"The work of the individual still remains the spark that moves mankind forward"

- Igor Sikorsky, founder of Sikorsky Aircraft and inventor of the modern helicopter
The result of the project, the Gryphon, is a helicopter concept designed for private use. The intention of the project has been to investigate how safe, personal airborne mobility could be an attractive transportation alternative in the future. As an aspirational concept the goal has been to inspire and show an exciting way to enjoy a modern, sustainable lifestyle close to nature without the need for conventional infrastructure.
Introduction

Personal motivation & initial thoughts

On the following pages you will find my personal motivation and initial thoughts on the project.
Ever since I was a kid I've been completely fascinated by aircraft and especially helicopters. At the age of four I used to ask my dad what kind of job I needed to have to draw aeroplanes.

At the age of twelve I moved from living in central Stockholm in to the northern parts of Sweden. I was there raised on countryside around helicopters with a stepfather being a helicopter entrepreneur and pilot. While growing up I really experienced all the sides of the life as an aviator. A few years ago I stood in for the decision of realizing one my childhood dreams of becoming a helicopter pilot myself. My decision to not follow through was based around the fact that flying is still risky business, either I fly them or I design them...

In my first project attending the transportation design programme at UID I took on the challenge to understand the future of urban mobility and car sharing. Being on internship at companies like BMW & Volvo I felt that it was the project that gave the most valuable and long-term insights.

For my final thesis project I have decided take on the challenge to investigate personal airborne mobility in connection to rural areas, designing a concept of the vehicle type that I'm the most passionate about. I hope to innovatively push the boundaries of what a helicopter can be and developing an aircraft design truthful to the scenario challenging my own knowledge about these machines.

- Erik Evers
Have you ever had the dream where you run across the ground and you suddenly realize that you can fly?

You have right? Can you recall the unmatched feeling of freedom, the excitement felt from the thrill. And the feeling of contentment you got from mastering the skill to soar like an eagle.

Throughout history humans have been fascinated by the birds and their ability to conquer gravity and take to the skies. There have been countless early attempts to adopt the skill and many with a fatal outcome. It was not until the beginning of the last century that the first successful attempts of replicating the birds became reality.

The aircraft is a vehicle that was borne purely out of a desire to fly alongside the birds. Today aeroplanes, helicopters have made our world smaller and more accessible in many ways. Flying is considered to be the safest way of transportation available today, and most of us do not feel its any stranger to get on an aeroplane than getting on a buss or a train (despite the inconvenience of airport security getting to and from the airport).

Yet, when someone mentions airborne personal mobility it suddenly starts to feel like fiction. The reaction is understandable. Still in 2013, the ability to fly is a skill that very few people possess. And most of the smaller aircraft today are flown manually without any aid of computers.

In this project I will be looking in to the lifestyle surrounding a possible airborne mobility scenario and design a vehicle concept for that context. I aim to generate insights about the main challenges and how they could be solved.

Above all my goal is to inspire You, and maybe, just maybe, my vision will appear in your dreams tonight...
Initial thoughts, Aircraft and industrial design

One of my goals in this project has been to convince that with a conceptual approach using only the basics of aerodynamics and reasoning it is possible to develop a progressive aircraft design that is both tangible and credible. There are few vehicles where the form has such an importance for the function as on aircraft. Every aspect the shape matters and will affect the dynamics of the vehicle. Some things more than others. Therefore, to design a conceptual aircraft concept you need to have a high level of understanding of advanced form. At the same time you have to understand the rules of aerodynamics. You have to get the big picture and develop an understanding for what is important and what is not. You can then create an aesthetically pleasing and functional composition.

Initial thoughts, man machine collaboration

What if the pilot and the helicopter would complete a task in collaboration. Instead of the pilot flying the helicopter, monitoring its systems and completing a given task all by himself.
One of today's most influential futurists, Syd Mead, expresses in his visions something he calls positive futurism. Instead of trying to accurately predict the future, what will happen and what should happen next, he looks a step further and asks us the question, 'what could be?'

The vision has room for both existing technology and values as well more conceptual or purely utopian ideas. This all to inspire the audience, future decision makers and to create a contextual meaning to fields of research and technology.

Syd Mead believes that if one is to produce a picture of a possible future, it might as well be positive. I mean, in the world we live in today, as a designer you are essentially responsible to.

All the projects I have done at the Umeå Institute of Design have been of the nature, 'what should be, and the next step ahead.' For my final thesis I have chosen to pick up the binoculars and try to look further ahead beyond certainty, but still with one foot in the now. This time I wanted to ask, 'what could be?'
Introduction

Research

In the following section of the report you can read about the different areas that I have looked into in order to develop an understanding for airborne mobility, lifestyle and technology.

Initially you will find the contextual research and a conclusion followed by reflections on the target group and user. After that you will find research and thoughts on lifestyles followed by brand research. Finally, a section about helicopters and technology.

At the end of the research section you will find an overall conclusion and design opportunity along with the vehicle attributes that frame the basic specifications and functions of the vehicle.
By the 1990’s less than 40% of the global population lived in urban areas. But since 2010 more than half of the global population live in cities. According to the World Health Organization forecasting statistics the urban population will grow to 60% in 2030 and 70% in 2050. The urbanisation is connected with the shift from agricultural economy to mass industrialization.

Almost all of the urban population growth in the next 30 years to come is said to happen in developing countries as they move from agricultural to more industrialized societies. In high income countries on the other hand the Urban population is considered to stay relatively unchanged. More than two-thirds of urban growth is due to immigration. If immigration the urban population in these countries would most likely remain static or decline.

Today around 3% of the earth land surface is occupied by urban areas and today 51% of all mankind live there. This means that on the other 97% of the earth surface the other half of all people are spread out. Majority of all mobility efforts today goes into solving the urban scenario and preparing an even larger urbanization.

In the years to come a large portion of the people on the planet are still going to be living in rural areas. These areas are essential to everyone since this is where we can find agriculture, food production and commodities like minerals and wood, are produced here. These areas are also popular to escape to, and they benefit from tourism and activities. But the urbanization in the past century has degraded these areas from flourishing productive societies to being left behind in the wake of industrialism. Economical support is being reduced down to functions like healthcare, schools and public transportation.

One of most challenging topics to solve for rural areas is mobility. How we physically move our bodies require energy, time and extensive infrastructure. In rural areas these factors increase even further, the distances are longer and more infrastructure needs to be maintained per capita. Individual mobility is important in the urban environment, it is perhaps even more important in rural and sparsely-populated areas.
In a paper from 2007 the future historian Janken Myrdal from the institute of future studies analyses our history makes a prediction on the future on the northern Europe country side.

The urbanization will continue, to a large extent because of the information society and transport limitations. The urban environment simply offers the advantages in transportation efficiency and organized public transport. It is also more environmentally effective. Urban environments with multiple centres will more and more start to emerge. Longer transport between these areas will be mainly consist high speed trains. The individual mobility in the cities will be done with bicycles and lightweight small electric vehicles.

The rural areas closest to the cities will be dominated by summer cottages. It will become more frequent with longer stays in these areas and it is likely that own production of food and raw materials will increase. We will be able to find more people that chose to occupy themselves as part-time farmers or foresters, but mainly for their own consumption, a smaller market or friends.

If you go further out from the cities, then these areas will be further depopulated. In a global perspective large nature preservation areas will be instituted. Some of the cities will still be there because these areas have to be maintained and further explored buy people. Large investments will be made in to the countryside in the future, even if the goal will not be to retain maximum population there.

Ideeologically, the countryside will have a much more central role. Ideologies and religions will be charged with more natural romance and generally there will be increased knowledge of nature and its importance for the transformation of our life styles.

Prices of land are likely to increase, but more important is that we will see the preservation of nature as a common challenge. Here, nature’s role will be a part of the study to understand the quality of human life. There is already research that points to what most of us would probably imagine, that people feel good and benefit from being close to nature.

When trying to foresee the future, even further ahead than above, it will become more of a speculation rather than a prediction. But the speculation is according to the author based on historical human behaviours and her origin. He believes that if one imagines an utopian world with unlimited access to energy and raw materials, with limitless and effective mobility, our urban areas would gradually be depopulated. People would choose to settle themselves more evenly over the planet and return to a more natural existence. Trade with heavy goods would gradually cease and cities would be centres that people would choose to visit during certain times.
The first industrial revolution is said to have started in Great Britain with the mechanization of the textile industry. Work that earlier had to be done by weavers in hundreds of cottages could be moved into one single cotton mill. The second industrial revolution came in the early 20th century with Henry Ford mastering the moving assembly line which started the age of mass production. This revolution has been the greatest reason to today’s urbanization and economical wealth.

A third revolution is now under way. For more than two decades the internet has been changing the way we get our hands on and share information. Today there is not the same need to work from an office and projects can today essentially be carried out across the globe.

3D-printing or rapid manufacturing is one of the most promising tools that could enable a positive radical change in our world. With rapid manufacturing techniques we have the ability to directly manufacture not just identical objects but individualized objects with integrated functionality and without the need for assembly. This can be done without essentially no material waste and without the need for expensive tools to be produced. The different types of materials that can be used are increasing along with different methods like sintering, knitting, etc. Together with clever software, advancing robotics and processes, manufacturing is going to become more digital.

Electrification and biofuel research is advancing at a rapid pace. Continuously we are informed about new ways to harvest electricity and produce fuels in more sustainable ways. Bio-engineering will enable us to grow algae and modified virus-cells that can be used to radically increase the energy density in our batteries. Integrated healthcare with real-time biometric data surveillance and home self-diagnostification will ease the load on hospitals and care centres. In the future we will be able to get an earlier warning of when we are about to become sick. We will also be able to insert the treatment earlier and have shorter illness and hospitalization.

Meetings with doctors will be able to occur over a distance away from home and travel to hospitals will only happen when it is absolutely necessary.

Digital learning environments are tools that when we fully understand how to use them effectively will change the way we learn. It will be easier to learn at home and maybe it will be more about lifelong learning, rather than intensive school years.
Many trends already point towards a desire to live closer to nature.

Glamping or Glamorous Camping is one of the hottest trends while writing. Essentially it means camping on an extraordinary location in a spectacular but comfortable way out in nature. In northern Sweden you can find the Treehotel in Harads, another more known one is the famous Ice Hotel in Jukkasjärvi.

A lot of modern architecture signal a wish for simplistic lifestyle in nature. In contrast we have for a long time seen the more organic and nature inspired architecture concepts for cities.

In Norway we can witness another interesting development. The government there have invested in a project called National Tourist Routes in Norway. The slogan is “- scenic roads for exploring Norway’s breathtaking landscapes” and it consist of modern conceptual architectural look out points. These are located throughout the country, north to south.
While future observers talk about contiguous urbanization in developing countries, the trend is that the development is staggering in high income countries. Observers also talk about a higher and deeper understanding of our environment and how this will develop in to strong political and cultural values. It is also most likely that this insight will be spreading in to the developing countries as their living standard increase, and this will probably happen at a much faster rate than in the high income countries.

Current urban escape trends point at inhabitants wanting to take a break from the system, urban society and capitalism. This in exchange for the commodity and non superficiality of the countryside. Research and studies shows that the human benefits from spending time close to nature.

Technology development paves the way for an increasingly stand-alone and independent existence, the time to come is not that of standardization it is that of flexibility and choice. Freedom to pursue a desired occupation in a desired geographic location. Production that goes towards customisation and special purpose and that works well on large scale as on a small scale. Energy harvesting will become more versatile and efficient, a large number of solutions to sustainable power generation will be available and accessible. Oil will where it is irreplaceable gradually be replaced by renewable bio fuels. Functions such as health care and schools will with the help of technology undergo major revolutionary changes.

My personal interpretation of the scenario is that we moved to the city for the stability and security it that it offered. I see a future where people for extended periods of time will be changing the urban environment for a life closer to nature and vice versa, at their own discretions and their own needs. In the short term, this might happen maybe more like an exclusive opportunity for those who can afford it, but in the longer term as a new type of societal-structure. People will not only come just to visit but to actively participate in the tasks that characterize the different areas, urban or rural. This would also provide a valuable exchange of knowledge and culture, which in turn would lead to further societal development.
Target group: Natives of the third industrial era

People born with access to internet digital technology are called digital natives. People before that era are digital immigrants.

A new type of native is now about to emerge, the one of the third industrial era. These people will have access to all the technology that is needed to radically change the world we live in. We as immigrants to this age have the responsibility to guide the natives and teach them about past mistakes and initially show them the direction for the future.

With this concept I aspire to paint a positive future making use of what is to come in a fun and inspiring way.
Aspirational User:
The Future Bohemian

The people in this scenario would have extensive knowledge and be dependent on the use of advanced technology. At the same time they would enjoy the commodity and non-superficiality of the countryside. They know the impact we humans can have on nature and see it as a destiny to carefully maintain the natural balance. Yet they cherish human achievements and don’t dismiss life in the city and see it as a centre for cultural exchange. This persona empathises our dualist nature as human beings.
Lifestyle and mobility

Through history, mobility has been an enabler and a creator of the whole lifestyles. Whether it's a donkey or camel that carried us through the desert, a boat that allowed us to discover new continents or the car we drive to and from work. Mobility is such an essential part of our history, our lives and our future.

The lifestyle a mobility scenario forms is very complex. It is almost impossible to intentionally design every aspect of it. Therefore a lifestyle is very much a consequence of the strengths and limitations of the scenario.

The automobile have shaped peoples everyday lifestyles around the world. The car is so integrated in to our lives that it is hard for us to even imagine what it would be like without them.

In order to get an understanding of this we could compare the scenario of using cars to that of using boats. Boats is a vehicle type that most of us can relate to. We quickly realize that whole system of using boats as a mean of transportation is just different than to cars. Since there
are no roads you have read sea charts to not hit obstacles. And since the open sea compared to the road is dynamic medium you have to consider weather to be safe.

There is a certain lifestyle and culture connected with Sailing. There are certain manners and phrasings to be used on the sea. This has evolved through hundreds of years for both practical and cultural reasons.

Boats need a completely different type of maintenance to cars, they need to come out of the water from to time, and they need to be repainted and protected in other ways. But still people do it, all across the world. Simply because it is an enabler to a desired way of life. Some aspects about boating is more comfortable than a car and some are not.

In many aspects boating is similar to that of flying. We realize that if airborne mobility will become reality, it will just like boats have it’s own characteristics and culture.

The relation that people would have with an aircraft is going to be different and characterized by the reality around the whole scenario. Just like as a kid in a city is taught to not cross the street without permission and the kid by the to sit down in the boat and always wear a life jacket when playing by the water.

I believe, that with the help of technology, airborne mobility is going to be possible and safe. But it is not to be directly compared to the car. There are going to be pros and cons, and that is what’s going to characterize the scenario and give it a charm of it’s own.
Fly in communities

There are a small group of people in the world that have managed to make a reality out of the dream of an airborne lifestyle. These people have created something called fly in communities. It usually consists of a group of houses situated around and along a runway. Many of these are situated in really beautiful locations hardly reachable by other transportation. On one hand this creates a sense of isolation, but the inhabitants compensate by developing strong a bond to the whole community. It seems that most fly in communities use mainly airplanes and not helicopters. Reasons are likely the more uncomplicated nature and lower operations cost than a helicopter. Though, the aircraft and the solutions used in a fly in community are not in anyway specifically developed for the scenario. All the aircraft are flown in traditional ways with no particular aids other than what’s available on the market. Therefore this still remains a dream to anyone other than the true enthusiast.
We will probably never have flying cars, at least not in any large extent, simply because cars are not meant to fly. To directly try to translate the nature of a car to an airborne vehicle is simplifying and cheating the truth to much. Just in the same way that the amphibious car never took of as a transportation alternative despite numerous iterations and technical solutions.

But if we talk airborne mobility there is another parameter to take in to consideration. When researching the internet for answers on when we will be able to have flying private vehicle it is difficult to get a clear answer. But one recurring answer is that when we have autonomous cars that works flawless the time is has come for private airborne mobility.

Over the past few years, much progress has been made in this area. But it will probably be several years before the technology is well integrated and the public have begun to embrace and started to understand the implications of this shift.

Until then we have to wait with patience, but we can prepare by continuing trying to understand, what could be!
As the project evolved I decided that I wanted to work with an automotive brand to embody the concept. The choice fell on Peugeot because of their progressive image, design philosophy and lifestyle focus.
With the new design direction of Peugeot and the launch of Peugeot Designlab, the brand has developed an image that to me goes far beyond the competition. By turning the focus away from the technological and dogmatic they have managed to take the brand in a very modern, aspirational and progressive direction.

With the Peugeot Designlab, Peugeot are able to outsource their design competence to other vehicle and product industries as well as support their own scooter and bike brands.

The future of Peugeot design will be characterized by a balance between simplicity, an obvious readable design and a sophisticated creative latin input. This will result in harmony with unexpected lines. Even though making a radical change to the image and design language, the ambition with the Peugeot brand is to remain stable and consistent with a long term image. This blend of elegance and creativity was just the right tone for this project.
With the HX-1 concept car Peugeot made a bold statement in the automotive industry. It’s by Peugeot themselves referred to as an exploitation of new lifestyles and evolution of mobility and society, an example of pure design without compromise.

The car features loads of design innovations beautifully integrated in to one solid sculpture.

It is this way of beautifully and seamlessly blending the design intent with a functional concept that truly inspires me.
The concept shows a great deal of duality and it becomes especially obvious in the interior. The design is made to be adaptive to different life situations and showcases both sporty driver focus and passenger comfort and luxury. At the same time it has the ability to provide additional seating through extra seats integrated in the driver seats.
A more subtle part of the HX-1 was the two-piece high heel shoe that was designed along with the car in collaboration with fashion designer Pierre Hardy.

Peugeot were observing how some women in Paris had an extra pair of shoes with them in their purse for driving. High heels are not really up to the task.

The concept proposed the special high heel shoe with a removable inner piece out of neoprene for driving.

An curious little detail that showcases emotional problem solving.
With the Onyx concept car, Peugeot expresses desirability and luxury using materials that are processed as little as possible. It is described as a true super car for the 21st century.

The concept uses Newspaper “wood” and recyclable felt for the interior. On the exterior we find handcrafted and untreated cooper that over time will age and express patina.

In between seats there is a camera that captures the driving experience and saves it on a tablet inserted in the dashboard to be viewed later. Extending the experience.

With the Onyx Peugeot also showcases the versatility of their design language by also applying the philosophy to a scooter and a bike.

“An showcase in REponsibility”
Peugeot has a 200-year history of non-automotive product development and with the launch of Peugeot Design Lab they have the ambition to take on other vehicle industries such as planes, trains and boats. Highly complex products that have thousands of engineers involved and takes five to ten years to develop.

According to the chief designer Cathal Loughnane, no product design agencies are equipped to cope with projects of this scale. But car design studios face these challenges on a daily basis.

Peugeot Designlabs chief designer says in an interview with car design news that the aeronautical industry is very attractive to them. Especially on the VIP side.

“...my thing is to build things, it has to be blue sky and completely innovative.”

— Cathal Loughnane, Director of Design, Peugeot Design Lab
“...a versatile design language creating a long term and stable image.”

“Harmony & Unexpected Line”
Helicopters
“The helicopter approaches, closer than any other vehicle, the fulfilment of mankind’s ancient dreams of the flying horse and the magic carpet”

- Igor Sikorsky
The helicopter is undoubtedly one of the most versatile vehicles around today. It’s ability to take off and land vertically and hover in mid air maintaining full manoeuvrability is what makes it the most special.

The verity of missions performed by a helicopter operator today ranges from inspecting power lines, animal control, forest fertilization, heli-skiing, taxi, ambulance, fire fighting, mounting large antennas, poring concrete and much more.

Other than becoming a versatile platform that responds to vital needs in society the helicopter has become a symbol for success, independence and freedom.
The small aircraft business got its big break in rural areas since transportation of goods and people could be done in to places without roads. What previously required travel on foot, on skis or by horse suddenly became possible in just a fraction of the time. All that was required was a lake, or a snow covered field. Where it was not possible to land, goods and supplies could be dropped from the air. When the helicopter was introduced even more missions could be conducted.

Today the helicopter remains a tool mainly for the professional. Instead of getting easier and more accessible to own and operate, it seems as if the market has moved in the completely opposite direction. The new machines are more expensive to own and operate, to take and maintain a licence also costs a fortune. On top of that regulations are getting more and more restrictive and complicated.

Despite all the adversity, the helicopter’s special characteristics and agility makes it the vehicle type most suited for the task.
Visions that didn’t take off, yet!

In the helicopter’s early years there were great and bold visions. People were certain that the helicopter soon would replace the car to a large extent. The helicopter did not need roads or airports. You could now take a straight line between sites. With its ability to land and take off vertically in tight spaces it was superior to other aircraft and vehicles.

But helicopters are hard to fly and the technology and materials required for anyone to safely be fly a helicopter was at the time far from reality.

The helicopter development took another direction. With skyrocketing operating costs and training requirements the helicopter is now further than ever away from the romantic visions of its childhood.
In recent years there have been a lot of experimentation with electric drivetrains for helicopters and aeroplanes. The main benefit is radically reduced technical complexity. There is less need for expensive gearboxes and driveshafts. That means better economy, more sustainability, less noise and a higher level of reliability and safety.

The main drawback for now is battery life and energy density. There is still quite some more work and development to be done to match the performance of current aircraft. But when that point is reached the benefits are going to huge.

On the following pages are a set of interesting concepts that shows promise.
The r/c industry in general

There has been an explosion on the market for r/c helicopters in the past years. Cheap electronics and durable plastics has made it possible to build and test a wide range of designs. With the help of simple mechanical innovations and cheap piezo electric gyros everyone can now be a helicopter pilot in their living room.

The Japanese RC-helicopter manufacturer Hirobo are one of the companies that are taking the opportunity. Being a textile machine manufacturer until the 70's, the company decided to completely shift in to making radio controlled models focusing on helicopters. They have had the ability to build and test design solutions without the need to live up to the rules of aeronautical legislation. After four decades of developing what most people would see as toys they have generated enough knowledge and insights to dare to enter the market of real helicopters.

Earlier in 2012 Hirobo announced their concept called HX-1. It's a one man electric helicopter for personal commuting and evacuation. Instead of using traditional mechanical controls it uses a digital fly by wire system with electronic servos. Not only does this reduce weight but it also enables the machine to be remote controlled for example in an evacuation situation.
MyCopter is an official and fully EU-funded four year project with the goal to solve the congestional problems connected with ground based transport.

The aim is to find a solution that successfully combines the best of ground based and air based transportation. The ultimate goal is to create a Personal Air Transport System (PATS) that overcomes all of the environmental, safety and economical problems connected with the current methods of transport.

The project has three main focus areas.

User centred Machine interface & training: The PAV’s are predicted to be controlled autonomously on a high level but still allowing the user to feel in control over the vehicle’s movements.

Automation: The project is focusing on aerial mobility in cluttered areas like cities and, therefore, a high level of automation would be needed to safely navigate close to buildings, avoid other aircraft and find landing spots in tight areas and safely land.

Socio-technological aspect: The project aims at looking in to this. What is the public expectation and how will users with a new aerial transport system. This is probably the greatest effort made so far to understand the benefits and use of airborne mobility. What the project does not cover so far is the design of the actual aircraft.

The eCO2avia concept is a study on using hybrid technology in helicopters. The benefit would be a greatly improved range compared to pure electric drive. Noise would also be reduced drastically when running on pure electric power.

Simplified design. Helicopters rely heavily on lightweight and super durable gearboxes and transmissions with a lot of moving parts. Using a hybrid drivetrain would remove all of these components and replace them with electric cables and motors.
Project Zero, Augusta Westland

In 2012 Augusta Westland presented the technology incubator concept called project zero. The philosophy of the project was to try as many radical ideas as possible and put them in one single vehicle and fly it. It is not aimed to be a next product.

The concept is fully electric, has no gearboxes or hydraulics. It features individual blade control without the traditional swash plate solution.

The exterior design of the concept was done by Bertone.
The bold vision of the matternet is to create an aerial distribution network of physical things with the help of autonomous aerial helicopters. For the past couple of years there has been a tremendous development in the short term the team aims at solving things like distributing medication and other necessities to remote road less locations and villages in countries like Africa.

In the longer term the goal is to create a world wide delivery network for gods and it is referred to as the internet of matter, there by the name the matternet.
There are a huge number of experimental helicopters and rotorcraft in different configurations to be found. Here are some of my insights from researching this.

**Auxiliary propulsion**
Helicopters forward speed is mainly limited by the rotorsystem. By using two or more main rotors and a pushing propeller or jet in the back forward speed can be greatly increased.

**Reduced exposure**
One of the key factors when it comes to perceived safety and usability. Helicopter rotors are today completely exposed and moving at extremely high speeds. This makes them very dangerous and the aircraft very vulnerable. By covering them the helicopter could be less intimidating and more approachable to everyday users.

**Electrification and multirotor redundancy**
Electric drivetrains have the potential to greatly simplify helicopter architecture. Rotors could be placed in other locations since there is no need for a transmission and. It seems also that using a number of electric motors could improve safety increasing redundancy to failure.
I decided that I wanted to make a radically innovative concept. Important to me from a user friendliness and perceived safety perspective was to reduce the exposure of moving parts. I also wanted to investigate innovative ideas for forward propulsion. I decided to go with a Bi-copter configuration. It offers symmetry in lift and is suitable for hybrid technology and electrification.
Inspiring technological enablers
By farming algae, exposing them to sunlight and providing them with CO2, they have the ability to produce biomass from all kinds of waste products.

The biomass can then be used to extract and produce renewable biofuels. The fibres from the algae could potentially also be used for highly efficient batteries. Another benefit is that the algae also absorbs CO2 in exchange for oxygen, O2.

The algae can also be active by night if illuminated by light.

In November 2011 United Airlines did the first ever commercial flight using algae derived jet fuel. In aviation there is no near future replacement for the jet engine. Therefore, renewable jet fuel produced from algae is one of the most attractive alternatives.

Algae fibres have the ability to radically improve energy density in batteries. Batteries made from algae and paper would also be very cheap to produce and very sustainable.
Structural batteries is a very elegant concept where structural carbon fibre parts also become batteries without adding any substantial weight. This has huge potential in aviation saving both weight, increasing available interior space and reducing the amount of components.

Thermo electric membranes

A technology already on the market is Thermo electric membranes. It produces an electric current when heated on one side while being kept cool on the other side. A combustion engine only makes use of around 20-30% of the energy from the fuel, the rest gets lost in form of heat. Thermo electric membranes could make it possible to make use of this heat and potentially radically improving hybrid technology drivetrains.
Ion wind propulsion is essentially a way of silently creating thrust in air using only an electric current and no moving parts. The effect is created when a current passes between two electrodes. If one electrode is thinner than the other, an air current will be induced in between them—with enough voltage the device could produce powerful thrust.

Ion thrusters have been in development since the sixties, until now they’ve been dismissed or suitable for only for lightweight vehicles. Researchers at MIT now believes that ion thrusters could potentially power commercial airlines in the future.

Ion wind effect could also be used in hybrid mode to improve a traditional propulsion system, like a jet engine. It’s not likely provide enough thrust for direct vertical lift but could work for forward propulsion.
Electro active polymers deform when an electric current is passed through them.

The benefit is that we could reduce the amount of kinetic components like the rudder on an air plane and just let the wing deform. Simplifying and improving aerodynamics

Currently the effect is not responsive enough for precision applications. But when the technology improves the benefits could be huge.

FILAMENT LIGHTWEIGHT CONSTRUCTION FOR AVIATION?

In aeronautics structural integrity is absolutely paramount. Today constructions are calculated be light weight and the safety margins are narrow. This places high demands on the materials and makes them expensive.

The problem is that when a continuous surface becomes exhausted and cracks begin to happen, they spread rapidly through the material until it breaks.

By winding or weaving a structure of fibres redundancy is increased drastically. If there is a crack it only develops through a thin fibre and not on through the whole construction. If one also focuses the density of the fibres around the area where the forces are the most concentrated materials can be saved, reducing cost and weight. An advantage is also that natural fibres could be used and no material and energy is wasted in the manufacturing process.
Laser Stereo Lithography
High resolution printing method that already works for large scale objects has potential to be fast.

3D printing techniques
Multi material printing mean that a single part can be manufactured with different properties integrated. Like hard and soft, solid and transparent, porous and dense.

Printing Graphene
Some of the properties of Graphene are, lightness, transparency, extreme strength and conductivity.

The scientists that discovered this material were awarded the noble prize a few years back. We are still waiting to see large scale and useful applications of the material.

Graphene might soon be available for 3D printing in different ways. When ever that happens it can be an enabler for game changing design.
Mind control & automation

Philosophy on machine collaboration

Inspired by the relationship between a rider and his horse. The rider has full control over the journey at all times, the horse at the same time the horse is managing all its legs, keeping the balance and avoiding obstacles. The horse does not know where to go if the rider don’t instruct him. At the same time if the rider would fall a sleep or pass out the horse could still manage on its own.

By using brain machine interface technology and ambient intelligence concepts perhaps we could mimic this relationship to continuously control vehicles that already know how to operate on their own.

In turn this concept could enhance the feeling of flying by having the pilot and the helicopter solving the task together rather than the pilot monitoring the helicopter, performing a task and flying the helicopter simultaneously.

Brain Machine Interface

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Brain machine interfaces are already implemented in military aircraft to monitor the pilots cognitive performance and to adapt the avionics to mode.

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UBIQUITOUS COMPUTING & AMBIENT INTELLIGENCE

The idea and vision of the internet being everywhere in anything, seamlessly integrated in every object that you own to already communicate in between. In contrast to traditional computing where you have to interact with a computer, cellphone or tablet.

Another term is Ambient intelligence. It is essentially the concept of an environment that responds naturally to the presence of human beings.

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My goal will be to take this opportunity to push my boundaries and experiment with my process before going out to meet the real world.

I want to challenge myself by developing a range of really iconic and innovative design solutions. Carefully combine them and carry them through the project to the final result with as little compromise as possible to the initial idea and sketch. While on internship, I became acquainted with the concept of designer intent. After a theme or direction has been chosen for further development the designer’s role becomes to ensure that the design will survive the entire process up to realisation. I also wanted to achieve a result where design and functionality are completely uncompromised and interwoven into an emotional truth. Peugeot is the company that I think really have demonstrated this in their concepts. They call it “design without compromise”.

The overall conclusion is that there is a clear contextual relevance to airborne private mobility.

The technology needed is here or on it’s way. It’s now a matter of interconnecting and making it meaningful. The main challenge is according to me the sustainable aspect.

Electricisation is clearly a way since it’s quiet, simple and robust. By taking advantage of hybrid technology and bio fuels a sustainable demonstrator could be created.

From a brand point of view, car companies have valuable insights through having spent the last century creating user friendly emotional masses. Most likely a car company like Peugeot would not develop a vehicle for this scenario on their own but in collaboration with a helicopter manufacturer, but they would provide great knowledge when it comes to understanding the lifestyle, creating emotional value and thereby true design innovation.

The opportunity is to create a vehicle for a small group of early adopters and paint a picture of an inspiring lifestyle scenario connected to it. With optimism my aim is to showcase where we could go in the fifty years to come.

“design without compromise”

Overall research conclusion and design opportunity

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Personal Goal

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“design without compromise”
The Gryphon concept is a helicopter for private use. The concept is a part of a future scenario where people will have the ability to enjoy a modern and sustainable lifestyle in rural areas with limited infrastructure. A lot of effort will go into developing a completely innovative and holistic concept, but maintaining the feel of a helicopter.

The interior should be of dual nature and be both focused the pilots flying experience and passenger pleasure. The pilot will be in full control of the vehicle at all times through a brain machine interface. Invisibly the helicopter will monitor the pilots cognitive level and continuously adjust the amount of automation. Leaving the pilot with an unmatched experience of flying.

It will have a bi-copter configuration since there is potential for a unique, innovative and user friendly design. The rotors should have some kind of covers to reduce exposure of moving parts and also increase the impression safety. The covers also have the potential to work as wings in forward flight and reduce rotor vortices in a hover.

It will fly using a hybrid drivetrain that runs on batteries and utilizes turbines powered by algae produced biofuel as range extenders.

To improve forward speed of the aircraft I will investigate the use of electric ion propulsion together with some of the effect from the turbines.

The helicopter should take 4-5 people and be reminiscent of an automotive 2+2 or a nautical day cruiser. Visually the machine should have a distinctive, iconic and elegant appearance. It's advanced technology should have a silent presence and subtly convey a sense ambient artificial intelligence.

Vehicle

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Method
In the following part of the report you will find the creative part of the project. Initial design, design development, Clay progress and CAID development.

Initial design phase
Initially I wanted to stay quite abstract trying to find a unique and honest expression. By mainly being inspired by art, technology and nature I was hoping to find new semantic expressions true to the concept and scenario.
Initial design inspiration

AVANT GARDE

ELEGANCE

ICONIC

SIMPLEX
3D WOVEN SUBFRAME

STRONG, LIGHT, REDUNDANT
PROVOCATIVE AERO

FUNCTION

FORM

FOLLOWS

INTERSECTING PLANES
Air openings

Auxiliary propulsion

Air flow

KEY SKETCH

Elegant
BALANCE ACT

ANIMAL CHARACTER

KEY SKETCH

Iconic
PROTECTED VS. LIGHT WEIGHT

BREAK THE CIRCLE
Interior layout and concept
Basic design platform
The basic design platform contains all of the initial design ideas combined in a dynamic and iconic proportion. Intentionally the proportions were kept a bit exaggerated to maintain the design intent and allow for natural refinement in the development of the final direction.
Bird nest house concept

Inspired by a bird nest the house would be 3D printed from material in the surrounding area by a set of drones. The landing pad for the helicopter would also be an algae bioreactor producing biofuel from waste in the house and provide sustainable fuel for the aircraft.
The idea is essentially a floating yacht with a built-in house. The house would be built using the structural battery principle. The exterior would be covered in solar capacitive material. It would slowly float over land or water and use ion propulsion technology. The helicopter would be used as a shuttle and together they would enable the traveler to go anywhere on the planet with essentially no environmental footprint.
Ion propulsion channel

Door integration

Soft nose for visibility
Final direction

In the final direction I have tried to combine the ideas from the main key sketches and truthfully implement the Peugeot design language. I was especially inspired by the Peugeot SR-1 power boat concepts pure silhouette and details.
Final direction
Tape and clay
POLYGON TRYOUTS

CAID Development

SURFACE RECONSTRUCTION

ALIAS SKETCHOVER

BASIC DESIGN MODEL
Package evaluation

In order to get an understanding for the dimensions and basic ergonomics I projected the front of the helicopter in full scale. I tested things like the movement of the pilot seat, height of the footrest and ingress egress.
CAID Interior
Model build

Test assembly

Ion propulsion channel

Manufacturing Details

In progress
The result is the Peugeot Gryphon. The name Gryphon, comes from the legendary creature with the head and wings of an eagle and the body of a lion a symbol of strength, wisdom and heraldry. The name was found suitable since the Peugeot logo is a lion and also because the name has a sharpness in its pronunciation that goes along with the final design expression.

In the following section you will find the result and description of the final design first overall an exterior. Finally you will find a set of contextual visualisations giving a glimpse of the vehicle in action.
Piezo electric control
Direct drive electric motors
Graphene "wing rings"
Swash plate less blade control
Interactive spine
3D-printed Graphene glass
3D-printed Graphene glass
Exterior
Pilot seat slides back for entry.

Armrest lowers.

Cargo space behind the interior backwall, removes the need for doors on the exterior.
“...aeronautical purity and silent technology with a precious accent.”
The visor

The visor designed to be a cool wearable piece that displays all necessary information for the pilot. It also monitors the pilot’s cognitive performance and sends the information into the helicopter.
Night time illumination
Navigation Lights
Package comparison

On these pages I have done a comparison to the Bell 206L (407 on the 3D model) and the Robinson R-66. These are the two most successful and commonly used helicopters in the world. It's clear how the Gryphon is much more protected than the other aircraft. A helicopter should have its center of gravity on the same vertical axis as its center of lift. In the design it's visible through the alignment of the rotors and the center of the landing gear.
Capture the early sketch

One of my personal goals in the project was to keep the gesture and design intent of the sketches alive through to the final model. It takes time since you have to interpret the sketch while refining proportions and feasibility and not just go for the obvious design solutions. I’m very happy about the outcome.
Takeoff: ETA to destination, 12 minutes
SENARIO FLYING OVER TRAFFIC

ETA: 11 min 20 seconds
distance traveled: 3.5 km
ETA: 10 minutes
distance traveled: 15km
Scenario: Flying Rear

ETA: 8 minutes
distance traveled: 39 km
AEROROMANTIC

Taking the characteristics of a context related to flying vehicles and transforming them into strong emotional values through the use of cutting edge technology and design. Creating a vision of a sustainable lifestyle without limits.
Re-discovery

Evoking curiosity and inviting its users to go and explore. The Gryphon enables people to go far beyond what any other vehicle allows with no environmental footprint.
Guided by your thoughts and with nothing but glass between you and your surrounding, the Gryphon becomes an extension of your body. With ambient intelligence, it enables you to push the envelope without having to worry about safety or limitations.
Will airborne mobility become a future transportation alternative? I’m much more convinced now than when I started the project. And I gained some really valuable insights. Flying vehicles are not to be directly compared to cars, probably a comparison with boats are more suitable. Airborne mobility will therefore must likely result in new type of lifestyle scenario. All the technological enablers are there and there is a need for mobility over long distances from a societal perspective. Even though the proposed design is an aspirational concept it was interesting to dive deeper in to potential future societal relevance. And my conclusion is that if airborne mobility becomes reality it could play an important part in how the world would change in the coming industrial era. It was a great challenge to design a progressive concept of a complex vehicle like a helicopter and at the same time develop and reflect on the context of a lifestyle scenario. It was a process back and fourth between complete visionary thinking and tangible realism trying to keep a link to science and technology.

Reflection

When executing an automotive project the constraints are very much more set and you dont need to explain a lot of things since everyone is very familiar with the reality around cars. However I tried to do the same for this project and trust my own knowledge about helicopters while remaining self critical and progressive. I decided to not just make a traditional helicopter. Actually I tried to go as far as I could and still maintain the basic semantic expression. It was a real challenge. When I was on internship I felt that designers that dared to experiment and not compromise were the ones that gained the most valuable insights. Even if it meant hitting their head a few times more.

Another challenge was the translation from final CAID design to reality. This took way more time than expected. Figuring out the construction without compromise on the design and with available materials. Since parts of the project was about new manufacturing methods and conveying that in the design I had to take great care when translating those details in to reality.

In the end the final result of the project reflects the goals that I set up from the start and along the way. I think the design is a clear and simple way shows the possibilities and with the technology suggested and both functionally and emotionally. To me it comes close to the idea of design without compromise with the technology concept and design concept being closely interwoven and mutually supportive. The result is a really unique proposal packed with innovative ideas relevant to a future aircraft for private use.

I learnt a lot by pushing my boundaries and going out of my comfort zone one last time before graduating. I put an end to this project and my studies with curiosity, inspiration and food for thought for years to come.
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