The Royal Loop

JUNE 2022

THE HISTORY AND FUTURE OF TRANSPORTATION

Water - rail - road - air
Find out what comes next!

WHAT IS THE TEAM UP TO?

Keep up with our latest progress and future plans!

MEET THE WOMAN LEADING US FORWARD!

Team captain Sofia Hansson shares the strategies of her leadership and what drives her motivation!

KTH HYPERLOOP

Introducing:
The Royal Loop

It has been a great year full of progress within the KTH Hyperloop team. We have had new members joining us, as well as getting closer to a fully manufactured pod being ready for showcasing. In the marketing team, we have spent countless hours thinking of ways to highlight the journey that we have taken together.

After a few days of thinking and brainstorming, the idea of a magazine was born. Our aim was to create a magazine that is meant to elevate the quality from our previously released newsletter. Our aim was to create a magazine that makes it easier to understand our progress with the pod and the importance of Hyperloop in an ever-growing urban sprawl, while at the same showcasing the personalities that are a part of our mission to reinvent mass transportation. Our result? The Royal Loop.

Happy reading!

Imran Diva, Marketing Lead

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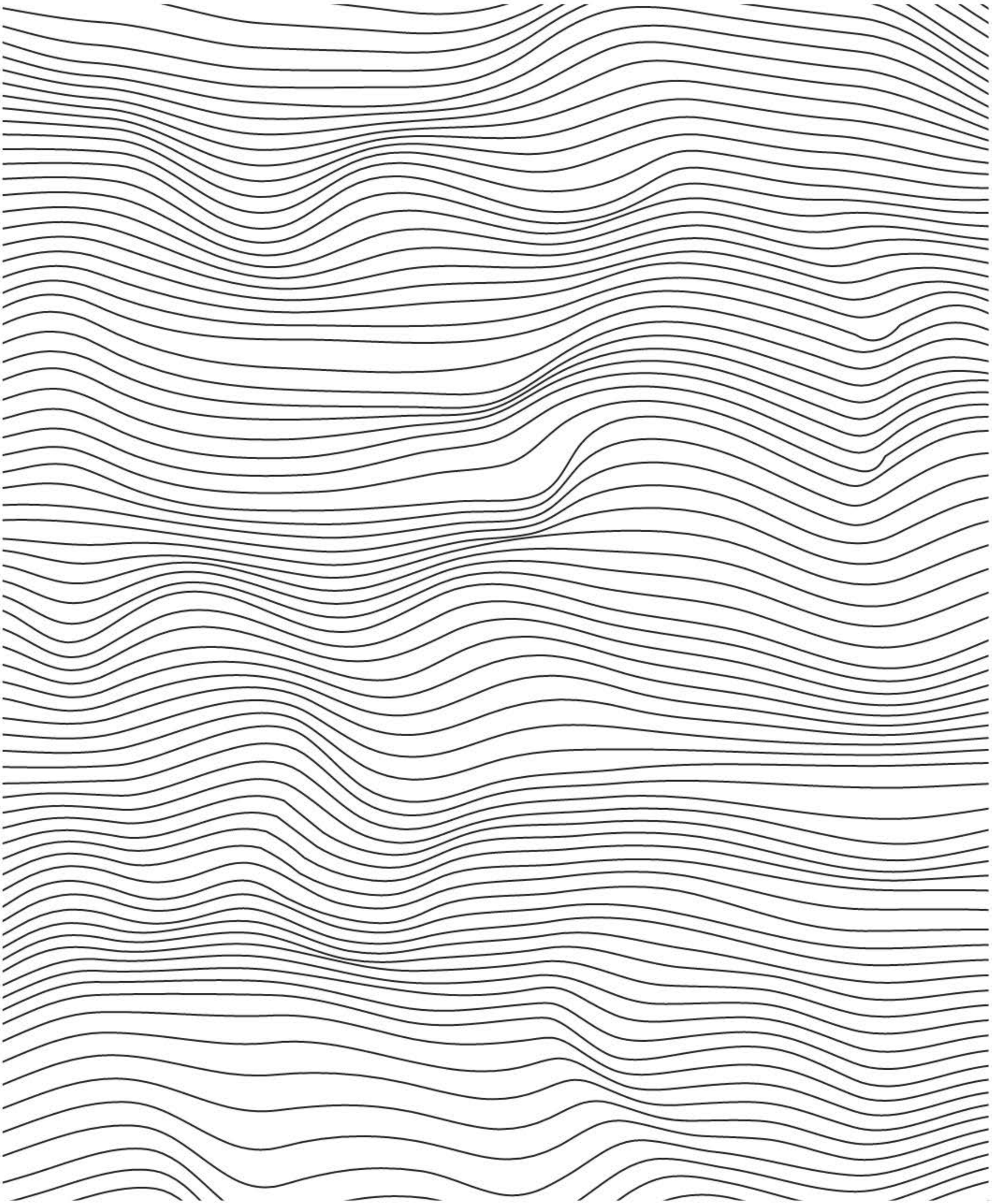
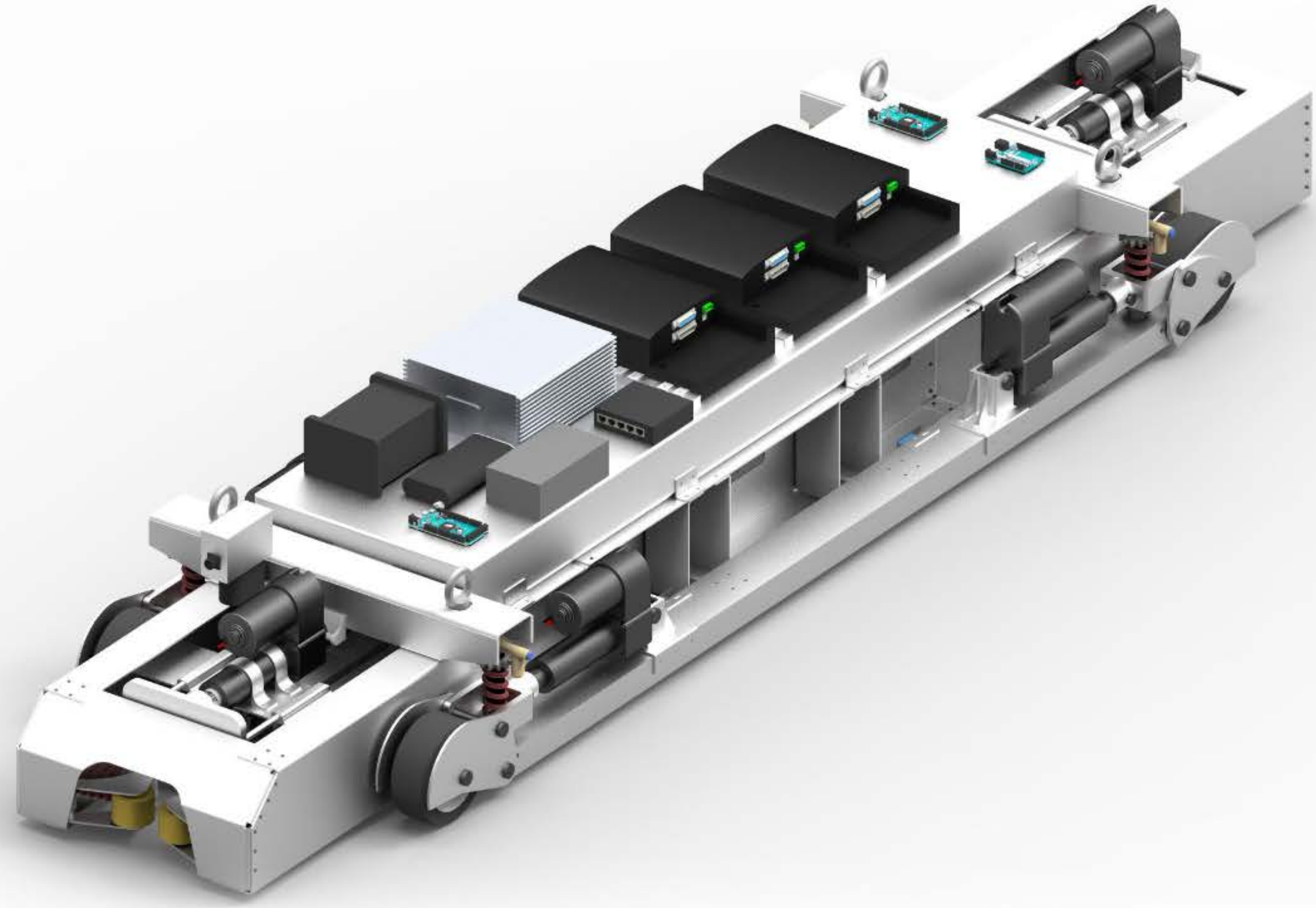


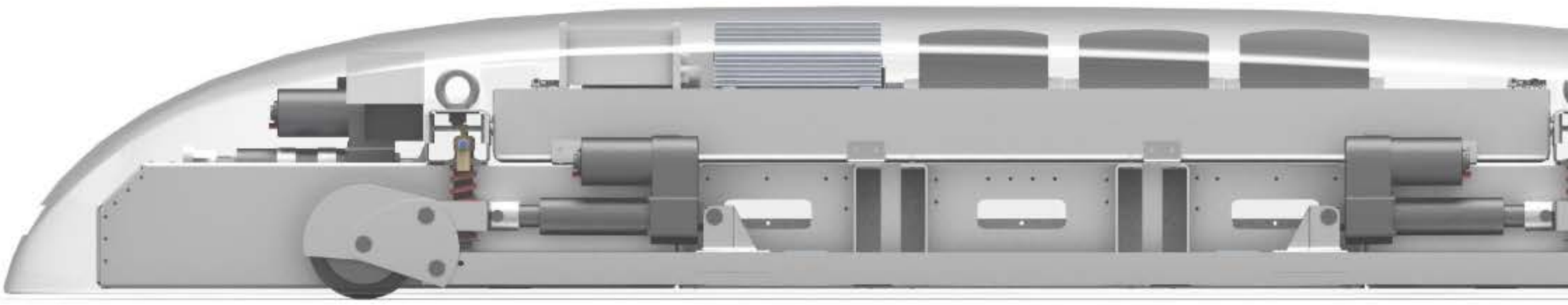


Keep up with the loop!

Written by:
Joseph Blanco

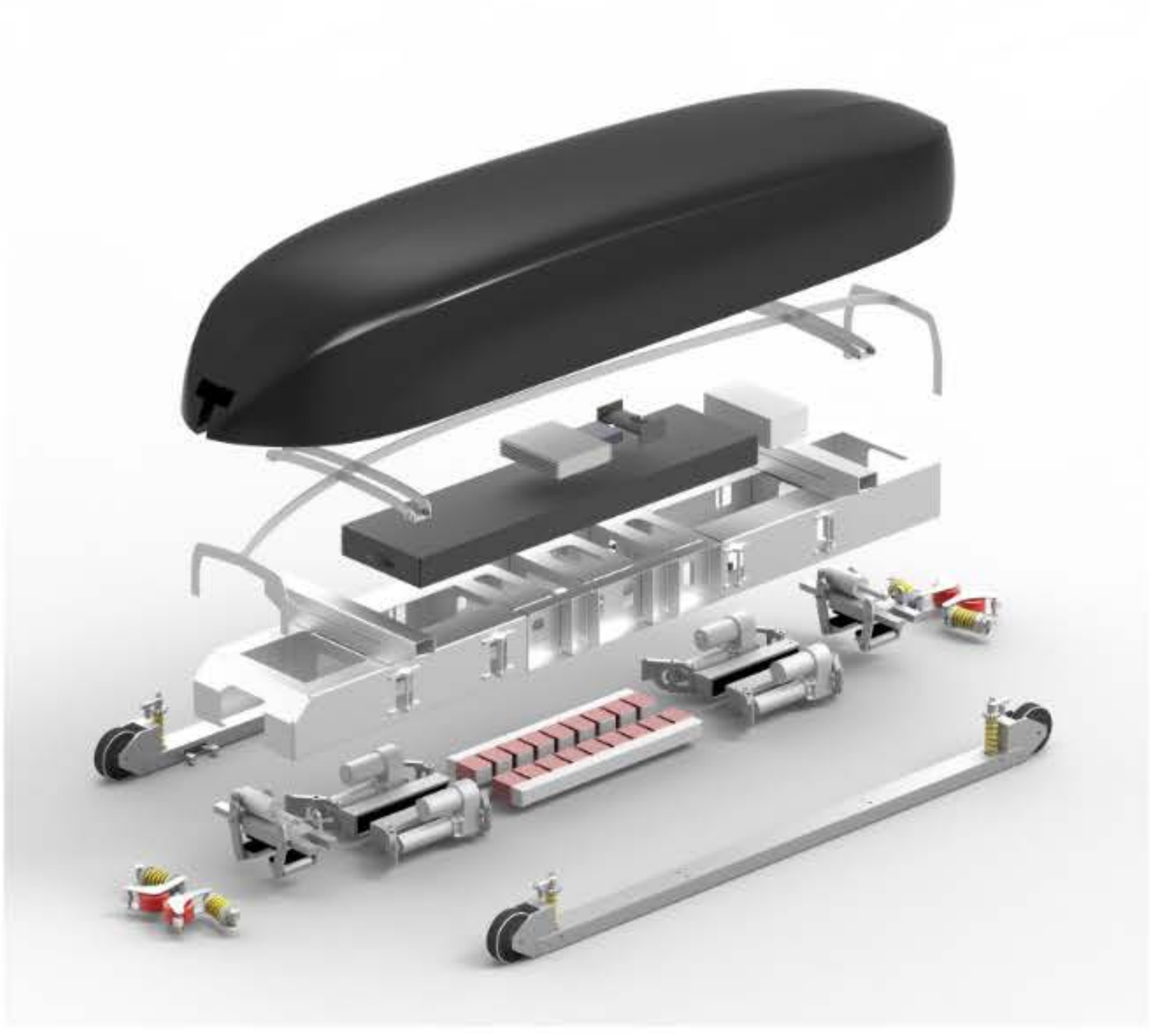
Seeing the progress in transportation made through history, that can only inspire hope for what the future will bring. Modern methods are constantly improving, but with exceeding societal and environmental pressure to improve human mobility, it is essential to revolutionize. Many have theorized what can be done, but one that has become popular in recent years is the realization of the hyperloop. While there are hurdles that will eventually be needed to be addressed, there has not been as promising a time technologically to enable significant developments. But through utilizing innovative technologies and methods, as detailed in a report by the KTH Hyperloop team for European Hyperloop Week, through meticulous work and generous support from sponsors, we will commence manufacturing its first pod for the foundational research into Hyperloop technology.

Using CAD software, a model of the chassis that stores all subsystems will serve as the functioning. To achieve such high speeds, propulsion research has been conducted, with an efficient design that can be enabled through a motor for producing motion by generating a magnetic field, a converter for controlling the signals and speed, and two battery systems to provide power to both the propulsion and other subsystems. Within the challenge of outputting a high velocity, guidance systems are necessary to develop, not only in controlling the path a pod is traveling, but as well as the lateral motion. Braking within the pod is crucial for safety, where using a pneumatic panel to apply force that is connected to brake actuators, which can fully slow down the pod from 100 km/h in only 11 meters. This will all be contained within an aerodynamic carbon fibre shell, which will further provide safety



to the chassis and ease of operations to all the functioning subsystems.

Of the most essential considerations within the technical design of subsystems is safety. When designing the propulsion system, monitored and controlled usage of Lithium-ion batteries is essential for keeping the components within authorized ranges. Additionally, the pneumatic systems for braking and springs within the guidance systems are integrated for the most secure usage of parts. During operation of the pod, it is necessary within the control to include an emergency state, where if any potential safety risks during movement is detected, power will be cut off and the brakes applied fully.



With the completed design, before manufacturing can begin, a series of tests and simulations are done so that each component of the machine is safe and efficient. Free body diagrams are created for all forces being applied to the guidance systems, electronics and propulsion systems are functioning as anticipated, and wireless communications between the pod and the control are measured and reliable. Finally once the pod is completed, tests will be held on a real track, building up from idle, to slow, to eventually top speed ensuring optimal performance.

While these are significant steps for the team's in-house developments, considerations still need to be made when converting these results to full scale. Even within the eventual model improvements will be made. However, these steps are just the beginning for what we want to do to improve the team and contribute to the future of Hyperloop. But through this constant improvement, in a cycle as technology gets better, so does the people's ability to make the technology even better, which is the nature of innovation.

Written and conducted by: **Joseph Blanco**

Paving the way

For as far as the technology advances, its realization can be understood through the people making developments. The Royal Loop sat down with team captain Sofia Hansson to discuss the team, current trends in hyperloop manufacturing, and her hopes for the future.

Why do you believe in the concept of hyperloop?

Well, the primary criticism tends to be related to costs, but I believe with time it will not be a problem. For every mode of transportation that was the concern, but while the technology is not really there yet, it will progress. And that's what I'm really more interested in, in making those developments possible, more than implementing, which is sort of secondary to our motives right now, but that is why I believe in hyperloop, because I believe we can actually make it happen.

From that technological aspect, what is the team working on right now?

Right now we're working on getting experience on the team and soon manufacturing. We've always designed and optimized but never created a pod, or tested if what we were working on was viable. To be able to start manufacturing, starting simple will allow us to improve on something more complicated like the LIM (Linear Induction Motor) afterwards. This includes us publishing a paper on the work done, and submitting it to a conference were we get to present the research done for the LIM because of hyperloop. It's amazing to see the progress over three years and realize that the world is recognized. The next step after manufacturing experience will be constructing the LIM design and implementing magnetic levitation.

What is the long term vision/hopes for this team?

Oh wow, I'm not sure since I probably won't be here, but I think being able to manufacture and test the LIM and current optimized design to see if it works. I think we can get pretty far from the improvements we can learn from that, and especially soon with European Hyperloop week, that collaboration with different teams by getting to know their research and building off of it together will be really impactful as student teams, but it will take time. We had some talks about turning this club into a company, it would be really interesting, but only a thought.

What is the role that university student clubs play in advancement of the hyperloop?

On a logistic level, I think we could create the baseline of the technology, and then a company can take that with their resources and realize it. But I think the motivation and innovation comes from the students and the passion we bring into making the technology real and spreading the idea that we believe in. There are alot of engineers from a lot of good schools that believe in this technology, so there is a hope around the world for this to become real. Making developments and spreading the message this technology is real and can help is our responsibility and how we can help to make hyperloop possible.

> **"THAT IS WHY I BELIEVE IN HYPERLOOP, BECAUSE I BELIEVE WE CAN ACTUALLY MAKE IT HAPPEN."**

I thought it would be interesting to talk about being the team lead. In the past year and a half, what's changed about the team?

Well, the number of members going up and down has always been an issue on the team. As people come to KTH and join and then graduate and leave it has been a hassle but it's part of life. You make a lot of close contacts and then they leave, along with that experience. So when the teams change it is really important to implement a knowledge transfer. We didn't have that before but that was something I set to get done as leader. That involved contacting all the alumni and I appreciate them taking the time for us. For what's changed our work has become very formal, an implementation of rules, documentation, and organization has made us very effective, and closer to a company than a club. But the people and spirit is still the same, during COVID it was a bit rough to stay on track and get work done, but we survived.

Do you have any philosophy to guide you in being the team lead?

Well, why I wanted to join the team was to get to know people, make new technologies, and develop myself. And as team lead I want to give that opportunity to new members, make sure they feel welcomed and learn alot while feeling as part of the team. Even with the flux of the team I try to make people feel united and comfortable.

And that translates into success and accomplishing goals for the team?

Yeah exactly! This excitement and passion for the team makes it easier to make deadlines, get work done, and have motivation in an environment to make progress. There's not a salary or reward besides self development and being a part of a team. However, making advancements and the satisfaction of completing the pod will be very high. I can't wait!

Any special opportunities or challenges to being a leader?

Well, as I'm studying industrial management courses, some of the things that I learn I can apply, and it is really interesting. For example how we handle documentation like our gant or flow charts that I can directly implement to see what works and what doesn't. It has the same feeling of a startup, seeing how to be productive and what benefits can be gained. And even just the responsibility that comes with being a leader is both rewarding and challenging, as someone in charge of reaching this goal can feel heavy with 50 members, so that is a lot of organizing and planning, but with the help of everyone contributing really gives me the ability to do well.

The Histoy of:

Transportation

Written by: **Lucas Lind**

The hyperloop is often referred to as "the fifth mode of transport" but what does that really mean? Some would categorize today's way of transporting people and goods into four different parts – water, rail, road and air. The hyperloop may, at first sight, be considered a form of rail-bound transport, but no. A vacuumized tube is far more complex, earning its place as the fifth category. Even though the hyperloop is a vision of the future, it won't hurt to stop and reflect on how we got where we are today. We should thank all the inventors who paved the path that made further development possible. Here we will present the most revolutionary ideas of each mode of transport, alongside some of the brains that came up with them.

Upon ripples and waves

Around five thousand years ago people started using boats in Mesopotamia. Since the civilisation was located in the river system of Tigris and Euphrates, water transportation was a necessity for travel and trade – the lack of paved roads made transportation of goods by land inconvenient.

The solution came to be history's first sailing boats. The construction was primitive with square sails made of cloth and a wooden hull. They were unable to adjust to the direction of the wind, making the Mesopotamians rely heavily on the weather. Despite the bulky design, it came to be the basis for what transportation by water is today.

On the right track

In February 1804, the first steam-powered tramway journey took place in Pendydarren ironworks, south Wales. The unnamed locomotive, being the first full-scale version of its kind, was invented by the British engineer Richard Trevithick.

The engine utilized high-pressure steam to bring the heavy vehicle forward over the local tramway. Trevithick however, never had his invention surpass the experimental stages of going over a real metal railway because it was too heavy.

It was not until 1812 that a commercially successful steam locomotive, the Salamanca, was built by Matthew Murray. Its twin-cylinder engine was light enough not to break the track and so it became the first real steam-powerd vehicle to travel by rail.

Let's get rolling!

Karl Benz is most often identified as the inventor of the car. In 1186 he patented the three-wheeled Motorwagen, alongside several components fundamental to its design such as spark plugs, gear shifters and a water radiator. The Motorwagen was the first true and modern automobile, having a tremendous historical impact, as it is by car, or similar road-bound vehicles, most people travel by today.

Even though we have Benz to thank for the car being a reality, comparable ideas had been introduced earlier on. Sailing chariots, propelled by the wind, were used in warfare in ancient China and another example is a ketch from the 1500s made by Leonardo da Vinci depicting a horseless, mechanized cart. It was never built though, yet a radical idea at the time.

Fast, sustainable future

In 2013 Elon Musk conceptualized the idea of having autonomous pods traveling at ultra-high-speed in tubes of near-vacuum. The concept would be revolutionary, making it possible to travel from Stockholm to Berlin in an hour – quicker and more sustainable than taking a plane or train.

Without doing much himself, Musk invited the world to the project and today hundreds of student teams and several companies are working hard to make the hyperloop a reality – and we are advancing. In 2020 Virgin Hyperloop conducted the first ever test in which passengers experienced a ride in a hyperloop, demonstrating that a human can safely be put in a pod traveling through vacuum.

Surpassing this milestone had us at KTH Hyperloop filled with motivation and the will to bring the hyperloop to the Nordic countries. The last century started with two brothers taking to the sky and ended with millions of people doing it every day. This century started with two people riding a hyperloop – we trust you to do the math yourself.

Among the clouds

It was at the end of 1903 that the aviation pioneers, Orville and Wilbur Wright, successfully made the first controlled flight of a powered aircraft heavier than the air (the Zeppelin was invented a few years prior). The Wright Flyer, as the brothers named their invention, took to the skies in North Carolina and flew 6 km before landing.

One year later, their second version, the Wright Flyer II, had its first takeoff and managed a prolonged and more aerodynamic journey. However, it was the Wright Flyer III that truly became the seed for modern aviation, in which the brothers incorporated their "three-axis control system" that remains standard in all kinds of fixed-wing aircrafts to this day.

Thanks to our sponsors!

Together we are reinventing mass transportation

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