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Programme of Study: Automotive Design
Module: M6X02237 - 2

Task: Major Project: Design Research and Manifesto
2157 words (excluding bibliography)

Future of Electric Supercars

The car industry is evolving rapidly. In the past, cars used to be only petrol or diesel-powered, nowadays the market is flooded with different options such as hybrids, electric-powered or even hydrogen-powered vehicles. The major focus of car manufacturers for future cars seems to be lowering the emissions of the cars as much as possible, improving performance, and shifting slowly to an all-electric range of cars as new regulations for the year 2030 will come in place.

Main problems in today's EV cars and possible solutions

Technology for electric vehicles is progressing day by day, yet carmakers are struggling to overcome some major issues regarding them. The 1st big issue to overcome is the range. Two main factors determine the range of an EV – weight, and aerodynamics.

The 2nd big issue is desirability. The transition from petrol and diesel cars to electric ones is quite sharp for most people. We are all used to a lot of things with our ICE cars that are missing on the EV platform – sound, gear changes, charging instead of fueling up, etc. Overall, the driving feel is the thing that changes the most. The EV's acceleration is rapid as the power delivery is instant and there are no gears to go through, but most EV's carry a tremendous amount of weight which makes them slower in corners.

Problem 1: Range

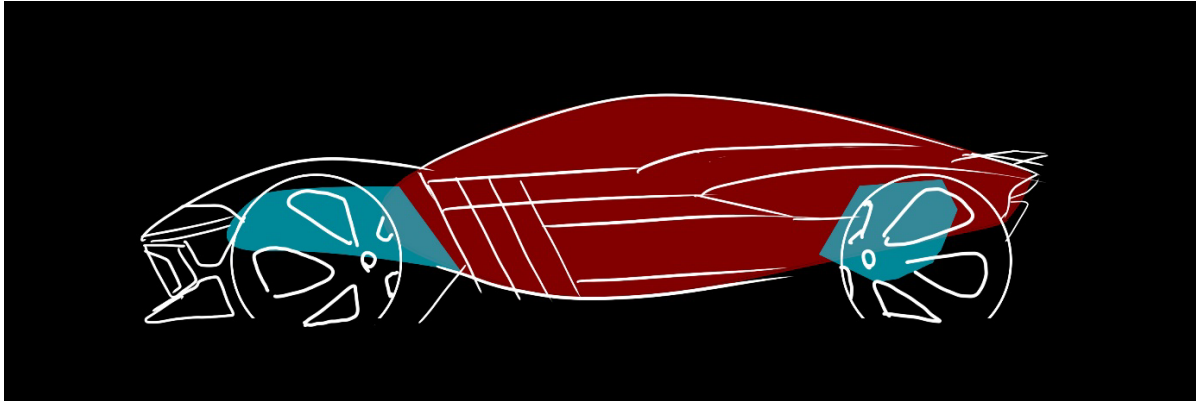
1. Aerodynamics

What is the drag coefficient and how does it relate to the range and economy of the car?

The drag coefficient is a common measure in automotive design as it is a measure of aerodynamics. The way the automobile passes through the surrounding air determines its drag coefficient. Reducing the drag coefficient in an automobile improves the performance of the vehicle as well as its fuel efficiency. The Tesla Model S held the record for being the lowest drag coefficient car for a long time with a .24 CD. Currently, Lucid Air is the lowest drag coefficient electric vehicle. Lucid Motors have released the results of aerodynamic testing for their upcoming Air electric sedan with an impressive .21 Cd, which they claim makes the Lucid Air the world's most aero-efficient luxury car. This will enable the Lucid Air to have up to 400 miles of range and beat the Tesla Model S in a drag race. (*Electrek, 2020*)

Solution

Reduce the frontal drag area, reshape the body of the car to the optimal shape (teardrop). Use the lightest possible materials. An F1 inspired carbon tub combined with exposed suspension elements with the wheels featuring carbon fiber composite protectors.



2. Weight

Most of the electric cars are quite heavy compared to the majority of gasoline-powered cars. For example - let's take two sportscars from the same platform but one is petrol powered and the other- electric. The Mercedes SLS 63 AMG has a 6.3-liter AMG engine and it weighs in at 1695kg while the Electric Drive SLS weighs in at 2095kg.

The main thing that weighs down the EV cars is the car's batteries. Batteries are one of the main things that limits the production of electric cars. They are the heaviest and the most expensive component of electric cars, they also are the factor that limits the range.

(iflscience, 2020)

3. Power regeneration

Solar panels can generate free electricity from the sun. This power can be sent straight to the power source to boost the range of the car significantly. This concept is yet to be thoroughly developed in the future. Integrating thin solar cells into the glass roof will be a good range-boosting option.

Solution

A future solution would be to replace batteries with supercapacitors. A supercapacitor film has been developed by a team of researchers. Graphene supercapacitors can possibly replace the lithium batteries once and for all within the near future. The supercapacitor is made of two layers of graphene with an electrolyte layer in the middle. The film is very thin, strong, and is able to provide a big amount of energy as quickly as possible. Supercapacitor film would be able to be fully charged in just a few minutes, instead of the several hours it

This technology could be integrated basically everywhere in the vehicle. For example the film could be placed in the body panels, roof, floor, and doors. A large supercapacitor can provide the vehicle with all the energy it needs while significantly reducing its weight.

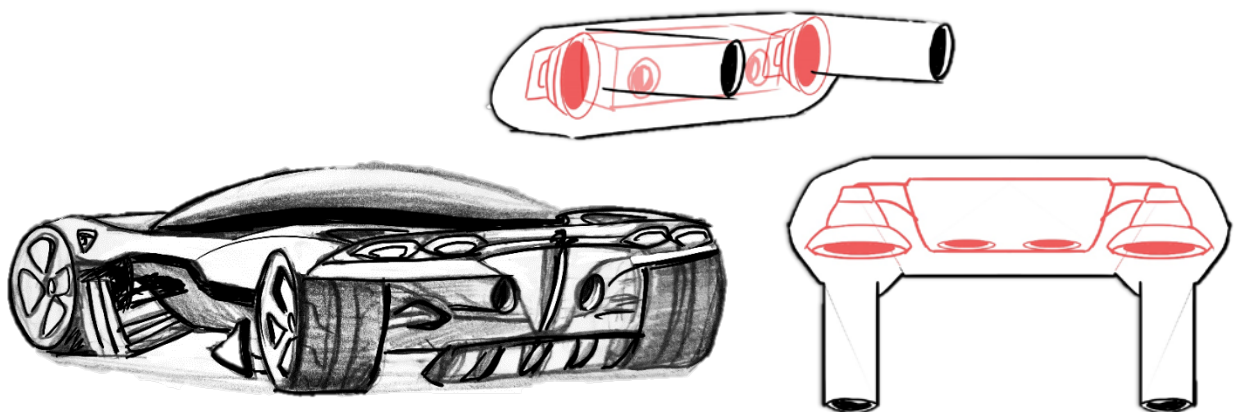
(iflscience, 2020)

Problem 2 : Desirability

The supercar industry is highly affected by the new regulations and the transition to electric power. Most of the supercars that came out in 2020 are fitted with an OPF filter to reduce emissions. What is an OPF filter and how it works? The OPF (also referred to as GPF) is a gasoline particulate filter. They are developed to control particulate emissions from gasoline direct injection (GDI) engines. (*drivetribe, 2020*). As a result, many of our favorite cars lost their raw exhaust note that all of us petrolheads love. Many automotive journalists have expressed their disappointment with the new regulations, but as it seems, new even stricter rules will be introduced in the near future. With the introduction of the planned Euro 7 standard, the EU Commission are planning to ban cars with combustion engines from 2025. If the exhaust emission limits are too strict, there is a chance that combustion engines will no longer be competitive and go extinct (*electrive.com , 2020*). Meanwhile, the electric car industry is growing significantly - carmakers have sold more than 500,000 fully-electric cars in Europe during 2020, which is a marginal difference compared to the previous year and shows that there is a huge potential market for electric vehicles (*The Guardian, 2020*). As of now, there are a few true electric supercars on the market – the Porsche Taycan, Tesla Model S Plaid, Rimac cTWO, Lotus Evija, Audi RS E-Tron, and others. All of those cars aim for the best performance and the best driving feel for an EV. Porsche has integrated an interesting new sound solution that differentiates it from the others. The Porsche Electric Sport Sound in the Taycan Turbo S is custom made to match the vehicle's personality and status. All Taycan models are also fitted with a system to meet the legal requirements for pedestrian protection (*newsroom.porsche.com, 2020*). I think this is a move in the right direction but still not the solution we are looking for. Ideally in the future electric cars would be able to truly replicate the same emotion and feel we get from our favorite ICE supercars. Design-wise I think ideally cars would still have the exhaust outlets we are so used to as they compliment the looks of the car.

Solution:

I have designed a solution that is a full sound system with the subwoofer put into the titanium case for greater acoustics. With this, the car would not only gain the desired sound, but it would also preserve the aesthetics of the back end of the car with the exhaust tips we are familiar with. The system would feature a couple of different sound modes with preloaded sound files from the manufacturer. A couple of "engine sound" options would be available such as the V12, V8, V10 sound notes we strive for and also for the people that would still want the car to sound "futuristic" a sound specifically made to suit the vehicle. The car will come preloaded only with the "stock" sound + only one "engine of choice". Other sound options can be purchased and even more, can be added in software updates.



Design direction:

My aim is to design an electric supercar for the year 2030. The vehicle's main aims are going to be lightness, agility, range, and performance. Overall I want my supercar to be as engaging and exciting as possible while being electric and having basically 0 emissions.

Proposal 1 – Lamborghini EV Hypercar

Lamborghini is starting to move into the electric market with their 1st hybrid – the Lamborghini Sian

Yet Lamborghini still hasn't produced a fully electric vehicle.

As a company obsessed with the use of lightweight materials, Lamborghini is the perfect fit for a Super-light electric hypercar.

Proposal 2 – Bugatti Agile Speedster

After the recent events of Rimac acquiring Bugatti, the 1st electric Bugatti is getting really close to production

In the recent trend of big companies producing a speedster version, there is yet space for an electric speedster to be produced.

It would be interesting to see Bugatti produce a very lightweight speedster with an electric powertrain

Proposal 3 (MAIN) - Ferrari Daytona Hommage Coupe

I have chosen Ferrari as it is one of my favorite brands and they produce an absolutely breathtaking experience for the driver. I have had the amazing opportunity to drive both a V8 powered and a V12 powered Ferrari and the feeling they deliver is like in no other sportscar. I feel like if Ferrari manages to translate the same feel and emotion into an electric-powered sportscar they can conquer the electric sportscar market.

Ferrari is one of the most recognized car brands in the world and it's time for it to produce an all-electric model. Ferrari CEO Louis Camilleri, quoted by Reuters today, said that a fully electric Ferrari is going to happen eventually, but it won't arrive before 2025.

A groundbreaking EV with mind-blowing performance would be key to EV breakthrough for Ferrari



Design Parameter:	Description:
Target Customer	The target customer would be a wealthy person that would like to dive into the world of Electric Vehicles with the best possible car of choice. This Ferrari will be for the ones that want to feel the most thrill out of EV supercars, but will still be able to daily-drive the car. This car will be the fastest EV when it comes out, which would also be key in marketing.
Aesthetics	When it comes to design, most of the things we see around us are inspired by nature's forms. For my Ferrari Daytona Homage, I have chosen to base the design on one of nature's most fascinating predators – the hammerhead shark. Sharks are one of nature's most dangerous predators. Their shape has inspired many car designs as they are very intimidating, yet agile. Sharks have a very aerodynamically shaped body that helps them get to high speeds and glide through the water to catch their prey. I have chosen the hammerhead shark in particular as I think I can best implement its features into my design The Daytona Homage Coupe will keep some key Ferrari design features. The design will mainly be inspired by the 1970's Ferrari icons – the Ferrari Daytona and the Ferrari Modulo. Key features will be the long front light bar inspired by the Daytona, but with an added modern twist. The added side stripe, inspired by the Ferrari Modulo, will also have an added safety feature.
Ergonomics	The vehicle would be a 2+2-seater with enough room for two grown people in the driver's and the passenger seat. The two rear seats would be able to accommodate children and child seats.
Size	Length: 4660mm Height: 1275mm Width: 1975mm
Performance	0-100kph in around 2sec. 100-200 in around 3 sec. Maximum speed – 440 kph Power output – 3000hp

Environment	As a fully-electric vehicle, the Ferrari Daytona Homage will be very eco-friendly. As the supercapacitors are made out of graphene and an ultra- thin layer of carbon, the film will be a far more ecological choice compared to standard lithium batteries. Also, carbon is much easier to get sourced than lithium. The car will also be packed with multiple pedestrian and traffic safety features. The black portion of the lightbar would be able to display messages that other drivers can see in their rearview mirror. The stripe on the side of the car would be fully made out of LED's and it will not only act as a styling feature but also it would be a safety feature. The light will start to blink if another car gets too close to warn the other driver. The active sound booster exhaust will produce a sound loud enough for pedestrians to be aware that a car is coming.
Production Quantity	Around 1500 units overall production quantity in the course of 2 years.
Manufacturing Properties	By the year of 2030, manufacturing times and costs should have been reduced significantly. Most of the labor-intensive jobs would be automated. I believe there will be multiple different composites that could be implemented such as carbon fiber, carbon composite, magnesium, etc. Graphene supercapacitors could be outsourced and not in-house made.
Materials Properties	The majority of the panels will be made out of carbon fiber, carbon composite and magnesium. All of those materials are light, but very strong.
Target Product Cost	750,000 €
Launch Date	18.02.2030
Sustainability	Sustainability would be greatly improved over the current day EV's. My concept will use graphene supercapacitors which have much less environmental impact than traditional lithium battery packs.

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