

The effect of tyre characteristics on how a car handles

A definition of handling

“Handling” is

different to maximum steady state
lateral

acceleration (“grip”)

Slightly awkward to define

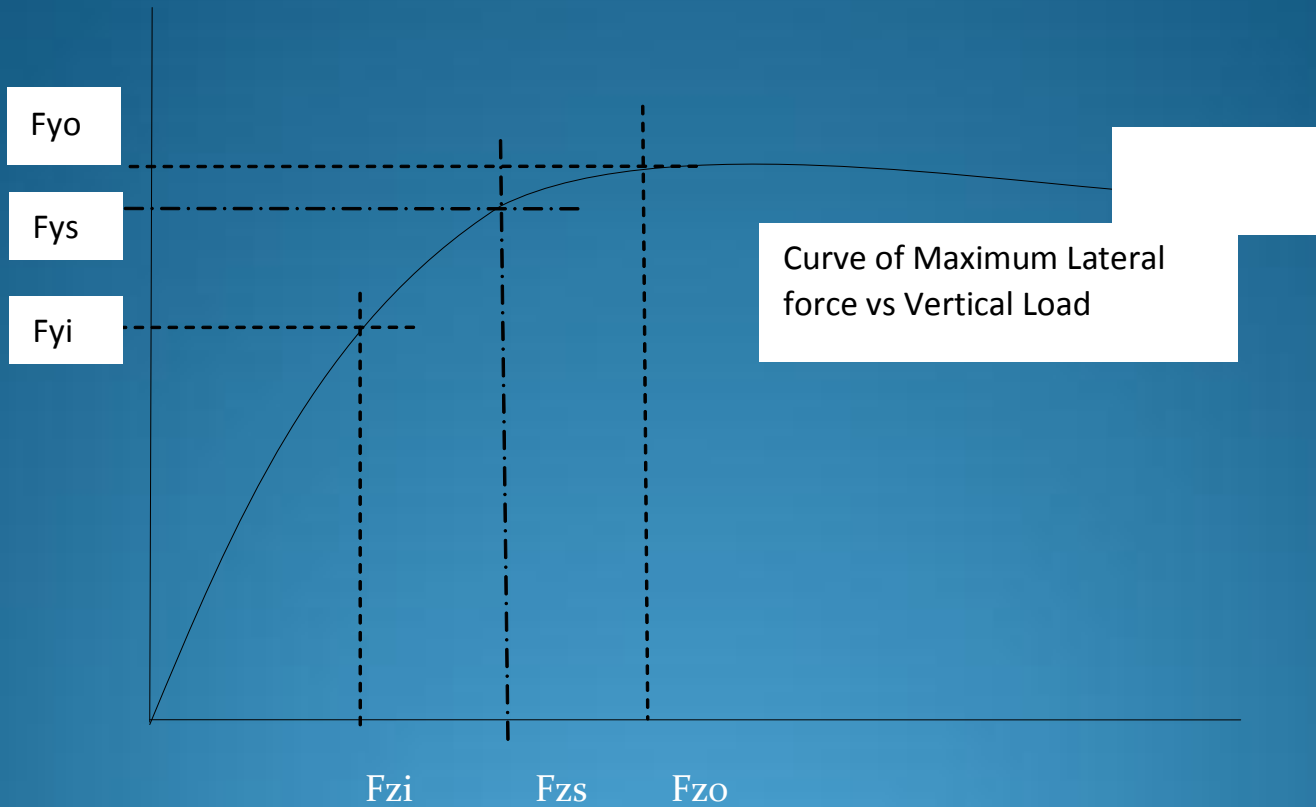
Prodrive’s working definition

“a quality of a vehicle that
allows or even

encourages the operator to
make use of all
the available grip”

[Car Handling - Grip, Oversteer amp;...\\.\Documents and Settings\All Users\Desktop\QuickTime Player.Ink](#)

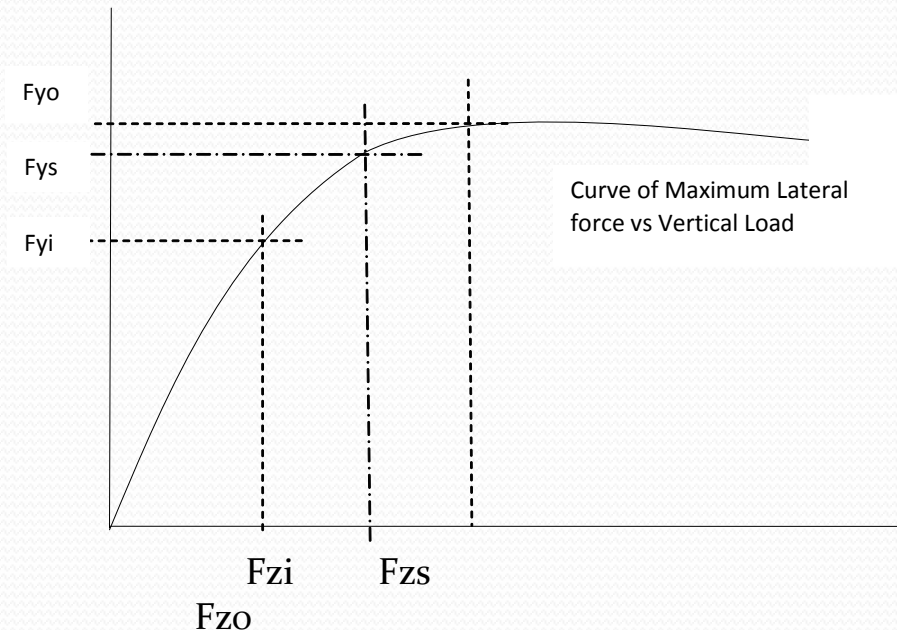
Typical Tyre Behaviour



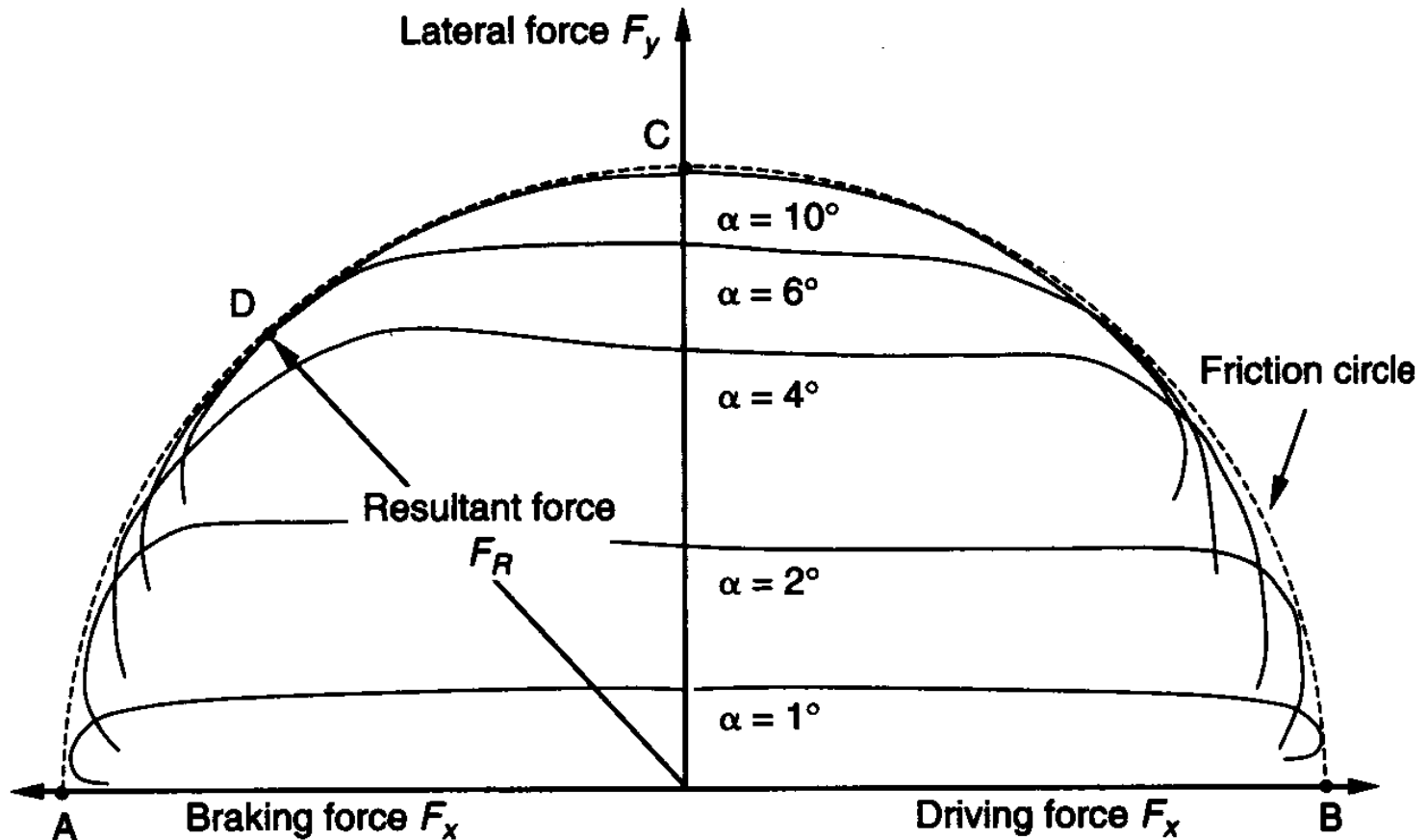
Increasing Weight transfer

The greater the weight transfer the greater the difference in vertical loads between inner and outer wheels .

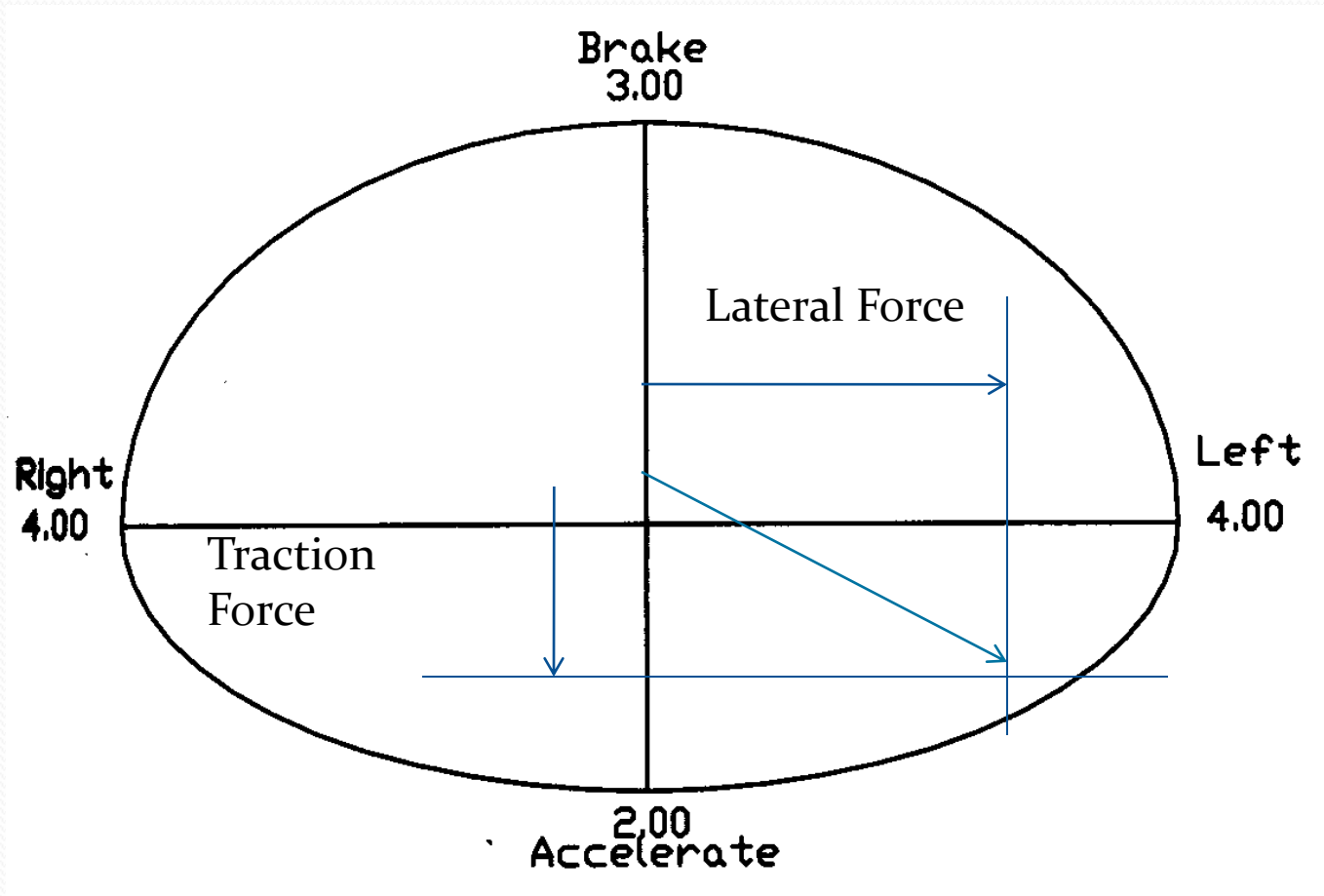
This leads to a loss of lateral force and grip



Traction Circle

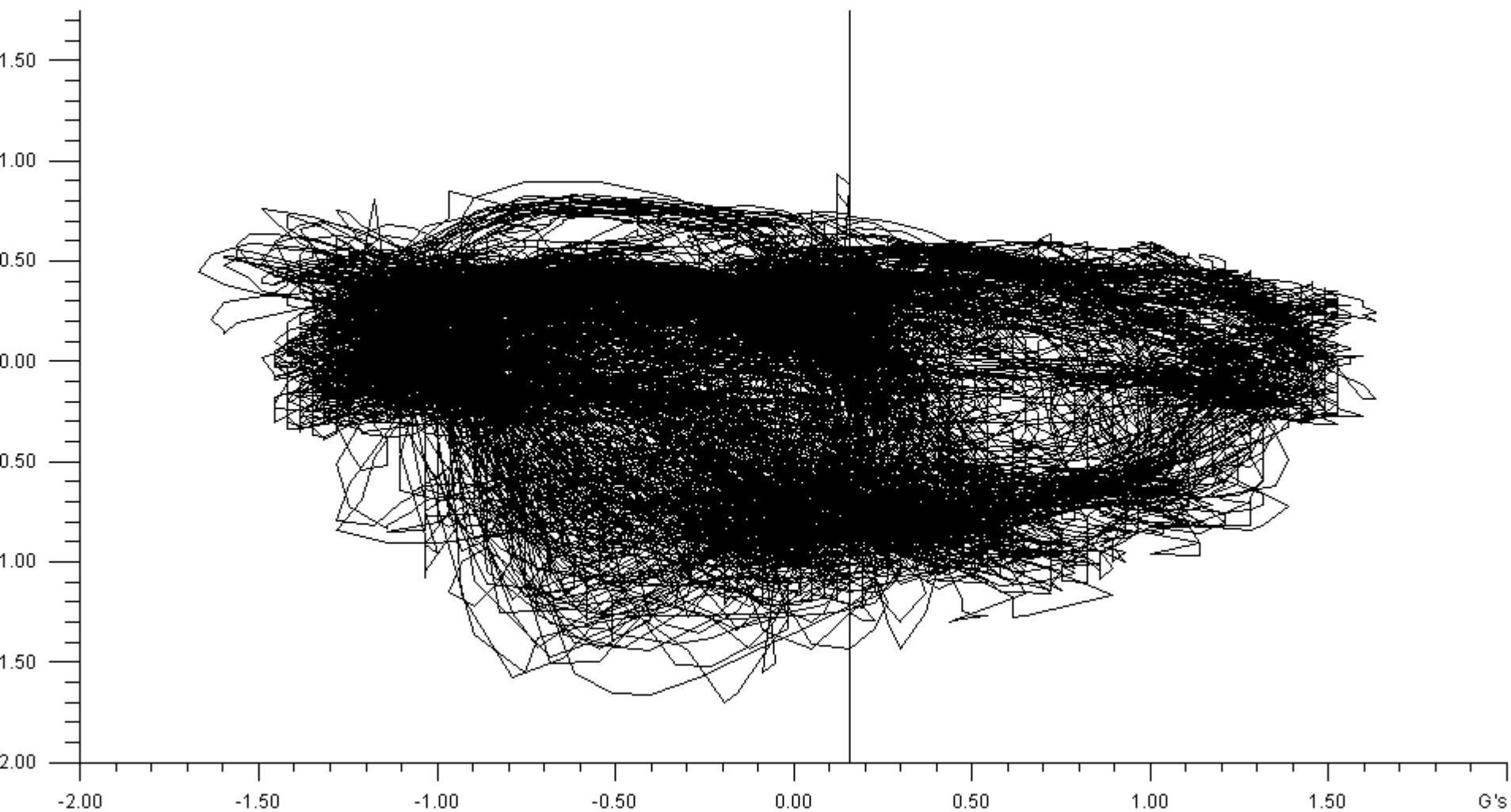


Traction Circle (another version)





G's



Time 0.000 (secs) Lateral Accel -0.23 (G's) Inline Accel 0.00 (G's)

042:002:001 - 034 59:45.76 MATT GT 2

Inline Accel (G's)
Brands Indv

Neutral Steer

The SAE defines neutral steer as :

*A vehicle is **neutral steer** at a given trim if the ratio of the steering wheel angle to the overall steering ratio [ie the actual steered wheel angle] equates to the Ackerman steering angle for a given radius of turn.*

Which means ...

If the amount you have to turn the steering wheel to go round a particular corner at speed is the **same as** when travelling at very low speed then that is **neutral steer**

Understeer

*A vehicle is **understeer** at a given trim if the ratio of the steering wheel angle to the overall steering ratio is greater than the Ackerman steering angle for a given radius of turn*

Which means....

- If the amount you have to turn the steering wheel to go round a particular corner at speed is **greater than** when travelling at very low speed then the car is **understeering**

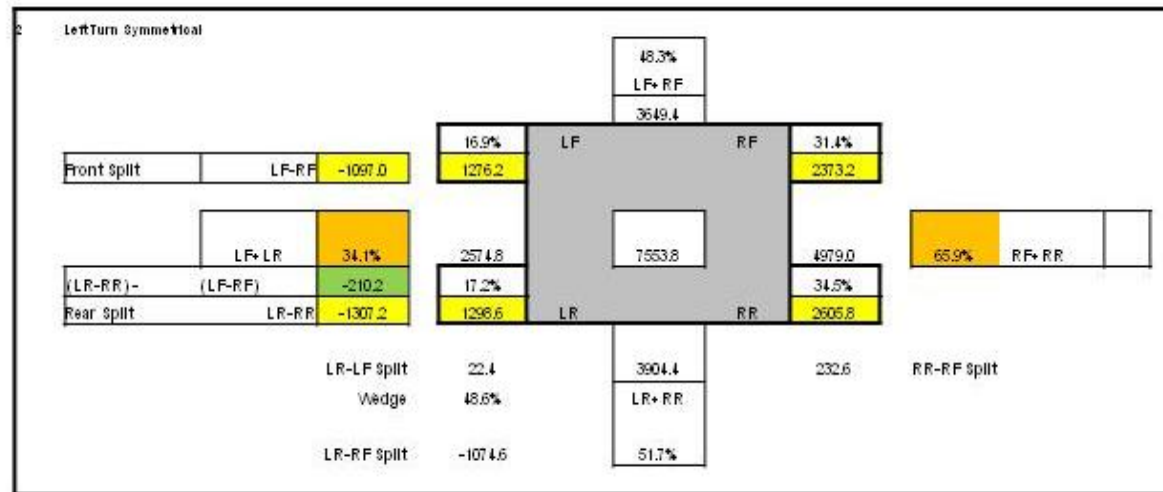
Oversteer

A vehicle is oversteer at a given trim if the ratio of the steering wheel angle to the overall steering ratio is less than the Ackerman steering angle for a given radius of turn

Which means

If the amount you have to turn the steering wheel to go round a particular corner at speed is **less than** when travelling at very low speed then that is **neutral steer**

Wheel load distribution as a guide to potential handling behaviour



The car behaves in the same way on left and right hand turns

Straight line braking and acceleration are achieved best due to equal wheel loads when travelling straight

The handling balance of the car will be influenced by the difference between Front and Rear Splits

In this symmetrical case the Front Split is 1097 N and the rear Split is 1307 N for both left and right hand turns. The difference between front and rear splits is 210 N in each case indicating **oversteer**.

The overall grip of the car will be influenced by the magnitude of the difference between Left and Right splits. In this case the difference is **31.8 %**
(34.1% and 65.9% in each direction of turn)