

## Study of Jack-Knifing Behaviour of a Truck Semi-Trailer System



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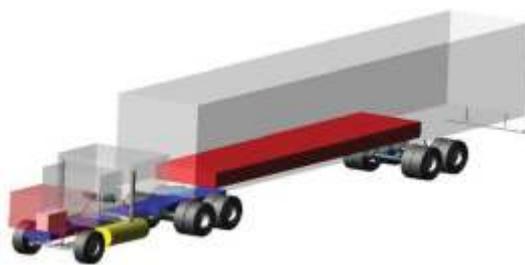
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**Abstract:**

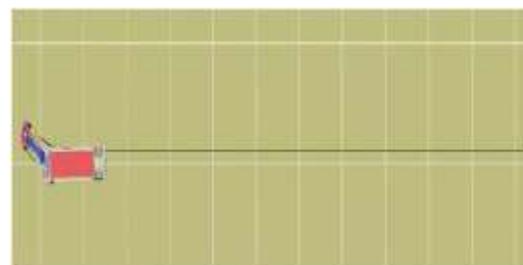
Most of the truck accidents occur due to roll-over or jackknifing. Jackknifing of a truck semi-trailer is caused when the vehicle becomes unstable during braking on low co-efficient of friction. Most of the stability issues related to trucks during jackknifing occur because the truck pivots backwards into the trailer. The present work is a study to reduce the probability of occurrence of jackknifing by varying parameters like truck wheelbase and tire cornering stiffness.

In this study, a benchmark truck was selected and the MBD model of the benchmark truck was built in ADAMS software. Various vehicle dynamic tests like braking and double lane change manoeuvres were simulated in MSC ADAMS software tool. The simulations were carried out for various speeds from 40 to 65 km/h for braking. Double lane change has been carried out for various speeds from 35 to 40 km/h as per ISO-3888 standards. All the vehicle dynamic tests were carried out for road co-efficient of friction ranging from 0.5 to 0.8. A parametric study was carried out to identify various parameters which can cause jackknifing.

Truck semi-trailer experienced jackknifing at speeds between 55 to 65 km/h for co-efficient of friction ranging from 0.5 to 0.8 during braking and 40 km/h for DLC manoeuvre. The lateral displacement of truck and trailer was observed to be high. It was observed that jackknifing can be avoided if there was significant increase in wheelbase of the truck and cornering stiffness of truck tires. The lateral displacement was also reduced when the changes were made with respect to wheelbase and truck tire cornering stiffness.



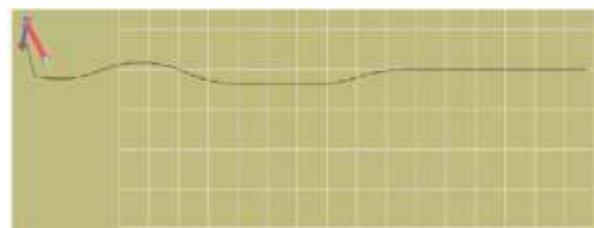
**MBD model of the truck semi-trailer**



**Truck semi-trailer braking path for speed of 70 km/h and  $\mu=0.7$**



**Path traced by truck semi-trailer during double lane change event**



**Path travelled during DLC by truck semi-trailer**