Trap Speed versus ET Explained

1) Trap Speed will tell you about your HP to weight.
2) ET will tell you more about traction and your launch.

ET is an idication of traction while MPH is an indication of horsepower

Of course ET is important to true drag racers, because the winner is the one that gets there first. However, we're not necessarily true drag racers in our attempt to get a power estimate. Honestly, ask 10 guys at the track "What kind of trap speed are you running?" and 8 out of 10 will answer with their ET - to one or two decimal places even. When you say, "No, no, I meant trap speed", they will fumble with a broad estimate with NO decimal places and might even have to pull a time slip out of their pocket to check. Try this question when you're at the track; it's almost funny.

THE DYNAMICS OF TRAP SPEED VS. ET

After running lots of quarter miles, it becomes clear that how well you do in the first 100 feet of the track is KEY to a good time. The last half of the track is KEY to a good speed.

Let's use an example of a stick-shift mini-pickup that on a perfect run, gets a timeslip of 19.50 seconds at 70.00 mph in the quarter.

Imagine that the light turns green, the truck moves two feet and the engine dies for three seconds. After restarting the engine, the driver proceeds to then complete a perfect pass. His time slip would show 22.50 seconds at 69.97 mph. The ET was 3.00 seconds high but the speed was almost unaffected.. why?? It's because his racetrack was 1318 feet long instead of 1320, and in those last two feet this truck usually gains an additional 0.03 mph. However, the clocks recorded the long time. My point? Much of a great ET is made by a great launch.

Now take this truck again, and the driver leaves right on the green light. However, he misses the 3-4 shift when he's at 1250 feet. He coasts for the last 70 feet while trying to find fourth gear. Now instead of accelerating another few mph in this final 70 feet of the track, he decelerates over this distance. His timeslip; 19.51 at 67.83 mph. Note how the et is almost perfect (only off by 0.01 second) but the trap speed is way off (over 2 mph slow)! On a good run, traveling that last 70 feet at an average of 69 mph, would have taken .692 seconds. At a 68 mph avg., that 70 feet takes .682 seconds. That's why his ET only varied by .01 seconds, yet the trap speed was 'way off'. My point here: the end of the track is critical to trap speed; shift rpm, missing a gear... these are the big players.

Hopefully these examples are clear. Neither of these runs are 'perfect' runs, it's just that one has an error at the start, one at the finish and the results are obvious. The start of the track is a big player in the ET, but a small player in the mph. The end of the track is a big player in the mph, but a small player the ET.

So for the casual T-Bricks member who wants to get a HP value, you don't have to buy slicks, or wish you had a limited slip differential. You don't really need to heat the tires in the waterbox, or launch with huge power braking. As long as people get their shift rpm right and don't miss a gear, even a rookie will get the appropriate trap speed for their vehicle.. but honing the perfect ET. requires being rude to a clutch, buying steeper gears or slicks.... hey, we're trying to make this recreational.

OPTIMIZING SPEED

If your goal is to get a good trap speed, what are your options? More power, of course - and less weight is obvious (but it will come out in the power calculations as no increase in power). Shift rpm chosen (auto or manual) and the time it takes you to shift (with a manual) are probably the most important tools you've got. Try different shift points to maximize your trap speed. Reduce rolling resistance by pumping up all tires to their rated pressure. Some people think that running lower pressure might help the traction in the rear, though. Of course more traction will help et, but with most street tires, running street tires within 5 psi of rated pressure will provide you with maximum traction in the first place.

REACTION TIME

The ET clocks don't start until you've actually moved around 8 inches (this is called the rollout)... so don't worry about trying to leave right on the green light. You could wait 5 seconds after the light turned green, and still get a 19.50 timeslip in our truck example above. Your timeslip does show a separate calculated time, the "Reaction Time", which in this case would be 5 seconds. That is the time from the light turning green until you rolled out of the starting zone. It's not a big thing for our discussion here.

THE LAUNCH

For the most part, a decrease in ET is accompanied by an increase in trap speed, but don't go overboard on the launch in your zest to rule the world. Just try to get smartly underway without spinning the tires much at all. Traction levels usually drop a solid 0.10 g when the tires start spinning.

THE HP FORMULA

Here's the formula to use to calculate HP:

Net HP = Weight in pounds* (Speed in MPH/228.4)^3

As an example, Car & Driver tested the 744 Turbo in their June 1990 issue. The car weighed 3,081 lb. without the driver.. the 'race weight' was 3,231 lb. The car ran a 15.7 second quarter at 86 mph. Let's plug it in to the formula:

HP = 3231 * (86/228.4)^3

HP = 172 Net

Volvo rated this at 162 Net. We come out a little high. Or does Volvo underrate a little? I'll say this - I've used this formula for years and that's how the 228.4 was honed - actual experience from cars that had actual power curves - and when I use it on Volvos it tends to always come out a few percent higher than the factory rating. This could simply be that Volvo underrates just a little.

Still, for such a simple formula and such a simple test, it's surprising how accurate this can be. And the best thing is - there's no arguing the numbers on a timeslip. There are always differences between a DynoJet and an Eddy Current Dyno, or G-Tech numbers, but every setup is done by someone different and subject to error. The quarter mile is arguably the best comparison a diversely located group like Turbobricks will ever have. The only real difference to argue about is the altitude of the track! You can compare ET and mph all day and have a good discussion.

HANDY RULE OF THUMB

Once you have a baseline, you should probably use a rule of thumb that each additional 6 HP will give you another mph. That's for a 3200 lb car that runs 88 mph. If you want the real formula for different weights or speeds, here it is:

HP for another mph above "X" speed: = Wt * (((X+1)^3-X^3) / (228.4^3))

For instance a 89 mph quarter vs. an 88 mph quarter for a 3200 lb car:

HP delta = 3200 * ((89^3-88^3) / 228.4^3))

HP delta = 6.3 HP

Once you're going 110 in the quarter, it would take an additional 10 HP to go 111 mph in the 3200 lb car.

60 FOOT TIME

This is the standard measurement tool to evaluate your launch. It's the time that it took you to travel the first 60 feet of the track. Naturally, patterns emerge again after looking at lots of runs and of course these correlate best to time, not mph. Typically, most everyone's 60' time will be between 14% and 16% of their quarter mile time. If it's under 13% or over 17%, this was not your best pass.

1/8 MILE VS. 1/4 MILE

After monitoring tons of good passes, patterns emerge. Typically, the mph at the quarter is around 1.26 times of the mph at the eighth, and the time at the quarter is around 1.55 times the time at the eighth. You can use these values if you only have a 1/8 mile track and

get a real good idea of the theoretical 1/4 mile.

IS MY ET TO SPEED RATIO REASONABLE?

One fact of the quarter mile is; no matter how slow or fast your car is, the mph multiplied by the ET will pretty much be the same number every time. Before the NHRA changed the way that speed is measured in 1989, the product of speed and time was around 1400. Let's calculate some easy examples of this. A 14.00 et usually resulted in a trap speed very near 100 mph. A 10.00 et meant around 140 mph. A 200 mph pass usually takes around 7.00 seconds. These are still good rules of thumb to remember, but now the product is more like 1380 for us - The example from Car and Driver above comes out at 1350. (The reason for this shift is explained below). Remember, most everyone focuses on ET so much that they'll even optimize a car for slower mph if it gets them a better ET. (Rear end gearing is one way to do this). Those guys tend to have a product closer to 1300.

RESPECT MORE SPEED - A LOT. EVEN 3 MPH.

If you look at the formula again, you'll note how trap speed shows up as the cube root of power to weight. That's critical to understanding how fast one car is over another. Let's say your car does a 90 mph quarter and the guy who raced you in the other lane ran 71 mph. After the race, he wanders over to you to say the 'race was close'. Your reply: "I could have towed you and still smote you". (This might not be the best way to make friends, but yes, it is TRUE if the cars weigh the same.)

Do the math. (90/71) cubed is 2.04. Yes, the 90 mph car has 2.04 times the power to weight of the slower car. It has 2.04 times the acceleration of the slower car. It's just that the track is a fixed length, and in accelerating to higher speeds, you use up the track quicker. You accelerated to 90 in about 20% less time than he had to accelerate to 71, right?

Bottom line; Down where most of us run, a 3 mph difference between two cars is NOT a race. It was a clear win. There's a full 10% difference between these cars.

Previous to 1989, there were three timing lights at the end of the track; one AT the end of the quarter mile, and one 66 feet before, and one 66 feet after. The middle light was used to calculate the et of the run, and the time to travel the 132 feet at the end of the track was used to calculate the trap speed. This gave the average speed at the end of the track, but you can see what this lead to. Most of the racers stayed on the gas for an additional 66 feet past the quarter to get a consistent speed to evaluate their setup. The track's 'shut down area' of course is a fixed length, but the pro racers were starting to hit 300 mph plus by the end. In an attempt to get these guys off the gas 66 feet earlier and 'make' the cars appear slower, the NHRA stopped using the last light around August of 1989. Today, the trap speed is calculated between the light at the quarter mile and the one 66 feet before. So any timeslip after 1989 is really giving the average speed 33 feet from the finish, which is pretty close to one percent slower than before.