Lateral Load Transfer Front and Rear in Cornering

Lateral load transfer on each axle from elastic (roll stiffness) and geometric (roll centre) parts, the outer wheel loads and the front share of total transfer.

Method: Lateral load transfer with roll axis

Input parameters

Unit system: SI

Parameter	Value	Unit
Sprung mass	1,350.0	kg
CG to front axle	1.2000	m
Wheelbase	2.7000	m
CG height above roll axis	450.00	mm
Front roll centre height	50.000	mm
Rear roll centre height	100.00	mm
Front track	1.5500	m
Rear track	1.5500	m
Front share of roll stiffness	60.000	%
Lateral acceleration	5.8840	m/s²

Calculated results

Parameter	Value	Unit
Front axle load transfer	1.5260	kN
Rear axle load transfer	1.1502	kN
Front outer wheel load	5.2035	kN
Rear outer wheel load	4.0922	kN
Front share of transfer	57.021	%

Notes for this case

• ΔF_f = a_y[λm_sh' + m_sfh_rf]/t_f: the elastic part goes through springs and bars in proportion to roll stiffness, the geometric part through the links at each roll centre. More transfer on one axle lowers that axle's total grip (tyre load sensitivity), so a car with more front transfer understeers. Unsprung mass transfer is ignored.

Formula and method

$$\Delta F_f = \frac{a_y(\lambda m_s h' + m_{sf} h_{rf})}{t_f}, \quad \Delta F_r = \frac{a_y((1-\lambda) m_s h' + m_{sr} h_{rr})}{t_r}$$

Variables

m_s	Sprung mass	kg
a	CG to front axle	m
L	Wheelbase	m
h'	CG height above roll axis	m
h_{rf}	Front roll centre height	m
h_{rr}	Rear roll centre height	m
t_f	Front track	m
t_r	Rear track	m

λ	Front share of roll stiffness	-
a_y	Lateral acceleration	m/s²
ΔF_f	Front axle load transfer	N
ΔF_r	Rear axle load transfer	N
$F_{o,f}$	Front outer wheel load	N
$F_{o,r}$	Rear outer wheel load	N
$\Delta F_f / \Delta F$	Front share of transfer	-

Method and standards

Load transfer.

Assumptions and limits

- Steady cornering; unsprung masses neglected; linear roll.

References

Lateral load transfer with roll axis

Report details

Report reference	FCC-CA9V-WSC2 (the same inputs always give the same reference)
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Release checks	3 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/automotive/vehicle-dynamics/lateral-load-transfer-split

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.