

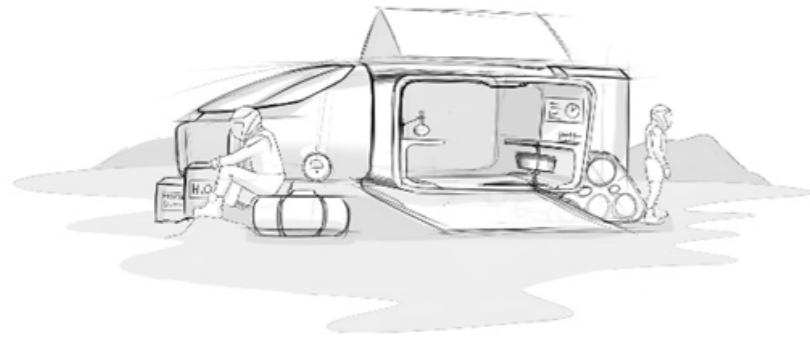
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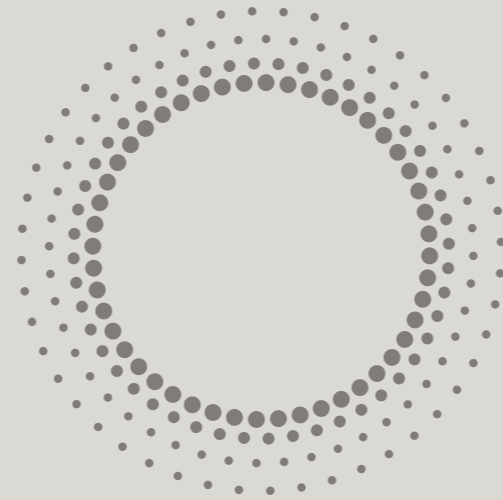
A colonisation vehicle for Mars : 2040
Jonathon Allen





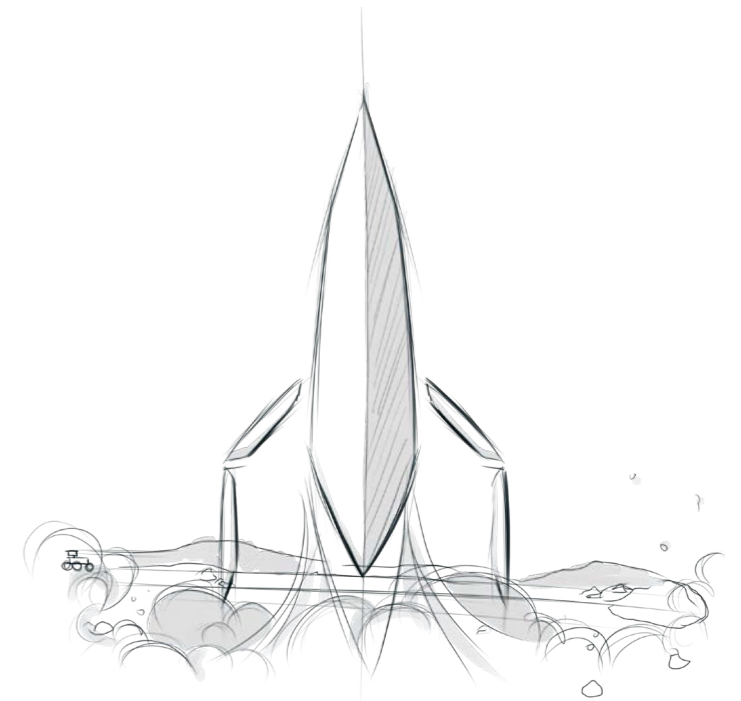
Context

- Mars is inhospitable, the vehicle should deal with extreme cold and protect users from environmental issues such as air pressure and temperature
- Air density at 1% of Earth so drag, downforce and lift are almost non-existent, good for battery range.



Brief

- Create a Vehicle to assist vital colonisation efforts on Mars in 2040
- Create an environment for healthy work, travel and sleep
- Create an adaptable vehicle that removes the need for multiple vehicles
- Use natively grown sustainable materials only, production should not rely on deliveries from Earth in a small, infrequent window



Back Story

The first Astronauts are sent to Mars to become the very first inhabitants, they set up basic infrastructure and living conditions ready for the real strides to be taken.

Selected civilians are sent in the next crop to begin advanced colonisation.

Introducing SOL....

Modularity

Modular approach to both the propulsion and the interior.

Users will be able to specify exactly which two interior modules (travel, sleep, comfort, work etc) they would like for their mission or expedition, this specification will be organised and delivered remotely

Solid State Battery

Why solid state?

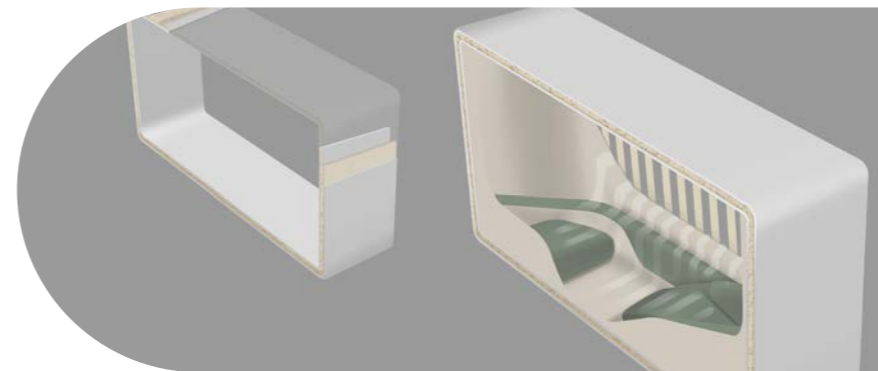
Solid state batteries have a higher energy density meaning that a vehicle could occupy a smaller area with batteries or achieve more range

From the expected mass of the vehicle and the range we need we will need approx 350-400kwh. assuming that by 2040 a SSB produces 500wh/kg we would need 700kg of battery equating to 1.4 cubic meters.

User

The percentage of women in STEM professions has risen from 8% in 1970 up to 28% as of 2019. We can assume that on this trend almost half of the SOL users will be female.

In terms of experience within the vehicle, I want to be able to provide a space that, when appropriate, can become a release from the harsh climate outside. The system would stimulate the body and mind via smell, climate, light and sound.



Materials

All materials sourced from Mars

Interior modules printed using bioplastics (hemp) with sustainable cork core

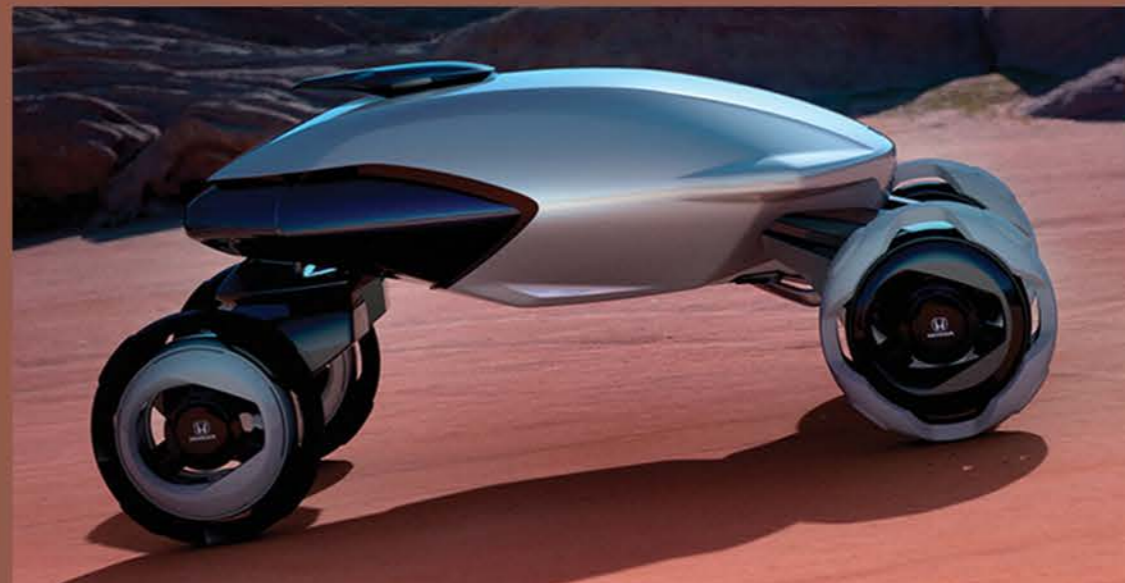
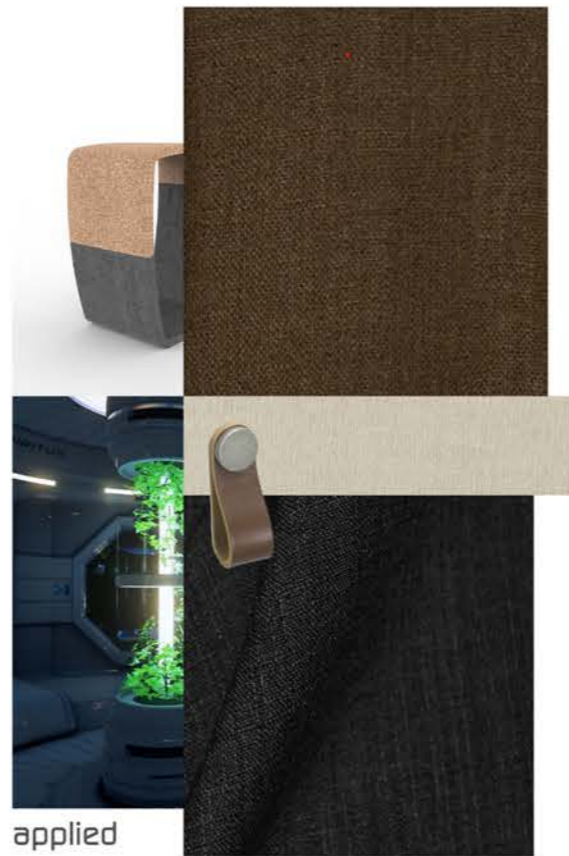
All Mars grown eucalyptus melange and hemp fabrics on interior soft furnishings

Sustainability

Not only will the materials be sourced from sustainable sources set up on Mars, but the vehicle itself will partially charge its battery using solar power from panels installed in the roof.

CMF

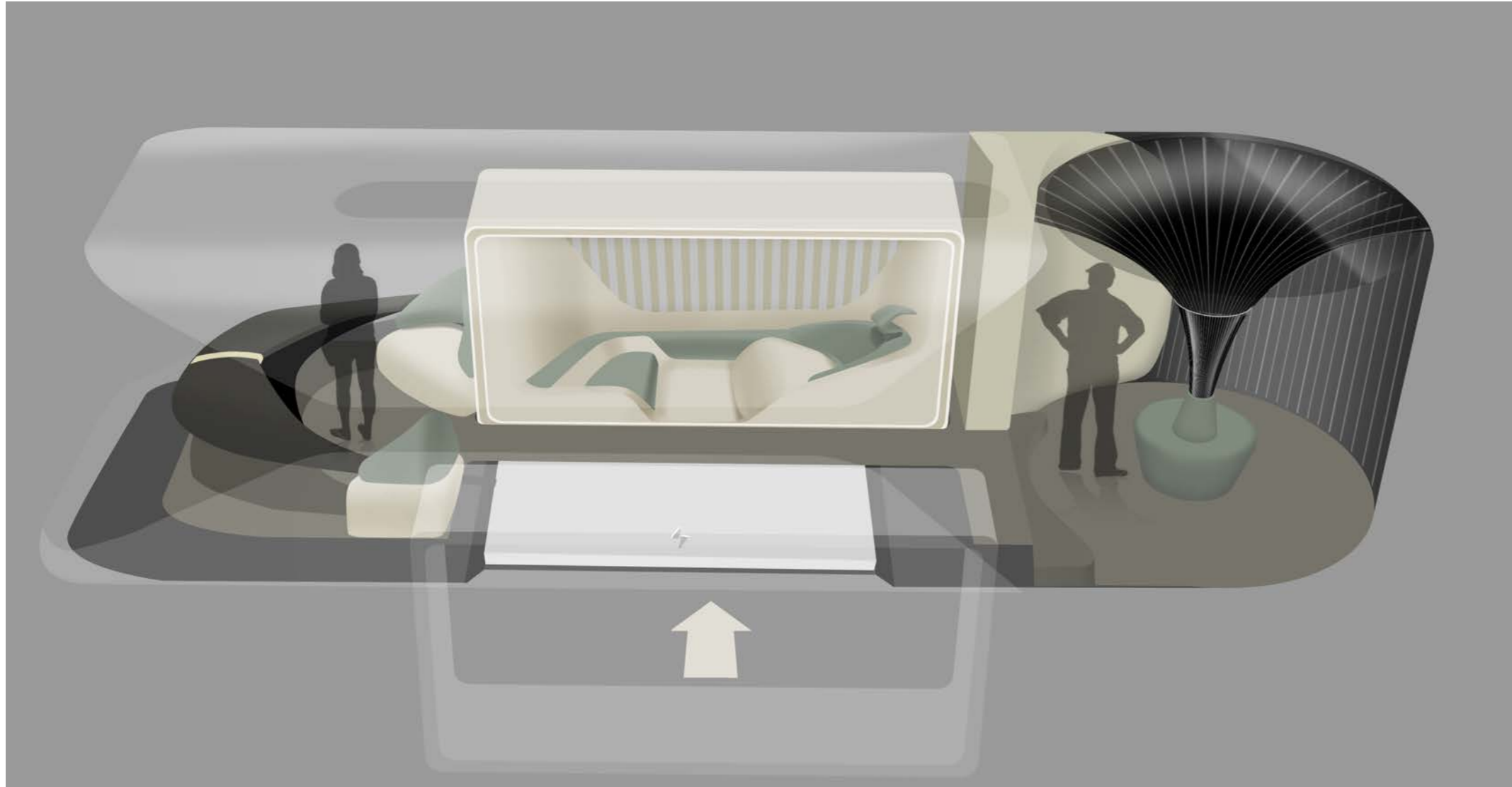
target feeling



Interior colour swatch



inspiration



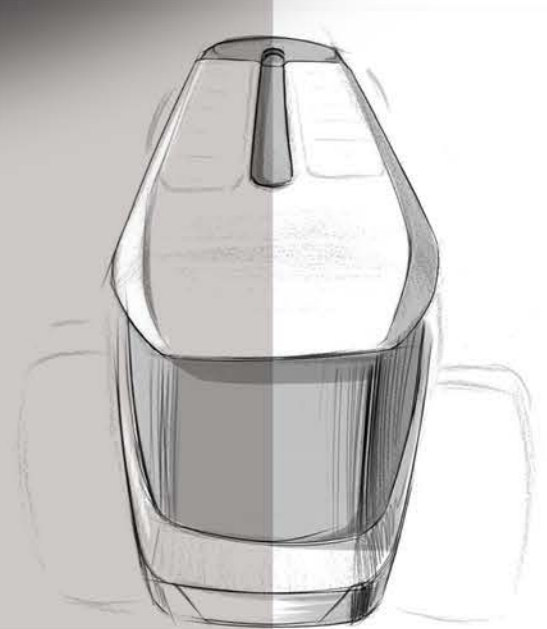
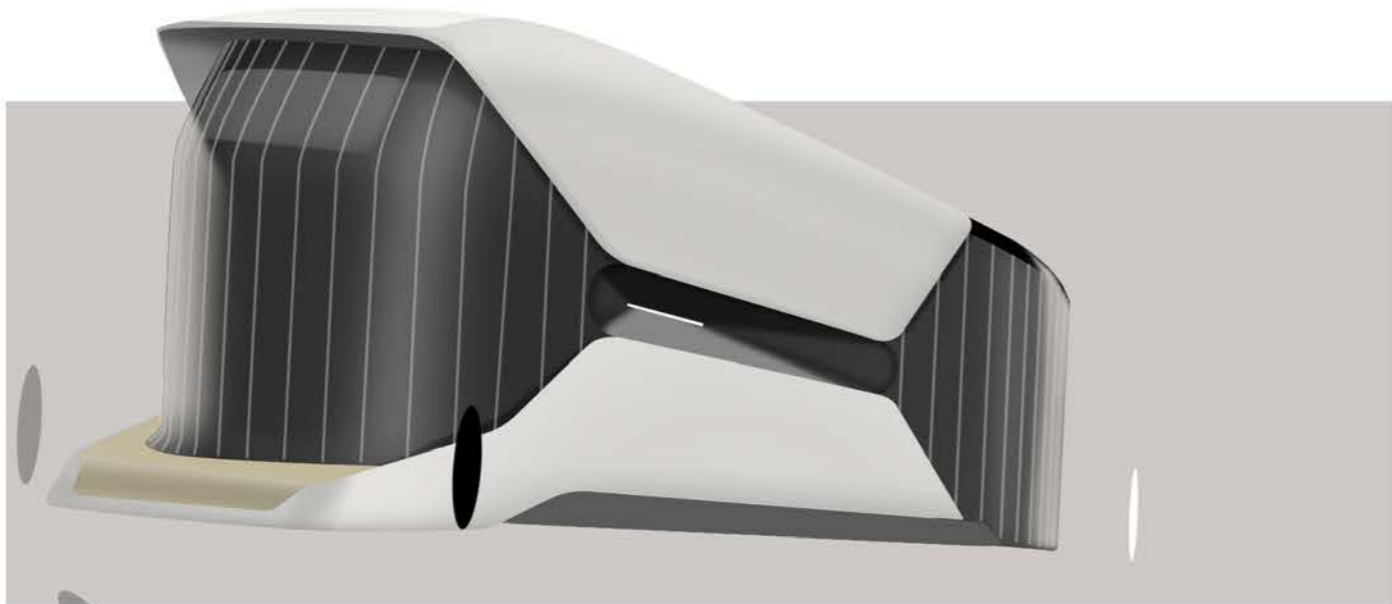
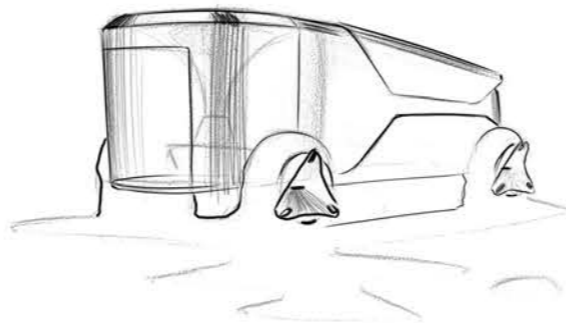
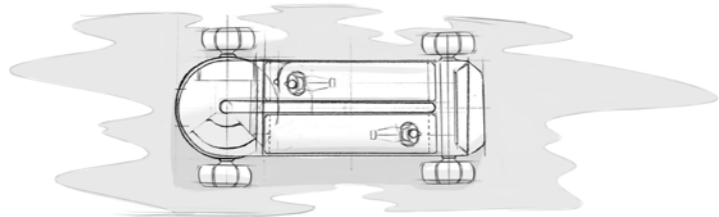
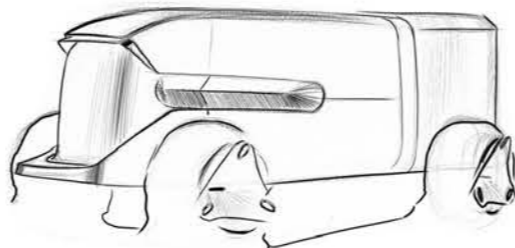
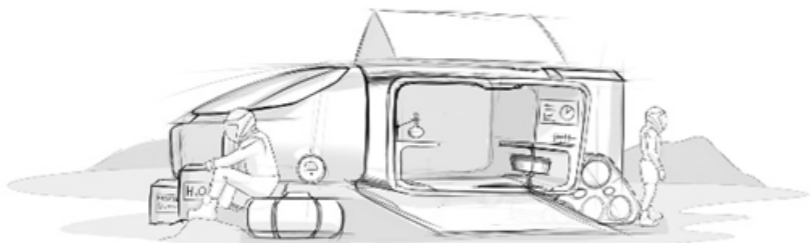
Initial Interior Design

I decided to take an approach often used in interior design and separate the 3 clear sections using levels. I wanted the design to have a sense of separation whilst feeling cohesive.



Interior Final design

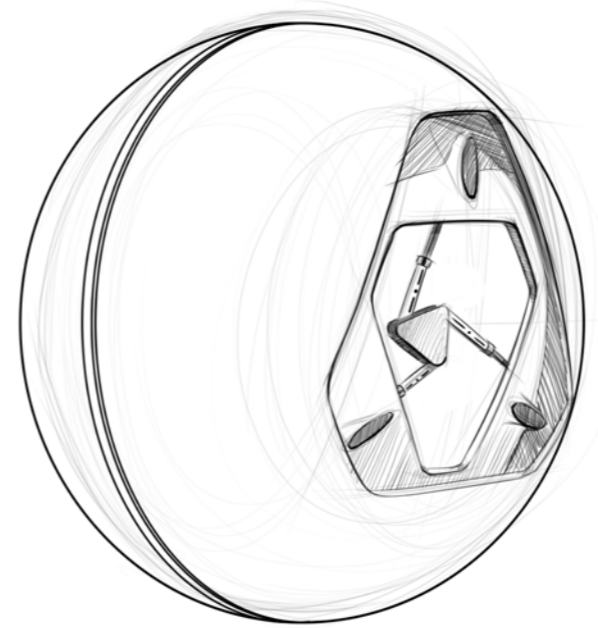
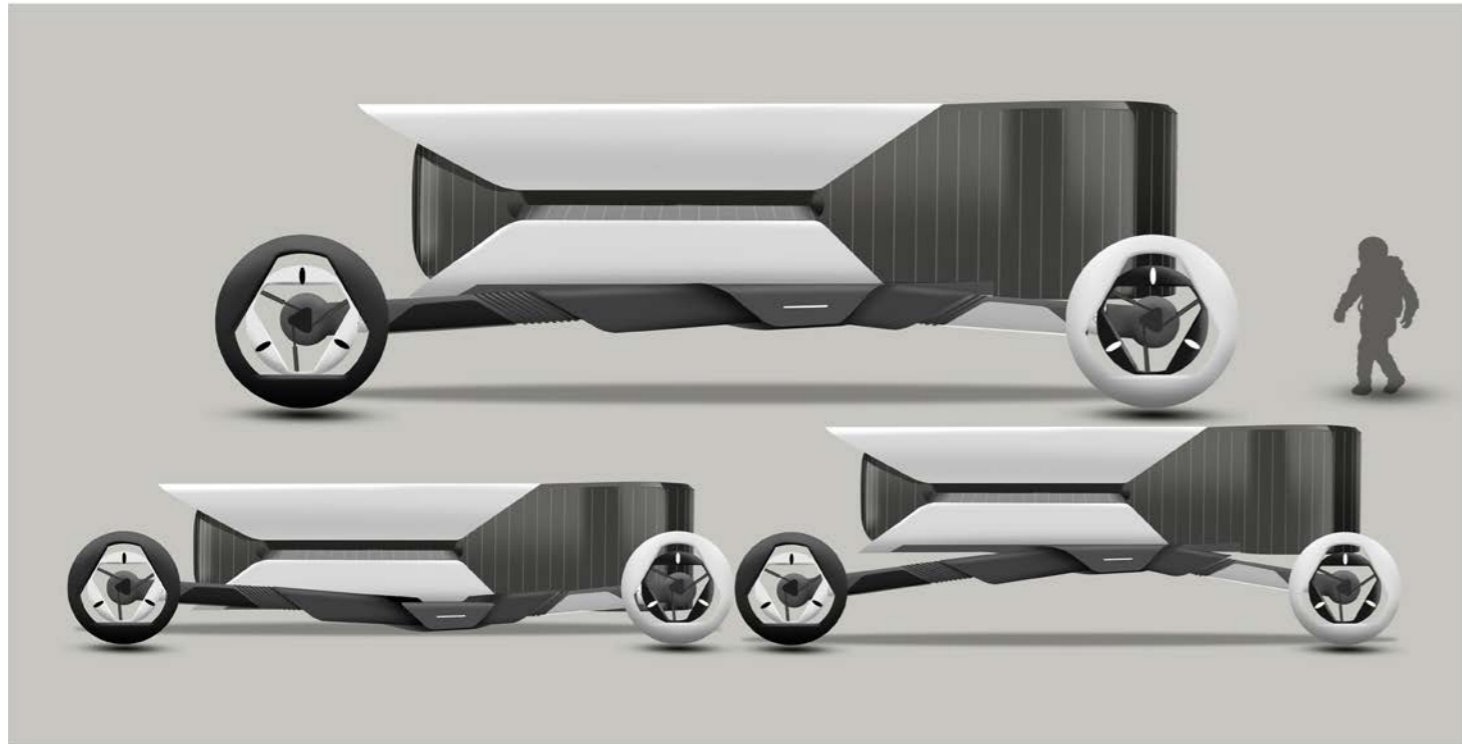
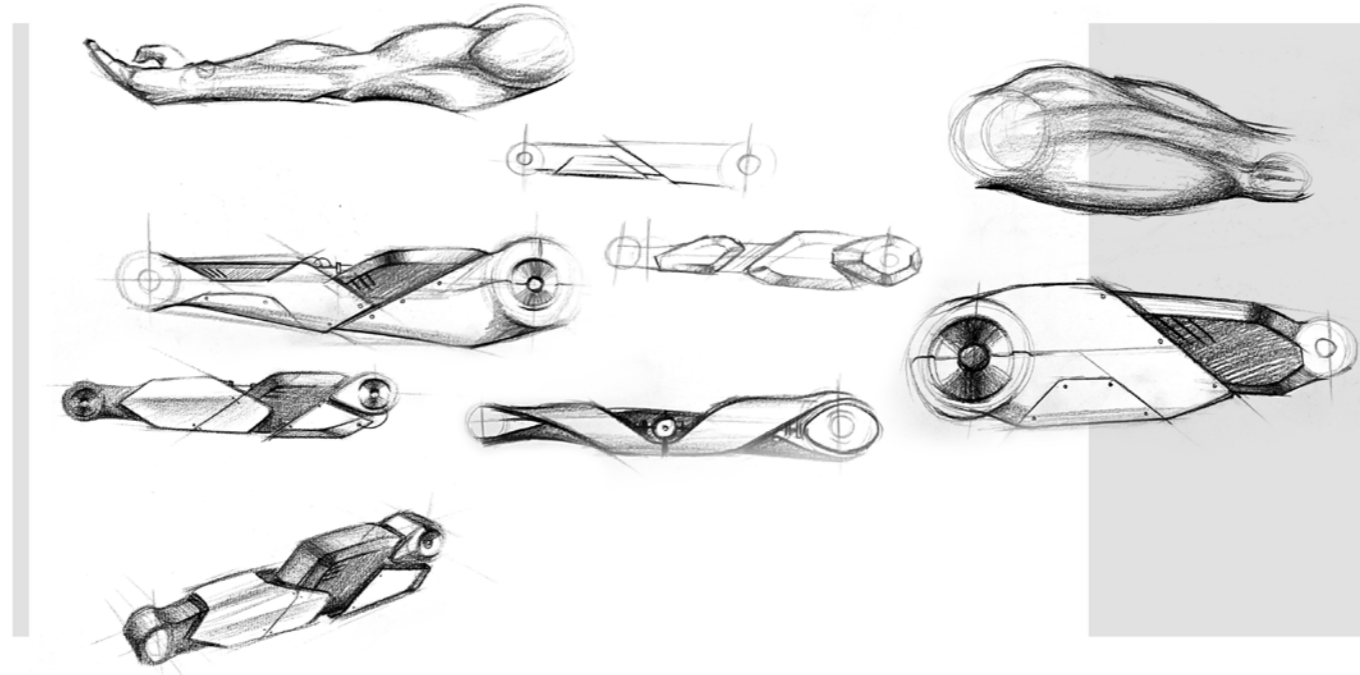
By creating an interior space first and then forming an exterior around it, I was able to achieve the right amount of space without compromise. The interior carries one line front to back and is separated by dark and earthy tones with a hint of colour and light from features inspired by nature.

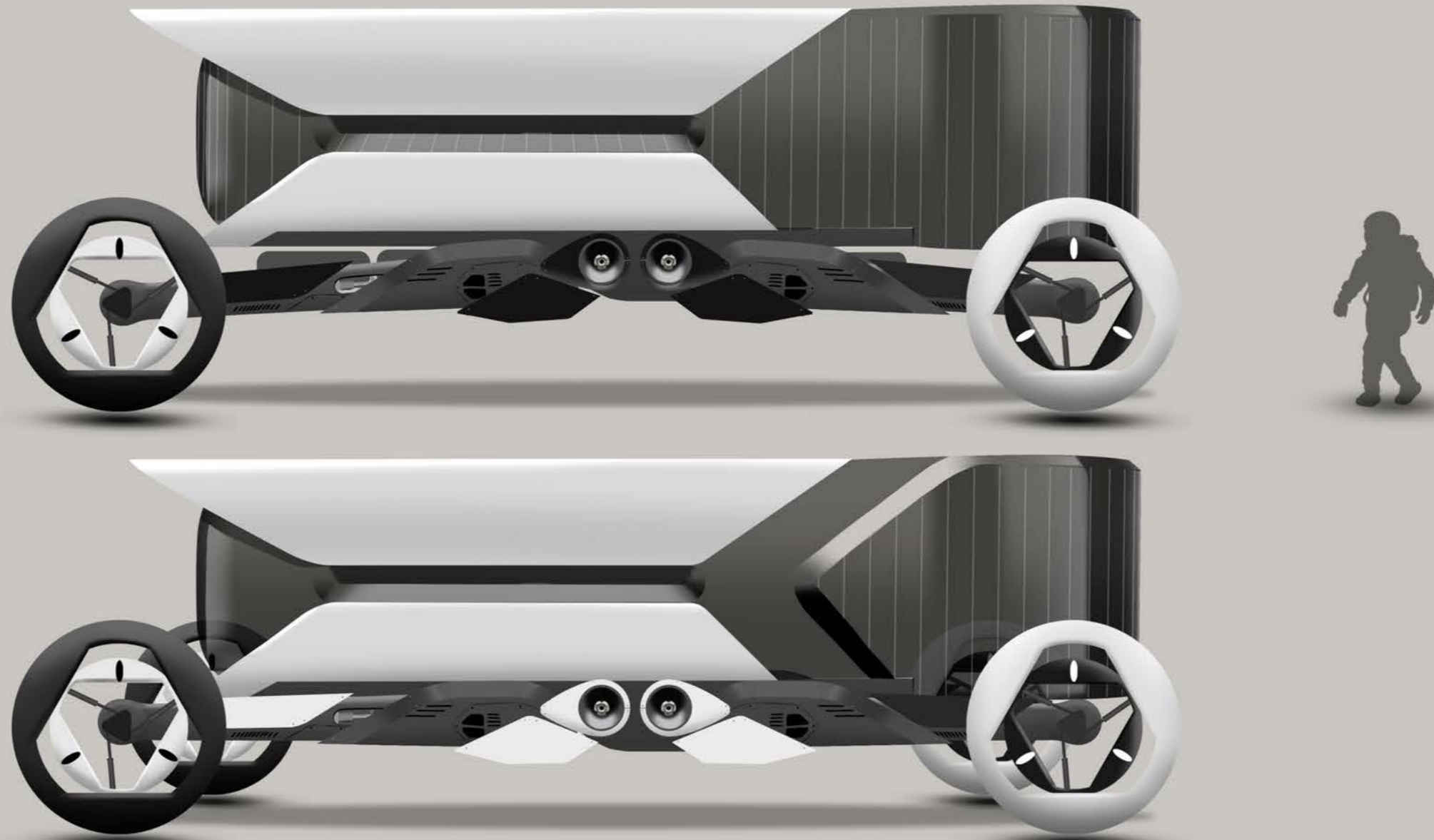


Wheel and arm design

For the articulating arms, I wanted to bring a sense of human anatomy to them to show a natural strength whilst applying the technical and angular design language.

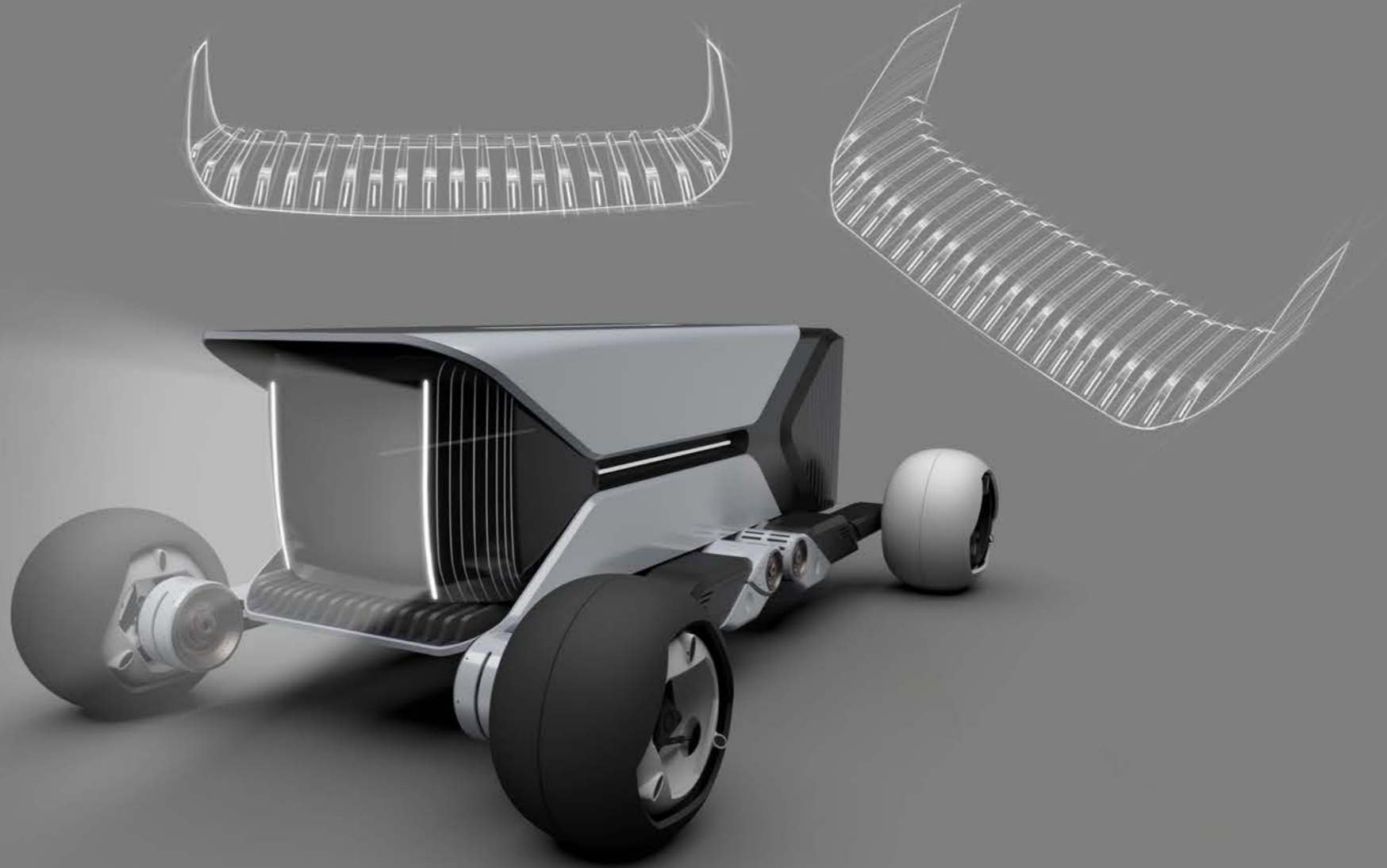
With the wheels I decided to use in wheel suspension and dual body construction inspired by the soft wheel concept.





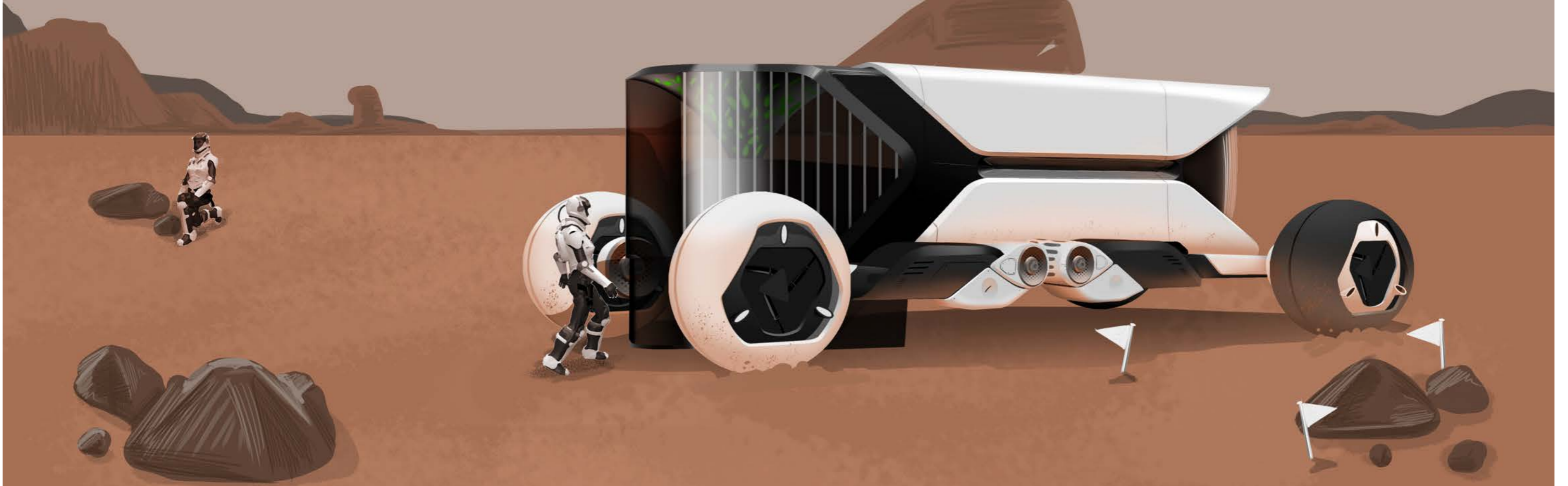
Exterior

Rather than creating a fluid form for the exterior I wanted to have a shell that wrapped around an interior and maximised space. I went for an angular design that used graphical contrast rather than fluid form to create interest in a very technical style.



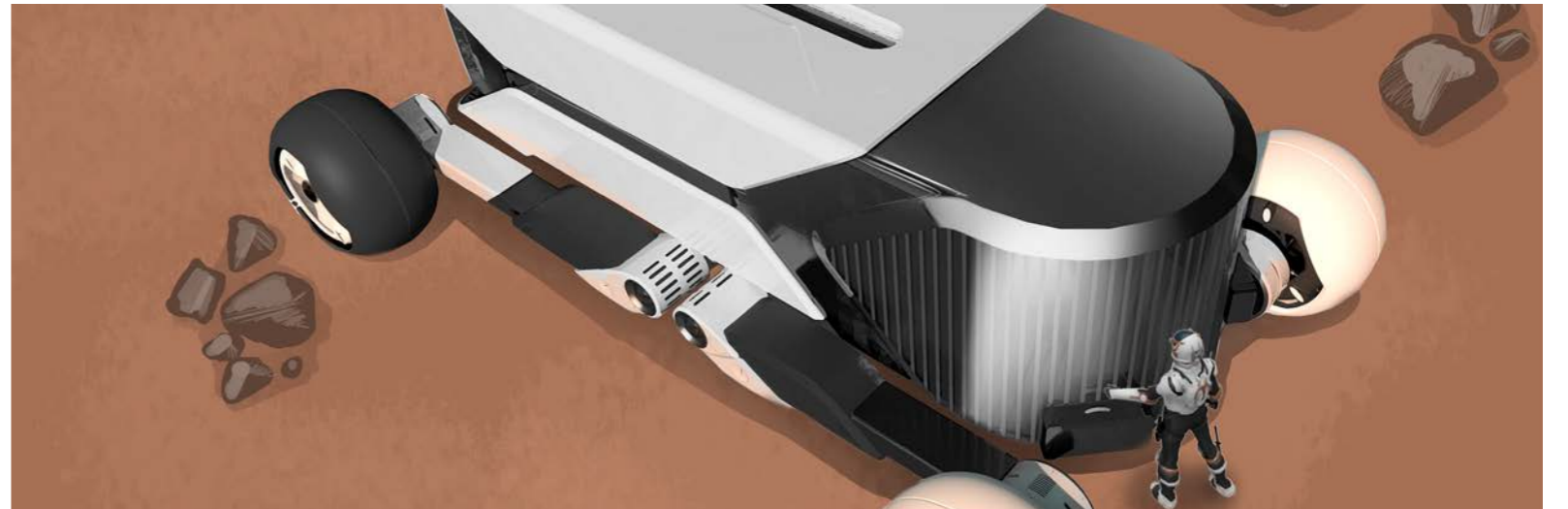
Lighting Design

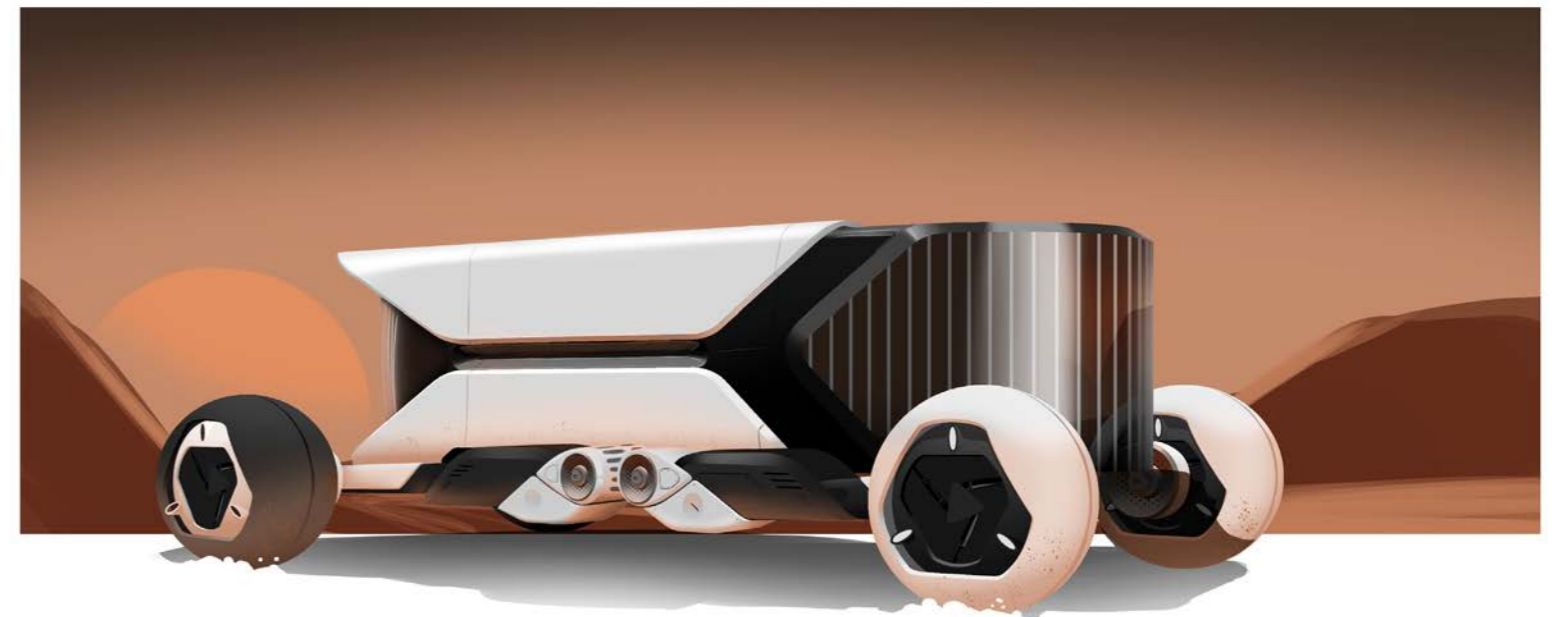
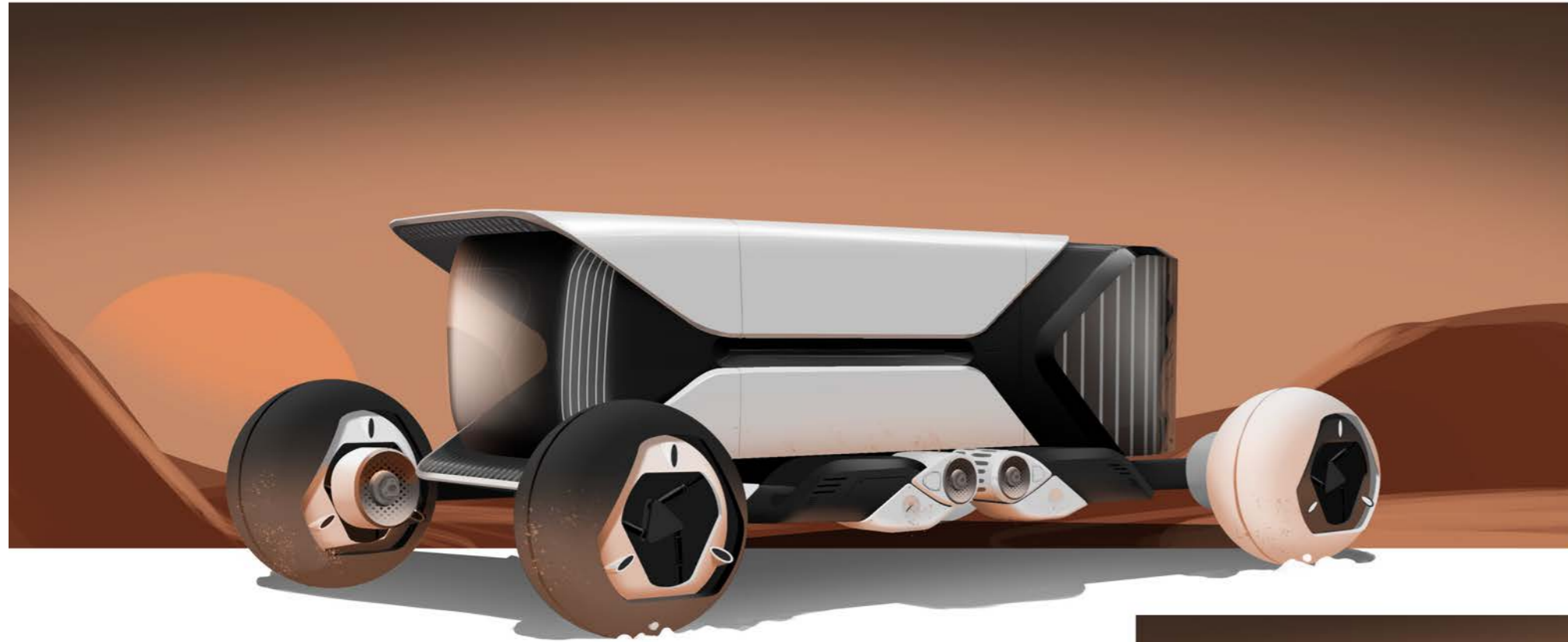
After exploring different ideas and directions I came to the conclusion that a combination of vertical lines to match the vehicle louvres in the rear greenhouse would make the whole design cohesive.

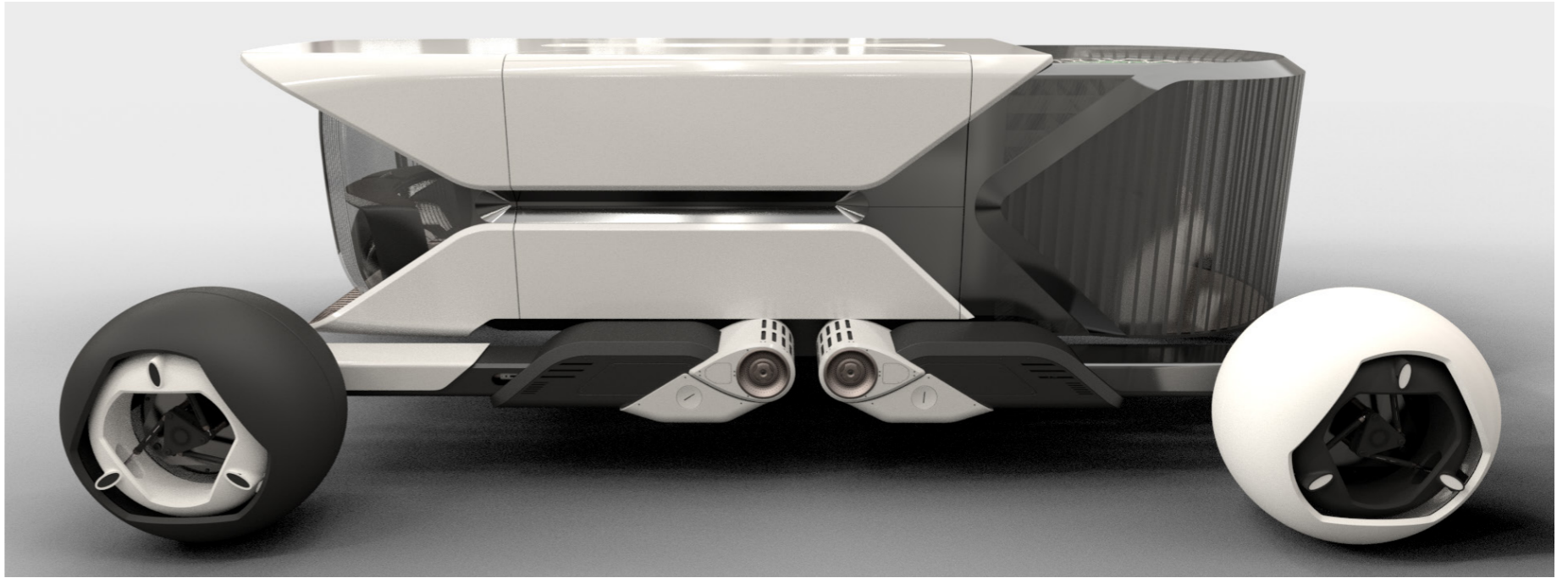
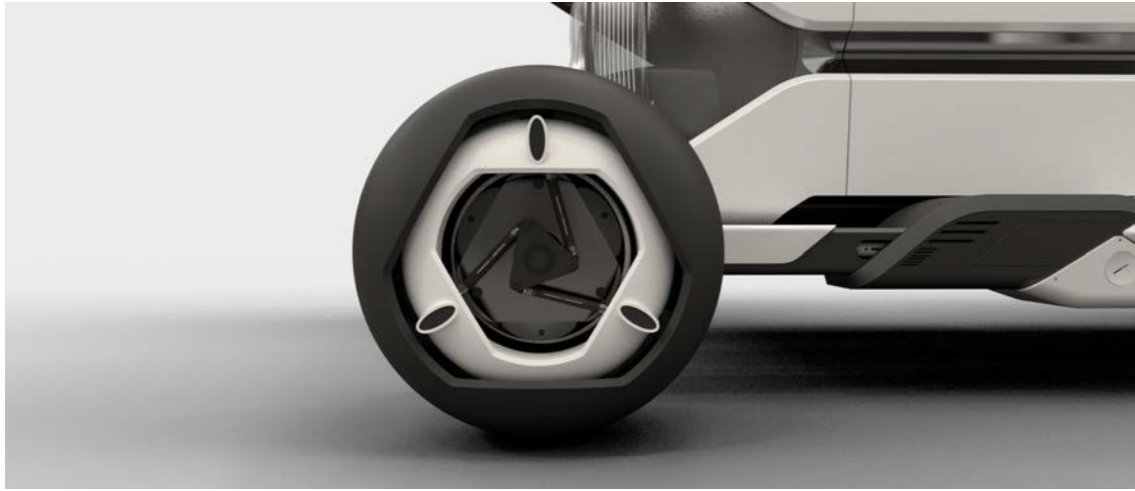


Usage scenario

Vehicles will be required to travel to sample sights and collect samples of material for suitability. The scenes show how astronauts will enter the air lock via the lift system as well as how they will then store samples outboard as to not contaminate the interior environment.







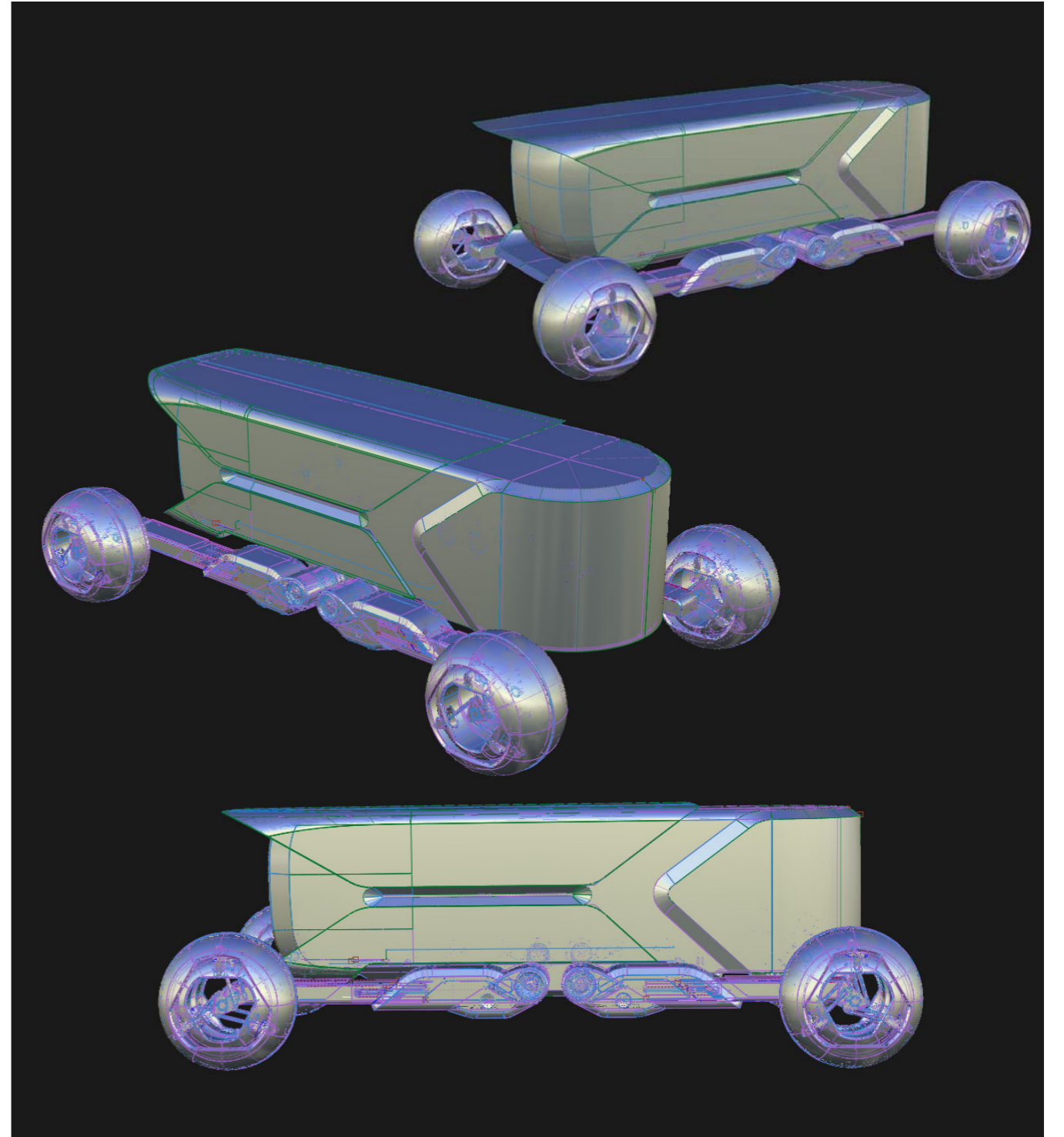
3D execution

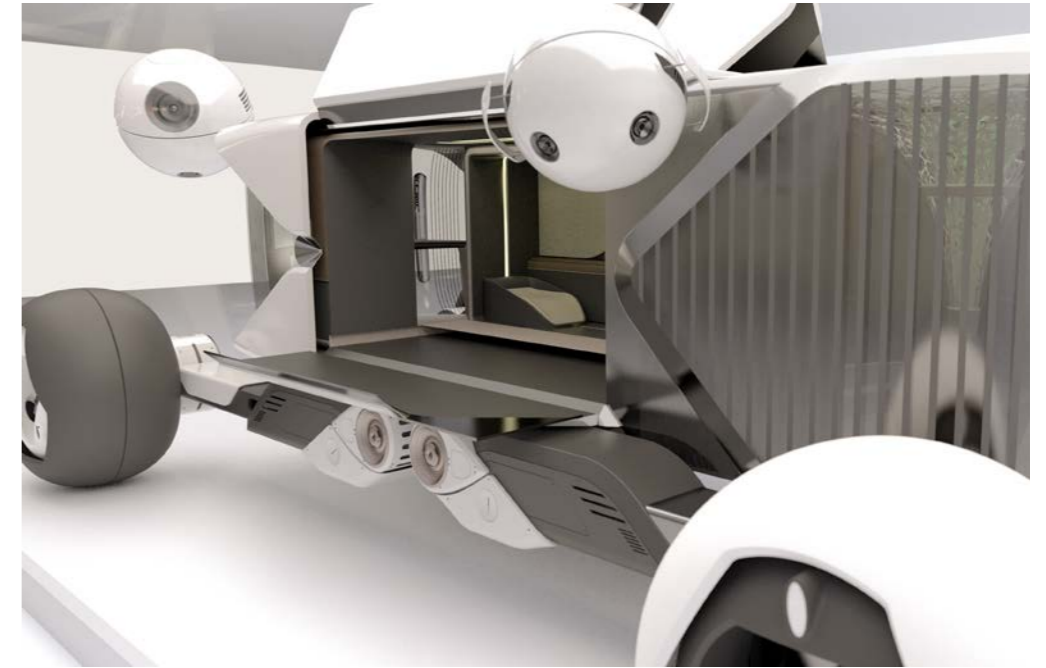
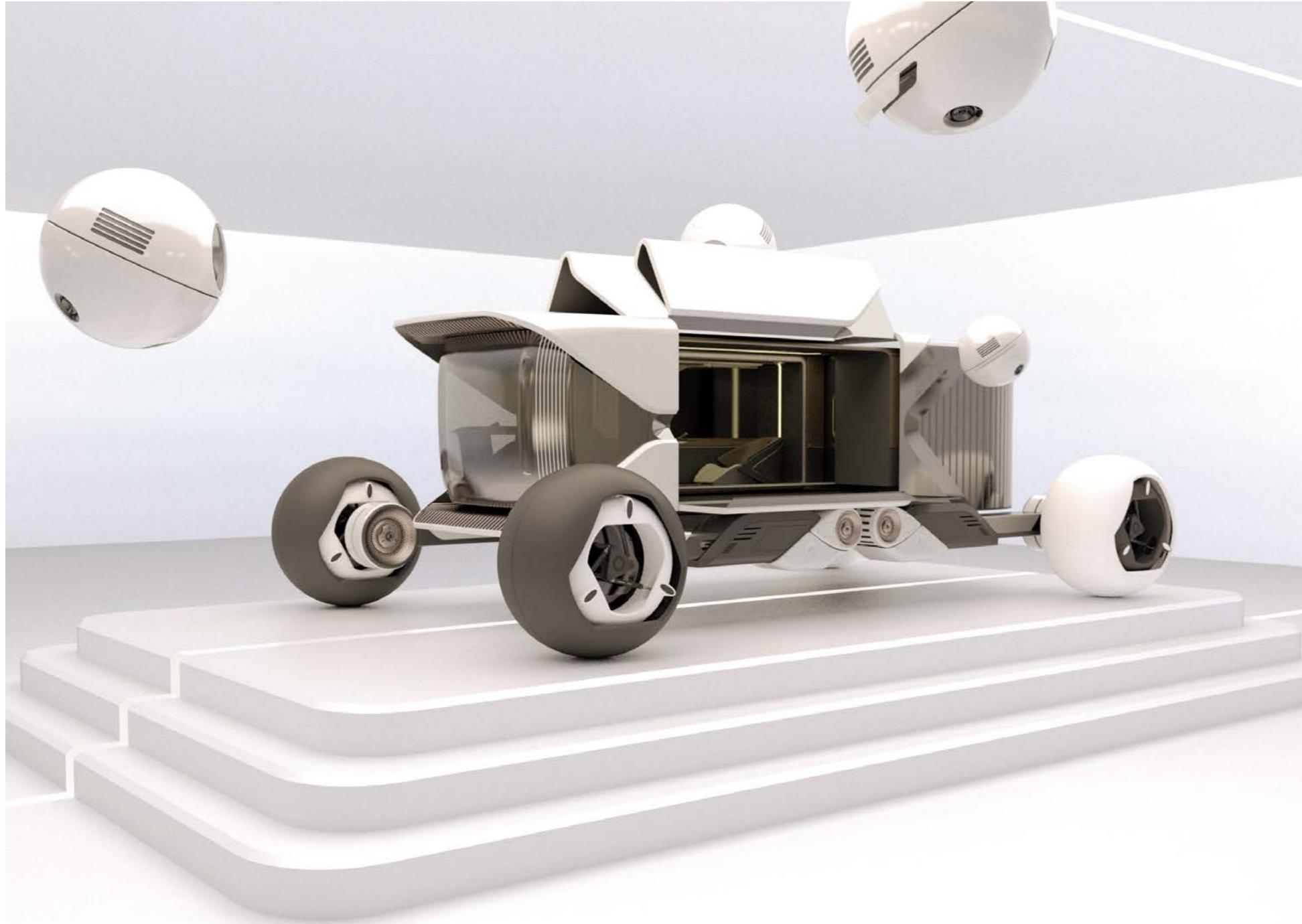
My aim was to create a highly detailed, technical looking exterior with an organic and welcoming interior.



3D Development

I learnt a lot in terms of working to theory with this model. I had an interior package before I had an exterior which is different to how I have worked in the past. A lot of time went into making each aspect of the model as detailed as I could to add interest, function and realism.

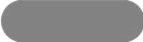




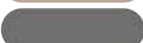





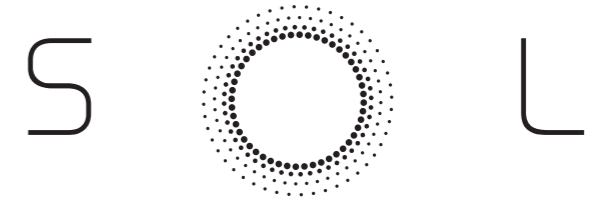
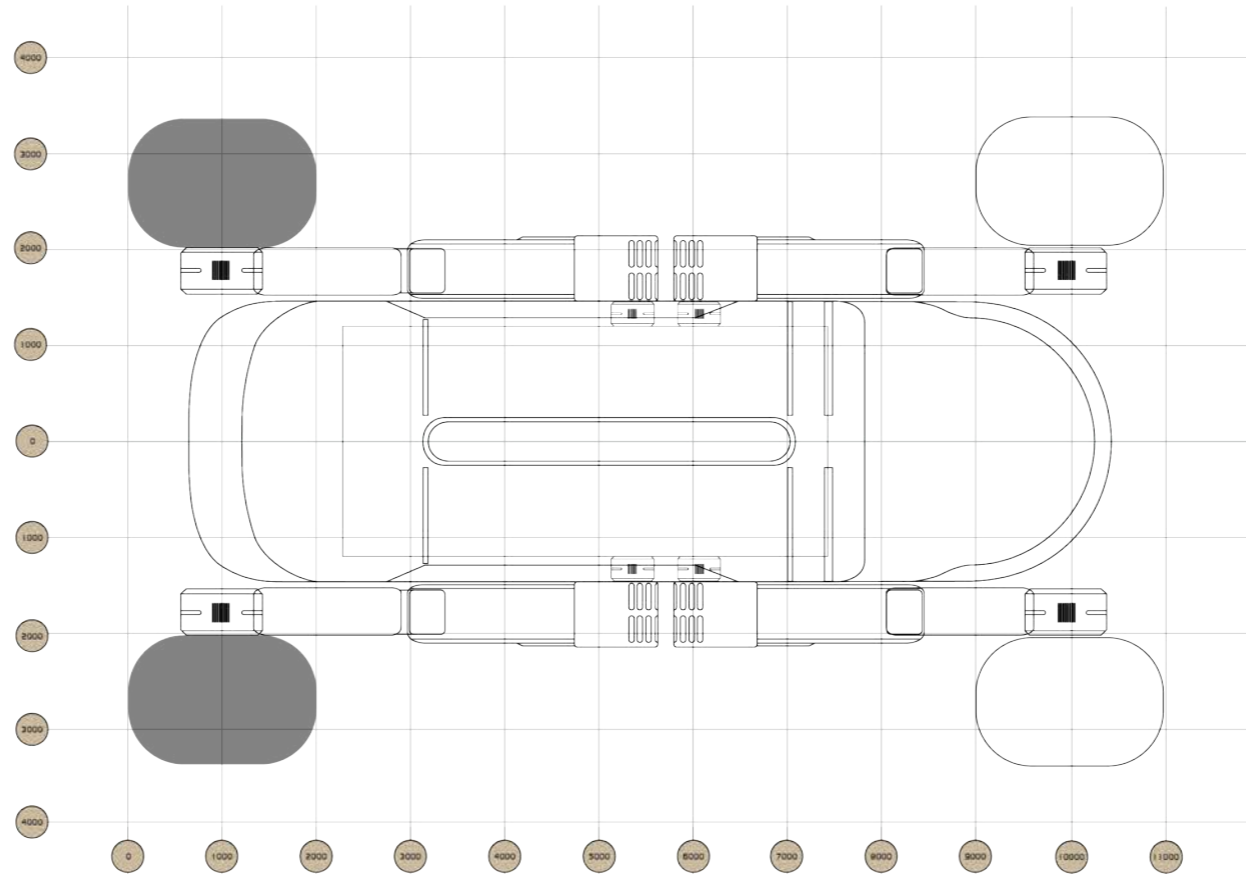


Construction

Not only will the vehicle be built entirely on Mars, but also 'made to order' for each mission, with unmanned drones swapping modules for ideal configuration.

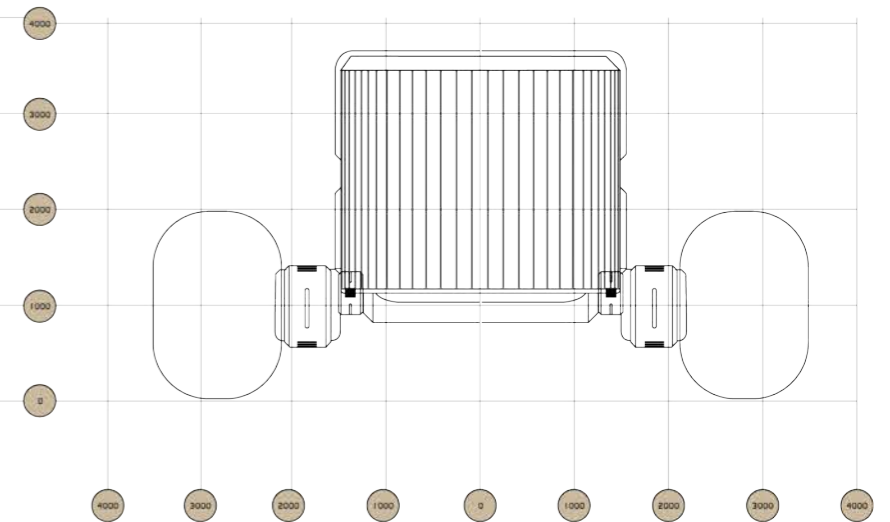
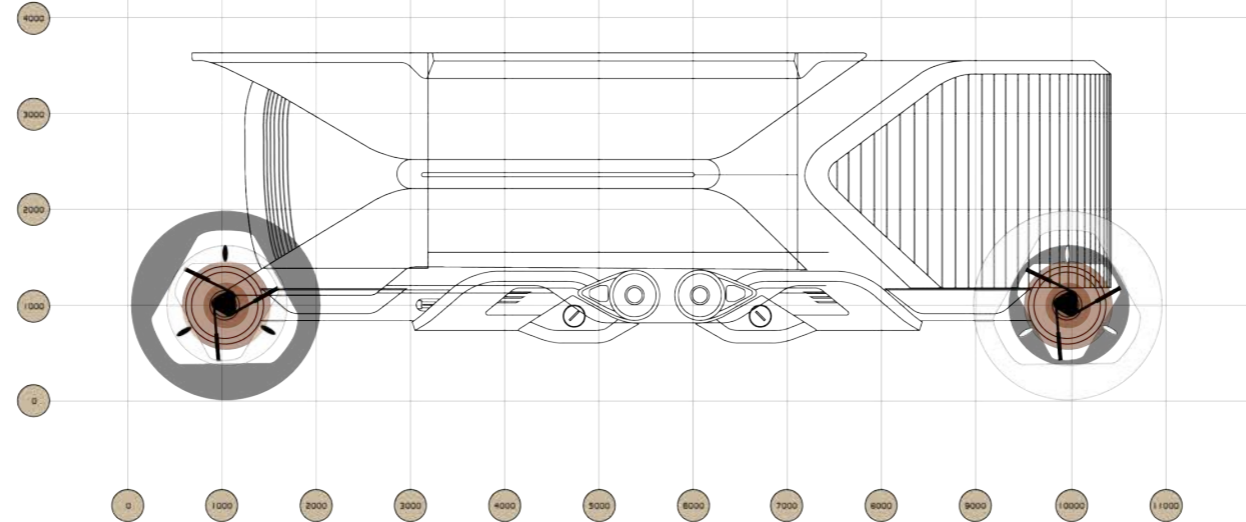
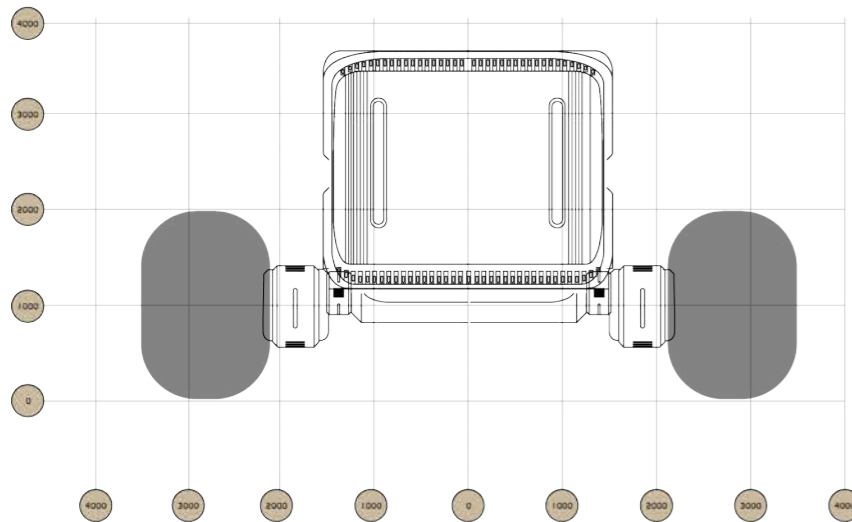
KEY

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-  battery
-  water tank
-  oxygen tanks
-  wheel motor
-  seating
-  module core
-  outlines
-  door armature



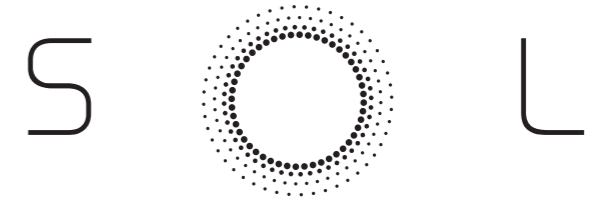
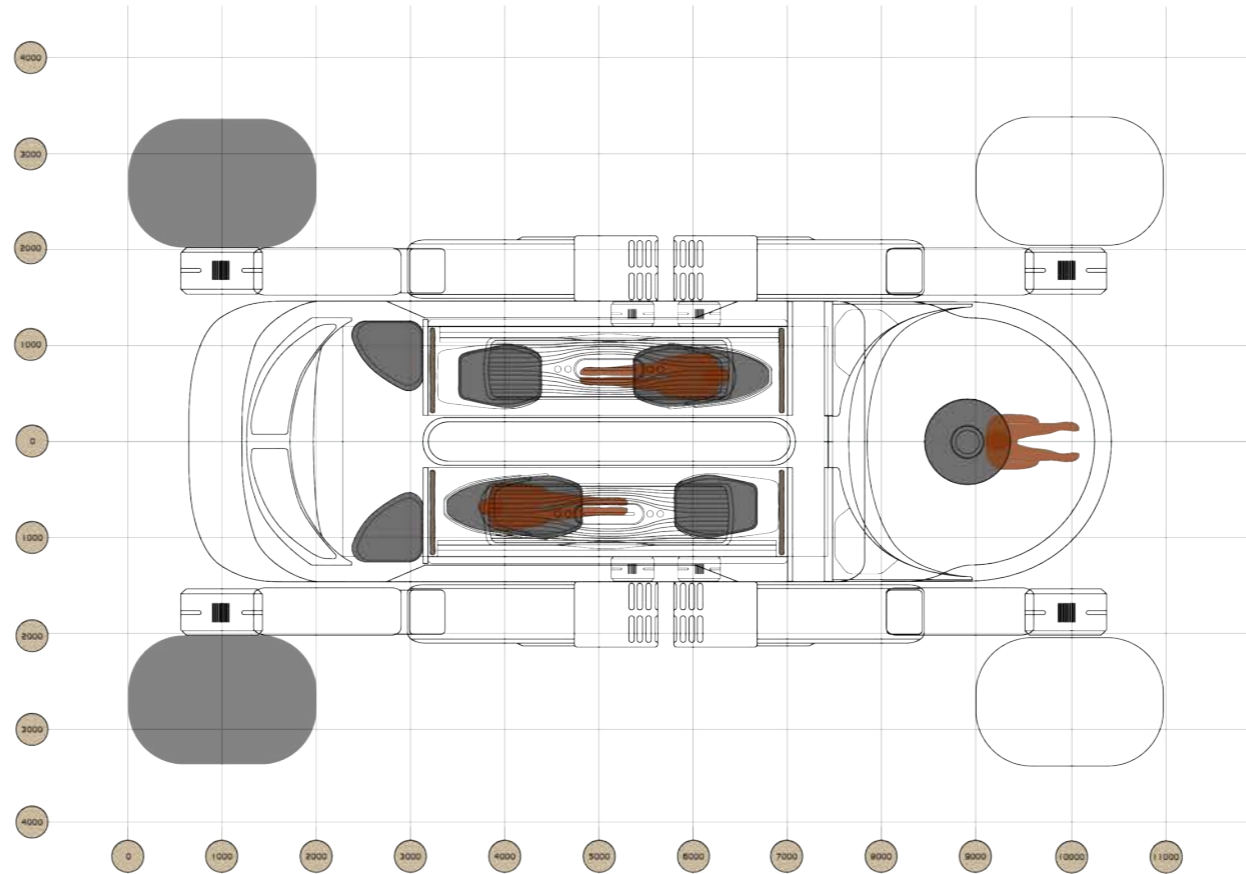
Package Drawing I

The first layer shows the exterior linework as well as shut lines giving the best overview of proportion and size



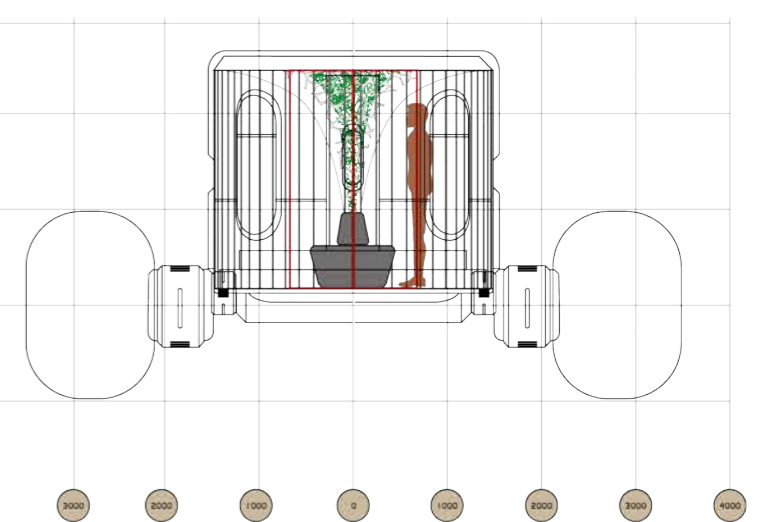
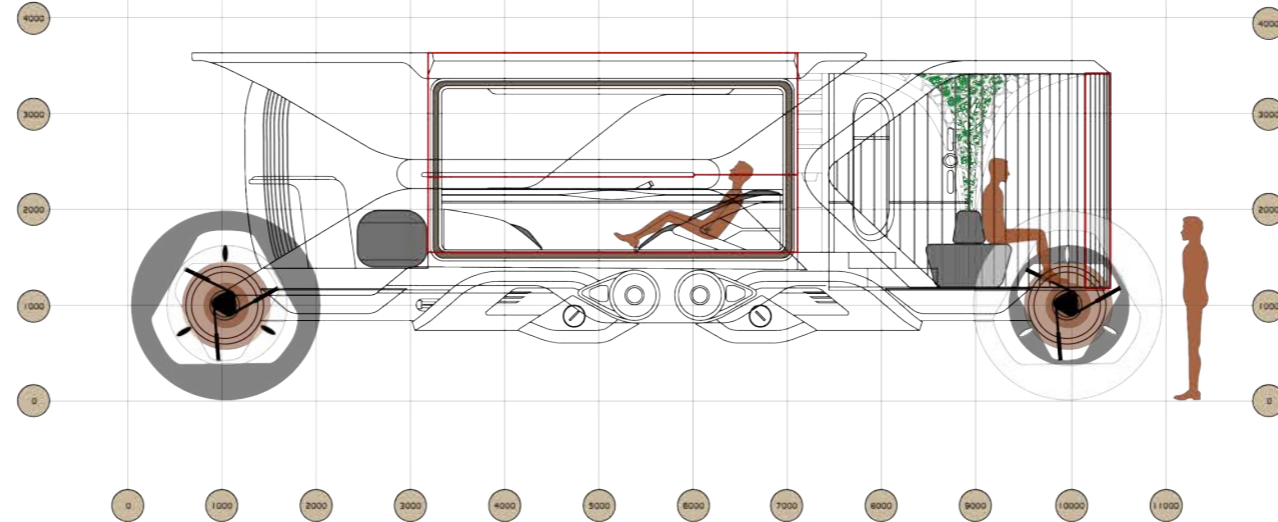
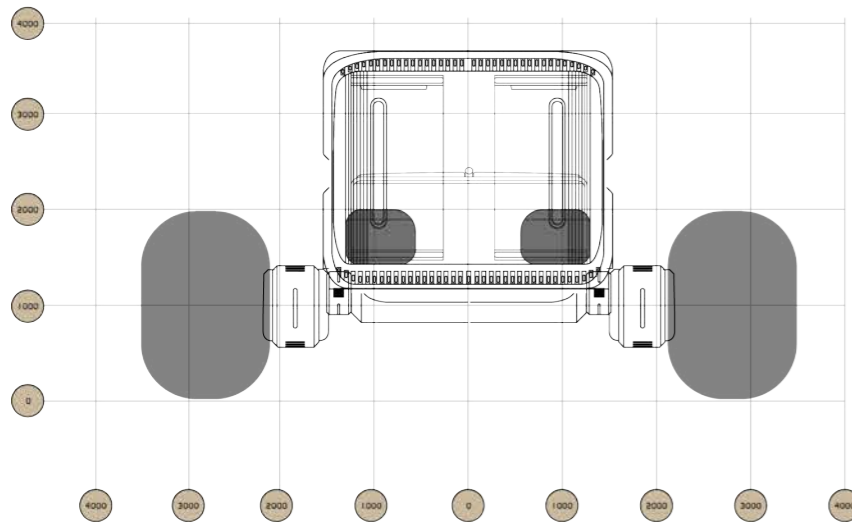
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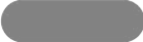




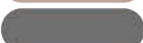





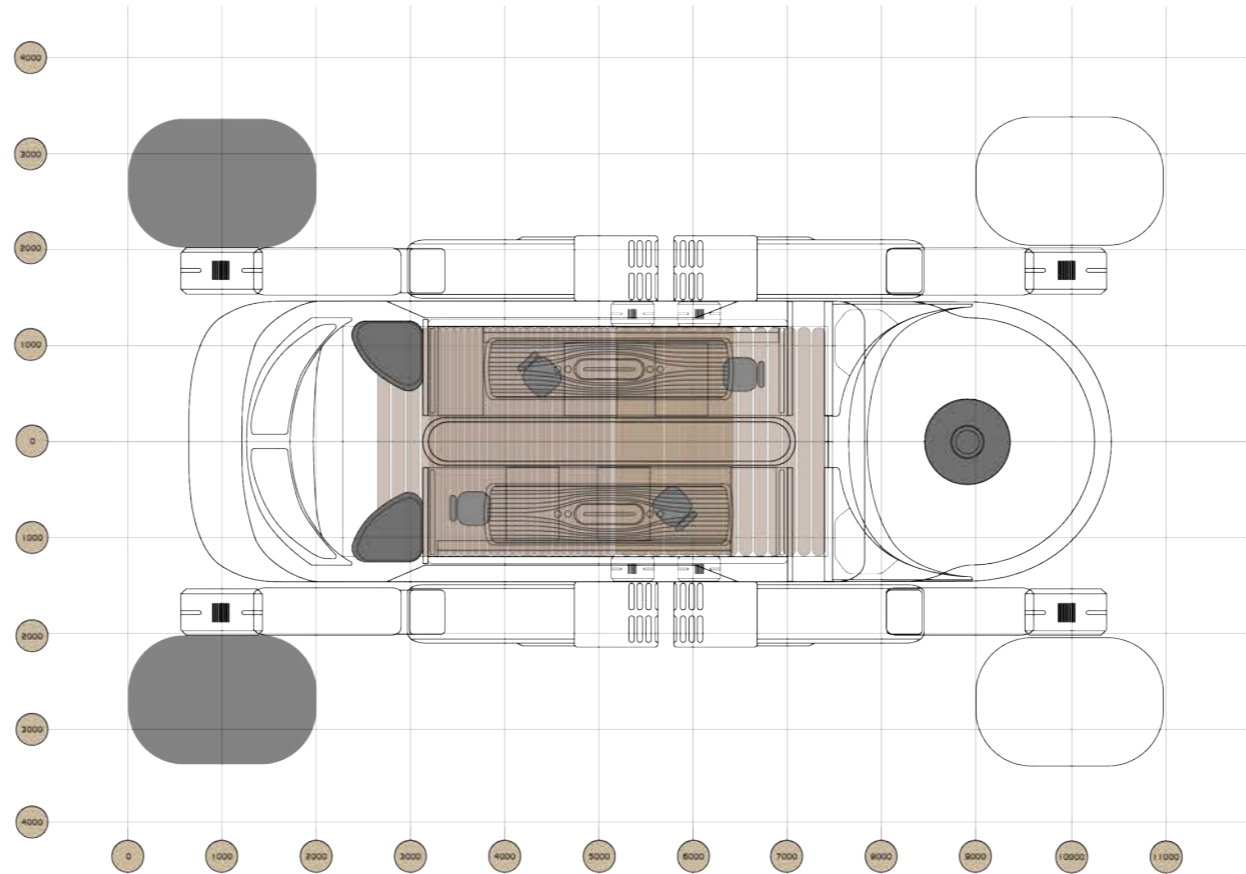
Package Drawing 2

Layer 2 Shows the first of 3 modules, the comfort module as well as seating in all 3 sections.



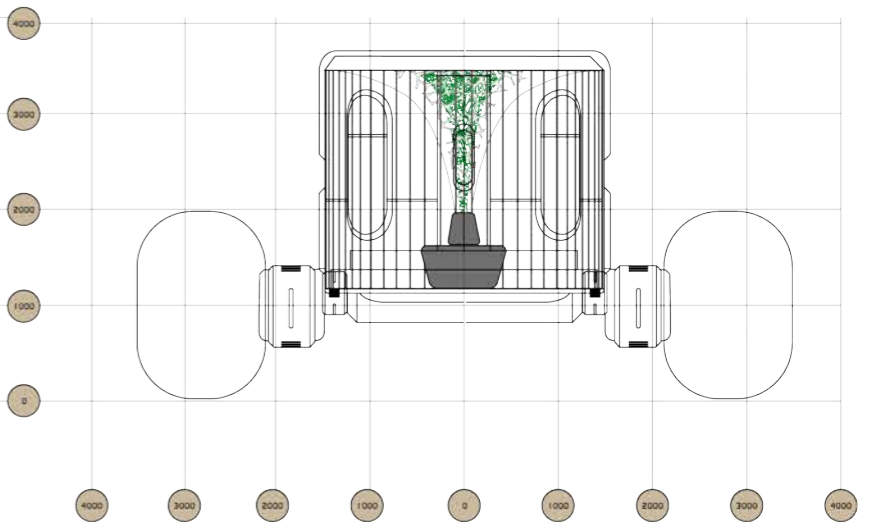
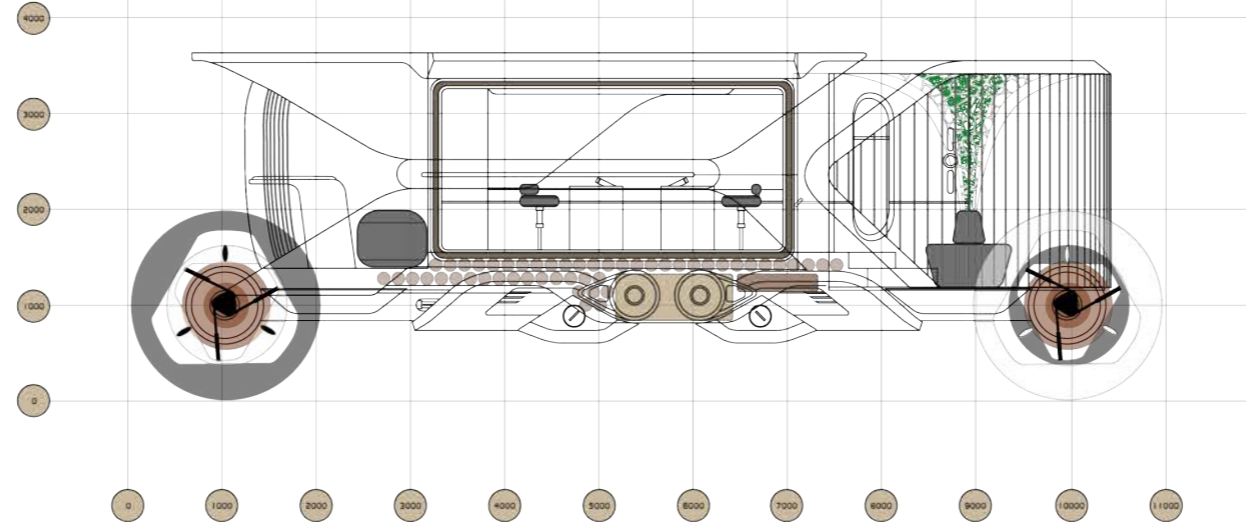
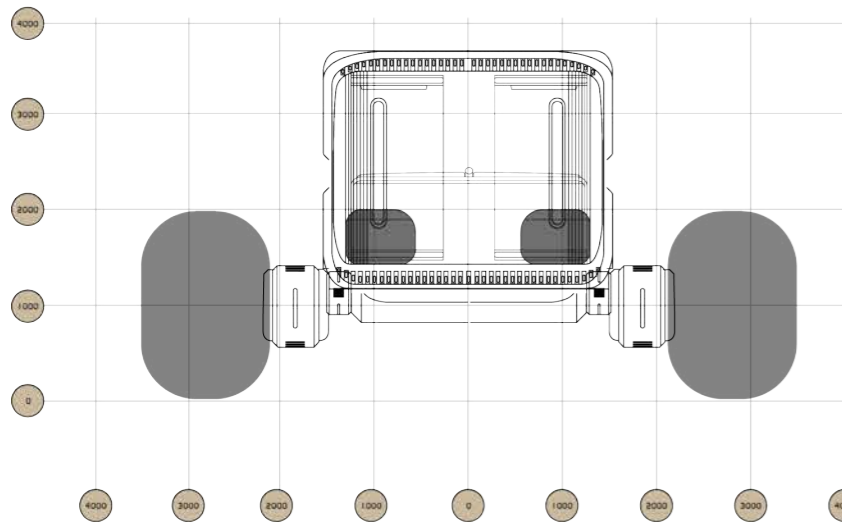
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-  battery
-  water tank
-  oxygen tanks
-  wheel motor
-  seating
-  module core
-  outlines
-  door armature

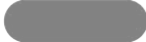




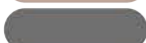





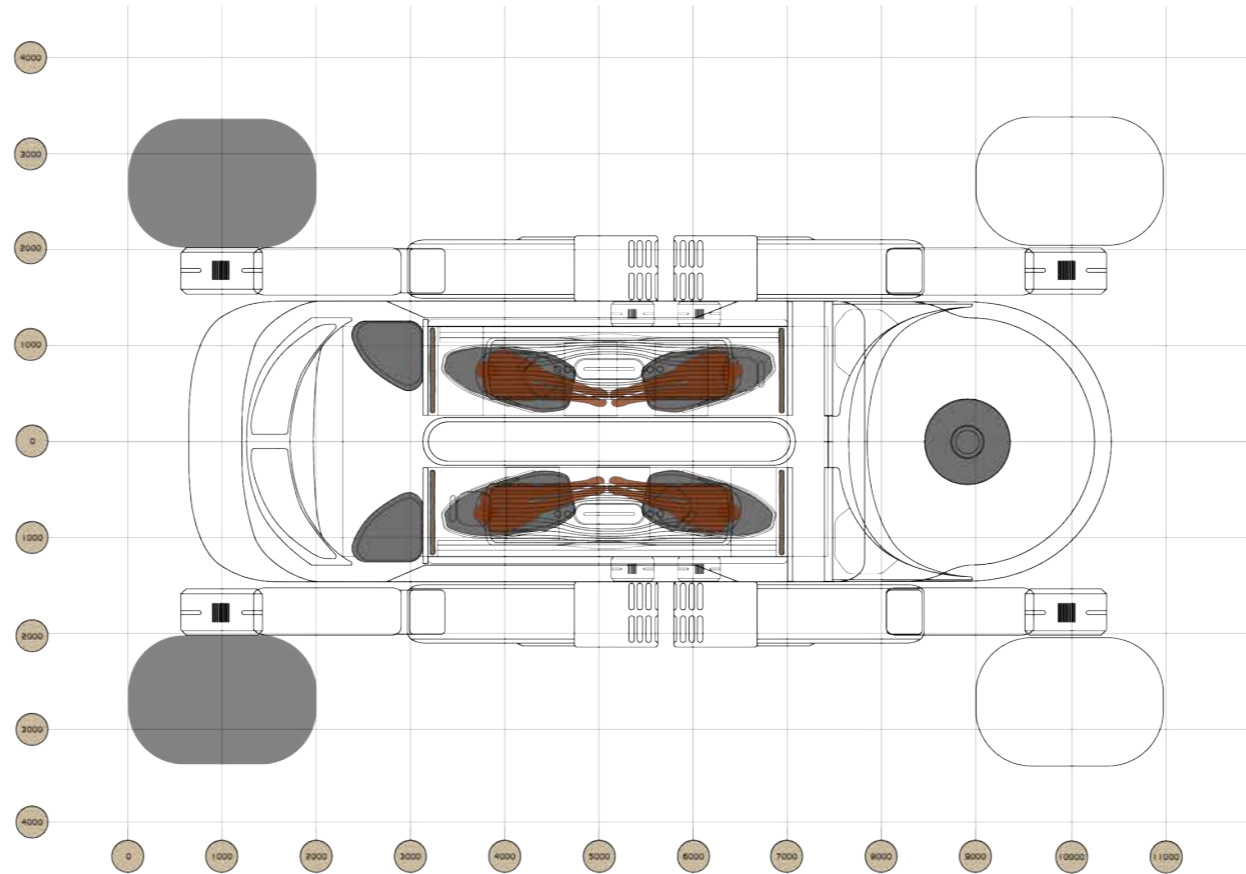
Package Drawing 3

This layer shows the work module as well as where the battery, oxygen tanks and water tank are located



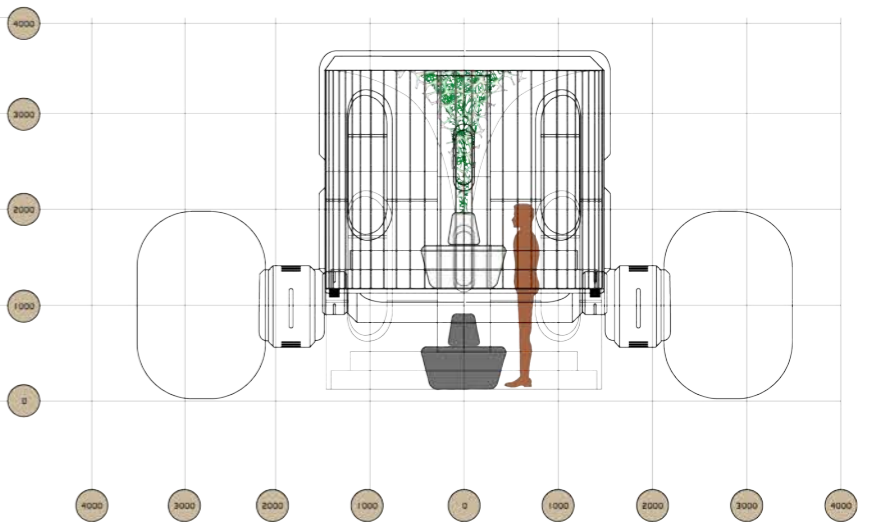
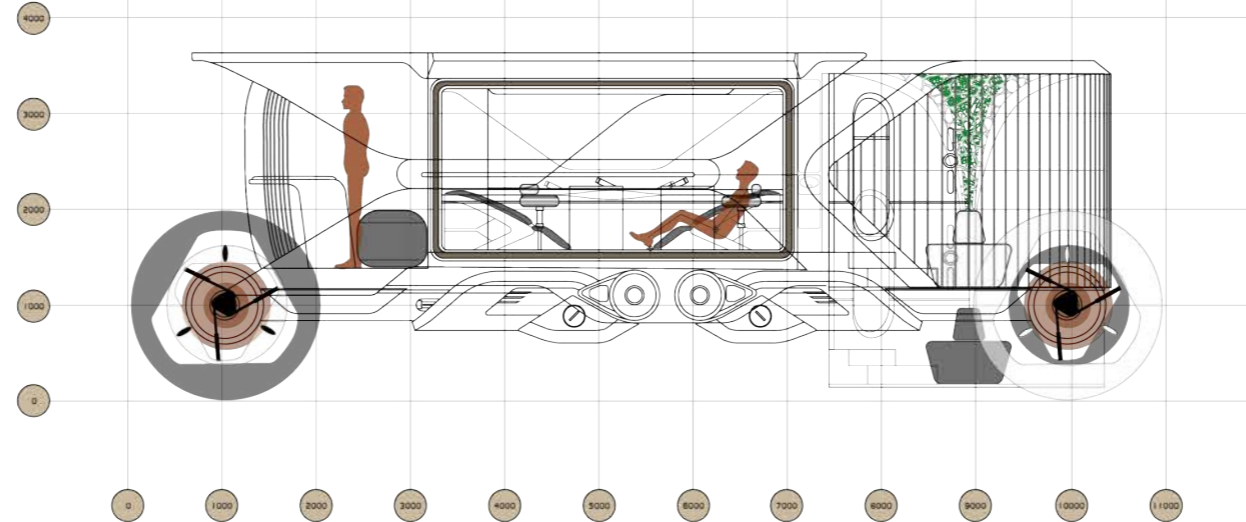
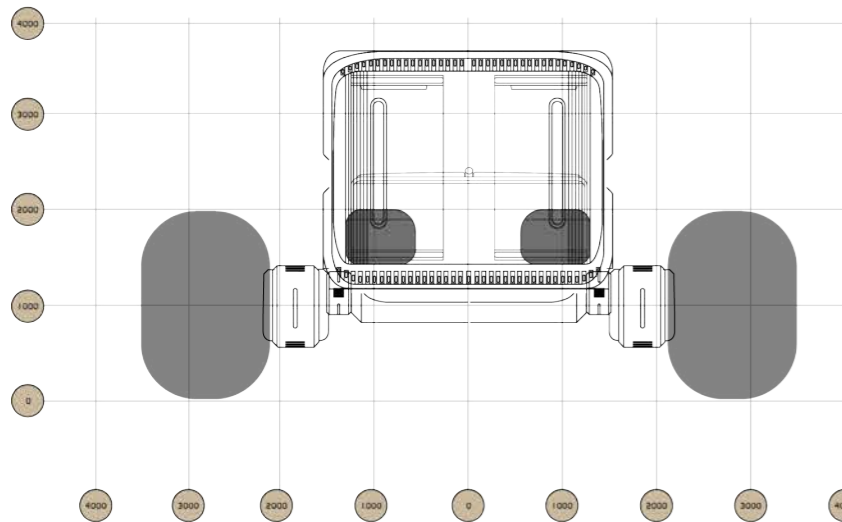
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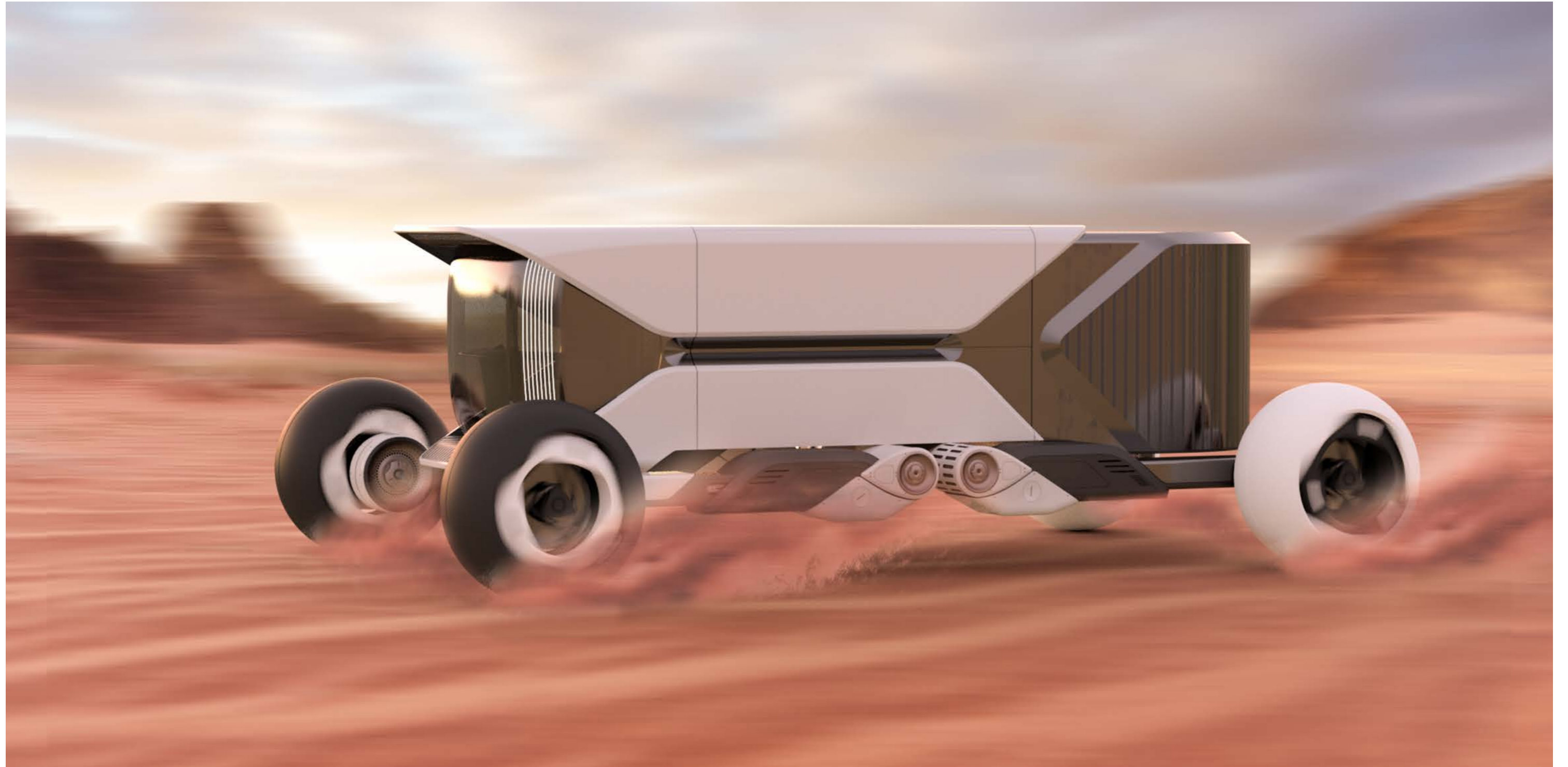
-  front wheel
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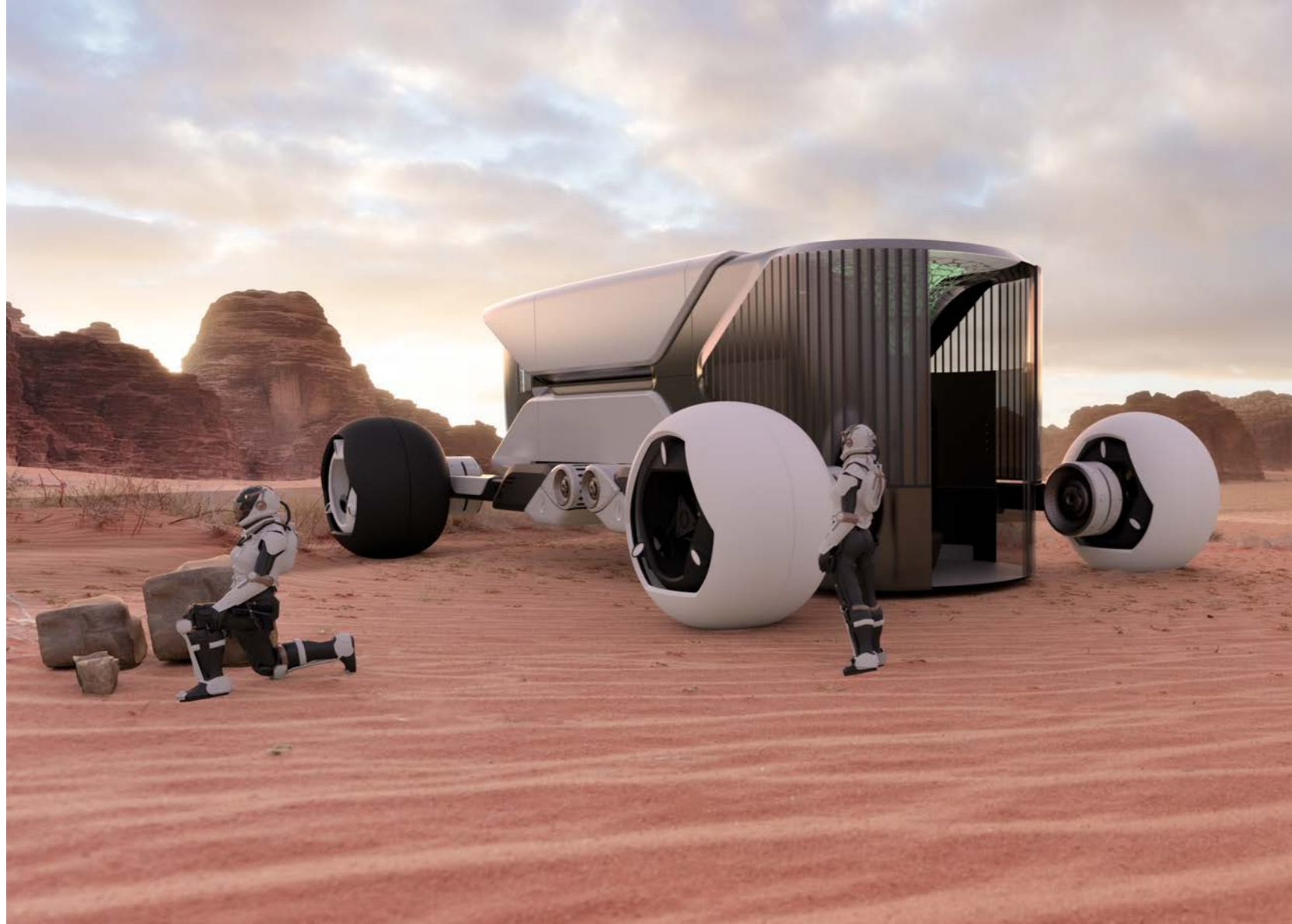


Package Drawing 4

The final layer of this drawing shows the air lock lift system in use and how it can make ingress and egress easy for the user. Also this shows the double seat module that would often be paired with the previous work module



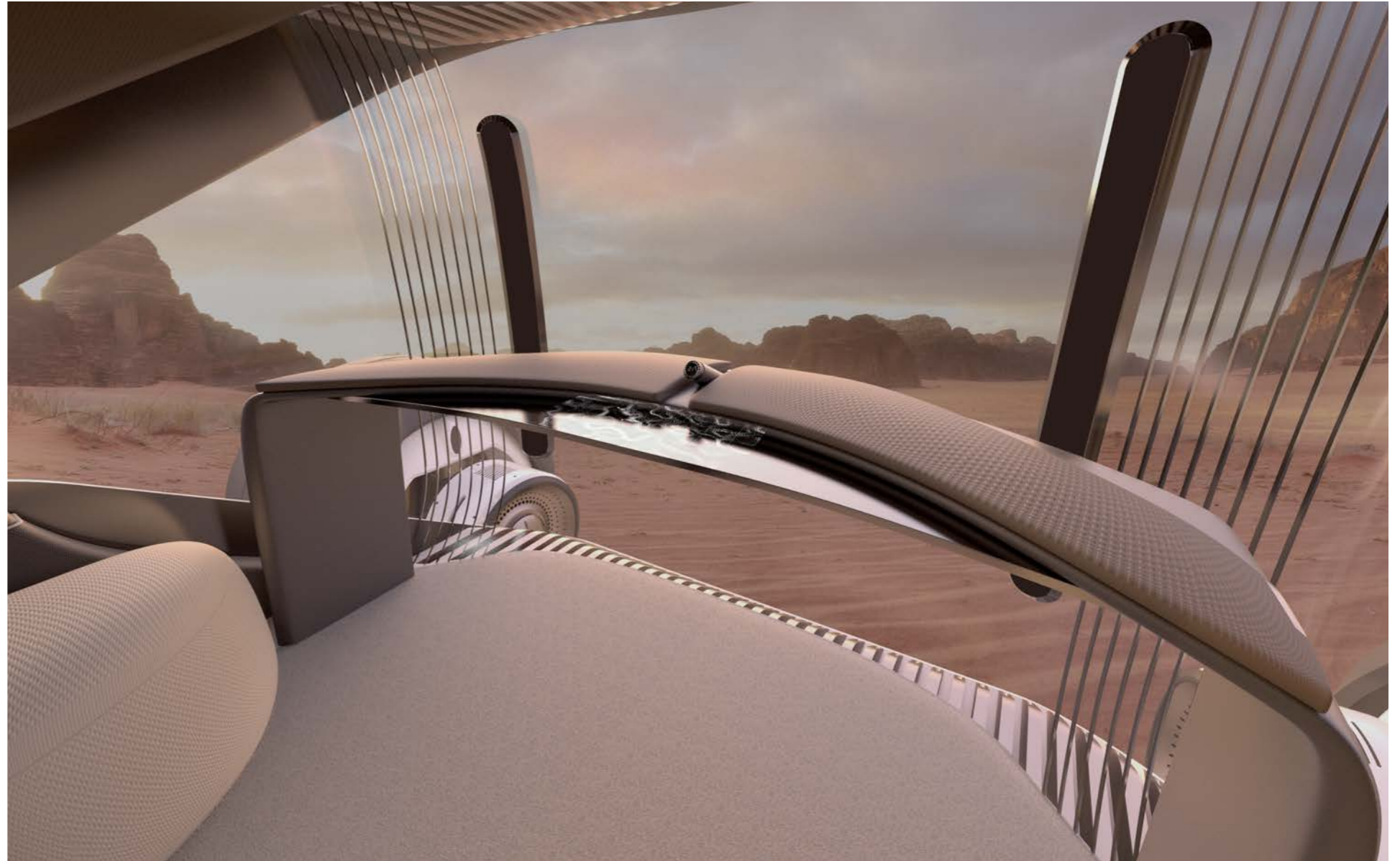




Usage scenario

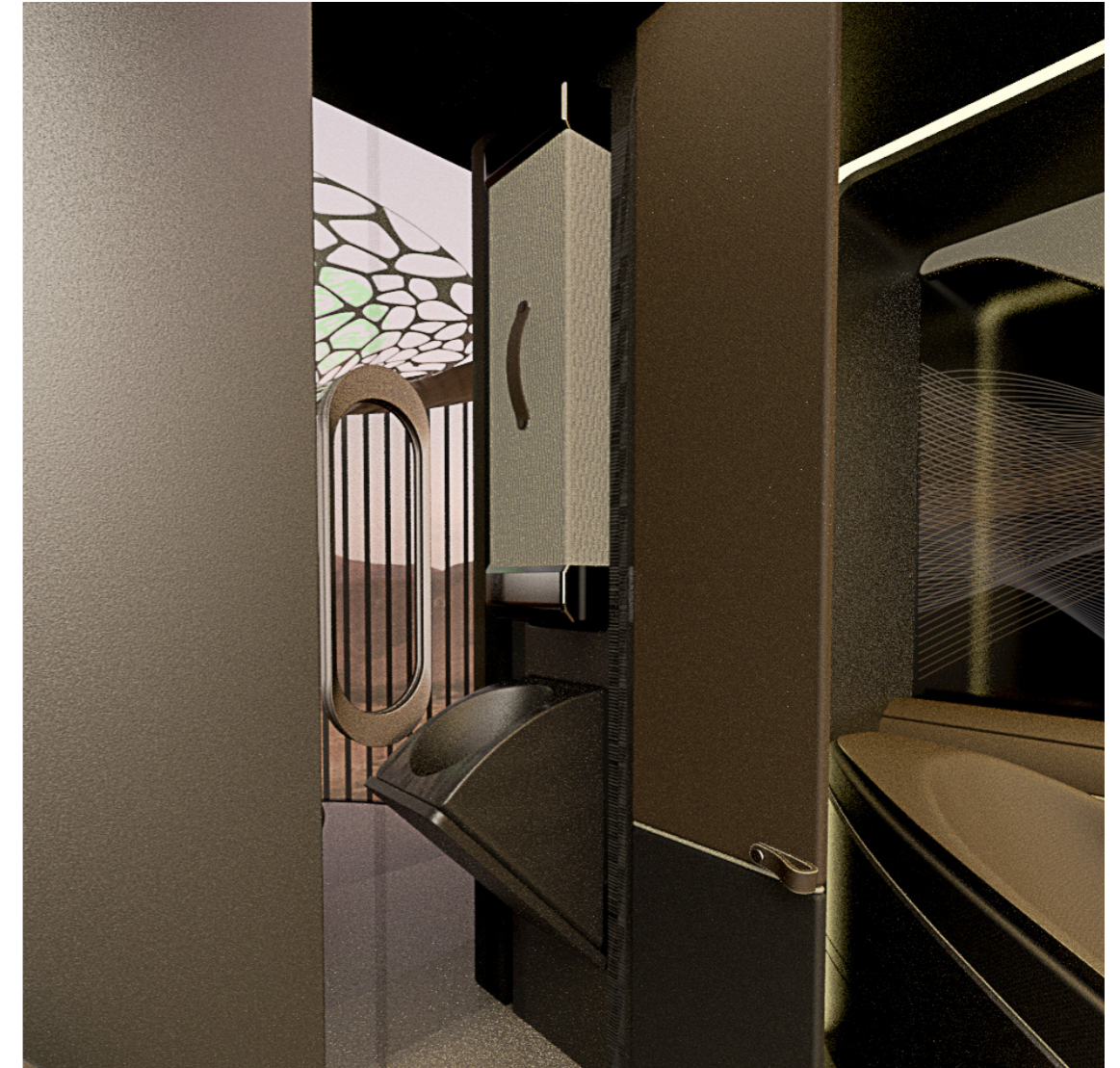
The vehicle is able to dock to HUB structures built in common sample sites. This allows the users to roam more comfortably and socialise in a larger community than just their vehicle whilst out on expeditions.





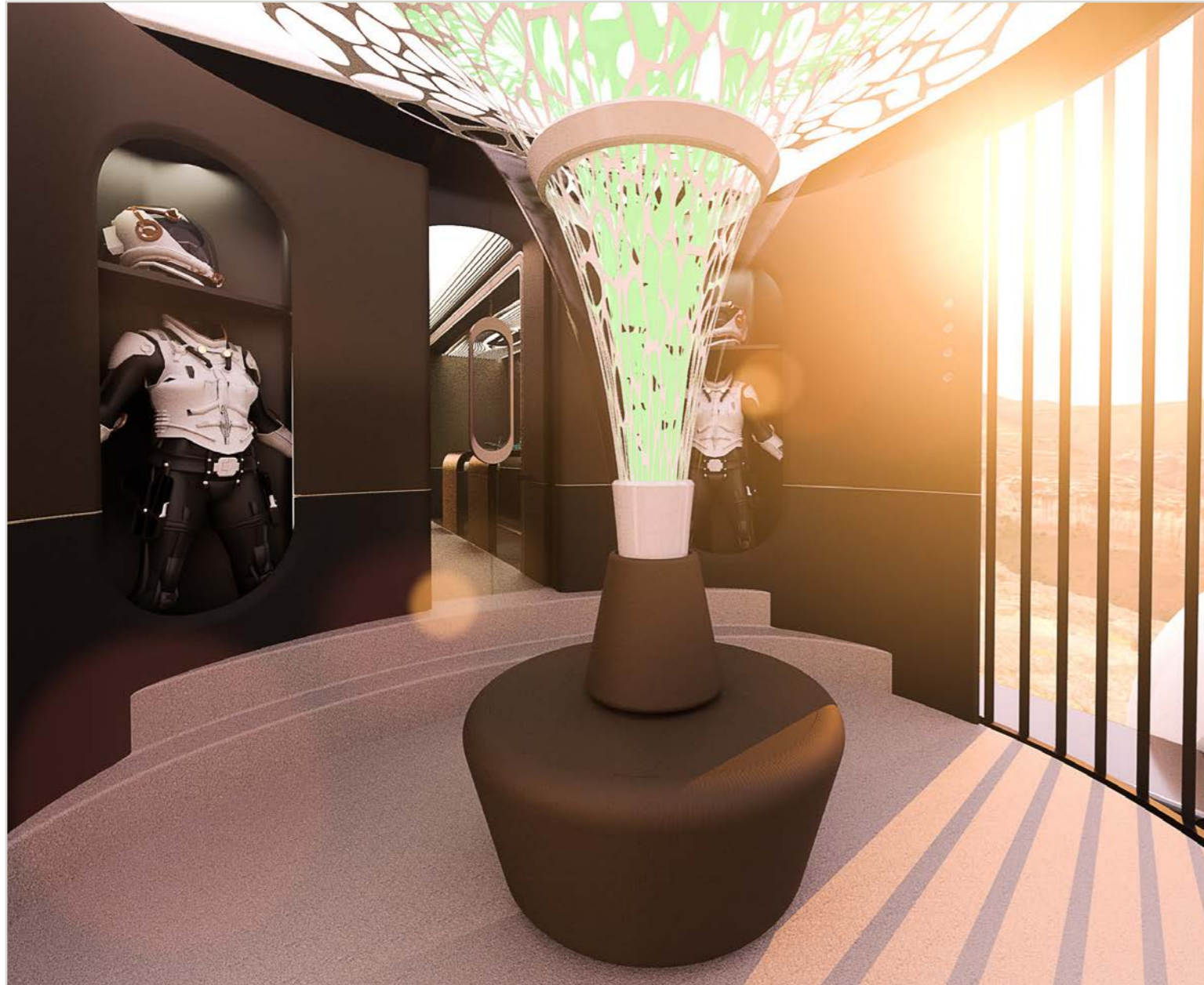
Front Cabin

The forward most area is an open control area housing only two small seats and a large instrument panel. Here the user will control the climate for the whole vehicle rather than localised climates as well as destinations, communication and environmental info such as storm warnings.



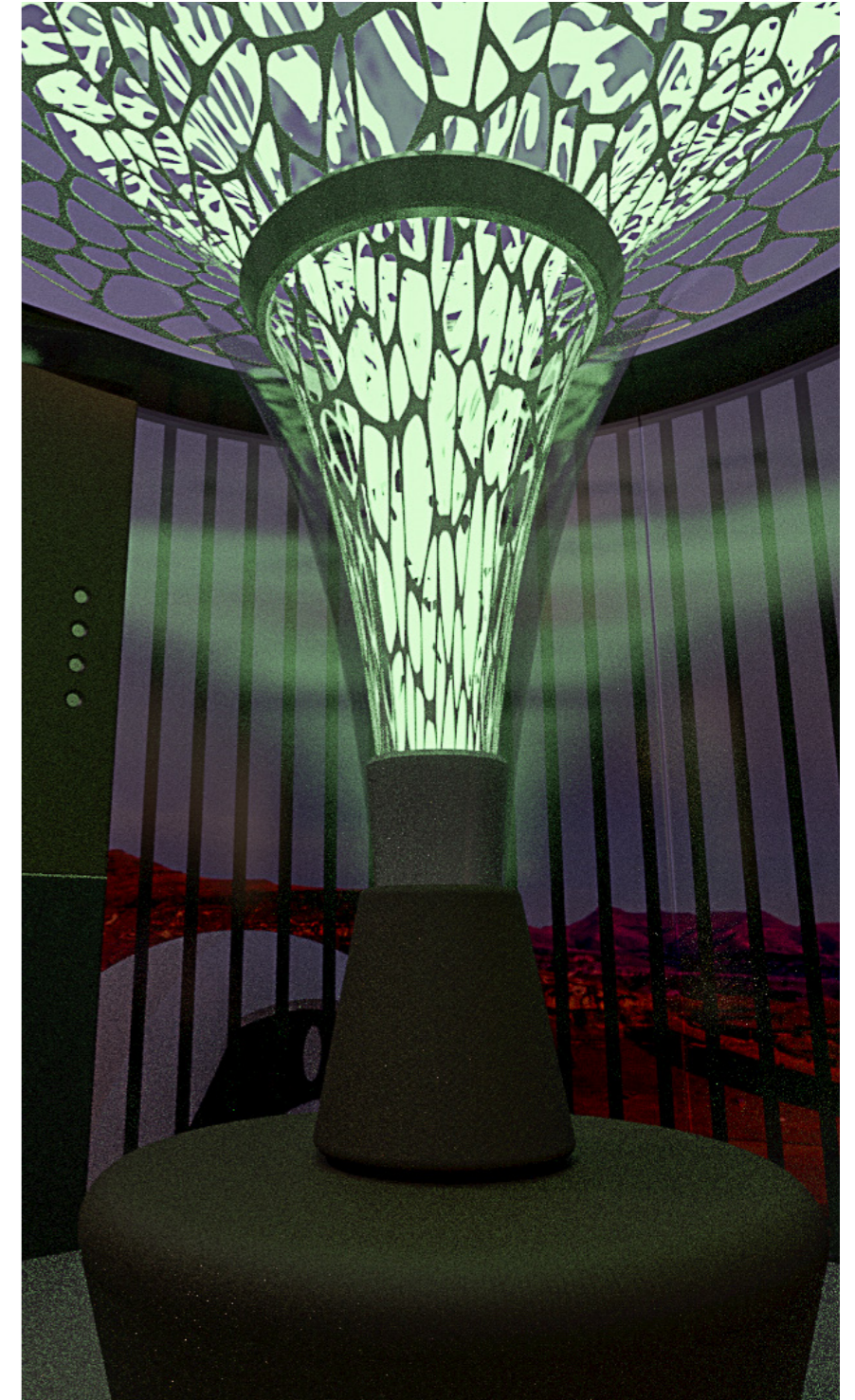
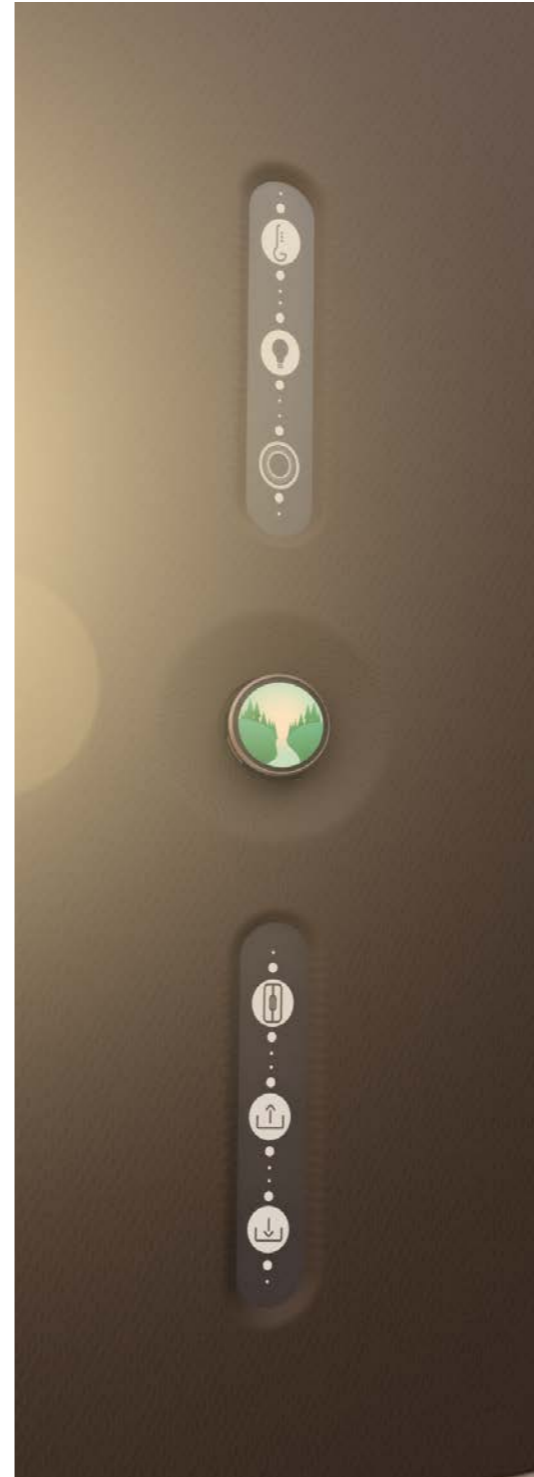
Middle Cabin

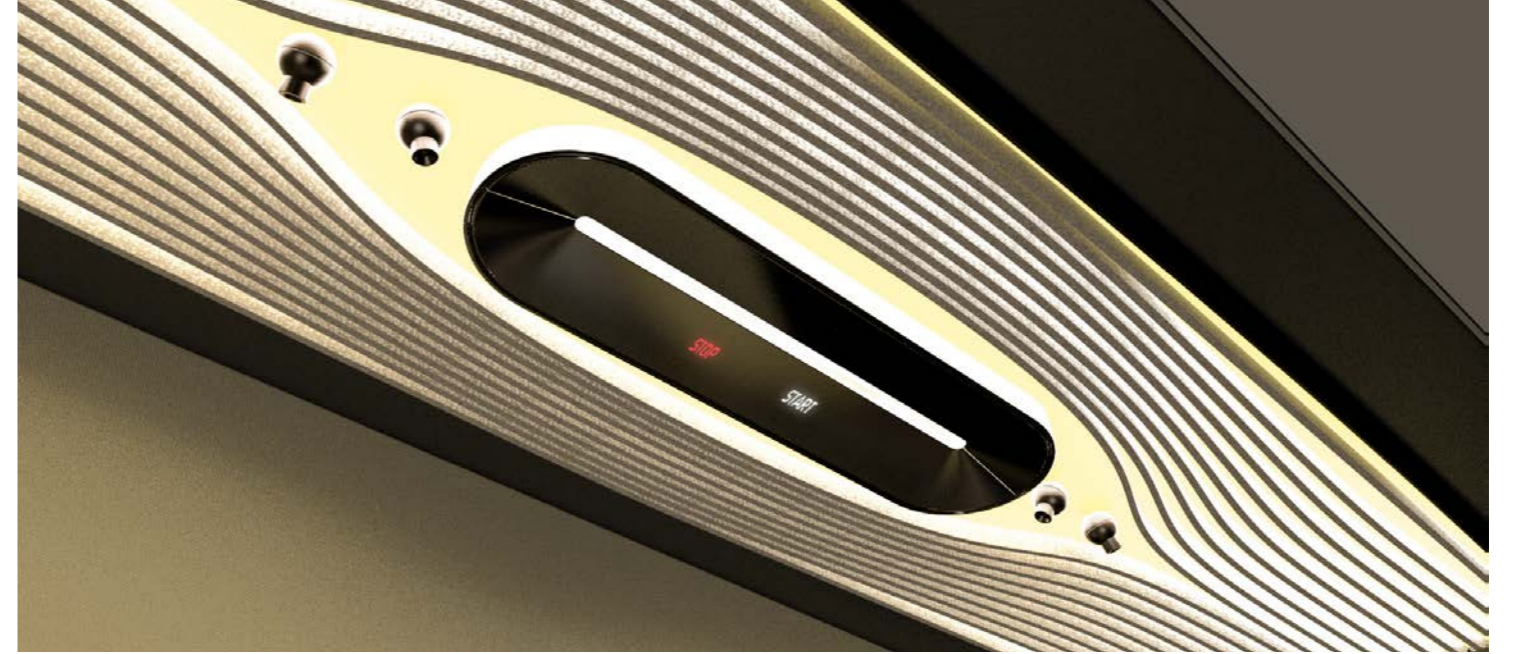
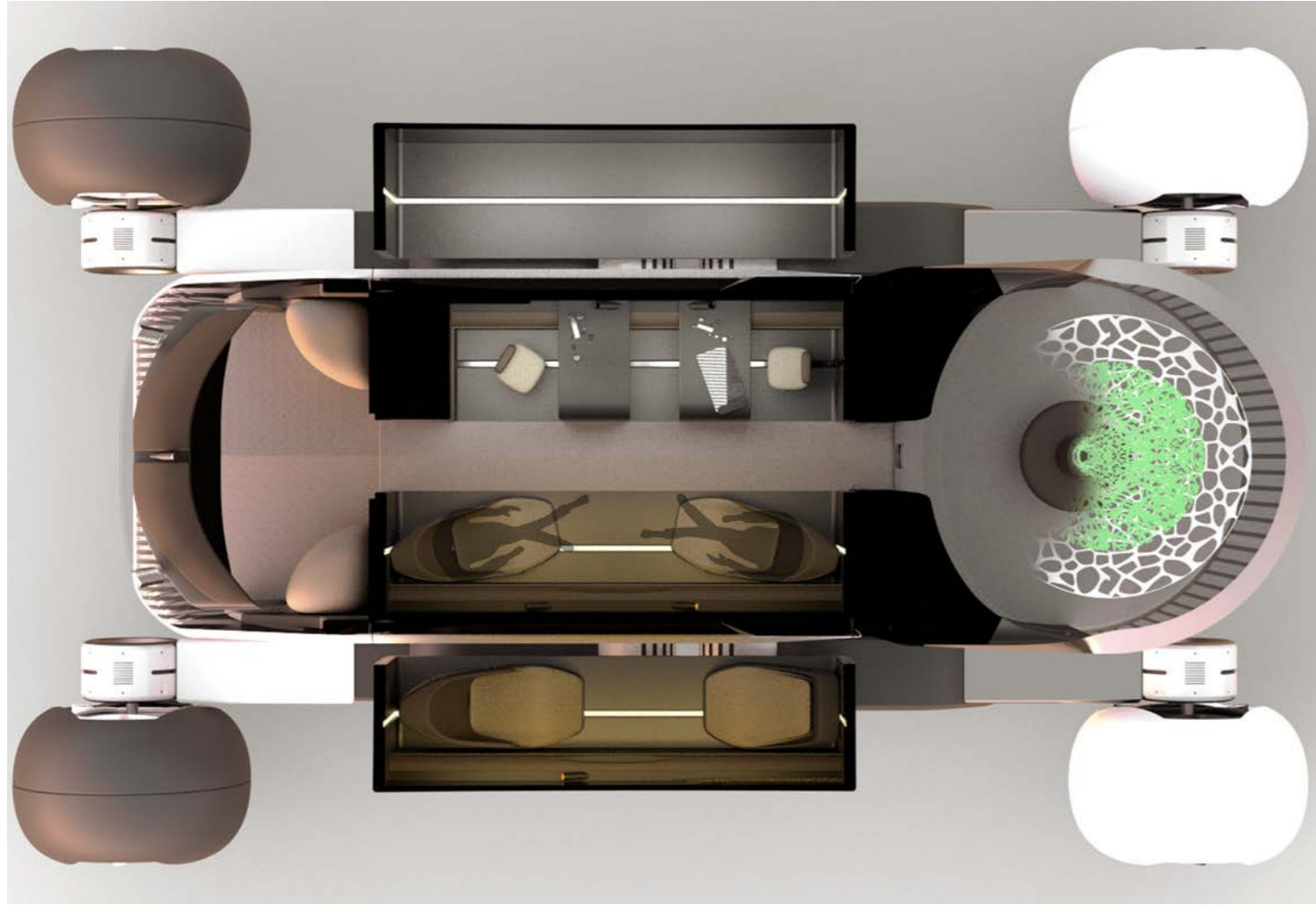
This area houses a galley either side as well as two module bays. These bays can be filled with whichever two modules will suit your mission the best. The galley features a Lav, custom luggage, water amenities and storage.



Air Lock

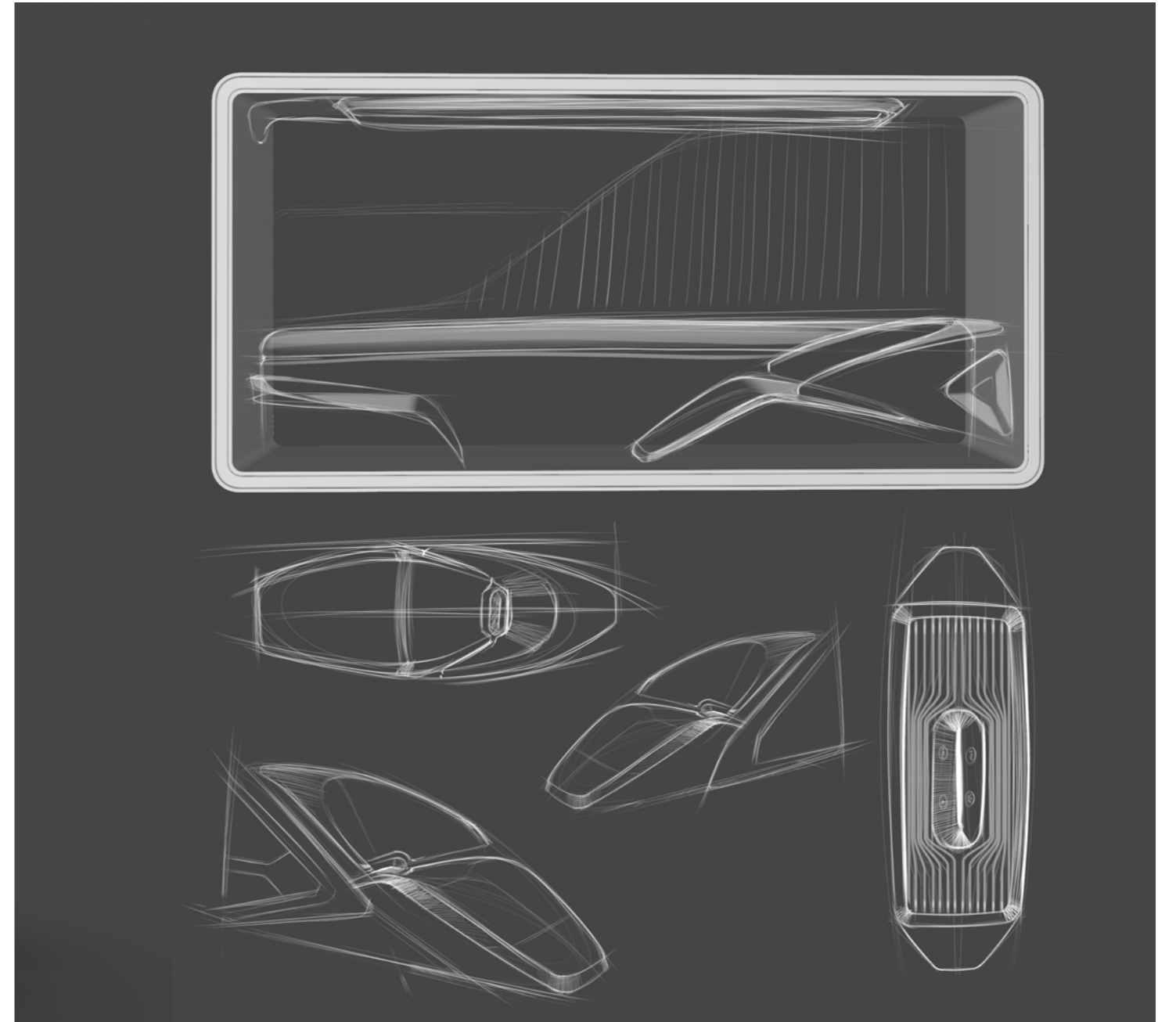
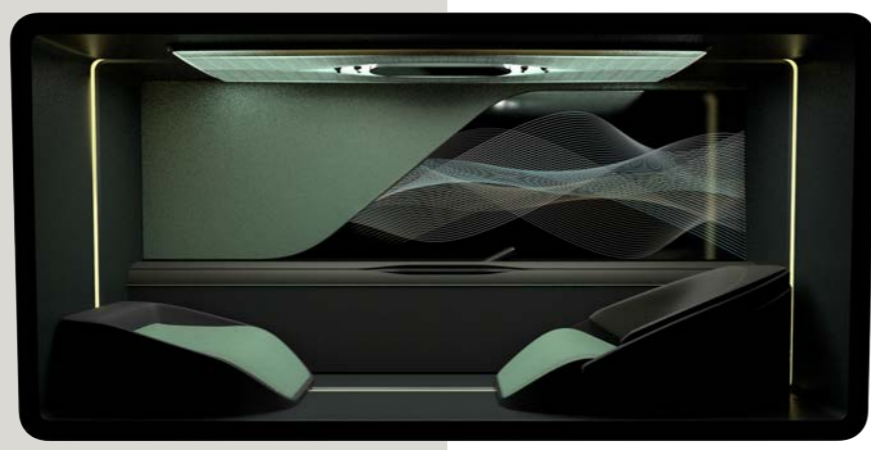
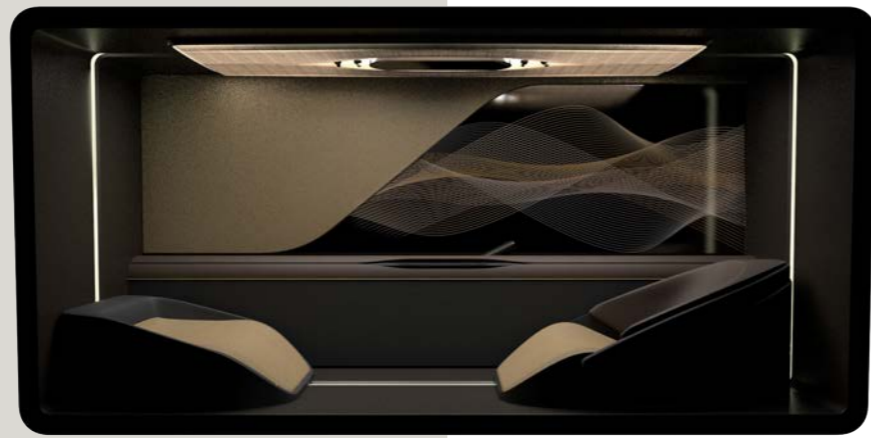
The air lock features a lift system that makes ingress and egress easy for users as well as providing more head room. This area is used storage and changing of space suits in a controlled area. The central lattice light feature recreates the organic structures we recognise from Earth.





Interior environments

To give the user a feeling of comfort and an escape from the hostility of Mars, SOL allows the user to choose from or create environment presets based on light, sound, touch and smell. The light fixture can emit any hue and gaspers in the unit disperse hot and cold air as well as scented mist.



Modules

The interior can be configured with any two modules depending on the task at hand. These modules can be set to portray different environments within the interior.

HMI

HMI toggles are located around the cab in each module, the front section and in the air lock. These will control the environment presets as well as more conventional climate control.

Toggles can be operated manually or, if the user cannot reach, they can be operated using gesture control and tracking.





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Thank you