IIIRace Louvers

Professional R&D - Wind Tunnel Tested - Track Proven

info@racelouvers.com - www.racelouvers.com

908-447-5788



Fender Louver CFD Analysis

Welcome to Race Louvers. Here we did some CFD analysis on our three fender vent options, our curved over the tire, upper rear and lower rear kits as well as various fender liner setups. CFD testing was done on a fully scanned Mustang and that same Mustang was later put in the wind tunnel for correlation.

Test car prep level:

- Mustang with AJ Hartman Aero package and Race Louvers hood and fender extractors
- CFD scans include exterior, underbody, wheel well, front grill area, engine bay and louvers.
- CFD was performed by Kyle Forster of JKF Aero, former Mercedes F1 lead aerodynamisist
- Wind Tunnel testing performed at Aerodyne Wind Tunnel

Fender vents tested:

- Curved over the tire RSF fender louvers
- Upper rear RSF fender louvers
- Lower rear FL fender louvers
- Oe fender liner, fender liner cutouts and no fender liner

Test procedure:

- 1. CFD analyse our three different fender louver options with various liner setups
- 2. Wind Tunnel test the curved over the tire with various liner setups for for real world data
- 3. Verify correlation

Conclusions:

- All fender louver setups increase front downforce, increase cooling and have near zero drag.
- Since the curved over the tire and upper rear kits are about the same size on various other cars and the rear lower size various depending on the car, all three fender louver setups work about the same if comparing our medium size 14x10 or 15x8 rear lower, if using a smaller rear lower it will function slightly less, if using a larger rear lower it will function slightly better.
- If front downforce is the primary goal then the fender liner should remain and a hole should be cut in it near the louver, this maximizes front downforce but still provides some cooling. If the primary goal is improved cooling then the front of the fender liner should be removed as well as a hole should be cut in it near the louver, this maximizes cooling but still provides some front downforce.
- All three fender louver setups net a similar result, two will net almost double, three is a waste of your time and money we just offer three for customer preference.
- Wind Tunnel testing has shown good correlation to our CFD testing.
- Other Wind Tunnel testing has shown other make and model cars have similar gains.
- CFD Is a simulation of the real world. In order to net the best results, scans of the vehicle's exterior, underbody, wheel well, front grill and engine bay are critical to accuracy. Remember air flows over the car, under the car and through the car. Use of an external scan only or CAD modeling of the engine bay for example instead of scanning it or testing a part in free stream air instead of on an actual car can lead to very inaccurate data.

Video: <u>https://www.youtube.com/watch?v=TQaJgdPdIaw&t=16s</u>

CFD Data



Aero Analysis



CFD - Coefficient Of Lift

Aero Analysis



A



CFD Is a simulation of the real world. In order to net the best results, scans of the vehicle's exterior, underbody, wheel well, front grill and engine bay are critical to accuracy. Remember air flows over the car, under the car and through the car. Use of an external scan only or CAD modeling of the engine bay for example instead of scanning it or testing a part in free stream air instead of on an actual car can lead to very inaccurate data.



Race Louvers RSF Curved Over the Tire



Race Louvers RSF Upper Rear



Race Louvers FL Lower Rear



Race Louvers RSF Curved Over The Tire



Race Louvers RSF Upper Rear



Race Louvers FL Lower Rear

Wind Tunnel Data

Aerodyne Wind Tunnel Front Downforce



Speed (80/100/120 mph)

Wind Tunnel Data Curved Over The Tire Louver - Front Downforce

Here we look at front down force with a liner notch vs no front liner



Speed (80/100/120 mph)

Wind Tunnel Data Curved Over The Tire Louver - Drag

Here we look at drag with a liner a liner notch vs no front liner

Aerodyne Wind Tunnel Radiator Differential Pressure Percent Increase (Cooling Air Flow Increase)



Wind Tunnel Data Curved Over The Tire Louver - Standard Front Center Mount Radiator Cooling

Here we look at the radiator differential pressure increase from fender venting with a liner notch for max front downforce, fender venting with no front liner for max cooling and hood vents. Generally speaking hood vents are far more effective at radiator cooling than fender vents.



Aerodyne Wind Tunnel Oil Cooler Differential Pressure Percent Increase (Cooling Air Flow Increase)

Wind Tunnel Data Curved Over The Tire Louver - Front Corner Mounted Oil Cooler Cooling

Speed 100mph

Here we look at the front corner mounted coolers differential pressure increase from fender venting with a liner notch for max front downforce, fender venting with no front liner for max cooling and hood vents. Generally speaking fender vents are far more effective at front corner mounted oil cooler cooling than hood vents.

> Race Louvers LLC 908-447-5788 info@racelouvers.com

1/19/23

Rev 1.0



No Fender Vent



Race Louvers RSF Curved Over The Tire Fender Vent









CFD - Wind Tunnel Comparisons





Speed (80/100/120 mph) - Dark Colors Actual Wind Tunnel Data - Light Colors Extrapolated CFD Data

Wind Tunnel Data - Front Downforce

Here we did actual Wind Tunnel testing using our curved over the tire louver with a notched liner on the same exact car used in the CFD testing. Using the CFD data from all three louvers and the Wind Tunnel Data from the curved over the tire louver we extrapolate Wind Tunnel data for the upper rear and lower rear louvers. It should be noted we list the lower rear twice, once for our largest kit and once for our smallest kit as size affects functionality. So generally, all three louvers/locations function about the same if the rear lower is our medium size kit.

Race Louvers LLC 908-447-5788 info@racelouvers.com

Aero Analysis



CFD Data - Drag



Wind Tunnel Data - Drag

Here we did actual Wind Tunnel testing using our curved over the tire louver with a notched liner on the same exact car used in the CFD testing. Using the CFD data from all three louvers and the Wind Tunnel Data from the curved over the tire louver we extrapolate Wind Tunnel data for the upper rear and lower rear louvers. It should be noted we list the lower rear twice, once for our largest kit and once for our smallest kit as size affects functionality. So generally, all three louvers/locations function about the same if the rear lower is our medium size kit.