

# Project Apex Race Report - Race Event

## Executive Summary

The race performance analysis reveals clear tiers of competitive strength, with tire management and driver consistency emerging as critical differentiators. BMW demonstrated outright dominance, consistently leading the field with superior average green flag pace (Rank 1 in manufacturer pace ranking, averaging +119.827s). Car #39 (BMW) showcased exceptional consistency with a low race\_pace\_consistency\_stdev of 0.438. Ford, Porsche, and McLaren formed a strong chasing pack, consistently operating well above the field average. Ford (Rank 2, +120.227s) and Porsche (Rank 3, +120.532s) maintained strong positions, while McLaren (Rank 4, +120.623s) also showed competitive speed. Aston Martin (Rank 5, +120.737s) and Cupra (Rank 6, +120.742s) established themselves as strong upper-midfield contenders, exhibiting competitive pace. Honda occupied a consistent mid-field position (Rank 7, +120.919s), operating slightly quicker than the overall field average. Mercedes-AMG, despite a lower overall manufacturer pace ranking (Rank 8, +121.165s), showed flashes of top-tier potential. Car #57 (Mercedes-AMG) recorded an optimal lap time of 1:55.912, the fastest among all manufacturers, indicating strong raw speed. However, their overall average pace was hampered by significant tire degradation (Mercedes-AMG ranked 10th in tire wear, 0.0722 average value). Hyundai (Rank 9, +122.118s), Toyota (Rank 10, +122.364s), and particularly Audi (Rank 11, +122.525s) faced significant performance deficits. Audi was the slowest in the field, with a substantial pace disadvantage and the worst tire degradation (Audi ranked 11th in tire wear, 0.2289 average value, with Car #56 showing an extreme deg\_coeff\_a of 0.362937). Toyota, despite its poor overall pace, surprisingly exhibited the best tire wear characteristics (Rank 1 in tire wear, -0.0193 average value). The biggest strategic differentiator in this race was tire management, with stark contrasts between manufacturers like Toyota (excellent degradation) and Mercedes-AMG/Audi (poor degradation), significantly impacting overall race pace and consistency. Pit stop efficiency also played a role, with some teams incurring substantial time losses in the pits.

## Tactical Insights

- {'team\_type': 'leading', 'team\_name': 'BMW', 'recommendation': "While BMW's overall pace and consistency are exemplary, a deeper dive into driver performance reveals opportunities for optimization within some cars. To maintain and extend their advantage, BMW should focus on targeted driver coaching and setup adjustments to bring the secondary drivers closer to the pace of their faster teammates.", 'justification': "Car #96 shows a 2.014s average lap time delta between Patrick Gallagher and Matt Dalton, and Car #4 has a 1.853s delta between Aaron Povoledo and Bill Cain (driver\_deltas\_by\_car). Reducing these internal gaps will unlock further overall car potential, as evidenced by Car #39's tight 0.283s driver delta."}
- {'team\_type': 'mid-field', 'team\_name': 'Mercedes-AMG', 'recommendation': "Mercedes-AMG possesses exceptional raw pace, as demonstrated by Car #57's optimal lap time. However, this potential is currently undermined by severe tire degradation and inconsistent average green flag pace across the

manufacturer's cars. The primary tactical recommendation is to urgently address the inherent tire degradation issues through chassis setup, suspension tuning, and potentially driver technique adjustments to extend tire life and maintain performance over longer stints.", 'justification':

'Mercedes-AMG ranks 10th in manufacturer tire wear with an average degradation value of 0.0722 (manufacturer\_tire\_wear\_ranking), significantly worse than the field average. Car #57, despite its optimal lap of 1:55.912, has an average green flag pace of 2:01.165, indicating a substantial loss over a stint, directly correlated with its high deg\_coeff\_a of 0.07225 (enhanced\_strategy\_analysis).']

- {'team\_type': 'lagging', 'team\_name': 'Audi', 'recommendation': "Audi is currently at the back of the field in both raw pace and tire management. A multi-faceted approach is required, starting with fundamental improvements in tire degradation characteristics, which is their most significant weakness. Simultaneously, there's a critical need to improve pit stop efficiency, as they are losing significant time in the pits.", 'justification': 'Audi ranks 11th (last) in both manufacturer pace and tire wear (manufacturer\_pace\_ranking, manufacturer\_tire\_wear\_ranking). Car #56 (Audi) exhibits an alarmingly high deg\_coeff\_a of 0.362937, indicating extreme tire wear (enhanced\_strategy\_analysis). Furthermore, Audi cars #10 and #52 are ranked 38th and 32nd respectively in average pit cycle loss (full\_pit\_cycle\_analysis), highlighting a systemic issue in pit lane operations. Addressing these two areas offers the most immediate gains.'}]