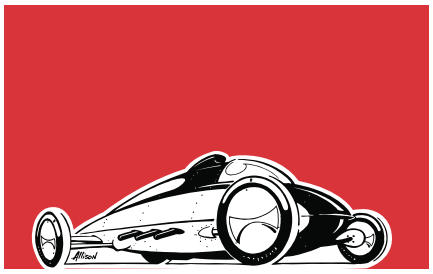

FUEL FOR THOUGHT

BY LANDSPEED LOUISE

"The solution to this problem that we recommend is to move the weight you have positioned in the rear bumper into the front of the truck bed, by the cab."

Entering The No-Spin

As promised last month, we'll take a look into a specific task completed by the United States Air Force Academy cadets that will assist land speed racer Norris Anderson in achieving greater speeds through improved safety. All involved hope the information will assist others in a similar manner.

This is the work of mechanical engineering cadets Matt Major and Tucker Tipton who completed a double analysis for Anderson, who runs a 1949 Studebaker that snagged a 219MPH record in AA/Modified pickup truck. The cadets figured out why he was spinning out by identifying the center of gravity, center of pressure, tractive force and predicted steering responses using different weight distributions.

Without exception, this is precisely the type of partnership I had envisioned for the land speed racing community. Further, I happily report that Lt. Col. Buckley is equally pleased with the first semester results for the cadet student body. We have a few lumps to pound out, to be expected when implementing a totally new concept, but the "win-win" benefits are solid all-around. Let's get to some details so you can judge for yourself.

Cadets Tucker Tipton and Matt Major, through a series of conversations, data analysis and mathematical tests, determined the weight distribution on the Studebaker pickup was giving Norris Anderson most of his problems.

"Because it is so heavy in the rear, it is causing the truck to become aerodynamically unstable," they wrote in their recommendation to the land speed racer, "The solution to this problem that we recommend is to move the weight you have positioned in the rear bumper into the front of the truck bed, by the cab."

Cognizant of down force and traction, they added: "You may be concerned that this will detract from your max speed because there isn't as much weight on the rear tires, reducing your force on the road. We looked into this issue and it turns out it isn't a problem for two reasons. First, your car is producing 4500 lbs of force more than it needs to. You probably notice that the tires of the truck are spinning a lot on the ground.

This means that the truck could not transfer all of the power of the engine to the ground, so instead it spins the tires. This means that you have a lot of power that you can give up without affecting max speed. Also, once the tires begin to spin, the friction between the tires and the ground significantly decreases. Friction is what allows you to put force on the ground, which means as it decreases so does your max speed. If you did not spin your tires, you would be able to apply more friction to the ground and achieve a higher speed.

The second reason is that instability is what is limiting your speed, not force output. By moving some of the weight forward, you would lose some force on the road. However, you are currently unable to get close to the maximum theoretical speed of the vehicle due to stability issues, so your maximum theoretical speed may decrease a bit, but you will remain stable at higher speeds than before. "

Analysis Summary

There are a few things that having this much weight in the rear are doing when it comes to stability.

1. Oversteer

When a vehicle is significantly heavier on the rear wheels than the front, a condition called oversteer occurs. This means that as you move faster, the truck will have to turn its wheels less in order to traverse a turn. There is a speed called the Critical Point at which your wheels actually must be straight or begin to turn away from the direction you want to turn in order to traverse the curve. We believe that you are reaching this Critical Point, and although your wheels are pointed straight, it is causing you to turn, thus disturbing the truck from its aerodynamically stable condition. This is what initiates the spinning of the truck.

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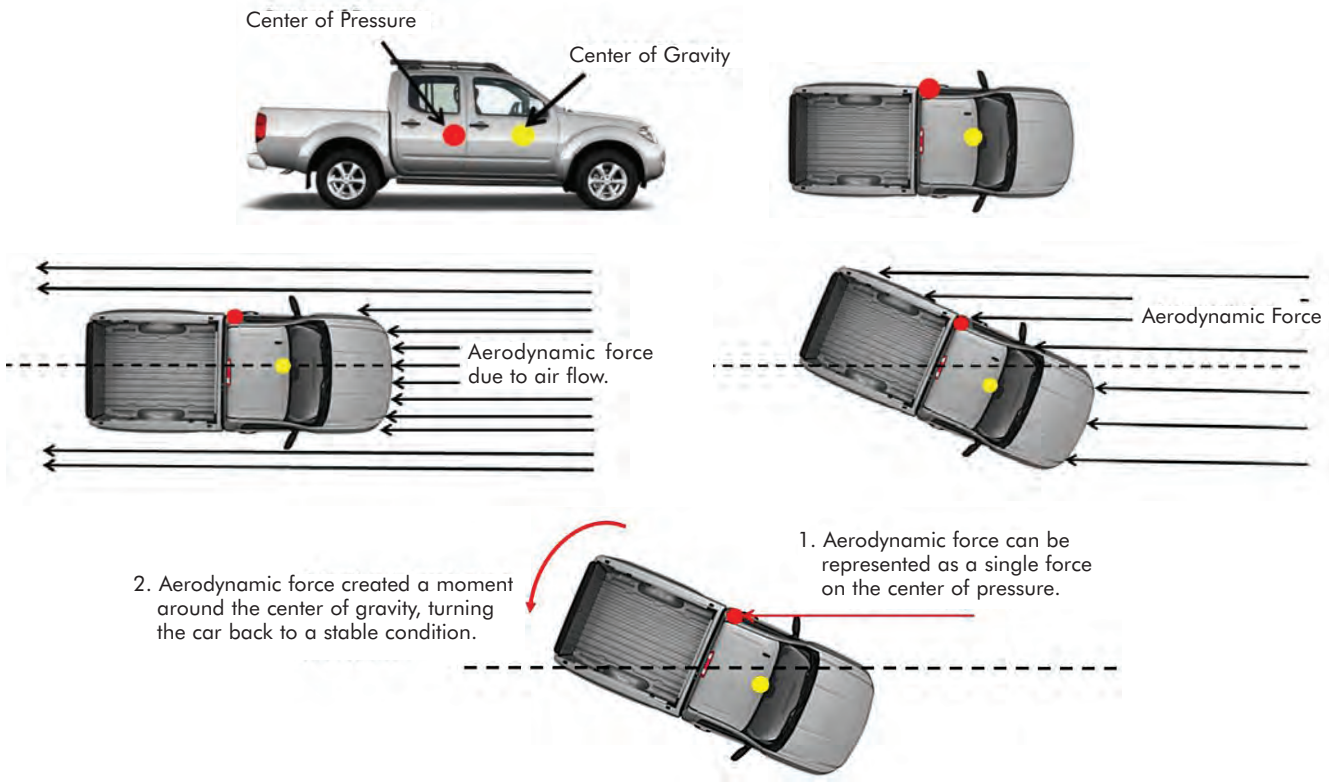
EXAMPLE 1: CENTER OF PRESSURE AFT OF CENTER OF GRAVITY



Fuel For Thought
Continued from Page 14

2. Center of Pressure

The center of pressure on a vehicle is a point on each side through which the force of drag will act when in the wind. If the center of pressure is behind the center of gravity, the aerodynamic force of the wind will correct the car back to a straight line of travel if any swaying occurs. If the center of pressure is located in front of the center of gravity, the aerodynamic force will push the car in the direction of the disturbance, causing the car to become more unstable, increasing the possibility of spinning out. The following diagrams will visually explain two situations. The first will have the center of gravity in front of the center of pressure. The Second will have the center of gravity behind the center of pressure. (Note: These examples only show the center of pressure on the left side of the truck, when in reality there is one on all four sides.)

Through our analysis we have determined that your truck falls under example two, where the center of pressure is in an unstable position. Moving the weight as suggested above will help to correct this problem.

Force on the Ground From the Tires

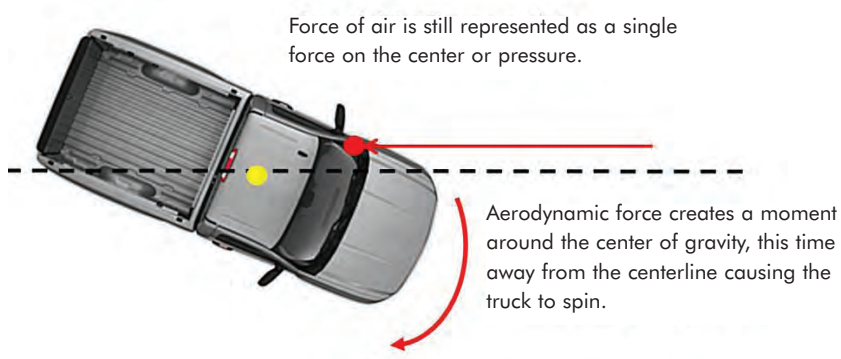
At the maximum theoretical speed that your truck could reach based on the engine output, you would have to overcome about 1100 pounds of resistive force due to air drag and friction. We believe that your truck is outputting about 4500 pounds more than that. This is causing your tires to spin. The point of adding more weight to your rear wheels is because it allows you to apply more of that force to the ground. However, instability is what is limiting your speed, not your force output. By moving some of the weight forward, you would lose some force, but you are currently unable to use a large amount of it. Moving the weight forward would make the truck more stable, therefore it would not spin out, and it would reach a higher speed than you are currently getting to. You are also outputting so much more force that your wheels are slipping a large amount. In this case, more power is not necessarily better.

"I will implement most all of the suggestions," Anderson told me, "Weight will be shifted, and fuel tanks, batteries and ballast will be shifted around. The cadets handled most every problem I posed and the information on the center of pressure was."

How about that racers and riders? Do you know where your "centers" are tonight?

EXAMPLE 2: CENTER OF PRESSURE IS LOCATED IN FRONT OF THE CENTER OF GRAVITY

IN THE SAME SITUATION AS EXAMPLE 1, THE VEHICLE BECOMES UNSTABLE



Note: Photojournalist Louise Ann Noeth is the authoress of the critically acclaimed, "Bonneville: The Fastest Place on Earth," a complete historical review from 1896 to 1997. For high-speed details: www.landspeedproductions.biz. GG

Bangin' The Gears
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soaked putting tires back on and getting the car off jackstands. At least it was warm rain, unlike Colorado's cold rain. I cleaned up, changed clothes and took the car for a test drive…no more rumbling – problem solved.

We thanked the manager, paid for the gaskets and gear oil, but he wouldn't take money for the use of the jackstands. We left the shop at 2:00 PM…fastest major repair job on the side of the road I ever did. We drove well past Chicago before we stopped for the night and made it the rest of the way home the next day without further incident. At least, that's the way I remember it. GG

Roger

Now available -the fifth book in the series: *Faded Thunder*, stories of Denver hot rodding, cruising, car shows, drag racing and general chaos on the weekends. Don't forget to check out my recently "overhauled" website: www.RAJetter.com to order the fifth book personally autographed.

Gazette Pick – Spring Nationals
Continued from Page 96

Tech Specs:

Body: 1972 Ford Bronco. One-off metal fender flares, roll pans and firewall. One-piece front clip, flushed windows, filled body seams, Washington Blue and Wimbledon White paint by Lucky Luciano Custom Paint in Phoenix.

Chassis: Original Bronco rails, Currie FAB 9 axles with 4.56 gears. Custom crossmembers, shock mounts and four-link suspension, 3" King internal bypass shocks, stock Bronco power steering, and Baer 6-piston brakes with 14" rotors.

Power: Smeding Performance 347ci Cobra Jet with 480hp . Imagine injection cross-ram injection, MSD ignition, Ford 4R70W trans.

Wheels and tires: Custom 22x10" wheels designed by Jimmy Smith and made by Evod. 325/50R22 Nitto LT tires.

Interior: Modified BC Bronco's dash, Limeworks sprint car steering wheel, Classic Instruments Bomber Series gauges, custom 40/60 split bench seats, all leather, Alcantera suede, and aircraft carpet by Armando's. GG

Gazette Pick – Spring Lone Star Nationals
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Within a few years, the business was profitable and I began the tear down process. In just a few hours I had the sedan spread all over garage and I looked forward to the challenge of reassembly. It wasn't until 2001 (just a few months after our dad passed away), it was back on the road and I had kept my promise to put my family before the car.

As anyone can see when looking the car over today, it is tired again and ready for another rebuild. The paint has countless chips, scratches, and flaws, but I'm committed not to tear it down until the time is right. With a young teenager in school, his activities and sports keep us plenty busy with no time for another complete tear down. You see, we are working on our son's '51 Chevy truck at the moment and enjoy having a running car to participate at the rod runs. We are almost finished with the all-new chassis for the truck and he is getting more excited by the month. He turns 16 in a few years and I'm passing the torch of respecting these old cars now so he is ready when I hand over the keys to the sedan. My goal is to have him help me rebuild it again...this time like he wants it, just as my dad helped me before.

I wouldn't take anything for the memories of working on it with dad. Some of our best times were spent with