



# The Rio Grande Redline



BMW CCA New Mexico Chapter

[www.nmbmwcca.org](http://www.nmbmwcca.org)

## *The Importance of Aerodynamics (A Look Into Making Cars Fly through the Air)*

In the tough struggle for crucial seconds in Formula 1, aerodynamics play a fundamental role. The teams invest up to 20% of their total budget in the science of the winds, making their cars even faster with innovative aerodynamic designs. Meticulous precision work is undertaken down to the last millimeter, according to the motto: races are won in the wind tunnel and lost on the track.

A stroke of genius by Colin Chapman in 1972 showed the way ahead for Formula 1. The legendary designer and team boss equipped his Lotus 72 with a flat front end in the form of a closed wedge, and hid the bulky radiators in side panels. Thanks to these revolutionary aerodynamics, supported by a rear wing, Emerson Fittipaldi won the World Championship for Lotus.

The significance of aerodynamics can be seen primarily in the downforce. The search for greater downforce has become the driving factor behind entire Formula 1 teams. The shape of cars is grinded on the computer, in the wind tunnel and on the track, and the wings and wind deflectors are styled just as much as the diffuser on the rear underside of the car. The aim of this precision work is to channel the airflows perfectly and so generate as much downforce as possible, which presses the car down onto the road and permits shorter braking distances and higher cornering speeds. Experts estimate 80% of the car's grip is generated by the downforce and only 20% by the tyres.

But downforce is not everything: the recipe for true success is to find the best compromise between the greatest possible downforce and the lowest possible air resistance. There is no ideal set-up to suit every racetrack, so the true art of the designers is to get closer to the ideal than their competitors for every race. This is not an easy task, with 20 different possible settings for a rear wing and 100 possible settings for a front wing.

The aerodynamics are the most important factor in the design of a Formula 1 car. An air duct panel between the front wheel and the side panel, for instance, can add more speed than two or three extra horsepower. Only those teams with their own wind tunnel can keep up with the extremely fast development in this field. Engineers spend up to 15,000 hours every year at the wind tunnel, and each complex costs about 45 million euros.

Modern Formula 1 cars can withstand centrifugal forces of up to 4G without sliding off the track. The art of aerodynamics allows far higher cornering speeds than would be possible without downforce, and so not only ensures a better performance but also even more safety. As a rule of thumb, 35% of the total downforce is generated by the rear wing. However, as it also causes the greatest air resistance, it is the rear wing's setting that is changed most from race to race. For the Italian Grand Prix on the high-speed track in Monza with its long straights and fast corners, the teams use flat wings to gain the highest possible speeds. On city tracks like Monaco, or circuits with lots of narrow corners, wing elements with a steep setting help generate as much downforce as possible so the cars can drive through the corners faster. The front wings are responsible for 25% of the downforce – a value which can quickly be reduced to just 10% by air turbulence if the car is travelling directly behind another car. The remaining 40% of the downforce is provided by the diffuser on the vehicle underbody, a type of air accelerator whose tunnels and ducts lead the flowing air towards the rear so that it generates the strongest possible suction effect.

In contrast to Formula 1, passenger cars tend to create lift at medium and relatively high speeds, because of their shape. As this relieves the load on the axle and reduces the driving stability – and therefore also the safety – developers aim to keep the lift as low as possible by creating minimal air resistance. "This takes a lot of detailed work in the millimeter range. It ranges from smoothing down the underbody to optimizing the airflow through the wheels and even to working on integrated rear spoilers," explains Dr. Christoph Lauterwasser from the Allianz Center for Technology. "That is the only way to achieve drag co-efficient values under 0.30 while at the same time minimizing the lift on the rear axle. However, anyone travelling with a roof box or a bike carrier will completely undermine all that meticulous development work."

In Formula 1, too, aerodynamics will always remain one of the most important factors in spite of all the changes to the regulations. The developers are a long way from exhausting all the possible options, so in the future, losing a hundredth of a second will still be a real drag.

As seen at: <http://www.fltechnical.net/articles/3893>

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Remember to check our web site for periodic updates: [www.nmbmwcca.org](http://www.nmbmwcca.org)

## ***President's Message***

by Jon van Arsdel  
Oct 2007

It is now October, and fall has arrived. This is arguably the most pleasant time of the year here in New México. The temperatures are moderate, the leaves on the trees are beginning to change color, and the breezes are light. What a wonderful time for reflection on life in general! Perhaps this is the right time to wax your BMW for the upcoming winter.

Speaking of fall, BMW Oktoberfest will be in Fort Worth, Texas from September 30 to October 5 this year.

This past quarter, we had the annual Porsche/BMW Challenge, a great tech session at Santa Fé BMW, and a membership meeting.

The 13th Annual BMW/Porsche Event was held Saturday, July 28th. It was at Sandía Motorsports track. I am told we had a small but enthusiastic group of attendees. I was unable to attend due to a family emergency.

The Santa Fé BMW tech session was Saturday, August 25th. This tech session was postponed from June, due to construction at the dealership. As usual, Service Manager Andy Caperon put together a superb event. We all learned about the new line of BMW performance parts; I am told my X3 will now win the race against a normal city bus. We also learned about the new BMW diagnostic systems coming in the near future. Several classic BMW's were on static display, for members to envy. Chapter Vice-President Bob Kauffman arranged a great lunch for all of us; those on a diet need not apply.

Upcoming events include the Fall Tour and two tech sessions.

The Annual Karl Fox Memorial Fall Tour will be Sunday, October 7 this year. If you have never been on a BMW club tour, you should consider going. We always take a scenic route through the mountains, and look at the beautiful fall colors. We have several photo opportunities. The tour is normally a few hours, with a lunch stop around noon. If you own a convertible, bring it!

In answer to a question I have heard a few times: BMW CCA tours are mostly fair-weather events. In case of rain, snow, etc., the tourmeister has the option of postponing or canceling the tour. It is supposed to be fun and scenic, not an endurance contest.

The November tech session at Southwest Collision Craftsmen has been postponed. It will be rescheduled for early 2008. We will announce an alternate November tech session soon.

The December tech session will be on Wednesday the 12th at Sandía BMW in Albuquerque. Sandía Service Manager Jeff Cline always arranges a great meeting with lots of new

and exciting information. We will also have New México Chapter officer elections. Watch for updates on the web or in the mail.

As is our normal custom, food is included in the above events.

Vehicle update. The new (to me) BMW X3 was intended to be a bad-weather vehicle, but I am increasingly using it as a daily driver. I have added the factory fog lights and alarm system. I have also installed all weather (most weather?) tires and a 3M clear front-end protector. My wife and I have already traveled to Colorado in our X3, and plan to take it to México about the time you read this. The 6-speed manual is definitely the right transmission choice.

Correction. Tony Harris is the Used Car Manager at Sandía BMW. Last newsletter, I made an error on his last name. My apologies to you, Tony.

The New México chapter of the BMW CCA is always looking for event leaders, and also officers for the board of directors. If you are interested, please notify someone on the current BoD.

As always, watch your email for changes and updates to the events. You can also check <http://www.nmbmwcca.org/> for additional information.

I hope to see each of you soon!

**Jon van Arsdel**  
President  
BMW CCA of NM



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