

RevMag



The Argument for Tesla

And how they are ahead of the
competition

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A special thanks to Dexter
and Classic Car Club Manhattan
for letting us look around
and take some pictures!

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FOREWORD

BUS STOP.

MAZYAR AZMI
Editor-In-Chief

Every once in a while, you get one of those days where life decides to punch you in the nose. *Hard*. As you may or may not have already heard, the whole world is having one of those days right now. The kicker? It's been going on for over eight months. Eight months of unimaginably frustrating setbacks, eight months of never-ending panic attacks, eight months of constant compromise. Longest months of *my* life, that's for sure. "But it seems like it's only getting worse!" you might be thinking, yet you couldn't be farther from the truth. Of course, there's all the reason in the world to feel worried, anxious, or lost, but there's a point where all of us have to learn how to get through this. Together.

Now, you're probably looking at the title of this foreword wondering what in the world a 'bus stop' is. Start by picturing a race car barreling down a straightaway, throttle pinned to the floor. The engine's screaming, barely holding itself together at the absolute limit of its structural capabilities, the driver's sweating, focused like a laser, and there's a sharp right turn coming up. But that's not all, it's immediately followed by another left turn, and then you're spat back out onto the straightaway as if nothing ever happened. That's a bus stop chicane. It's called a bus stop because of its similarity to an actual bus stop, the small curves of road carved out of the sidewalk that allow buses to pick up passengers without clogging up traffic. A chicane, named after the French verb "chicaner," which means "to create difficulties," is a series of sharp snaking turns that make you regret ever getting out of bed. Bus stops sound a little pointless, no? Why did they feel the need to put a turn smack dab in the middle of a straightaway? The answer's deceptively simple: Racing wouldn't be fun if it was easy, would it?

So the next time you come to a bus stop in your path, don't give a second thought to the fact that you have to let off the gas, hit the brakes, and shave off all that speed you just built up. Instead, try to remind yourself that the only way to get back on the throttle again is to nail the turn.

Enjoy Issue 001.

Best, your editors-in-chief,

- Mazyar Azmi and Leonardo Hess





How a Combustion Engine Works

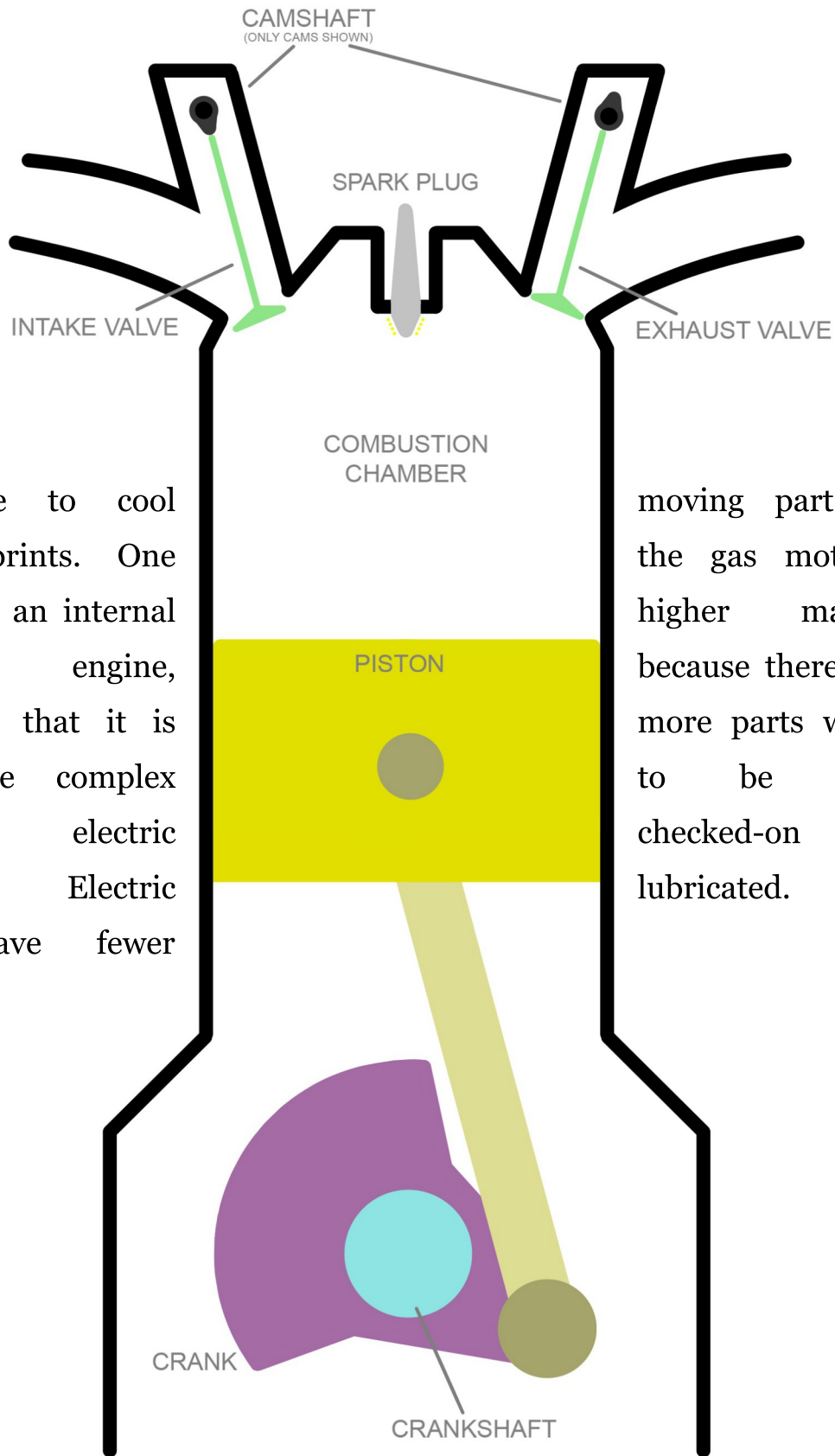
Leonardo Hess

Engineering

Fuel is introduced into the combustion chamber through the intake valve. The piston in the chamber lowers as the gas enters. Then, the piston moves up, increasing the pressure, and the spark plug creates a spark when the piston is at its highest point. The spark ignites an explosion in the combustion chamber with the gas and oxygen, and the explosion forces the piston downwards. Because the pistons are strategically coordinated on the crankshaft, when one gets forced down (by the explosion) the others continue moving in the cycle (another moves up). This cycle, known as a stroke, allows for continuous smooth movement of the crankshaft—the

axle connecting the engine to the wheels. The intake and exhaust valves are timed through an axle called the camshaft. The camshaft is turned by the crankshaft as well, and has cams which open each valve after a full rotation.¹

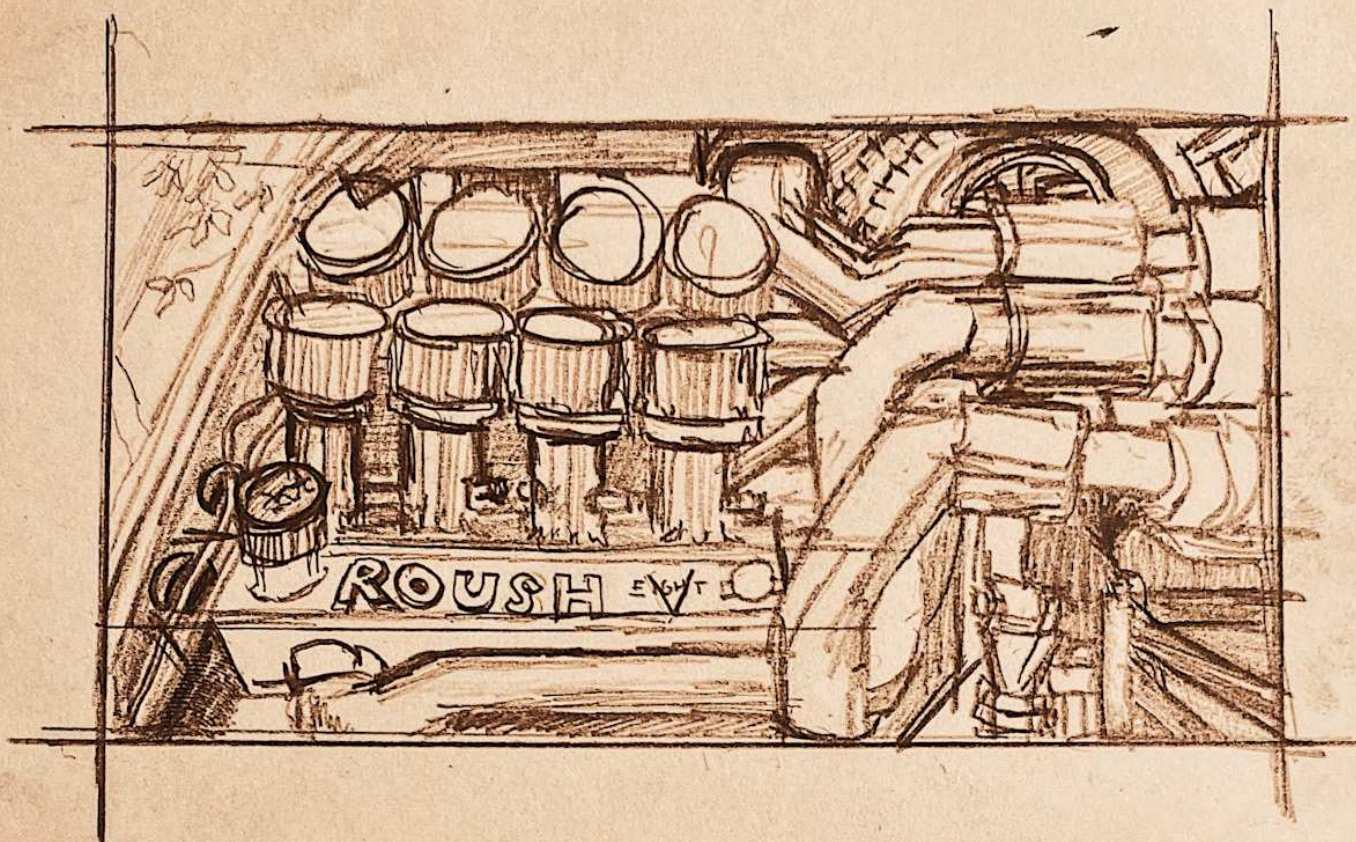
Currently, the main benefits of the internal combustion engine are that it performs better than electric in both range and top speed. The technology in electric cars is simply not yet advanced enough to compete with the range of a gas tank. Additionally, the current electric motor cannot reach as high a top speed as a gas-powered engine. Most production electric cars also cannot constantly drive at high performance, either, as the battery



needs time to cool between sprints. One downside of an internal combustion engine, however, is that it is much more complex than its electric competitor. Electric motors have fewer

moving parts, making the gas motors much higher maintenance, because there are many more parts which have to be constantly checked-on and lubricated.

Credit: Leonardo Hess





Credit: Daniel Schlumberger

How an Electric Motor Works

Alexei Le

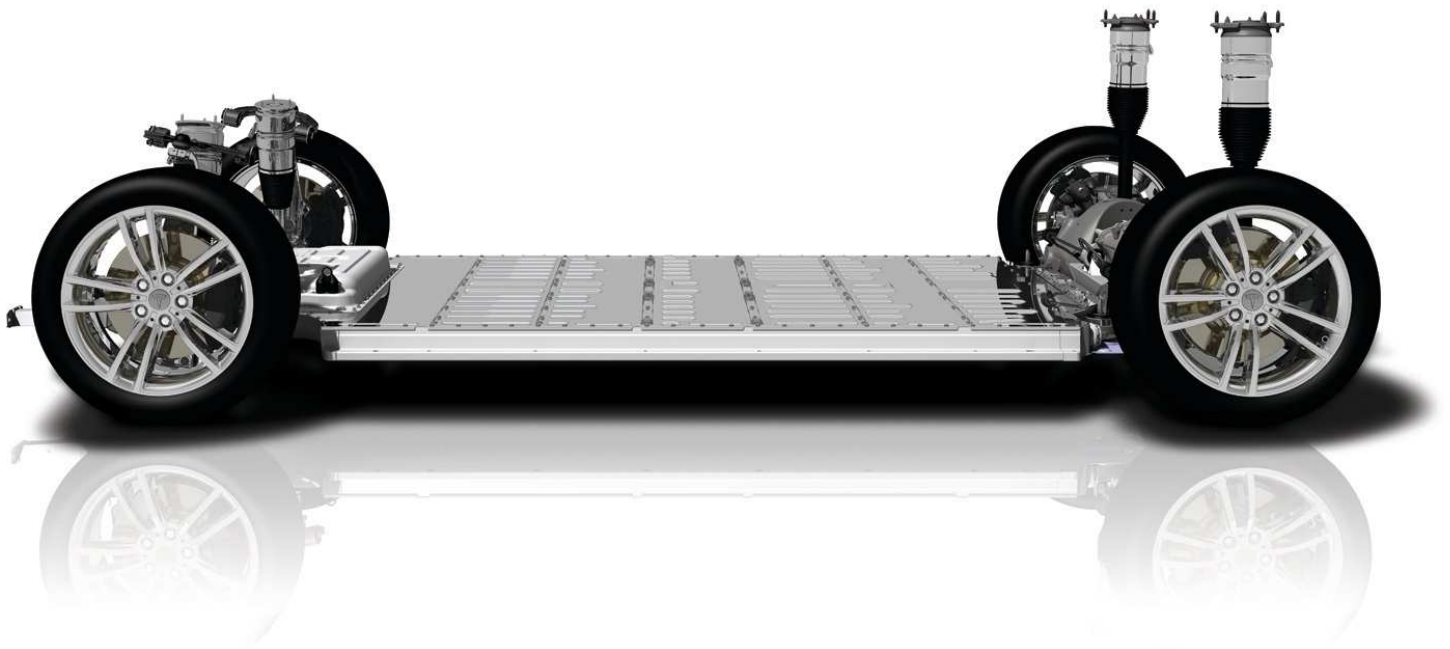
Engineering

Have you ever wondered how an electric engine works? In order to understand how an electric vehicle works, it is first important to understand its powertrain. A powertrain is basically the group of parts in a car that generate power and move that power to the wheels. In electric cars, stored energy from the battery is sent to the inverter, which spins the induction motor and the wheel axles. Lithium-ion batteries are typically used in electric cars as they are low maintenance, lightweight, and more efficient than other types of batteries.² These batteries store direct current electricity, also known

as DC, which presents a significant issue as induction motors can only run on alternating current electricity or AC.³ The problem of electrical current is solved by using a device called an inverter, which converts the direct current electricity and produces alternating current electricity for the electric motor to use. This means that the inverter can be manipulated to control the speed at which the motor turns. The induction motor is an AC motor, meaning the speed at which the motor turns is based on the alternating current frequency sent from the inverter.⁴ Induction motors can work efficiently at any speed;

their performance does not drop in efficiency or power as different speeds require similar amounts of electricity.⁵ One advantage of electric cars is that they can use regenerative braking, which generates extra charge for the battery by allowing the motor to try to spin in the opposite direction to slow the car down. Compared to gas power cars, electric cars take less time, money, and parts to maintain, adding another benefit to going

electric. Electric vehicles tend to have lower maintenance costs, since there is no transmission fluid, coolant, and engine oil that need to be changed. However, the main advantage of electric cars is that they are much less harmful to the environment as they do not emit carbon dioxide. The next time you or your family is shopping for a car, consider going electric! Your planet and your wallet will thank you.



Endnote 6

THE ARGUMENT FOR TESLA

A red Tesla is shown from the rear, driving on a paved road that curves through a hilly landscape. The hills are covered with trees and dry grass, and the sky is filled with soft, golden light from a setting or rising sun. The overall scene conveys a sense of motion and natural beauty.

Why Tesla is ahead of the competition in many aspects of product design and engineering.



The Argument for Tesla

Leonardo Hess

Opinion

Tesla is the most prominent electric car company in the United States. Their uniqueness as a brand, fueled by CEO Elon Musk and his wild vision for the future, has polarized today's automotive community. Nevertheless, Tesla is helping us all by significantly advancing the electric car segment, an industry which is ever expanding and will soon dominate over gas production cars.

There are four Teslas which you can currently buy: its luxury sedan—Model S, its luxury SUV—Model X, its economy sedan—Model 3, and its economy SUV—Model Y. Cars that have been announced but are not yet being produced include the Tesla Semi—their electric semi truck, the Second Generation Roadster—the quickest car in the world, and the Cybertruck—Tesla's boxy pickup truck. I encourage you to check out the statistics regarding these models on page 21, as their performance is truly stunning.

Before getting into the benefits of Tesla ownership, it is important to understand that Tesla is more than just an electric car company. It adds cutting-edge technology to the user experience, and is a glimpse into the future of automotive technology. To start with, there is a 15+ inch touchscreen display on the center console of every car, which controls just about every function, from opening the glove compartment, to playing games and watching Netflix, to controlling the temperature and ventilation. Tesla also

features industry-leading safety and autopilot technology that comes standard on every car.⁸ There is also an app which allows you to monitor your car from a distance. A significant benefit of being a Tesla owner is access to technological integration that is designed to make the user experience more convenient.

Superchargers

A major advantage of Tesla ownership compared to other electric cars is the supercharger network. Superchargers are plug-in electric chargers made by Tesla, specifically for Tesla cars (although Tesla does allow other manufacturers to use them if they want to). Tesla currently has over 18,000 individual chargers in over 2,000 supercharging stations around the world.⁹ That's over 3,500 more individual chargers than when I first drafted this article (to give you an idea of how quickly the charging network is expanding). Paying for gas is approximately one and a half times more expensive than Supercharging (per mile), so even if the car itself may be more expensive, long term savings can reverse the initial cost difference.¹⁰ Using its integrated technology, the navigation system on the display of the car takes into account timed charging needs and locations when planning your route. Then, once your car is plugged in and charging, the Tesla app on your smartphone will notify you when the battery is full enough to continue your trip. Through the app, information regarding climate control, supercharger navigation, software updates, and more, is available. No other manufacturer has anything close to the interconnected charging system that Tesla has set up. Non-Tesla electric cars, unless outfitted with a Tesla plug-in socket (which none currently are), must charge at generic public charging stations, which are not connected to your car or mobile device in any intelligent way.

Another option Tesla offers is to install a charger in your garage or parking lot.¹¹ This way, you can plug in every night or while at work and not think twice about charging. This is a luxury that gas-powered cars cannot offer, and that other EV manufacturers do not make widely available, if they even have it as an option in the first place. Also, Tesla is developing solar panels designed to look like roof tiles that can power your house and your car charger. With the panels installed, your house and your car can be entirely powered by the sun, and you can customize the power distribution through the Tesla app!¹² Simply put, no other company, be it a car manufacturer or energy distributor, is integrating charging technology together in such a cohesive fashion.

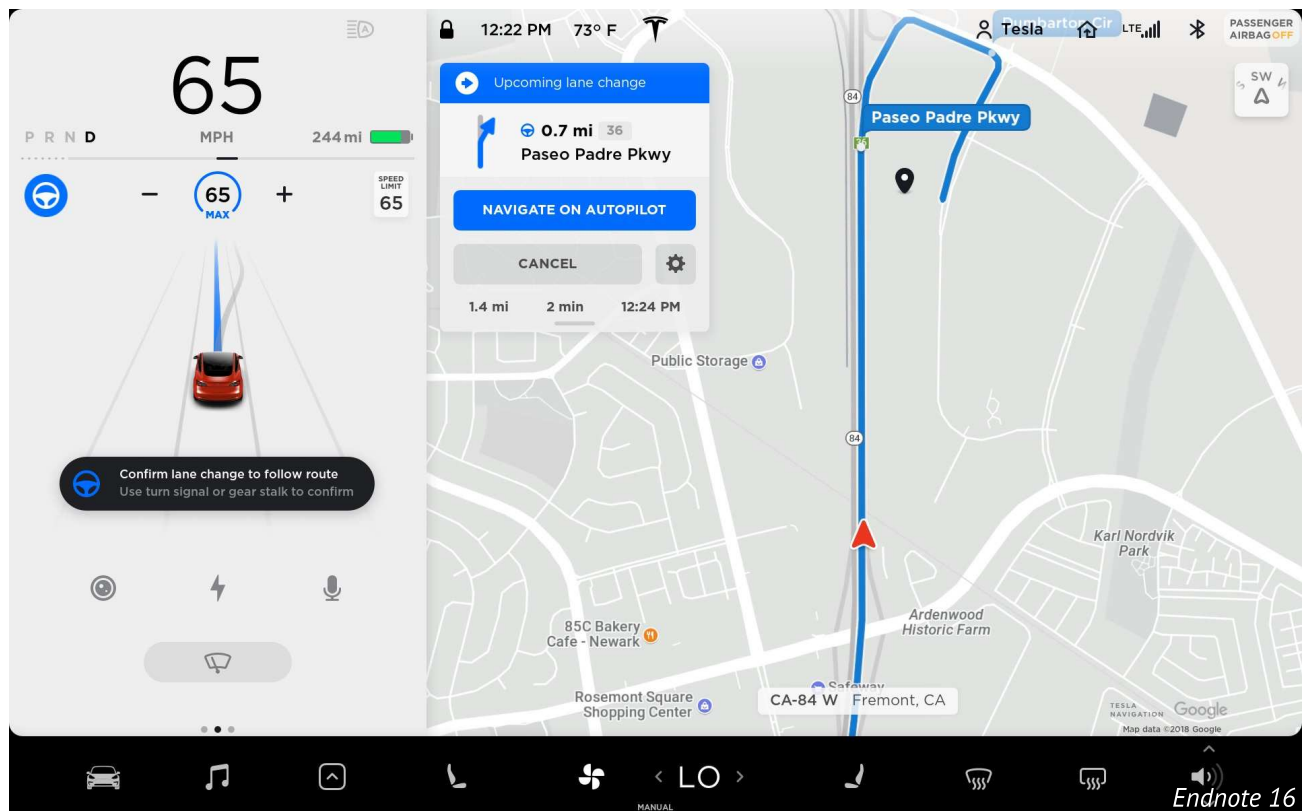


Software

Another category in which Tesla beats the competition is software. The intelligent software in your Tesla that controls everything from safety and performance to comfort and autonomous driving gets periodically improved through updates. If your car gets parked somewhere with access to Wi-Fi, such

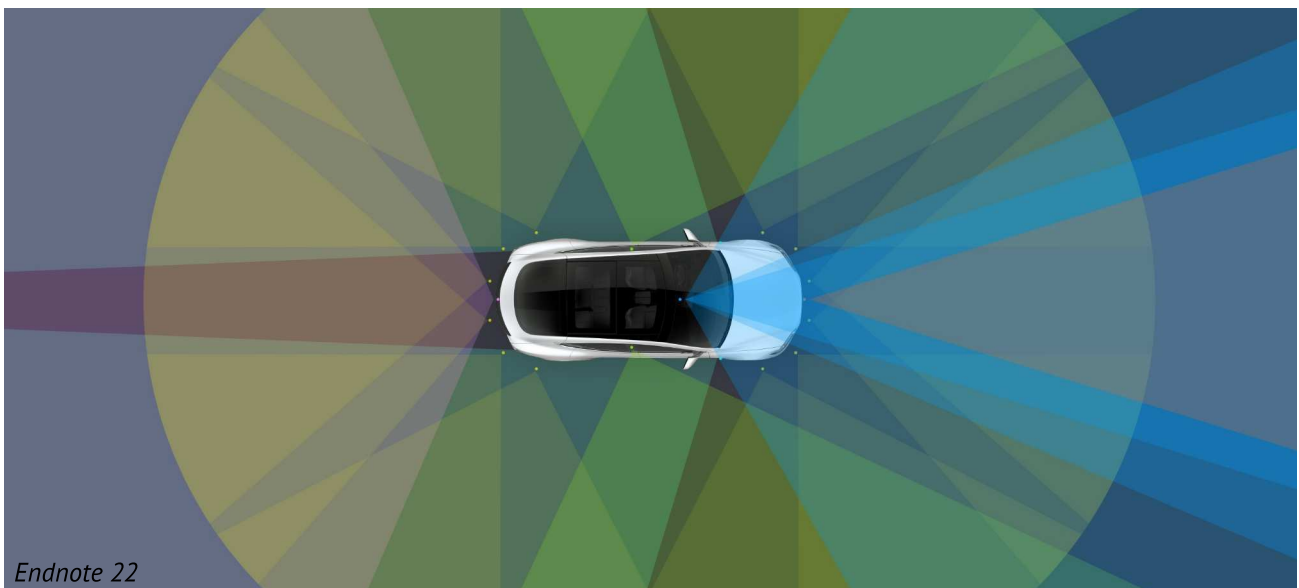
as perhaps your garage or workplace parking lot, it can update to the latest software. This is important because new software allows older Teslas to still have the latest safety and features. For example, Tesla installed cameras and sensors in its early models despite it not having yet developed the self driving tech that used all those cameras. In other words, the cars are future proof, and can become more safe as time goes on.

Performance can also increase with software updates. In recent months updates have improved range and acceleration times.^{14 15} It is quite remarkable for the performance of any car to actually *increase* over time, and this is a rare example of that. These updates also add other features, such as entertainment. Using the large touchscreen, you can play games while parked using the steering wheel and pedals as controls. They have also added streaming services and entertainment such as Netflix, Hulu, and YouTube to the many functions available on the screen.



Safety

Curious about how safe these quick electric cars are? The answer is simple: every Tesla model has gotten 5 stars in every category tested by the NHTSA - the National Highway Traffic Safety Administration.¹⁷ They all come standard with some electronic safety features that Tesla describes as “Autopilot”. Autopilot enables the car to perform all driving functions within its lane, essentially keeping the car in line with the traffic around it.¹⁸ Instead, “Self-Driving” capabilities such as lane-changing, overtaking, exiting highways, parking, and summoning, can be purchased separately for \$10,000.¹⁹ In addition, the Model S and Model X come standard with AWD. Instead, Models 3 and Y have AWD as an additional option.²⁰ Tesla also gives attention to other, less conventional safety features. One of those is an HEPA-grade air purification system for air entering the car (known as Bioweapon Defense Mode).²¹ This has proved very useful for people experiencing wildfires in their area, as the air is usually filled with smoke. The air filters in the car get rid of toxic gases as air passes from the outdoors through the ventilation system into the cabin.

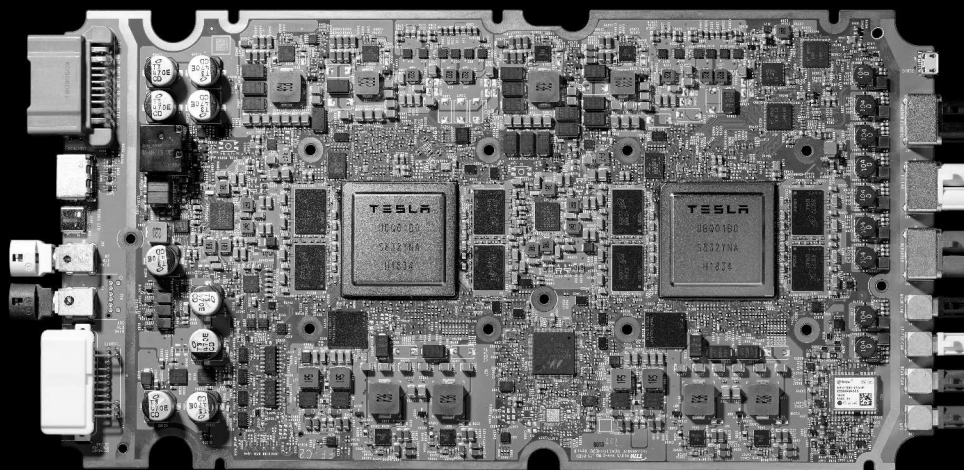


Another unusual safety feature Tesla offers is called Sentry Mode. Sentry Mode allows the cameras around the car, usually used for autonomous driving, to act like security cameras in case someone tries to steal or damage your car. You can also set a password for the front display, so that access to the car can only be granted to trusted people. Even if your car gets stolen, all the tech inside your Tesla makes the car easily trackable. Thanks to all these features, Teslas are ahead of the competition in safety, too.

Autopilot

One thing that Tesla is well-known for is their autopilot technology. Currently, every Tesla has all the hardware necessary for full self-driving capabilities.²³ Those capabilities are only being limited by software based on the self-driving package that gets bought with the car. Autopilot comes standard on every car, and “enables your car to steer, accelerate and brake automatically within its lane.”²⁴

Computer chip used for the full self-driving package



Endnote 25

With the \$10,000 “Full Self-Driving” package, a true driverless experience becomes a reality. Using the app, one can driverlessly summon their car from the other end of the parking lot. Then, once you get in, the car will drive you to the chosen destination using the route on the navigation system, and will search for a parking spot once you have reached your destination.²⁶ This all happens without the driver needing to touch the wheel! Not all of these features are fully developed, but they will soon be made available through software updates. The main roadblocks at the moment are the legal and ethical components of self-driving vehicles. Despite those factors, Tesla states the following:

All new Tesla cars have the hardware needed in the future for full self-driving in almost all circumstances. The system is designed to be able to conduct short and long distance trips with no action required by the person in the driver’s seat... The future use of these features without supervision is dependent on achieving reliability far in excess of human drivers as demonstrated by billions of miles of experience, as well as regulatory approval, which may take longer in some jurisdictions. As these self-driving capabilities are introduced, your car will be continuously upgraded through over-the-air software updates.²⁷

Environmental Impact & Competition

With all these incredible features, it is easy to forget the environmental impact that Tesla cars, and all electric vehicles, have. According to CarbonBrief, a climate science database in the UK, total carbon dioxide emissions were three times lower for the average electric car than for the average gas car in 2019.²⁸ This includes emissions from battery production, vehicle production, electricity production, and driving. As the production of electricity moves to more renewable sources, electric cars will emit even lower

numbers of net CO₂. By not emitting exhaust, electric cars are reducing the amount of carbon dioxide that we release into the air. Carbon dioxide destroys the ozone layer that protects the earth from the sun's heat. This causes global heat levels to rise. The less CO₂ we emit now, the fewer irreversible repercussions we will have to face later on.

Tesla's new Gigafactory in Nevada will run entirely off of solar and wind power once it is complete. It will reuse its water through an on-site purification system, and eventually old parts will have the capability to be recycled for reuse.²⁹ Around the world, Tesla has saved over 3.6 million tons of carbon dioxide.³⁰ No—Tesla will not solve the climate crisis, but at least Elon Musk has taken huge steps into developing the electric car market—a change necessary to preserve this planet. Tesla is currently the most valuable car company in the US, and they have demonstrated that people favor electric cars over gas ones. When demand for electric cars rises, other car companies will build their own, and competition for the best will begin.

Tesla's Impact

Tesla has accelerated the electric vehicle market not only by simply building great electric vehicles, but by giving real attention to detail in categories like safety, performance, practicality, and overall user experience. By building electric cars that are great in their own respect (aside from being electric), the company has demonstrated their mission of delivering the most that they can offer, in an electric vehicle, for the lowest price possible. This has guaranteed that the competition surrounding electric vehicles across the board will be aggressive and unrelenting.

For more information on Tesla, their global environmental impact, and their impressive commitment to safety, visit their 2019 Impact Report.



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Model S



32

Model 3



33

Model X



34

Model Y



35

Gen. 2 Roadster



36

Cybertruck



37

Semi



38

Solar Roof, Powerwall (energy storage),

Model 3

Base Models

Spec	Model S ³⁹	Model 3 ⁴⁰	Model X ⁴¹	Model Y ⁴²
Acceleration (0 - 60)	3.7 seconds	5.3 seconds	4.4 seconds	4.8 seconds
Range	402 miles	263 miles	371 miles	326 miles
Top Speed	155 mph	140 mph	155 mph	135 mph
Drivetrain	Dual motor AWD	Rear wheel drive	Dual motor AWD	Dual motor AWD
Purchase Price	\$69,420	\$37,990	\$79,990	\$49,990

Performance Models

Spec	Model S ⁴³	Model 3 ⁴⁴	Model X ⁴⁵	Model Y ⁴⁶
Acceleration (0 - 60)	2.3 seconds	3.1 seconds	2.6 seconds	3.5 seconds
Range	387 miles	315 miles	341 miles	303 miles
Top Speed	163 mph	162 mph	163 mph	155 mph
Drivetrain	Dual motor AWD	Dual motor AWD	Dual motor AWD	Dual Motor AWD
Purchase Price	\$91,990	\$54,990	\$99,990	\$59,990

Models not yet in production

Spec	Cybertruck (Top Spec) ⁴⁷	Semi (Top Spec) ⁴⁸	Gen 2 Roadster (Base spec) ⁴⁹
Acceleration (0 - 60)	<2.9 seconds	20 seconds (with 80,000lb load)	1.9 seconds
Range	500+ miles (est.)	500 miles	620 miles
Top Speed	N/A	N/A	>250 mph
Drivetrain	Tri motor AWD	Quad motors on rear axles	AWD
Cost	\$69,900	\$180,000 (est.)	\$200,000 (est.)

Elon Musk

Sam Siegel

Biography



Credit: Leonardo Hess

Elon Musk is widely regarded as the pioneer of the electric car industry in the United States. Tesla is the most valuable car company in the US, in addition to being one of the most valuable in the world.⁵⁰ It is leading the electric car industry into the future. Musk began his life in South Africa, and spent much of his youth coding computer programs. To avoid being drafted into the South African military, he moved to

Canada, where he attended college.⁵¹ Once he graduated, he moved to the US to study at Stanford, where he immediately dropped out to pursue his own business. In 1995, Musk created Zip2—an early maps internet software. Four years later, the company was bought for \$307 million, and his share of the money was used to start X.com, which later became PayPal. Once again, the company was sold within three years

to eBay.⁵² The same year, Musk started SpaceX—a space exploration company which is thriving today. The company has successfully built three rockets, and successfully launched over 80 times, thanks to their ability to autonomously land on landing pads and be re-launched. NASA has granted them permission to fly to the International Space Station. The future of SpaceX involves Starlink, a series of high-speed internet satellites able to deliver a connection in remote parts of the world.⁵³

Elon Musk also owns Tesla, Inc. which was recently valued at over \$464 billion.⁵⁴ The company was founded in 2003, and within a year Musk joined and became CEO. Tesla currently sells a luxury sedan, a luxury SUV, an economy sedan, and economy SUV. They have announced a sports car, a semi truck, and a pickup truck—all of which are fully electric, just like

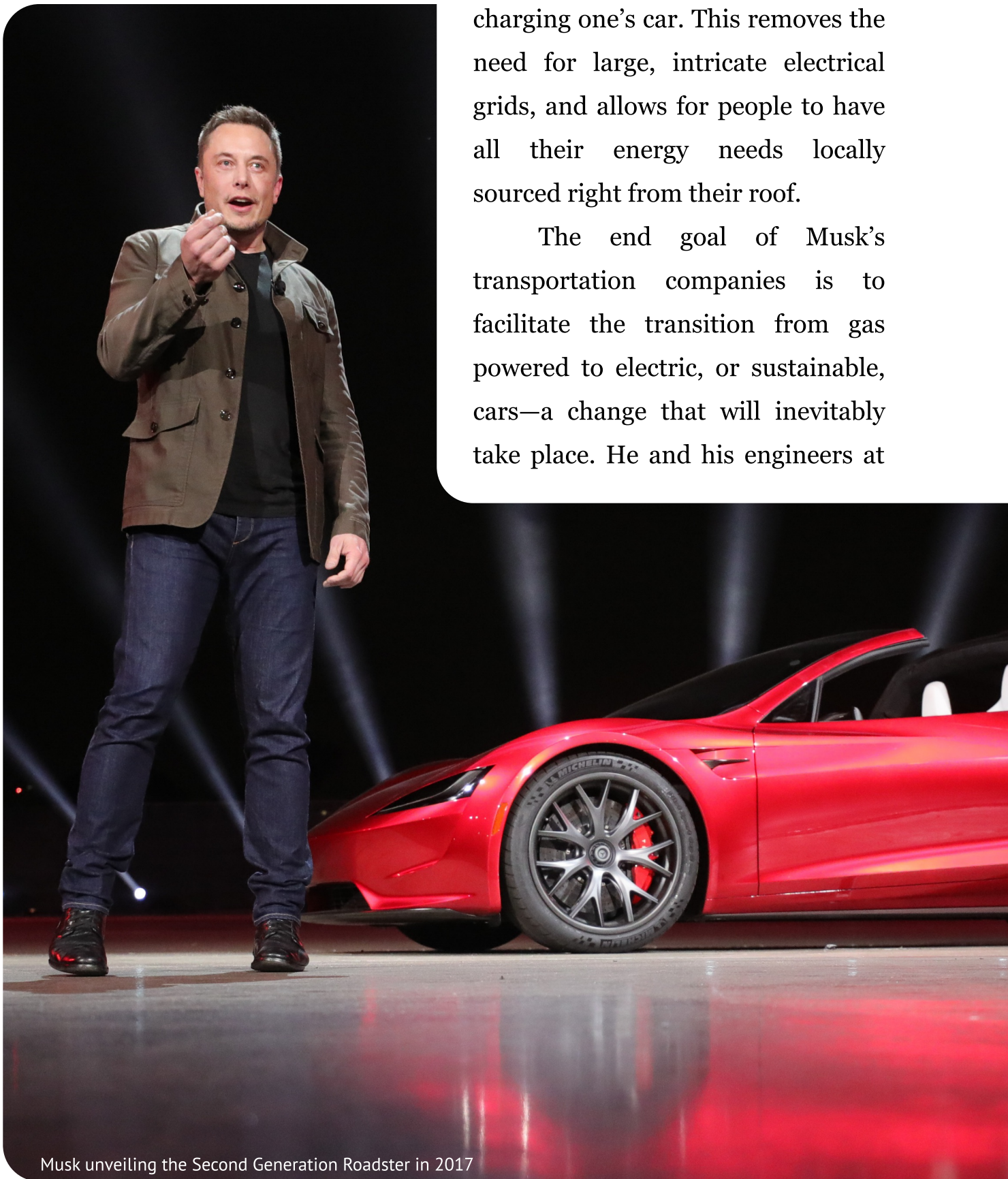
their main production cars.⁵⁵

Musk also owns the Boring Company, a project he believes will be the future of transportation. The concept is that to alleviate traffic, some cars should have the option to go underground. The Boring company will dig tunnels which are about the width of a car and allow for higher speed movement between large cities. Musk has expressed his opinion that aerial travel above ground will not be the primary transportation method, mainly due to the danger and noise of aerial traffic.⁵⁶

Another company Elon Musk owns is SolarCity. SolarCity, whose parent company is Tesla, makes solar panels which easily connect with the Tesla charger ecosystem.⁵⁷ This allows for someone to own all the resources necessary for their electrical supply. Solar panels draw energy from the sunlight and can power one's house, in addition to

charging one's car. This removes the need for large, intricate electrical grids, and allows for people to have all their energy needs locally sourced right from their roof.

The end goal of Musk's transportation companies is to facilitate the transition from gas powered to electric, or sustainable, cars—a change that will inevitably take place. He and his engineers at



Musk unveiling the Second Generation Roadster in 2017

Tesla have managed to make cars that aside from being electric, include features beyond those of most gas-powered cars in the same price range. With his electric cars sweeping across the United States, Musk is demonstrating the power that electric has over gas in the automotive segment. The growing sales of his cars speak for themselves. In early March, they

produced their millionth car. Tesla is the number one producer of electric vehicles worldwide.⁵⁸

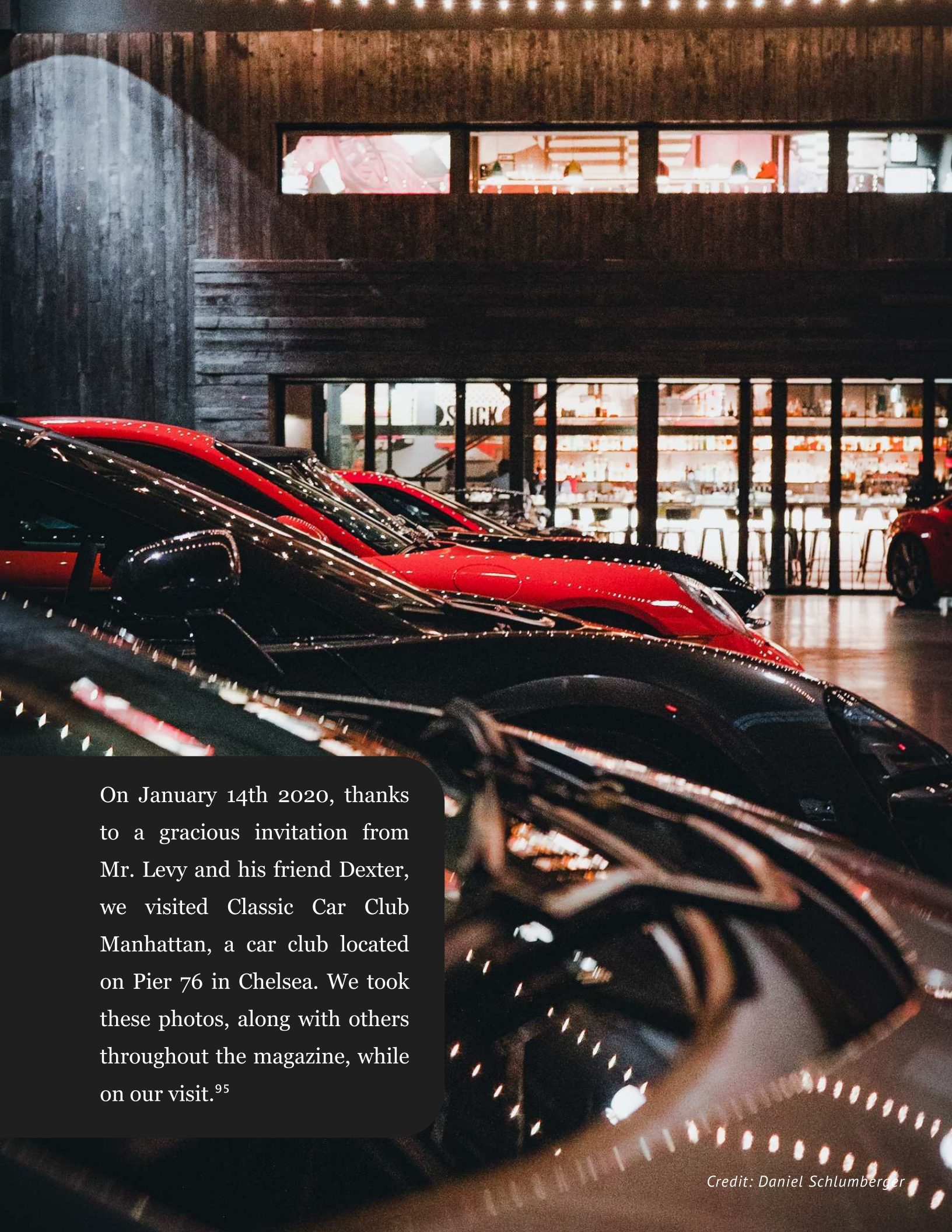
Because of the success that Elon has had in the electric car segment, the competition from other businesses increases daily, and maybe one day will match the production and consumption levels reached by Tesla. Musk has initiated competition within a movement that is rapidly developing because of his drive to execute his ideas. As human beings, I think it is our job to support people who are trying to save the ground upon which we walk. Overcoming the climate crisis is a job everyone must contribute to. Elon Musk has created electric cars that are more desirable than most gas-powered cars. However, his ideas and creations will not save the world. We all have to make changes to our lives and mentality to reduce our effects on the environment.



Endnote 59



Credit: Mazyar Azmi



On January 14th 2020, thanks to a gracious invitation from Mr. Levy and his friend Dexter, we visited Classic Car Club Manhattan, a car club located on Pier 76 in Chelsea. We took these photos, along with others throughout the magazine, while on our visit.⁹⁵

Credit: Daniel Schlumberger

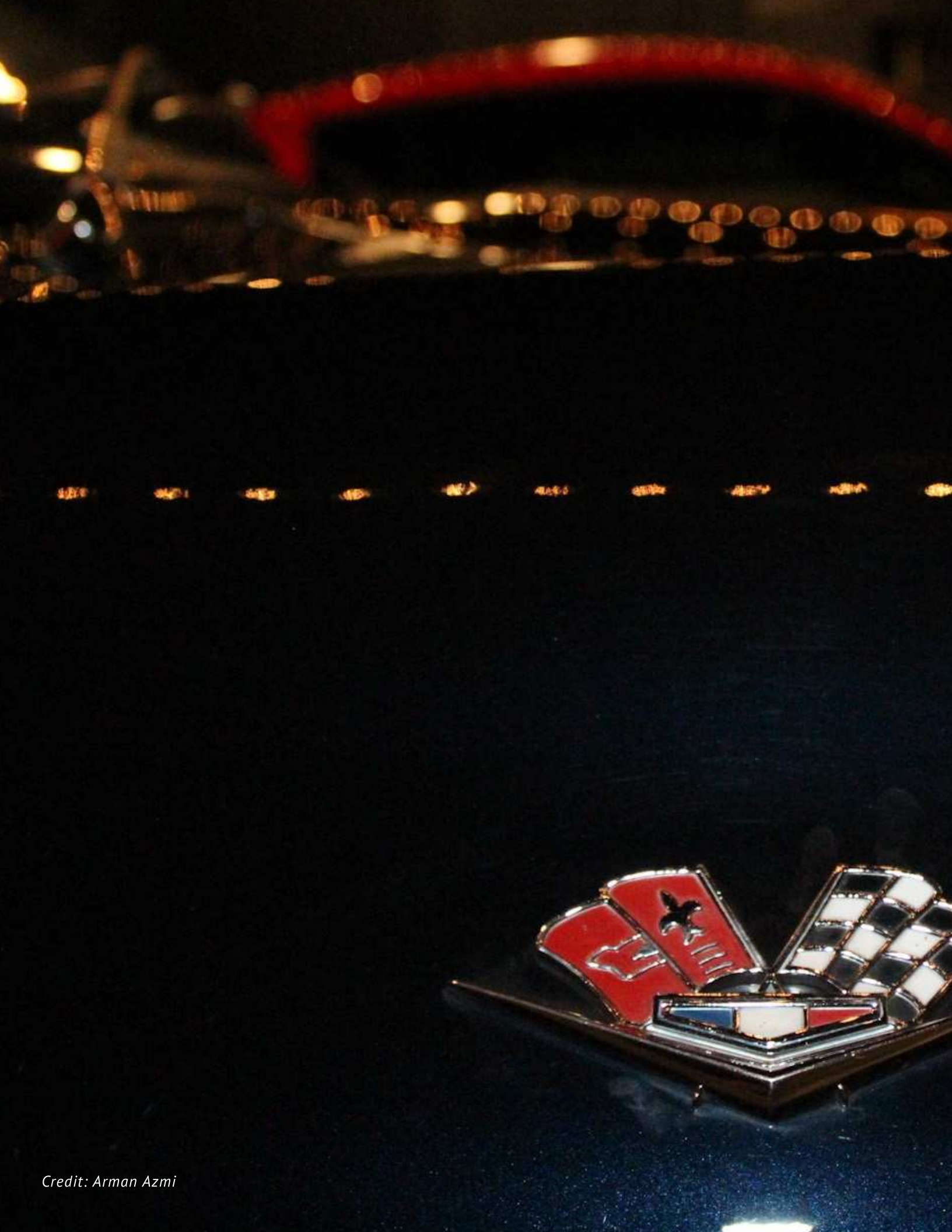


Bronco



Credit: Arman Azmi









Credit: Mazyar Azmi



LeMans 2019 Recap

Helena Yang

Motorsport



Beginning in 1923, Le Mans is the oldest active endurance race. The 2019 24 Hours of Le Mans at the Circuit de la Sarthe in France marked the 87th edition of this race. As the final race in the FIA World Endurance Championship, Le Mans is often the title-deciding race and

considered one of the most prestigious events in motorsport.

If this is your first time hearing about Le Mans, or if you consider yourself a newcomer to the world of motorsports, all the information may seem quite confusing. First off, imagine Le

Mans as four separate races going on at the same time, and cars from these different races are not competing against each other. These four races, or classes, are LMP1, LMP2, GTE Pro, and GTE AM. LMP1, or Le Mans Prototype 1, is the fastest class on the grid. These cars are the second fastest race cars in the world after Formula 1, and this is where big road car manufacturers like Toyota, Audi, and Porsche compete. These cars are purpose built race cars, which means that they don't look like anything you can see on the road. The teams that can afford to have hybrid power systems installed, which are superior to just combustion engines. If you can't tell if a car is an LMP1 or not, look for the red number sticker. LMP2, or Le Mans Prototype 2, is the second fastest class on the grid, and is just slightly slower than LMP1 because of their limited powertrains. The LMP2 grid is composed mostly of

private teams. You can spot these cars by their blue number sticker. GTE Pro, or Le Mans Grand Touring Endurance Pro, is the third fastest class on the grid. These are homologation cars, which means they are based on real sports cars that you can see on the road. All of the GTE teams are manufacturer teams like Porsche, Ferrari, and Ford. You can spot these cars by their green number sticker. GTE Pro teams have only professional drivers behind the wheel, which is one of the main things that separates GTE Pro from GTE AM. GTE AM is almost identical to GTE Pro, minus the drivers. Some AM drivers are professional, but most are amateur. However, the main difference between the two classes is that GTE AM cars must be at least one year old, and must comply with the previous year's regulations. You can spot these cars by their orange number stickers. However, even though there are four different races

going on at the same time, the most prestigious of these four is LMP1 for many reasons. The drivers are the most well known, the budgets are the highest, the cars are the quickest, and generally the races are the most competitive.

For the 2019 race, it was evident that Toyota dominated the race from the start, being the sole road car manufacturer in LMP1 last year, and having two teams there. Throughout the practice and qualifying sessions, the No.7 Toyota Gazoo Racing car of Mike Conway, Kamui Kobayashi, and Jose Maria Lopez consistently placed first. They were followed closely in second by the No.8 Toyota with Sébastien Buemi, Kazuki Nakajima, and Fernando Alonso.⁶⁰

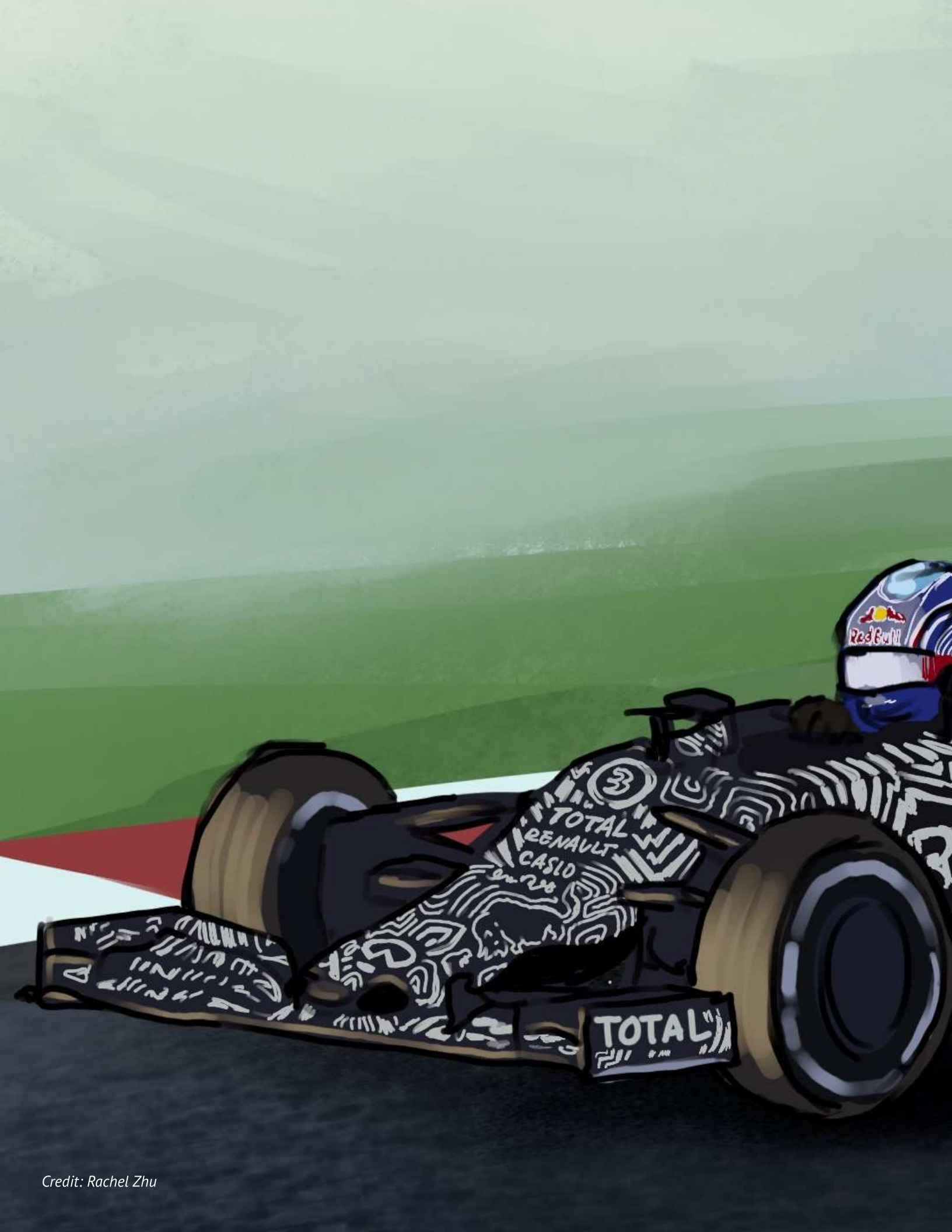
The No.7 car led for most of the race, albeit swapping places with the No.8 car a few times during the first half. However, car No.7 was able to regain and maintain their

lead until the final hour. Then, in a seemingly routine overtake of a GTE car, the No.7 car picked up a tire puncture and was forced to pit. However, a sensor mishap caused the pit crew to replace the wrong tire, and the car had to come back into the pits a lap later, losing valuable seconds that allowed the No.8 car to catch up. With insufficient time left, the No.7 car wasn't able to retake the lead and followed about 17 seconds behind the No.8 car as they reached the chequered flag. The final gap was still relatively small though considering that their closest opponent, SMP Racing, was six laps behind. The team consisting of Sébastien Buemi, Kazuki Nakajima, and Fernando Alonso as reigning champions, collected their second consecutive win.⁶¹

Elsewhere, the teams in the remaining classes had closer races comparatively, with teams Signatech

Alpine Matmut winning LMP2, AF Corse winning LMGTE Pro, and Team Project 1 winning LMGTE AM.⁶² The LMP2 class featured a tight race between teams G-Drive Racing and Signatech-Alpine. They battled from the start and remained close to each other until a technical glitch relegated G-Drive to the garage for 20 minutes, eventually costing them a podium position.⁶³ They were not the only team who encountered issues that potentially cost them a victory; both Racing Team Nederland and Dragonspeed were in contention but collided with the barriers. In the LMGTE Pro class, the winning AF Corse team, a Ferrari, led for the majority of the race but endured close fights with the No. 63 Chevrolet Corvette during the final leg. The LMGTE AM race was no less dramatic; While the Keating Ford had a comfortable lead over Team Project 1 for the most part, the Ford GT had to serve a stop

and go penalty which reduced the gap to just five seconds.⁶⁴ Though the Keating Ford clinched the victory, they were slapped with a 55.2 second penalty for violating refueling regulations which demoted them to second place. Upon further investigation, it was discovered that their fuel tank exceeded the maximum mandated capacity, and they were subsequently disqualified.⁶⁵

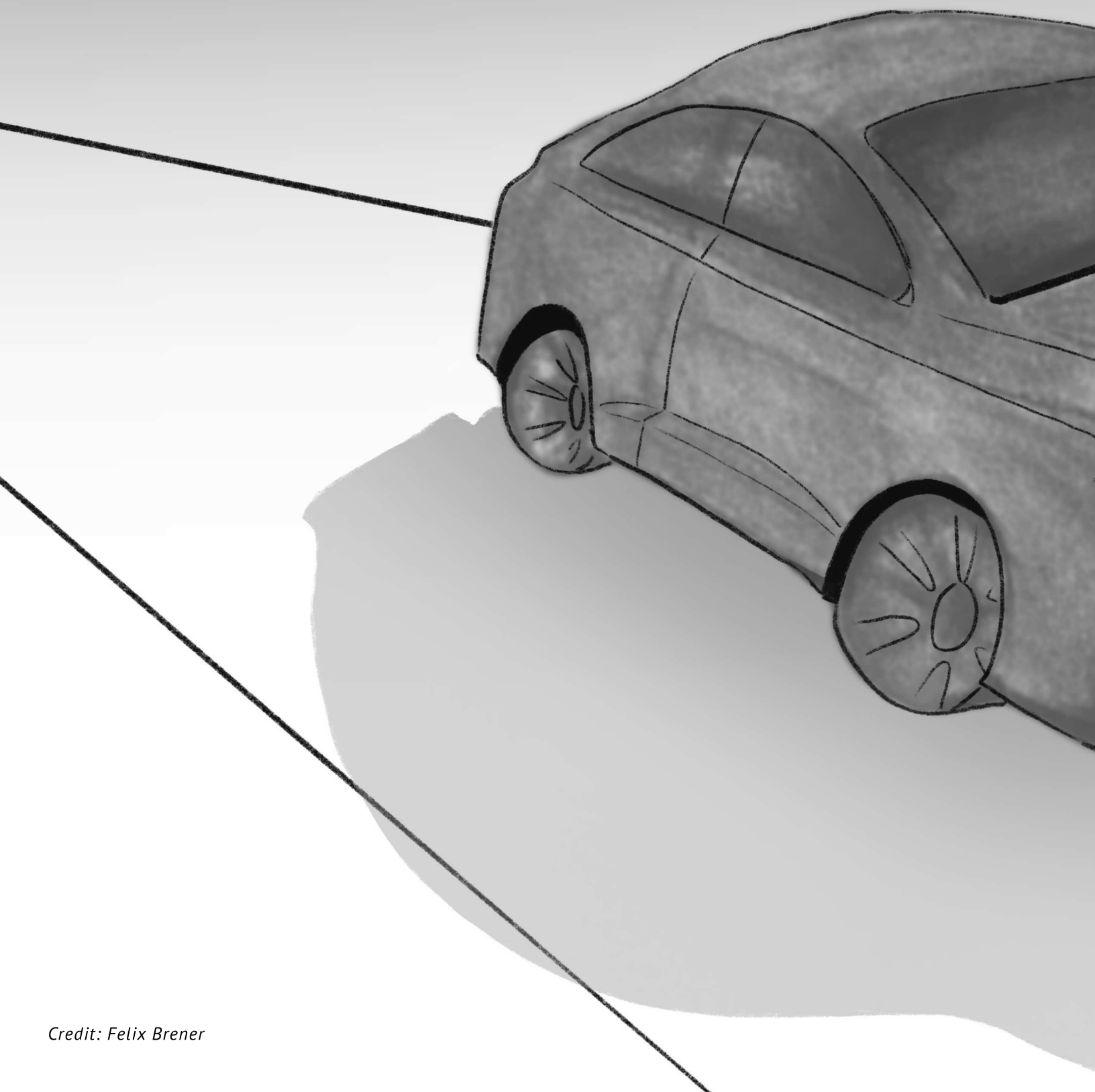




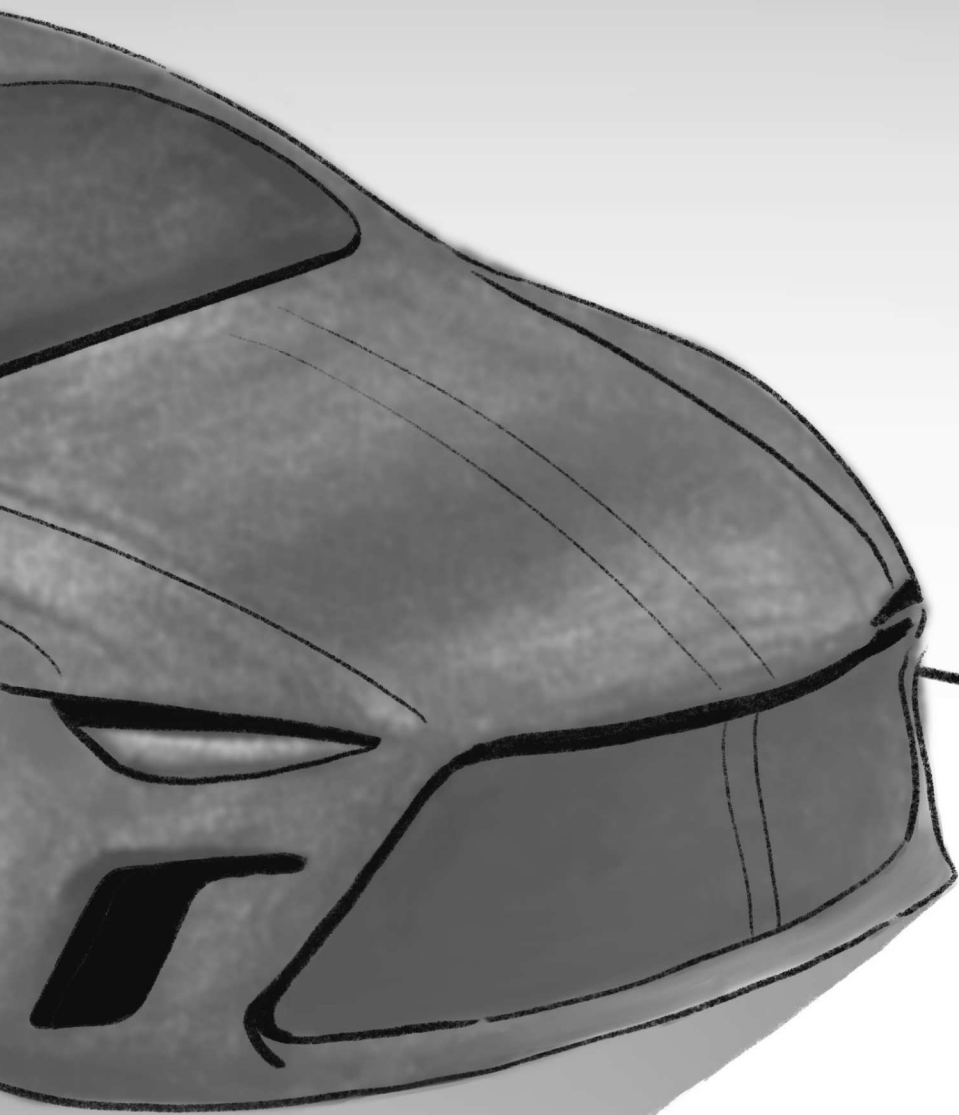


Credit: Aimee Yang

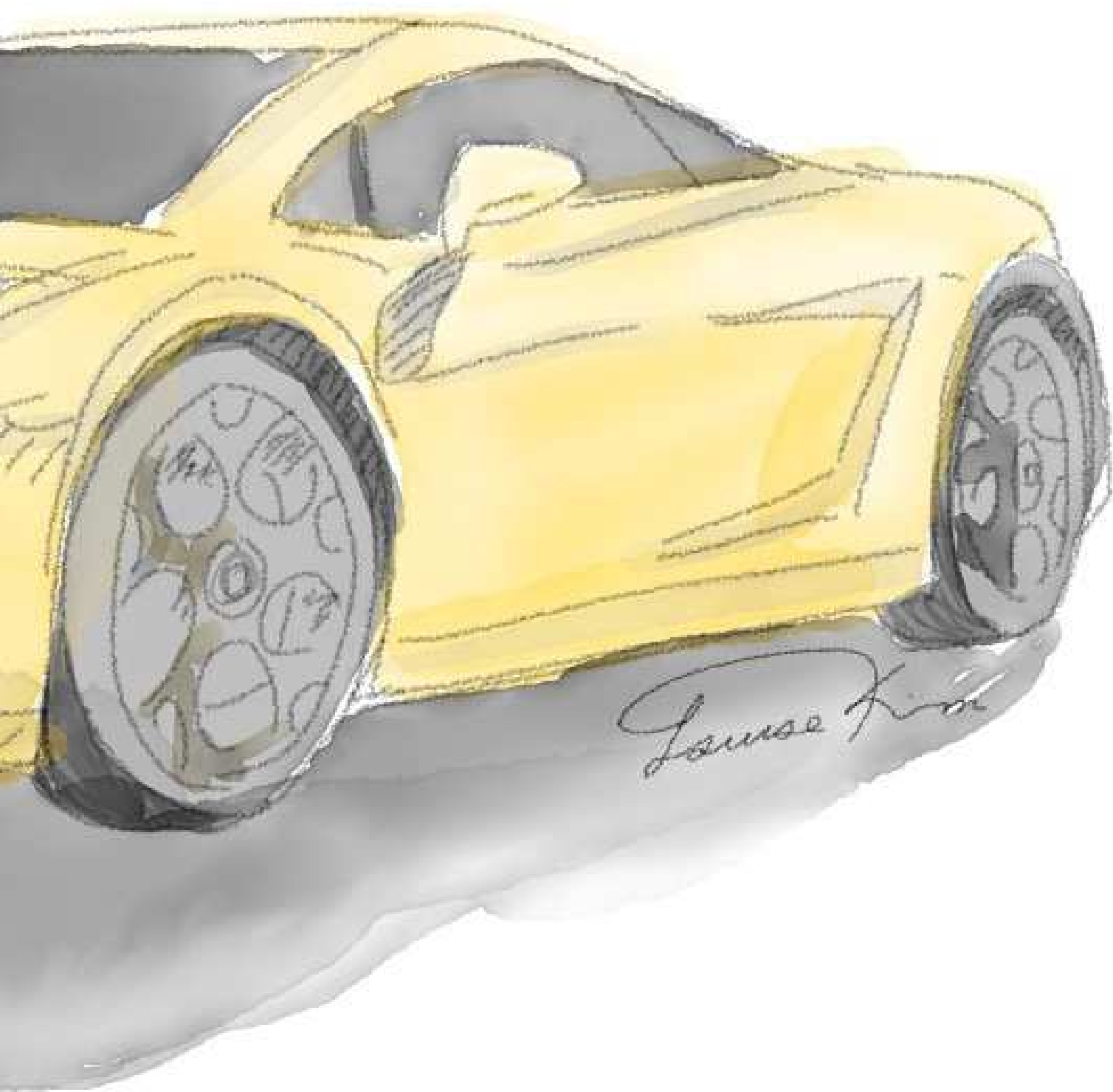




Credit: Felix Brener







Driver Profile:

Ayrton Senna

Arman Azmi

Profile

Born: March 21, 1960 in Sao Paulo, Brazil

Series raced in: Formula 1

Active years: 10 years, from 1984-1994

Teams: Toleman, Lotus, McLaren, Williams

Race Starts: 161

Wins: 41

Championships: 3

Championship years: 1988, 1990, 1991⁶⁶



Ayrton Senna is a name that is often mentioned when discussing the great trailblazers of the Formula One sport. He has 3 world titles, 41 race victories, and 65 pole positions which is near unrivaled by any other driver throughout history.⁶⁸

Ayrton Senna, the man considered by many to be the greatest Formula 1 driver of all time, came and went through the sport like a shooting star; he was in a world of his own, no one could catch up to him no matter how hard they tried, and before anyone was ready, he was already gone. His fierce passion and desire to surpass his limits to attain unattainable perfection, which on their own were enough to prove his greatness, coupled with his charisma and altruism made him an icon and a legend who was looked up to by aspiring drivers all over the world.

Senna was born as the middle child to a wealthy Brazilian family. For the first four years of his life, Senna stayed at a house that belonged to his grandfather João Senna. He developed

an interest in motor vehicles when his parents bought him a go-kart as a kid. Though he wasn't aware of it yet, four year old Ayrton had begun to make his mark on the racing world.^{69 70}

As Senna realized that this was the path he wanted to take, he moved up to more powerful karts. His father built his first competitive kart, which used a small 1 horsepower lawnmower engine.⁷¹ He entered the race in pole position, racing drivers a few years older than him. He led most of the race but unfortunately collided with another driver. Thankfully, his talents were not lost on Lucio Pascal Gascon, the manager of a small karting team, who offered to train the up-and-coming hotshot.⁷²

At 17, Senna won his first championship, the South American Karting Championship, and then competed in the World Karting Championship not just once, but five times. He won the series in 1977, and contested the title for the next four years, finishing second in 1979 and 1980.⁷³



Endnote 79

Senna yearned for more, so he traveled to Britain to compete in the world of single-seat, open cockpit vehicles in 1981. At the end of his first Formula 1600 Championship, which he ended up winning, he was offered a drive with a Formula 2000 team. Unfortunately, Senna did not believe he would be able to continue his motorsport career. Under pressure from his parents who needed his help running

the family business, he announced his retirement.⁷⁴

Not even a year after he moved back to Brazil, he realized that racing was his calling, and decided to take the Formula 2000 team up on their offer. He wasted no time getting back on the track, and he went on to win the 1982 British and European Formula Ford 2000 Championship.⁷⁵

In 1983, Senna moved up to

Formula 3, driving for the West Surrey Racing Team. He dominated the first half of the season until future F1 rival Martin Brundle closed the gap in the second half of the series. Senna ultimately was able to secure the title, but it was a close competition. His win earned him the chance to test with several major Formula 1 teams, including Williams, Brabham, McLaren, and the relatively young Toleman. Formula One always was, and still is, the pinnacle of motorsport. Drivers all across the globe dream of getting a seat on an F1 team and a chance to prove that they are truly the best in the world. But there can only be one number 1. He knew this was his shot.⁷⁶

Twenty-four-year-old Ayrton Senna made his choice after testing with the relatively new Toleman Team and deciding that the car was “very easy to drive.” He would also be able to grow at Toleman, which, despite being a small team, had sufficient financial resources. Although the main drawback that came with being a new team was that the

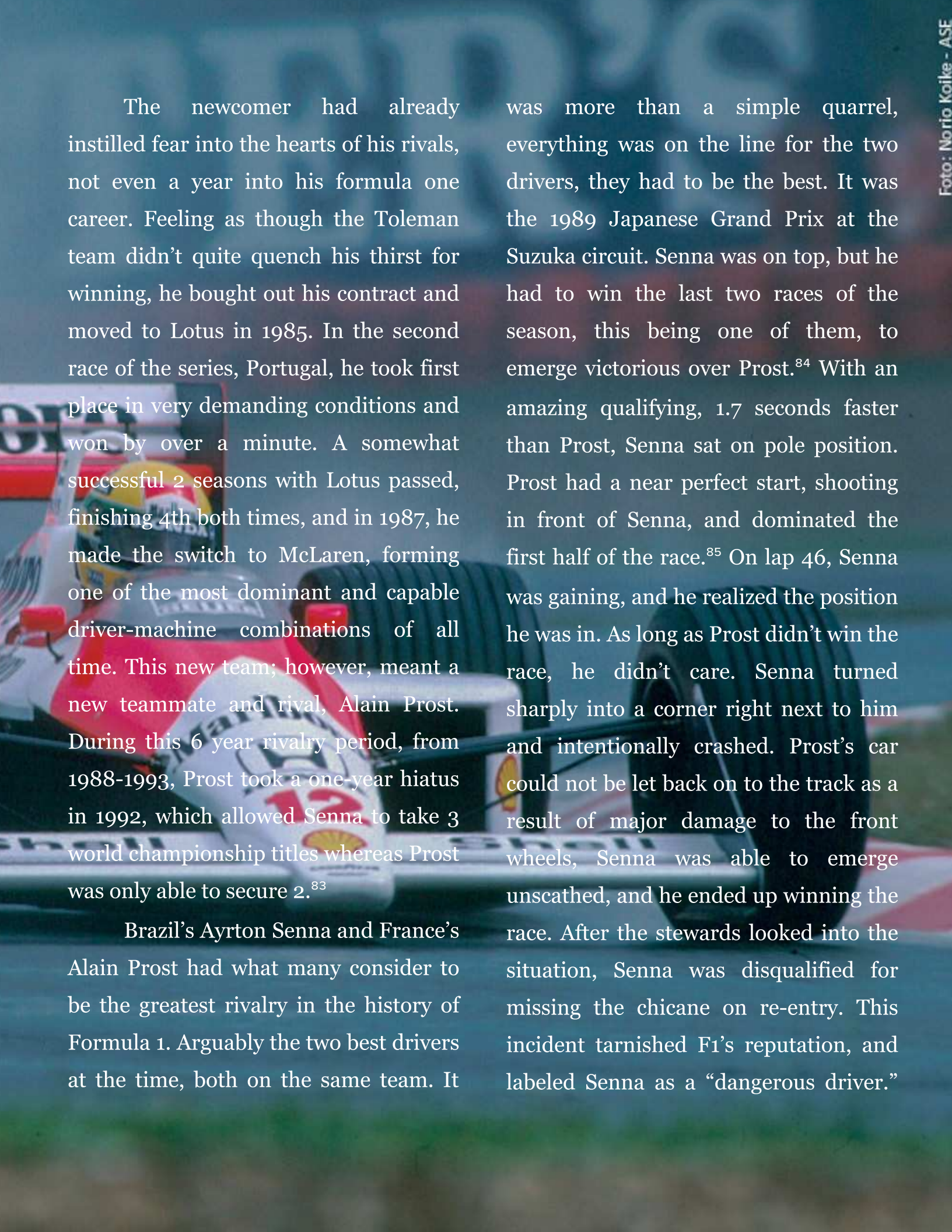
Toleman car was generally uncompetitive.⁷⁷

Race 6 of the season was the infamous Monaco Grand Prix. This particular circuit was well known for its extremely technical corners, and overall skilfully demanding layout because it was one of the only races that took place on regular city streets instead of a dedicated race track. To make matters worse, weather conditions made it almost undrivable. There were strong winds and heavy rain that delayed the start of the race for 45 minutes. With the track completely soaked, and no sign of the rain ceasing, Senna took his position on the grid. Starting in 13th, he began making serious progress through the pack, and on lap 15, he was already in 4th.⁷⁸ This was Senna’s first-ever race at Monaco, yet he was able to find grip where others couldn’t. With the rain coming down harder than ever, on lap 29, Prost, the race leader, waved to the stewards to indicate that the race should be stopped. Prost was concerned about the weather conditions, but he was also

suffering from a major brake imbalance that was a result of not enough heat being generated within the wheels.⁸⁰ Prost was leading, but Senna had put in the fastest lap of the race and was gaining on him every minute. The red flag was waved at the end of the 32nd lap. With Prost in 1st, but Senna close behind in 2nd, the race ended. The newcomer put in a drive beyond his years. The other drivers were astounded. He drove like a seasoned veteran. Senna was able to distinguish the absolute limit of the car, and ride that limit for the entire race, never pushing it, and never falling under. And just like that, a star was born.⁸¹

A few races after Monaco, Senna traveled to Texas to race in the first-ever Dallas Grand Prix held on July 8, 1984. It was blistering hot, over 100 degrees Fahrenheit. On lap 47, Senna was battling for 3rd place when he crashed out. He went to the pits, furious, telling his race engineer, Pat Symonds, "I just cannot understand how I did that. I was taking it no differently than I had been

before. The wall must have moved." Race car drivers are known for their excuses: "the car wasn't feeling good," "the tires weren't warmed up," and, of course, most commonly, "the other guy got in my way." So, suspecting a hint of poor sportsmanship, Senna's race engineer just brushed off his statement; how could some massive concrete blocks have moved? But Senna was insistent that the wall had shifted. After the race ended, Symonds took Senna to the wall that had "moved" to prove him wrong. Lo and behold, the wall had moved. Apparently, before Senna's crash, another driver had hit the far end of the block and moved it. It was only a minuscule 4-10 millimeters or 0.2-0.4 inches. Symonds was astonished saying "That was when the precision to which he was driving really hit home for me. Don't forget, this was a guy in his first season of F1, straight out of F3." But what surprised him most wasn't just Senna's driving capabilities, it was his conviction in his conclusion. If Senna said the wall moved, then it moved.⁸²

A background image showing a close-up of Ayrton Senna's McLaren Formula 1 car. The car is white with red and yellow accents, featuring the number 12 and the Shell logo. Senna's helmet is visible in the driver's seat.

The newcomer had already instilled fear into the hearts of his rivals, not even a year into his formula one career. Feeling as though the Toleman team didn't quite quench his thirst for winning, he bought out his contract and moved to Lotus in 1985. In the second race of the series, Portugal, he took first place in very demanding conditions and won by over a minute. A somewhat successful 2 seasons with Lotus passed, finishing 4th both times, and in 1987, he made the switch to McLaren, forming one of the most dominant and capable driver-machine combinations of all time. This new team; however, meant a new teammate and rival, Alain Prost. During this 6 year rivalry period, from 1988-1993, Prost took a one-year hiatus in 1992, which allowed Senna to take 3 world championship titles whereas Prost was only able to secure 2.⁸³

Brazil's Ayrton Senna and France's Alain Prost had what many consider to be the greatest rivalry in the history of Formula 1. Arguably the two best drivers at the time, both on the same team. It

was more than a simple quarrel, everything was on the line for the two drivers, they had to be the best. It was the 1989 Japanese Grand Prix at the Suzuka circuit. Senna was on top, but he had to win the last two races of the season, this being one of them, to emerge victorious over Prost.⁸⁴ With an amazing qualifying, 1.7 seconds faster than Prost, Senna sat on pole position. Prost had a near perfect start, shooting in front of Senna, and dominated the first half of the race.⁸⁵ On lap 46, Senna was gaining, and he realized the position he was in. As long as Prost didn't win the race, he didn't care. Senna turned sharply into a corner right next to him and intentionally crashed. Prost's car could not be let back on to the track as a result of major damage to the front wheels, Senna was able to emerge unscathed, and he ended up winning the race. After the stewards looked into the situation, Senna was disqualified for missing the chicane on re-entry. This incident tarnished F1's reputation, and labeled Senna as a "dangerous driver."

With these two prideful individuals going head to head, one would think that they would never reconcile, but surprisingly, that's not the case. After Prost's retirement in 1993, the foes became friends. Prost began to understand Senna as a person, and they came to respect one another.⁸⁷

Although Senna was hellbent on being the greatest, he never looked out for his and only his well being, nor did he disregard his fellow competitors. In 1992, during the qualifying session for the Belgian Grand Prix, Érik Comas, a driver for Equipe Ligier crashed his car heavily on turn 17 of the Spa circuit, hitting the barriers on the side of the track at close to 200 miles per hour.⁸⁸ Comas was left unconscious, with his foot pressed completely against the throttle, pumping gas directly into the car.⁸⁹ Crashes in motorsport are inevitable, but usually the procedure is to slow down and pass the crashed vehicle. Generally the stewards will be on track cleaning up the debris and moving the car off. Multiple drivers

passed Comas, following procedure and slowing down as they arrived at the wreck. Senna passed, but noticed that Comas wasn't exiting the car, and that he wasn't even moving. Senna leapt out of his car, ran across the track through oncoming traffic, shut the screaming engine off, and supported the unconscious Frenchman's head until a medical team arrived. Looking back on the incident, Comas believes that Senna had, without a doubt, saved his life.⁹⁰

The race weekend known throughout Formula 1 history known by many as the "Black Weekend" rewrote and changed the Formula 1 sport forever. It was May 1, 1994, during Senna's tenth F1 season, and he was driving for the legendary Williams-Renault team. The San Marino Grand Prix in Imola, Italy, was the 3rd round of the season and Senna faced great pressure from the less than desirable results of his last two races, qualifying in pole position twice, but unfortunately retiring mid race both times. The weekend started on a tense note when

Rubens Barrichello, a driver for the Jordan team, had a massive crash into the tire barrier at unabated speeds, miraculously surviving with only a broken nose. The next day during qualifying, the first tragedy struck. Roland Ratzenberger, a driver for the Simtek team, crashed his car into a corner at a high speed and suffered fatal injuries. Senna was evidently distressed. His old foe, Alain Prost had remarked on how different and indescribable Senna's mood was. He started from first on the grid and got ready to race. At the green light, a Benetton driver stalled his car and got hit from behind by a Lotus driver, showering debris, some of which entered the grandstand, injuring spectators. On the beginning of the 7th lap, Senna was defending his position against future Formula 1 legend Michael Schumacher in his bright blue Benetton B194. Little did they know, the world of motorsport was about to change forever. At the left-hand Tamburello curve, a turn Senna had done countless times before, his car veered to the right at over

190 miles an hour, colliding with the concrete wall lining the outside of the track. The force of the impact caused the front right wheel to come into the cockpit, with the suspension fatally striking Senna in the head. His old friend, Professor Sid Watkins looked back on the incident, "And that was the moment -- and I'm not religious -- that I thought his spirit had departed."^{91 92} A global sporting icon was lost that day, but the legacy he left behind is timeless.⁹³

Ayrton Senna, the shooting star of Formula 1, proved that anything can be accomplished if you are determined and willing enough. His career consisted of 41 wins, 65 poles, and 3 world titles, cut short during the prime of his career due to his untimely death.⁹⁴ But while statistics are an important factor when comparing drivers, they don't do justice in illustrating how truly special of a driver he was.



Credit: Arman Azmi



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