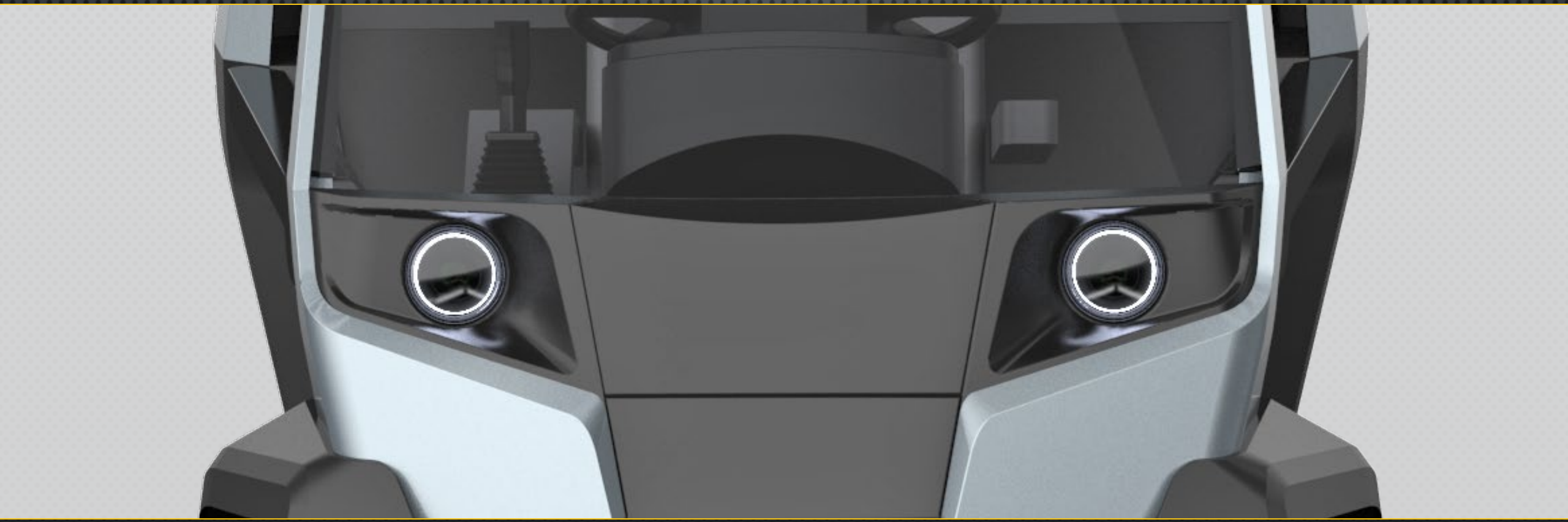


PRESENTATION

Development of a Multitruck with equipment carriers

AGENDA

1. TASK AND GOAL
2. REQUIREMENTS
3. RESEARCH
4. SOLUTION APPROACHES
5. DESIGN REQUIREMENTS
6. TECHNICAL REQUIREMENTS
7. FIRST DESIGNS
8. DRIVE AND ENERGY
9. FIRST IMPLEMENTATIONS

AGENDA

1 TASK & GOLAS

TASK & GOAL

- Development of a hybrid vehicle with equipment carriers
- Size, color and design = YOUR COMPANY
- Mobility despite empty batteries = HYBRID
- A range of at least 4 hours
- Manufacturing costs of less than € 10,000 (80.000RMB)

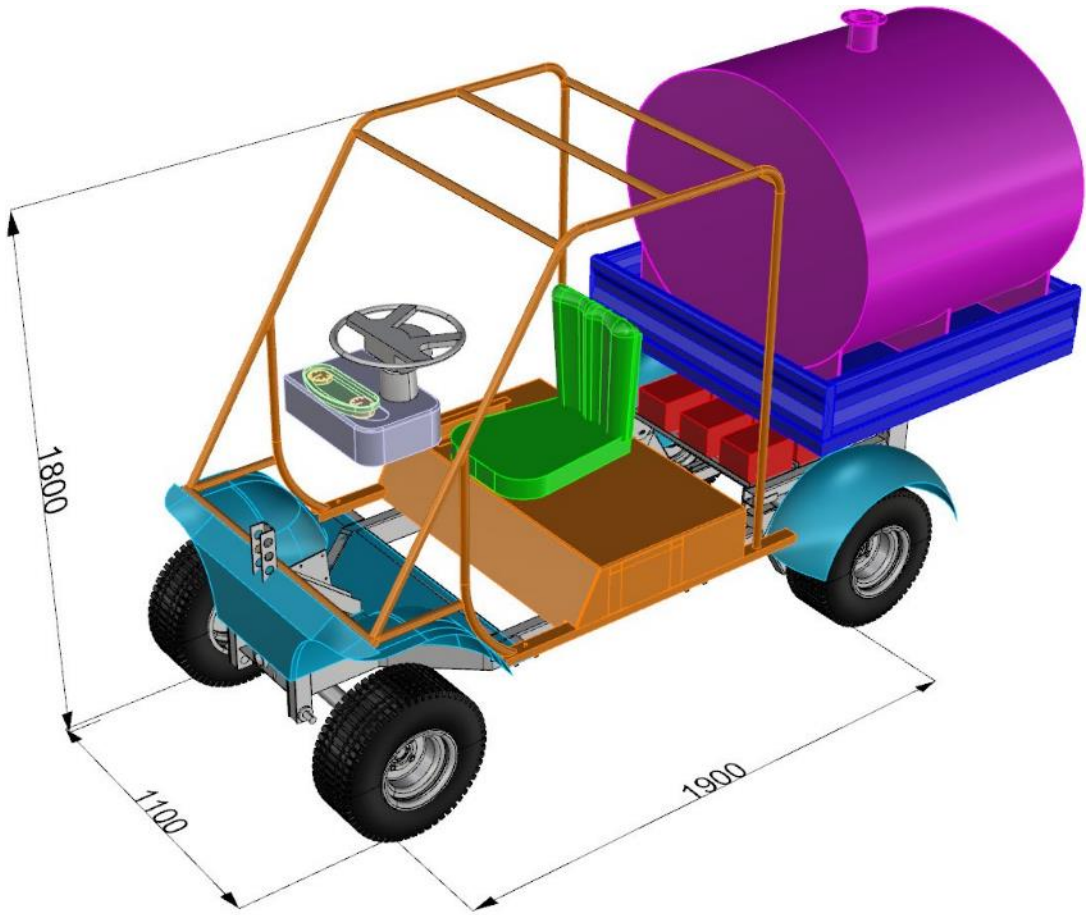
TASK & GOAL

Requirements	Aim
Size	Wheelbase (ref. V-axis / H-axis) 190 cm 270 cm (total length) 114 cm (width) 200 cm (height)
Design	Your company
Colour	gray / black / turquoise (?)
Modell-Types	4
Energy drive	Hybrid
Manufacturing costs	**>10.000 € (80.000RMB)**

AGENDA

2 REQUIREMENTS

REQUIREMENTS



REQUIREMENTS

- Target groups:
- Municipalities (supervision of schools, smaller shipyards, etc.)
- Public institutions, e.g. Universities, hospitals, etc.
- Construction companies, e.g. Office space, industrial facilities, etc.
- Recreation areas, e.g. Hotels, promenades, lake landscapes, parks or sports areas
- Applications in all seasons, that is:
- Summer: cutting, trimming, watering (with tank on trailer), etc.
- Winter: Snow clearing with a plow, tiller or shield, salt and gravel spreader, etc.
- Cleaning: collecting leaves, sweeping, etc.
- Other areas of application:
- Transportation, power generator (for power tools), lighting, etc.

REQUIREMENTS

- Additional requirements:
- Low noise for the driver and the environment
- Low vibrations on the driver's level
- Easy handling
- Automatic tool change
- Low maintenance, simple operation, no complicated technology (no hydraulics)
- Compact dimensions for placement inside buildings
- Low curb weight
- Precise and sensitive control
- continuous and “jerk-free” movements

AGENDA

3 RESEARCH

RESEARCH // *MULTIFUNCTION-CARS*

John Deere Gator

DIVACO

Multicar Citymaster

DIVACO Alke ATX

Twizy Cargo

DIVACO Alke XT

Multicar Tremo

DIVACO D-Line

KÄRCHER MIC

RESEARCH // *INTERIEUR*

BOBCAT Kabine

Multifunction steering column Claas

STILL Driver cabin

Armrest with integrated joystick

Climate-Panel

Compact-Cockpit Nuko

Cockpit Multicar Tremo

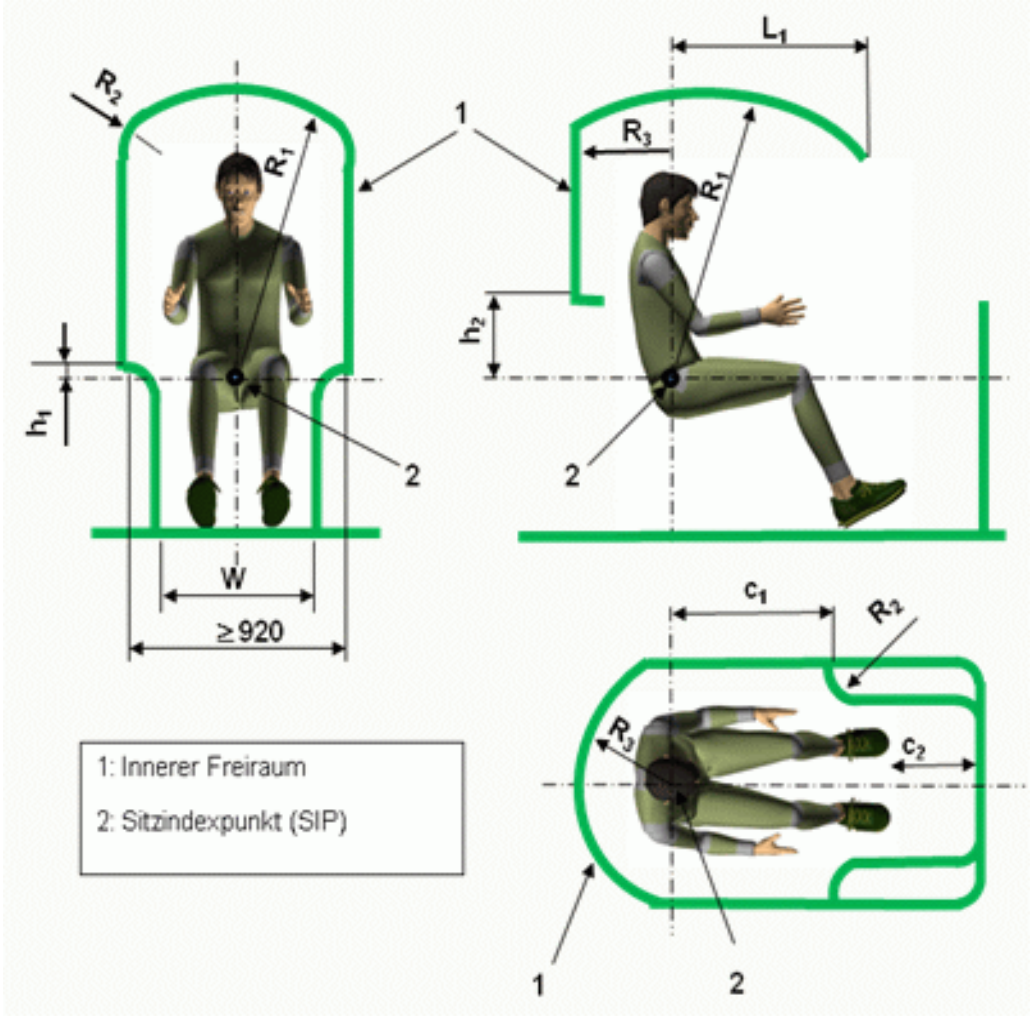
Compact-Cockpit Nuko

Multicar Citymaster

RESEARCH // *Ergonomics*

Body measurements of machine operators and minimum free space

DIN EN ISO 3411:2007



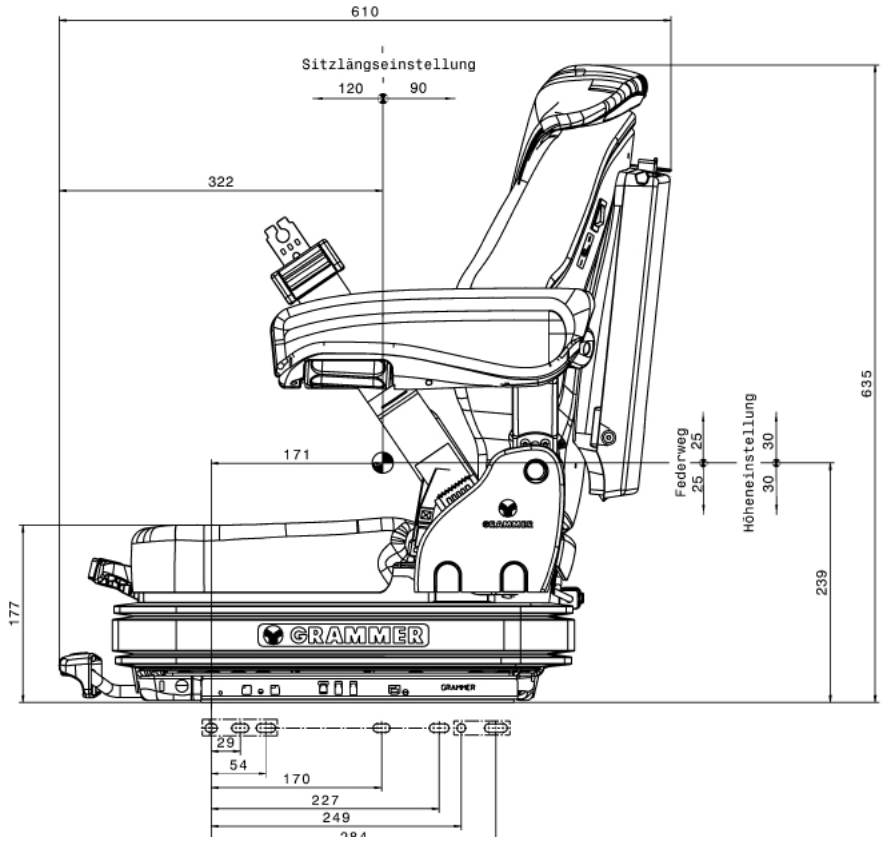
Source: according to DIN EN ISO 3411: 2007
Earth-moving machines - body measurements from
Machine operators and minimum clearance

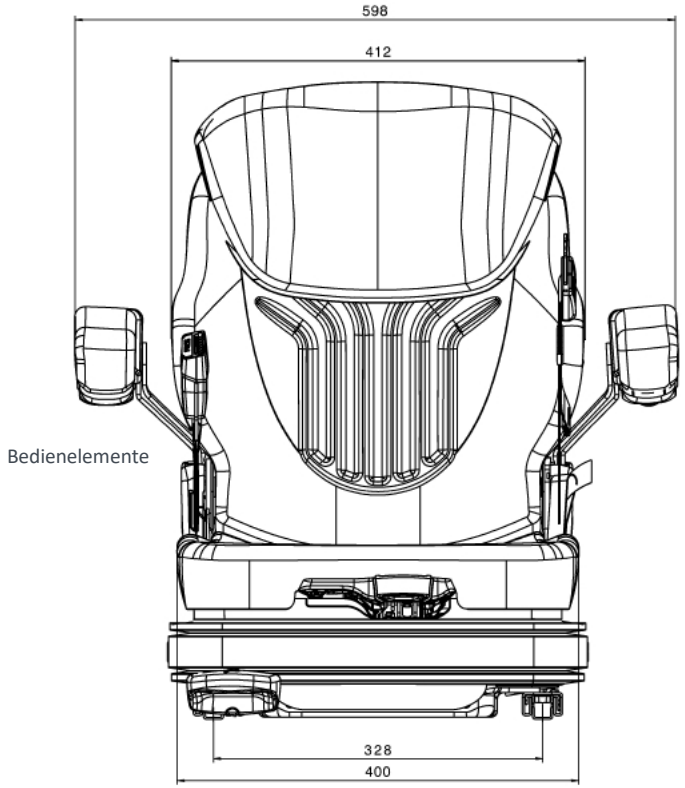
RESEARCH // *Ergonomics*

Space requirement seat

Exemplary:
Grammer Primo
Professional M

/ Universal
Compact seat
with lowest
more constructive
Air suspension





CONCLUSION: Due to the seat width of the main seat and the additional width of the side controls, the ergonomic requirements (DIN EN ISO 3411: 2007) with a second seat next to each other (emergency seat) with a cabin width of 110cm cannot be met.

RESEARCH // *Ergonomics*

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Compact seat
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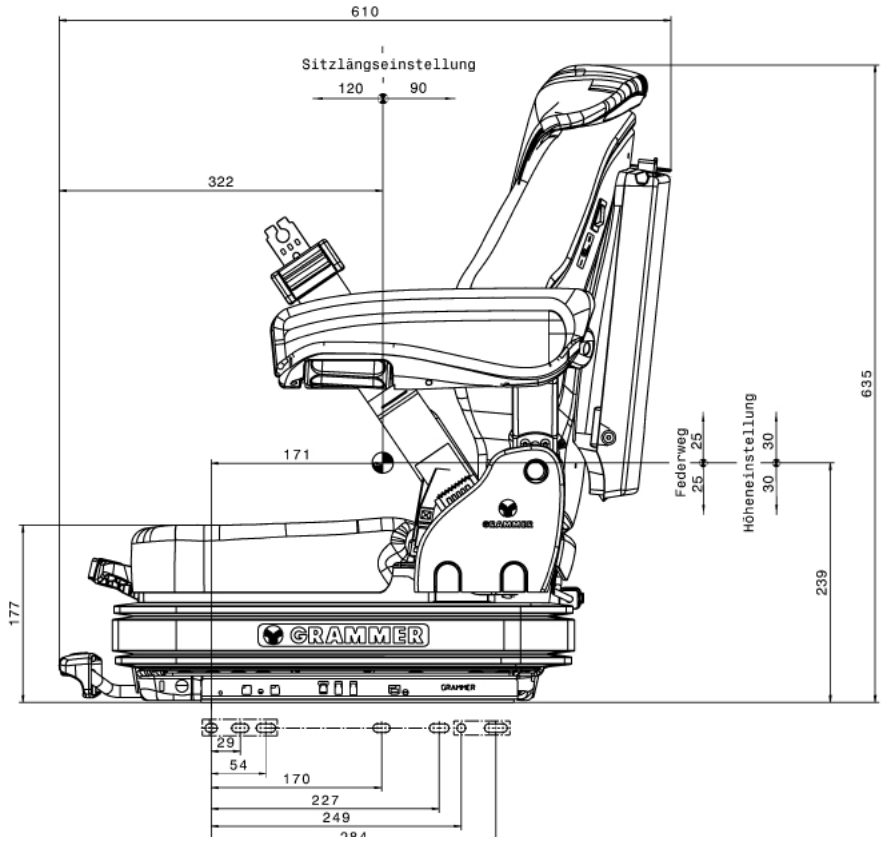

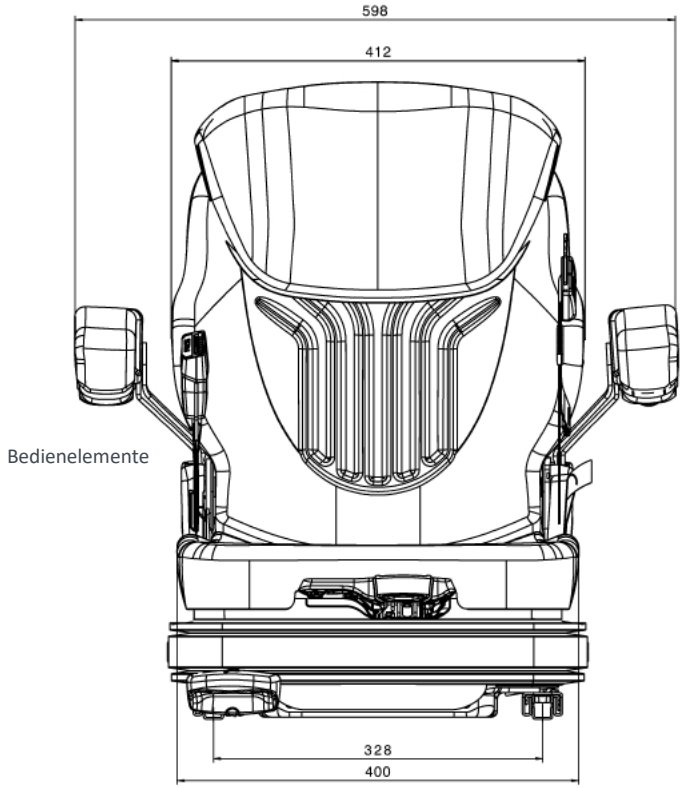

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AGENDA

4 SOLUTION APPROACHES

LÖSUNGSANSÄTZE

MULTITRUCK BASE

Suggestions for improvement of current machines:

Electric drive for easier handling:

more efficiency

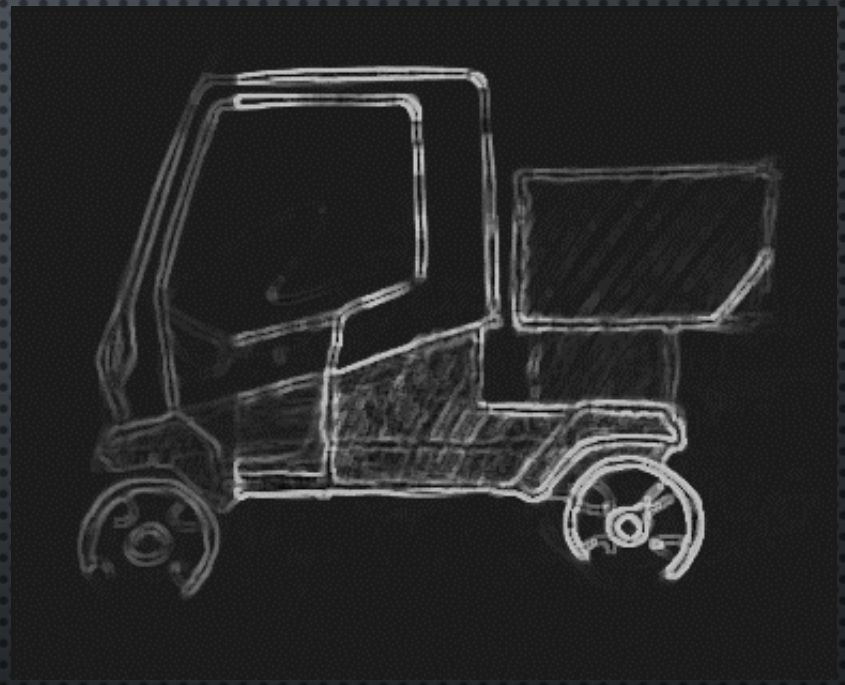
less noise etc.

Connection for equipment carrier

Better operator convenience:

easy handling

more convenience



AGENDA

5 DESIGN-APPROACH

DESIGN-APPROACH

What should the new e-mobile look like?

- Model type
- Color (gray, black)
- Functionality (safe, powerful, agile, comfortable, reliable)
- Connection of optics and technology

What is a good design?

- clear design underlines the concept
- Concept: daily use, endurance, power and security
- compact design = stability, whether off-road or on the road

DESIGN-ANFORDERUNG

DESIGN-APPROACH

What should you pay particular attention to when designing?

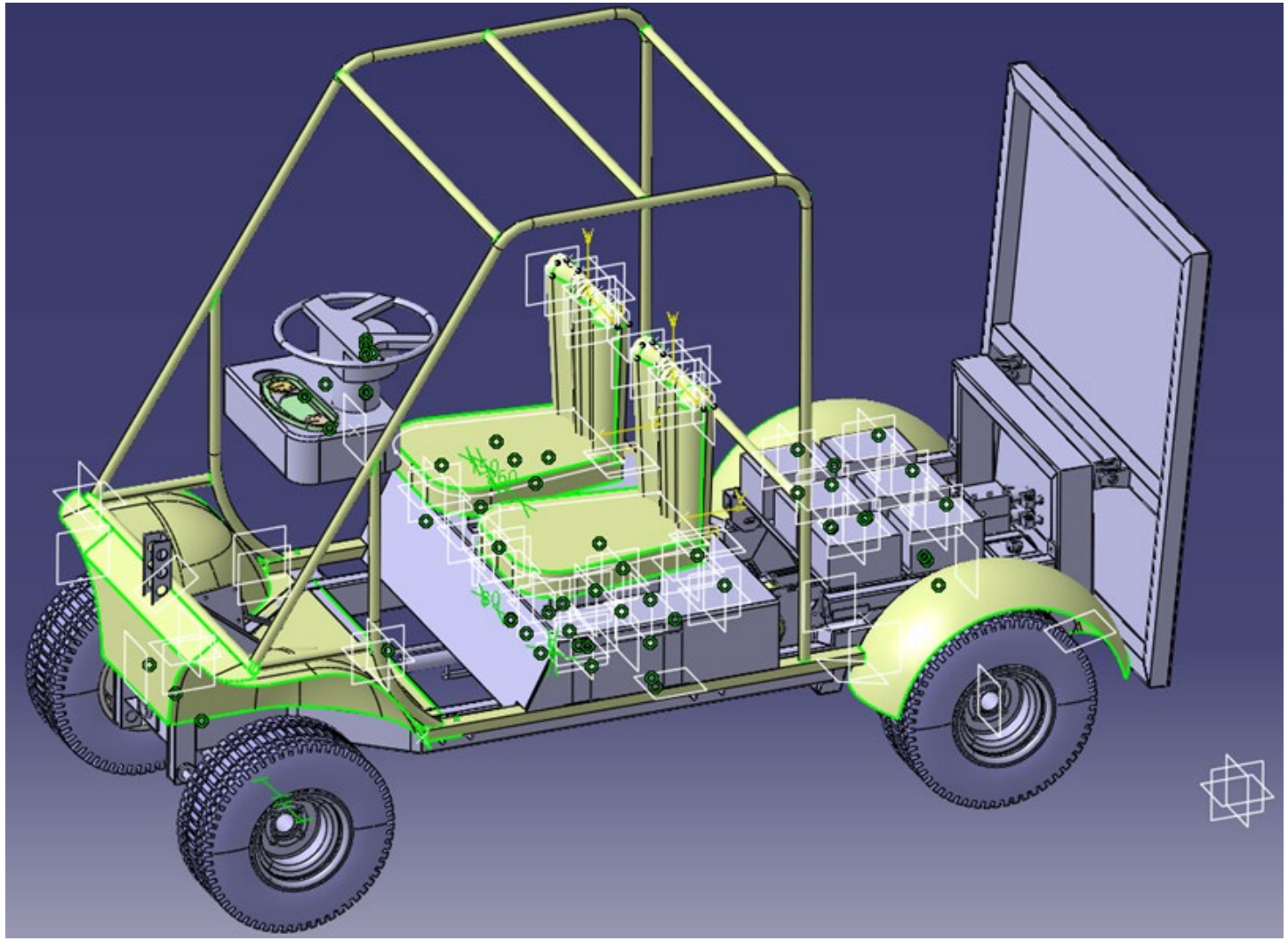
- Details (concise features such as landing gear, lights, etc.)
- Brand recognition
- Flowing surface transitions and dynamic lines
- optimal ergonomics and clarity in operation
- Logically structured elements placed around the driver

Other questions:

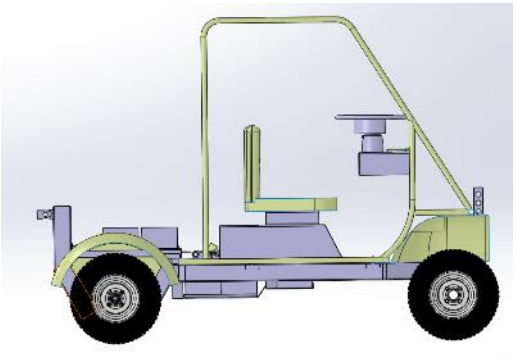
Build on existing designs on the market or dare to try something new?

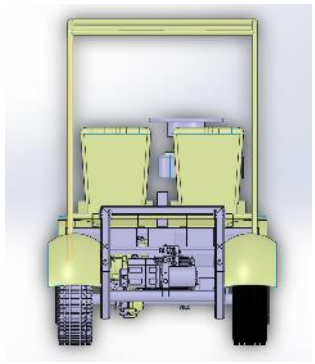
6 FIRST SKETCHES

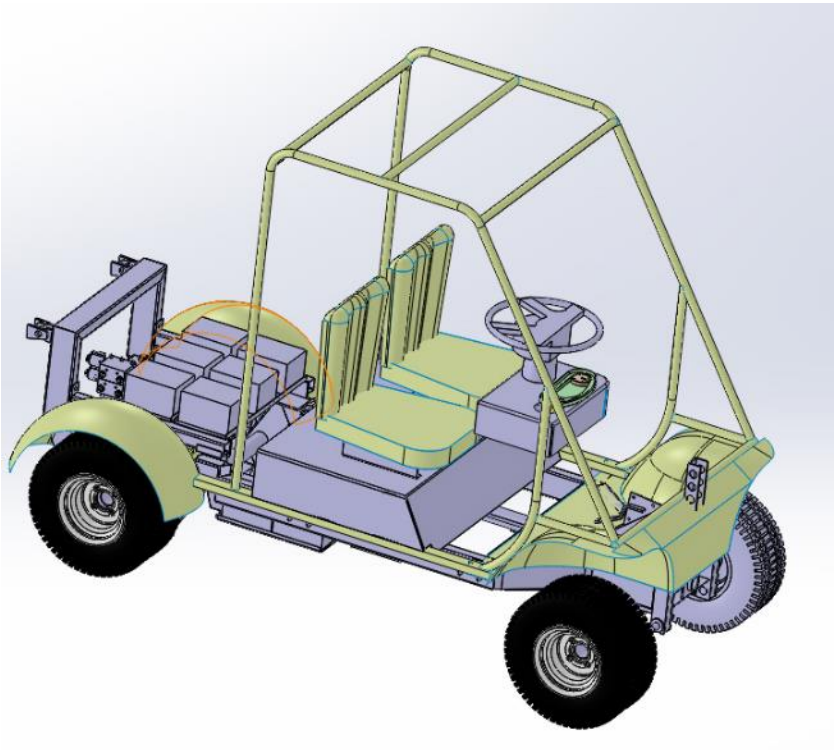
FIRST SKETCHES

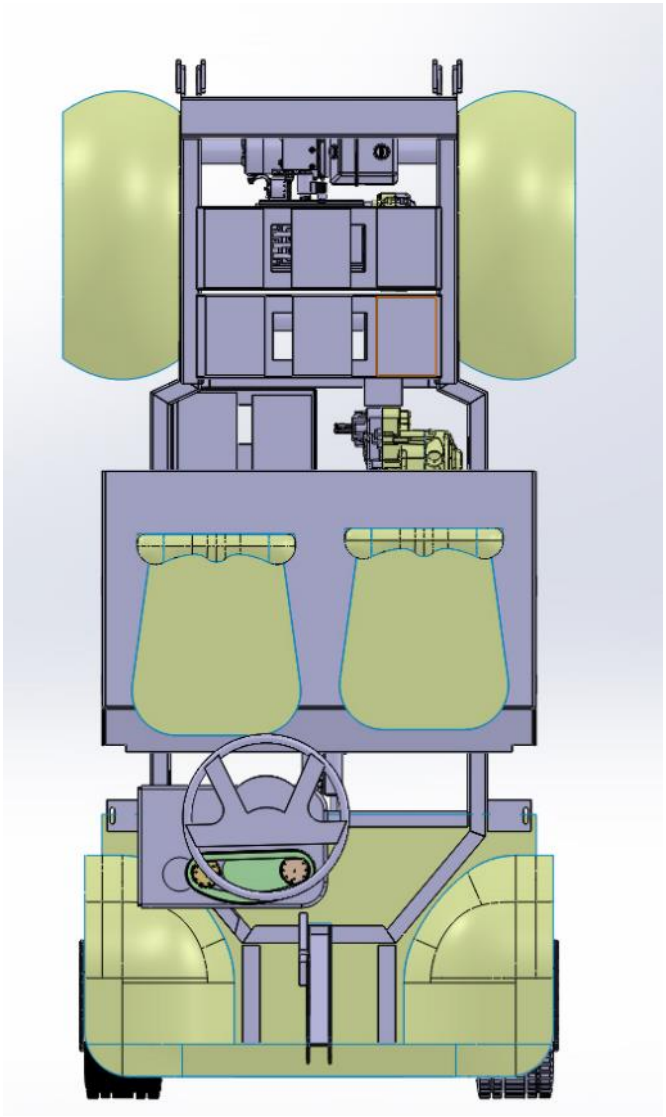


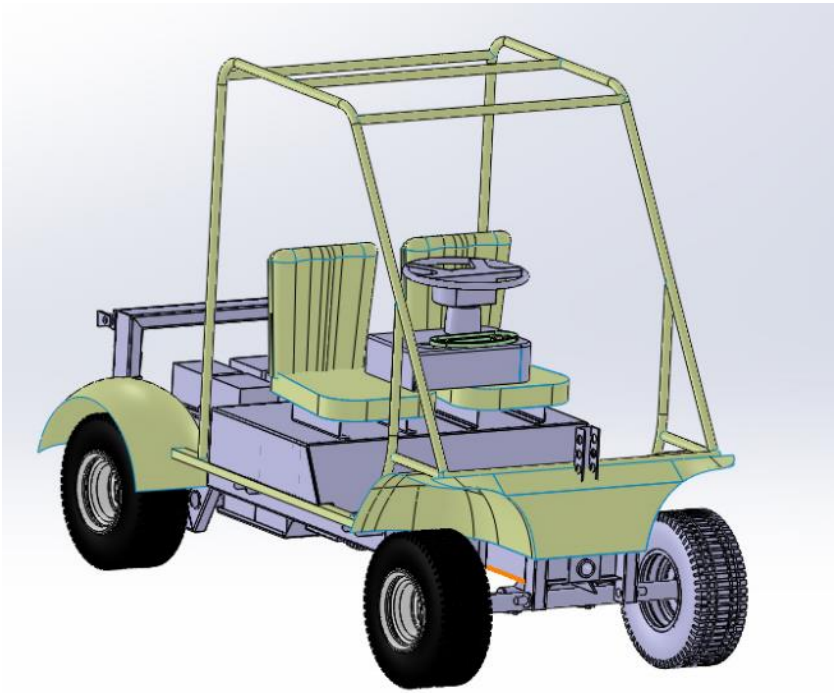
FIRST SKETCHES

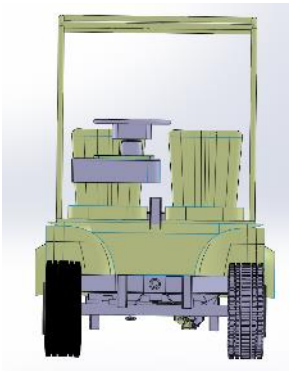


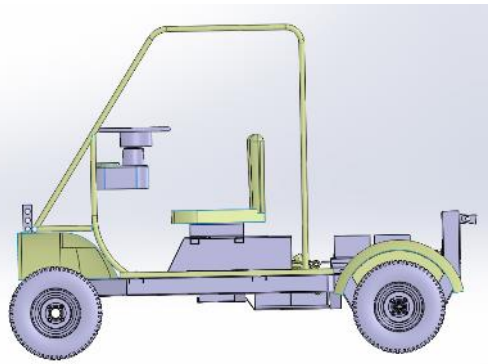












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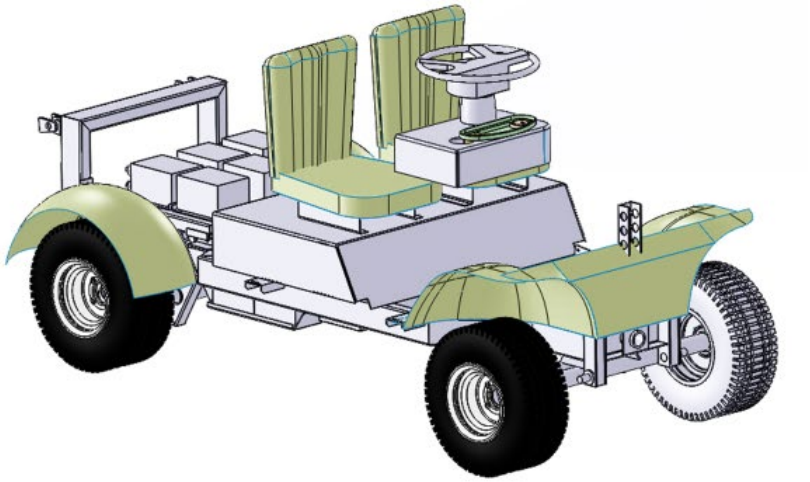

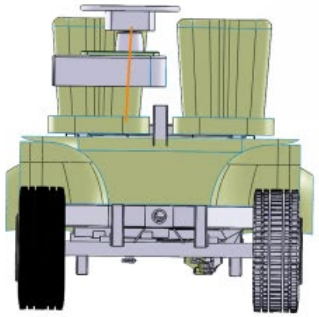

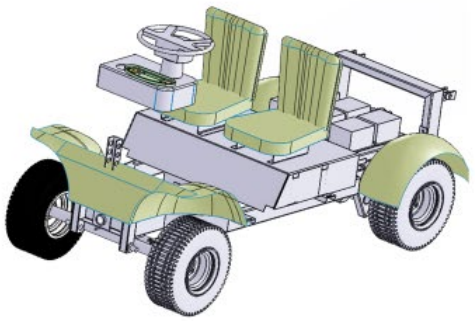

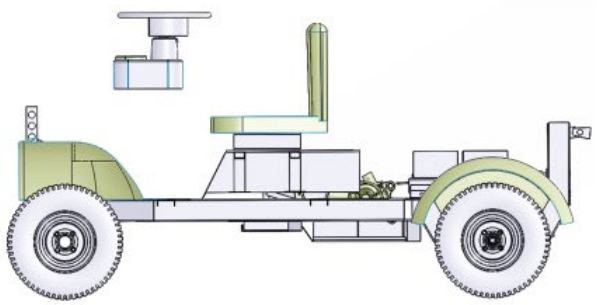

FIRST SKETCHES

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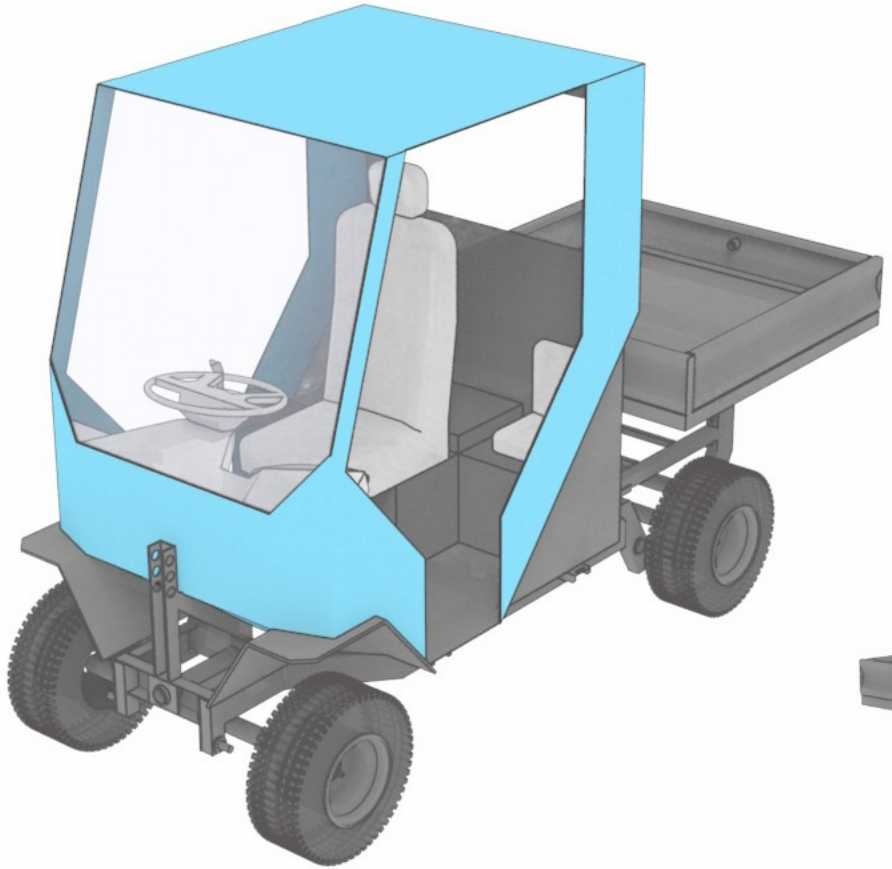
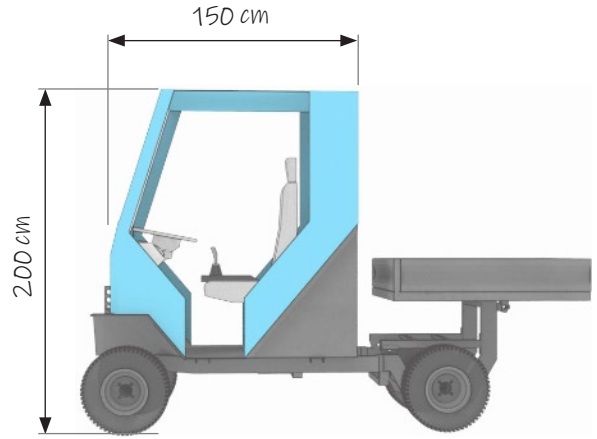
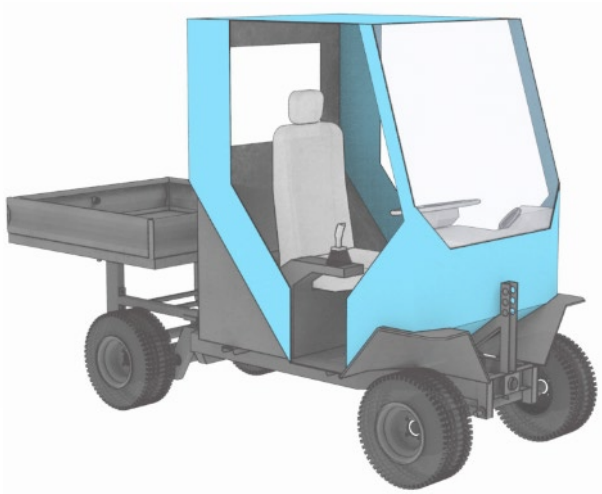






ROOM CONCEPT CABIN

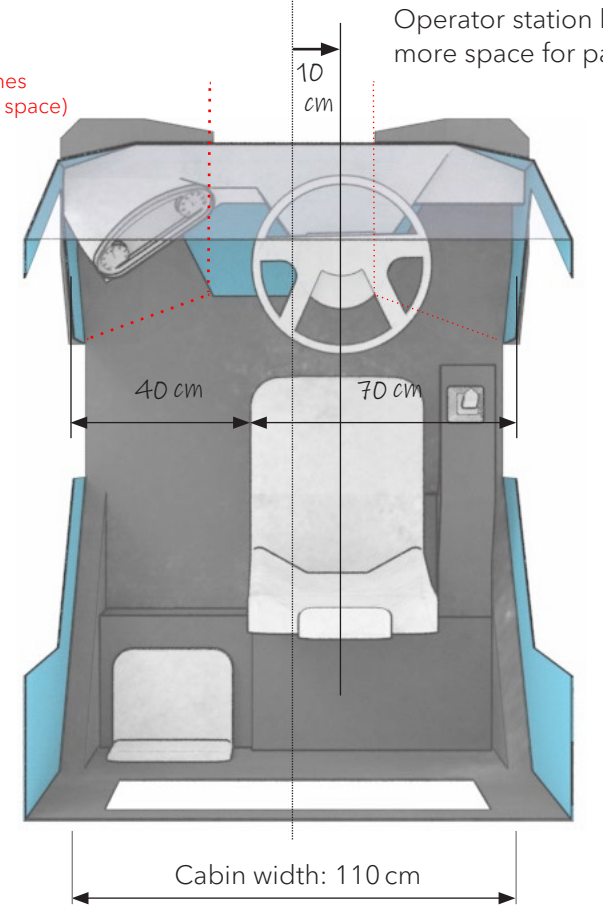
CONCEPT 01
„SMART“

- Frame and cabin width / length are based on the data model
- Car roof raised for better freedom of movement (+ 20cm)

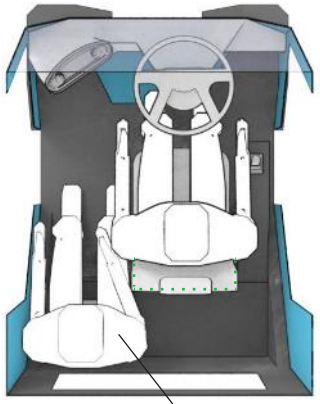
- Entry from both sides (a closed side is also possible)

- Operator position slightly offset to the center
- there is enough space for a passenger
- > Side / rear passenger seat
- moved

FIRST SKETCHES



Operator station laterally offset
more space for passengers



Shoulder area of the passenger behind
the driver's seat

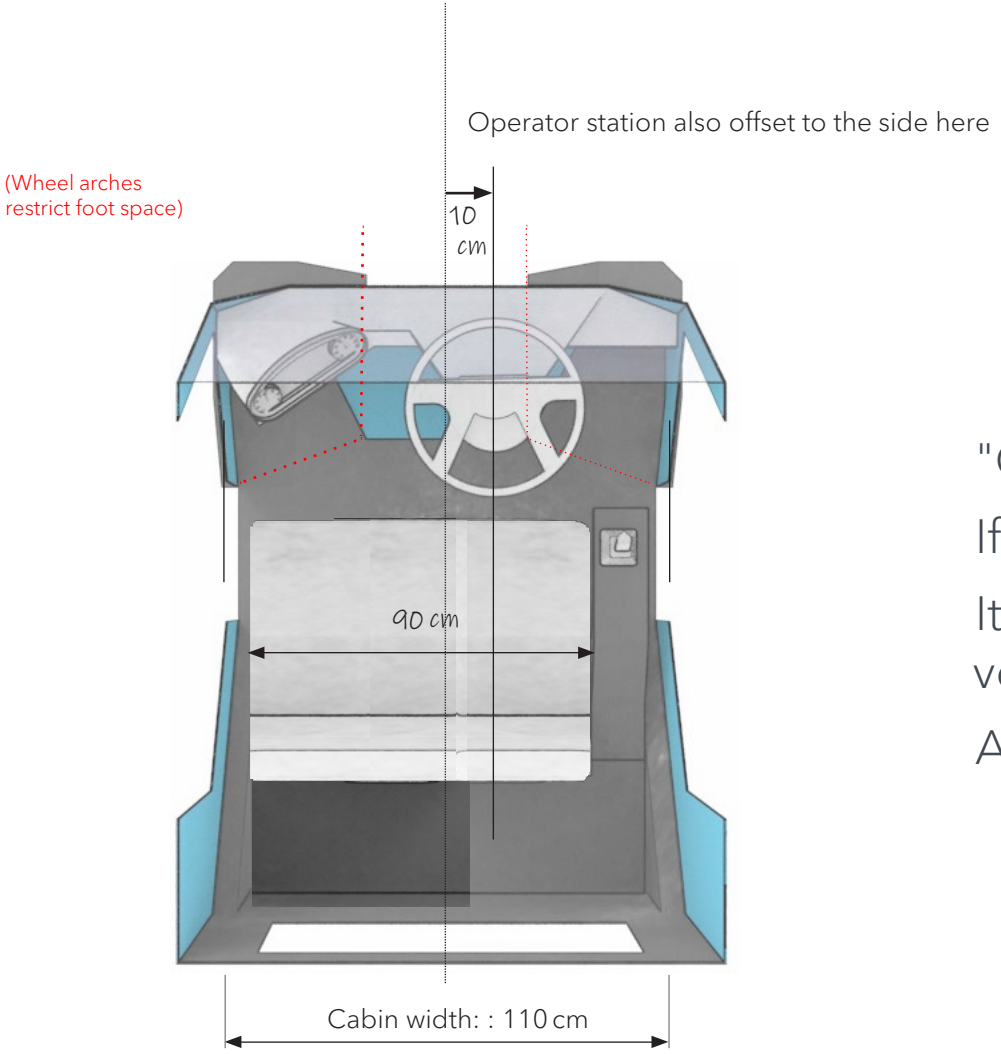
Option: removable cover for device coupling

ROOM CONCEPT CABIN

CONCEPT 01
„SMART“

The backward-shifted emergency seat position enables people to sit next to each other even with a narrow vehicle. The passenger's upper body is not level with the rider. This is hardly restricted in its radius of action.

FIRST SKETCHES



ROOM CONCEPT CABIN

CONCEPT 01
„SMART“

"Golf caddy principle"

If necessary, two people can share the wider bench.

It must be checked whether it is possible to operate the vehicle safely with two people in the vehicle.

A sprung comfort seat for the driver is not possible here.

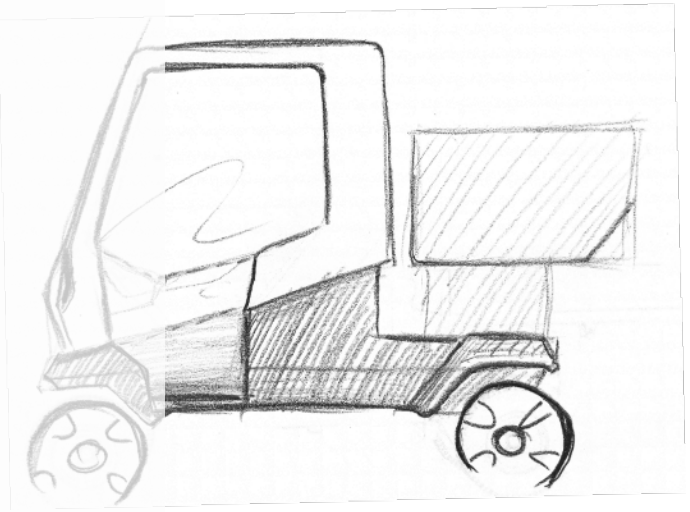
FIRST SKETCHES

DESIGN SKETCH

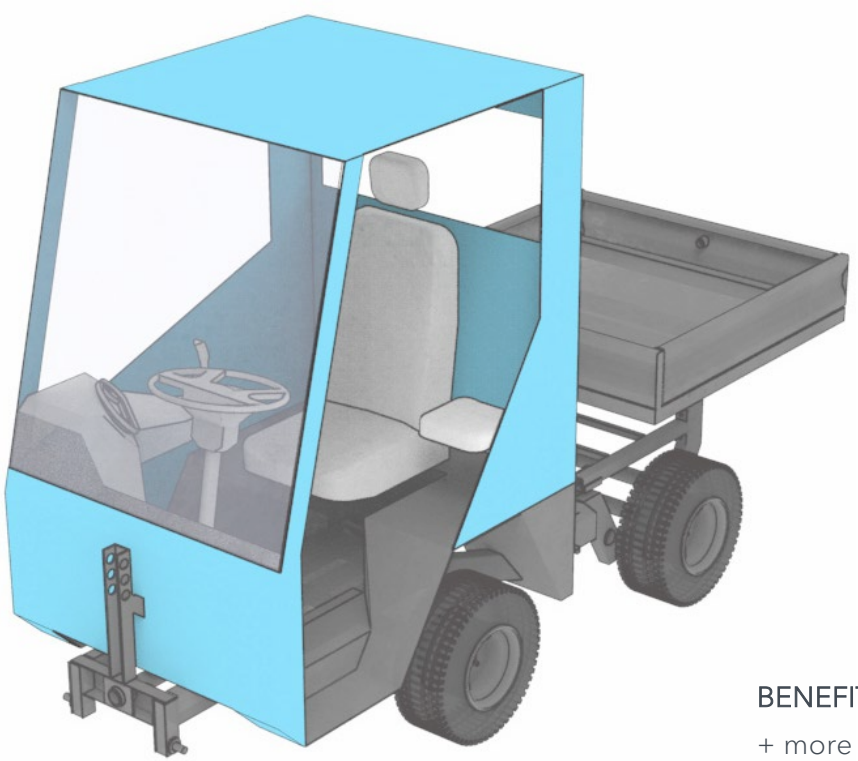
ROOM CONCEPT CABIN

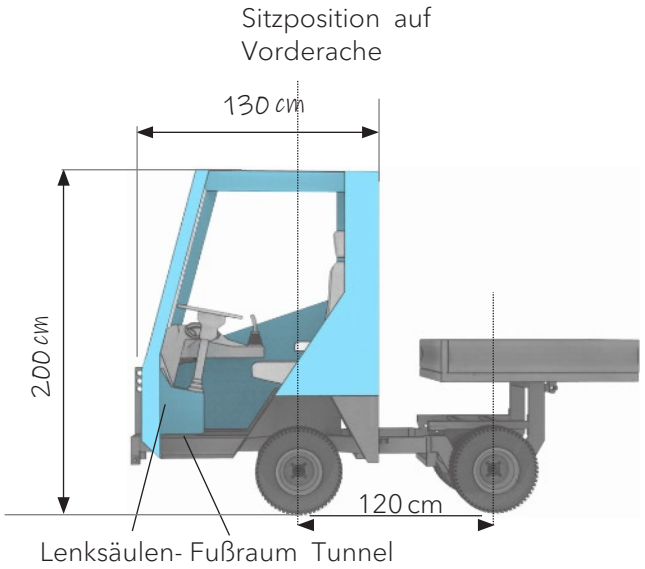
CONCEPT 01

„SMART“



FIRST SKETCHES

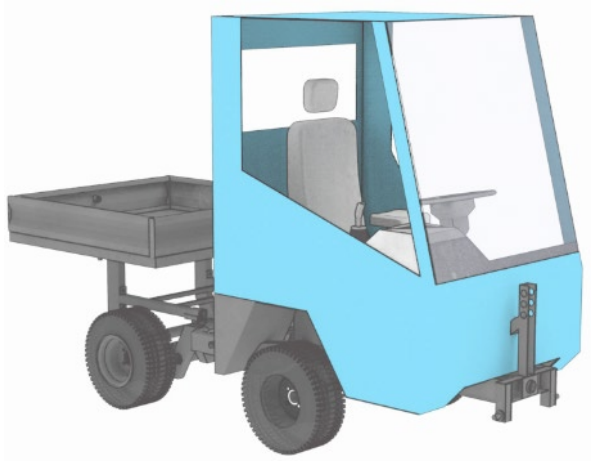




ROOM CONCEPT CABIN

CONCEPT 02

„MINI TRUCK“



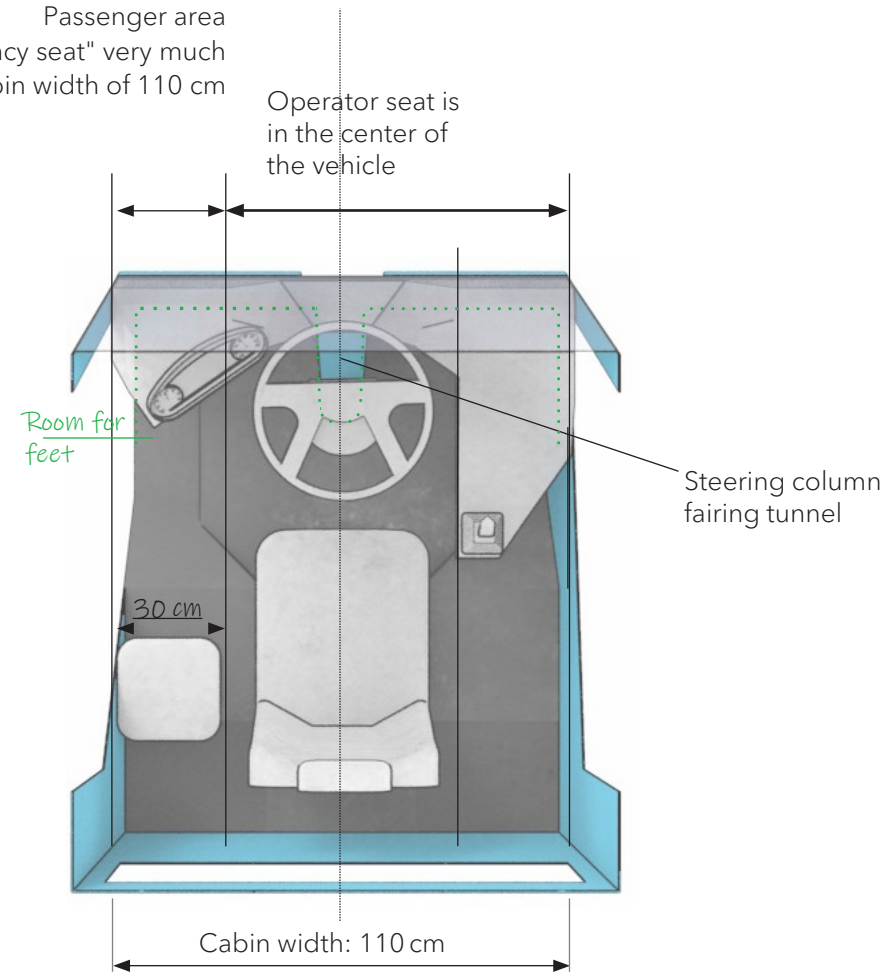
BENEFITS

+ more space in the footwell
(Wheel arch under the seat)
+ small turning circle
+ easy entry / exit
(Access in front of the seat)
+ better view of the front
devices possible

DISADVANTAGE

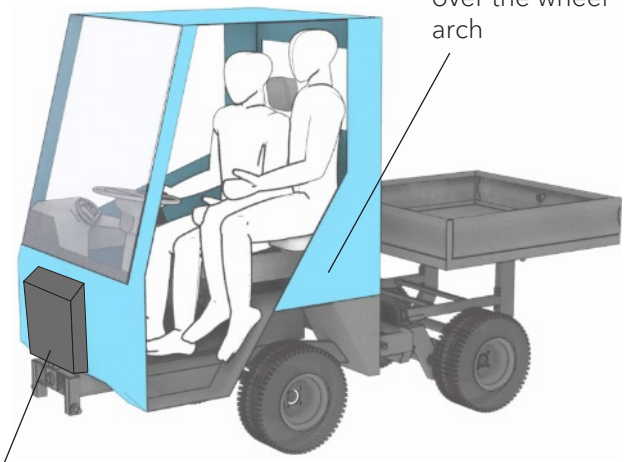
+ smaller footprint
+ Danger of tipping over (to the front)
by larger lever
(e.g. in forklift operation)
+ greater distance
Wheel / front attachments

FIRST SKETCHES



ROOM CONCEPT CABIN

CONCEPT 02
„MINI TRUCK“



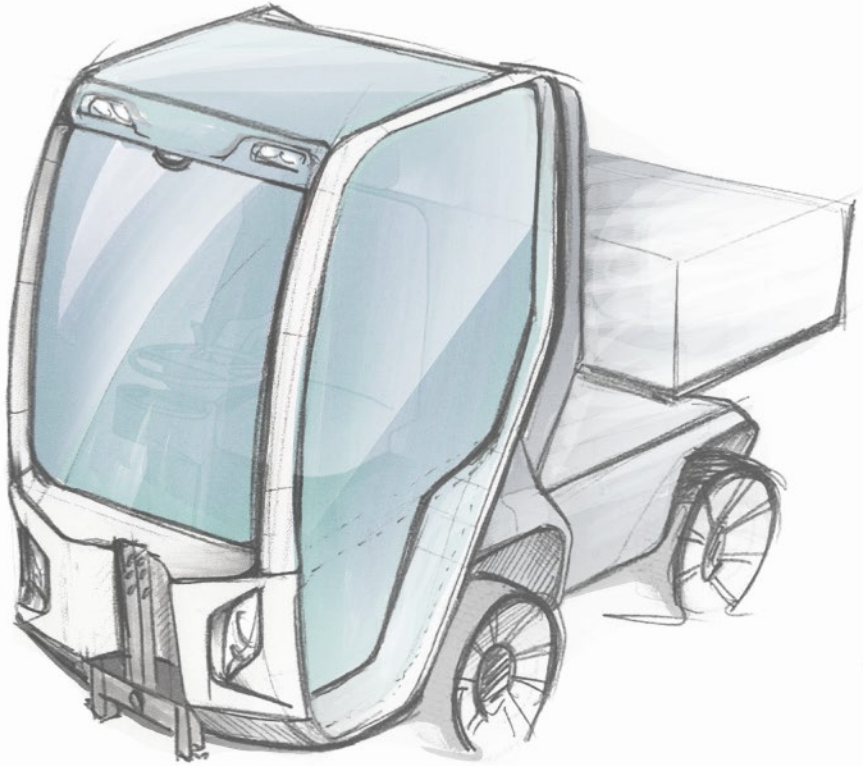
CONCLUSION

Many advantages in user ergonomics.

Chassis must be developed for the adapted conditions.

FIRST SKETCHES

DESIGN SKETCH



ROOM CONCEPT CABIN

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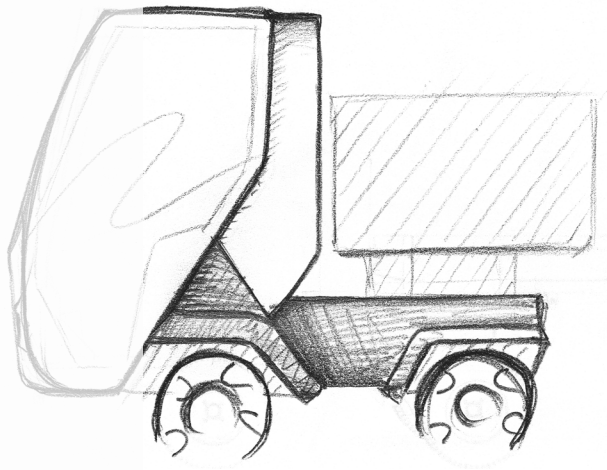
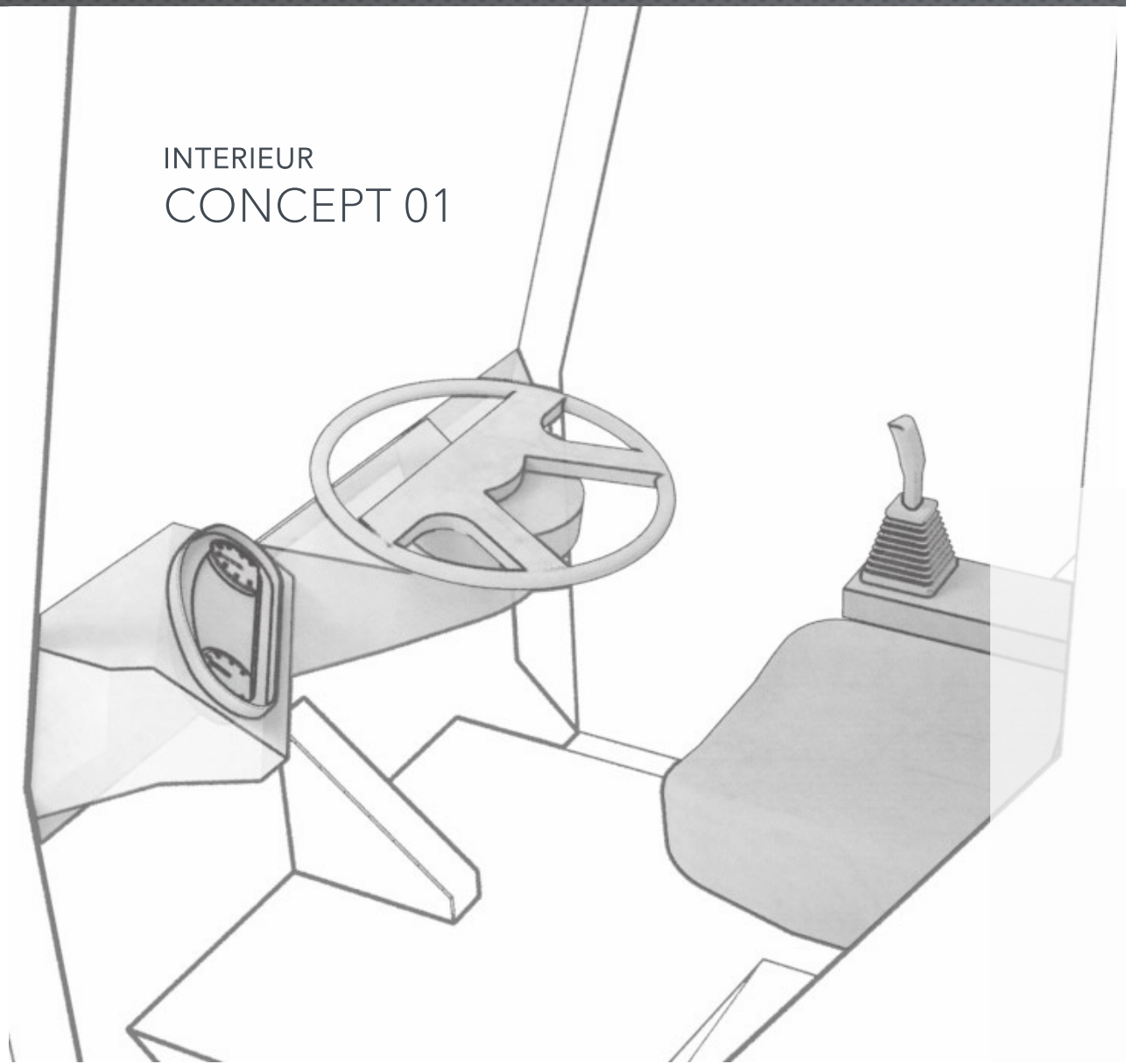


FIRST SKETCHES

INTERIEUR

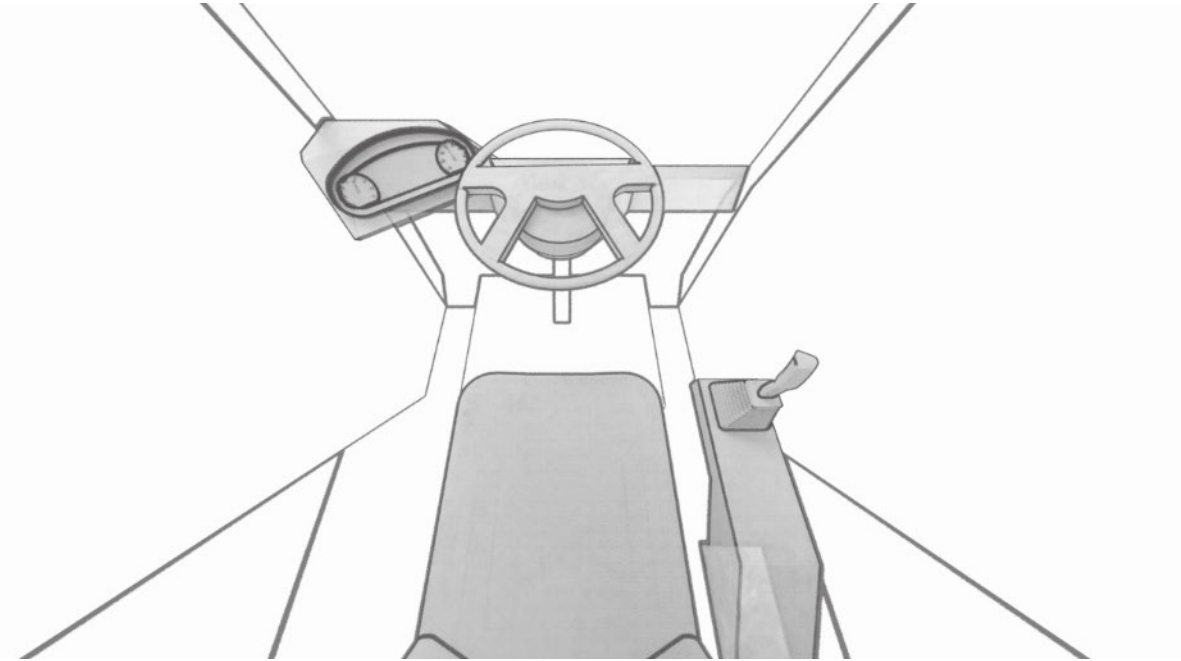
CONCEPT 01



- Instrument panel (L) and steering wheel integrated in the board

- Steering wheel without steering column (fixed or adjustable)

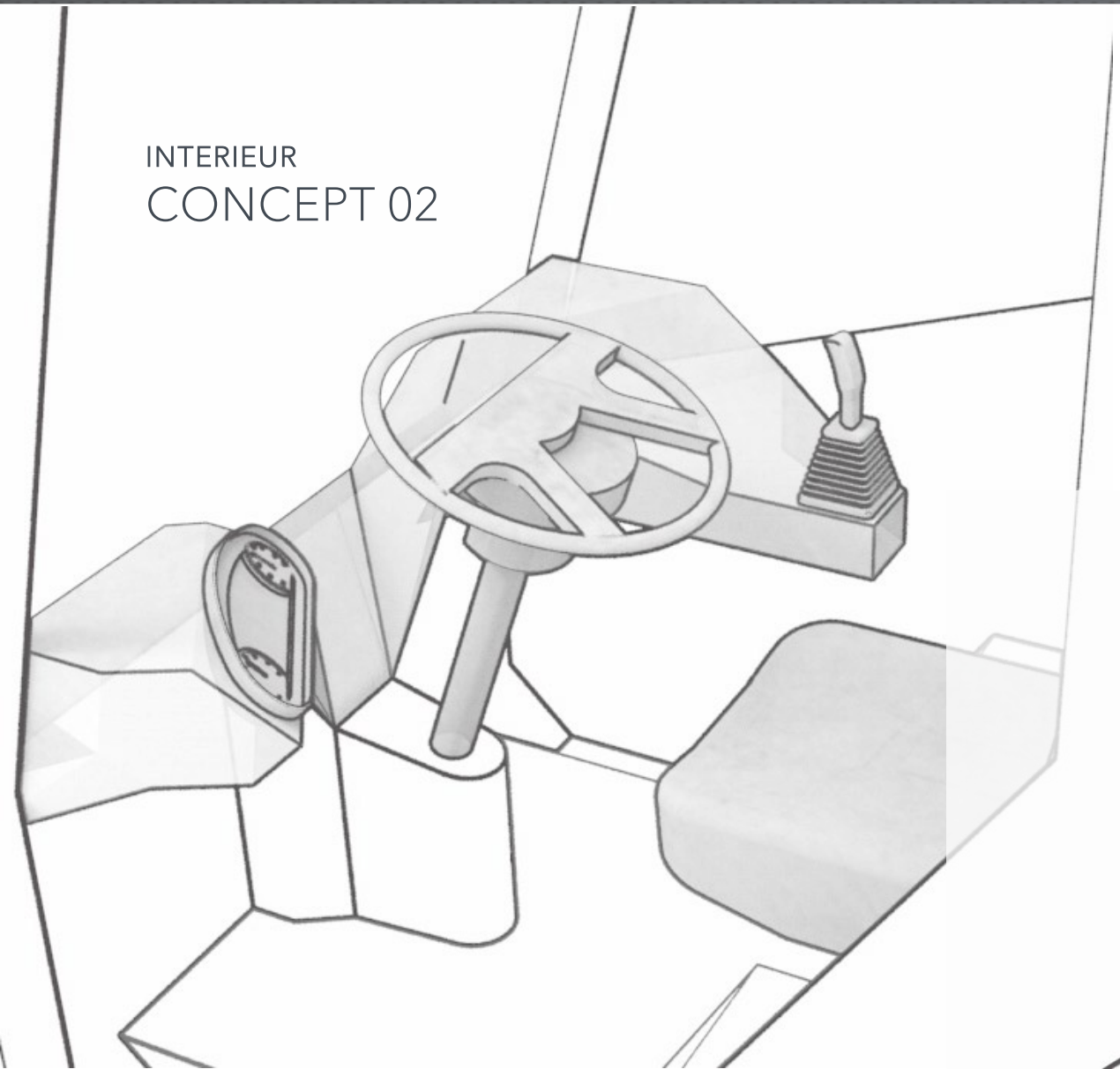
- Control unit with joystick placed next to the seat (R)



FIRST SKETCHES

INTERIEUR

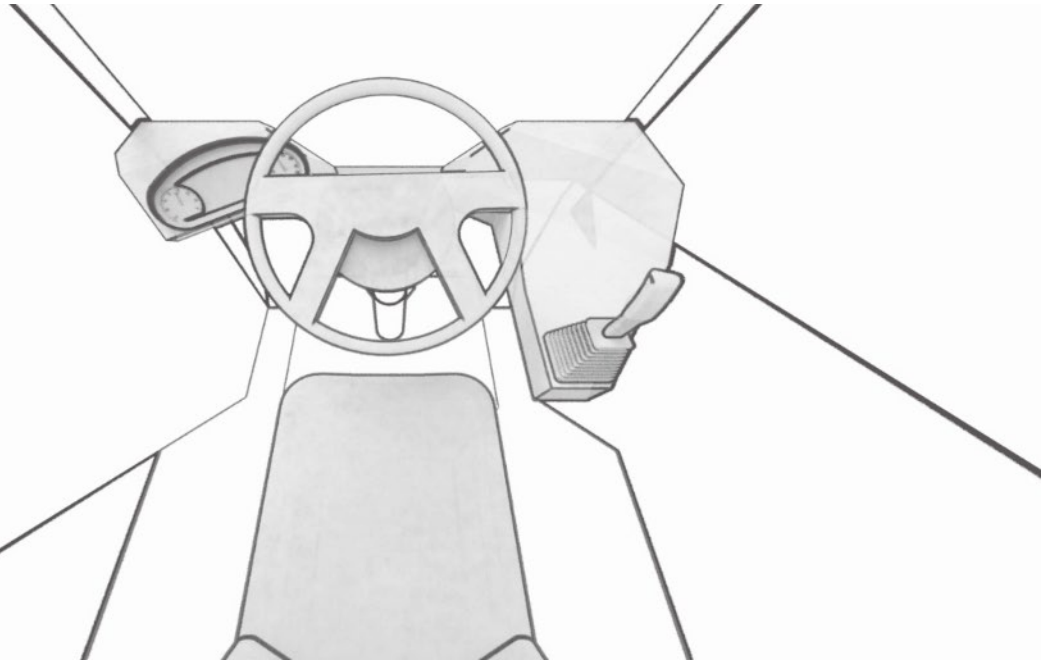
CONCEPT 02



- Instrument panel (L) and control panel with joystick (R) via a continuous board connected

- Board lowered in the area of the steering wheel for better visibility

Steering wheel with free-standing, adjustable steering column



FIRST SKETCHES

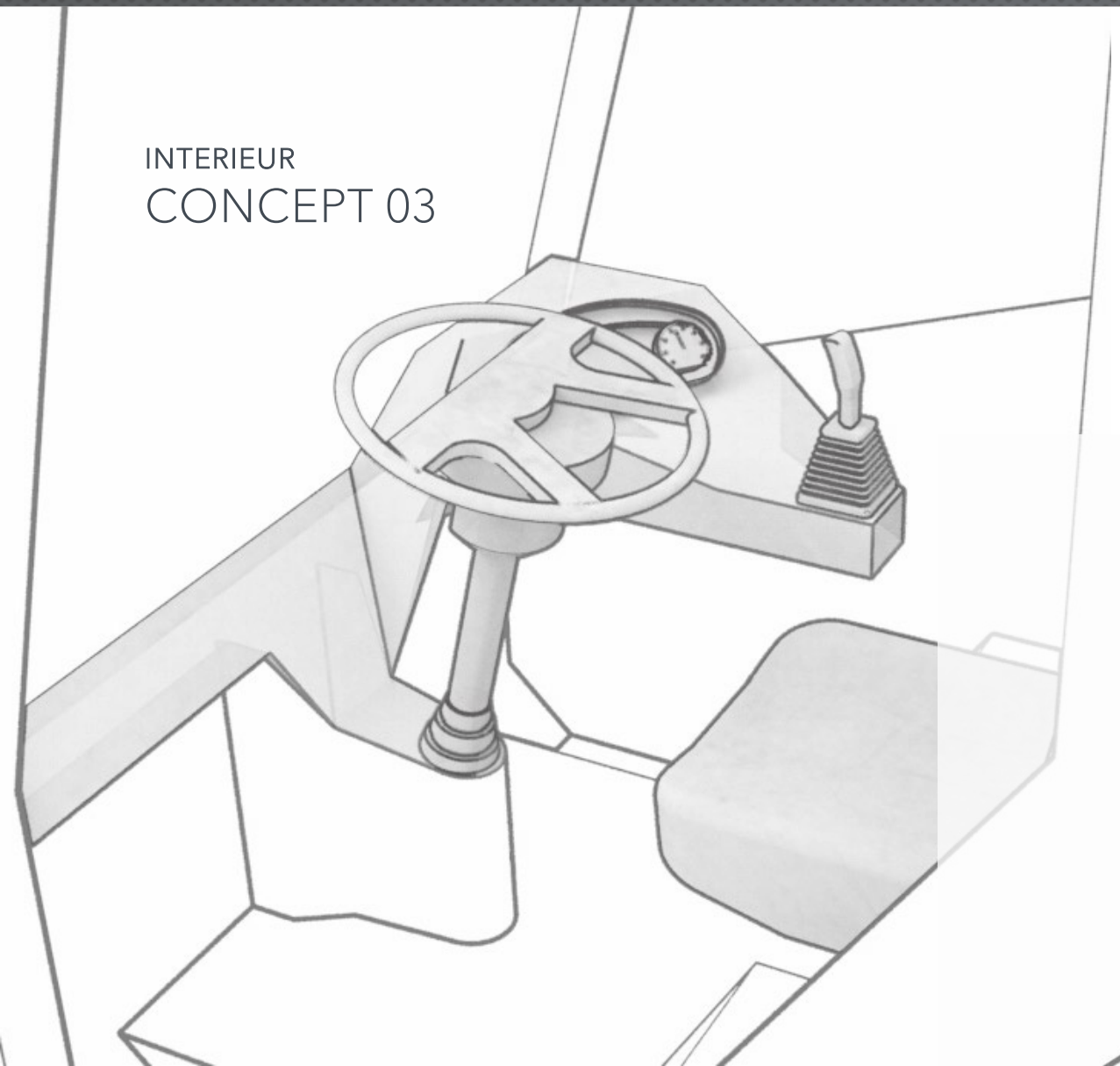
INTERIEUR

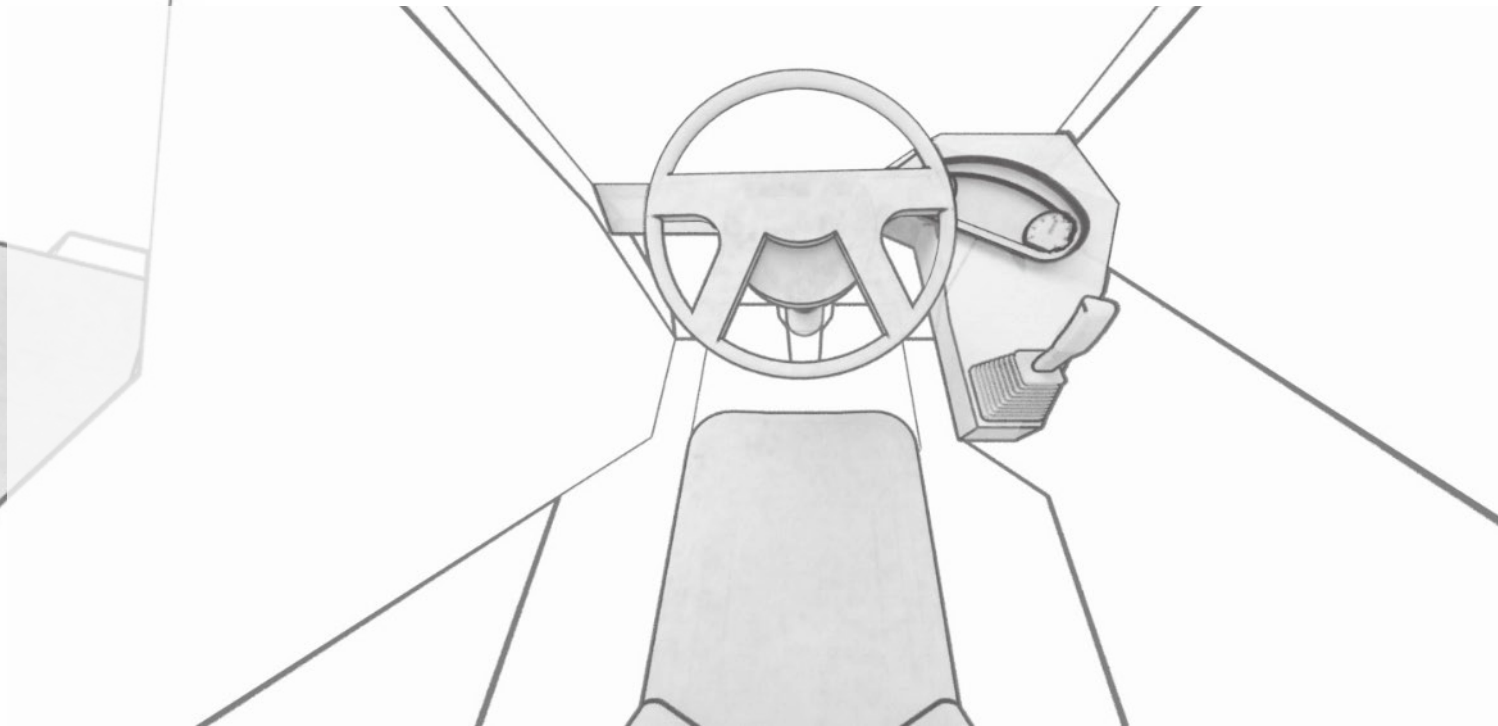
CONCEPT 03

- Instrument panel and control panel with joystick as a unit

- Free areas lowered for better visibility

- Steering wheel with free-standing adjustable steering column

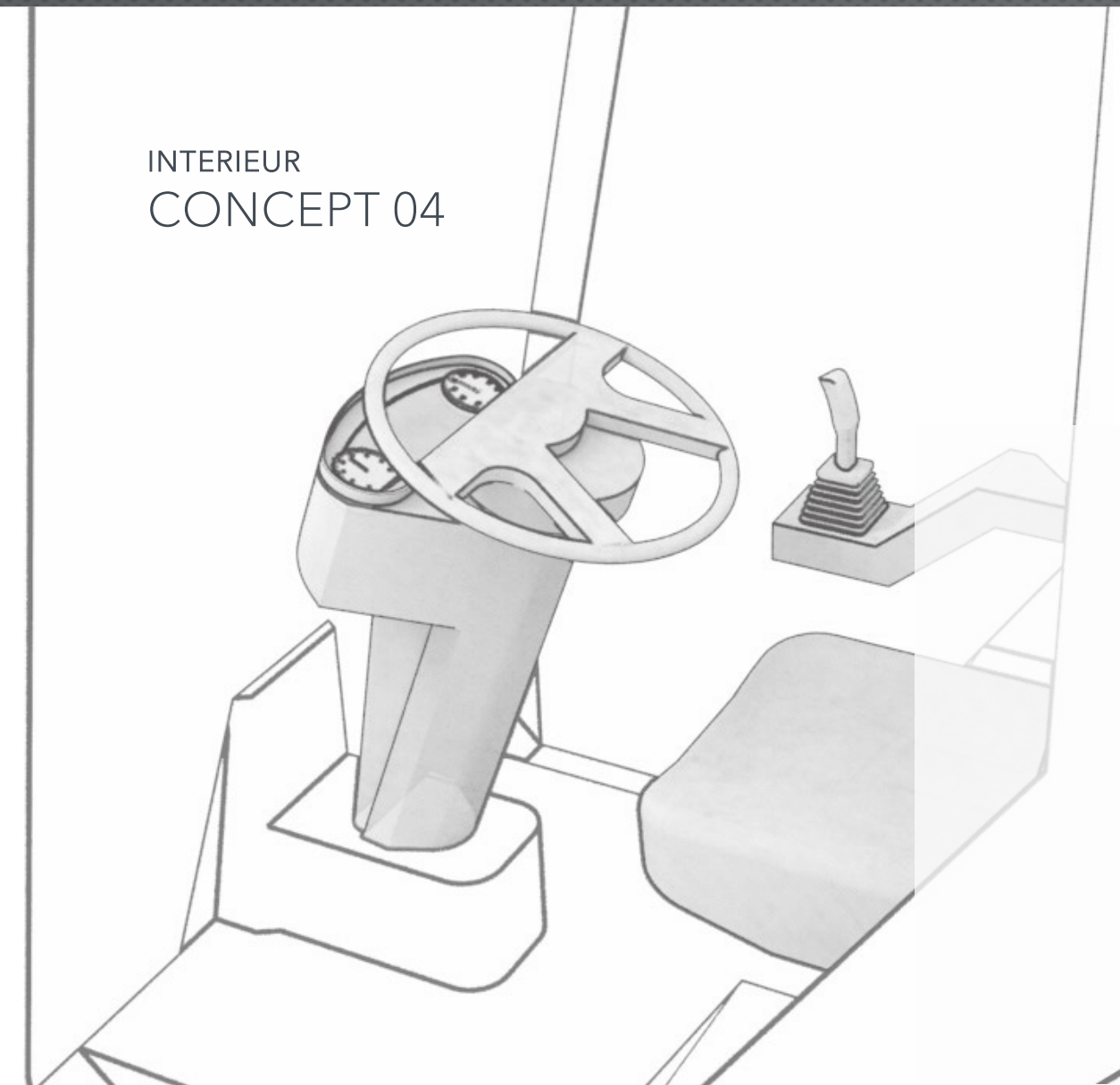




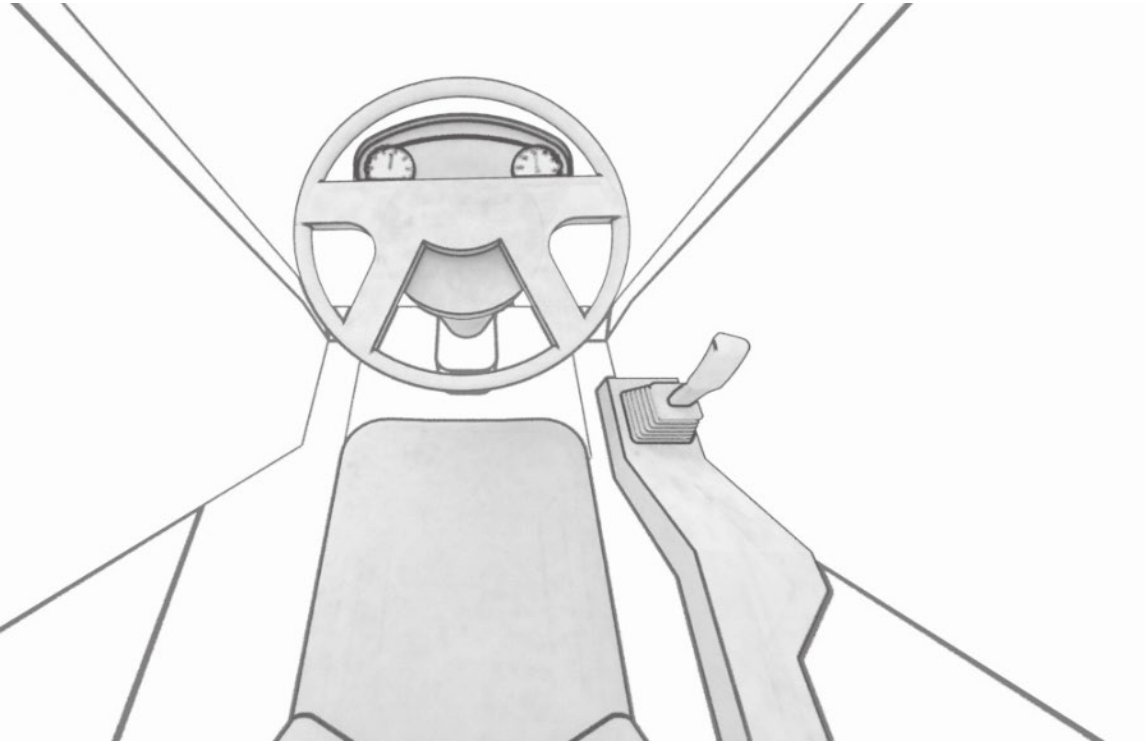
FIRST SKETCHES

INTERIEUR

CONCEPT 04



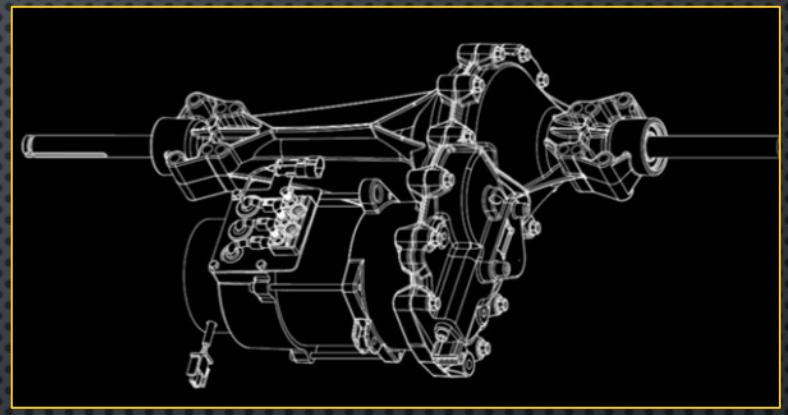
- Free-standing steering column with integrated instrument panel
- Fixed or adjustable steering column
- Joystick integrated in the armrest

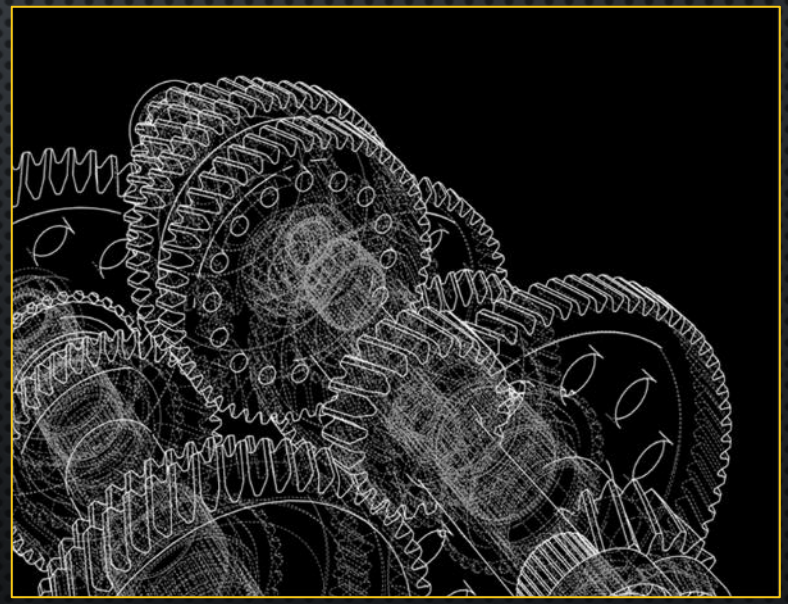


7 DRIVE & ENERGY

DRIVE & ENERGY

REQUIREMENT	AIM
Drive:	Main 2WD / optional 4WD
Overall performance:	2 kW bis 5 kW / 300km
Supply voltage:	36V / 48V
Axis width:	max. 800 mm (IC15 / 240 = 736 mm)
Drive-axis:	900W bis 1500W
Climbing performance:	25%
Battery technology:	Lithium and traction battery
Can also be activated:	Internal combustion engine (Hybrid)
In process:	Hydraulic system with hydraulic pump to double the performance





green
concept

SERIELLER HYBRIDANTRIEB

- Unabhängige Positionierung der Verbrennungsmaschine
- Rein elektrisches Fahren mit maximaler Fahrleistung
- Einfache Umrüstung auf rein elektrischen Betrieb

8 FIRST IMPLEMENTATIONS

FIRST IMPLEMENTATIONS// PHASE 1 // MODEL I

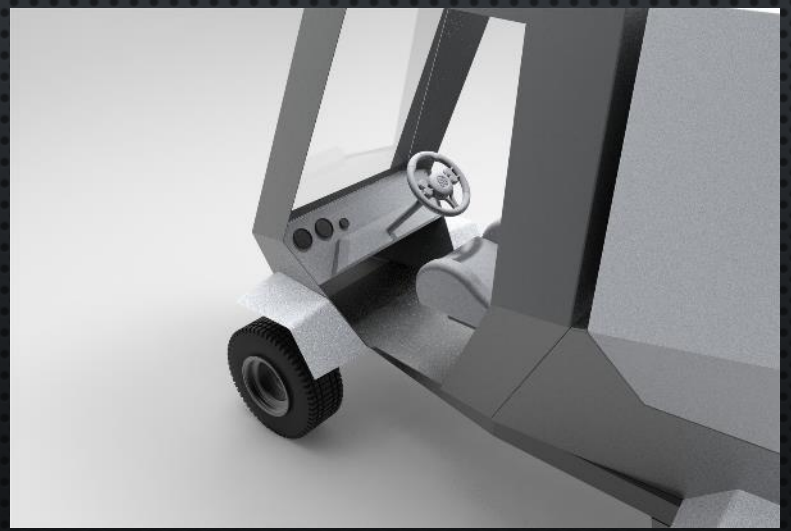
FIRST IMPLEMENTATIONS// PHASE 1 // MODEL II

FIRST IMPLEMENTATIONS // PHASE 2 // MODEL I

FIRST IMPLEMENTATIONS // PHASE 2 // MODEL I

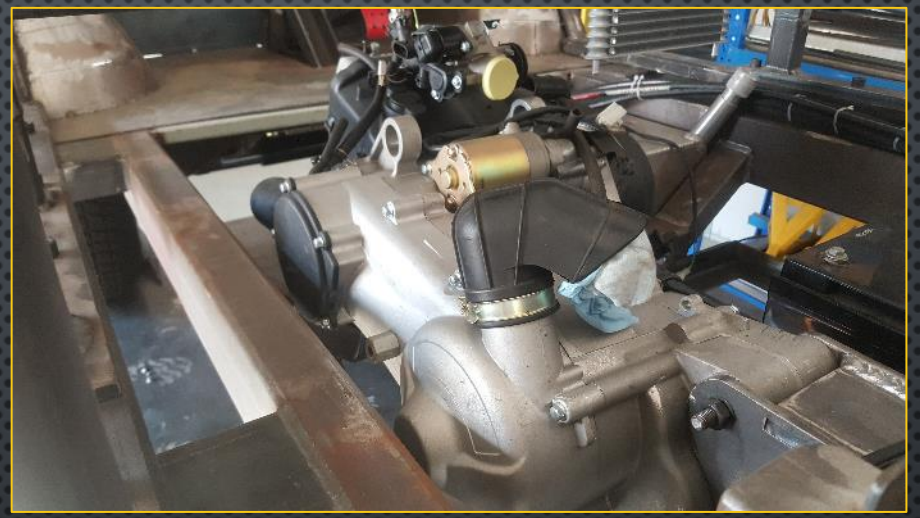
FIRST IMPLEMENTATIONS// PHASE 2 // MODEL II

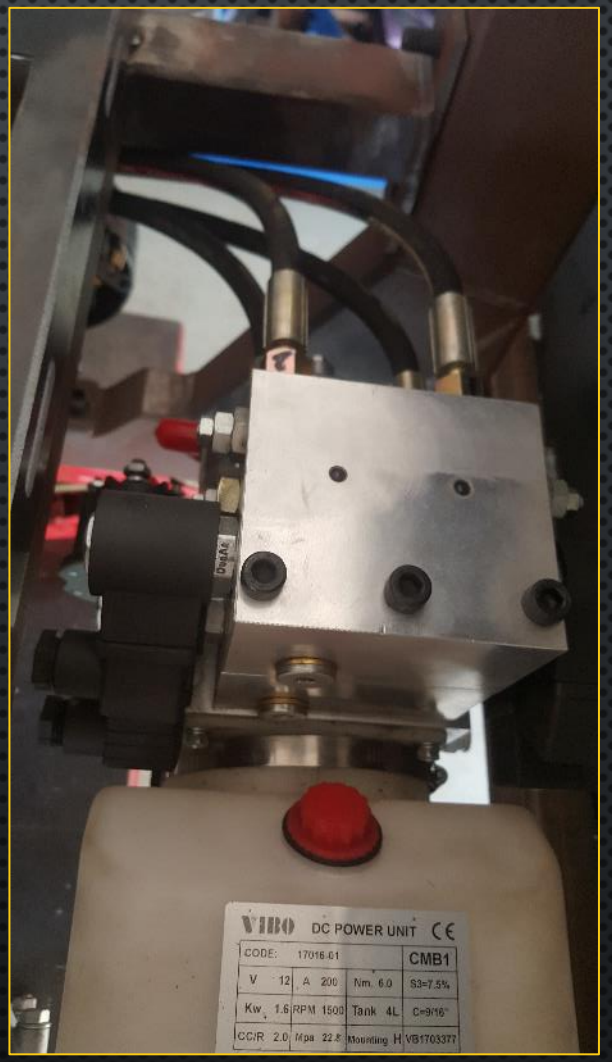
FIRST IMPLEMENTATIONS// PHASE 3 // MODEL I

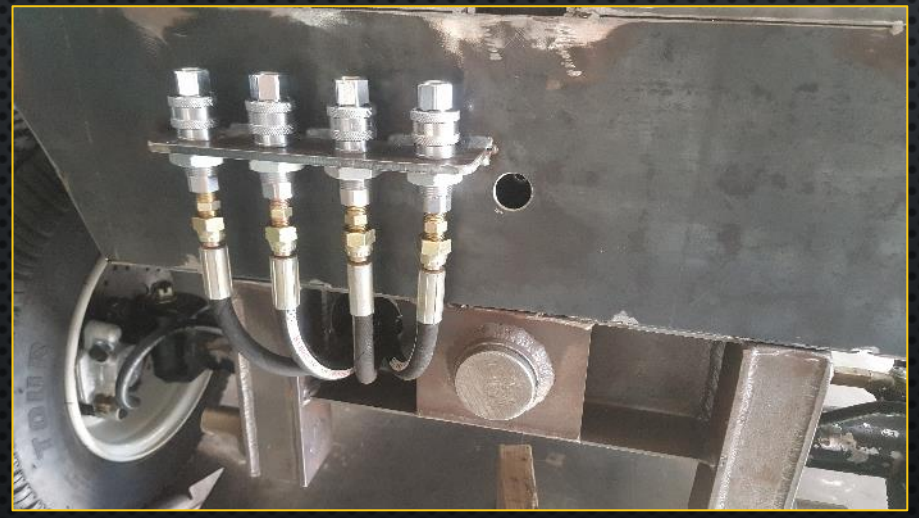


FIRST IMPLEMENTATIONS // *COMPONENT SEARCH IN CHINA*

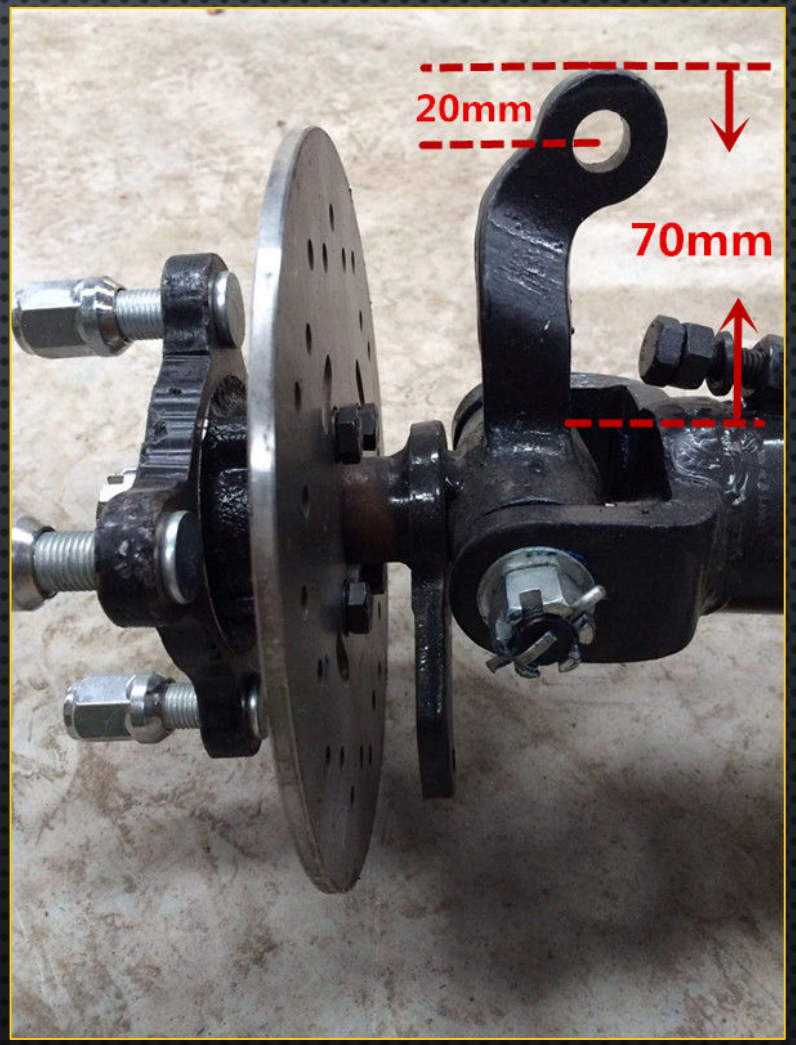
FIRST IMPLEMENTATIONS // *COMPONENT SEARCH IN CHINA*







FIRST IMPLEMENTATIONS // *COMPONENT SEARCH IN CHINA*



FIRST IMPLEMENTATIONS // PHASE 4 // MODEL I // *DESIGN FAKTOR M*

FIRST IMPLEMENTATIONS // PHASE 4 // MODEL I

FIRST IMPLEMENTATIONS // PHASE 4 // MODEL II

FIRST IMPLEMENTATIONS // PHASE 4 // MODEL III

FIRST IMPLEMENTATIONS // PHASE 4 // MODEL III

THANK YOU

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