

# **TUNING SECTION**

It's like Ripley's Believe It Or Not – Take it for what it's worth!

## **TRANSMISSION HEIGHT**

The X – 6 is the first mass produced off-road buggy we know of with adjustable transmission height. This allows you to adjust the height of the point of contact between the dogbones and the outdrives. In theory, raising this point of contact gives more forward bite and less side bite. Lowering the point of contact does the opposite: more side bite and less forward.

We are changing the angle of the dogbone in the outdrive. If you keep the ride height the same, changing the height of the outdrives changes the angle of the dogbones. On a conventional buggy, rear ride height changes are done to affect dogbone angle, and front ride height is adjusted secondly to compensate for the rear.

The New Math allows you to set dogbone angle and ride height independently. The Team usually sets transmission height first, then adjusts the remainder of the car, with front and rear ride heights based on the remainder of the set-up rather than dogbone angle considerations.

Included in Bag E is a Ziplock bag of transmission shims; four each of .030", .060", .090". and .120" Counting zero, this gives five transmission height positions. .060" is about the same as your B4.

Unfortunately, we have yet to figure out an economical way to change transmission height without moving the motor in tandem. Therefore, changing transmission height also changes the car's C.O.G. slightly, which affects handling. As with any other car, by the time qualifying starts it's the whole package that counts. We solicit input from the X Factory family on this problem. The key word here is economical – nobody will buy a \$300 buggy!

*Important note:* For all settings above .060", add equal shims under the motor plate support. You can use #4 flat washers for this purpose.

## **ANTI-SQUAT AND TOE-IN – More Math!**

Your X – 6 has been designed to make adjustments of rear toe-in and anti-squat as easy as possible. Two toe-in bars are provided in Bag F: 3° per side and 4° per side. More toe-in helps the car develop forward traction coming out of corners, but less toe-in gives better side bite. So it's another trade-off and is an adjustment you should

make early in your set-up work for each track. There are commercially available hub carriers from RaySpeed and Racer's Edge which put different amounts of toe-in at the hub (the AE hub carriers are 0°), so you have a wide range of options.

We have run all the way from 3° at the pivot + 0° at the hub = 3° to 4° at the pivot + 1 1/2° at the hub = 5 1/2°! At 5 1/2° the rear end gets so locked up that steering reaction decreases, but you can do it. On the xx-4 it was discovered that toe-in at the pivot performs differently from toe-in at the hub, so please have at it and let us know how it works out.

Anti-squat adjusts the up-and-down angle of the rear hinge pins, thus affecting the angle of the rear hubs. This changes the way the wheels put power on the ground and changes the way the suspension works. Tilting the hinge pins so the rear is down increases forward bite, reduces side bite, makes the car jump with an higher arc and lets it accelerate better through bumpy sections. Raising the rear of the hinge pins does the opposite: less forward bite, more side bite, flatter jumps, better acceleration in smooth areas.

Bag F includes a Ziplock bag with 2 .030" shims and four .060" which allows anti-squat adjustment all the way from zero to .150". The Team no longer refers to anti-squat in degrees, but rather we discuss the number of inches of shim.

Once again, you should adjust anti-squat early in your preparation for a race, taking into consideration dogbone angle,

## **IT'S ALL ABOUT WEIGHT DISTRIBUTION**

"I never saw a Ferrari with the motor hanging out the back." That's a quote from Greg Hodapp, former Worlds' TQ and ROAR National Champion. Better weight distribution is the raison d'être for the X – 6. The typical rear-motor buggy has weight distribution of about 70% on the rear wheels and 30% on the front. The X – 6 is about 55 – 45%. The New Math.

Everything about the X – 6 is different from a rear-motor buggy, and many drivers must learn to drive all over again. A rear motor acts like a pendulum, making the back of the car want to "come around" in corners or fly up like a bucking bronco over bumps. With the weight in the center these things no longer happen.

First, you'll carry more speed through corners. With more weight on the front wheels, the X – 6 turns in better. With no pendulum effect in the back, the rear end stays more planted. The car naturally takes a smoother "normal" racing line through corners rather than the "point-and-shoot" or "rotate" line now in use with rear-motor cars. Watch out that you don't run into cars slowing down for the corners!

Even though less of the car's weight is on the rear, the Team runs rear springs, oils, pistons as stiff or stiffer than a "normal" buggy. (What's "normal" about the motor hanging out the back?) Initially, we thought we would run softer because of less weight back there, and we've still got bottles of 15-wt oil and Losi white springs hanging around. But as we've learned to calculate The New Math, we've gotten stiffer, and faster.

At the '06 ROAR Mod Nats, an indoor pink taper track, the rear was actually so planted that Paul experienced push exiting corners. In-line front hubs helped a lot.

Second, the X – 6 is more stable in bumpy sections and is particularly good in off-camber turns. Stability allows stiffer suspension settings all around for better cornering.

We're still learning in the area of set-up, so stay tuned to our web site, [www.2wdrc.com](http://www.2wdrc.com) for the latest set-up tweaks.

## **AERODYNAMICS AND *THAT MONSTER WING***

The Team carries three or four wings around, each with different "Gurney" on the back. (The vertical section at the rear of the wing is named after Dan Gurney, the American F-1 driver & team owner who invented it.) As you might expect, more Gurney = more downforce, and it works at any speed. You'll also be surprised at how the large side dams help hold the car in corners.

We like winning races, and how the car looks is secondary. Some people think the big wing is ugly, but it works, even at small tracks. We had a pro driver run our X – 5 at a small indoor track. After a couple packs for him to get used to the car, we began switching wings in the middle of the pack: Our big X – 5 wing and a smaller one from another car. He said the car felt more stable with our big wing in corners, through the whoops section, and in the air. He was ½ second per lap faster with the big wing. He agreed the difference might be as much as ¾ second at a large outdoor track.

At the same time you must attenuate the front and rear suspensions. Too much rear downforce and the back end is too planted, with deleterious effects on steering. So try different wings on each new track or lay-out to see what works best for you. That's why we have provided all the cut lines on the wing.

Remember that changing the wing also affects the suspension set-up. For example, a track with a long straight may call for lots of Gurney to add downforce for the sweeper, and the springs will have to be stiffer to maintain ride height at speed. But you may want a softer spring due to some other feature of the track, say a bumpy

section; thus, you might sacrifice some downforce to stay with the springs you want. Only testing will determine the fastest lap times.

The amount of rear downforce is critical when airborne. We took the X – 6 for a photo shoot when we only had one prototype wing, so we left full Gurney on. The track featured a very large triple jump, and Paul could not get the car's nose down in the air, resulting in some bad landings. We kept removing Gurney until finally the car flew correctly. So this is another consideration: how does the car fly?

Because of its “scoop” in the front and the inward slant of the side dams, the X – 6 wing is more effective than any other we've seen. You'll need less Gurney on the X – 6 to achieve the same effect.

Our last point here is perhaps counter-intuitive: the '06 Worlds was held on a very rough track that got zero maintenance. Many holes right on the line were three inches deep! The really fast guys, including Champion Neil Cragg, all used large wings with full Gurney. These wings pushed the cars down even at low speeds resulting in more traction, both forward and side. They had greater stability and could better make quick moves to avoid the holes.

Do not be afraid of a big wing on rough or bumpy tracks. We think aerodynamics gives the greatest opportunity for lower lap times in off-road R/C racing.

## **GEARING AND SLIPPER**

Because the X – 6 gets its entire driveline from the B4, use the same gearing that you did with your B4. The Team usually starts with a pinion 8 teeth over the wind and proceeds from there. We like to be geared 8-over because the motor seems to be in its “sweet spot” there. So a change in spur to change the final ratio may cause a change in motor.

The Team mainly uses the 78 spur gear. With the 81 we suggest you grind a bit off the ends of the dogbone pins so the pins no longer protrude from the outdrives. Under certain circumstances, we think often when the car is up-side-down, we've experienced contact between the pins and the 81 spur. It doesn't seem to bother the pins much...

In instruction D11 we suggested slipper adjustment a bit looser than on the B4. Slipper and diff adjustment is critical on the X – 6. Under all circumstances, the slipper must slip before the diff, so after adjusting the slipper as you need, re-adjust the diff to suit.

Running a looser slipper allows you to get on the power harder and quicker coming out of corners and through rough sections taking advantage of the X – 6's higher speeds in these sections.

There is one advantage to a rear motor car: in the first five feet after a corner weight pivots back on acceleration reducing the car's tendency to "fishtail." On most tracks the X – 6 has no problem here (see Weight Distribution and Monster Wing above), but on slippery surfaces (That's different from "loose.") power application is more difficult and trigger skill is required. A looser slipper helps now. It's not a real disadvantage – remember that you came through the corner faster – but many drivers will want to readjust the slipper and learn better throttle control for the occasional slippery track

That's too much bloviation, but we love talking with the family.

We do this because it beats working, and hope you have much fun with your X – 6.

Please, please, call or E-mail with  
comments and suggestions.

Complaints go to the top of our list because  
that's how we improve our products.

Suggestions from the family are the fastest way  
to new ideas for improvement and new products.

We solicit your input.

Now let's show the competition what fast means!