front wheel will ensure that with proper rear alignment, the rear wheel never touches the guide rail. For a fast car, only the dominant front wheel makes contact with the guide rail. If the rear wheel touches the guide rail, it will increase energy loss and drag thus resulting in slower times during car races.

These are the basics of setting up a fast “Rail Riding” Pinewood Derby® car and are a great starting point for any level of racer.

May this method make your Pinewood Derby® experience fun and successful!

Good Luck and Happy Racing!

