# Gettin' It

# TIGHT

# WHAT DOES IT MEAN?

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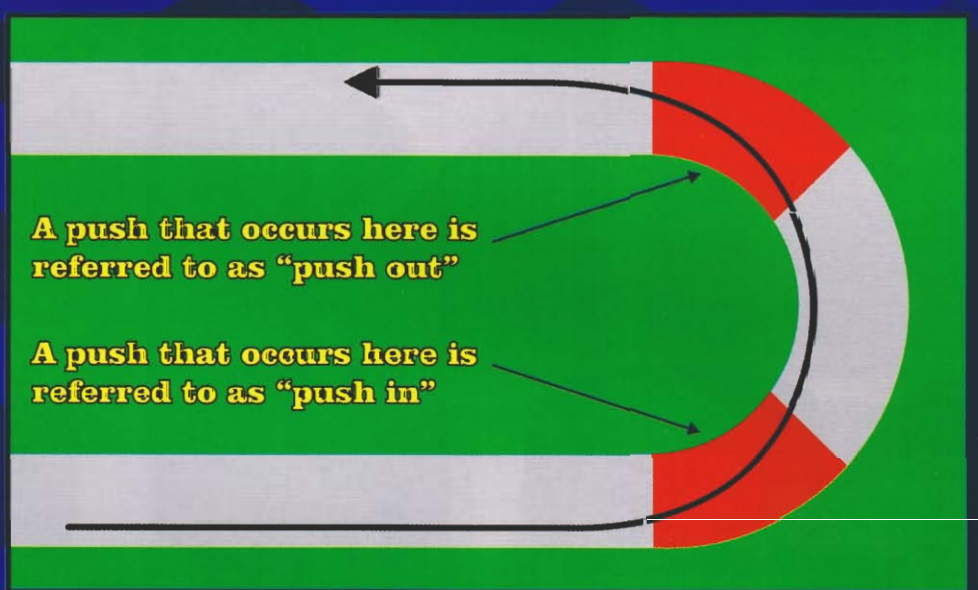
Something that is absolutely critical in kart racing is to properly identify a problem so that the right decisions can be made to fix it. One of the aspects of proper problem diagnosis is to have an understanding of what the kart is actually doing and then using the right words to convey the problem accurately if we have someone helping us tune our chassis. In this article we'll be looking at possibly the most overworked term in kart chassis setup and one which is misunderstood more often than not. The term we're going to look at is "tight". It's very common in all parts of the country to hear karters use the term tight to describe a condition on the kart but the problem is that so many karters use it differently that it is very easy to get confused over exactly what the kart is really doing so that an accurate solution can be implemented. Even worse, a couple of the conditions which the term "tight" is used to describe are exactly opposite from each other and misunderstanding will cause chassis and tire tuning to go in a direction exactly 180° from what it needs to.




Ok then, what conditions do karters use the term "tight to describe? Here's a list:

- Push in
- Push out
- Kart getting over on the RR too much center off, over working it, slowing the kart center off
- Kart sitting on the LR too much center off, over working it, slowing the kart center off

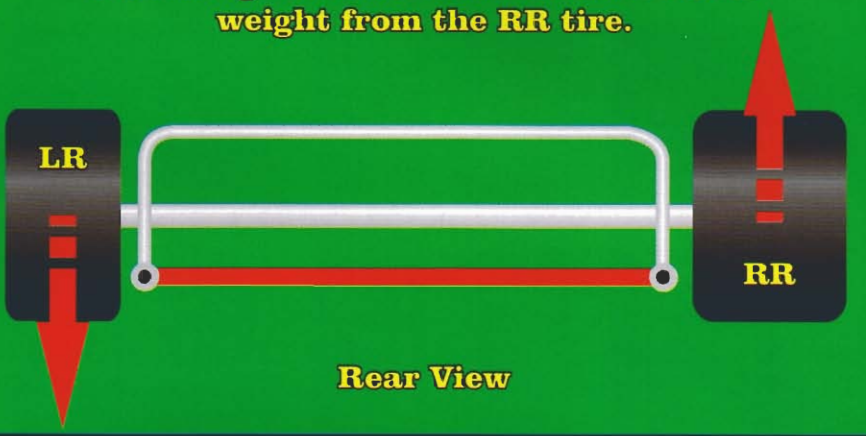
Immediately we can see that one of the four describes a problem getting into the corner (push in), one of the remaining three describe a condition where the kart won't turn (push out), and the final two describe conditions where the kart will turn but it's not fast (kart on the LR or RR). These same final two also describe two conditions which are caused by the exact opposite conditions. Looking at this we can see very easily that more detail is necessary if we want accurately understand ourselves or convey to someone else what is really going on with our kart. Given this, we need to standardize on some descriptions which will allow us to convey what the kart is really doing accurately.

First, I never use the term "tight" to describe a push. If the kart

is pushing it is typically more clear just to say, "it's pushing." If it's pushing and that term is used then there can be no misinterpretation of what's going on- "I turn the wheel but the kart doesn't turn." It might be pushing in, pushing at the apex, or pushing off but pushing is pushing and not tight. Incidentally, just as we need to understand pushing vs. tight vs. sitting on the LR, we also need to note where the kart is pushing because the optimum fix will vary based on where the push is occurring.

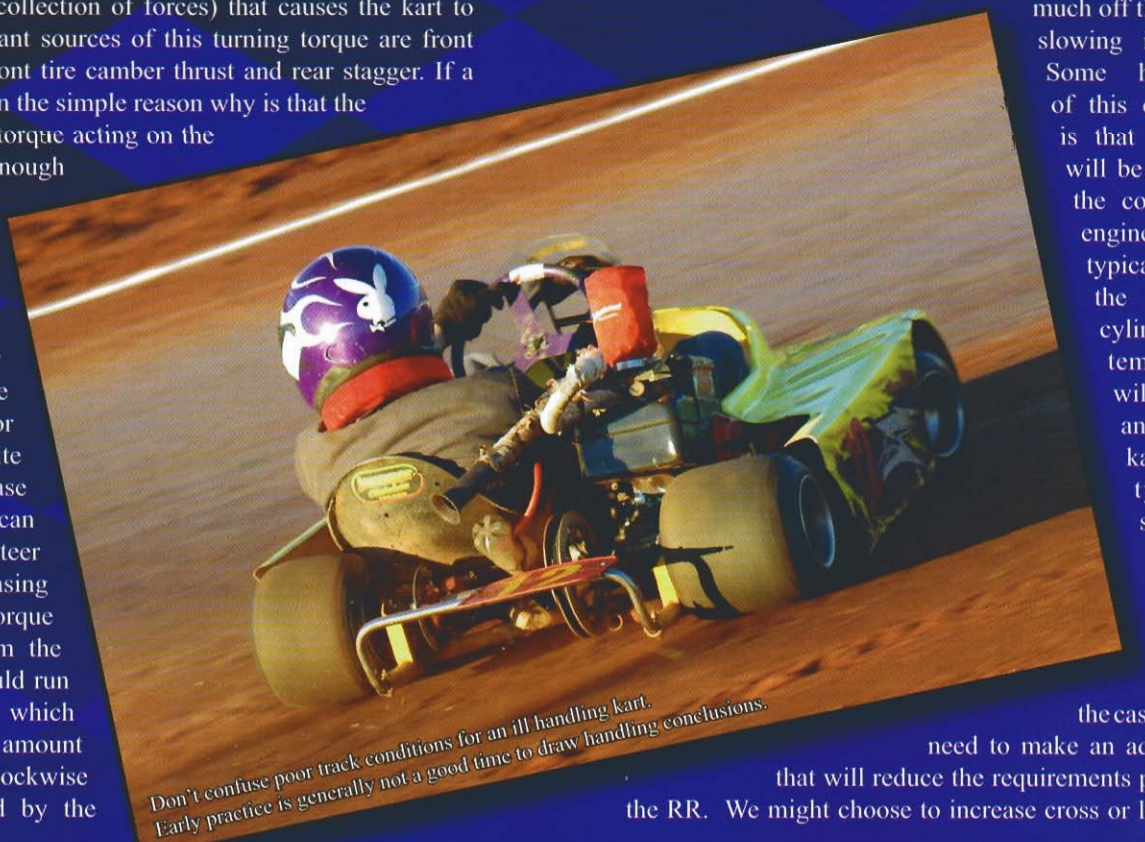
Now, why might a kart push? To answer this question lets look first at the physics taking place. What we have to understand is that all the forces on a turning kart need to produce a torque on the kart in the counterclockwise direction in the right amount if it is to navigate the corner properly. Too much torque and the kart will be loose (back end sliding); too little and it's pushing (front end sliding). Think of it this way: a kart is heading in one direction down one straight and in the other direction down the other straight; therefore the kart must rotate 180° to go from one straight to the other. Because we run in a counterclockwise direction the kart must rotate counterclockwise. There has to be a force (or collection of forces) that causes the kart to rotate. The dominant sources of this turning torque are front tire steer angle, front tire camber thrust and rear stagger. If a kart is pushing then the simple reason why is that the counterclockwise torque acting on the kart is not large enough to cause the kart to turn. How can we fix this? Increase the torque. We might use tires or chassis or both. We could run a LF or RF with more bite which will increase the force they can produce through steer angle, thus increasing the part of the torque which comes from the front tires. We could run more rear stagger which will increase the amount of counterclockwise torque contributed by the rear tires being on the same axle rotating at the same RPM. We might also remove bite from the LR to reduce the amount of counterclockwise force necessary to cause the kart to turn. In order to change the amount of grip a given tire or combination of tires can produce we always have the option of whether to use tires which will make more grip, different tire loadings through chassis setup to alter the grip made by each tire or some combination thereof. These same principles apply at corner exit as well as corner entrance and up to the apex - the same things about the counterclockwise torque apply equally well.

**Crossweight can be a very useful tuning tool. Adding crossweight to the kart adds weight to the LR tire and removes weight from the RR tire.**




Rear View

Now comes the more hazardous uses for the term "tight": a kart overworking the LR or overworking the RR. As we said before, what we would do to fix one of these problems is exactly the opposite of what we'd do to fix the other. If we misunderstand this or miscommunicate it to someone helping us then we could lose valuable practice time, a heat or a main because of adjusting the wrong way. The condition I reserve for the term tight is when the kart gets over on the RR too much off the corner slowing it down. Some hallmarks of this condition is that the kart will be slow off the corner, the engine will typically bog, the engine cylinder head temperature will go up and the kart will typically slow down as the run goes on. If this is the case then we need to make an adjustment that will reduce the requirements placed on the RR. We might choose to increase cross or left or we



Don't confuse poor track conditions for an ill handling kart. Early practice is generally not a good time to draw handling conclusions.

might put a softer tire on the LR, move the LR in or put a harder tire on the RR. This condition was quite common years ago but due to advances in chassis technology and also to the release of newer, wider, freer rolling tires and tire cutting it is less common these days. If tire cutting and prepping are eliminated this condition may become more prevalent once more.

The last condition which is often referred to as tight is a kart which is overworking the LR. Over the last couple of years this has been a more common problem than one which is truly tight (on the RR). I normally call this condition sitting on the LR or flat or more rarely tight on the LR. In the same way we can overwork the RR center off and kill the kart's run off the corner we can also overwork the LR. This is most often caused by too much left but can be too much cross, too large of a left to right air pressure split, LR in too far, LR too soft, etc. Some of the more common symptoms of this condition is that the driver may report that he/she can drive the kart anywhere he/she wants but the kart will be slow. It will also tend to look flat off the corner. When this happens, the engine temperature does not typically go up (or if it does it will go up relatively little) and the engine doesn't really bog down; mainly the kart just looks flat. Some karters struggle with understanding this condition because they believe that that if the LR gets overloaded the kart will push but this is not true. If we recall our discussion on the torque that makes a kart turn we know that if we have enough counterclockwise forces, the kart will turn, period. While an overworking LR may increase the amount of counterclockwise force needed to turn the kart, it may not necessarily increase it to a level beyond which the kart can supply. Okay, now that we know that the condition exists and what it looks and feels like, how do we fix it? What is actually happening when the kart overworks the LR is that there is too much load on the tire or bite in the tire too soon at corner exit. The result of is that the LR's drag due to cornering (induced drag) goes up and burns off the engine's horsepower not allowing it to accelerate. To correct this we might run less left, less left to right air pressure split, less cross, move the LR out, etc.

As we constantly work on our karts to tune out problems and tune in speed it is critical to understand precisely what the kart is doing so that we can choose the right change to make to improve. When we communicate to others what the kart is doing so we can get help, it is just as important to communicate clearly what we are feeling. Next time you're at the track and you think you're kart might be tight, remember all the different conditions described by the term tight and make sure the one your working on or getting help to fix is the right one.

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