

RYAN LYNCH
P151888
MAJOR PROJECT
DESIGN EVALUATION REPORT



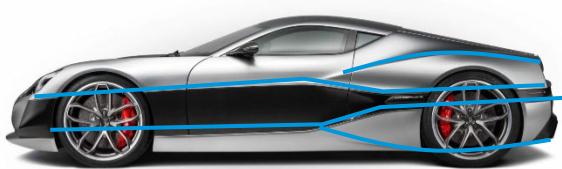
RIMAC
AUTOMOBILI

THE OUTLINE

I began this project with one vision in mind, to evolve Rimac Automobili as a brand. They currently are a small Croatian company who are creating very advanced cars, but in small volumes. But when you consider the size of the company, who have no more than 500 employees, they are certainly competing. Richard Hammond certainly gave Rimac good publicity, but for the wrong reason. This is how I first found out about Rimac and wanted to pursue the brand further. Before the launch of the Concept 1 and the unveiling of the Concept 2, Rimac were a company who supplied various companies with EV technology. With them now being one of the top players in the EV market, companies like Jaguar, Aston Martin, Pininfarina, Renault, Koenigsegg and Seat Sport are now using their battery technology. But being a new company, I feel certain elements of design were compromised to deliver popular first cars for the company.

My vision is to create the next generation Rimac based in the year 2025, which keeps the design philosophy, whilst modernizing in unison. Rimac have always delivered technological advancements on each model and mine will be no exception, it will be a self-charging EV.

When I started designing, I wanted to create a new design direction for Rimac. The two current cars that they have unveiled I feel are similar in design. Both featuring the same tie design and shoulder lines, but you can see a more aggressive figure in the Concept 2.



CONCEPT 1



CONCEPT 2

I began by taking inspiration from birds of prey, to get the smooth, streamline shape for my initial silhouette of the vehicle. I felt the peregrine falcon was a good starting point, I wanted to mimick the falcon diving for prey, creating a very streamline shape.



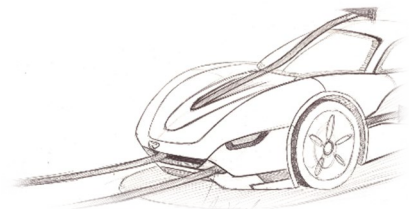
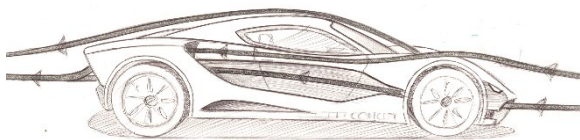
DESIGN OUTCOME

Once I found a silhouette, I began adding in the main details. I began by looking how I could keep the iconic tie design, as you can see from the concept 1 and 2, the tie design is very similar. As this feature is a big part of Rimacs design DNA, I wanted to keep this as the main focal point of the car. I looked at ways to modernise the design of the tie but didn't want to lose the meaning of it.

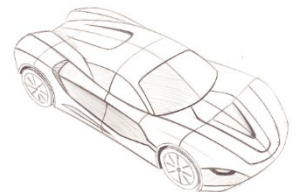
The tie design plays a big part in Rimacs design DNA as the Croatians were the first inventors on what used to be called the 'cravat'. A scarf which was worn in similar fashion to a tie. This was one of the first details to be include due to the historical significance for Croatian culture. The current design goes from thick to thin, it works in tandem with the air intake, channelling the air to the rear motors.

I decided to flip the tie horizontally, so the tie would start from thin to thick, thus giving a larger area for the air intake and making the tie unsymmetrical as I believe it gives the car more acceleration than the previous designs. The concept 2 has a drag co-efficient on 0.28, and this is down to the aerodynamics. Every detail on the car works to make the car as slippery as possible there are several ait intake/outtake ports around the car. I wanted to keep this theme going on my vehicle.

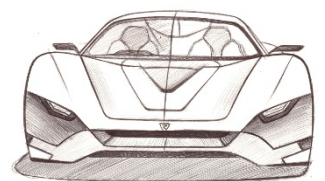
As the air passes through the front grill it gets directed out of the bonnet and out to the beginning of the tie, so the air gets dispersed all around the car. As the air enters the larger air vent at the widest point of the tie, it cools the motors, as well as being funnelled out of the rear of the car.



I wanted to bring as much of the peregrine falcon features into the car as I could. As the falcon lands the wings point backward in an aggressive shape and I felt this could be incorporated into my design. I carried out a similar way of thinking for the rear, it gives the car a muscular stature whilst blending seamlessly into the roofline. And from this, it creates one continuous line around the car, travelling from one 'winglet' whilst connecting with the belt line to continue down to the nose of the car. This connection between each section of the car helps create the smooth flowing shape I desired from the beginning, nothing looks out of place and everything has a reason for being on the car, just as Rimacs DNA values.



The front needed to be noticeable as a Rimac, whilst improving the styling of the car. Rimacs have large open grills with intakes either side. This is something I carried over to my car but refining the front to make it look less cluttered. I reduced the size of the grill and made the intakes more discrete, placing them on the surface where the tie design ends.



Once I had a solid base for a new design, and from here created my blueprints to begin the process of creating the clay model.

The first stage in creating the model was to create the base board and lining it up with the clay table. This ensured that the model was parallel to the grid lines to certify that the model had matching symmetry when transferring measurements. Once the baseboard was lined up correctly with the clay table, I was then able to begin cutting foam and shaping to the correct size.

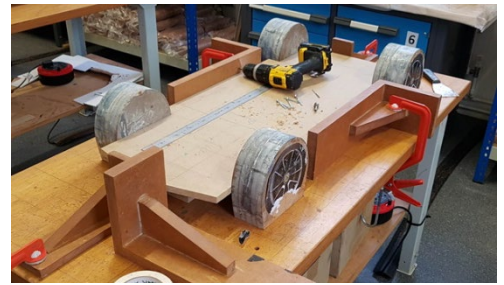
When making the buck, we had to make the profile of the car 20mm smaller in every direction to allow for enough clay. From the GA drawings I was able to create the ABC lines to give indications on the heights above the wheel arches and the highest point of the car. I was then able to begin adding the clay and build up to the correct height. I first transferred the ABC lines onto the model, then marking with tippex to identify I was at the correct depth.

To help with the larger areas of the car I added miniature guides, so it gave me a better idea on what the complete surfaces was doing. Once the car was loaded with clay, I was able to begin to work on getting the main surfaces in, firstly beginning with the roofline and then the greenhouse. Then working methodically, I began to get the next major surfaces in. Once these were in place, the back and front of the car fell into shape. Once all the surfaces were in, I began creating details such as; -

- The tie features
- The grill
- Diffusors
- Lights etc

Certain elements of the car changed from the original blueprints due to some proportional issues which will be discussed in the design development. But overall the generic shape stayed the same, I just needed to fine-tune certain elements of the car. Once the car had every detail in and every surface was matching for symmetry, I was able to begin to add the radii and fillets and begin the final slicking.

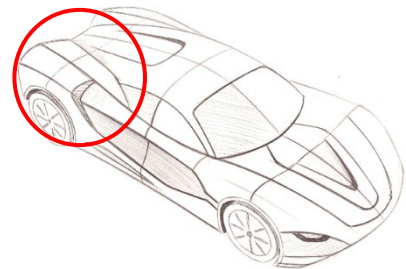
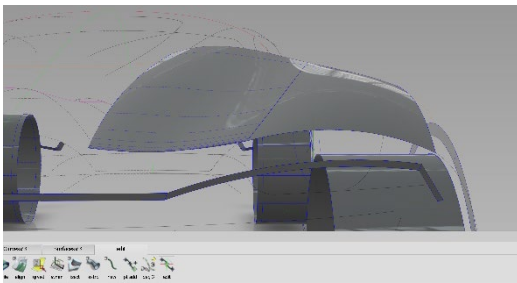
This was by far my most favourite part of the whole project; it gave me the ability to visualise in person what each part of the car was doing and was able to identify any issues quickly due to me being a hands-on person.



DESIGN DEVELOPMENT

Once I created the buck and started applying the clay, I could see that some details and proportions needed working on. As modelling is my strongest aspect over sketching and alias, it was easy for me to see imperfections and flaws in my design that had been overlooked during the sketching stage.

GREENHOUSE



Once I began to plot out the shape of the greenhouse, I could see that the transition between the belt line and the green house was not going to suit the car.

I wanted to model the transition in Alias to see what the surface would be doing, so I used the wireframe I created for the GA drawings and could see that there would be a large twist in the surface which did not suit the car at all. It would be positive curve transitioning into a negative curve, so I decided to keep the greenhouse and the body separate, rather than try to blend them into one surface. I preferred how the surface flows undisturbed to the rear of the car whilst keeping the fast, flowing shape I wanted achieve.

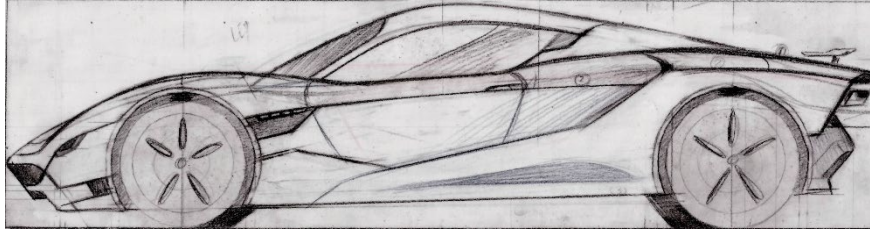


The silhouette also needed seeing to, as the flow of the roofline wasn't one continuous surface. At the highest point there was a slight point which needed to be flattened to create the desired shape. Once the green house was in place, I could then begin to move down to the side surfaces.



SIDE SURFACE

The original blueprint for the side silhouette was a good foundation, but some minor changes were needed.



The first noticeable change that was needed was the belt line, I needed to make a much cleaner transition from front to back. So I decided to bring the transition in line with the A Pillar, this way the lines on the car accelerate right the way along the car. I then moved down the car adding the light catcher. Originally the light catcher was working in tandem with the tie, but I decided to extend it the complete length of the side surface as there was a large amount of empty space at the bottom half of the side surface. It was then time to plot in the tie design.

After I had plotted the tie design onto the side surface I could see that it wasn't suiting the shape of the car. The fact that the car has flowing lines, to then have very sharp lines for the tie was a big contrast. The DNA of Rimac is there just the design wasn't right. So after mirroring the side surface to the opposite side of the car, I essentially had a blank canvas to sketch in a compromise.

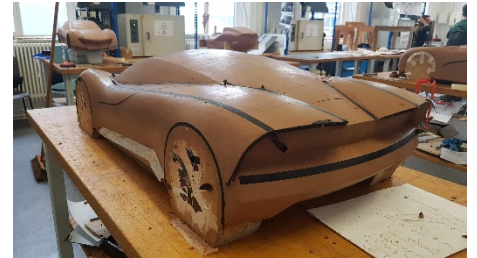
So I took pictures of the blank side to sketch new designs over, and after trial and error found a compromise I liked. After some discussion, rather than to make the tie a feature, I thought why not try to sculpt the body to generate the same effect as the tie design. After several knife lines and sketching out with tapes I found a shape that had potential so again it was back to sketching. Once I found a definitive direction, here I could start so sketch in the design in the clay itself.

This method was very useful due to the workability of the clay, I could create a sketch surface and if it wasn't what I wanted I could rebuild the clay to its prior form within minutes.



REAR

The rear of the car never really changed that drastically, during the early designing stage, the spread wings of the falcon was something I wanted to achieve in the clay, as it would not only be a challenging section to model, but also a very eye catching feature as the majority of the rear is recessed into the car, the only ground surfaces would be the bumper and the diffuser. When you look at the rear, it gives a real indication of tension to the car. As from the side view the majority of the rear is hidden from the overhangs, but as you travel around to the rear, you are met with a confined yet aggressive design.



I feel I achieved what I wanted the rear of the car to look like, and am really pleased on how the body blends into the greenhouse.

FRONT

The front of the car also remained fairly unchanged. The only drastic change was the detailing on the bonnet. The surfaces initially were all combined creating essentially one surface, which was causing confusion. So a crisper intersection was sculpted in where the shoulder line begins to join into the front of the car and finishing at the front headlights. I also had to make the angle in which the surface joined into the bonnet steeper, this created the separation between the bonnet and wheelarch which I was after and resolved the sagging surfaces I began with initially.



Overall I feel that there is a resemblance to the original, just certain features changed along the way. There was only so much sketching could show me, I had to sketch the design in the clay itself to see if it would work. Once I had the shape 90% there, here I could use the clay photos to help with photoshop.



At the beginning of my project I set out with one goal, to create a car for Rimac Automobili that did not follow suit to the current design language, but still had the DNA in its design. I thought that the 2 cars followed to much of a similar trend and felt now that Rimac Automolili are recognized highly in the automotive industry, to be more adventurous with the next generation car.

Looking back at the original Product Design Specification: -

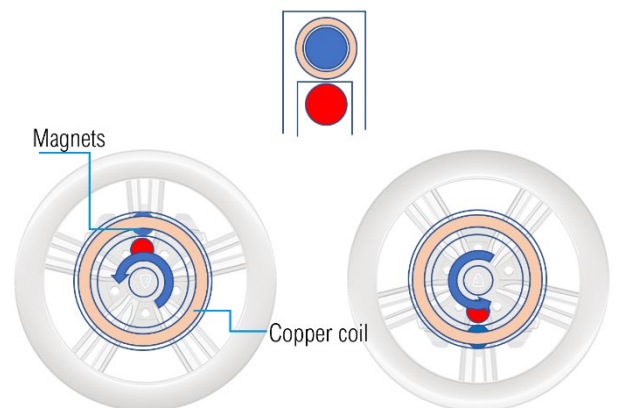
Price - £750,000	Power - 1500hp	Efficiency - 100%
Materials – Carbon Fibre	Range – Unlimited	Quantity - 1500
Ergonomics - 2 people	Length - 4.348m	Width - 1.997m
Height - 1.198m	Wheelbase - 2.750m	

The only figures that have changed is the dimensions of the car, the overall length reduced by 35mm and the height reduced by 50mm

The 2 current cars are priced around £1-1.5 million which is aimed at a very small amount of the market but due to the exclusivity of a fully electric hyper car, both models sold out almost instantly. Rimac have never made large volumes of the 2 vehicles due to the initial size of the company. Now they are a driving force in the EV market, and the popularity is there, my plan was to make a higher volume of cars, as the proof is there that people want the next technological advancement.

The only negative aspect of the EV era is the dreaded word RANGE. No matter what EV company you look at, the range values limit the user's ability to fully enjoy the car due to the inconvenient of charging. With my car based in 2025 and the advancement of technology, my car will be 100% efficient. Whatever energy is used is instantly recouped due to the onboard charging system.

The inspiration came from when I was in school doing physics. We were taught the phrase "For every action there is a reaction" Newtons laws of motion. This was paramount in one experiment we did, Electromagnetic induction. This is where a magnet is passed through a copper coil to create a current. And with 4 rotating shafts from the motors, what better way to utilize the rotation to generate the current.



Referring to the scenario, where in 2030 we are expected to need to produce an additional 8GW and an extra 18GW by 2050. When the ban of internal combustion engine is implied, and most vehicles on the road are powered by electricity, it will put a significant strain on our infrastructure to generate the additional power.

Sustainability wise, it will be extremely environmentally friendly as there will be no need to plug into charge. The energy generated will be form an onboard system.



EVALUATION

Overall, I thoroughly enjoyed this project. I felt I had a large amount of freedom to really create something different that wasn't tied down due to the design language. I feel what I have created really does resemble a Rimac and have not lost its connection the culture and heritage.

During the sketching stage I was initially boxing my self in straight away, trying to keep the same tie design as the previous two cars. So essentially, I was just modernising the shape and not creating something new. Once I sketched just the silhouette and found a shape I liked, I could use this as an underlay and begin adding the details in. I feel I have captured my inspiration of the Falcon in my design very well. The long overhang on the front and a fast-flowing shape to a short overhang at the rear. I'm also extremely pleased on how the rear turned out, how the rear surfaces blend into the body really captures the aggressive shape of the falcon once it captures its prey. From a rear $\frac{3}{4}$ angle I believe its one of the best views of the car, you see the one continuous shoulder line connecting the front wheel arch as well as the recessed rear, you can really picture wings as I was initially intending. The one continuous light bar also adds to the look of the car as your eye is instantly attracted to it.

I feel the clay stage was my strongest ability throughout the whole process. My sketching ability wasn't my strongest point, I sometimes struggled to create the idea in my head onto the paper. Whereas on the clay, I had a free reign, carving knife lines, adding tapes and even creating sketch surfaces to help me create the design I wanted. Although I felt the process went smoothly, looking back there would be certain elements I would change next time around. In my haste, I carved out the original tie design and the bonnet surface far too early, it limited my working space, reducing the size of the workable surface by half. What took a week or two to create I had to fill them back in to get once correct surface, and from here could then begin to add in the details. Here it made it much easier to work on one big surface rather than 4 small surfaces. The overall result is something I'm very pleased with and was a very enjoyable project from start to finish. What began as an idea has now been brought to life as a model.

