

5.3.19 CAPSTONE

MRD
WYATT COE

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Mixed reality brings digital and physical products into the same space, unlocking powerful new potential.

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ACKNOWLEDGEMENTS

The people, places, resources and tools that helped make this project a reality.

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MIXED REALITY WILL FUNDAMENTALLY CHANGE THE WAY WE DESIGN AND EXPERIENCE PRODUCTS

introduction

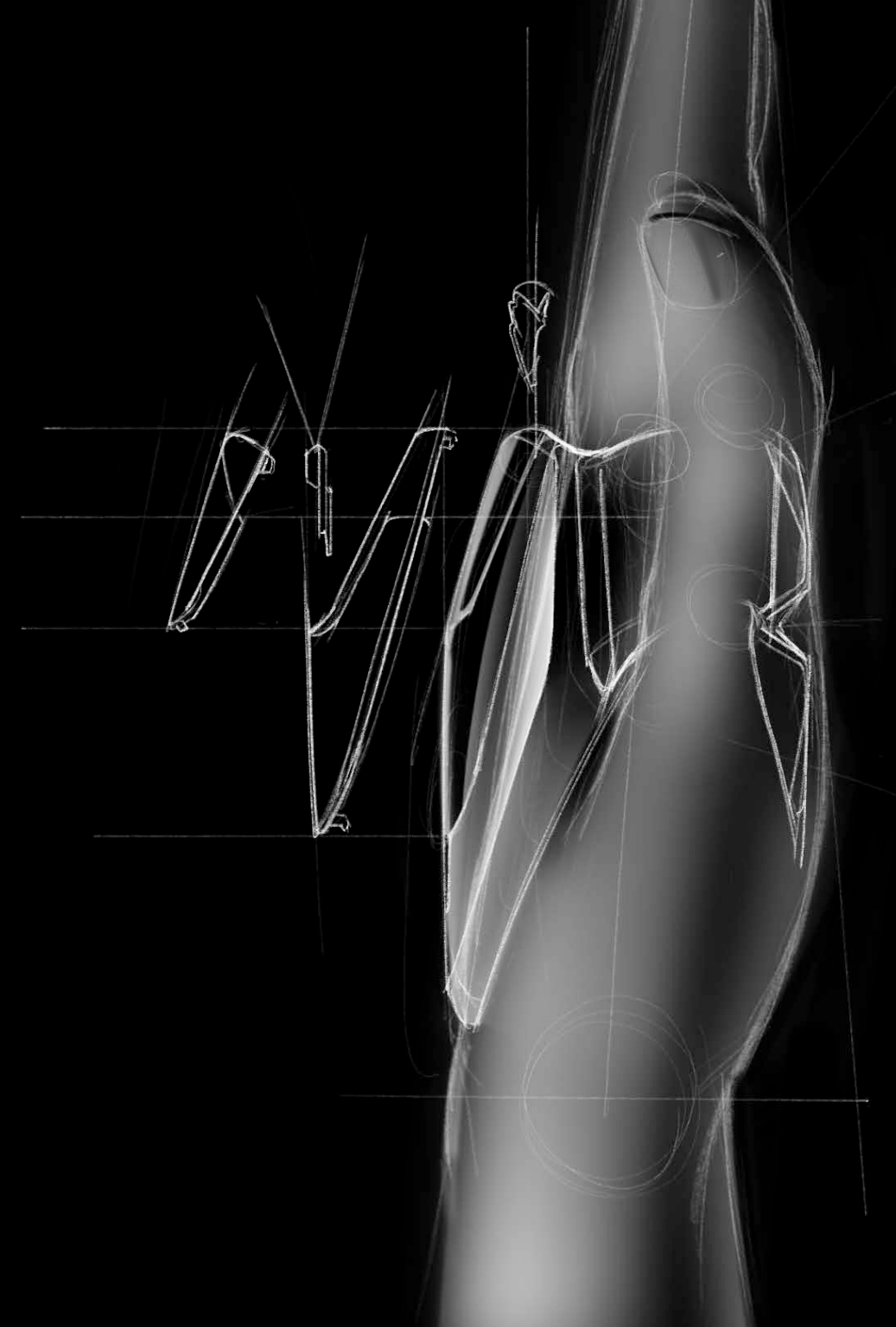
If we define reality by the experiences and things within it, then designers shape reality. New mixed reality technology like the Magic Leap One and Microsoft HoloLens has the potential to merge our digital and physical worlds; unlocking a completely new realm of experiences and design possibilities. When digital holograms can inhabit and respect our physical space, we can literally shape reality as we see fit. The capability of software to simulate reality will alter the way we produce both physical and digital products;

allowing for vastly simplified product platforms that organically support personalized digital experiences. Our attachment to physical products may be significantly reduced. Just as mobile computing has revolutionized the way we live, so too will mixed reality. Screens will be rendered obsolete, and with them a generation of “smart” devices. As designers, we must consider how this will impact future people and products now, in order to find the most desirable applications of this technology.

01

INTRODUCTION

new realities.



VR



enter new worlds.

VIRTUAL REALITY

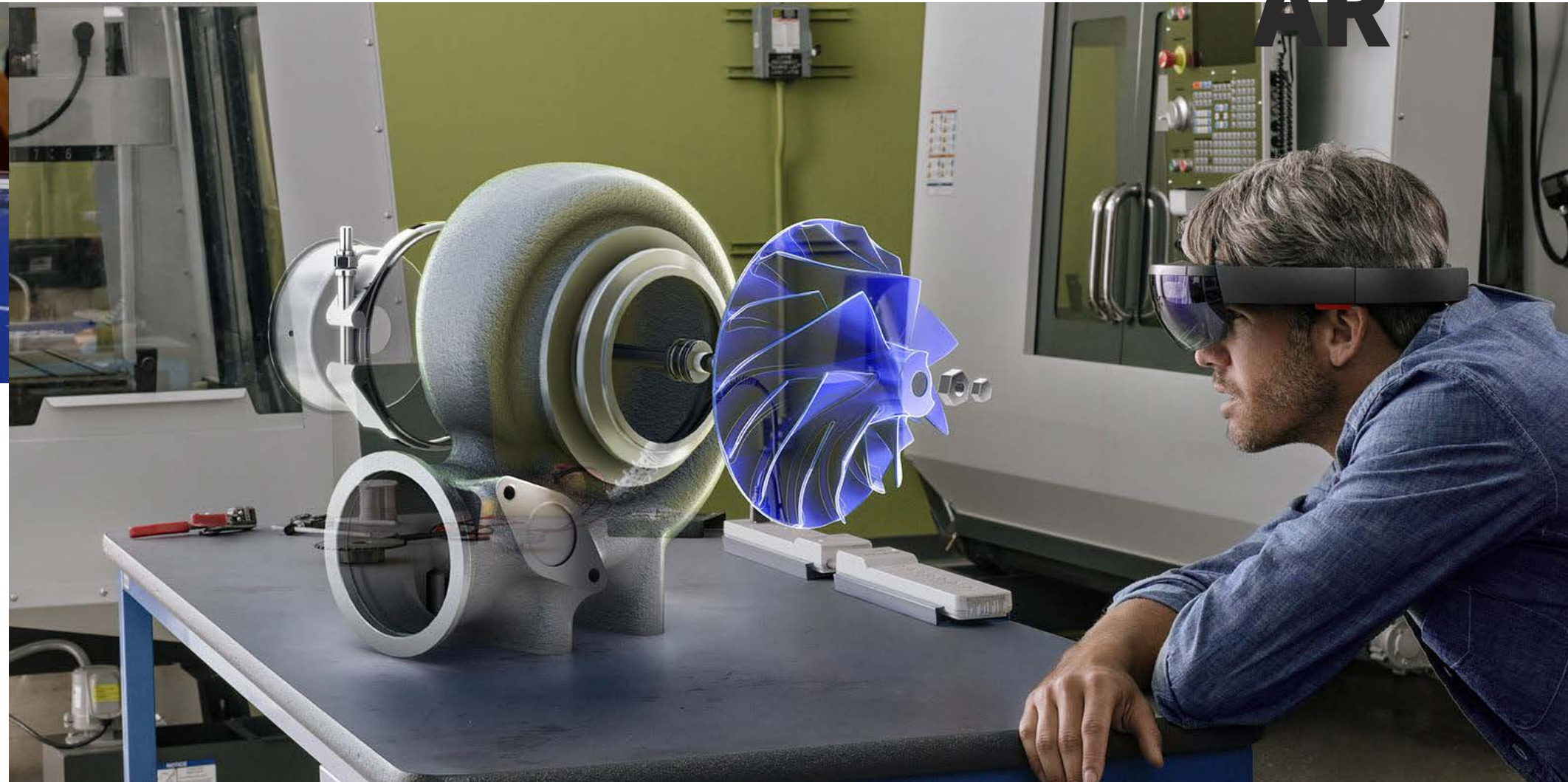
VR creates an immersive 3 dimensional simulation by placing offset screens in front of a user's eyes. Existing products in this category include Facebook's Oculus Rift and HTC's Vive. Due to physical tethers, as well as the inability to function in the real world while wearing, VR has limited application in daily activities, but is useful for designing and viewing 3D assets at scale.



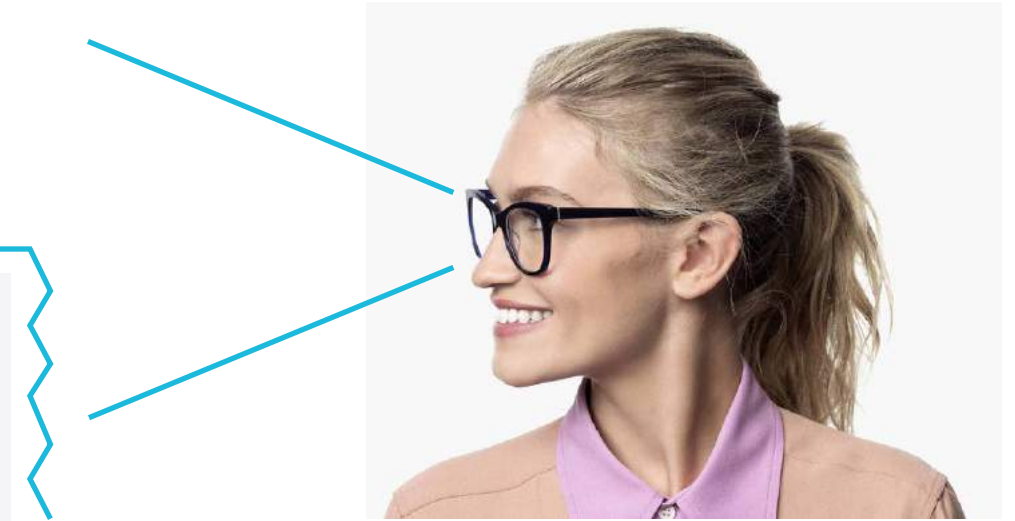
bring digital worlds to you.

AUGMENTED REALITY

AR superimposes a computer-generated image on a user's view of the real world, providing a composite view. AKA holograms. This is much more useful than VR because it affects real space. Digital objects can be placed on real surfaces. Companies like Magic Leap are already experimenting with persistent digital assets that can be viewed by multiple users simultaneously.



AR

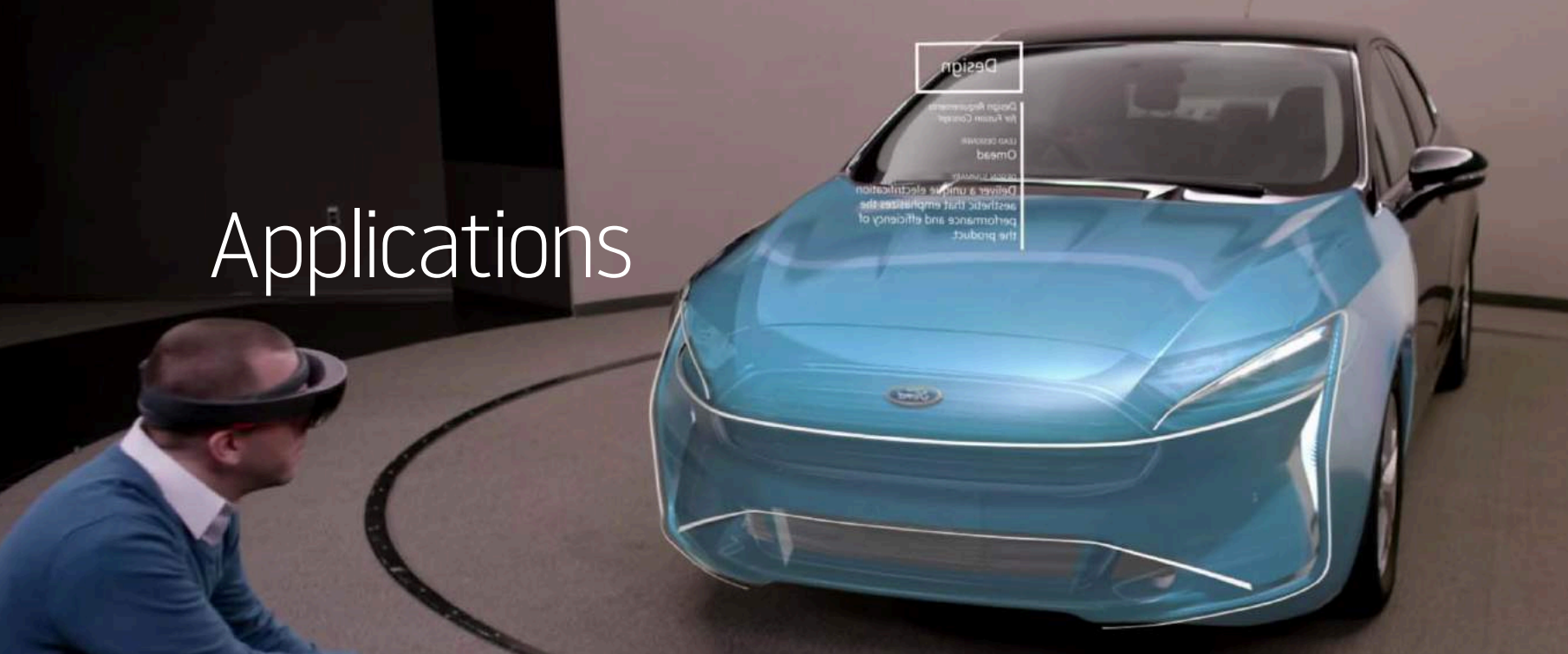


Spacial Mapping

LAYERS OF REALITY

MR hardware uses cameras to map the world around you in real time, allowing it to see the world the way you do. Digital assets can be projected into/onto physical spaces and objects and respect the real environment. Once this technology is commercially available, people will be able to see this way at all times and digital products will have a permanent place in our world.

Applications



design

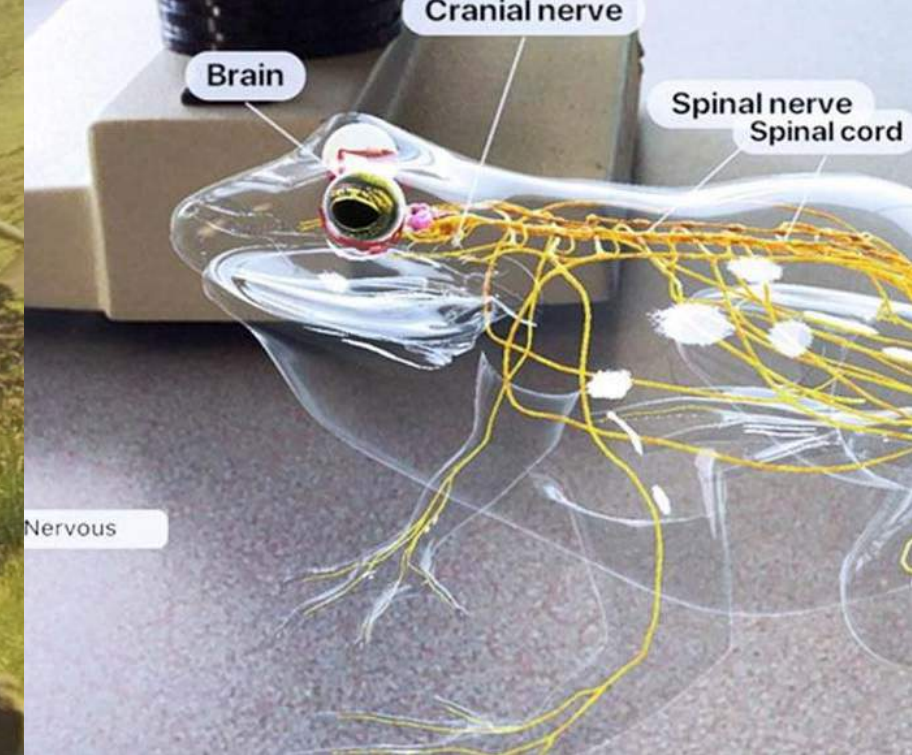
The automotive industry in particular has taken interest in the ability of MR to speed up their design process. Audi and Ford, pictured above, are using a Microsoft HoloLens to project digital models of potential design iterations on top of an actual sedan. This allows them to view designs at full scale more quickly than they could sculpting in clay and makes changes easier.

However the objective is still to create a physical product. Mixed reality is being used as a means to an end and not an end in itself. What if this digital model is enough? Do they really need to retool the entire front end for the next model year? That's awfully expensive, but it's what we're used to.



entertainment

The first application of almost any emerging technology is entertainment. This is because new technology offers new experiences and some of the most enticing examples of AR potential so far have been games. Pokemon Go had 147 million people outside chasing after virtual pocket monsters in 2018. The game relies on your phone screen as a viewfinder, but it's a start.



education

MR can be an excellent teaching tool because it can visualize things more accurately than traditional 2D media. It's also interactive, which is engaging for children and adults alike. Who wouldn't want to look at a holographic nervous system? Unfortunately the price of MR is still too high for most schools, but Medical facilities have begun employing it due to cost benefits.

LAYERS OF REALITY

a new form of
personalization

Living in a digitally augmented world will change the way products are experienced and used, eliminating screens and enabling a completely new level of personalized user experiences. Because your entire visual field is covered, any object within it can be individually customized through software. The repercussions of this are immense. The most essential parts of any product experiences travel with you wherever you go. This would give us

the ability to take things with us that we couldn't before, like the interior of your car, or the layout of your desktop. It also means that users have more control over their product experiences and can easily change them in a digital format. It also makes sharing easier because the personal part of the product is now digital. Physical products will function as universal supportive platforms for digital experiences, adapting to the needs of the user.

02
LAYERS OF REALITY

enter the matrix.



System



GLASSES

The VR headsets of today will continue to grow smaller and eventually be contained in something much closer to a traditional pair of glasses. Computing will be handled externally.

WEARABLE CONTROLLER

A flexible band of sensors and drivers will record fine motor inputs and provide sensory feedback in the form of haptic impulses. Current haptic engines can product highly realistic tactile sensations, that can simulate physical interactions.



PHYSICAL PRODUCT

The physical product is an essential part of the system, which the headset uses for reference and can connect to for deeper integrated functions, such as unlocking the doors with a look.

Experience



SEE WHAT YOU WANT TO SEE

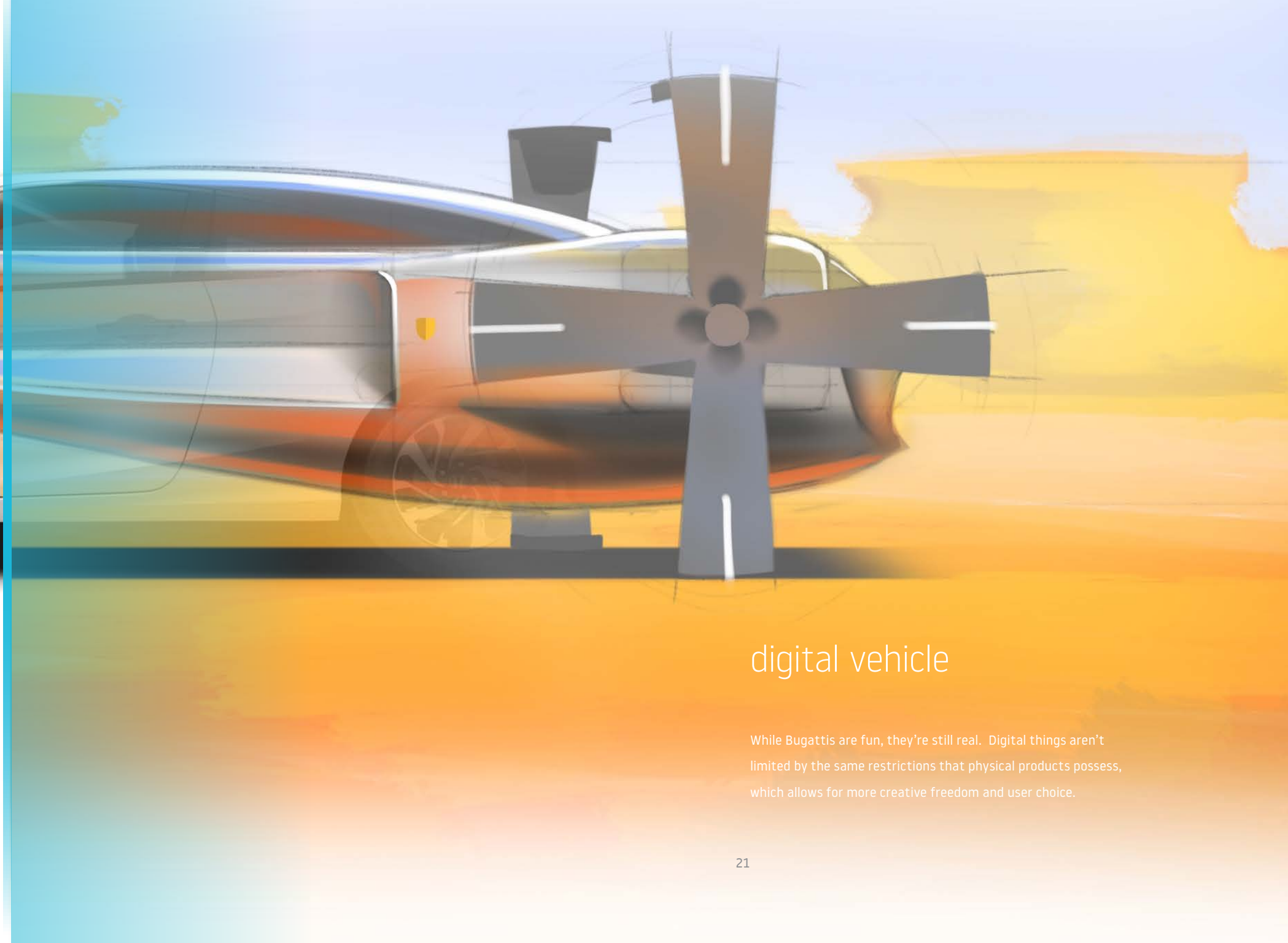
Most people will never have the opportunity to own a Bugatti. Mixed reality can transform any car into a virtual Bugatti for the price of the system alone. This is a much more attainable and realistic goal for the average consumer and it provides a solid portion of the supercar ownership experience.

Experience



physical vehicle

The MR system scans a vehicle in real time, mapping form and lighting details, which are used for placement reference.



digital vehicle

While Bugattis are fun, they're still real. Digital things aren't limited by the same restrictions that physical products possess, which allows for more creative freedom and user choice.

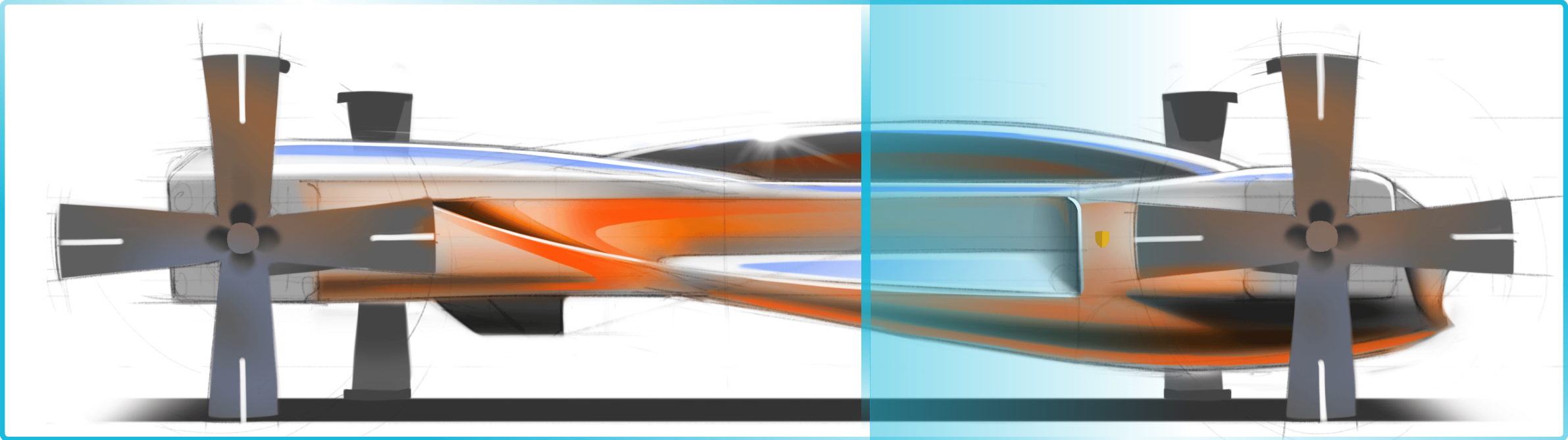


Interior

Customization

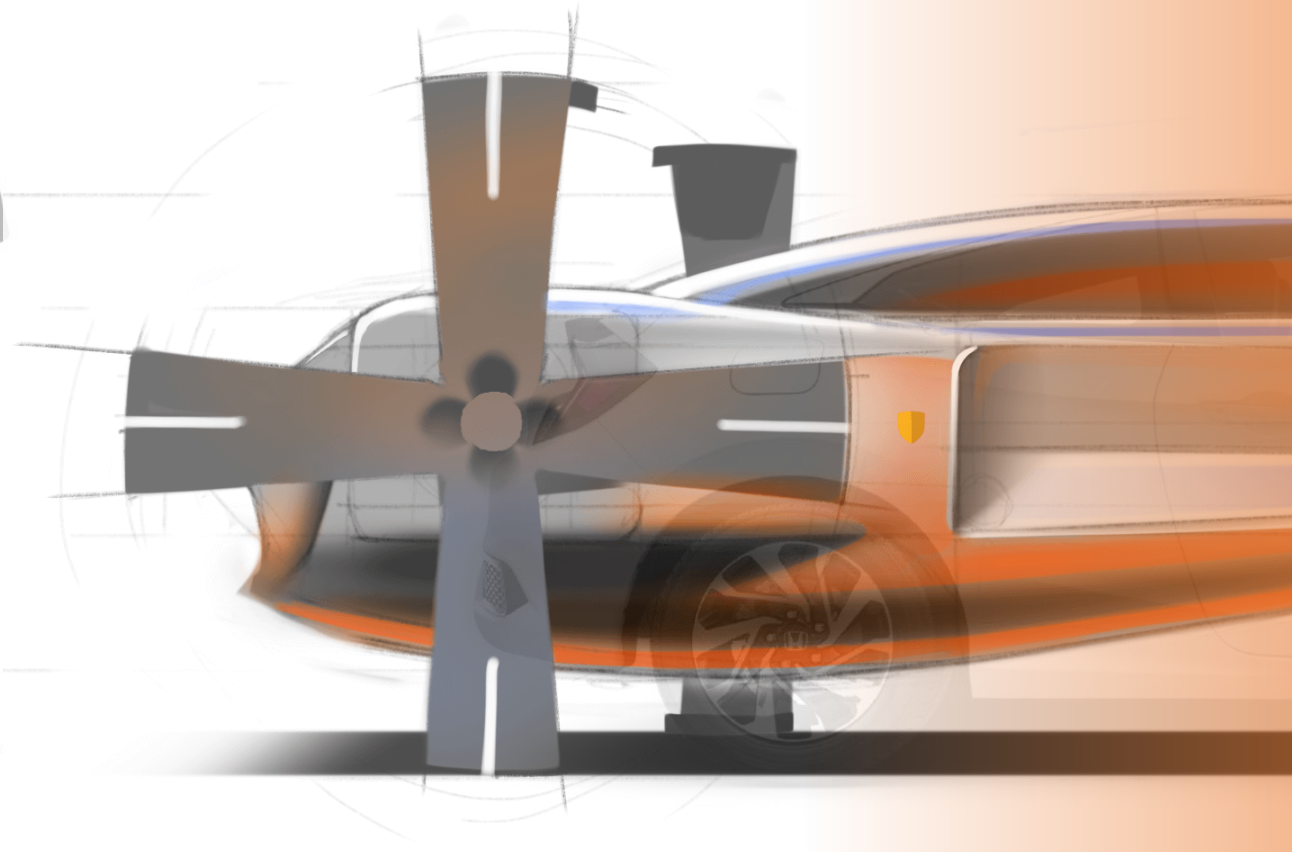


SELECT APPEARANCE



WHAT YOU WANT, WHENEVER YOU WANT

Change the look of your vehicle, like the radio station. The days of arduous painting and finishing are over. Color, shape, even brand is a choice that the user can change at any time with a swipe.



solo

Product experiences can be isolated to you and you alone. Other people could look at the same object and see something different. The potential flexibility of this could make sharing products much easier. You can make anything yours without much effort.



"I don't know..."

shared

Over a data connection, devices could share a product appearance, or entire world view with others. This is great if you want to share a product experience with someone else. It could work long distance, by sharing digital licenses for product overlays.

CONSERVE, REDUCE, SHARE.

designing for mixed reality

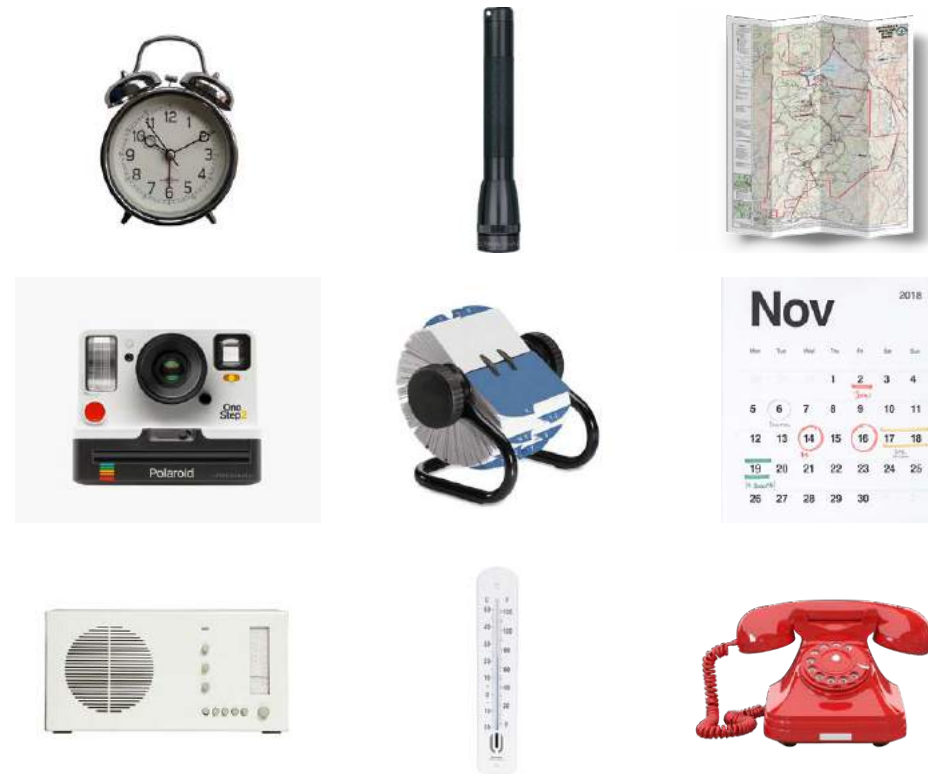
Mixed reality could significantly lower the cost of living and increase quality of life. Most people own a tremendous number of things and an increasing number of them are customized to our individual tastes. The industry wastes tremendous resources personalizing physical products for millions of people. Mixed reality can achieve this personalization digitally, but what does this mean for physical products as we know them? It means fewer, higher quality products designed to be purely functional. Software can add personalized aesthetic layers on top of this primary experience. Mobile technology has replaced many traditional

consumer products. Instead of using this to live with less, the industry has flooded the market with connected “smart” products. We now do everything on screens, which means all products have to have screens to be used? This is bad design, inefficient and unsustainable. We need fewer, more versatile products. Mixed reality can condense all product interfaces onto a platform that you carry, like your phone, eliminating the need for screens entirely. This is an opportunity to reduce the impact we have on our environment and save money by building physically only what we need and letting digital do the rest.



CONSERVE, REDUCE, SHARE

a world without screens?



PHYSICAL PRODUCTS

Traditional consumer products perform a single function and require us to own many separate things. Low efficiency.

Product Evolution



2D DIGITAL AND MOBILE COMPUTING

The digital age has replaced many physical products with 2D digital facsimiles. Smartphones allow us to carry much of this functionality with us wherever we go. Unfortunately it means that all digital devices need screens, which is expensive and wasteful.



MIXED REALITY & SPACIAL COMPUTING

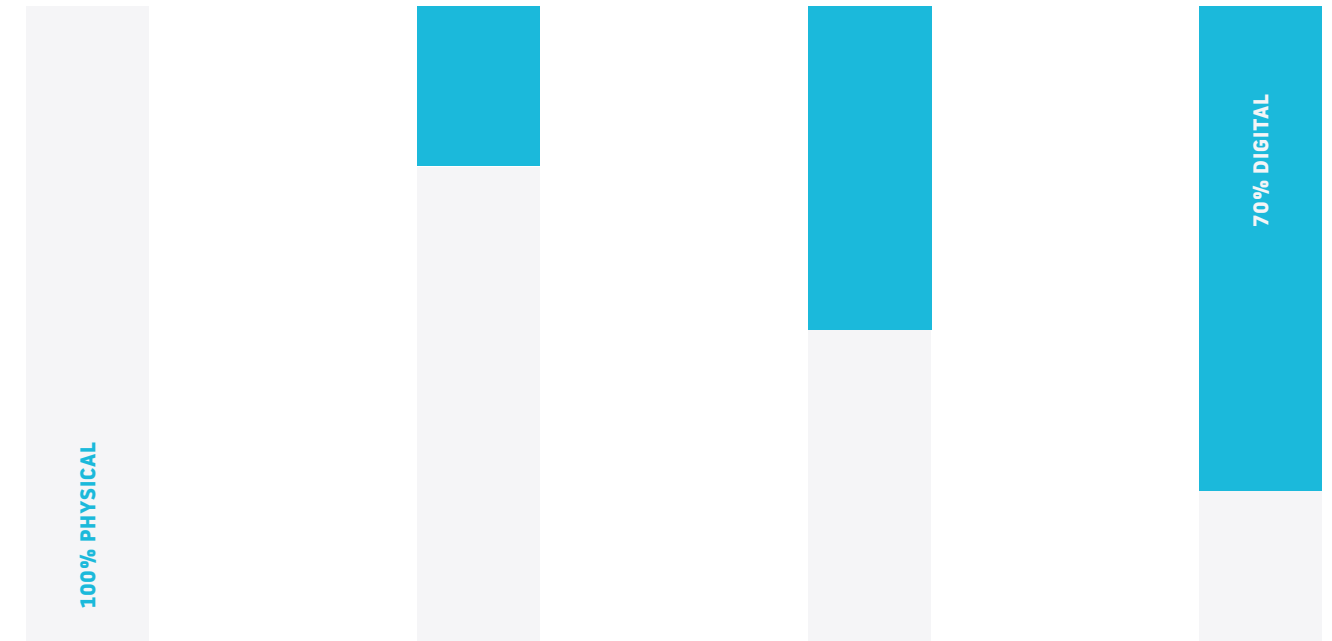
Mixed reality offers an less tethered approach; removing the need for screens entirely. Your entire field of view is a screen. Digital interfaces can be cast anywhere they are needed, whether in space or on a product. Dedicated terminals will be a thing of the past.

Design Approach



PHYSICAL/DIGITAL CONVERGENCE

Physical and digital products have been growing closer and are starting to overlap. Yet we are still using them in a mutually exclusive way, instead of leveraging software to simplify hardware.



THE COMPLETE EXPERIENCE

As time passes, more and more of our product experiences will be handled by software. If we embrace this, we can reduce the complexity of physical products as software capability increases.

Conserve

\$30,000
200,000 MILES

WHAT WE HAVE

If the appearance of your vehicle is controlled by software, then the physical aesthetics no longer matter. This means manufacturers can save all the money they would normally spend on styling and instead focus on versatility and efficiency.

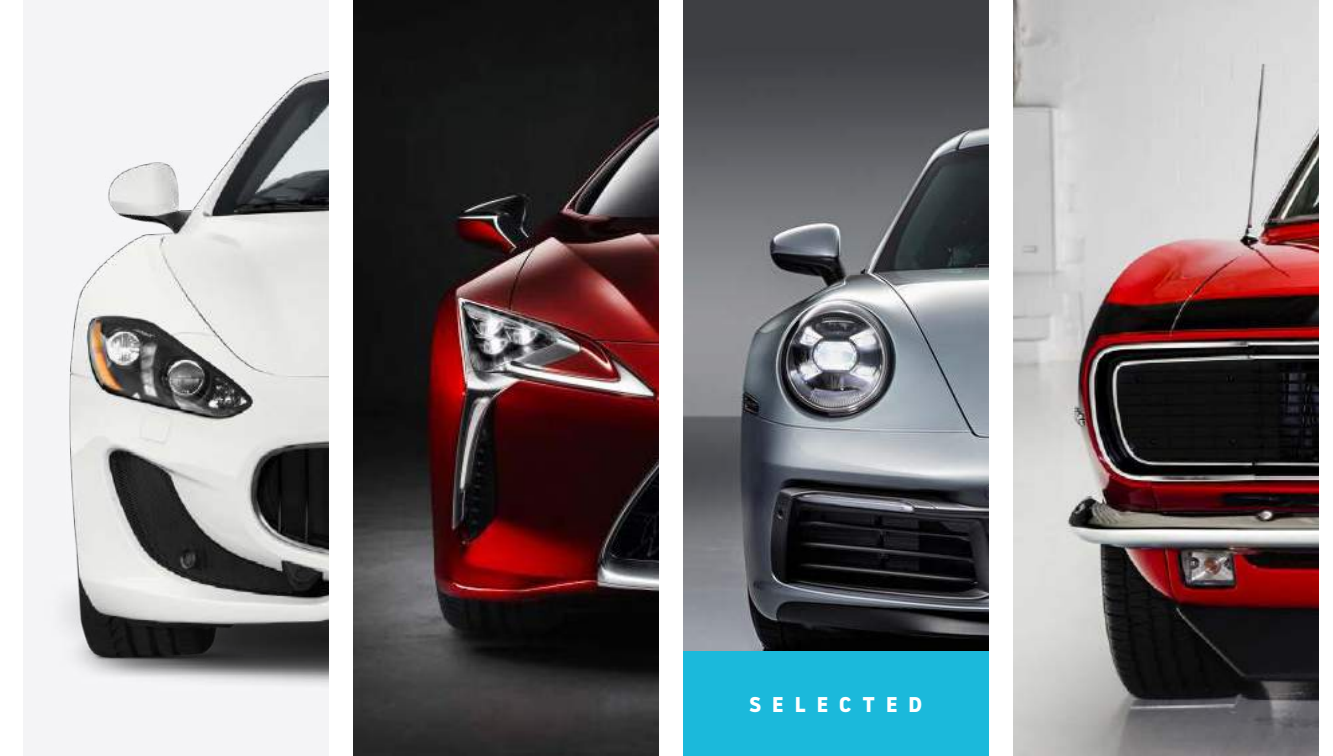


\$20,000
400,000 MILES

WHAT WE NEED

The perfect functional vehicle. It has no windows, no color and nothing that can be simulated by mixed reality. It is aerodynamic and efficient, plus, with fewer digital and physical components, it lasts much longer. The wheelbase adapts to match whatever virtual vehicle you may be driving, to achieve more accurate ride quality compared to what you see.

Reduce



LESS IS MORE

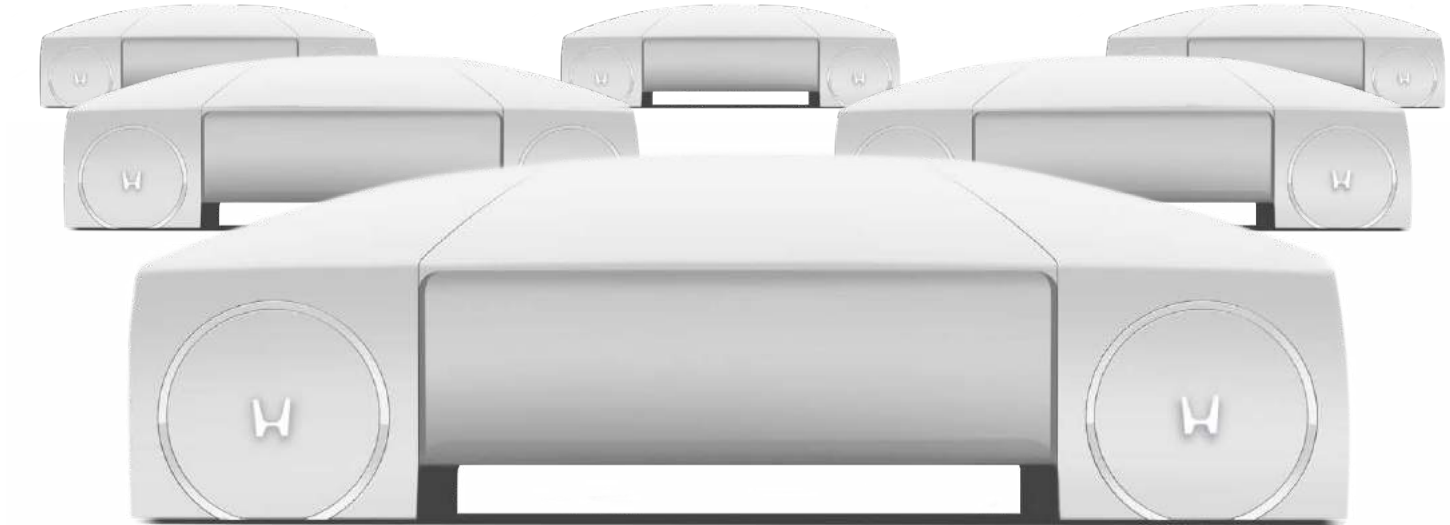
There is no need to own more than one car anymore. All you need is one platform and MR can transform it into whatever your heart desires. Obviously the performance will not necessarily match, but the layman who has never driven a real Porsche won't mind.



Share

SHARING IS CARING

Simpler products are less personal and therefore easier to share. Your car can transform into your friend's when they need it and drive itself back to you when it's done; much the way bike sharing works in large cities. We are already seeing new approaches to product ownership with ridesharing services and products should adapt to support this more frugal lifestyle.



need a lyft?

PROCESS

how mixed reality was used to develop this project

Mixed reality will soon be a universal technology and we must start designing for its capabilities now. To develop these concepts I had to immerse myself in the technology. I wanted to understand not only how this could benefit consumers, but how it could benefit industry. I gained access to the latest 3D creation tools and used them to build digital assets for demonstrations of the prior concepts. This saved me precious time that would have normally been spent building more complex physical models. It was important to show that these tools are already useful for creative workflows and that once more people can interact with

them, their value will only increase. In using the various available systems, I had ideas for how their interfaces and experiences could be improved in future iterations. I also had to consider how one would approach the design of a product that is part digital and part physical, in a world where both occupy the same space. How much can we simplify the physical product without rendering it unusable by an unequipped user? How crazy can we make a digital product before you cause uncanny valley effects that disturb, or interrupt the experience? In doing all this, I helped usher in mixed reality as a design tool at RIT.

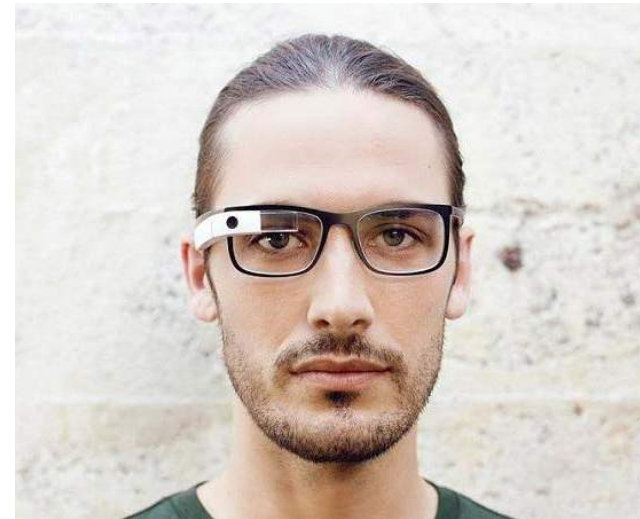
04
PROCESS



Headset



At its best, technology is invisible. Current MR hardware is cumbersome, heavy and uncomfortable. However we have seen strides towards smaller form factors and improved ergonomics in the few years that these devices have been available. It makes



sense that this technology will evolve towards glasses, which are a common and accepted component of personal attire and a functional tool that many people already need. Fashion will be a higher priority when marketing to consumers.



Input



WEARABLE CONTROLLER CONCEPT

As human beings, we interact with our three dimensional world with our hands. Controllers provide a satisfying tactile experience, but they fill the hands, making them impractical for all-day use. Gesture input, such as the Leap Motion controller, is

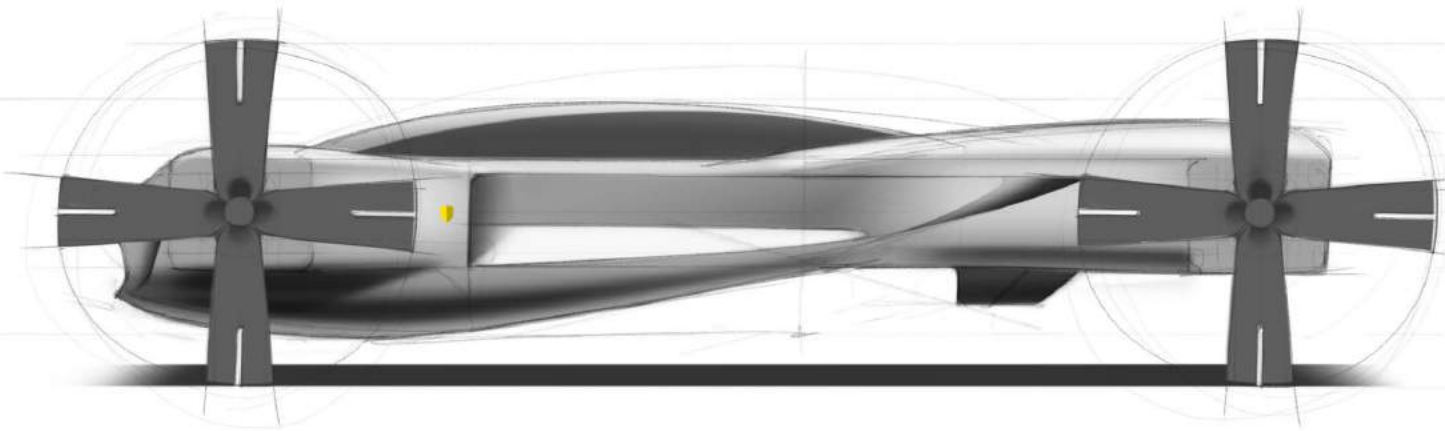
more natural, but lacks tactility. You can't feel what you're doing. A wearable controller would combine haptic feedback with natural motion. It also keeps the users hands unencumbered. Embedded sensors could provide more accurate motion data.



PHYSICAL MODEL

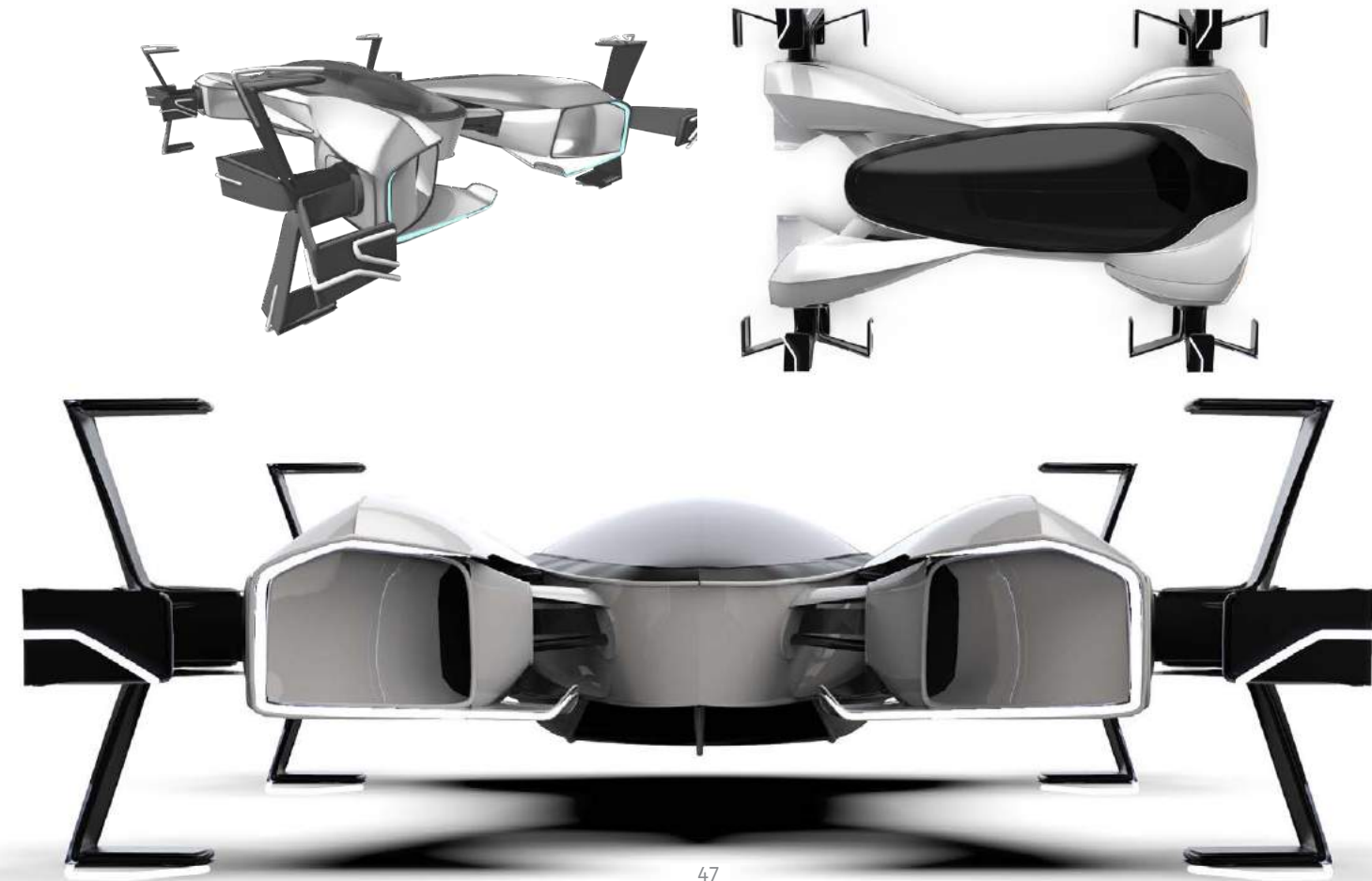
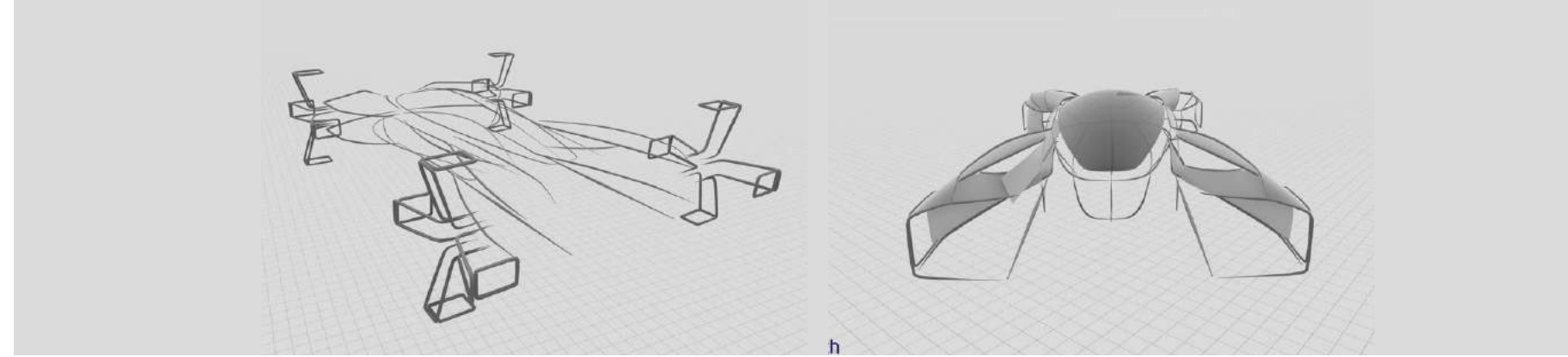
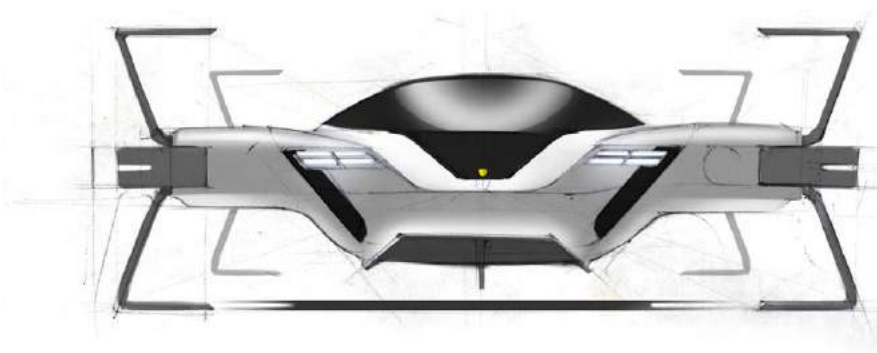


Digital Vehicle

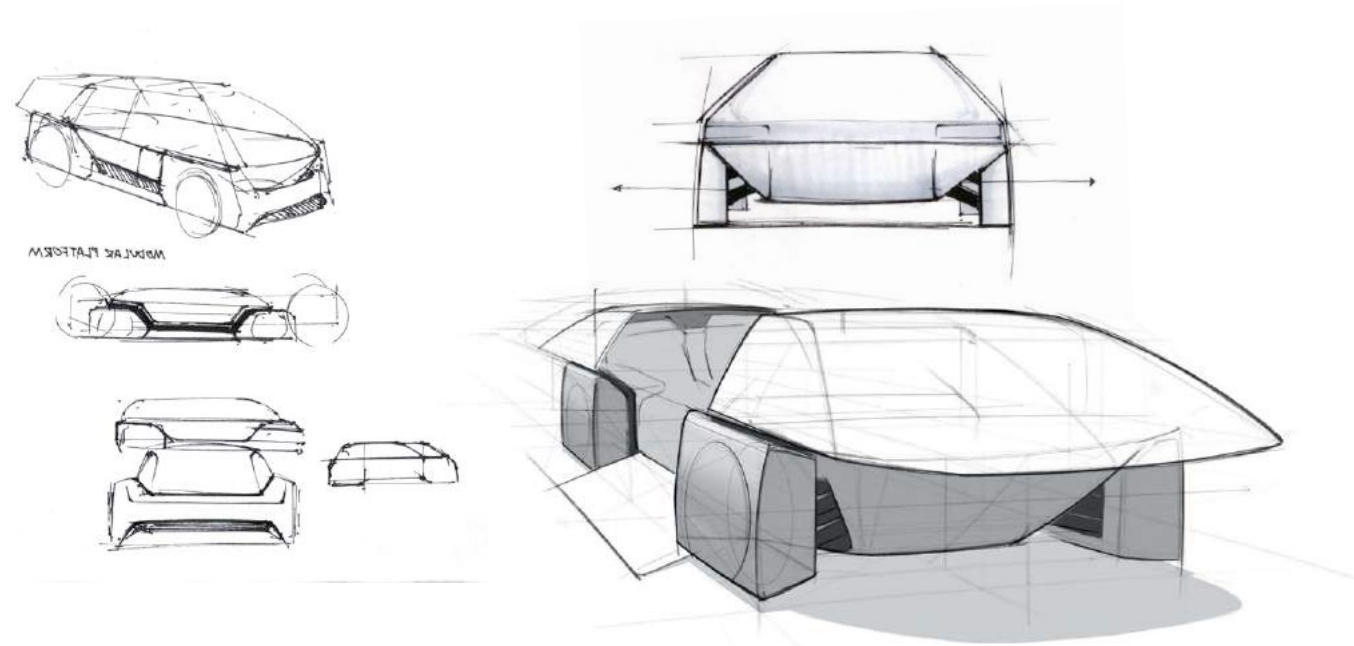


STYLE UNLIMITED

A digital car can look however you want. I intentionally went out of my way to design something that was too cool to be physically built! To get a feel for this, I created a 3D digital model of a conceptual digital vehicle in VR, using Gravity Sketch. This geometry was exported to a Microsoft Hololens for MR viewing.



Physical Vehicle

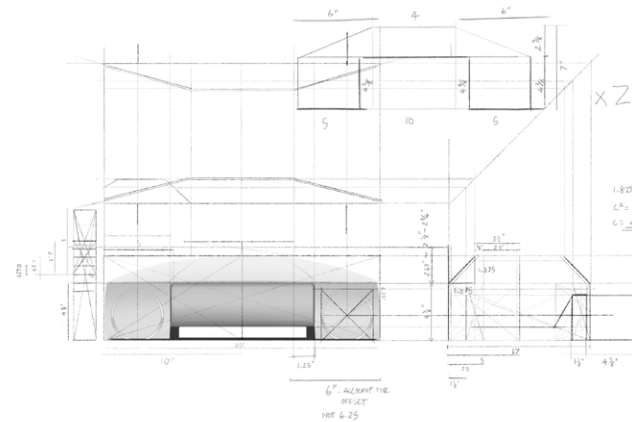


WHAT DOES A VEHICLE YOU DON'T SEE LOOK LIKE?

The flip side of this experiment was visualizing what a physical vehicle would look like sans styling. The emphasis is functionality and capacity, with a form that maximized interior space and passenger safety. It still required design, but with a new focus.

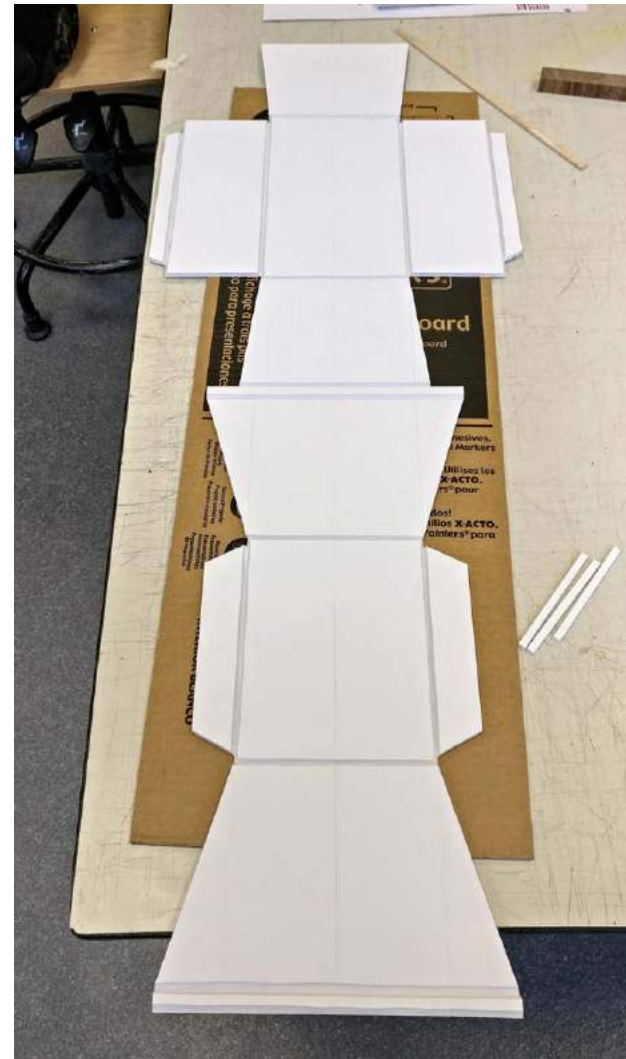


Model



FOAM FORM

Using the hero sketch for my futuristic physical vehicle, I created a measured orthographic drawing. This was used to build a basic scale model out of foam core, to be used for my show demo.



Capstone Show

A fantastic show to end a year's hard work. I was responsible for designing the layout and graphics for the show itself, along with a presentation of my own independent project. I borrowed a HoloLens from Magic Spell Studios to blow some fresh minds.





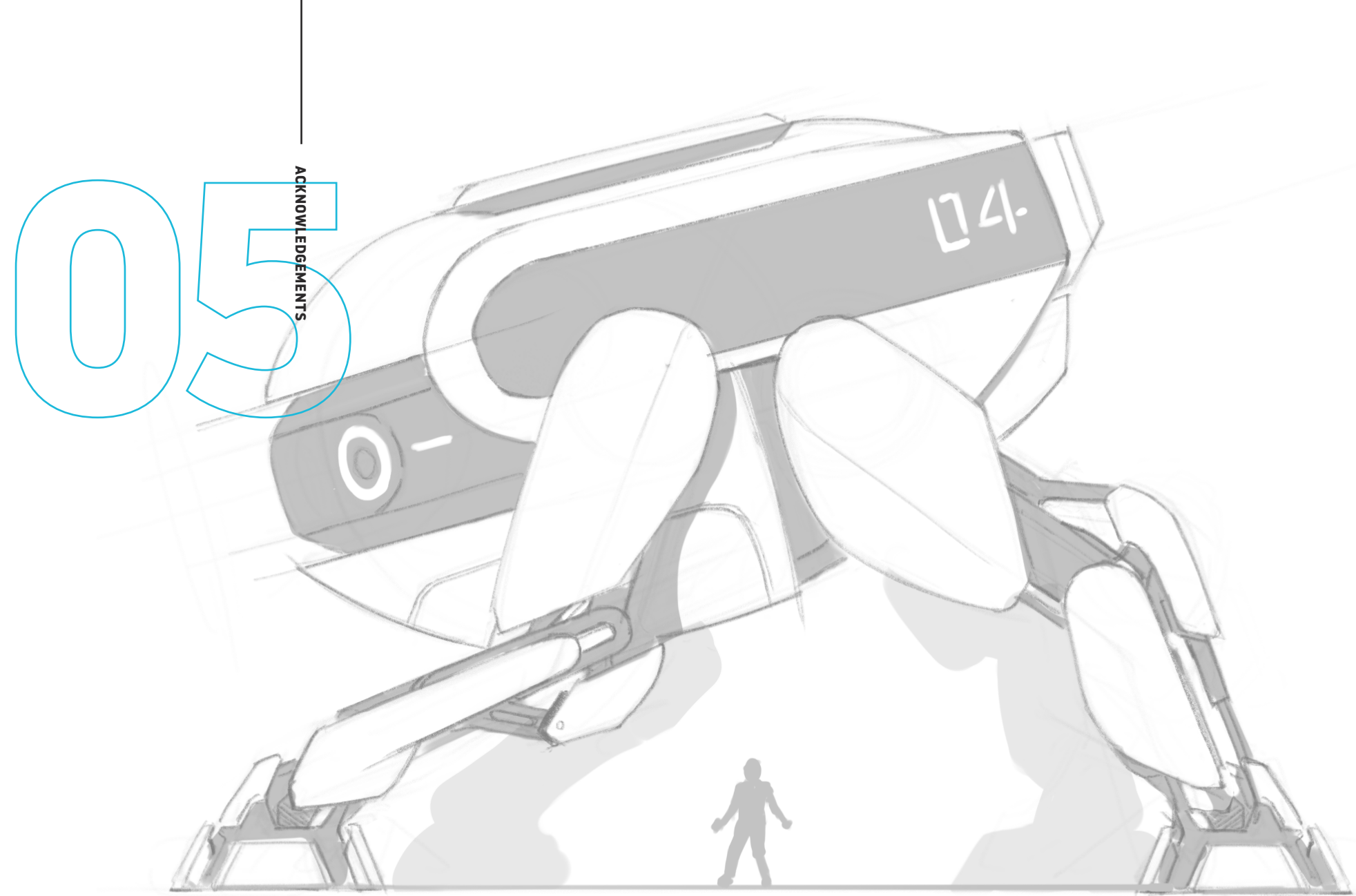
ACKNOWLEDGEMENTS.

the people, places, resources, and tools that helped make this project a reality.

I have been lucky to have an amazing network of people helping me throughout this project. David Long and Brenda Schlageter at Magic Spell Studios gave me access to their VR lab, without which I would not have been able to do this. Enough people were excited by it that I was able to get an HTC Vive in the industrial design studio with the help of Stan Rickel. The kind people at Gravity Sketch generously donated a free license to their

software to aid me in my research. Thank you to Bruce Leonard for being a steadfast supporter of this project, even when it was confusing. Thank you to Gary Molinari for being a constant source of inspiration and encouragement. Lastly, to my parents and my grandmother Lois, who have financially and emotionally supported me through four tumultuous years of college, thank you. I hope you can see its value here.

05
ACKNOWLEDGEMENTS



experts

BRUCE LEONARD

RIT ID Faculty and Co-Chair.
Senior Capstone Professor.
Guided concept development
and execution.

MARK REISCH

RIT SOFA Faculty. Mixed reality
mentoring, AR/VR access and
technical support.

BRENDA SCHLAGETER

RIT Magic Spell Studios
Provided access to augmented
reality hardware.

LEN NICHOLAS

Industrial Designer and Concept
Artist. Provided feedback
on visual development and
presentation.

IGOR SOBOLEVSKY

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Stanley Black & Decker. Digital
modeling and sci-fi expert.

ALEXANDER BENNETT

Industrial Designer at Microsoft.
Provided feedback on hardware
and technology concepts.

WAYNE COE

Storyboard Artist.
Storyboarding concepts and
visual communication support.

GARY MOLINARI

RIT ID Faculty
Aided with design direction and
just about everything else.

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