

“Jackknife”

A paper discussing the common causes of a jackknife condition

What is this term “Jackknife”, what is a jackknife and what causes a tractor-trailer(s) to jackknife? This term is used as a combination of vehicles while in tow can turn at the 5th wheel or the pintle hook and lunette eye at the trailer connections.

Jackknife as defined in the Air Brake Book is described as: “Uncontrollable articulation of a tractor-trailer typically resulting from lock-up or spinning of tractor drive axle(s)”. “The risk of jackknife is greatest on a slippery road with an empty or lightly-laden trailer in tow”.

The term originated from an old term used in a folding knife or a lock-back knife but commonly referred to as a “Jackknife” due to its ability to fold back into the handle from a straight and locked position.

Now let us examine the causes of a jackknife:

1. Drive axle tires slipping due to Jake Brake application on a slippery surface.
2. Tractor wheels locked up
3. Steering wheels lock up
4. Trailer wheels locked up
5. Poor brake balance
6. Sharp steering wheel turn by driver at speeds over 20 MPH, (cracking the whip)
7. Gearing down with a sharp clutch release

#1, 2, #5 & #7 = The drive axles on the power unit (tractor) are directly affected by the engine, exhaust or Jake Brake on the diesel engine. These brakes are not part of the service or emergency brake and are most commonly used where the driver might encounter travel in the mountains or hilly terrain. These engine brakes save a tractor-trailer combination from overheating the foundation brakes on the power and the trailer units when descending a grade. They also make a distinctive sound when in operation such as a deep sharp and even resonant roar from the exhaust stack. The drive axles will brake demonstrably when using this brake but it should never be used on flat or surfaces with low friction such as wet, snow, rain or fog. The resulting low friction on the surface of the roadway will cause the drive axles to lock up and the tractor spins around. This condition can also be caused by poor brake adjustment or brake imbalance. *The engine or Jake brake disengages upon acceleration. *This is a true jackknife.*

#2 = Tractor steer wheels locked. This is called a “Plow Out” and is caused by a mechanical failure of brake imbalance due to tight a brake adjustment on the #1 axle or the steer axle brakes. The driver cannot steer due to lock up. ABS is a cure for this rather uncommon anomaly. Not a true jackknife.

#4 = Trailer wheels locked. This is also caused by an imbalanced brake adjustment as compared to the tractor brake adjustment and the trailer “Swings Out” or “Spins”. Another cause is over use of the trailer or “Trolley” valve by the driver. This is seen when a driver is using his tractor while towing an intermodal freight chassis trailer or someone else’s trailer in order to save his own tractor brakes. Not a true jackknife.

#6 = Cracking the Whip. A sudden turning maneuver produced by the driver in a lane change at speeds over 20 MPH and as a result the higher the speed the more disastrous the consequences on the trailer sometimes resulting in an overturn if not a trailer out of control. Not a true jackknife although post accident it may appear to the lay observer to be one. Check for skidmarks!

Crack pressures on the many relays, lines and valves on an air-braked equipped tractor-trailer combination may result in the air not energizing the brake chambers at the same time in the combination of vehicles thus resulting in a jackknife or trailer swing condition.

Always look for and try to identify skidmarks and or a lack of all wheels braking. A thorough brake examination and teardown would be very helpful post-accident.

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