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### Chapter 1: Weight Distribution

#### 1.1 Introduction

The most important handling adjustment is made before the kart reaches the track. The kart must be scaled and adjusted to ensure optimum performance. The desired weight distribution is achieved by scaling and adjusting the chassis and moving around weights. Improper weight distribution can cause front end push (understeer), excessive or insufficient load on any one tire, chassis binding, and lack of side bite in cornering among many other problems. An improper weight distribution can also lead to incorrect diagnosis of handling problems at the track. For Tonykarts, the following weight distributions are recommended:

43% Front Weight  
57% Rear Weight  
50%:50% Left/Right Weight

These are just recommended starting points. Weight can be moved around at the track to change the handling characteristics of the chassis. Moving weight to the front of the kart will provide more front end grip while moving weight to the rear of the kart will provide more rear grip. Weight can also be moved vertically up or down. Moving the weight vertically upwards will provide more grip in the location of the weight while lowering the vertical position of the weight will have the opposite effect. Keep the side to side weight distribution as close to 50%:50% as possible.

## **1.2 Seat Placement/Adjustment**

The seat placement is the single most important weight adjustment on the kart and is done before weight distribution analysis. Perfect seat placement may result in almost perfect weight distribution before any weight is even added to the kart. Tonykart provides a set of specifications for seat placement that should be followed as closely as possible. Consult your local Tonykart Dealer for specifications for your specific model.

### **1.3 Factors to Check Prior to Performing Weight Distribution Analysis**

The following processes are all very important to ensuring accurate weight distribution analysis.

1. *Ensure that the floor is level.*

*This can be done by purchasing a 5-6 ft. level and checking the floor where the centerlines of the front and rear axles will rest. The floor should also be checked along both sides of the kart across the width of the wheel base. Compensate for an unlevel floor by placing shims under the appropriate corner scales.*

2. *Set toe and center the steering wheel.*

If the wheels are not centered during weighing, the geometry of the kart, mostly the castor, will cause the corners of the kart to be loaded incorrectly. The readings on your scales will then be false

3. *Set castor and camber*

4. *Set spindle heights at desired height.*

5. *Check tires to make sure they are at race settings.*

6. *Add weight in appropriate places to approximate fuel and/or oil.*

*Remember, however, that fuel and oil weights are dynamic. They will change during a race.*

7. *Replicate racing conditions.*

When the driver is in the kart, it's critical they maintain a normal driving position as movements will effect readings. Wear full race gear during weighing to have the highest level of accuracy possible.

8. *Zero all scales.*

### **1.4: Adjusting Kart Weight**

Kart weights are usually not at the desired specifications after the first weighing. If distribution is off, and weight is needed, begin to place the appropriate amounts in the appropriate places. By following Tonykart's seat specifications, you should be able to obtain 50/50% side to side distribution. If you are way off on your side to side weight distribution than recheck your factors effecting weight distribution. You might have to move the seat just a little bit to obtain the correct weight distribution. If you are at the limit of your specific weight class than you might have to live with weight distribution that is not perfect. However, your Tonykart seat specifications should put your distribution pretty close. If you are under your specific class weight limit, add weight to the appropriate locations. Do not place any lead shot inside the frame. The weight will shift during cornering and cause handling problems.

Although overall side to side weight distribution may be correct, individual front or rear side to side distribution may be slightly skewed. Your front wheels should weigh within 5 lbs. of each other while the same applies to the rear wheels. If this is not the case, recheck all of the factors effecting weight distribution given above and reweigh. If the problem still exists, you

may have a chassis problem.

Once final weight placement is determined, secure all weight properly. Preference is Grade 5 or better with 5/16 bolts of appropriate length. Be sure to cross drill and safety wire or safety clip each one. Most sanctioning bodies require double nutting of ballast as well. Be sure to consult your rule book. If your weight is not secure, this can cause serious problems for other drivers at the track if your weight comes loose. Not only does this have the potential to cause injury and equipment damage, it is basis for disqualification during a race.

## **Chapter 2: Front End**

### **2.1: Introduction to the Front End**

Many important and easy handling adjustments can be made to the front end of the kart. Most handling problems that occur during the entrance of the corner are probably results of improper front end adjustment. Turn in, front end bite, and steering response can all be corrected by simple adjustments to the front of the kart.

### **2.2: Toe Adjustment**

The toe settings on a kart can effect weight distribution, top speed, and cornering response. The more the kart is toed in or out, the slower the top speed becomes due to excessive drag by the tires. Increasing toe out will increase initial cornering response. If the kart feels touchy and the back end gets loose at the entrance of the corner than you probably have too much toe out. Neutral toe adjustment is recommended for Tonykart chassis. The toe should only be changed as a last resort. Look to other adjustments first to correct handling problems before changing your toe settings.

**IMPORTANT:** When making adjustment to toe, make sure that the toe is equal on each side. Twist the tie rods until they are completely in or out, and mark them. Turn them back in from there, measuring toe and counting turns until the desired point is reached.

### **2.3 Castor**

Castor effects the bite of the front and rear end and also changes apparent weight of the steering. It does this by transferring weight to the opposite rear wheel during cornering. The less castor in a kart, the less road-fell the driver will receive. Castor adds feel and bite to the front end. On Tonykarts, there are two pills used to adjust the castor giving you three possibilities:

12 degrees  
Neutral (14 degrees)  
16 degrees

For most applications, use the neutral castor pill. Too much castor slows the cornering speed of the kart due to unnecessary grip. However, on cold days, or when the use of harder compound tires are required, adding castor can help prevent understeer and make the kart more driveable. Although the use of 12 degrees castor in Tonykarts is uncommon, it may be necessary under sticky track conditions to free up the kart.

### **2.4: Spindle Height**

By rearranging the two spindle spacers, the spindle height of each side of the kart may be changed. Keep both sides the same height. By moving both spindle spacers to the top of the spindle, you are raising the front end of the chassis. Raising the chassis height creates more leverage in which to transfer side weight to the opposing tire and thus results in more front end bite at the entrance of the corner. Lowering the chassis, or moving both spindle spacers to the bottom of the spindle, has the opposite effect and creates less front end bite at the entrance of the corner.

### **2.5: Wheel Spacers**

The most common and easiest adjustment to make to the front end of the kart is to change the front track, or front end width. Widening the front track will create more flex in the front end of the kart and result in more front end grip and quicker turn in. Narrowing the front track will have the opposite effect and result in slower turn in and less front end bite.

### **2.6: Camber**

## **Chapter 3: Rear End Adjustment**

### **3.1: Introduction to the Rear End**

The rear end of a kart begins from the back of the seat with adjustments including wheel hub length, track, rear ride height, axle stiffness, and seat struts. Changes to these settings are usually made when handling problems occur on the exit of the corner.

### **3.2: Wheel Hub Length**

Tonykart makes three different wheel hub lengths for their chassis. It's highly recommended that you purchase all three of these sizes as they are the most commonly adjusted setting on the kart. The longer the hub the more rear end bite. Use the shortest hub if the kart feels tight at the exit of the corner and use the longest hub when the kart feels loose at the exit of the corner.

### **3.3: Rear Track**

For American sprint racing, most rules dictate a maximum rear track of 50.0 inches. Because Tonykarts are raced primarily in Europe, they are designed for rules allowing a 55.0 inch rear track. Therefore, it is important to set your kart's rear track to the maximum of 50.0 inches. It becomes necessary to narrow the track when the rear of the kart is tight at the exit of the corner and has too much rear end bite. However, this is an adjustment only made when you have first changed your wheel hub length to the shortest hub available and are still tight at the exit of the corner. Narrow the rear track in 1/2 inch increments.

### **3.4: Rear Ride Height**

On most Tonykart chassis there are two setting for the rear ride height. The factory recommends running the chassis with a higher ride height for better grip. The higher ride height, like the front end, creates more leverage in which to transfer the cornering loads to the opposing tire and thus results in more grip. Lowering the rear ride height will have the opposite effect and cause the kart to be extremely loose. Only in extreme cases should you change the rear ride height.

### **3.5: Axle Stiffness**

Tonykart makes two types of axles for American Sprint Racing, type N and type C with the type N being the softer axle. In almost all cases you will use the type N axle. Such cases in which you may need to use the type C axle are cold weather, slippery track conditions, and when rules mandate the use of harder compound tires. You shouldn't be afraid to run a type C axle but at the same time, changing to the type C axle is a dramatic change and should be used only when the rear end of the kart is uncontrollably loose at the exit of the corner.

### **3.6: Seat Struts**

On a Tonykart chassis, the factory recommends running two seat struts on both sides of the seat running from the very top of the seat to the two outer bearing cassettes. On the motor side it may only be possible to use one strut. The seat struts allow the high leverage point of the driver to be used to transfer load to the rear tires and thus create more rear end bite. When the extra seat struts are removed, the drivers high position on the kart is not taken advantage of and minimal load is transferred to the rear tires. As a result, the kart becomes extremely loose. The seat struts are therefore only removed when all else fails to loosen up the rear of the kart. If you do have to remove seat struts, try removing one set at a time.

## **Chapter 4: Miscellaneous Adjustments**

### **4.1: Center Torsion Bar**

Some Tonykart chassis have an adjustable torsion bar in the middle of the kart just below the seat. The bar can either be layed flat like a table top or vertical like a wall. Laying the bar flat will free the kart to slide from side to side while setting the bar vertical will give the kart more side bite and result in less drifting of the kart with all four wheels. Tonykart also makes different stiffness torsion bars to further enhance adjustment ability. The softer the bar the less side bite you will have.

### **4.2: Tire Pressures**

Tire pressures can range dramatically from as low as 10 psi to 30psi depending on the compound of the tire. For extremely sticky tires you should stay between 10psi and 14psi. For SL tires like a Bridgestone YGC you can go as high as 16psi and with Dunlop SL4's you can go as high as 18psi. For extremely hard tires such as Bridgestone YBN's you will need to run tire pressures as high as 30psi. All tires have a range in which they work the best. In general, the higher the tire pressure,

the faster the tires will come up to race performance and the more grip you will have. However, if you put too much air pressure in the tires, the kart will become very loose. The reason for this is because the high pressures will cause the tire contact patch to form a curve in which there becomes a high point on the center of the contact patch. As a result, only part of the tire is actually touching the track and the kart gets loose.

### 4.3: Front Bumper

Tonykart recommends keeping the front bumper tight at almost all times. However, loosening the front bumper can be used as a tuning tool. Loosening the front bumper will give you more front end bite.

### 4.4: Side Pods

In normal circumstances you will want to leave the side pods tight although you shouldn't be afraid to loosen them as a chassis adjustment. Loosening the side pods will give the kart more side bite and allow for less four wheel sliding.

## Chapter 5: Troubleshooting

Below is a chart of quick and easy adjustments recommended for different handling problems. Always make only one adjustment at a time.

Handling Problem	Chasis Adjustment
The back end is loose at the entrance of the corner or there is too much front end bite.	<ol style="list-style-type: none"> <li>1. Move in one wheel spacer on both spindles</li> <li>2. Drop 1 psi in the front tires</li> <li>3. Move weight away from the front of the kart</li> <li>4. lower the front of the chassis</li> <li>5. Put less castor in.</li> <li>6. Tighten the front bumper if not already tight.</li> <li>7. Check to make sure your toe is set at neutral</li> </ol>
The front end of the kart is "pushing out", there is understeer, or the back end is tight at the entrance of the corner.	<ol style="list-style-type: none"> <li>1. Move out one wheel spacer on both spindles.</li> <li>2. Raise the air pressure in the front tires by 1 psi.</li> <li>3. Add weight to the front of the kart</li> <li>4. Add more castor.</li> <li>5. Raise the front end of the kart</li> <li>6. Loosen the front bumper.</li> <li>7. Check to make sure your toe is set at neutral, add more toe out.</li> </ol>
The kart is sliding on all four wheels too much or there is not enough side bite.	<ol style="list-style-type: none"> <li>1. Turn the torsion bar in the center of the kart to the vertical position.</li> <li>2. Loosen the side pods.</li> <li>3. Raise the air pressure in all 4 tires by 1 psi.</li> </ol>
The kart is not sliding enough on all four wheels or there is too much side bite.	<ol style="list-style-type: none"> <li>1. Turn the torsion bar in the center of the kart to the horizontal position.</li> <li>2. Tighten the side pods.</li> <li>3. Lower the air pressure in all 4 tires by 1 psi.</li> </ol>
The kart is loose at the exit of the corner.	<ol style="list-style-type: none"> <li>1. Put longer wheel hubs on the axle.</li> <li>2. Set the rear track to the maximum 50.0 inches if not already done.</li> <li>3. Raise the air pressure in the rear tires by 1 psi.</li> <li>4. Raise any ballast to a higher vertical position on the rear of the kart.</li> <li>5. Raise the rear ride height to the maximum if not</li> </ol>

	already done. 6. Change the axle to Type C.
The kart is tight at the exit of the corner or the front end is understeering at the exit of the corner.	<ol style="list-style-type: none"><li>1. Put shorter wheel hubs on the axle.</li><li>2. Move in the rear track by 1/2 inch.</li><li>3. Lower the air pressure in the rear tires by 1 psi.</li><li>4. Change the axle to Type N if not already done.</li><li>5. Lower any ballast to a lower vertical position at the rear of the kart.</li><li>6. Remove one set of seat struts.</li><li>7. Lower the rear ride height.</li></ol>