

## **We want you to be safe, not a statistic**

With this we were thinking about how to relate good information to our readers about accident prevention. We contacted Chris Real of DPS Technical as we know that his firm tests a wide variety of vehicles and is active in Transportation Forensics.

When we asked him, what is one primary point that a rider should know about their vehicle to be safe, he said "understand the limits of balance of your machine and the affects of loads and angles". We thought this was very a useful point for ATV and MUV riders.

He said that if he could give one recommendation to our readers it would be to encourage them to know what loading the vehicle does to the general stability.

As luck would have it Chris had a project scheduled and was able to give us some beneficial and interesting points and gave a demonstration that would help us all in the "real world" out on the trail or when we are using ATV 's for utility work.

We needed a recreational test rider and Chris has a friend, Lylah. She is an avid off road and outdoor rider. She rides and ATV, and goes severe Jeep off- roading with her boyfriend, Robert. Robert rides off road motorcycles and is often the trail leader of a mixed group of ATV and MUV riders who have varying ability. Robert wanted to get an idea of some potential dangerous situations to avoid if possible.

Back to Lylah she is a good rider, and has equipped her sport ATV with a few common accessories. She has a tow rope, some bumpers a rear rack and has modified the controls a bit. Her modifications are normal, except that she has added a hand shift lever, a chest support and a rear rack to hold her wheelchair. Lylah has minimal use of her legs from a childhood illness, but that does not keep her from being active in outdoor sports and recreation. The modifications on her ATV don't add much weight, and she allowed the use of her ATV for educational purposes.

Lylah had questions about the balance angle of her ATV as she put it, "if it goes over, she cannot push off and get away from it, and having a 350 pound ATV land on her was not her idea of a good time."

Chris explained to us that many engineering tests are done to determine the stability of an ATV, some are dynamic or moving tests, others are static or stationary tests. For our visit we were able to observe a portion of a basic static "pitch stability" or tip test. After some measurements and instruments were fitted the ATV was suspended and we took rear balance measurements and weight bias measurements. Then Chris started adding common weight to the rear rack. The balance angle really started to change! Adding a rider substantially changed the balance point, and we were impressed what adding just a few items such as a case of water to the rear rack did to the balance point or "tip" angle.

When we completed the balance point ATV measurements we put the ATV on the "tip table" and observed how the weight bias changes with common angles that we would normally experience out on the trail, up hill, down hill and cross grain.

One thing that we now truly appreciate is that when the manufacturer has placed a maximum load recommendation label on the vehicle and the warning that added weight can affect the balance of the vehicle, we believe them!

In our discussion at DPS we also talked about accessories that are common and other adjustments, such as tire pressures and suspension modifications that change the center of gravity. The bottom line is vehicle dynamics can be complex and whatever we do with our vehicles, getting used to how a vehicle reacts to the terrain and following the manufacturer's recommendations are important if you want to enjoy your ATV.

**What we observed:**

Adding a (185 lb) rider and 2 cases of water (67 lbs) changed the rear tip balance angle by more than 20 degrees, and a common loading ramp is within 20 degrees of the potential rearward tip angle, (a typical truck ramp angle is about 29°) and wheels are getting light even with a 20 degree terrain change. This demonstration session was just static measurement without the variables of rider positioning, suspension movement, or bouncing.

This gives us a new perspective of wanting to be sure that we load our vehicles appropriately and get the feel of how loads change the stability of our vehicles.

Let's encourage our fellow riders to be safe and not one of those (unfortunate?) sad data points on a Transportation Forensic report.

**Resources:**     ATV rider training "RiderCourse"                     [www.atvsafety.org](http://www.atvsafety.org)  
                      Specialty Vehicle Institute of America                 [www.svia.org](http://www.svia.org)  
                      Discover Today's All-Terrain Vehicles <sup>sm</sup> (DTA)         [www.atvinfo.org](http://www.atvinfo.org)

## Photos



Pre-testing weight bias measurements. Note accessories, rack, hand shifter and chest support.



Unloaded balance angle being measured



Cargo loaded balance angle being measured.



Utility ATV with cargo box, unloaded

*When a cargo box is loaded the balance point changes significantly.*



Truck loading ramp angle 29° typical