Summary Report on Advanced Warnings and the Prevention of Rollover and Runaway Crashes

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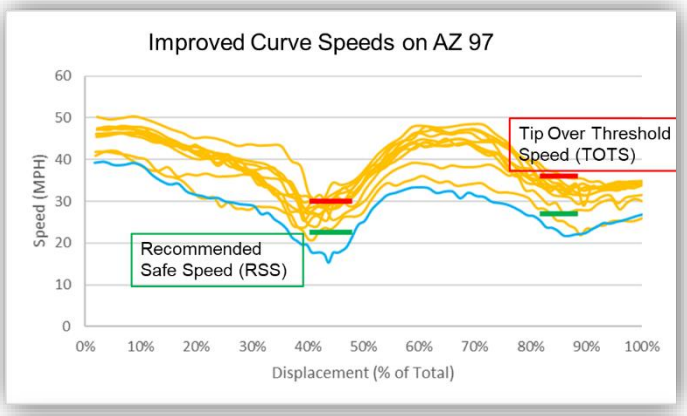
RoadAware Safety Systems LLC together with a bulk hauler partner, carried out a field trial of a new safety system called ***Road-Aware***. The trial involved 12 drivers using Class 8 tractors pulling bulk trailers carrying dry powder and liquid loads to a selected number of sites in Arizona and New Mexico over a period of 6 months. Over 1,000 runs across 8 difficult road segments were recorded and analyzed during the trial. GPS position and speed were recorded every second for the entire route.
The conclusions of the field trial are:

1. Drivers of semi-trucks are putting their loads, equipment, personal safety and customer relationship at risk by driving too fast through curves and down descents.
2. Driving performance is improved when drivers are provided with timely alerts and the correct speed for the next curve or descent.
3. Use of ***Road-Aware*** and coupled with management oversight, incentives and targeted training will all but eliminate truck driver at fault rollover and runaway crashes.

At the commencement of the field trial, it was expected that a wide range of driver behavior would be observed ranging from aggressive too conservative with some in between. Once the data were collected and plotted it was found that all the drivers were far too aggressive and that the speeds on curves were right at the edge of the stability threshold for fully loaded trailers.

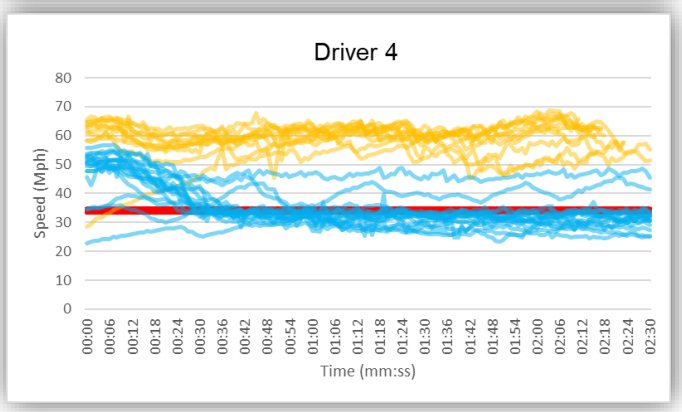
Speeds on Curves

This is an example of a positive change in driver behavior. All the runs shown in gold were runs completed during silent mode. The run shown in blue is in active mode showing that the driver responded to the alerts and slowed to below the Recommended Safe Speed (RSS).



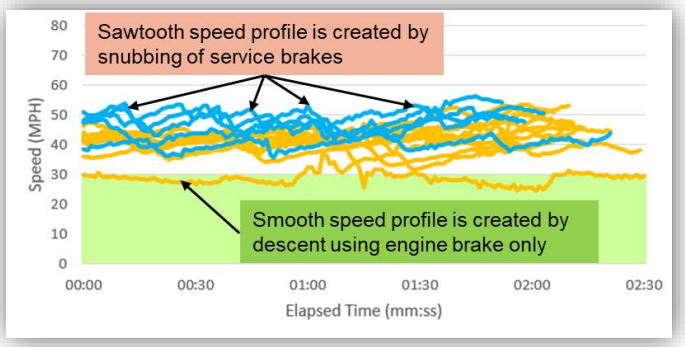
Descent Speeds

This graph illustrates a driver responding to alerts for slower descent speeds. (traces shown in blue) Note that the runs recorded in the baseline silent mode show speeds above 50 mph (traces in gold). The descent alert activates at the brake check pullout and the blue traces show that the driver responds with a lower speed for the descent.



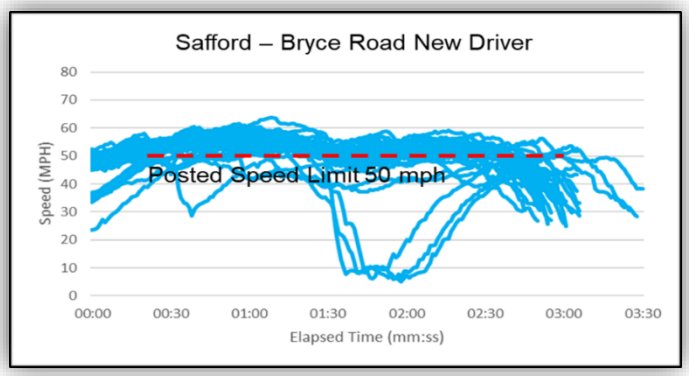
Braking Technique Assessment

The detailed presentation of speed and location provides a unique opportunity to assess driver braking techniques. The drivers shown at the right are using 'brake snubbing' to control their speed on the descent into Superior on US 60. This technique increases brake temperature, increases wear, and increases risk if the truck is required to make an unexpected stop on the hill or at the bottom of the hill.



Virtual Ride-Along: New Drivers

The field trial results illustrated the power of using ***Road-Aware*** to evaluate the performance of new and experienced drivers. ***Road-Aware*** records a GPS/speed point every second the truck is active. Analysis of this detailed data can reduce the number of active, ride-along events required to review driver performance. ***Road-Aware*** provides the opportunity for managers to evaluate the driving habits of new drivers and provide training and coaching support to improve the performance of all drivers. Recommendations supported by ***Road-Aware*** data can be used to focus coaching and training to help drivers overcome bad habits and reduce the risk to the company that accompanies a sloppy driver.



What is the Impact on Efficiency?

Managers and drivers will be concerned about the impact on efficiency if they are asked to slow down. To understand the magnitude of the reduction, a typical trip for an acid haul between Miami and Bagdad was examined. The total time for a round trip shows up as 9 hours on a Bing route. The additional time required to negotiate curves and descents at safe speeds totals 14 minutes with another 5 to 10 minutes for a stop at the brake check if required. The payoff is the elimination of rollover and runaway crashes that are caused by the driver of the truck.

Location or Feature	Time Difference
Several Curves – Miami to Top of World	1 minute
Descent from Top of World to Superior	6 minutes
Ramps between Superior & Wickenburg	1 minute
Two Roundabouts in Wickenburg	1 minute
AZ 97 - loaded	2.5 minutes
AZ 97 - Empty	2.5 minutes
Brake Check on US 60**	5 to 10 minutes
Total Time Difference	14 to 24 minutes

Although ***Road-Aware*** will not prevent all crashes it certainly will lead to improved driving performance which will eliminate certain types of crashes such as driver at fault single vehicle rollovers and driver at fault runaways. Companies can significantly reduce crash costs by using ***Road-Aware*** coupled with management oversight, additional training, daily scores, coaching, and performance incentives.