

TECHNICAL
REPORT 2



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INTRODUCTION TO AUTOMOTIVE ENGINEERING

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Introduction

To start off with my technical report, I have chosen the 2017 first-generation Ferrari 812 superfast, The main reasons being because of the design of the vehicle, which I have always admired, and because of many of the features, like the naturally aspirated 6.5L V12 engine which is it equipped with, The sleek design and many edges, including active aerodynamics which aid with the 812 being a slightly toned down, heavier f1 car for the road with the full V12 grunt of the golden era of F1, with help aerodynamically to achieve the raw acceleration and brutal top speed of the vehicle, being 0-60 in 2.8 seconds and 211mph top speed respectively, And how it has all of these features, Along with the very luxurious interior which also comes with it, which is a rare feature in many supercars, another reason is due to the pinpoint precision handling, and Overall, just thrilling experience of a car, which is rare considering the recent production date and with the motor industry heading towards a more hybrid and eco-friendly direction in the short future.

Some basic history of the car I have chosen, from the manufacturer standpoint, Ferrari has always been at the pinnacle of motorsport, designing raw power and some of the fastest vehicles since they were founded in 1947 by Enzo Ferrari, combining their history with the long racing pedigree of past and present, enabling them to create some of the best vehicles of all time at the peak of engineering, they first introduced the 812 superfast in 2017 as a successor, and at the time was replacing the Ferrari F12 Berlinetta which was produced from 2012 up till then.

My aims for the project are to produce a report on my chosen vehicle, being the Ferrari 812 superfast, and to list the reasons why it was my choice and explain different topics on why it is useful for the vehicle and what its purpose is, why it is relevant to the vehicle and how it benefits it using research, and whether the vehicle has been a success to the market, along with any advances that came along the way after production to ensure it is a more complete package, And then close the report out with explaining the current state of the automotive industry, as well as the conclusion and explaining how the vehicle fits in with the modern-day industry. In my report, I will research and explain about the history, design, and go in depth into the engineering, and performance of the Ferrari 812 Superfast in detail.

Chapter 2: Impacts of the chosen topics on the vehicle

2.1 - Aerodynamics

The Ferrari 812 Superfast features brand new aerodynamics that help it to boast its superior speed and handling. The 812 has a low profile with a sloping hood and roofline that helps air flow smoothly over the car. The rear of the car has a large diffuser and spoiler to increase downforce and maximize stability when at high speeds. The design of the 812 Superfast's bodywork was developed with a pure focus on maximizing downforce and minimizing drag. The car's aerodynamic profile is optimized with a combination of features such as air intakes, active aero flaps, and rear diffuser.

The front of the car features a wide grille that directs airflow over the front wheels to reduce drag and improve stability. The 812 Superfast's side profile boasts wide fenders and sharp lines that channel air toward the rear of the car. The active flaps on the front and rear of the car are used to control the amount of downforce and drag, depending on the driving conditions and weather.

On the rear of the 812 Superfast is where most of its aerodynamic attributes are located. the rear diffuser helps to create a low-pressure area underneath the car, which also creates more downforce. The diffuser also has a small lip spoiler that helps to reduce drag and increase stability, Overall the aerodynamics of the 812 Superfast are attentively designed to balance performance and handling. The result is a car that can reach soaring speeds while remaining stable and easy to handle at high speeds in any scenario, whether on road, or on track.

Chapter 2.2 - Materials

For This chapter, I will explain and give reasoning why such materials were used on the Ferrari 812 Superfast, with it being a supercar that uses advanced materials which are not commonly found anywhere else other than on expensive high-performance cars, to start with how the engineering achieved its impressive performance and aesthetic appeal. The car's body is constructed from a combination of lightweight materials such as aluminium, carbon fibre, and composites. Aluminium is a common material used in car body construction due to its high strength-to-weight ratio and low density.

With The use of aluminium in the vehicle it is a very effective way to improve the overall strength and rigidity of the car and is also heavily used in the 812 superfast's frame. Carbon fibre is another material which is used in the 812 Superfast. Carbon fibre is notoriously known for its very high strength and ultra-low weight which helps make it an ideal material for selective high-performance cars, with the main downside being the pure cost of the material, which is why it is very limited in many cars. The use of carbon fibre in the cars body has been extensively studied and has proven to reduce weight and improve performance (Scaramuzzino, 2016). There is also Composites used in the construction of the Ferrari 812 Superfast.

In basic, composites are made from a combination of materials such as carbon fibre and resin which is the key reason for the high strength and low weight and keeps it held together. This process using composites has been tested by many manufacturers and has proven to help with improving vehicle performance, and increasing the fuel efficiency (Shakeri, 2019). In addition to these materials, the car's suspension system is made from forged aluminium and titanium. These materials have high strength and low weight, making them ideal for high-performance applications. Overall, the use of advanced materials is heavily present, such as aluminium, and carbon fibre composites.

Chapter 2.3 - Emissions

The raw emissions for the Ferrari 812 superfast using data from Ferrari's official website, shows that the 812 has a CO2 emissions rating of 340 g/km. This is based on the car's combined fuel consumption rating of 14.9 l/100km. However, the figure of emissions can vary due to changes, such as a certain driving style, the terrain, and weather conditions as you tend to drive slower in rain or slippery conditions therefore a lower emission is produced. Additionally, some regions go by different emissions standards, as Europe's is highly different to that in North America. Overall, the 812 Superfast is a high-performance car that produces relatively high emissions with the main reason being the 12-cylinder engine, but it is prioritised and designed for enthusiasts who want speed and performance rather than caring about the environmental considerations.

Chapter 2.4 - Manufacturing

The Ferrari 812 superfast is a very complex, expensive car that is complicated to build, on average, it takes around three months to construct an 812 superfast, with the main focus being on the powertrain, heavy aero package and lightweight chassis, while also keeping the luxurious interior, and with the unparalleled handling of the 812, making it one of the best cars that enthusiasts can buy, for the crankshaft alone, it is estimated it takes around 25 days to build, with many lengthy processes occurring in the manufacturing of it, such as the machining, boring, nitriding, heat treating, and final handcrafted parts and inspections, all parts have to be approved by Ferrari standards to ensure they meet the standards, As well as the V12 engines having their own dedicated building line to the V8s due to the complexity and long time it takes, which overall covers 32 different building stages just to assemble the engine alone, all of this in the end, is for a state of the art product.

Chapter 2.5 - Powertrain

The powertrain used in the Ferrari 812 superfast, is a huge 6.5L V12 naturally aspirated engine which produces a maximum of 800 brake horsepower @ 8500 rpm, and 718NM of torque at a peak of 7000 RPM, the engine is an upgraded and updated version of the previous, less powerful 6.2L engine from the F12 Berlinetta, it also features brand new technology, and also has increased efficiency while also making it easier to handle than its predecessor Berlinetta, making it superior than the F12 Berlinetta, as stated above, the engines alone go through a very lengthy process to be assembled and are carefully inspected to ensure all motors are correctly put together and have quality parts to last the intense stress all of the power will put upon it.

Chapter 2.6 - Chassis design

The Ferrari 812 superfast is designed with a lightweight, aluminium frame which helps keep the weight down, and helps with the sleek design of the vehicle which in the construction of the Ferrari 812 Superfast, all of this has helped it to achieve its impressive performance and aesthetic appeal to a big market with high demand due to the engine used. These materials have been extensively studied and optimized for their potential to improve the strength, rigidity, and lower the weight of the car, as well as to improve performance and fuel efficiency throughout, providing many benefits for the driver.

Chapter 3 – Current state of the industry

With the current state of the automotive industry, It is beginning to start the process of heading into a time of more hybrid vehicles and electric vehicles being solely produced this is due to them using different methods of fuel or charging, which doesn't require burning of fossil fuels and can be ran off of sole electricity from sources such as wind, solar, and hydroelectric power,

Unless other alternative eco-friendlier biofuels can be used as fossil fuels aren't sustainable in our lifetime and will run out, then fossil fuels will likely become a thing of the past, with the UK banning selling production cars which use petrol and diesel engines in the next 10 years, many countries will likely follow this regulation, however in motor racing, F1 is heavily researching into bio fuels that are sustainable while Porsche are also doing the same, in my opinion I would prefer for bio fuels to be used, rather than sole electricity powered, but that will likely be the ultimate outcome in the future for vehicles, however the automotive industry still faces many challenges even today, stemming from the backlash of the global covid – 19 pandemic which product shortages are still happening today.

Chapter 4- Conclusion

To conclude my technical report with the vehicle I have chosen which is the Ferrari 812 superfast, it fits in the automotive industry because it displays all of the key characteristics of a vehicle, with its powerful and great design, interior, powertrain, and has always had a market focus of being super powerful and exclusive with the high price tags, which gives it so a high demand which has lasted for over 75 years, which always adds to the brands value and exclusivity.

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