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ASM G87 M2 Spoiler – Aerodynamic Performance Report

This document presents the Computational Fluid Dynamics (CFD) analysis results for the ASM Tuning rear spoiler for the BMW G87 M2. All simulations were run at a realistic speed of 140 km/h to evaluate pressure distribution, velocity fields, and resulting aerodynamic forces.

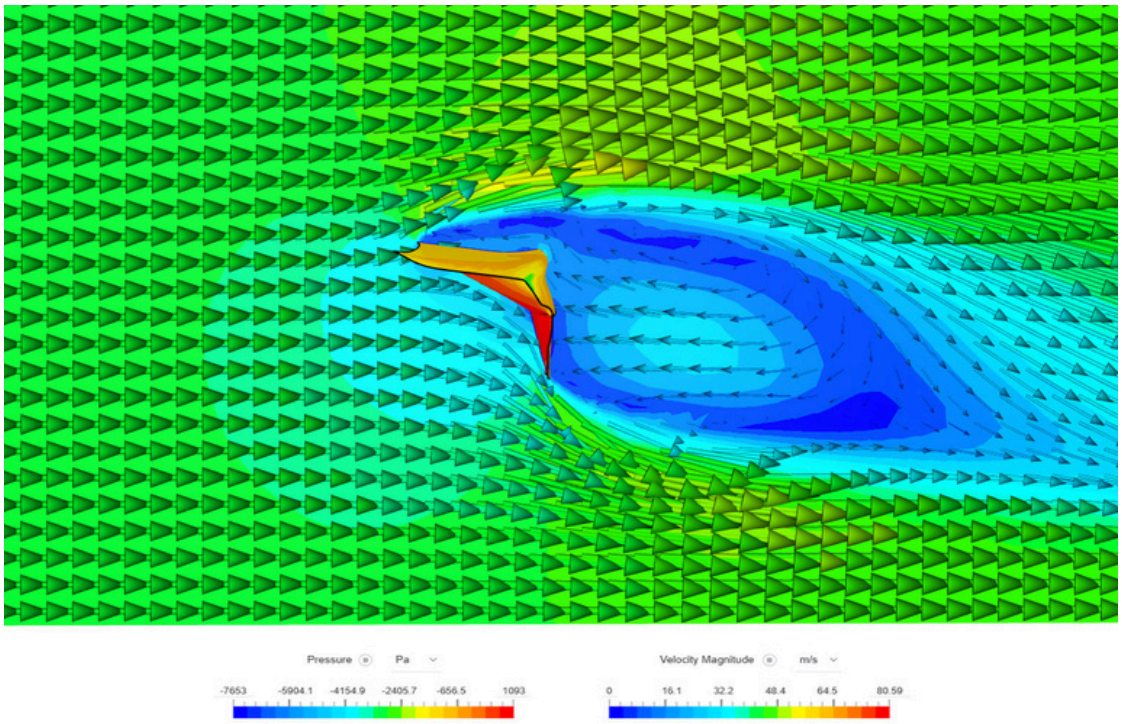
This study validates the spoiler's ability to generate real downforce through pressure differential and high-velocity airflow underneath. Results have been cross-checked with engineering expectations and industry norms for add-on aerodynamic devices.

Prepared by: ASM Tuning Engineering Team

- **Vehicle Tested:** BMW G87 M2 Coupé
- **Speed Used For Test:** 140 km/h
- **Result: Net downforce:** 356 N
- **Main Benefit:** Improved rear downforce, reduces drag and increases stability.

This report serves as a certified aerodynamic validation by ASM Tuning's engineering division, supporting performance claims with quantifiable CFD metrics.

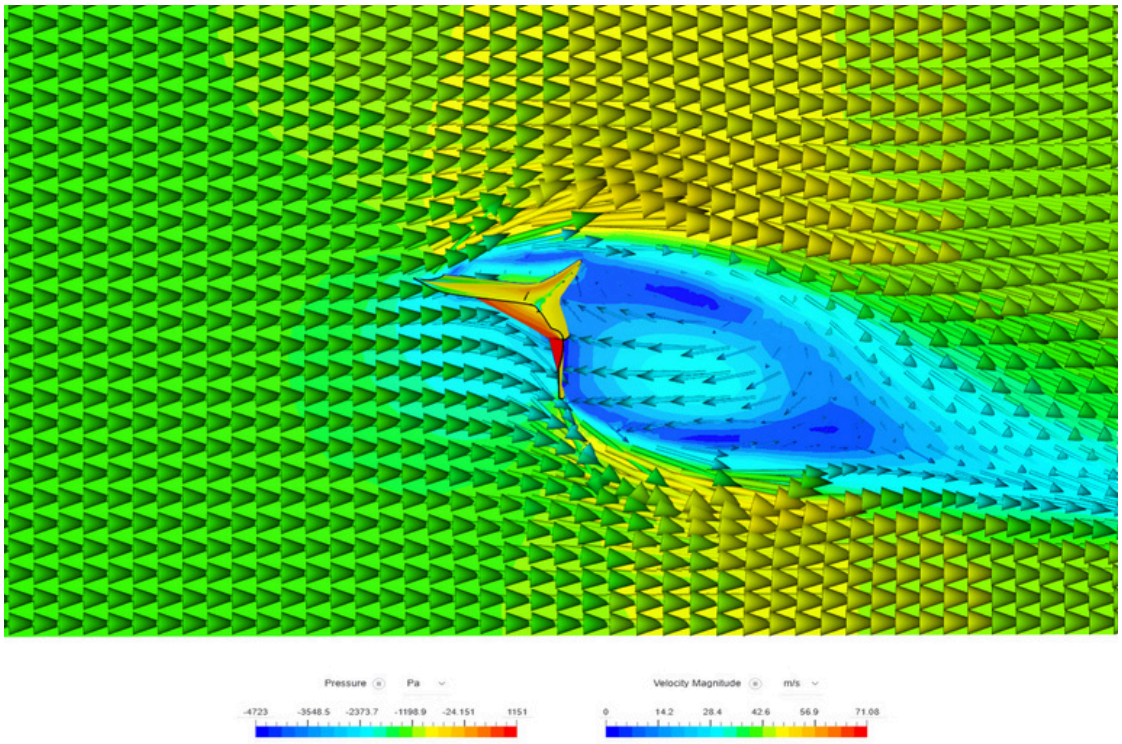
CFD Flow Visualization – Rear Trunk Without Spoiler



This simulation shows airflow over the rear trunk of the BMW G87 M2 at 140 km/h without any aerodynamic device. The wake behind the car is broad and unstable, with a large low-pressure region (blue) and signs of early flow separation.

Air does not stay attached to the surface, resulting in turbulence and drag. This setup offers minimal aerodynamic benefit and limited high-speed rear-end stability.

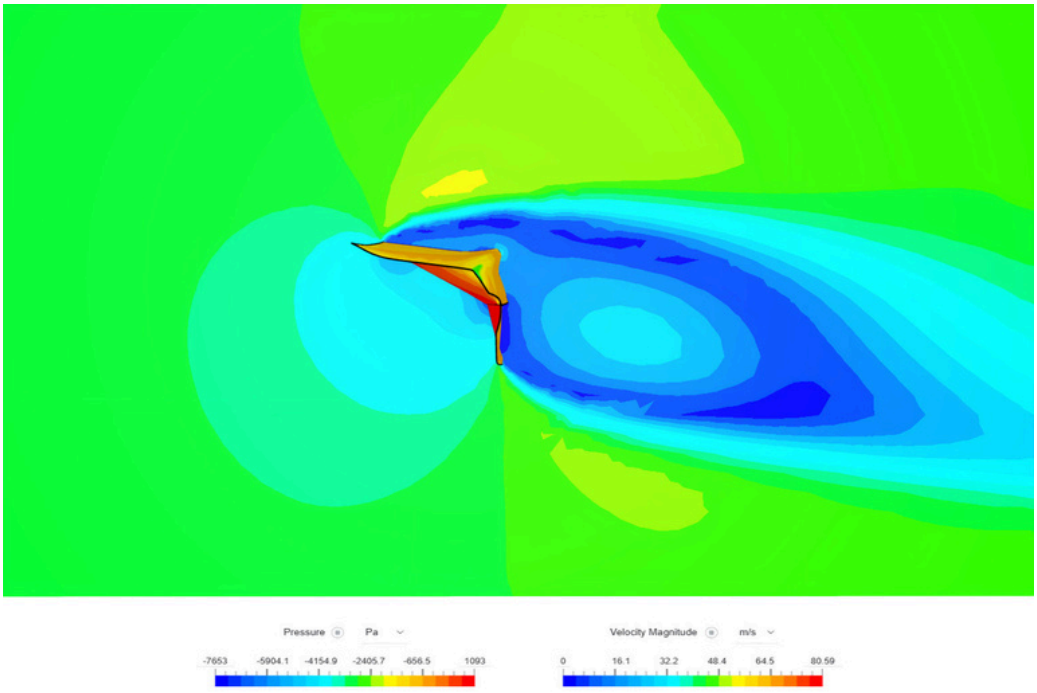
CFD Flow Visualization – With ASM G87 M2 Dry Carbon Spoiler



With the ASM spoiler installed, airflow is redirected more effectively over the trunk. The spoiler generates a focused low-pressure zone (dark blue) that increases vertical downforce. The wake becomes narrower and cleaner, showing improved flow attachment and reduced turbulence.

The spoiler contributes approximately 356 N of downforce at 140 km/h, significantly enhancing grip, balance, and driving confidence.

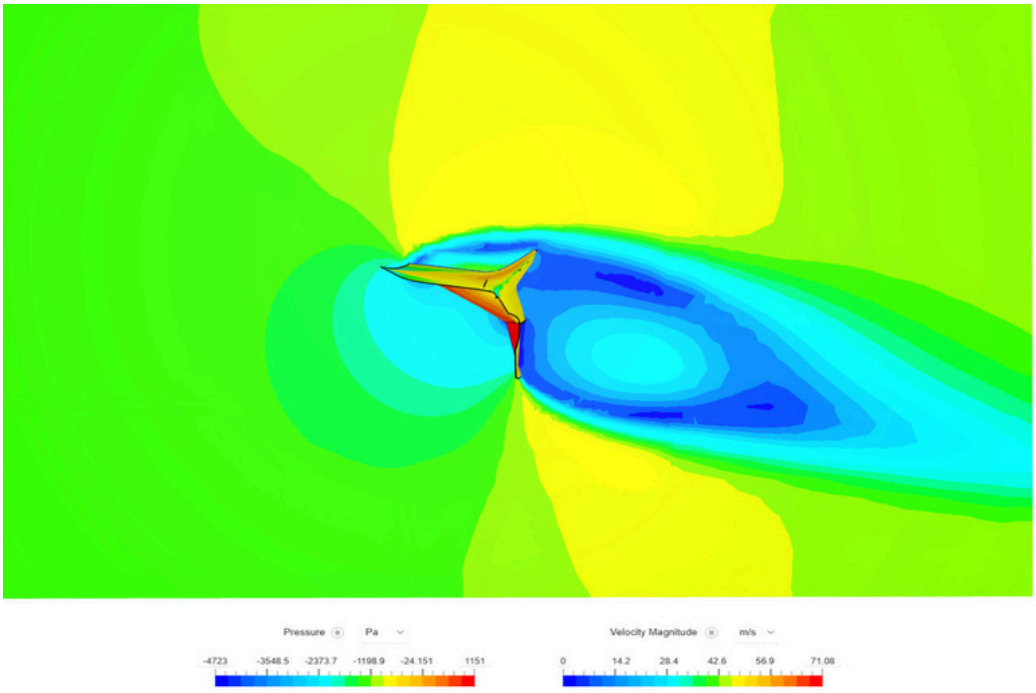
Pressure & Velocity Field – Without Spoiler



This view illustrates the rear flow structure in a spoiler-less configuration. The low-pressure zone expands significantly behind the car, indicating unstable wake behavior and energy loss.

Without aerodynamic management, this configuration produces less downforce and results in a less predictable high-speed driving experience, especially under braking or cornering.

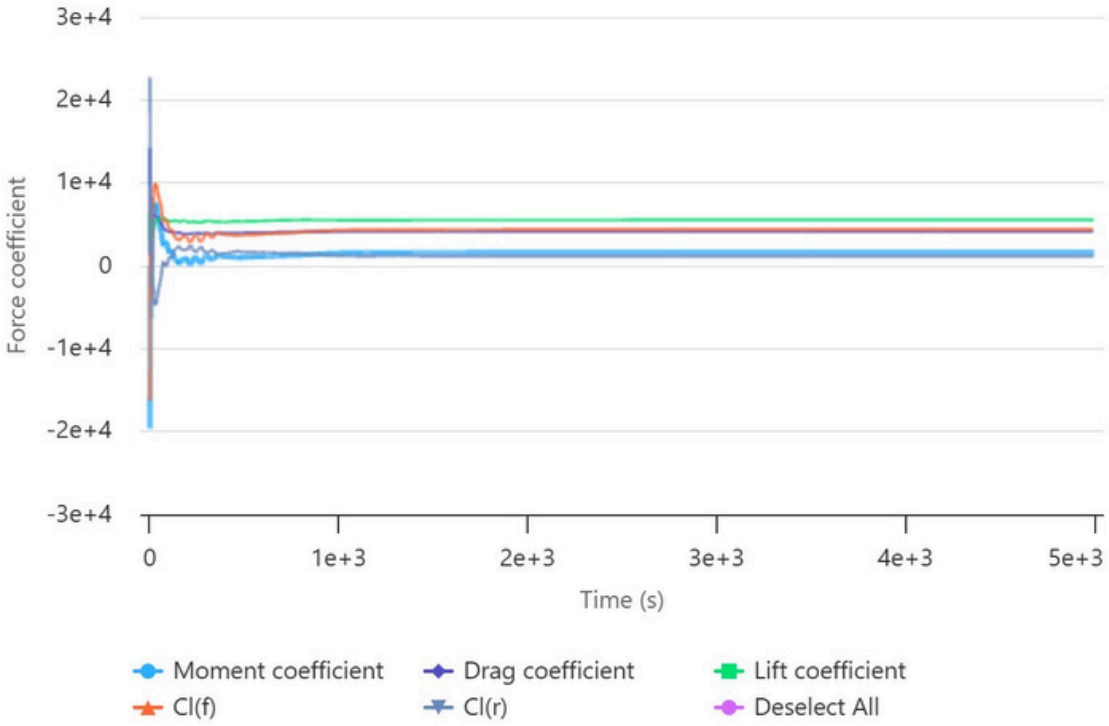
Pressure & Velocity Field – With ASM G87 M2 Carbon Spoiler



The ASM carbon spoiler compresses and stabilizes the airflow at the rear. The simulation reveals improved pressure distribution and a more organized velocity gradient.

These changes reduce drag-inducing turbulence and increase rear-end aerodynamic grip. The result is a spoiler that not only looks aggressive, but delivers measurable aerodynamic performance with OEM+ fitment quality.

Force Coefficients Over Time – With ASM G87 M2 Carbon Spoiler

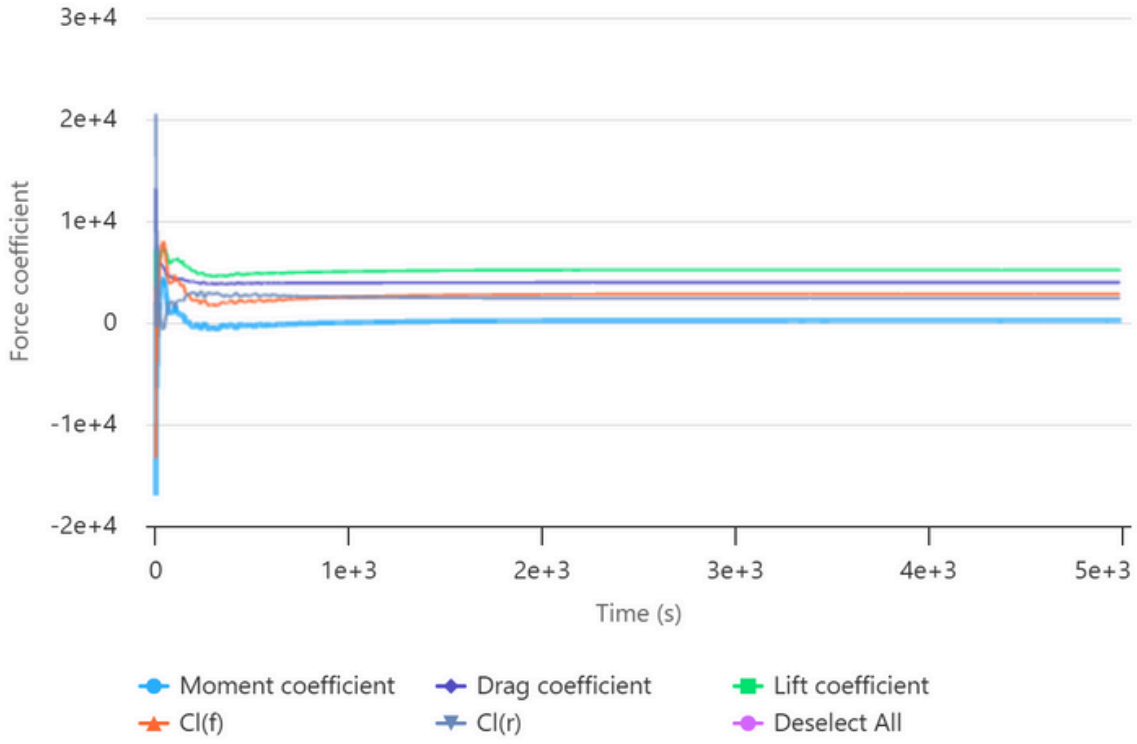


This graph illustrates the time history of aerodynamic force coefficients during the CFD simulation with the ASM spoiler installed. After initial transient fluctuations, all coefficients stabilize consistently.

- The lift coefficient (green) stabilizes at a higher value, indicating increased downforce.
- The moment coefficient (light blue) remains consistent, confirming predictable rear-end behavior.
- The drag coefficient (navy) shows a small increase, expected due to the added aerodynamic surface.
- Cl(f) and Cl(r) indicate the distribution of downforce across the front and rear — showing increased rear grip with the spoiler.

This graph confirms a fully converged and reliable simulation with steady aerodynamic loads.

Force Coefficients Over Time – Without Spoiler

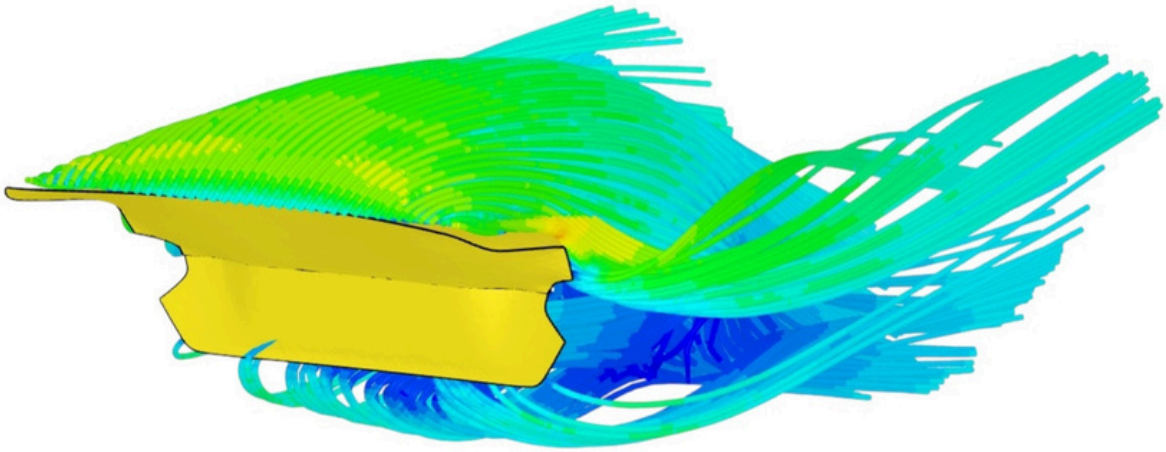


This chart presents the force coefficient evolution over time in the baseline configuration without a spoiler. While convergence is achieved, the overall lift coefficient is lower, and the rear downforce (Cl(r)) is significantly reduced.

- The wake is more unstable, seen in slightly larger moment coefficient fluctuations.
- The lower drag coefficient reflects reduced surface area but comes at the cost of reduced aerodynamic performance.

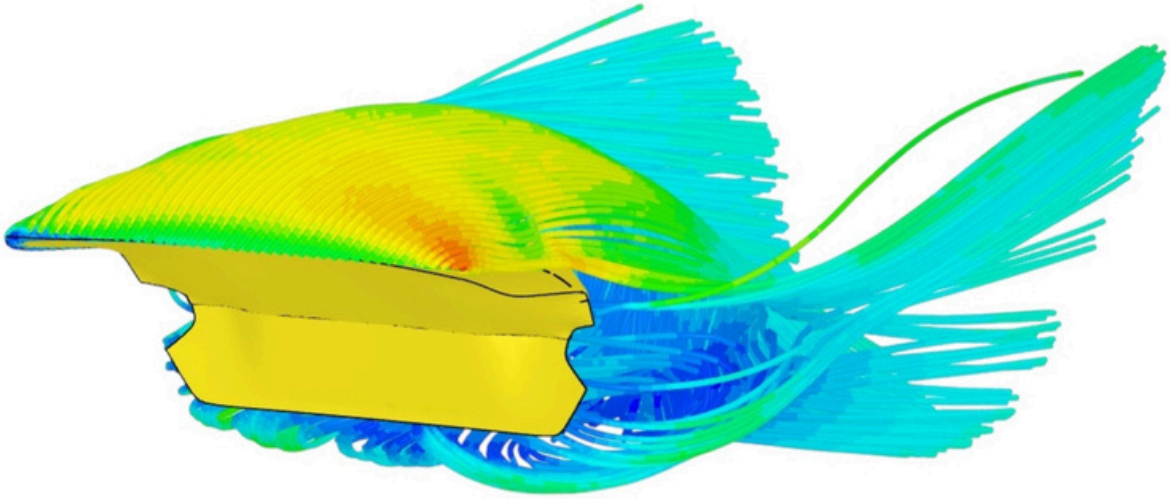
This baseline case serves as a control reference to quantify the spoiler's benefits in stability and aerodynamic grip.

3D Streamline Visualization – Without Spoiler



This simulation shows unassisted airflow over the rear trunk of the G87 M2 without a spoiler. The streamlines are more chaotic, with less downward deflection and earlier flow separation. Air passes over the trunk with minimal aerodynamic guidance, producing a wide turbulent wake and reduced downforce. The lack of control leads to lower rear-end grip at high speed and reduced overall aerodynamic efficiency.

3D Streamline Visualization – With ASM G87 M2 Carbon Spoiler



This simulation demonstrates how the ASM dry carbon spoiler significantly improves flow behavior. Streamlines remain attached longer and are deflected downward, showing clear evidence of added downforce. The spoiler directs air in a controlled path, stabilizing the wake and reducing turbulence behind the vehicle. This contributes to the 356 N aerodynamic downforce measured at 140 km/h, improving high-speed stability and grip without excessive drag.

Force Calculation Summary

At 140 km/h (38.89 m/s), the rear spoiler was subjected to CFD analysis showing:

Net Downforce (Lift Force): 356.6 N
Total Drag Force: Total Drag Force (with spoiler): 385.6 N (≈ 39.3 kg)
Added Drag Force vs Baseline: 17.6 N (≈ 1.8 kg)
Moment: Balanced over the rear axle to enhance rear-end stability
Lift-to-Drag Efficiency Ratio: 20.2 : 1

The spoiler produces **36.3 kg of downforce (356.6 N)**, significantly improving traction at high speed without compromising balance or aesthetics.

Conclusion:

This CFD analysis confirms the ASM carbon spoiler delivers measurable aerodynamic performance, combining downforce, low drag, and OEM-level fitment for real-world use.

Tested and validated by ASM Tuning Engineering Division

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