Why Race Engineer?

There is a lot to figure out to be competitive in a race

Whether you're driving in the professional Sprint Cup Series, amateur Legend's series or the Ten80 Student Racing Challenges, you'll find race performance depends on a lot more than just good driving.

The first step in racing is of course learning how to drive, but that only gets you to the front half of the pack. To get to the top, your car has to be designed well and set up right. For example, with the wrong gear set installed a great driver can't keep up with a mediocre driver who has the right gears. The car just can't go fast enough around that track.

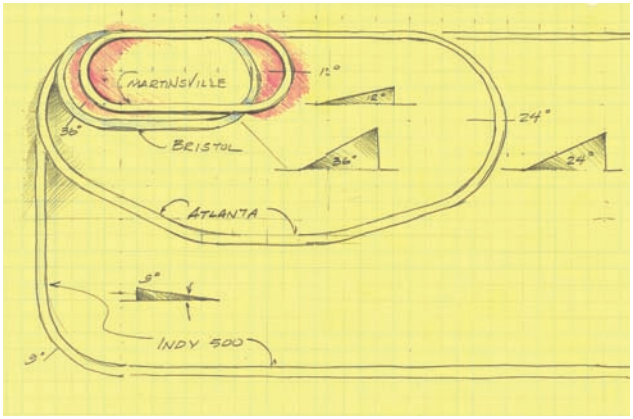
By "designed well" we mean its parts have to be strong, light, well-fitting and work efficiently (i.e. don't create too much drag). Proper design is addressed in the Ten80 Mechanical Engineering and Aerodynamic Design guides.

By setup we mean you have to install the right gears and tires. You have to choose the right tire and spoiler angles. These Chassis Set-Up Investigations are about getting the right setup.

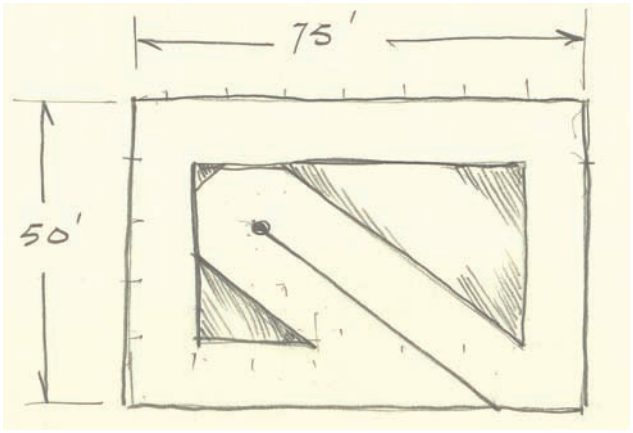
The setup for a wide, sweeping curve is different than the setup for a curvy, tight track. It will be different for a slick surface than for a rough surface.

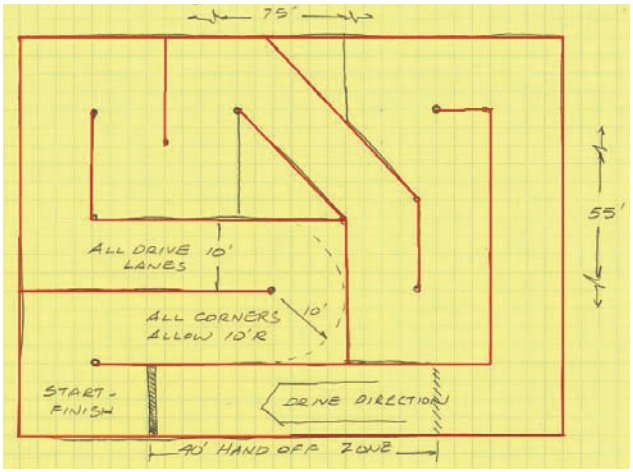
There are 14 million different ways to setup the car and it is your job to get the right one for a race. If trial and error is your method, the odds are very against you (14,000,000 : 1) . Only through systematically investigating and modeling performance can you make the right decisions and race well!

(Fig.1 Differences in professional Sprint Cup tracks. Turns are a lot more important in Martinsville than they are in Indianapolis where endurance is key.



(Fig 2 & 3) Different Student Racing Challenge tracks. There are a lot more turns on the very bottom track so you'd set up for more efficient handling on the turns.

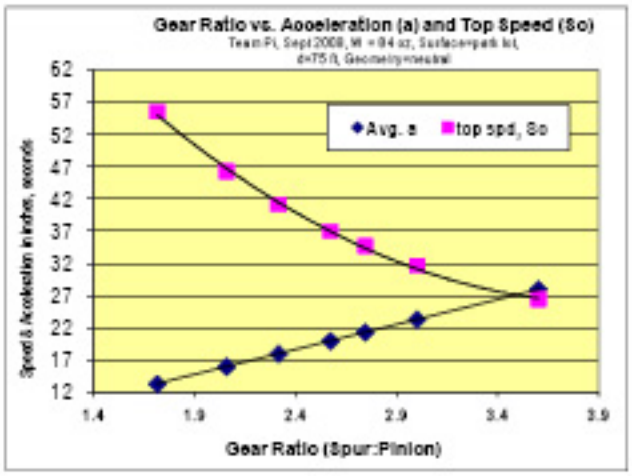




I'm Ready to Race Engineer
So what did you mean by 'model'?

Learning the game of football is really complicated, but that doesn't keep players and fans from digging in. Perfecting the latest online game or building an electric car isn't easy, but we do it and building or working with models is a big part of how we do it.

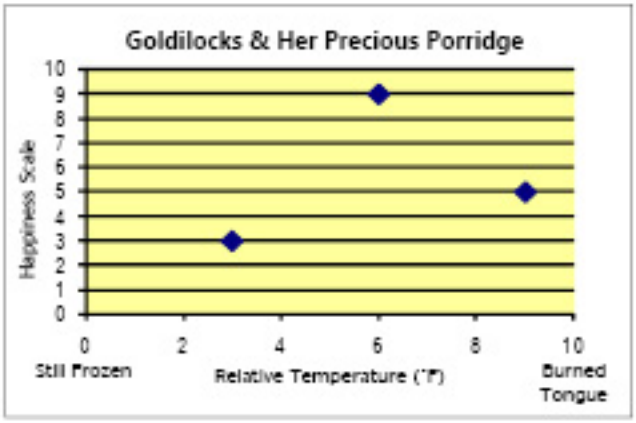
Models are representations of reality and they can be mental, mathematical and even plastic. We use models to break complicated things down into bits and pieces we can handle. Some are simple, like toy cars, while others are very complex like the math models that mimic human behavior in financial markets. Student Racing Challenge performance models are usually made of tables and graphs like the ones to the right.



(Fig 4, Above) TenSo model of top speed and acceleration for gear sets. It is a good example of the trade-offs in racing. Higher top speed = lower acceleration and vice versa.

Goldilocks & Superman

Everything in racing is a trade-off and Fig. 4 perfectly illustrates that point. If you gear up for a high top speed you get a low acceleration rate. If you gear down for high acceleration you get a low top speed. It is the Pit Crew's job to balance the trade-off by choosing a good combination of speed and acceleration for each race.



(Fig 5, Above) The Goldilocks Trade-off. One is too hot, one is too cold and one is Just Right. (Fig 6, Below) The same is true for gear sets in a car. One is Just Right for a race.

You've heard about this kind of trade-off since a very young age. Remember Goldilocks who was always looking for that perfect chair? That perfect bowl of porridge? Goldilocks knew there was always one too small or too cold. There was always one too big or too hot. What Goldilocks wanted is what every good engineer, scientist and race team wants:

That one that is JUST RIGHT.

Math models reveal the 'Just Right' setup.

OK...Not a fan of fairy tales, then how about superheroes? Math models can give you X-Ray vision, revealing things that are usually hidden. You can see patterns in something that otherwise looks chaotic.