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Project rationale

It is a reality that the world needs an urgent update on society's lifestyles because it is no longer sustainable. Due to constant changes in the surroundings, human interests and needs fluctuate so it is a designer's job to think ahead of time and focus on what's to come, prioritising the planet's wellbeing and ecosystems. For these reasons, it is a necessity to create the future of mobility by designing a self-sustained hypercar which will generate its own power from renewable and natural resources; such as wind and light obtained from the surroundings, and while maintaining the essence of road transportation.

Since the creation of the planet, constant changes are occurring and a persistent adaption to it is necessary. The humankind has always lived adjusting its lifestyle to the changes happening to the surroundings. Nowadays, those changes are developing exponentially due to the presence of humanity's will for progression. But, because of this, an endless loop has been created in which people don't see that their meaning of progression also means digging our own grave by not being able to be in tune with mother Earth. So, as time goes by, the adaptability to the new era of trying to reverse humankind's impact on the Earth's ecosystems becomes an even more urgent matter. For this reason, a new way of transportation needs to be created because mostly all of the existing methods contribute to the growth of climate change's impact on the planet's early future. So, why not create a zero emissions vehicle which can generate its own power from renewable energy sources, such as wind and light, while maintaining the essence of conventional transportation?

The climate emergency is a threatening matter that doesn't seem to be taken too seriously or as a priority by majority of the governments around the globe. Even though some countries might be taking action by imposing regulations, which a few, are directly addressed to pollutant transportation, I believe that these are just ways of disregarding the attention from making a significant change on our lifestyles and how we use our surroundings; because "the greatest threat to our planet is the belief that someone else will save it" (Swan, 2014). Due to this, investigations on improved ways of living in consonance with the environment will have to be done independently. Although green mobility is flourishing, in my opinion there still isn't an adequately clean way of travelling in order to achieve an eco-friendly lifestyle.



Figure 1

Nowadays, electric vehicles are seen as “the future of mobility” due to the generation of zero emissions on the road, but there are some other aspects that need to be taken into account when talking about this new way of transport. Because in reality, are electric vehicles as environmentally friendly as presented? Or are they just another threat for the planet and our future generations?

For the journalist Hilton Holloway, emissions-free travel remains a mirage. Firstly, this is because the generation of the electricity used to power these vehicles is usually from highly pollutant sources, such as coal plants or natural gas. Obviously, the carbon footprint of the electricity used to power a car depends on whether it is being driven in a country where electricity is generated from, for example, hydropower, as in Sweden and Norway or otherwise from the previously mentioned sources, as in Germany. Also, the manufacturing of the battery packs of EVs make its overall CO₂ footprint enormously high. This has been a very controversial topic throughout recent years due to contrasting data depending on various factors, but all conclude on a similar agreement: the production requires a considerable amount of energy and the obtention of lithium and cobalt needs from mining, which is also a highly pollutant process. For example, the production of the battery of a Tesla Model 3 delivers around 11 to 15 tonnes of CO₂, according to a study from the IFO.

On the other hand, the Tesla Model 3 currently holds the record for having the lowest energy consumption figures in a driving efficiency test. This worldwide integrated electric car consumes just 11,9 kWh per 100 kilometers, which is “much lower than the US-based EPA rating of 15kWh per 100 kilometers” (Schmidt, 2020). To produce this energy, 3,497 kg CO₂ are released. This figure is much lower compared to the petrol market competitor of the Model 3, the Jaguar XE, which generates 13 kg CO₂ per 100 kilometers.

Overall, some say that “the future is electric” (Morgan, 2020), but the problem with this new eco-friendly mentality is the thought of green mobility as a better option than some other conventional ways of transportation with non-renewable energy. Yes, it is true that electric cars produce zero emissions while driving, but the reality is that the existing production methods of electricity and EVs’ batteries release an even bigger amount of damaging gasses to the atmosphere than, for example, driving an average petrol car.

Obviously, it is a fact that electric vehicles are a step up towards a free-emissions world, but there is still a long way, and not too much time, to achieve a realistic zero emissions and eco-friendly way of transportation. For these reasons, I believe that there is a necessity for coming up with the real future of mobility, which in my opinion, are vehicles which can generate their own energy by taking advantage of the resources our environment supply us with, without releasing any damaging gasses in the process.

So, the solution is to take advantage, in a positive way, of our surroundings and create vehicles which directly power themselves with renewable energy, such as wind and light. But, how will the vehicle be capable of generating this energy straight away?

In order to generate energy from the wind, the car will capture it either statically from the surroundings or in movement from the cars' velocity with air vents incorporated in the body, which are made specifically to catch as much air as possible and make the airflow travel directly to high-tech air compressors. But, how will the air captured with the compressors generate power?

As explained previously in the design manifesto, the car will include two bladeless centripetal flow turbines as one of the main power sources. This uncommon mechanism, especially in the automotive industry, was patented by Nikola Tesla in 1913. It consists of a set of smooth disks rotating in a chamber to generate movement due to an exchange of momentum among the disks and a fluid. Contrasted with currently used turbines which use curved blades, like those on a windmill, Tesla's turbine produces movement through smooth and parallel disks.

Even though this method of generating energy might sound utopian, Tesla couldn't get more than 40% efficiency out of it after plenty of development years. But, a much more efficient Tesla wind turbine could be created nowadays if time and money would be invested in investigating how to include currently existing high-end technology and materials to the existing concept. Hypothetically, creating a 23 cm diameter turbine consisting of 30 kevlar disks, would produce around 250 horsepower whilst weighting 9 kg at most. This means that, by having two up to date highly efficient Tesla wind turbines, the car would provide 500 horsepower originated solely from wind energy.

In order to increment the final power output of the car, it will also generate power from the sunlight. This will be possible by using nano solar cells which will be incorporated in the body and

won't be detectable at regular sight due to its' petite size. As well as, for the generation of the wind energy the design will adapt to the idea of getting as much solar energy as possible. Because of this, most of the body's surfaces will face upwards for the sake of catching as much light as possible, but simultaneously for the improvement of the aerodynamics, have the minimum amount of surfaces horizontal to the ground as possible. Altogether, this symbiotical design mentality which merges technology into the design without altering its essence, will improve the overall efficiency and performance of the vehicle.

Getting into details, as investigated previously in my design manifesto, "solar cars produce energy to power themselves for 8 miles an hour with a maximum efficiency of just 45%". Currently, those figures aren't high enough to compete with electric or conventional cars. But, by doing further investigation, solar powered vehicles should be able to generate no less than five times the existing capacity, which equals to 40 miles in merely an hour from 95% efficient solar cells. So, from only 8 hours of sun a day, the car's range would be of 320 miles. If this is summed up with the ideal calculation of the car integrating around 300 horsepower from solar energy, which will be stored in the body thanks to the storing capacity of graphene, it's more than a reason to invest on it as the future of mobility.

Therefore, this self-sustained hypercar concept will generate 800 horsepower just from wind and solar energy, which is a satisfactory amount for an initial concept. Undeniably, this could be improved overtime with further technological refinements and money investments.

So, from the necessity of normalizing self-sustained vehicles at a global scale, demand has to increase by facilitating the obtention of these. But, how can this be done? Well, by doing something that might sound disturbing: forcing it into society without people noticing. Because, don't money investments come from society's interests and therefore, from investors? Isn't it true that to captivate society's attention and interest they have to feel a stimulus, and then a necessity generated from it?

The humankind, as an intelligent animal, has the capacity of being conscious of their surroundings and act correspondingly to the stimulus perceived. But, this capacity in people's behaviour can also be a handicap, because it can be taken advantage of by molding their responses to a desired way of acting. Consequently, masses of people act in a pre-established way, molded to feel and behave as desired by whoever or whichever has the capacity to do so.

But, it is a fact that society follows a conduct pattern, as seen over the years. This predictable sequence shows how masses follow the lifestyle and behaviour of minorities. Because of this, the concept vehicle and the new way of mobility will firstly have to be introduced into a small minority, so that it can afterwards be demanded by the rest. So, the target market will be initially aimed at the typical wealthy hypercar owners, which will unconsciously introduce the vehicle into society, generating those feelings of need on others. Therefore, the aim is to eventually move from the hypercar market to the general market when the technology is proven to work and it becomes more accesible and established.

Even though this sounds ideal, the first owners will overlook a controversial phase because, as José Ortega y Gasset wrote in his book “The Revolt of the Masses”, “the mass crushes beneath it everything that is different, that is excellent, individual, qualified, and select.” But, he also explains, as mentioned earlier, that masses will eventually follow whatever is different until it becomes normalized, and back on loop. Because, to provoke a change in human behaviour, firstly their surroundings have to change.

Moreover, an essential aspect taken into account throughout the whole design process was merging art and engineering in a symbiotical way with the inspiration of nature, in order to reach excellence. The environments are full of inspirations in different shapes and arrangements which, when captured with our senses, can acquire many contrasting connotations. Personally, I capture nature as the most pioneering and advanced matter of all. It has the impressive ability to adapt to any situation and offer the best performance required in any circumstance. So, by integrating this top efficiency philosophy, the design could achieve an optimum efficiency while keeping it as simple as possible which improved the overall performance.



Figure 2

Lastly, in order to resemble nature's qualities as best as possible, another design philosophy needs to be present. As Frank Heyl said, "design is where art meets engineering". This is perfectly relatable to how nature is created, because it's purely made to offer the best performance possible, which is what gives it beauty in every way. So, I conclude that finding the breakeven point between art and engineering is what creates a perfect design.

Furthermore, to understand my design development, it's essential to have explained minimally the reasons behind it and it's purpose. I believe that everything has an intention, that is what keeps the essence of most human creations. Without those reasons, the result of the concept development would have been completely different and it wouldn't make sense, because the elements that compose it wouldn't be in consonance with each other and would be lacking efficiency in many ways. So, in relation to the previous personal brief, the overall design outcome remained similar but with a few progressive and necessary developments of design applications, such as proportions, functionality and details. Even though some aspects changed, the initial vision and inspirations were reinforced.

So, what improvements has the design undergone? For example, when refining the functional aspects of the vehicle (ergonomics and technicalities), not many changes had to be done because from the start of the project, engineering aspects and aesthetics were considered alongside while designing. For that reason, as explained into details earlier, I believe that merging art and engineering when developing a concept is essential for effectiveness. Also, the technical characteristics took inspiration from F1 racing to make sure that the functionality and performance were as advanced as possible.

As seen below in figure 3, the vehicle has remained as a two-seater concept with some storing capacity behind the seats. The size of the concept will be of: 4550mm length, 1925mm width and 1050mm height, with a ground clearance of 100mm, 2721mm of wheelbase and 21inch wheels. These dimensions are in the spectrum of conventional market competitors, such as the Aston Martin Valkyrie.

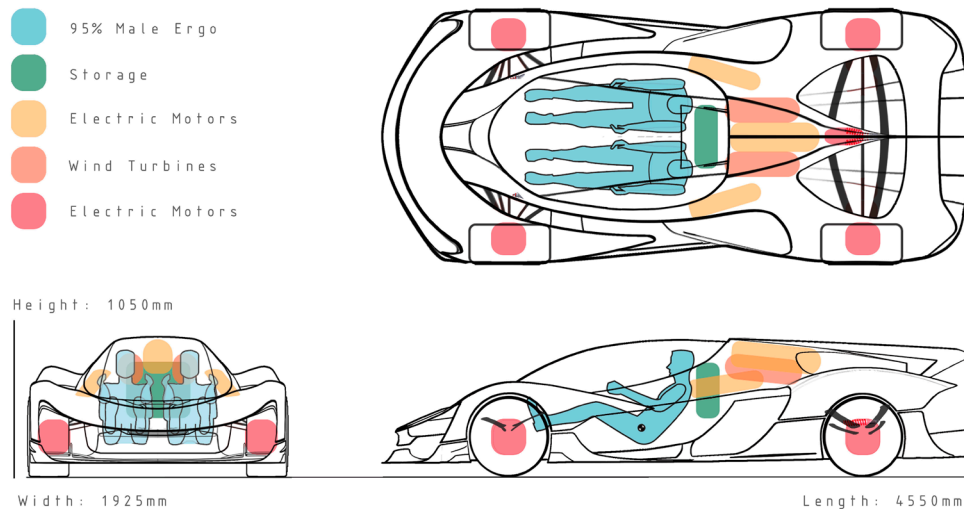


Figure 3

Additionally, horizontally placed suspension will be used, just as in F1 racing (figure 4), with inboard elements such as heave dampers, springs and anti-roll bars, which will be incorporated inside the bodywork. This will be connected to the outboard suspension, which will be located in the wheels near the motors, with elements in the airflow: wishbones and pull, push and track rods. Just as the Mercedes AMG F1 team explained, racing cars “rely heavily on aerodynamics to generate downforce.” Because of this, the suspension is made as aerodynamic as possible because it “has has to deal with tonnes of extra load when the car is going fast”. So, by applying this to the self-sustained hypercar, a top performance from the suspension is guaranteed.

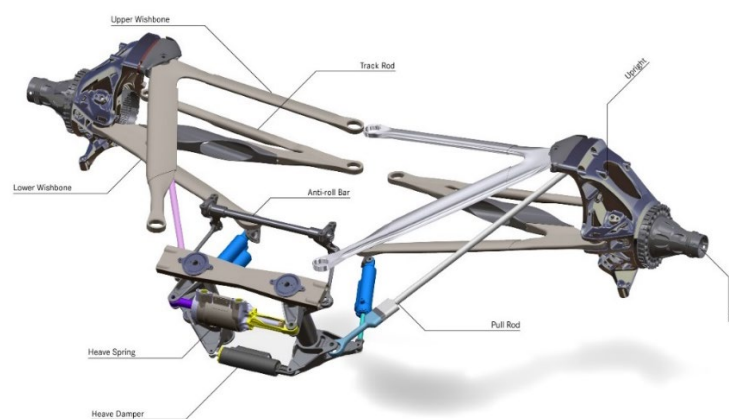


Figure 4

Design wise, every line and detail was improved to make them flow in consonance with each other and to give them a reason and a purpose to be there. If compared with one of the previous designs, it is noticeable how most of the side lines don't follow the same direction, therefore the design was too hard to understand because it wasn't harmonious.

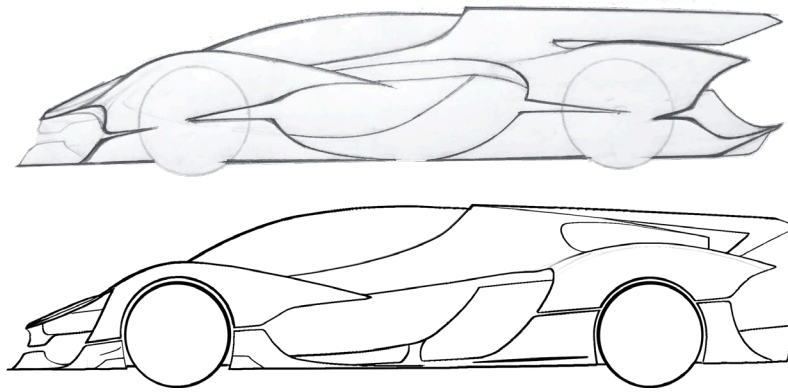


Figure 5

However, the final design incorporates organized lines which followed the same increasingly angular direction which gave it a sense of concordance and velocity. Also, nature inspired extra details present on the design, such as shark fins and gills for performance and visual improvements.

Even though the whole process was educational and fulfilling, there were some aspects which will need to be improved for a better work ethic on future projects. For example, when too much time is spent working on something, sense of perspective might be lost and a step back will need to be taken. Because of this, at one point of the model making process, dimensions were totally misplaced, which meant that extra time had to be spent on fixing it. Human errors sometimes happen unconsciously, but as mentioned by Graham Edkins, “specific human factors issues can greatly increase the probability of human errors occurring”, for example, time/productivity pressures or distractions. If breaks away from the work are taken often, the probability of these errors happening drastically decreases.

Additionally, even though an early start on the design process was helpful for the design vision to stay practically the same, and in order to have a long concept development time without losing the essence and keeping the same mentality, the schedule ended up being too short for an even better final outcome. But anyhow, a more than acceptable result was achieved by adapting the initial concept idea into a realistic, innovative and functional vehicle. The outcome can be seen in the several final VRED renders created, which try to communicate the design and its purpose as best as possible.

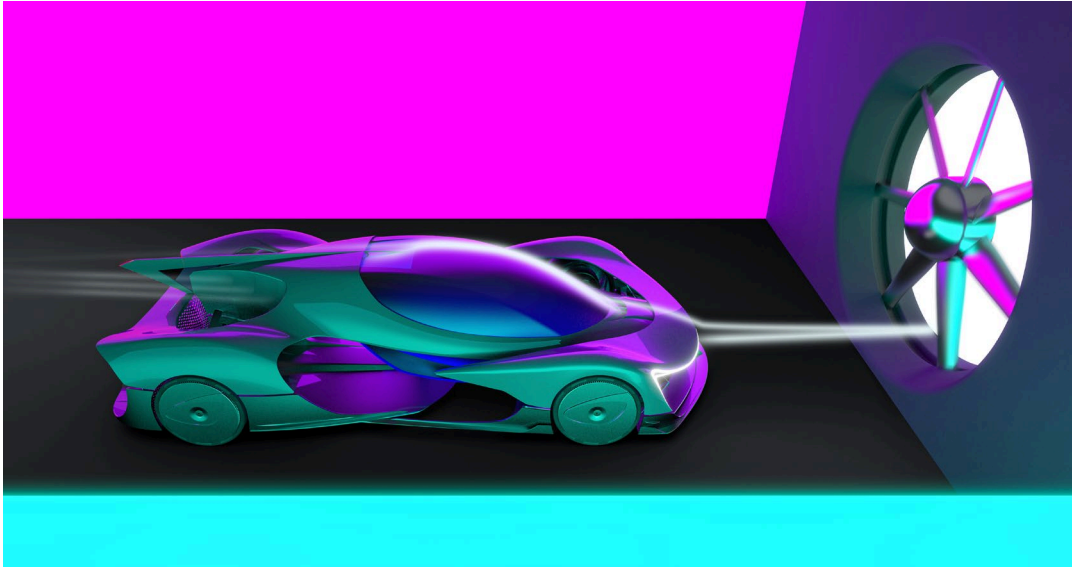


Figure 6

As explained into details earlier, all of the previously mentioned aspects were mainly achieved due to the inspiration taken from nature and its impressive ability to adapt and offer the best performance required in any situation. By integrating this top efficiency philosophy, the design could be kept as simple as possible which improved the overall performance. For this reason, nature's inspiration is present on the design, not only aesthetically, but also technologically with aerodynamical aspects and details, such as fluidity. Because, as mentioned earlier, the perfect design can only be found if art and engineering are merged together.

But, none of this can be achieved if an inflection point between evolving as a species and adapting to the surroundings is found. There is a need to normalize the consonance between the human lifestyle and keeping the environment. For this reason, the real future of technology and mobility has to be introduced into society as soon as possible in order to save our planet.

All in all, as well as being a pioneering concept which will aim to extend the target market of hypercars by reducing as much as possible their usual encompassed maintenance costs by using high-end technology, which will allow the essence of the car industry to be kept while accomplishing an eco-friendly lifestyle. The result of this project is a two-seater high performance self-sustained hypercar which will be fully powered by self-generated energy from natural resources obtained from the surroundings.

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