Constraints

When comparing laptime across different setups, strictly speaking one should rebalance the car. Constraints provide a quick and easy way to rebalance the car mechanically or aerodynamically.

For a study given with constraints, the Constraints Satisfier will automatically be run first to determine the new setup parameters (hRideSetup, ARB rStiffnessScaling, etc.), so that a new car with these setup parameters can be created to run the selected simulation(s), as normal. This new car can then be staged / saved / compared from the constrained study, to be reused in further simulations without the need to run with Constraints each time. You can see what trims were applied by checking the scalar results of the constrained study: -

Constraint Scalar Results

Straight Sim

Name	Value	Units	Description
rStiffnessScalingARBF	0.0528	-	Front ARB stiffness scaling factor required to satisfy the dynamic constraints.
rStiffnessScalingARBR	1.3688	-	Rear ARB stiffness scaling factor required to satisfy the dynamic constraints.
aFlapF	79.5448	-	Front flap angle/value required to satisfy the dynamic constraints.
hRideFSetupRequired	25.475	mm	The front setup ride height required to satisfy the constraint(s).

The following constraints are currently available for all our customers: -

Ride Height Constraints

Front and rear, symmetric or asymmetric, ride height constraints can be specified at a given Straight Sim or Limit Sim condition. These constraints are satisfied through trimming the car's "Ride Height Adjust Method", given in the Car Config, and the Constraint Satisfier outputs new values for the Setup Ride Heights (hRideFSetup, hRideRSetup etc).

For a left-right symmetric car, the user has the option to constrain the front and / or rear ride height. For an asymmetric car, up to three of hRideFL, hRideFR, hRideRL and hRideRR can be constrained (since the chassis is rigid, only three points are required to fully constrain the body - the fourth is determined by the other three).

- Ride Heights (Straight Sim)

These constraints trim the car at a Straight Sim point, defined by the user-specified vCar.

- Ride Heights (Limit Sim)

These constraints trim the car at a Limit Sim point, defined by the user-specified vCarTangential, Angle in g-g Plane and gFocus. Note that these "Limit Sim Constraints" can be run with any simulation - the Constraint Satisfier will run the required Limit Sim to constrain the car, before then running the specified simulation(s).

Bottoming

This undertray bottoming constraint constrains the ride height or vertical load of the front and / or rear of the undertray, through trimming the car's "Ride Height Adjust Method" at a Straight Sim point, defined by the user-specified vCar.

Aerobalance

This aerobalance constraint constrains rAeroBalTotalF at a given Straight Sim or Limit Sim condition, trimming one of:

- Front ride height;
- Rear ride height;
- Front flap angle;
- Rear flap angle;
- rAeroBalanceUserOffset.

By default, this aerobalance constraint is satisfied at the Straight Sim condition, defined by the user-specified vCar. If the "Limit Sim Options" are enabled, the aerobalance constraint will instead be satisfied at the Limit Sim condition, defined by the user-specified vCar, Angle in g-g Plane and gFocus.