UNDERSTANDING CHASSIS ADJUSTMENTS

There was once a time not so long ago when the "average" racer could arrive at the track with his "average" set-up and with minor adjustments, he could run competitively. The problem is that these days, we have come to the point where this "average" set-up will no longer get you better than mid-pack finish and, with today's competition levels as well as the amount of quality competitors out there, you might not even make the show.

I once had a very good friend of mine say to me, "You can always run midpack if nothing falls off". Now this is true as long as you cover all your bases first.

In order to cover all these bases it is important to first understand all the aspects of the chassis and how they affect the way your chassis works. Once you understand this then you can begin applying them to your set-up. The chassis is made up of many components and they all must work together in order for that chassis to achieve its full potential.

PERFECT NUMBERS

I cannot count the number of times that I have heard someone ask what the ideal or perfect numbers are. What you need to understand is that these numbers simply do not exist. Every kart as well as every driver performs differently and each will require a set-up to suit each individually.

Set-up sheets are a prime example of these "perfect" numbers. The key is to understand that these sheets only offer a starting point that will help get you into the ballpark. I have seen many times the situation where a driver relies far too much on these sheets and often for one reason or another, they never try anything outside these numbers. It is important to remember you can NEVER put too much effort into testing and trying new things. This is what makes the good guys better; they are always trying new set-ups and not just relying on what other racers are doing. Similar numbers will work for drivers who are riding the same make of chassis but they will still need fine-tuning and testing to get that chassis to work right for their own situation. I am not saying that you should close your eyes and ears to what others are doing. Information is invaluable and you can use information from many sources by pulling it all together to make your racing effort more successful. The idea is to keep notes and listen to all the information out there - just don't be afraid to step outside the lines by trying something new.

In this article, I'll try to explain several different points of set-up and demonstrate a little about how they affect your chassis. For instance, when we set up a kart here at our own shop or at the track, we take several points into consideration such as toe, camber, caster, nose weight, left side weight, cross weight and stagger. The first place we head when we are ready to begin setting up the chassis is the scales. This is where the most work is done. There is no specific order in which to check and adjust these points but if you go in a certain order each time, it can save you time and work in the long run. The key point to remember is to check and re-check everything and when you're done with the first run through, it's best that you check it again. When you're done, you should carefully document all of the settings in your notebook (you do have a notebook, right?).

ON THE SCALES

Once you have made it to the scales, the first thing to check besides making sure that they are zeroed and level (hey, it wouldn't be the first time) is the toe. Toe is probably one of the more simple aspects of the chassis to understand. Just the right amount and it will help the kart turn into and turn out of the corners. Too much toe-in will cause the kart to become 'darty' (this especially applies to pavement racers). A key point to remember is that while toe is a very small part of the set-up, every little bit helps. Toe can be affected by every change you make to the front end, whether it be changing washers to adjust cross weight or changing camber. This is why it is always important to re-check the toe after the set-up is complete.

You should also take your weekly maintenance into consideration because bearings and rod-ends will eventually become worn and I have seen karts with up to an eighth of an inch worth of play in the front end. It is extremely difficult to set a sixteenth of an inch toe-in with this much play. Also remember that the toe will change slightly when the driver sits in the kart and this effect becomes worse the more the driver weighs. This is why I use the *Accutoe Pro* laser system so that I can check the toe with the driver in the kart for the most accurate reading. You will also need to rely on your driver's input for toe because it directly affects the drivability of the kart.

CASTER

Next let's talk about caster. This is another one that is fairly simple. More caster equals more bite, less caster equals less bite - sounds simple enough? I rarely use caster as a chassis adjustment as it usually is a driver preference. Nearly all chassis manufacturers offer a chassis with adjustable caster and suggestions as to where it should be set. The average racer usually has the "it's set from the factory" attitude about caster and rarely bother to check it. This works OK on dirt because caster is less important than on pavement, the reason being that the dirt racing surface has less bite and translates less of this to the driver than on pavement. Don't read this as not being important - it's just more critical on pavement tracks. I have found that the manufacturers' suggestions are typically very close but you can still vary from this is testing and you may even find settings that better suit your driving.

Next in line are the camber settings, another very important part of the set-up. Changes in the camber can drastically change the way the chassis drives and feels to the driver. I personally try not to use camber for big changes in handling but rather I use camber to fine-tune the chassis and its drivability. There are many variables to take into consideration when it comes to choosing camber settings, such as track surfaces and configurations, tires, and most importantly, the driver. The only constant would be that in a typical oval set-up we would run negative right-front and positive left-front camber settings. Knowing this, all I can say is that it is very important to work with your driver's feedback in order to find the best camber settings for your chassis on each track. I can, however, give you a few suggestions for helping you adjust your camber in the right direction. For instance, if you kart tends to push slightly, you can add more positive camber to the left front and this allows the front end to bite a little harder, which in turn helps rotate the kart. Lap times can also be used to help dial in your camber settings. For example, if you kart takes too many laps to come in, you can add to your negative right-front camber or positive left-front camber. In turn, if you kart falls off and the lap times slow down after many laps, you can decrease your left-front and right-front camber. This is a little complicated but with some testing and understanding of basic camber adjustments you can tune your chassis for any track surface.

WEIGHING OUT

Now it is time to move on to weighing the chassis out on the scales. When we scale a chassis there are three primary numbers that we check. These are 1) nose weight, 2) left side weight, and 3) cross weight - all of which affect the amount of bite you will have in the chassis. Remember that each of these factors affect the chassis in their own way while at the same time working together. And this is where it gets complicated. Starting with nose weight, if you increase the amount, you will increase the amount of bite in the kart. In turn, by decreasing nose weight you decrease bite. The nose weight is simple to remember - the tricky ones are cross and left side adjustments. Cross weight and left side work backwards in terms of adjustment. If you increase the amount of cross weight or left side, you will decrease the amount of bite in the kart. This obviously means that decreasing cross weight or left side weight will increase the bite that the kart has. To summarize, if you want to increase bit in the chassis you'll need to increase nose weight or decrease left side or cross weight. Going the opposite way on the adjustments will decrease bite.

STAGGER

Stagger is another area of the set-up that is pretty simple to understand. The main purpose of stagger is to help the kart turn, period. Seems simple right? Well, maybe so, but stagger is

another important tool to help determine exactly how well that kart turns. Not enough stagger and the kart loses some of its ability to turn through the corners and too much stagger will cause the kart to lose straightaway speed. This is one of those trade-offs. We sacrifice straightaway speed for corner speed, but with some testing you will find that just the right amount will help you shoot through the corners fast enough to increase your straightaway speed after all.

Now that we have a basic understanding of the numbers and how they affect the chassis, we can apply them in adjustments to improve our kart's handling. The actual numbers are irrelevant for our purposes here, so we will just say that you usually start with a baseline of 44.5% nose, 56% left, and 57.5% cross, with -3 degrees right front camber and +1/2 degree left front camber. These numbers work well on a flat track, but what if you're heading to a banked track this weekend? On the flat track, we had to increase our bite because there is nothing to hold us in the turns yet on a banked track, we have the banking to help keep us "planted" into the turns, allowing us to reduce our bite in the kart. Armed with this knowledge, you may want to try bringing the nose weight down to 44%, increasing your cross up to 59%, while leaving your left at 56%, and bringing your right front camber down to -2.5 degrees. These changes would vary depending on your preferences of what numbers you would want to adjust to reduce the bite in this example. But by knowing the concepts, you should be able to make the primary adjustments to suit the track characteristics.

Another situation would involve making the jump from dirt to pavement. To change your set-up over, you need to decrease caster, adjusting your numbers to reduce bite in your kart because pavement will naturally have much more bite than your average dirt track.

I used these examples in order to try and show you how to use the track itself in order to put together a starting set-up to take to that venue. From there you must use your practice sessions to test your set-up and make adjustments in order to get your chassis performing optimally. You will also need to use some tools that we have not used up to now; such as, stopwatches, pyrometers and driver input to improve on your starting set-up. You must always remember that every track is different and each one has characteristics of its own; this is where that notebook we talked about earlier comes in handy.

You may have noticed that I left out tires and that's because I believe they are the biggest variable involved in how the kart works. I'd even go as far as to say that they are the most important component on the kart. To explain fully the different choices involved on the subject of tires would take one very long series of articles, so we left this out to allow us a chance to concentrate on the chassis itself. Maybe we can dive into that one another day, as for now I think that I will simply leave it alone.

I will say that I have found it beneficial to test without changing tires until after you have the chassis set. A lot of times, I see karters trying to remedy a problem by changing a set of tires when they actually were just covering up a problem in their chassis set-up.

I hope that this column will get your basic starting set-up knowledge going in the right direction and that it has given you some points to remember when diving into your chassis for the future. It is important to take all aspects into consideration, from the toe to the track itself. They all play into the final performance of the kart. In a future article, we will unwrap a new chassis, assemble it, scale it and take it out to the track for some test sessions. Until next time, see you at the track.