# BEARS

DARE THE LIMITS



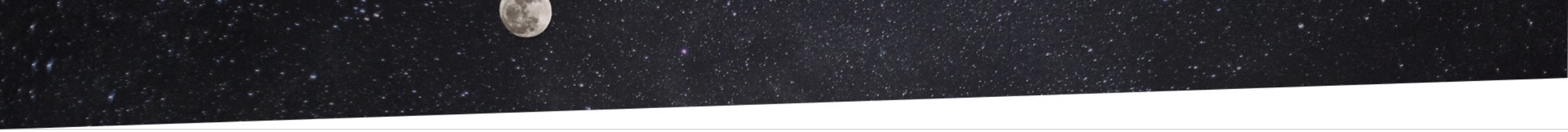


# TechTalk

Robin, Aurel & Eric

BEARS

DARE THE LIMITS



# Wer sind wir?











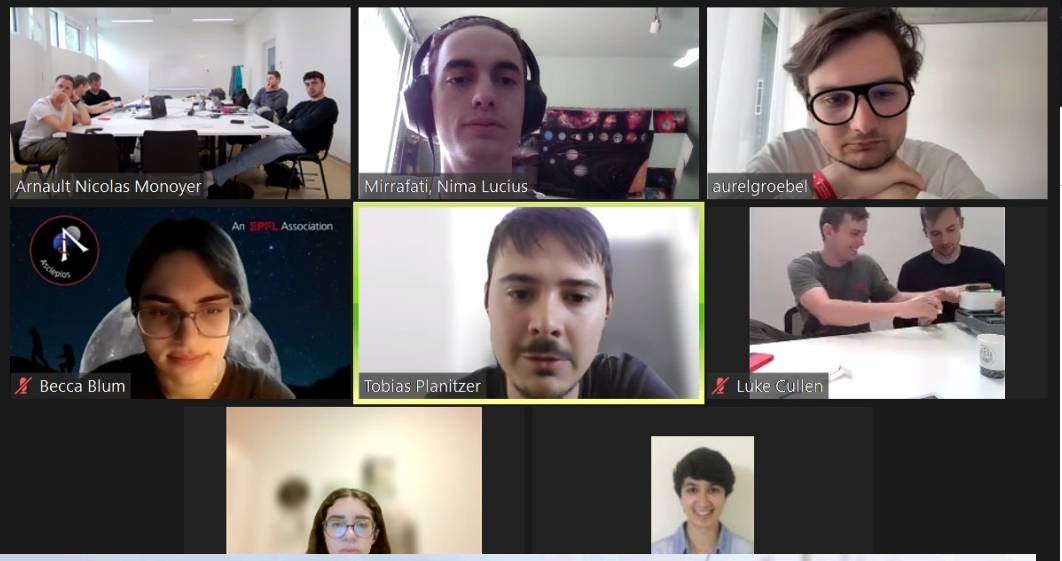


Technische Universität Berlin

BEARS






Arnault Nicolas Monoyer
Mirrafati, Nima Lucius
aurelgroebel
An EPFL Association
Becca Blum
Tobias Planitzer
Luke Cullen

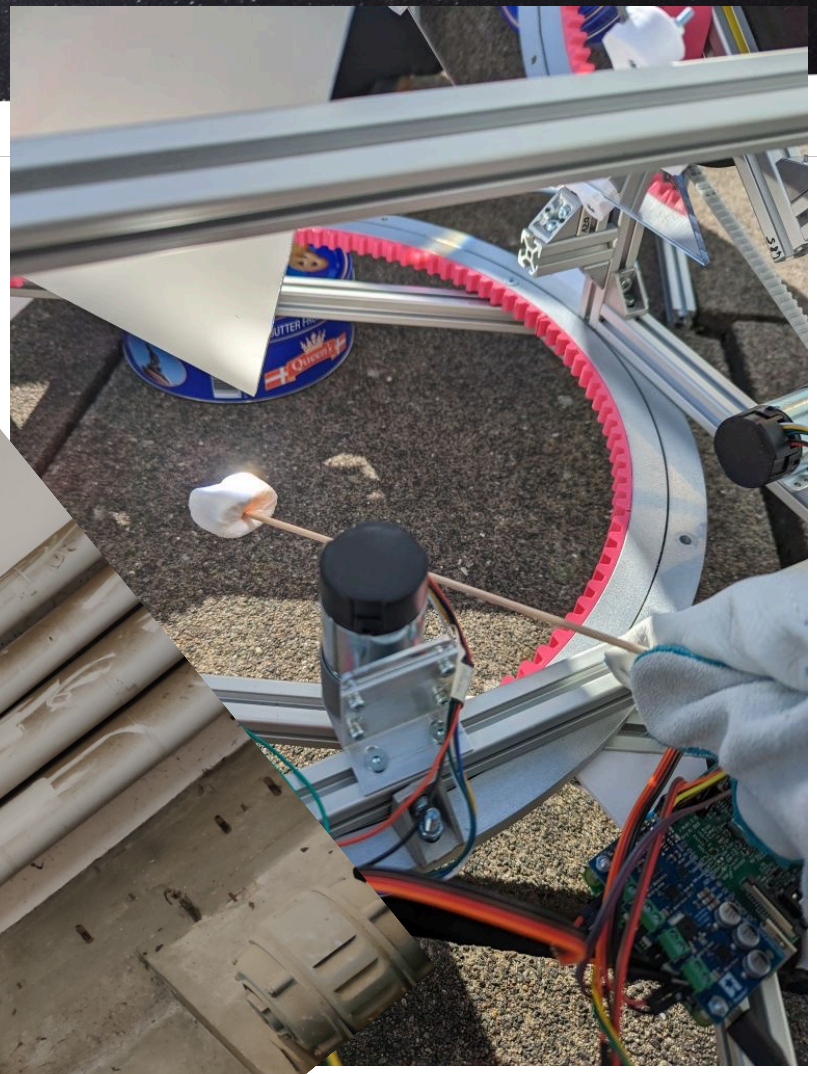




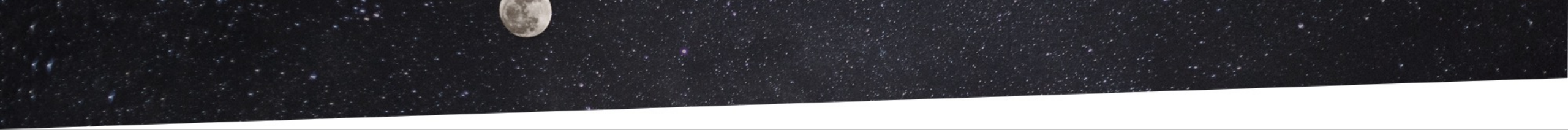








BEARS



# An welchen Projekten arbeiten wir?

# An welchen Projekten arbeiten wir?

## Robotics

## Science & Experiments

## Experimental Rocketry

# An welchen Projekten arbeiten wir?

## Robotics

- SOLAR
- LARS
- RoBro

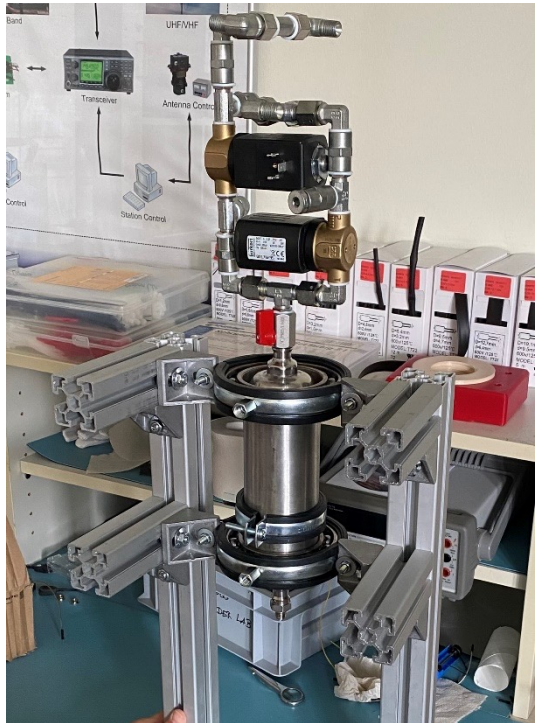






## Science & Experiments

- Cold Gas
- Career




## Experimental Rocketry

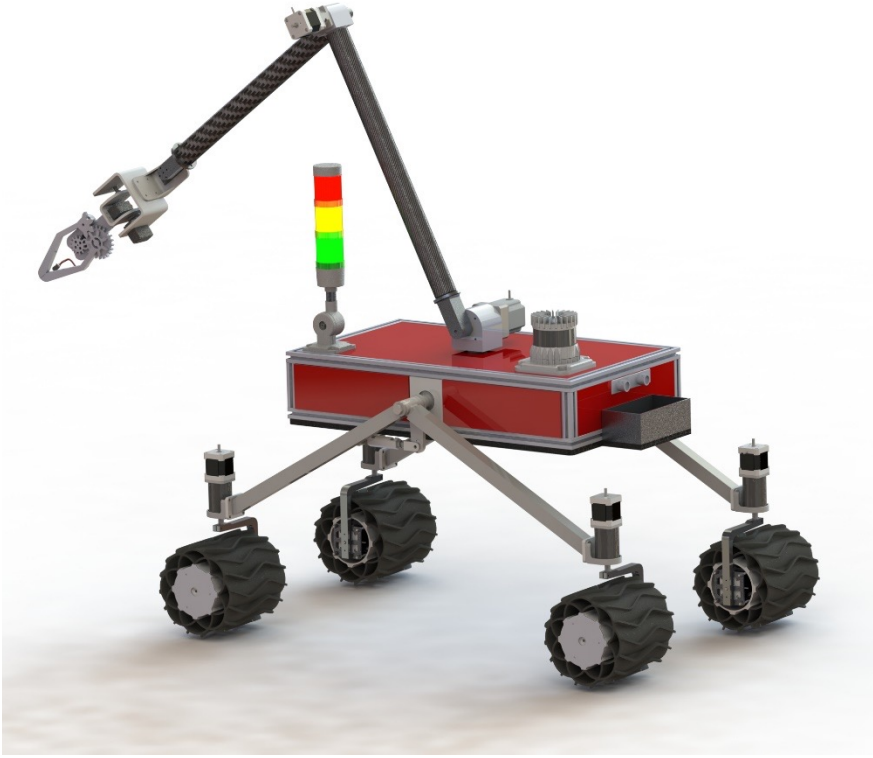
- Propulsion - Teststand
- Rocket Systems Stardust & Starmoon

# Robotics

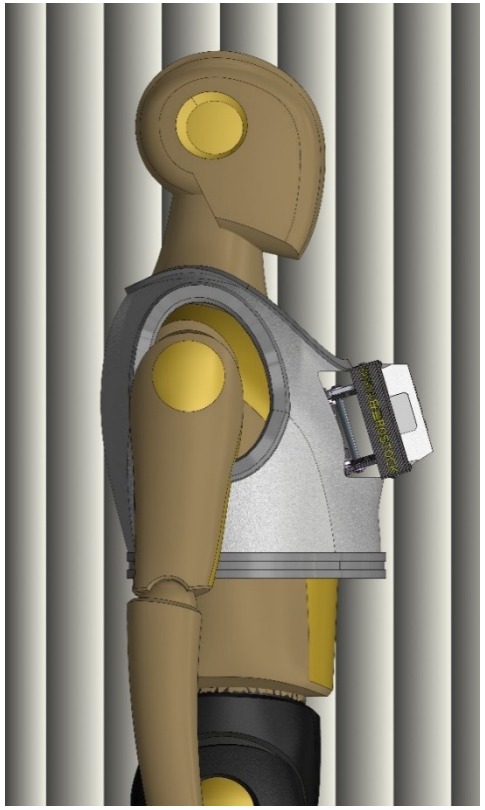
## SOLAR



## RoBro



## LARS

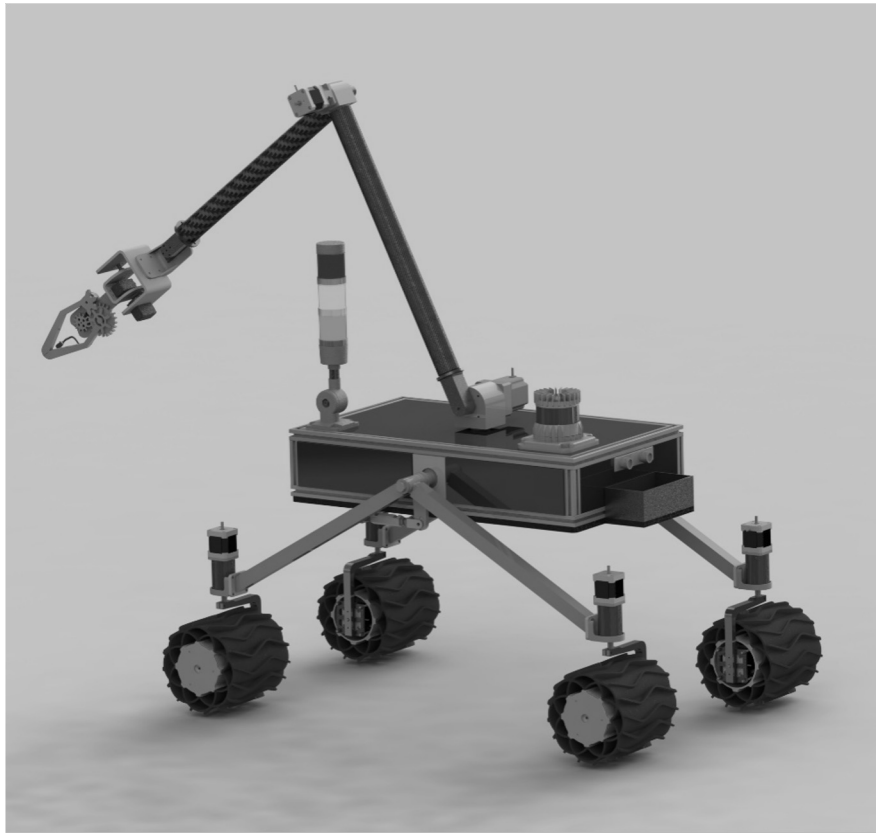


# Robotics

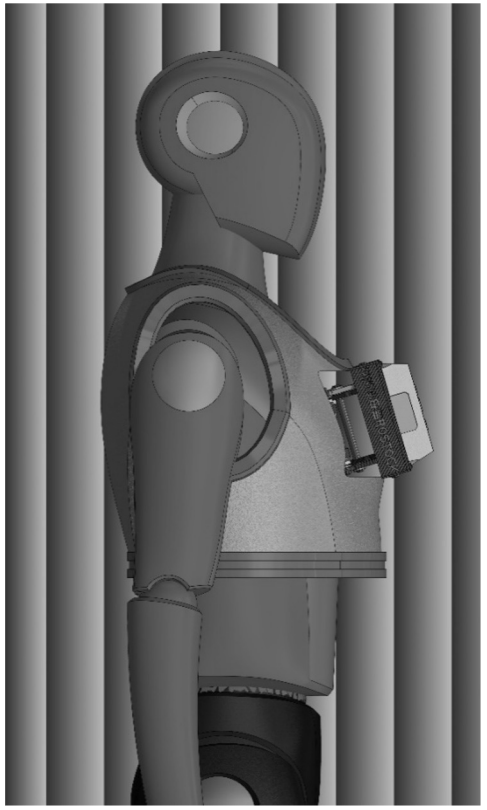
## SOLAR



## RoBro



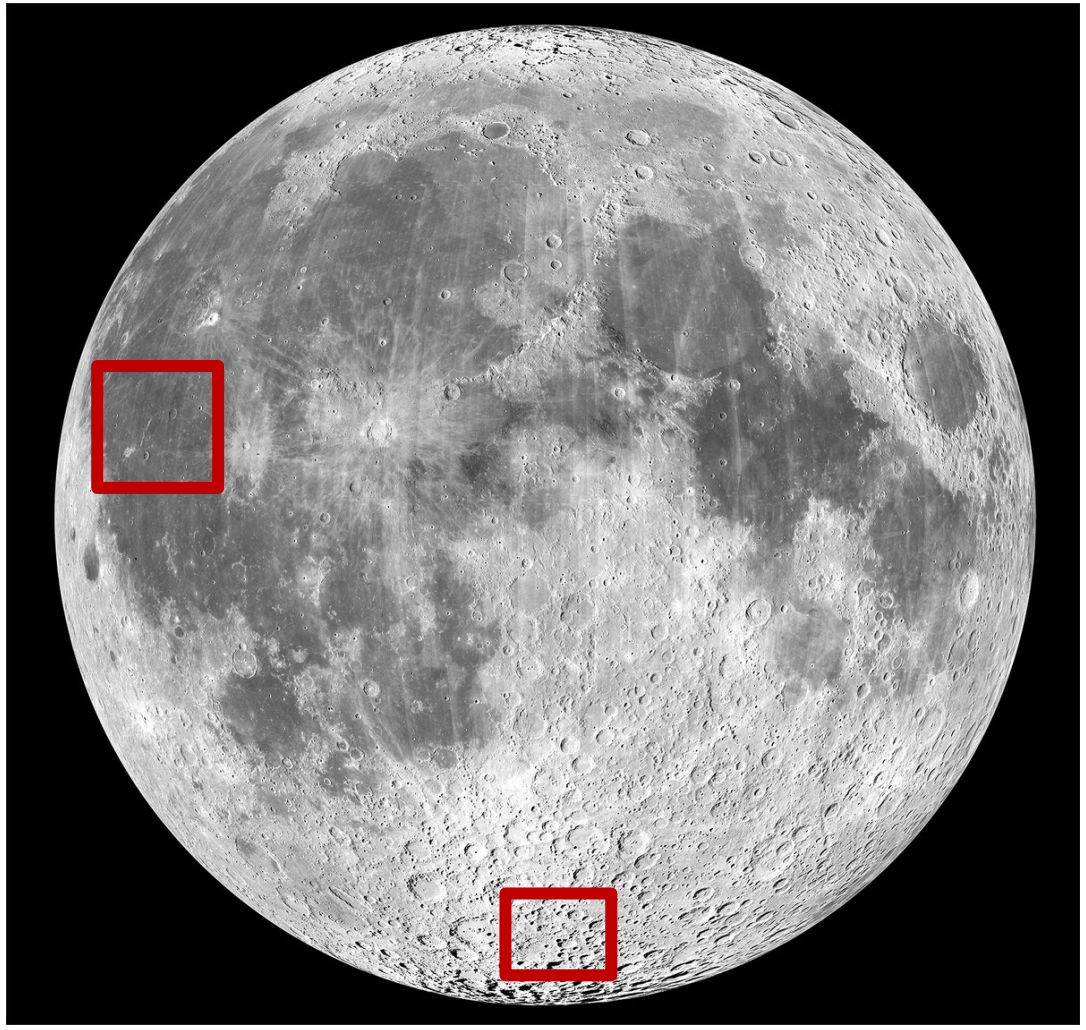
## LARS



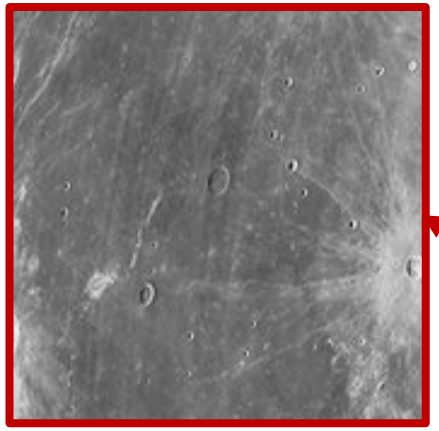
# SOLAR – Sintering Of LunAr Regolith



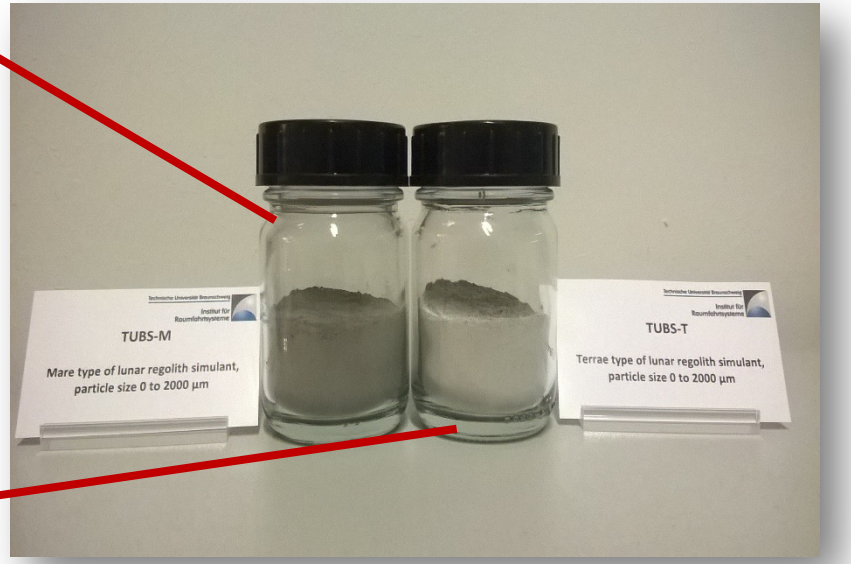
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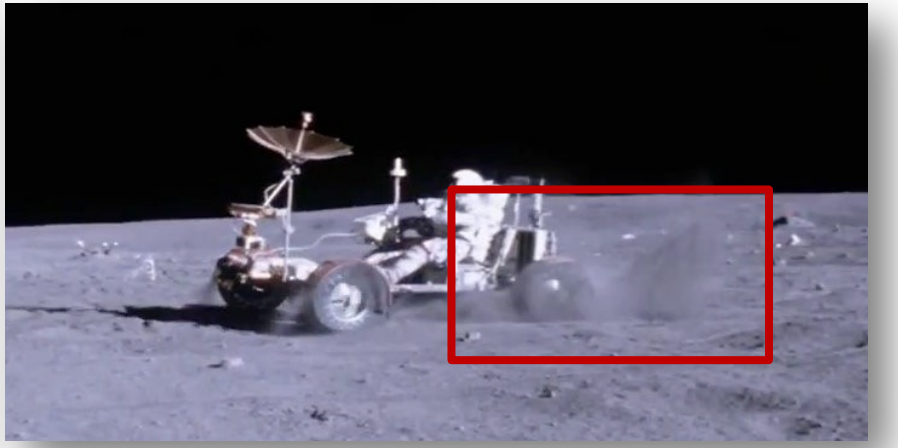


# SOLAR – Sintering Of LunAr Regolith

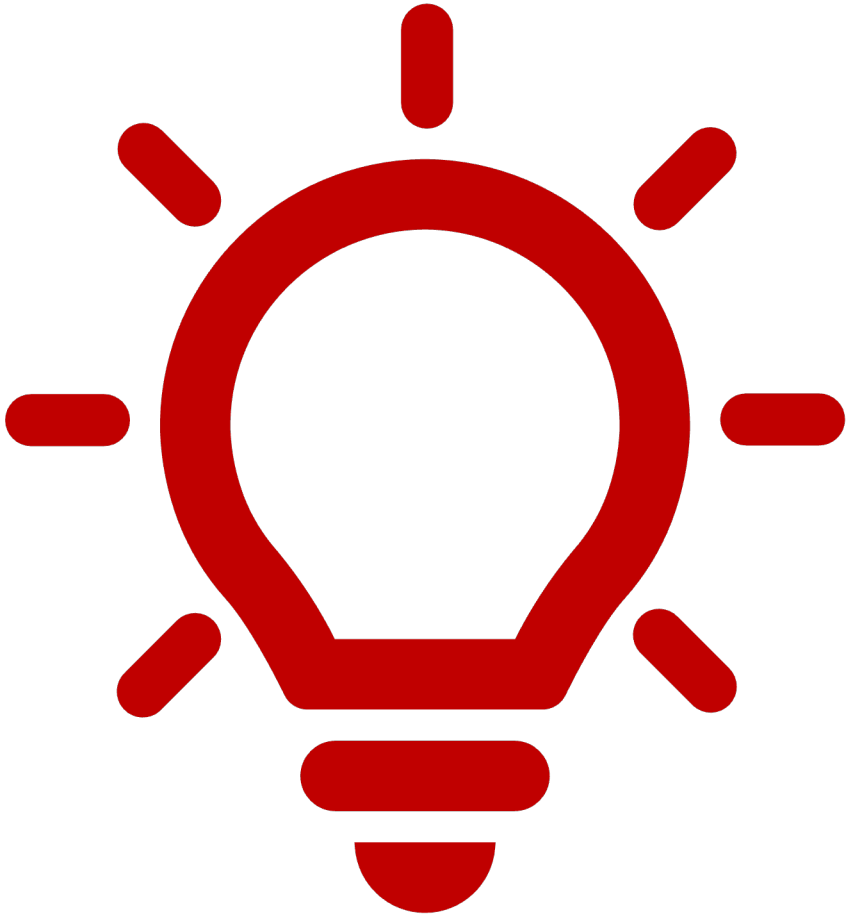




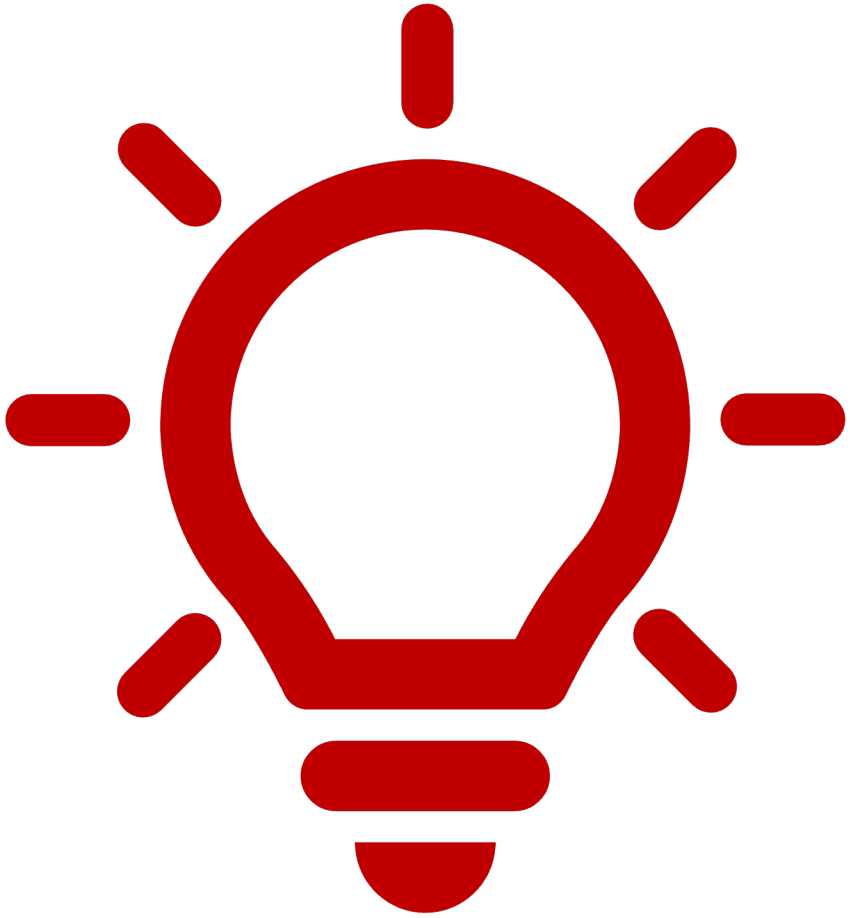


# SOLAR – Sintering Of LunAr Regolith



# SOLAR – Sintering Of LunAr Regolith



SOLAR

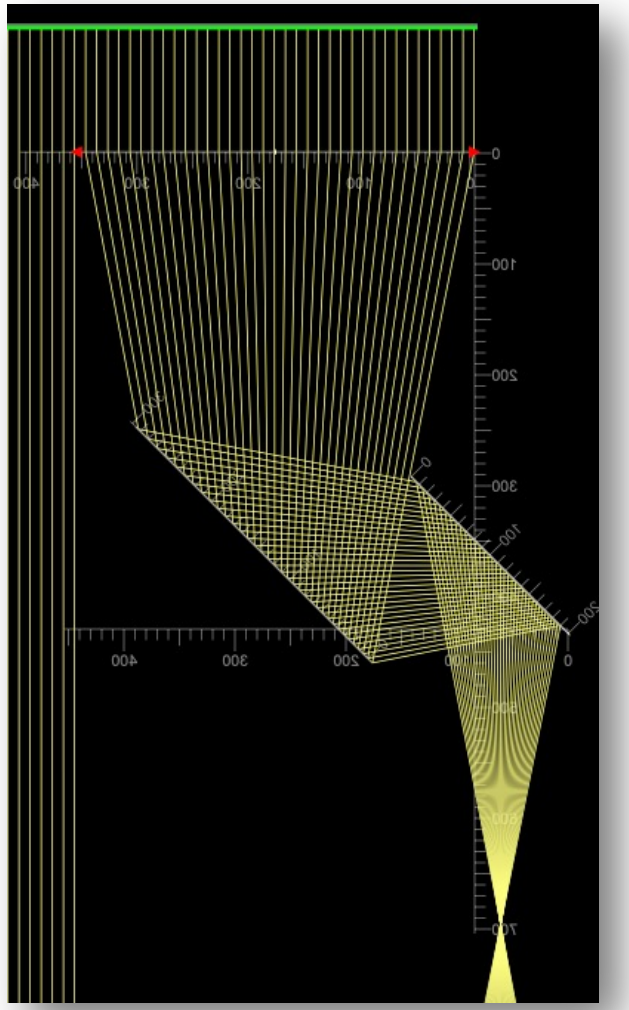
SINTERING OF LUNAR REGOLITH

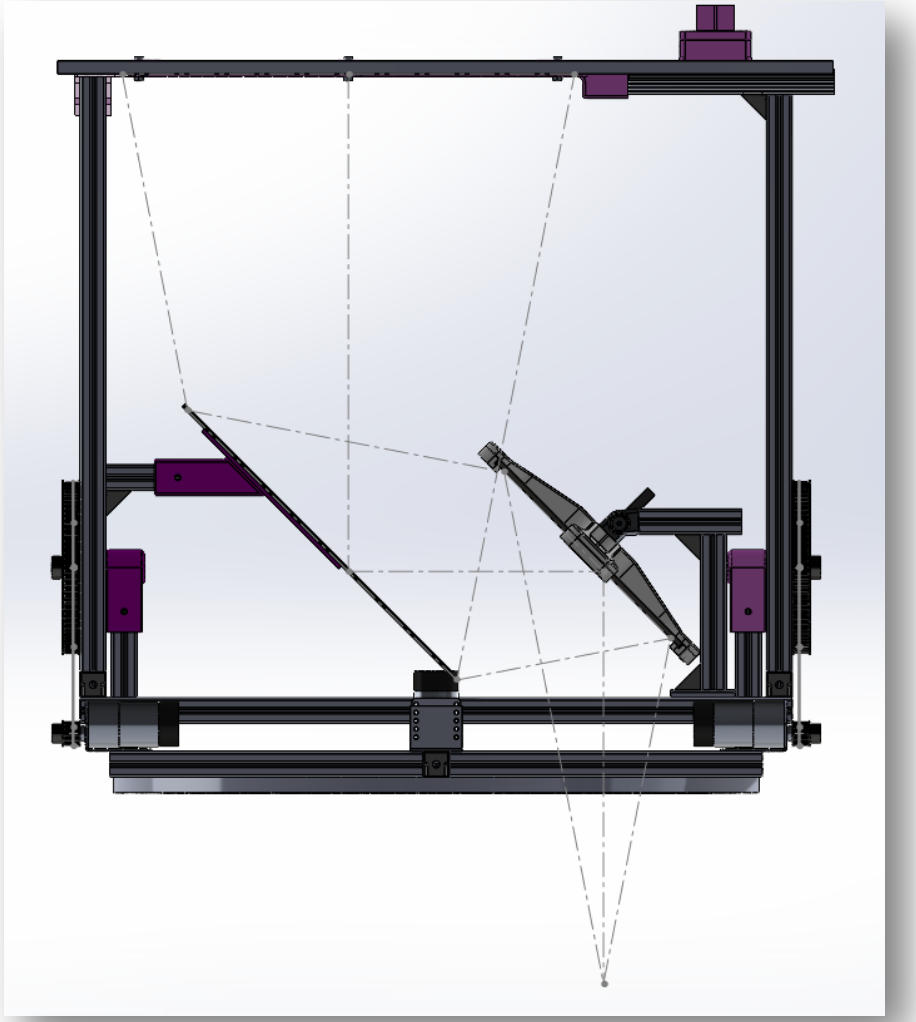
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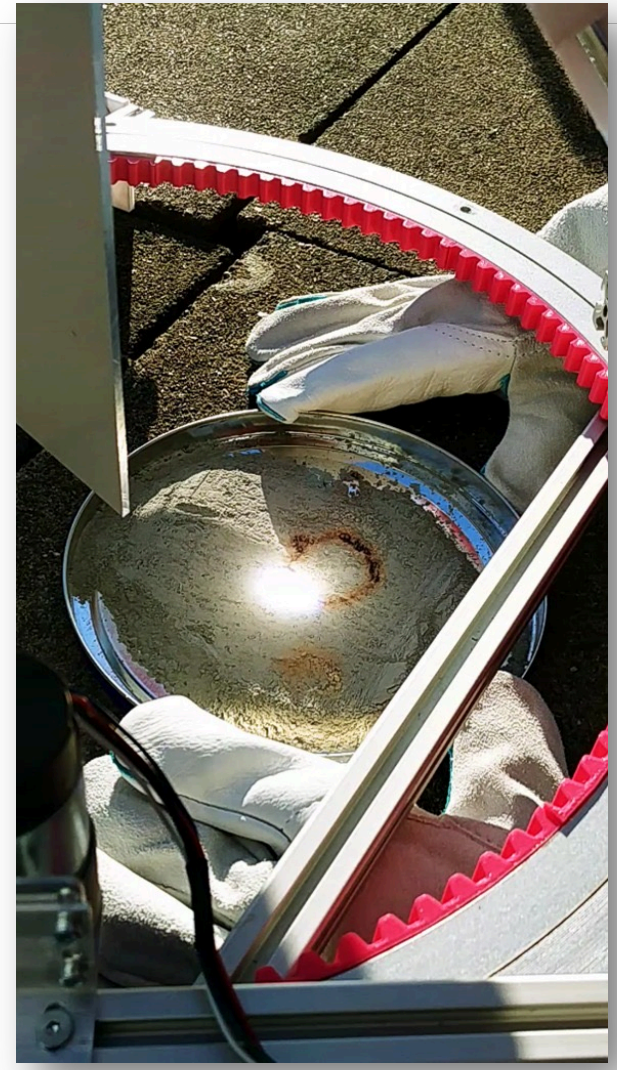




# SOLAR – Sintering Of LunAr Regolith







# SOLAR – Sintering Of LunAr Regolith









# SOLAR – Sintering Of LunAr Regolith





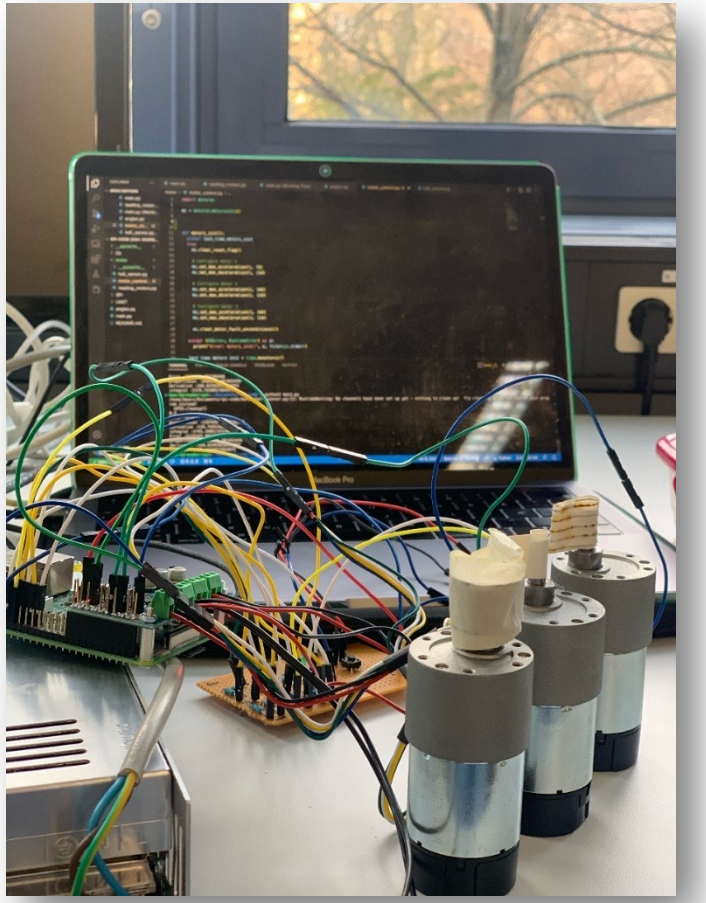


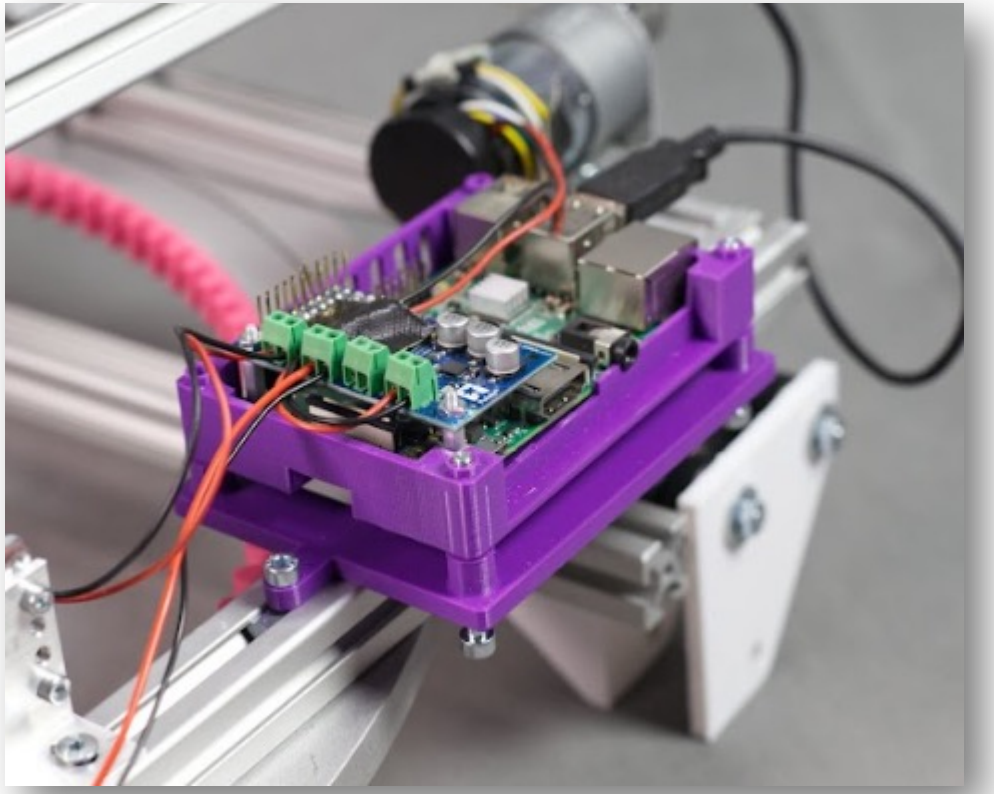


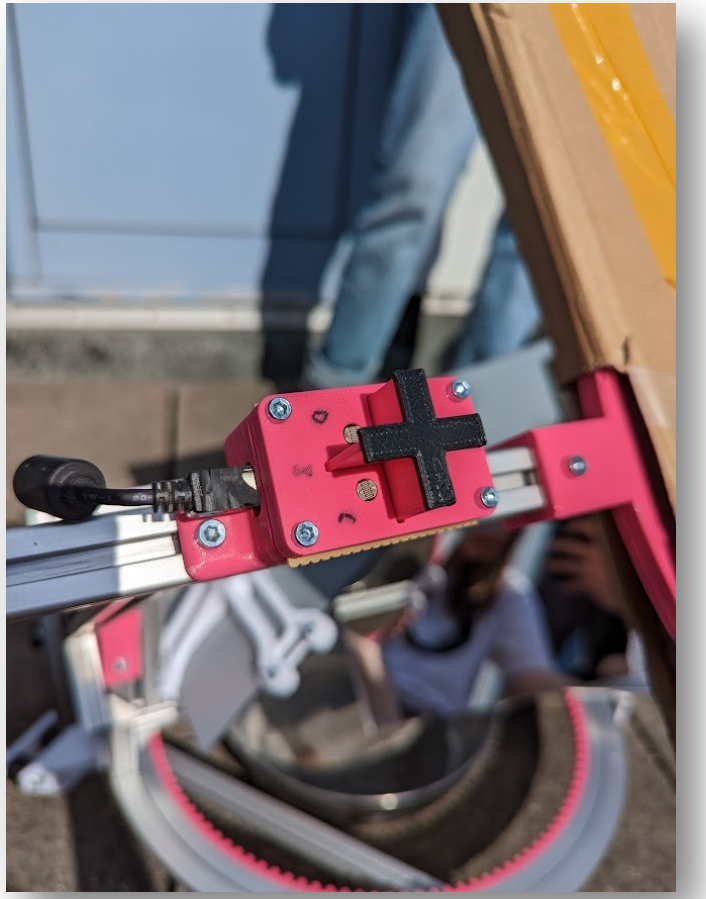
# SOLAR – Sintering Of LunAr Regolith

*Was steckt da alles drin?*

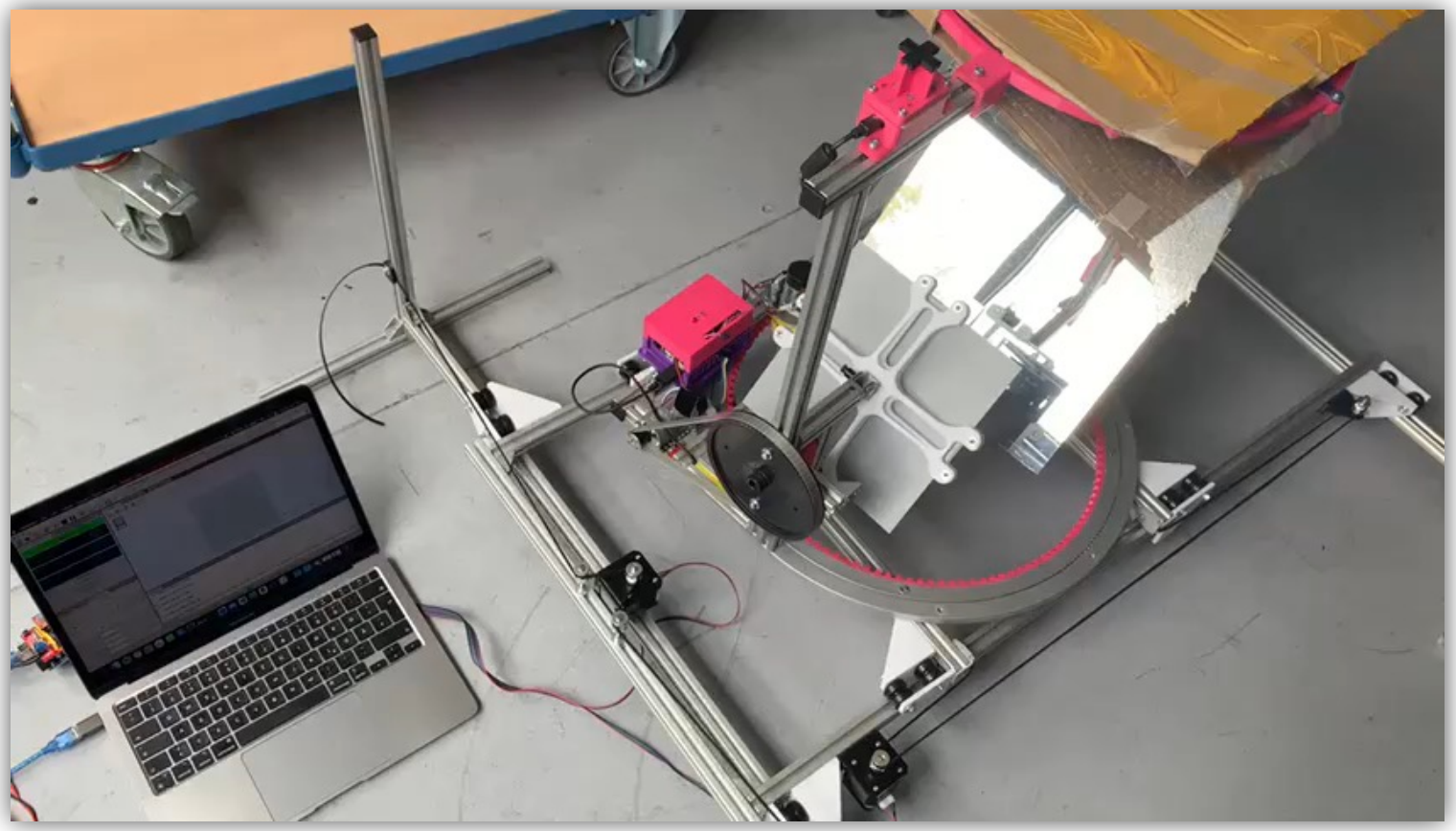
# SOLAR – Sintering Of LunAr Regolith







# SOLAR – Sintering Of LunAr Regolith





# Robotics

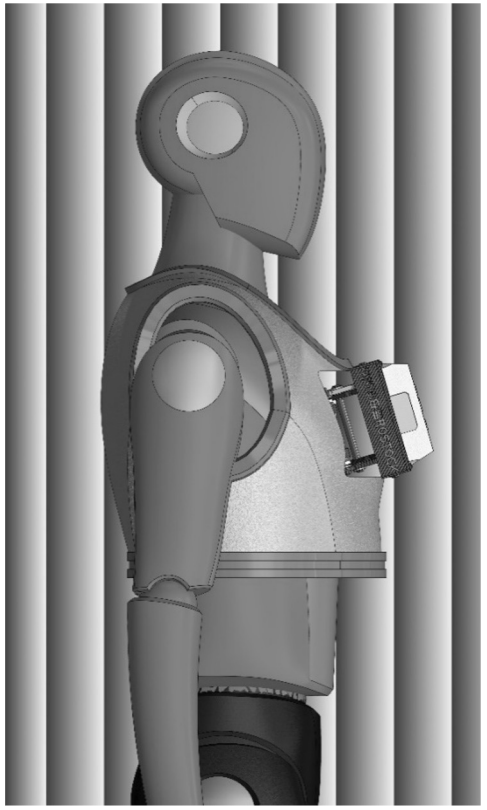
## SOLAR

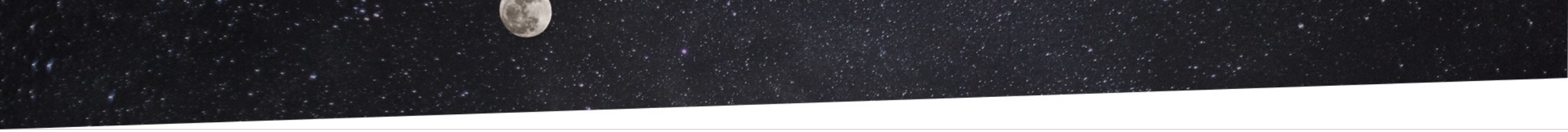


## RoBro



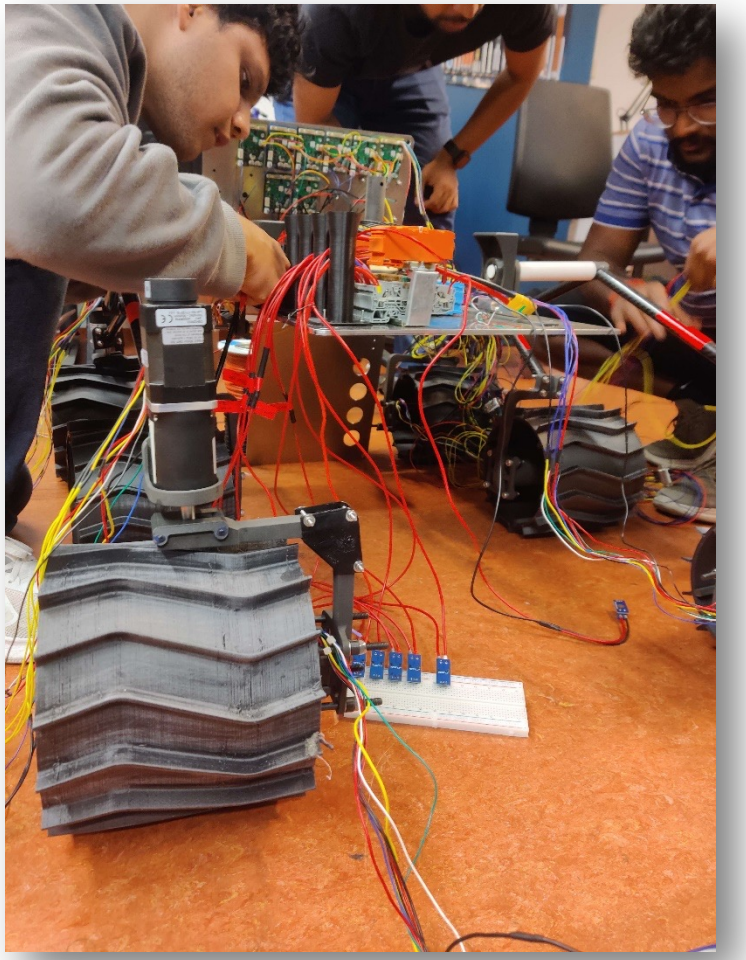
## LARS





# RoBro?

# RoBro



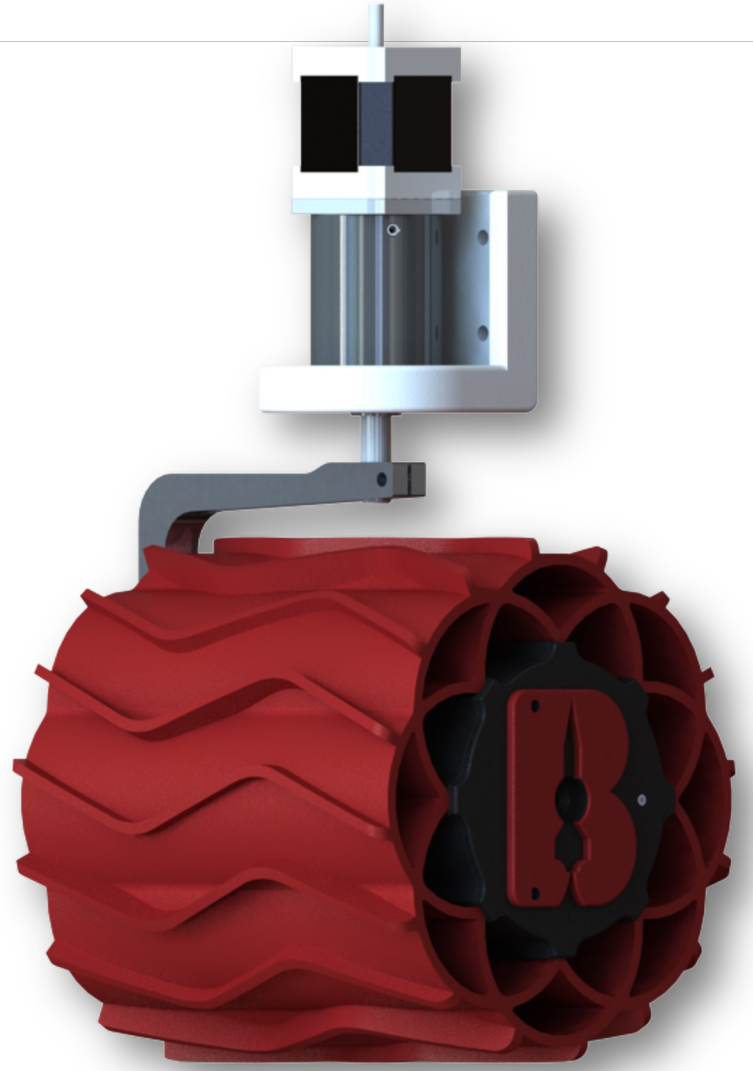
ERC
EUROPEAN ROVER CHALLENGE

2023

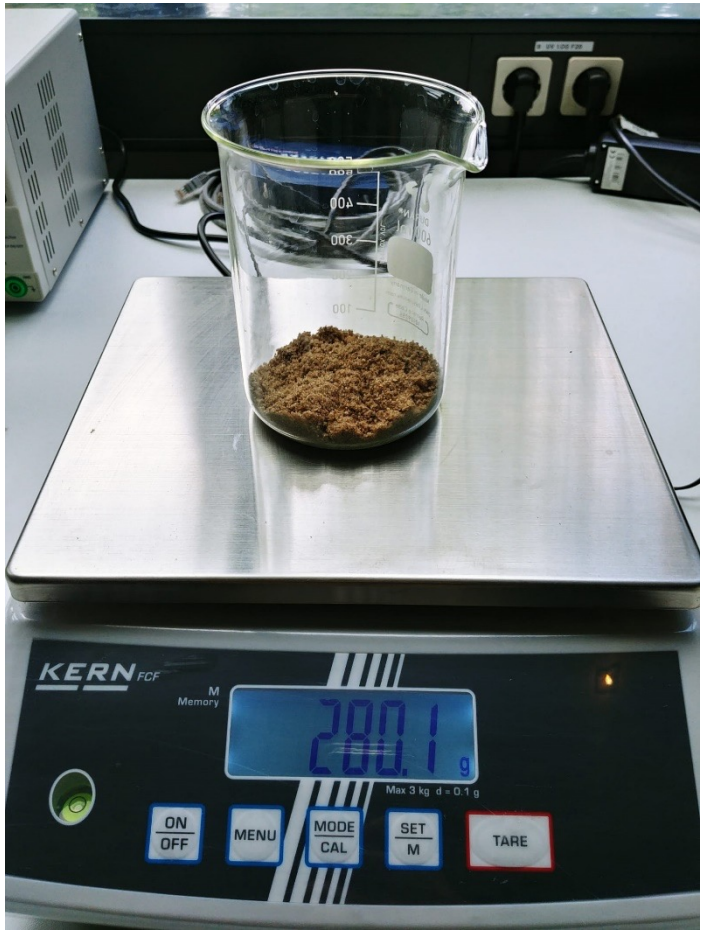


# RoBro



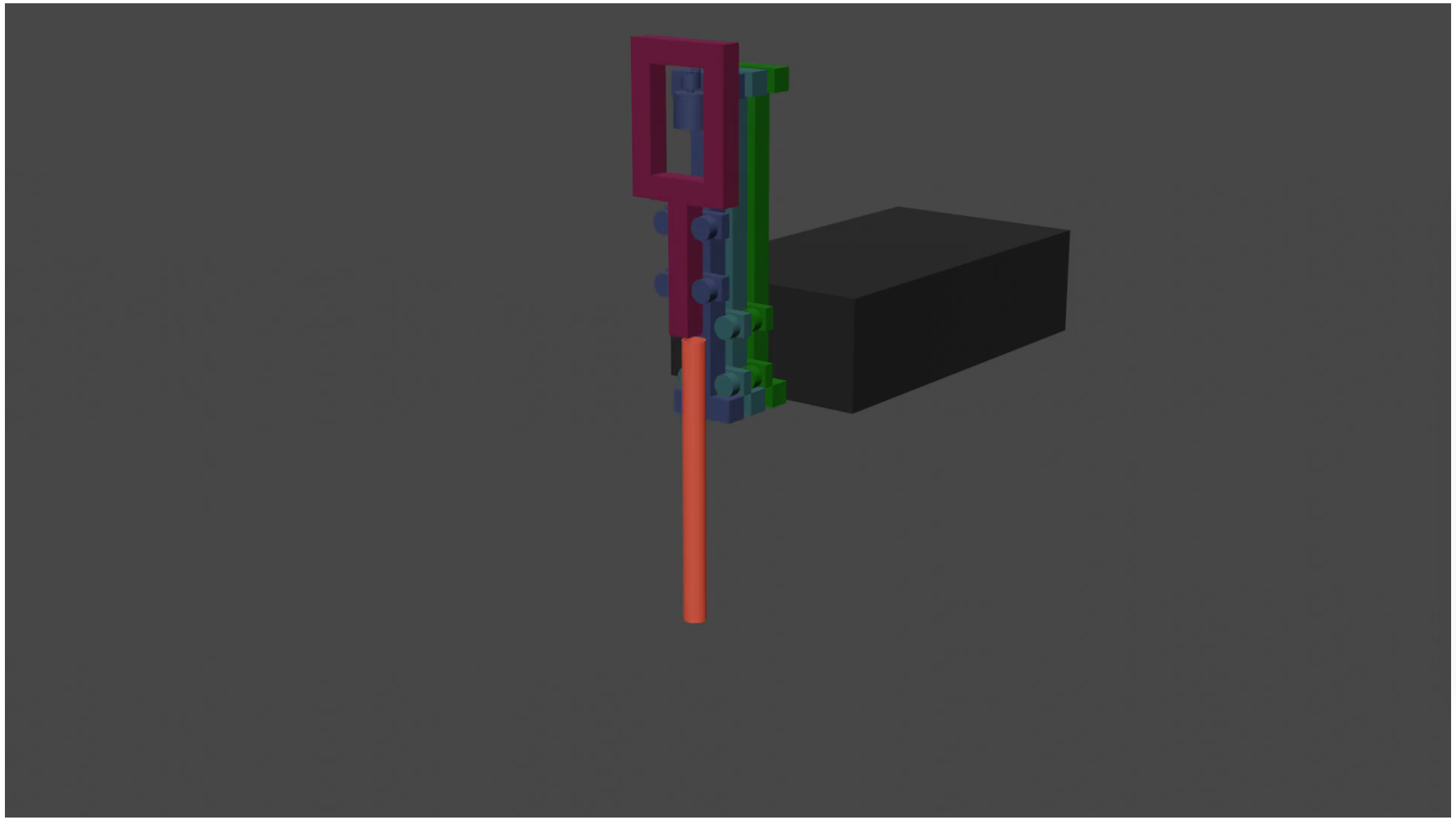




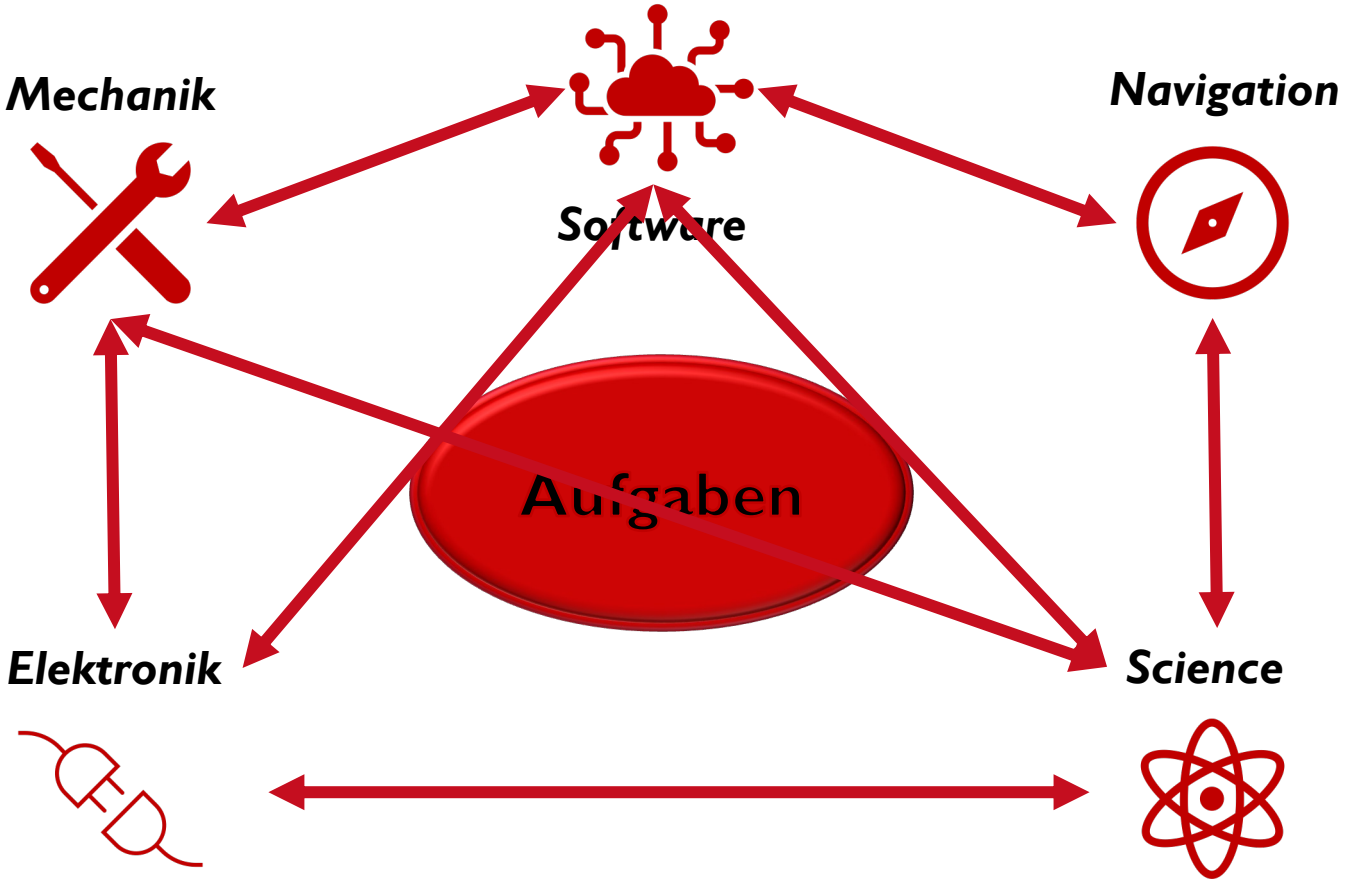

KERN FCF
M
Memory
280.1 g
Max 3 kg d = 0.1 g
ON OFF
MENU
MODE CAL
SET M
TARE



# RoBro





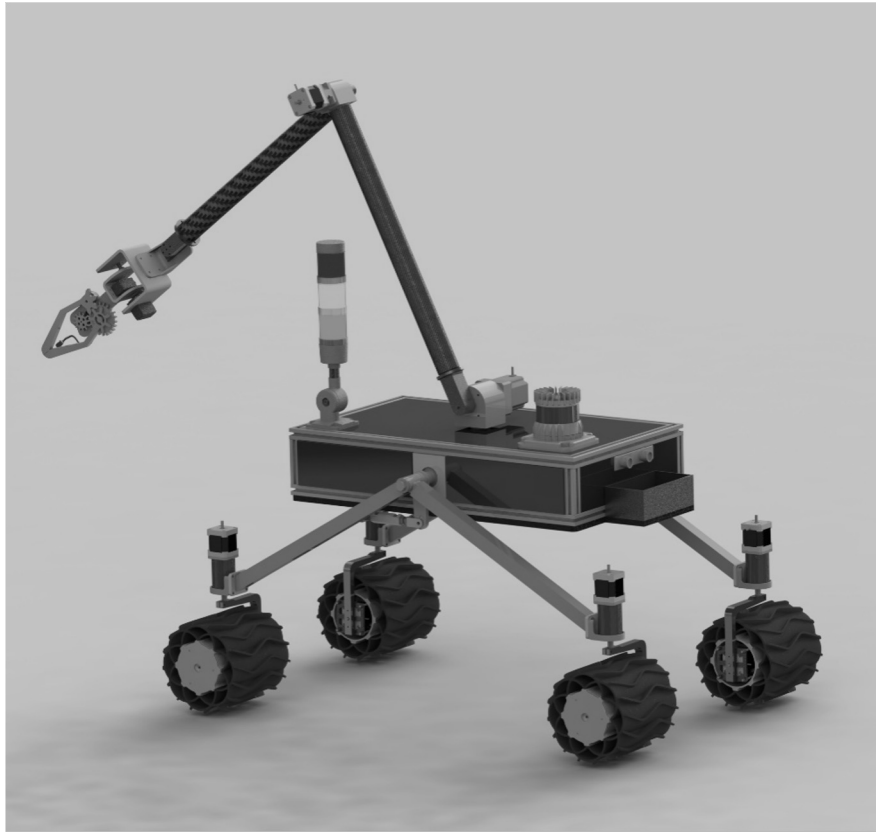

Mechanik
Software
Navigation
Aufgaben
Elektronik
Science

# Robotics

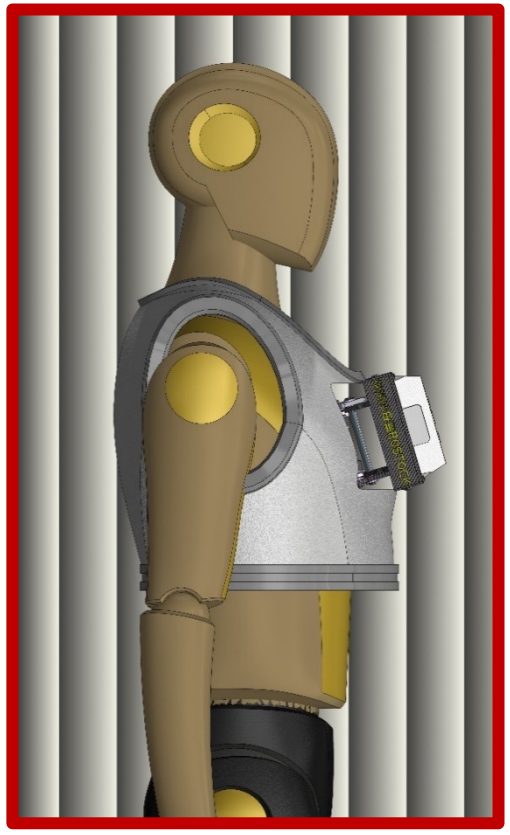
## SOLAR



## RoBro



## LARS



# LARS – Lunar Astronautic Revival System



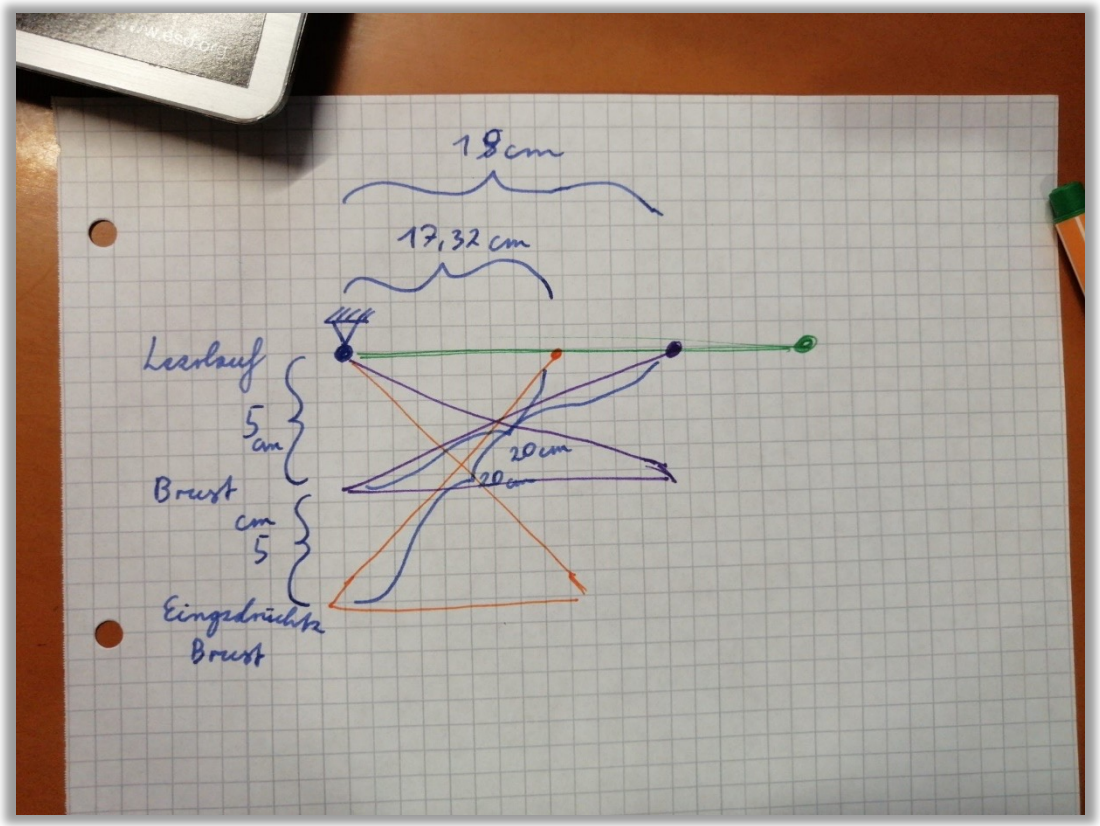
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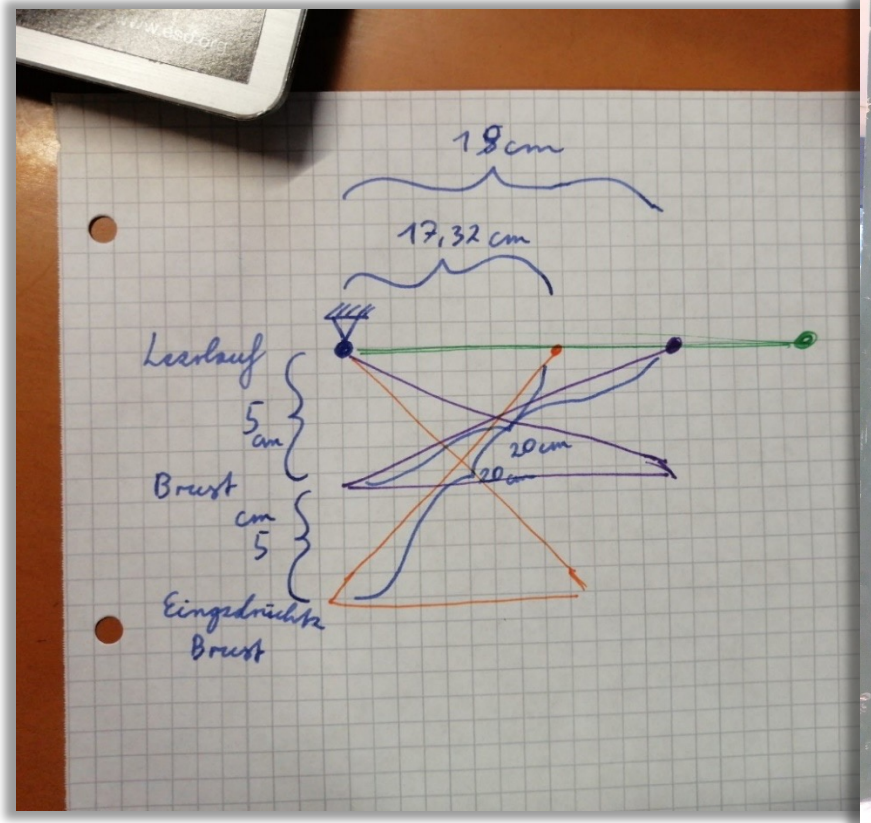

***Asclepios***

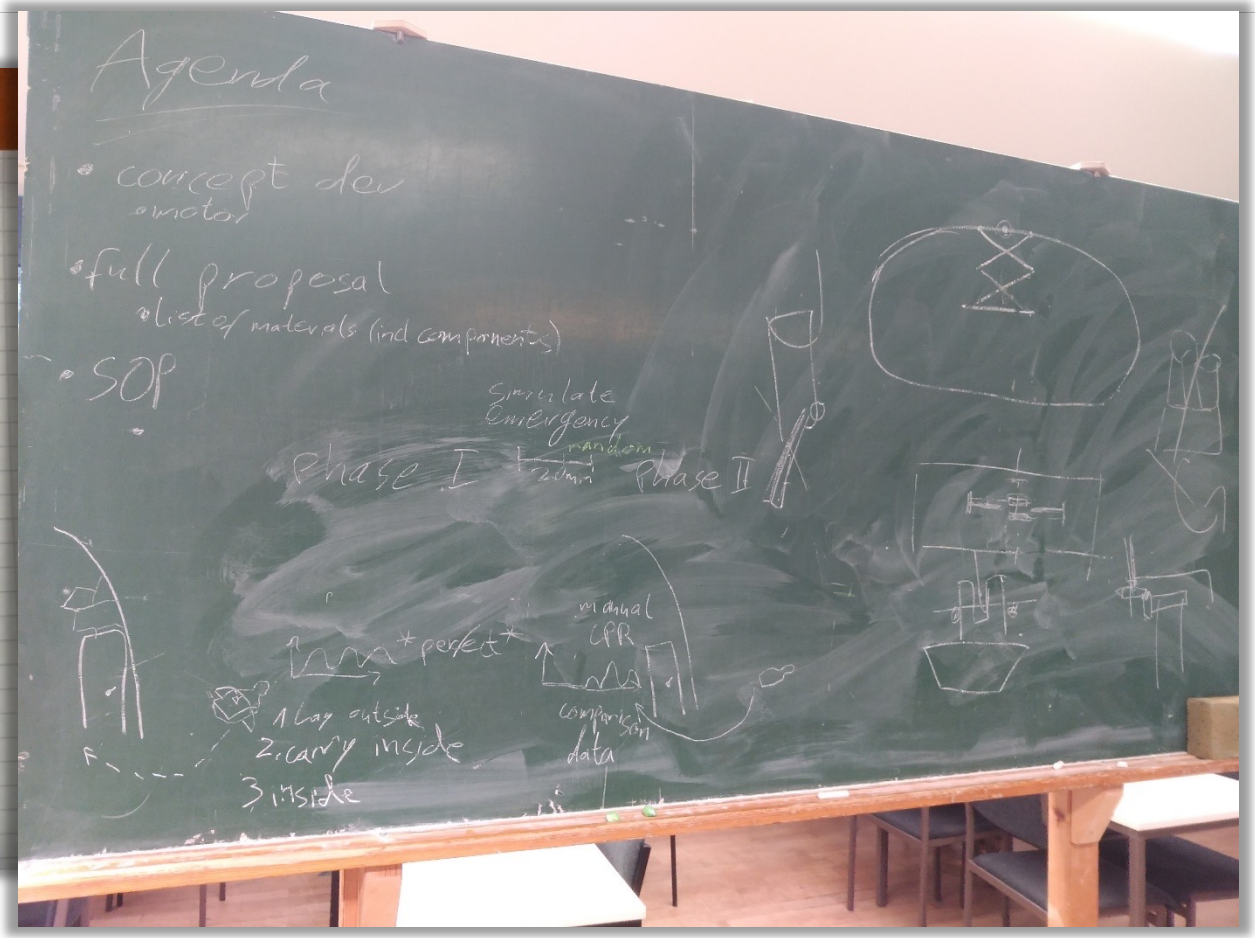
***Analoge Mond Mission***
***Von Studenten organisiert***

# LARS – Lunar Astronautic Revival System

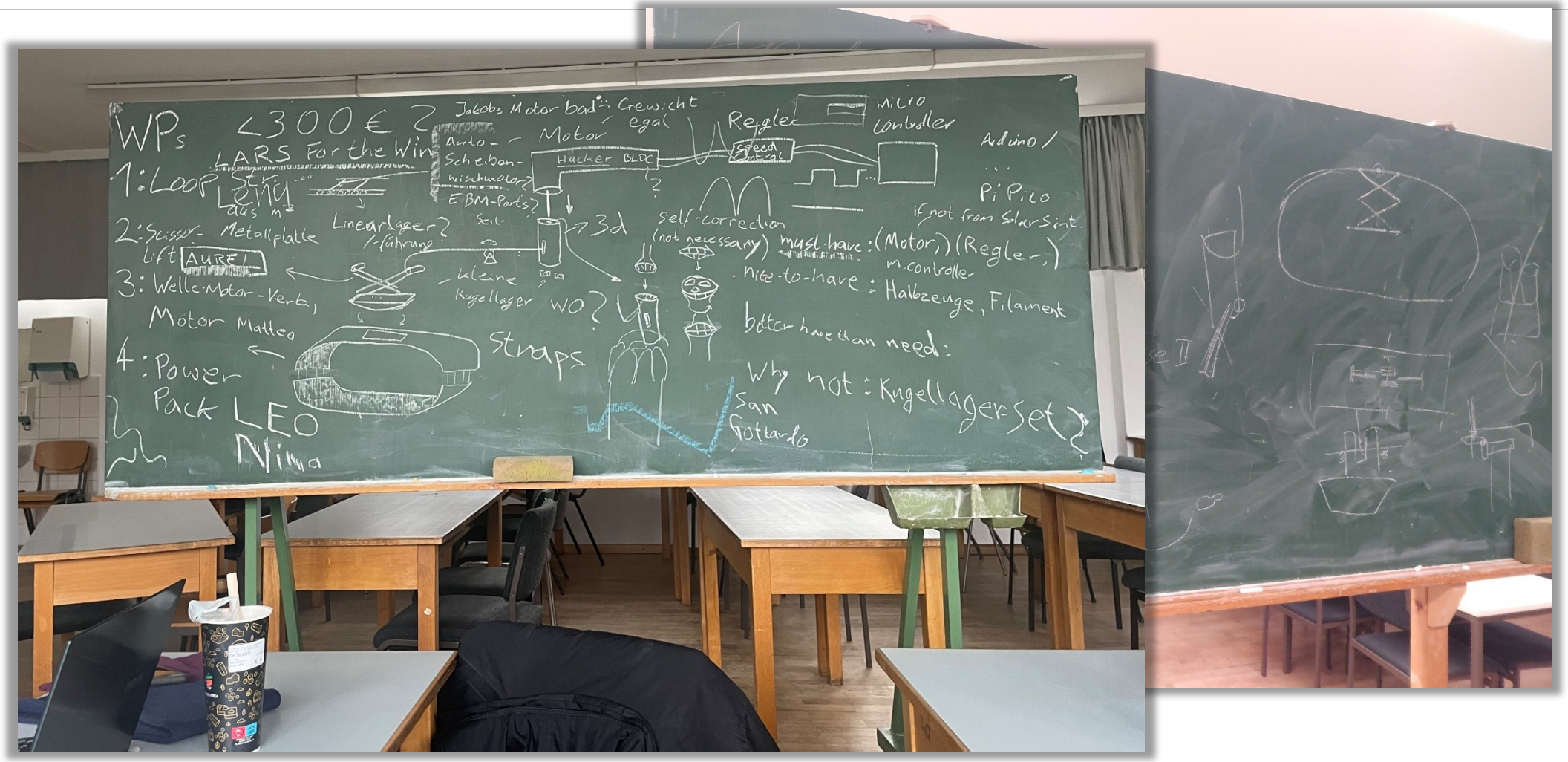


# LARS – Lunar Astronautic Revival System

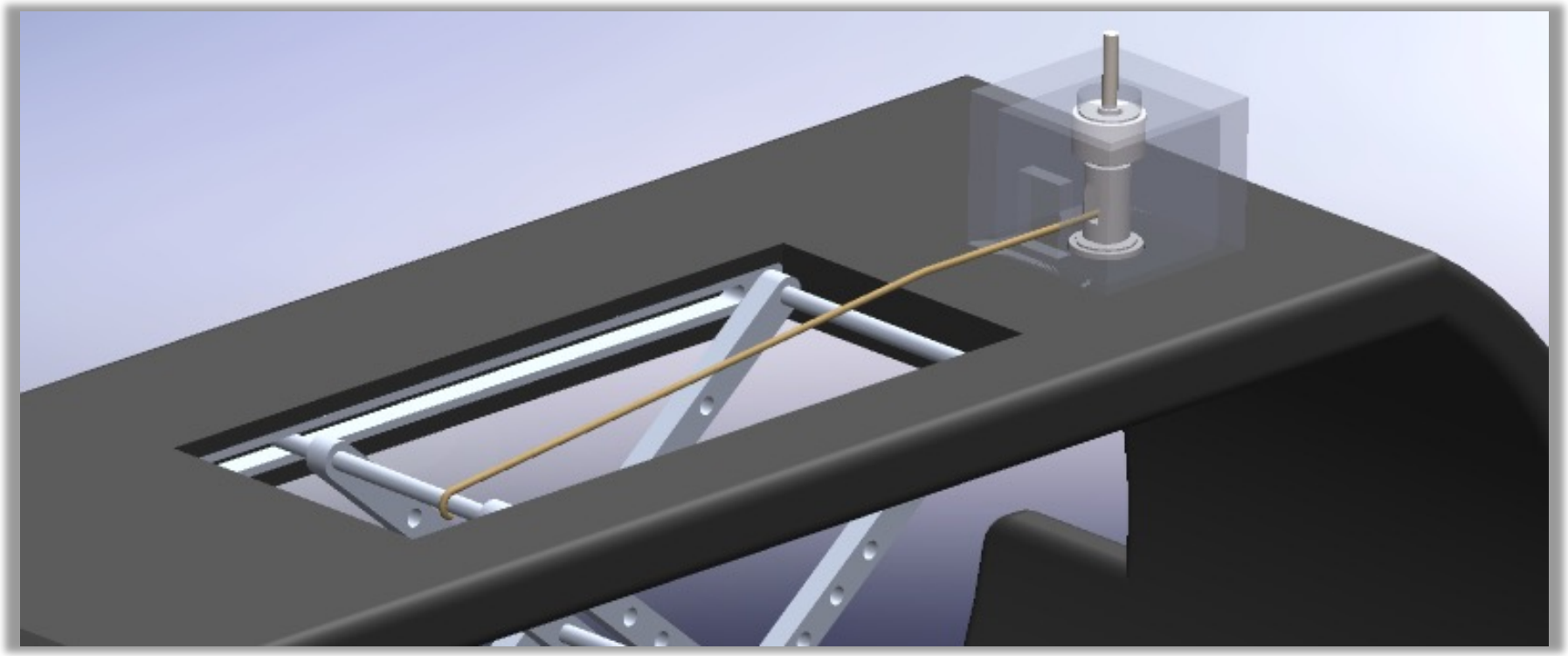


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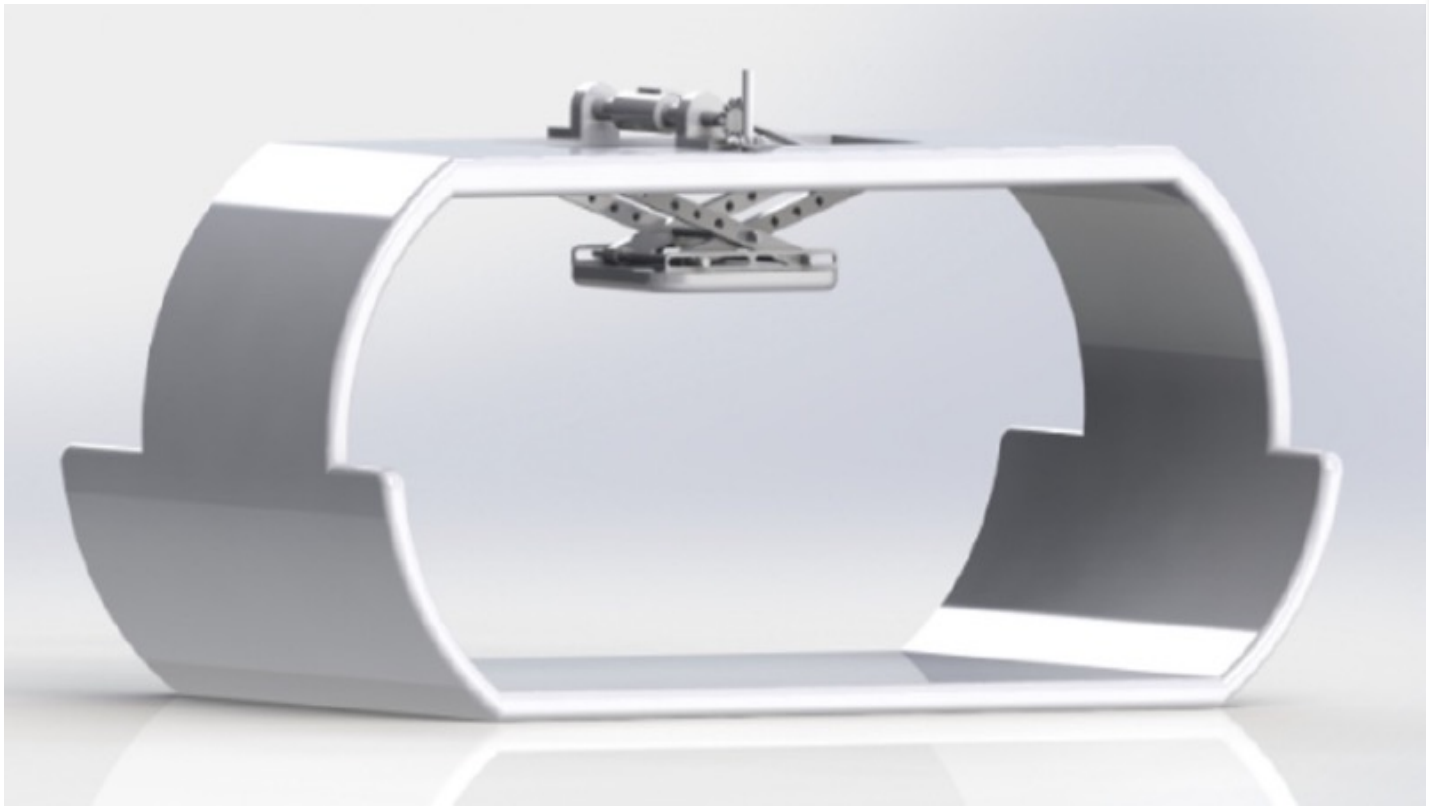


# LARS – Lunar Astronautic Revival System



***Erste CAD Modelle***

# LARS – Lunar Astronautic Revival System



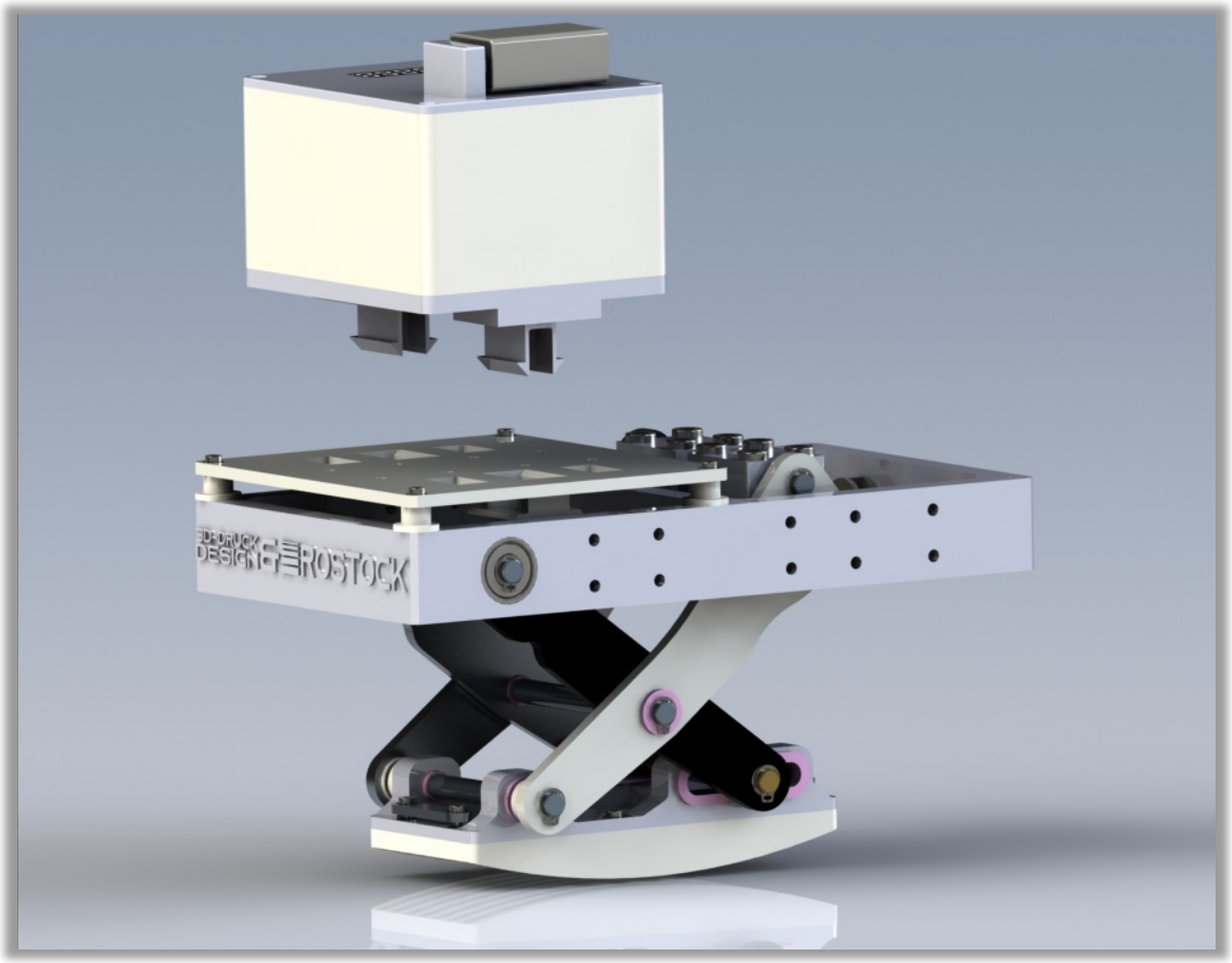


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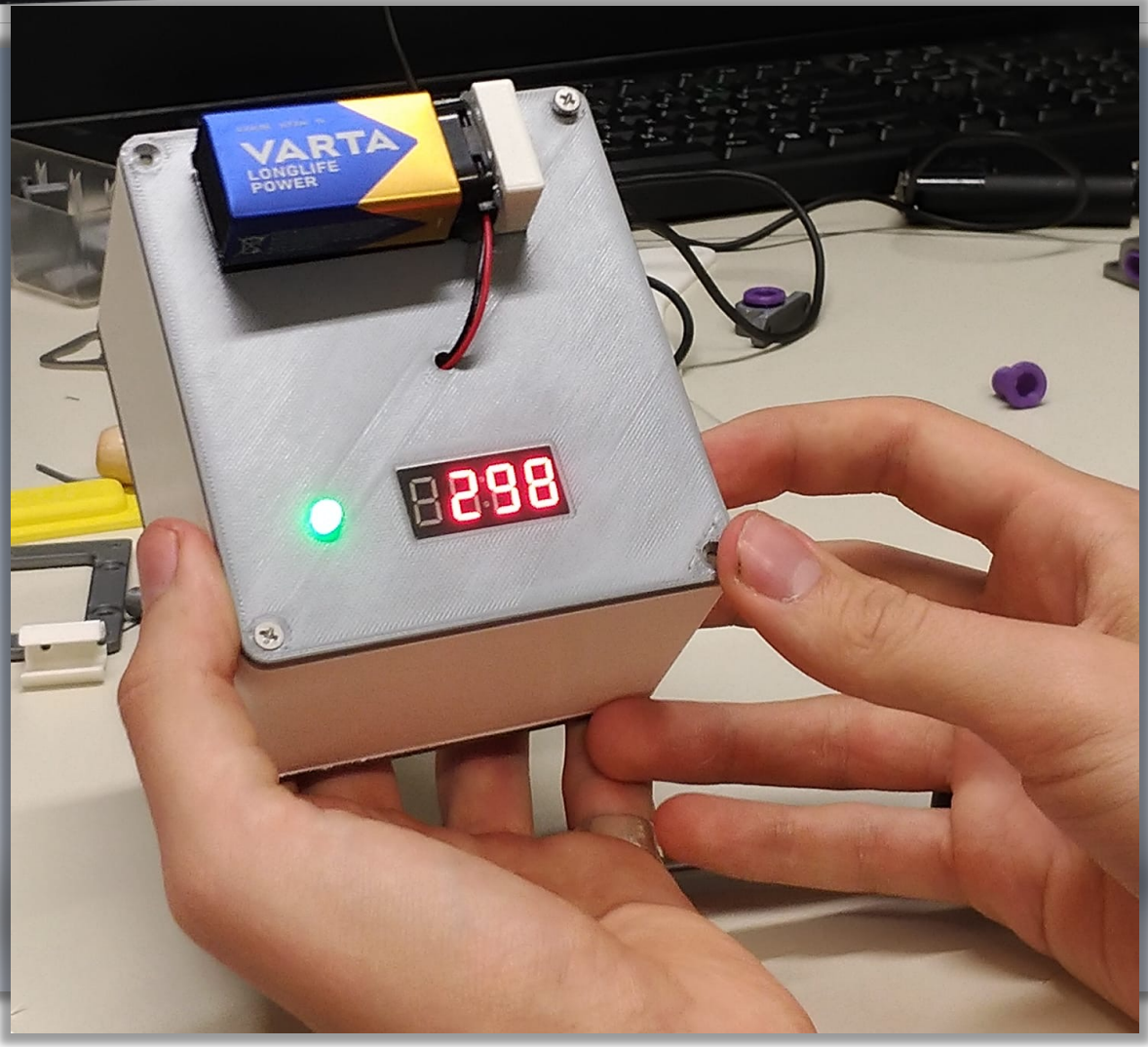

***Das Team***

# LARS – Lunar Astronautic Revival System



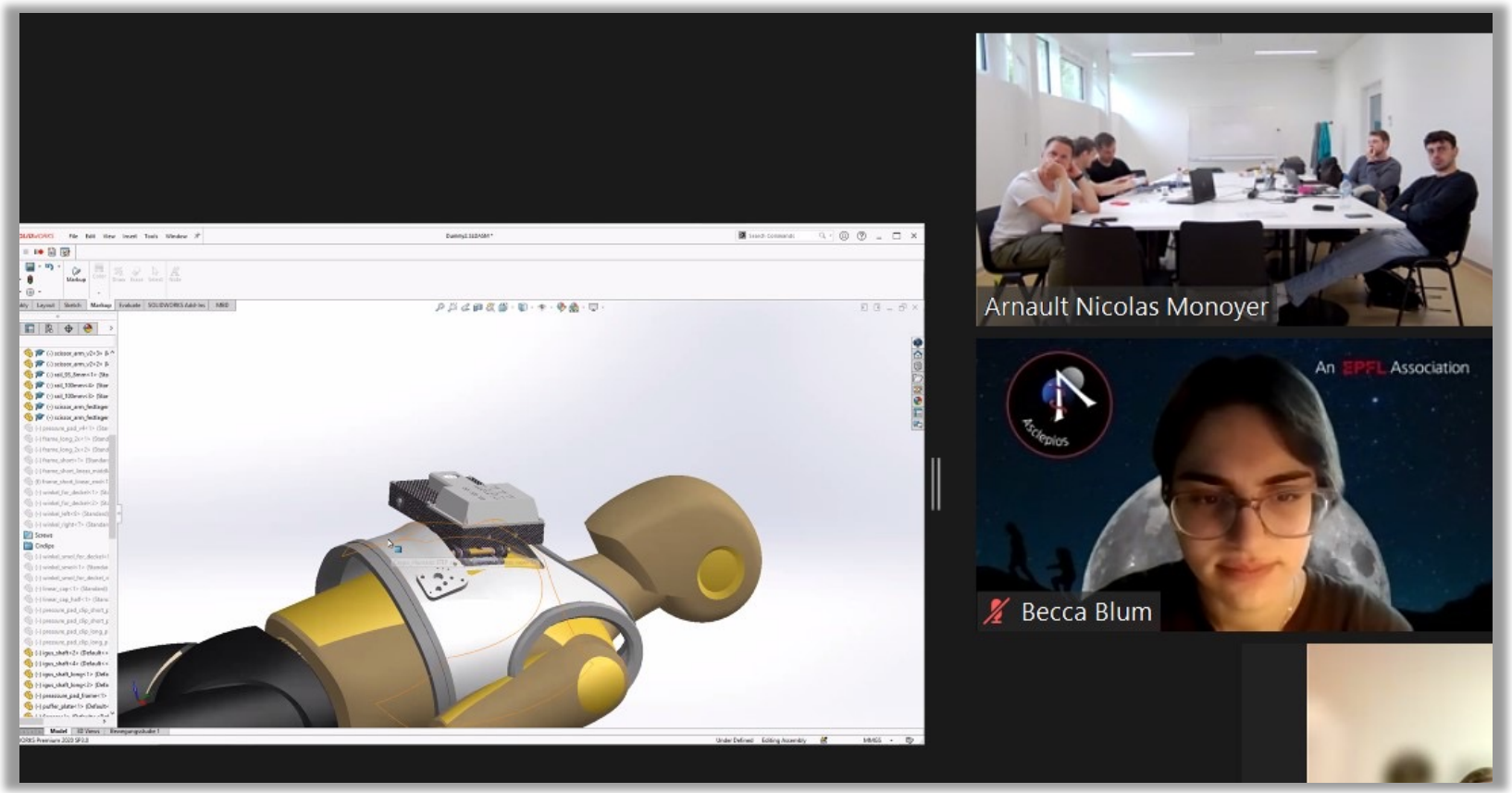

***Erster Prototyp***

# LARS – Lunar Astronautic Revival System




***Erster Prototyp***

# LARS – Lunar Astronautic Revival System



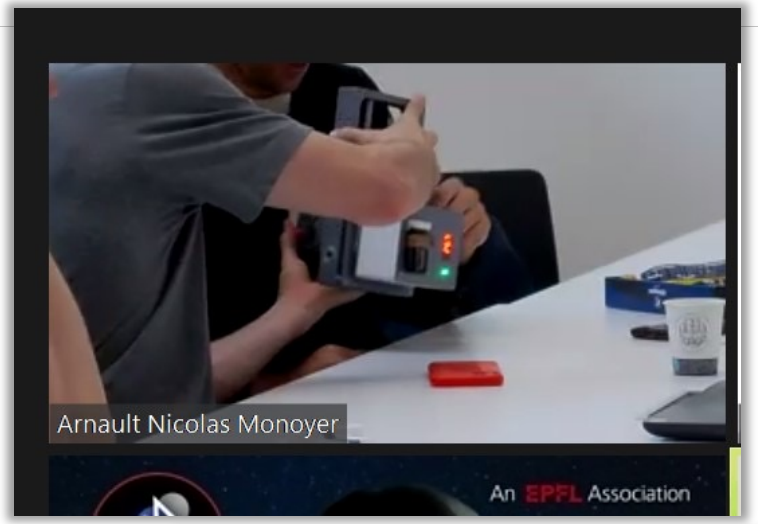

***Besprechung mit Analog-Astronauten***

# LARS – Lunar Astronautic Revival System













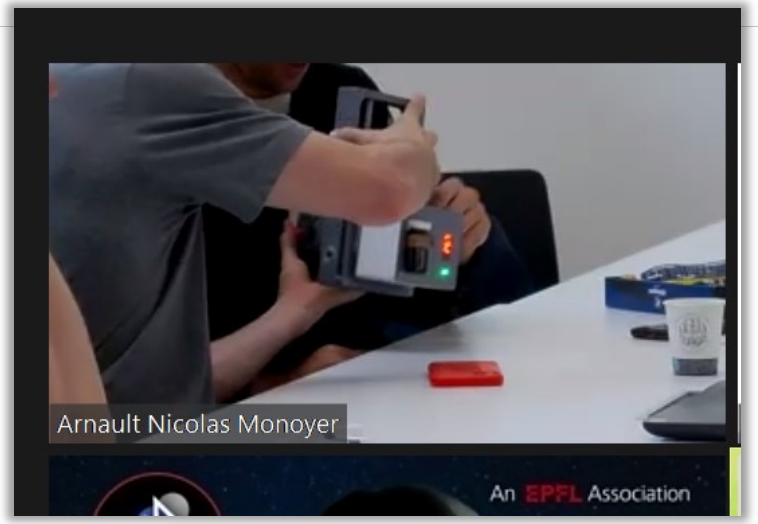
***Besprechung mit Analog-Astronauten***

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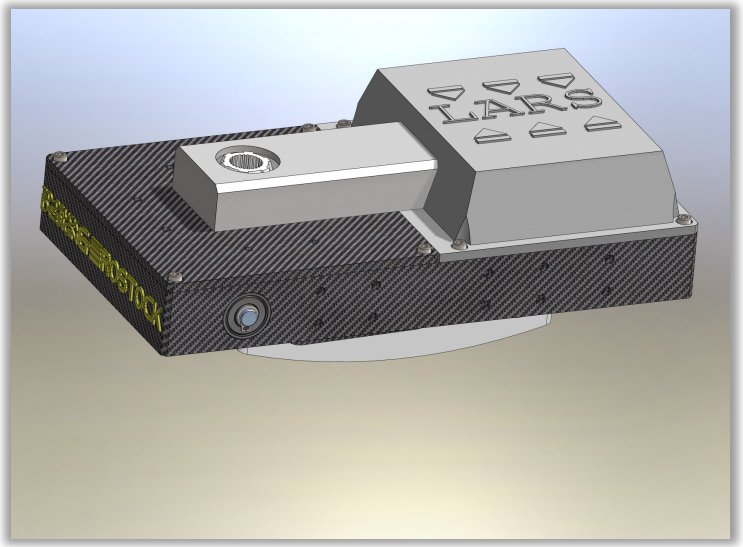


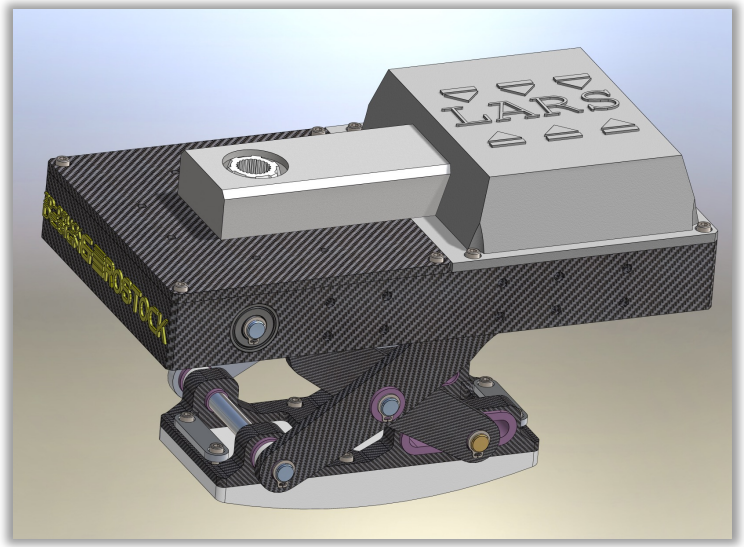




***Besprechung mit Analog-Astronauten***

# LARS – Lunar Astronautic Revival System

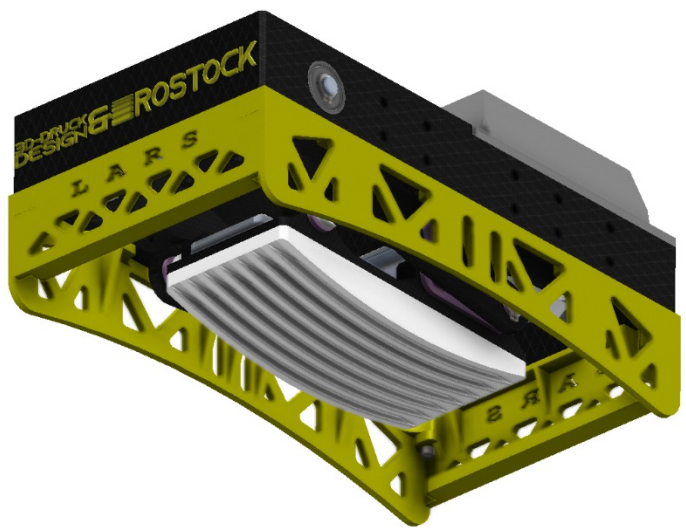


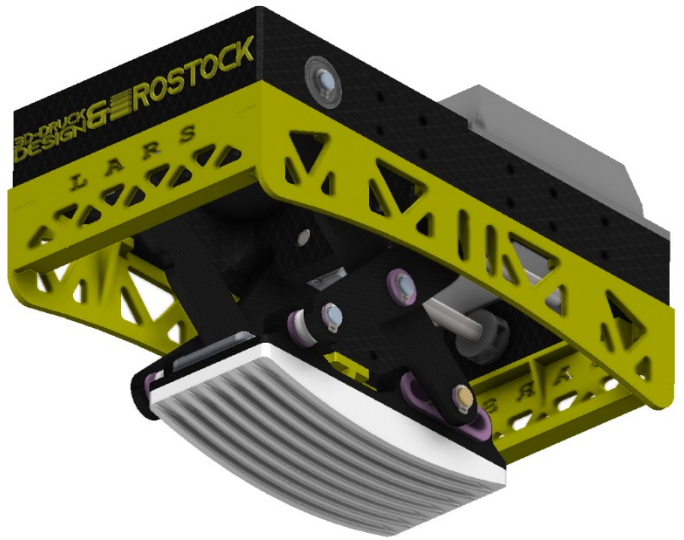



# LARS – Lunar Astronautic Revival System

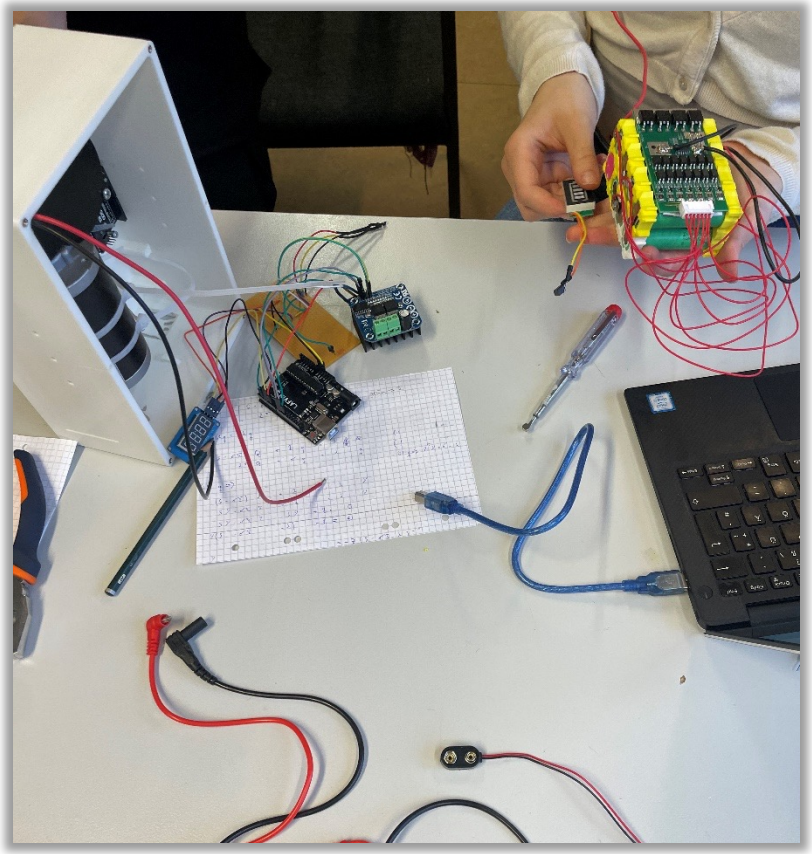
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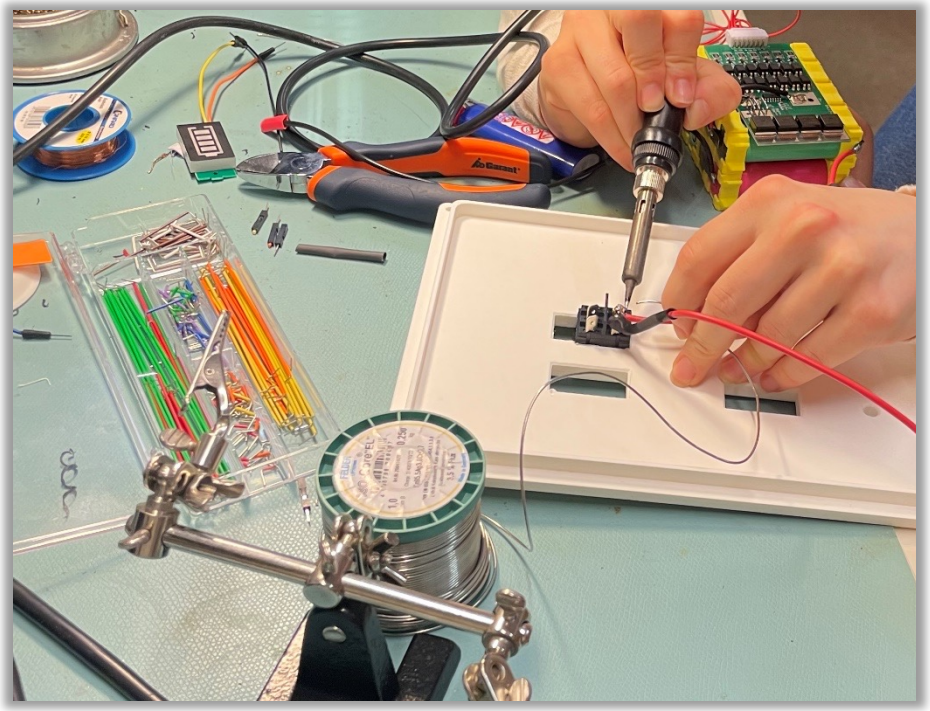


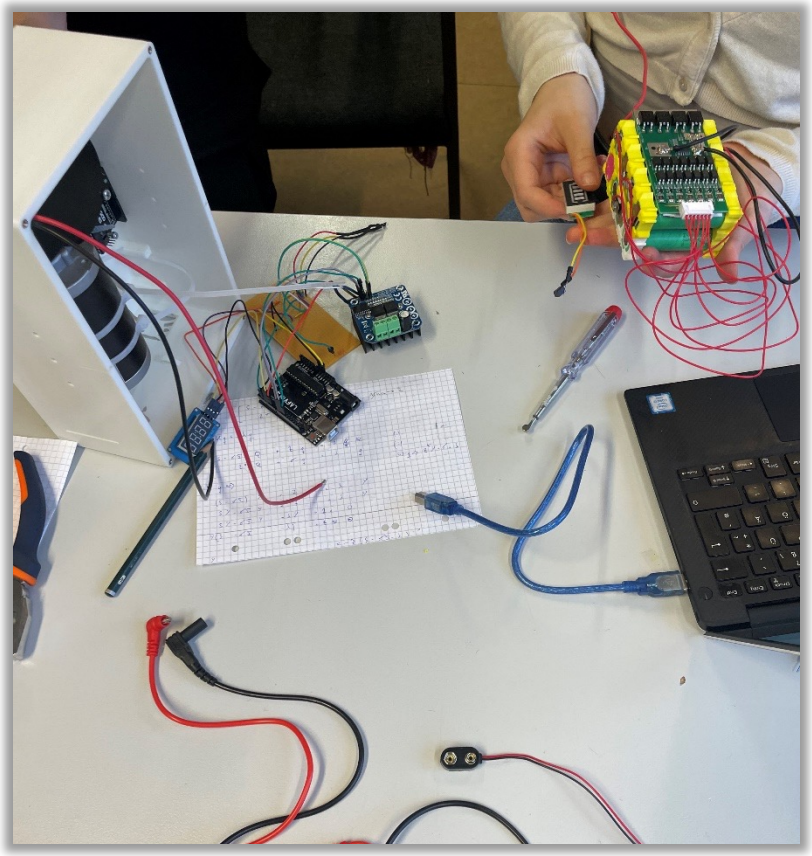
# LARS – Lunar Astronautic Revival System

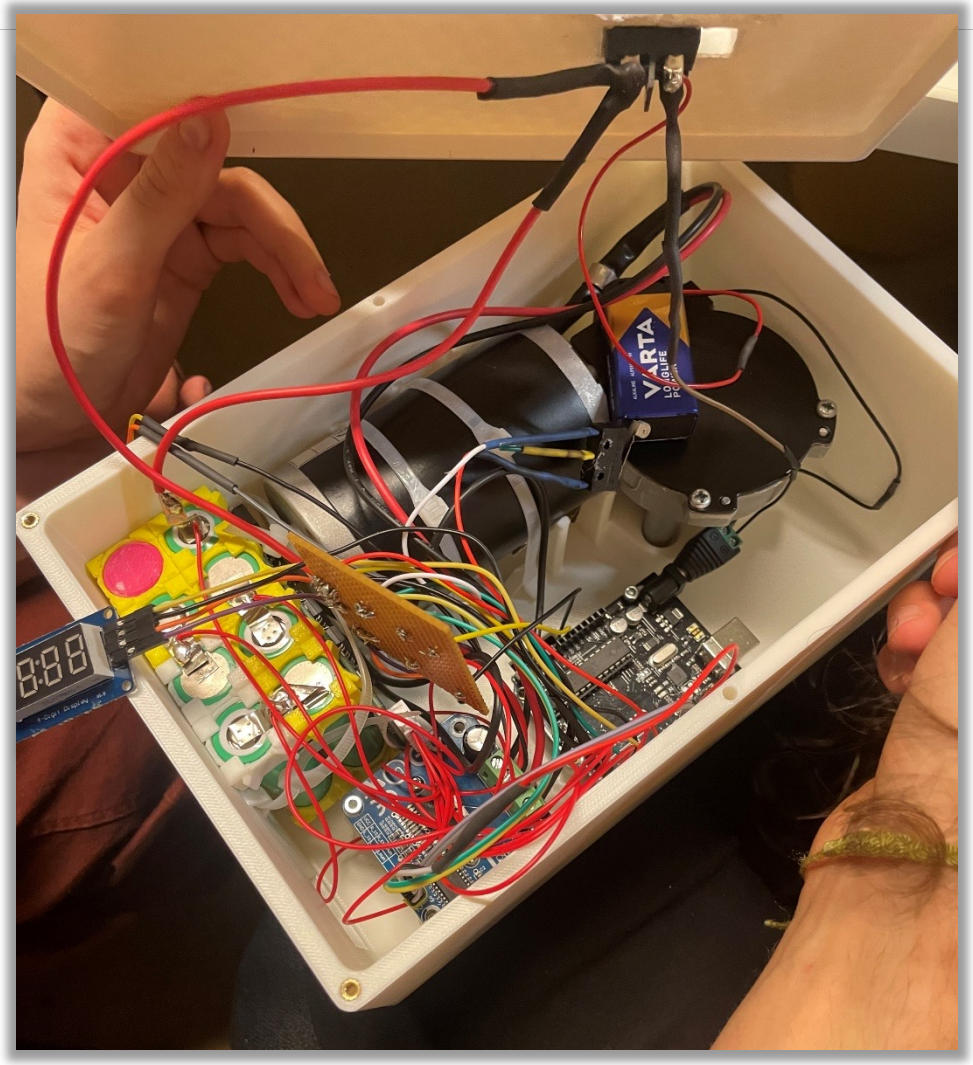




## Zusammenbau

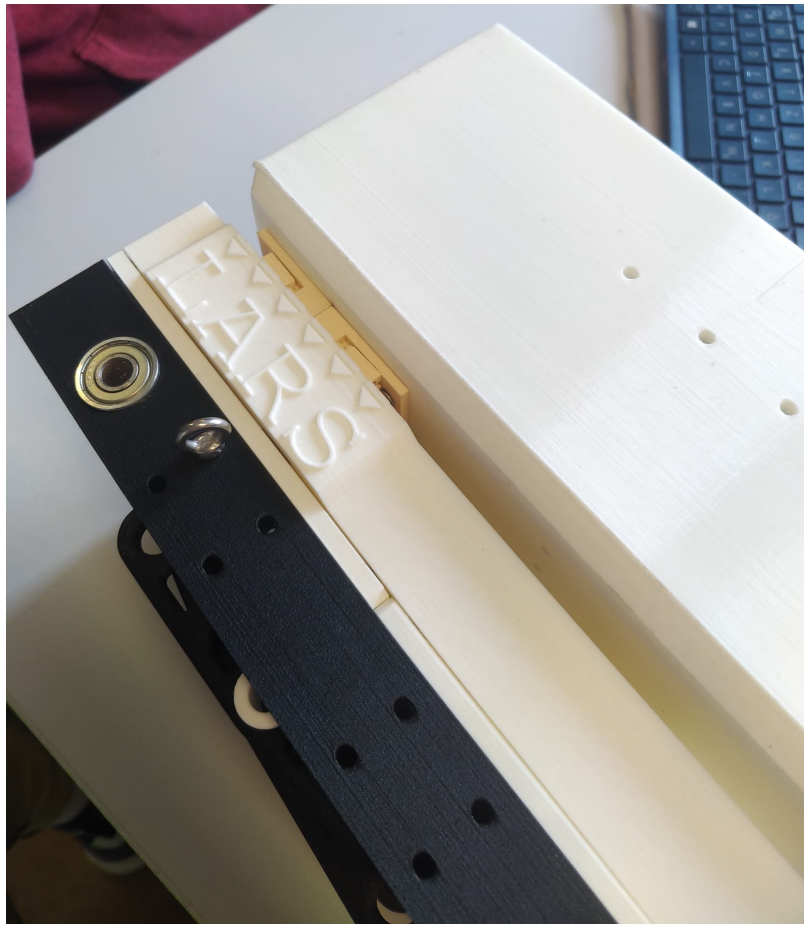
# LARS – Lunar Astronautic Revival System

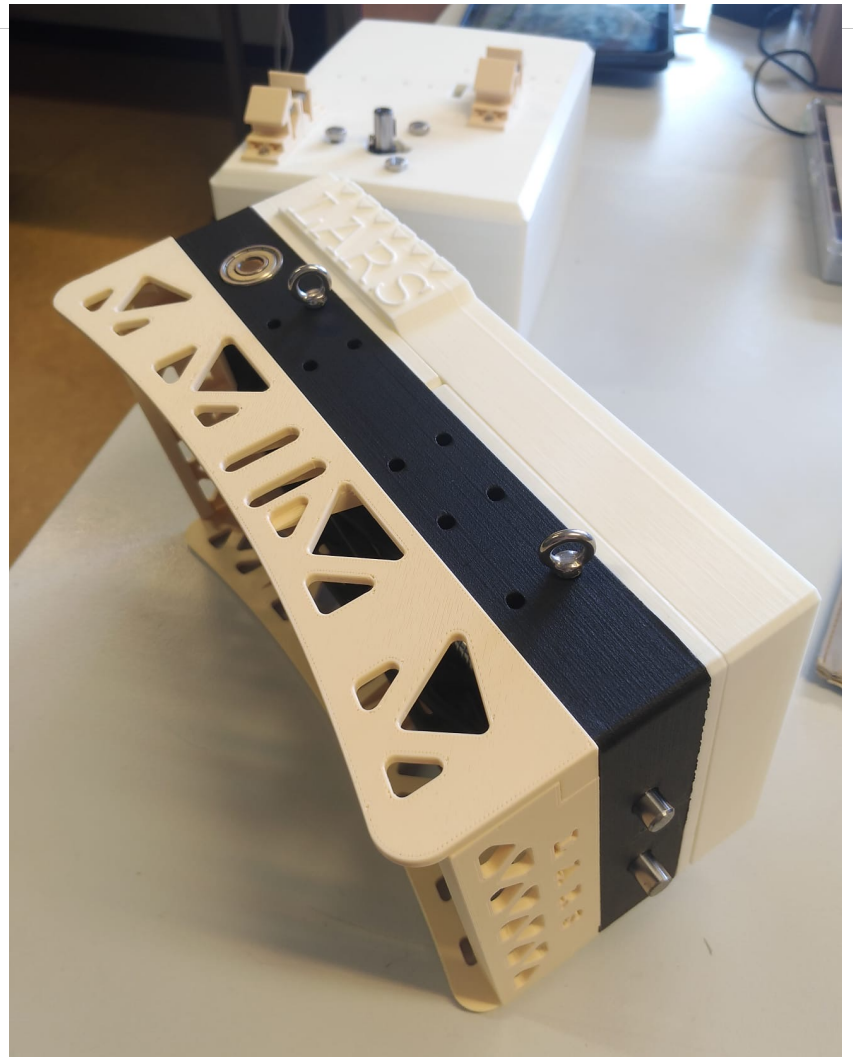




## Zusammenbau

# LARS – Lunar Astronautic Revival System




**Zusammenbau**

# LARS – Lunar Astronautic Revival System




***Asclepios-Mission:***
***13.07.-29.07.***

# Science & Experiments

## *CAREER*



## *Cold Gas*



# Science & Experiments

## *CAREER*



## *Cold Gas*



# CAREER

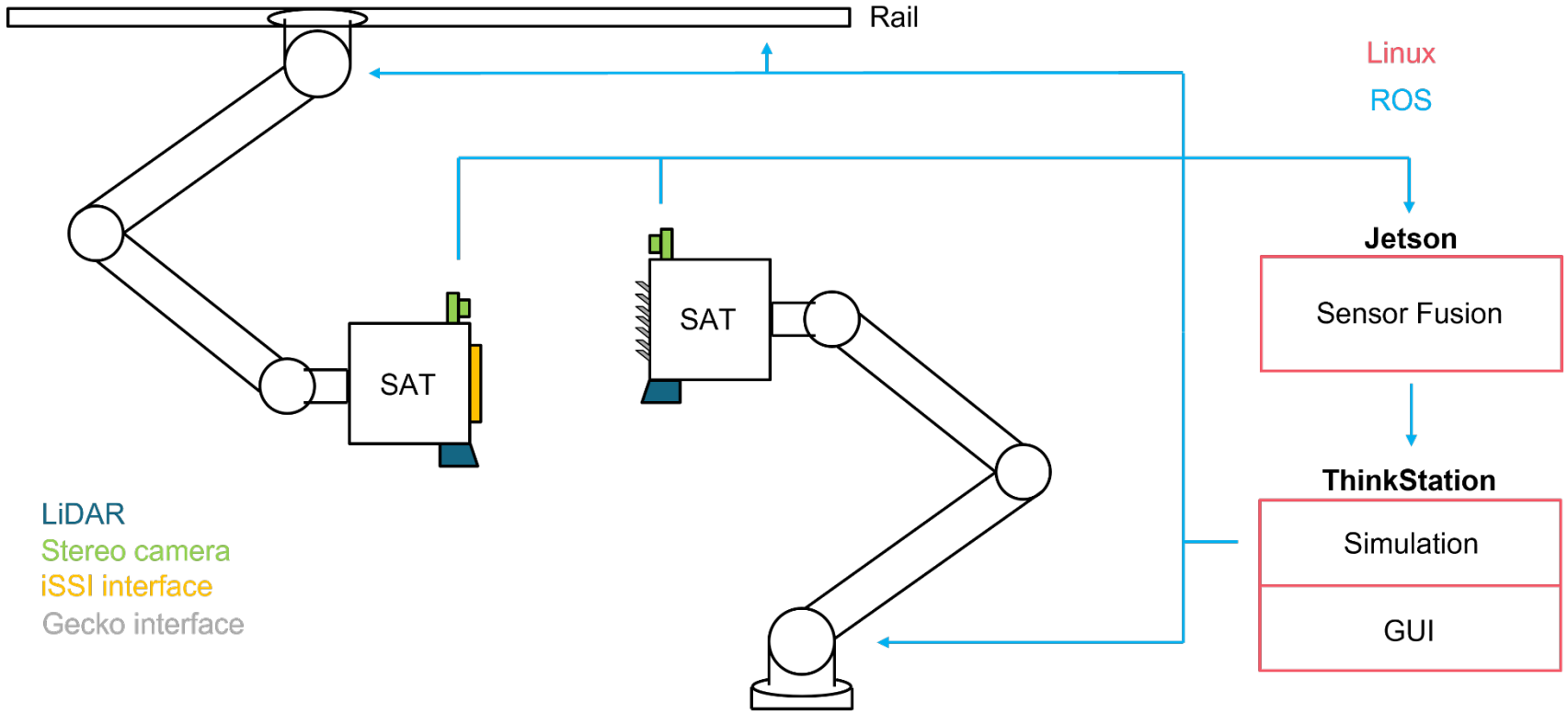


***CAREER** - CubeSat-Robotic Environment for Educational Research*

# CAREER

**Untersuchung und praktische Erprobung verschiedener Rendezvous und Docking (RVD) Konzepte für Anwendungen mit Kleinsatelliten**

- Betrachtung von  kooperativen und nicht kooperativen Zielen
- Kooperation mit dem Fachgebiet Raumfahrttechnik (FG RFT)



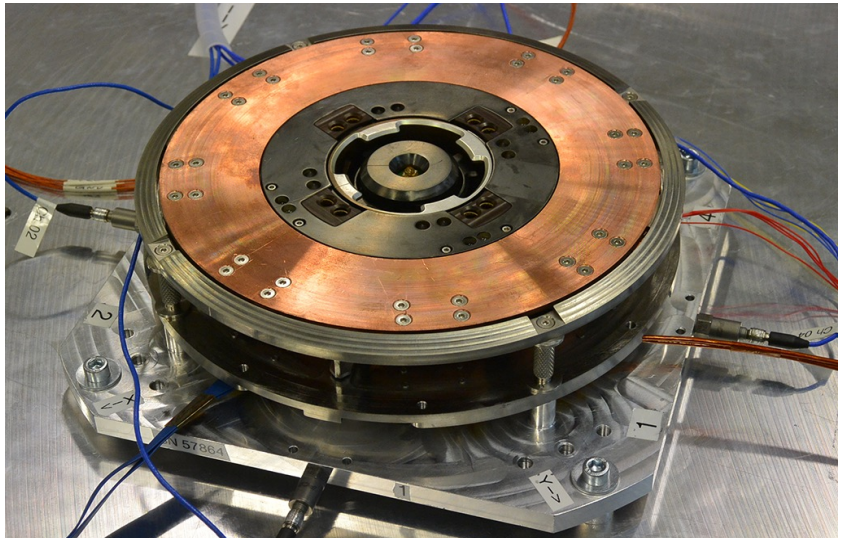

Schematische Darstellung der robotischen Testumgebung [FG RFT]

## *Entwicklung eines **Testbeds***

- 2 Roboterarme UR10e mit Endeffektoren (LiDAR, Stereo Kamera, ISSI-Schnittstelle & Gecko-Schnittstelle)
- OBC: NVIDIA Jetson AGX Orin
- Framework: ROS1 Noetic

## *Kooperatives Docking*

- *iSSI-Schnittstelle bietet mechanische elektrische & thermale Verbindung*
- *Hohe Anforderungen an Bahn- und Lageregelung*
  *→ Entwicklung geeigneter Algorithmen*



## *Nicht-kooperatives Docking*

- *Aktives Docking durch „Chaser“ an taumelndes Target*
- *Gecko Material am Endeffektor des Chasers*
- *Untersuchung Andockverhalten bei verschiedenen Kontaktflächen*



# Science & Experiments

## *CAREER*



## *Cold Gas*



# Cold Gas

## Projekt „Cold gas“:



**Entwicklung** eines „**attitude determination and control**“ Systems zur **Rollkontrolle**, um **Längsachse** zur **Stabilisierung** der **Kameraaufnahmen** beim Start



# Cold Gas

## Projekt „Cold gas“:

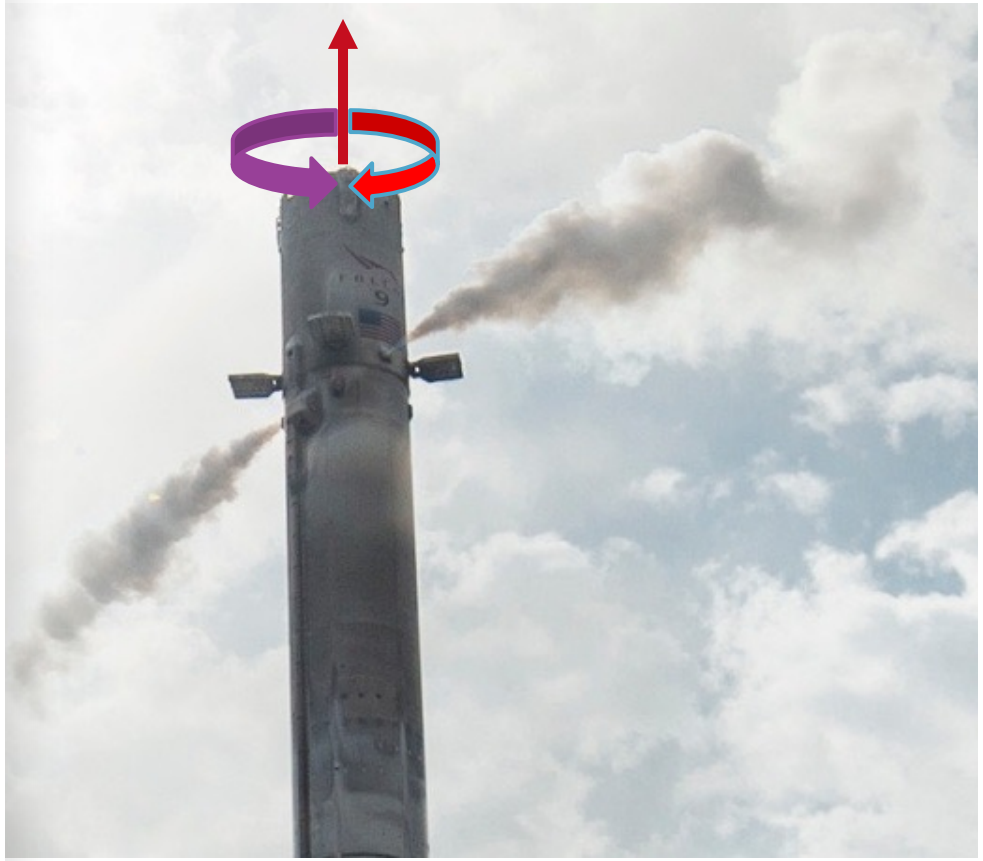
**Projektaktivitäten:** *Fluid-System-Design, Mikro-controllerprogrammierung, Zusammenbau und Tests*



# Cold Gas

## Projekt „Cold gas“:

**Langzeit-Ziel:** *Eine weiterentwickelte Version des Systems soll bei einer* ***Satellitenmission*** *des RFT* ***getestet*** *werden.*

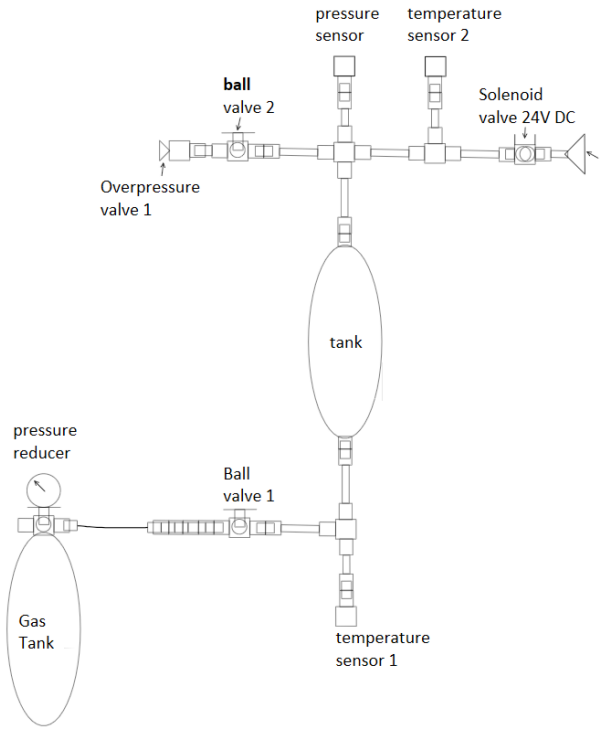


# Cold Gas

## Projekt „Cold gas“ - Roadmap:

### Stage I

(Düsen Teststand)




### Stage II

(Rotations Teststand)

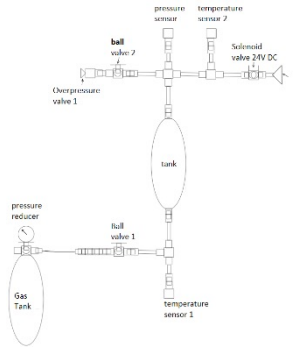


Fluidsystem mit Magnetventilen

Kugellager

# Cold Gas

## Projekt „Cold gas“ - Roadmap:

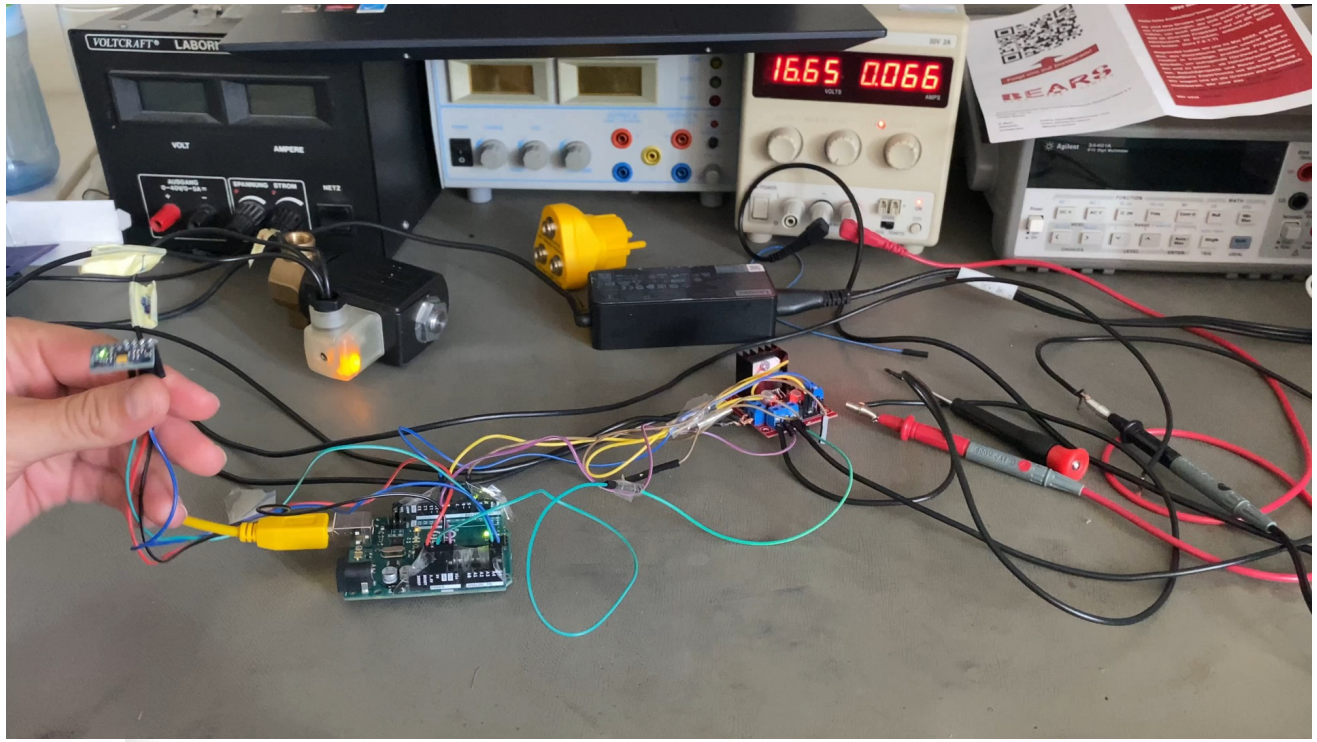
| | Stage I (Düsen Teststand) | Stage II (Rotations Teststand) | Stage III (Flugfertiges System) | Stage IV (Satellit) |
|---|---|---|---|---|
| |  |  | | |
| Development: | Abgeschlossen | Abgeschlossen | Konzeptphase | - |
| Assembly: | 70% fertig | 60% fertig | - | - |
| Tests: | beginnen bald | beginnen bald | - | - |

# Cold Gas

## Projekt „Cold gas“ - Fortschritte:

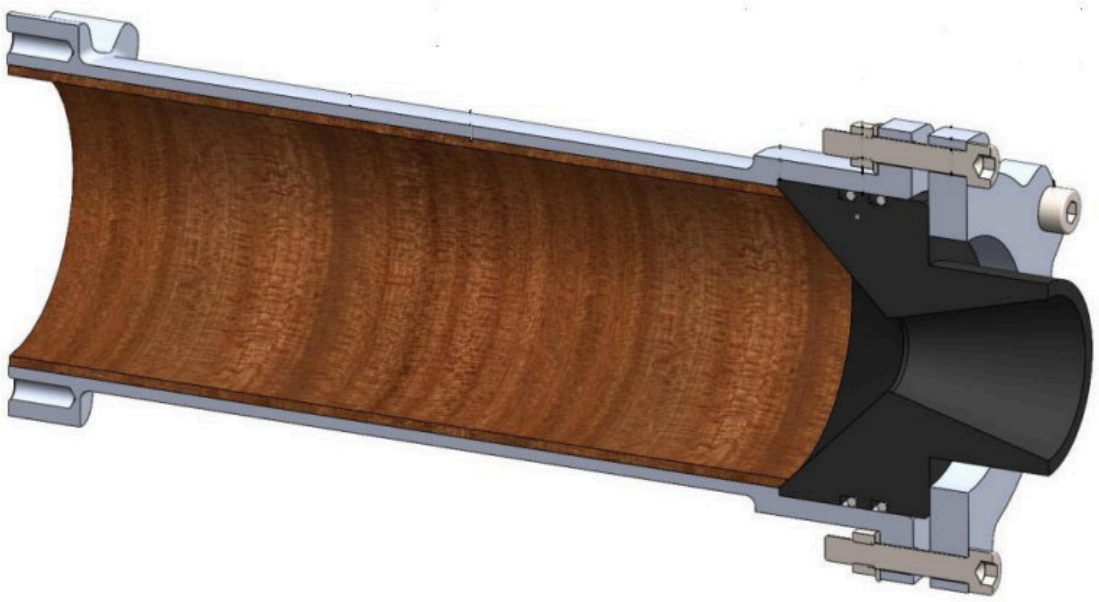
- ***Mikrocontrollerprogrammierung***
  *(Magnetventile können jetzt über Gyroskope gesteuert werden)*
- ***Zusammenbau*** *von Testständen*

***Neue Mitglieder sind immer willkommen!***



# Experimental Rocketry

## *Propulsion*

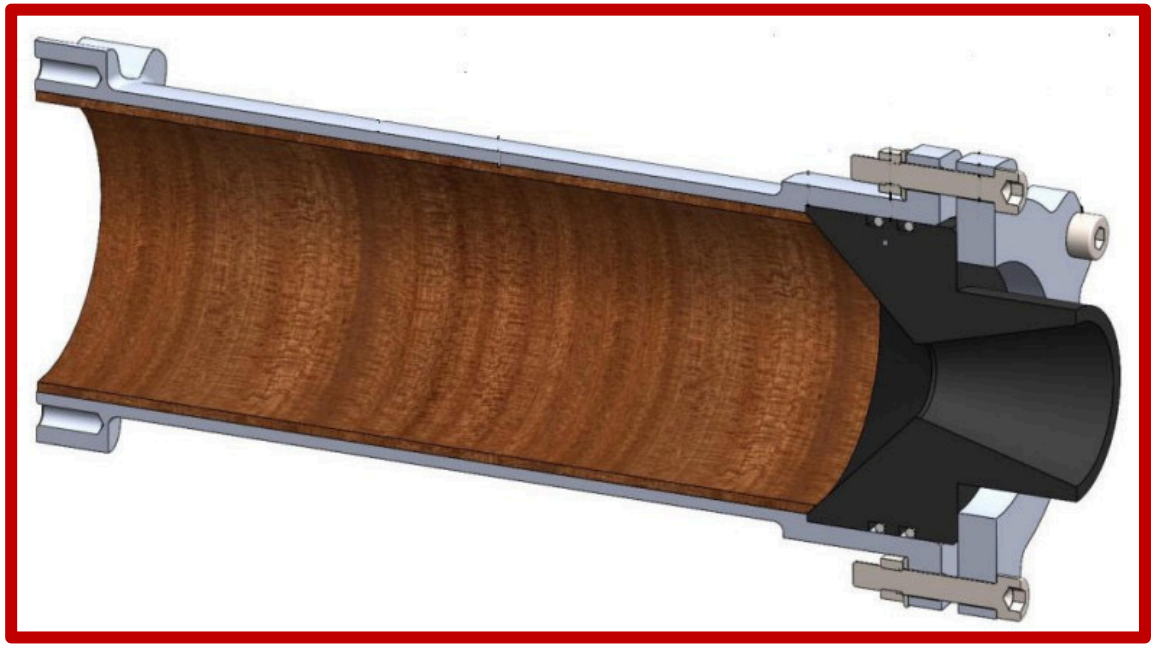


## *Rocket Systems*



# Experimental Rocketry

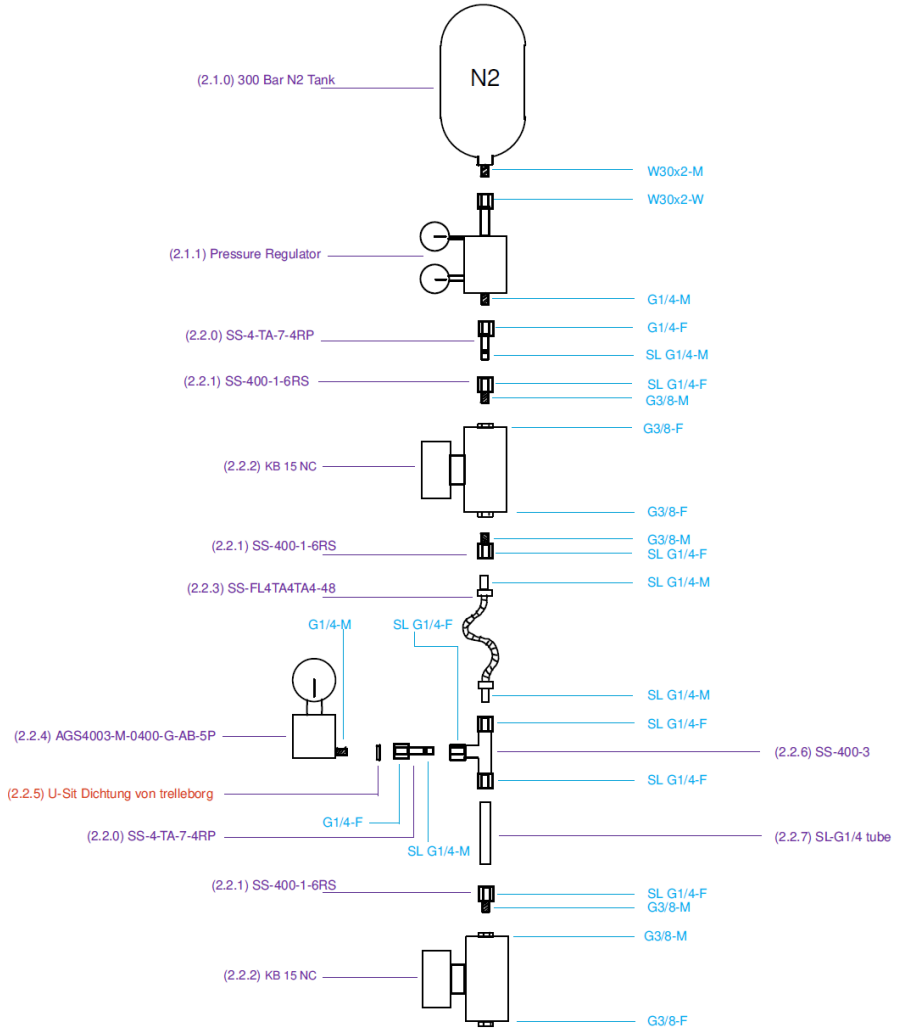
## *Propulsion*



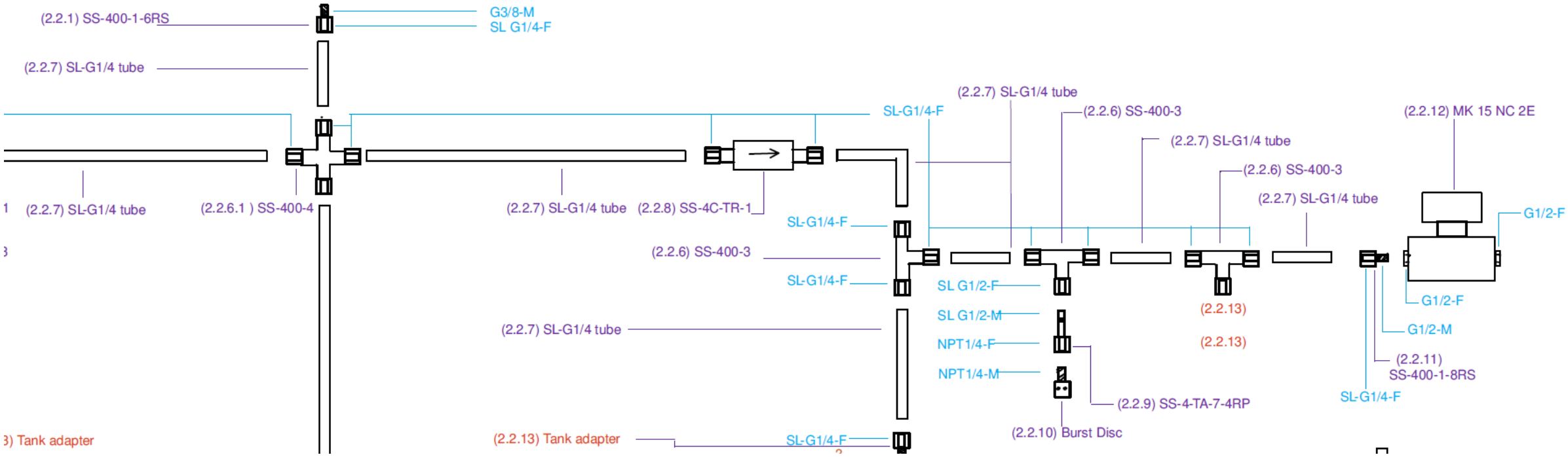
## *Rocket Systems*



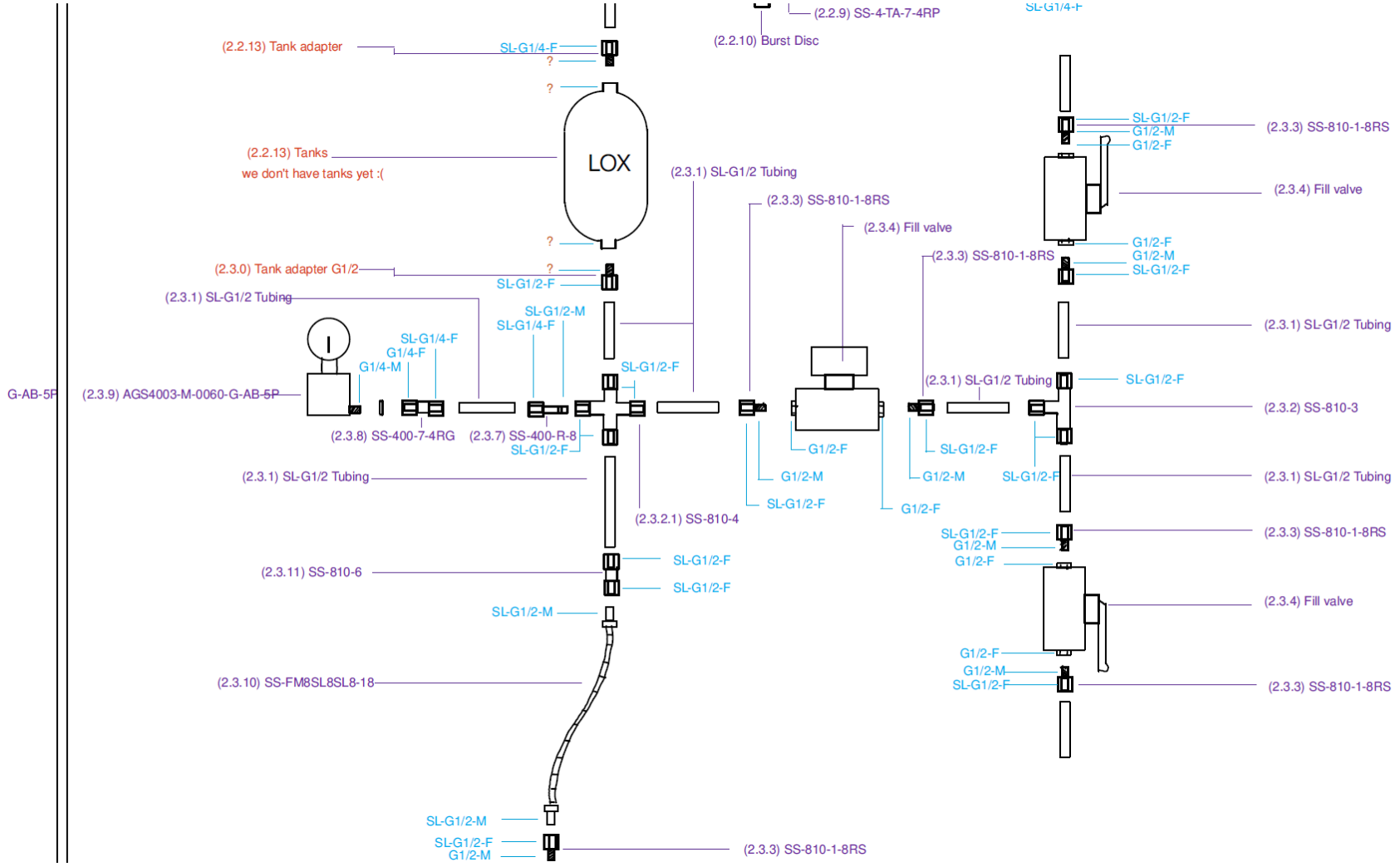
# Antriebssystem



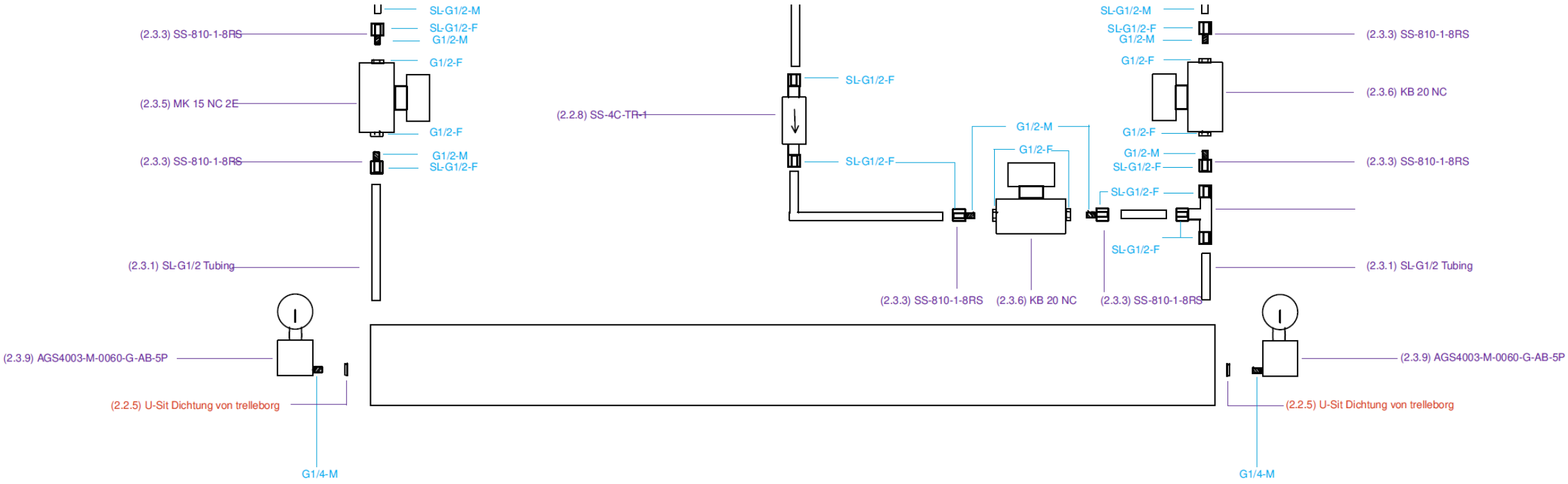
# Antriebssystem



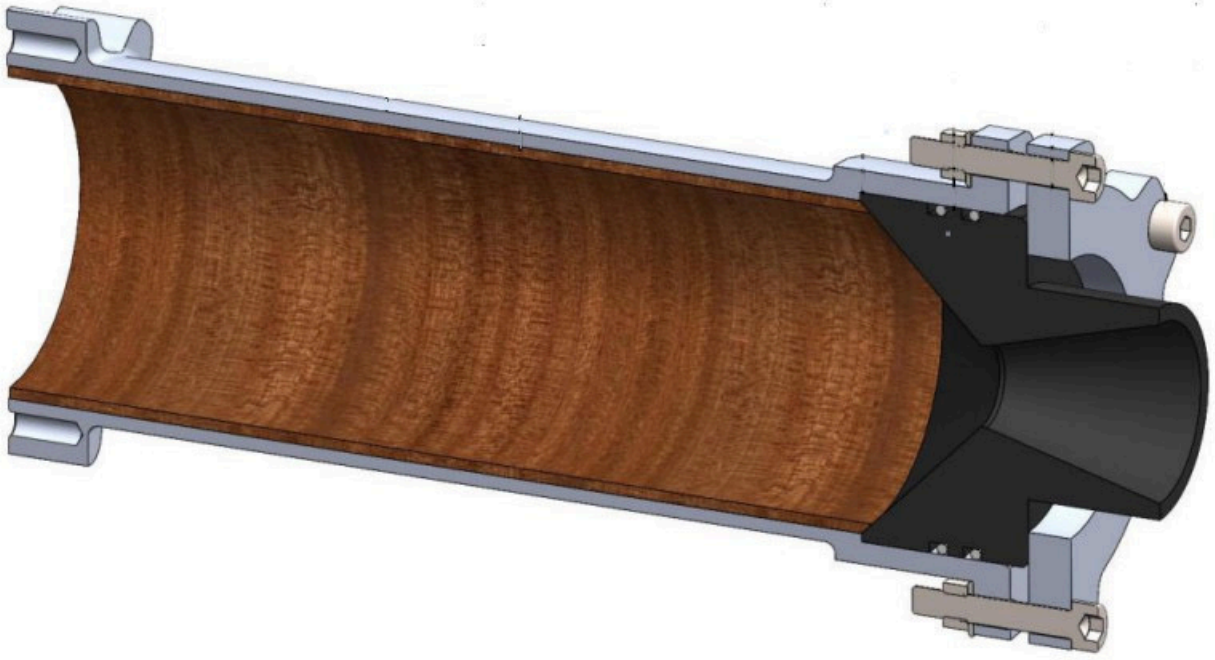
# Antriebssystem

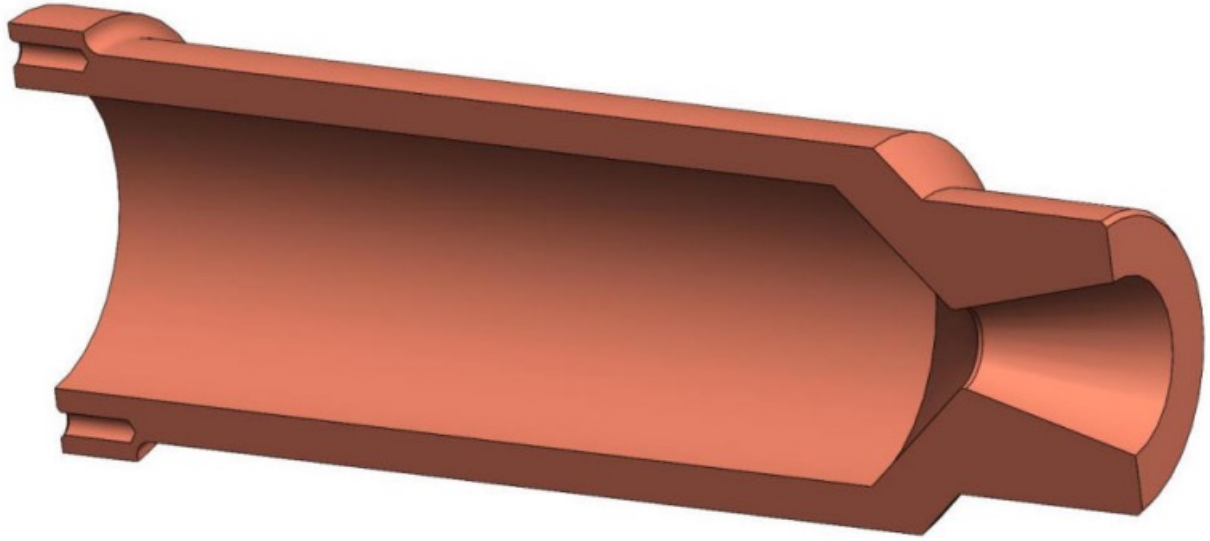


# Antriebssystem



# Aufbau Brennkammer

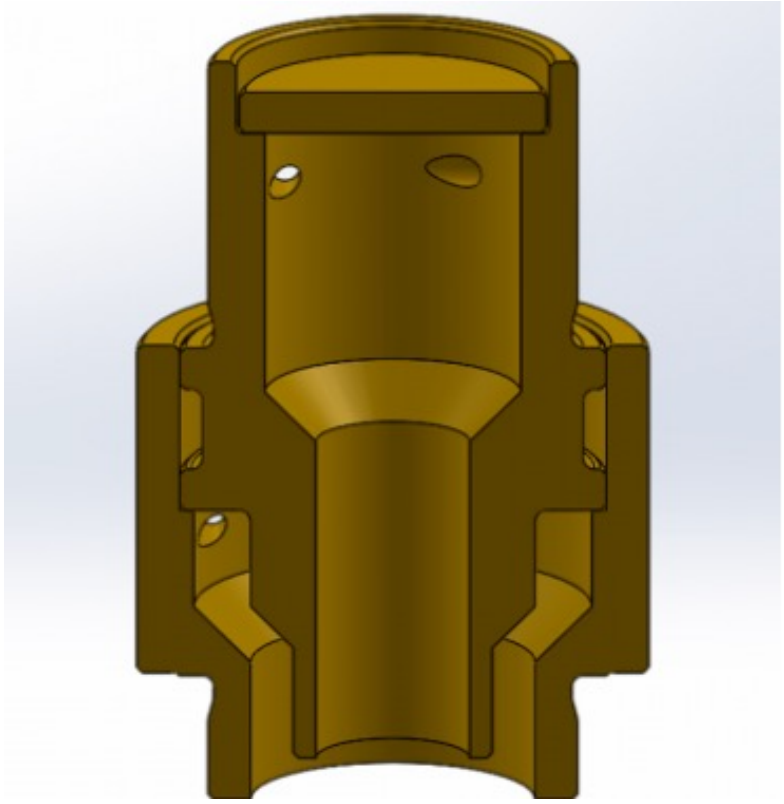




# Antriebssystem

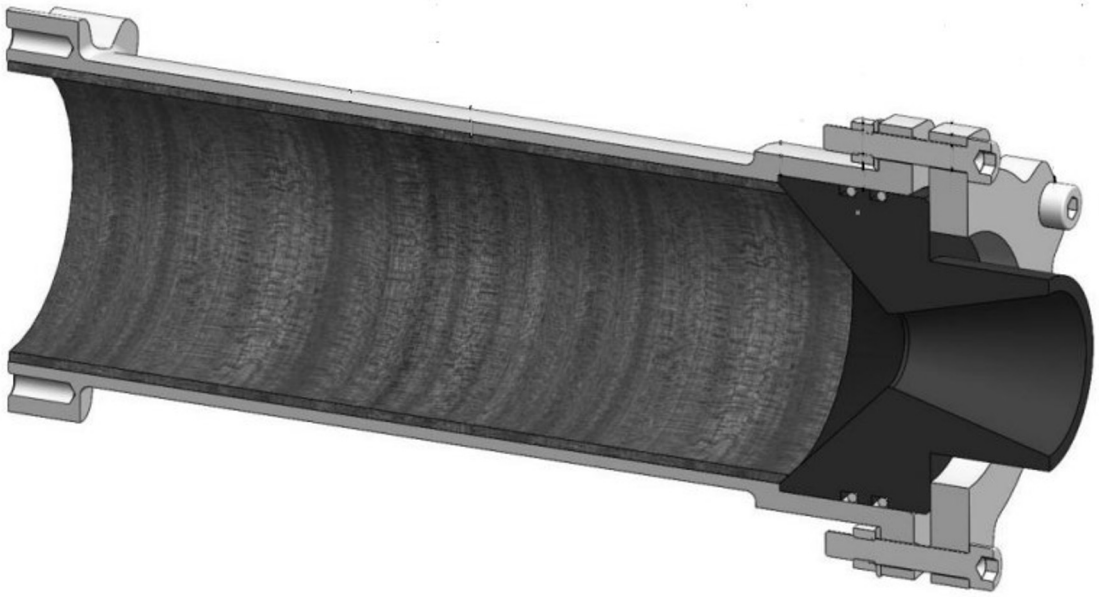
Next Working Packages for the moment

- Design of the injector plate
- CAD Design of the test stand
- Tank design and testing



# Experimental Rocketry

***Propulsion***



***Rocket Systems***



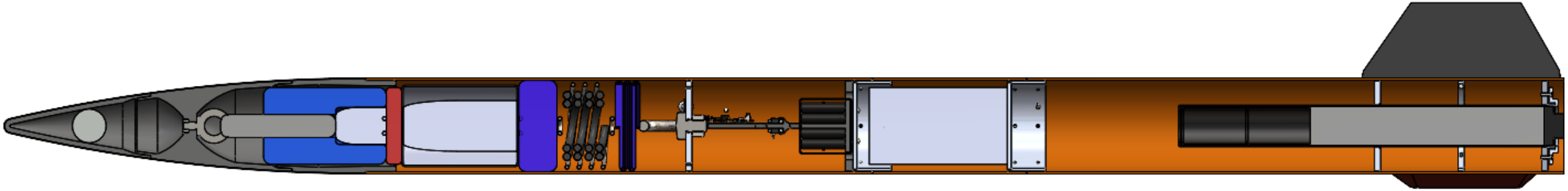
# Rocket Systems

STARMOON

- Länge von 2 m
- Durchmesser von 125 mm
- Gewicht von 10 kg
- Motor der Klasse J mit 500 N Schub
- Totalimpuls von 1,4 kNs
- Geschwindigkeit von Ma 0,3
- Höhe von 600 m wurde erreicht

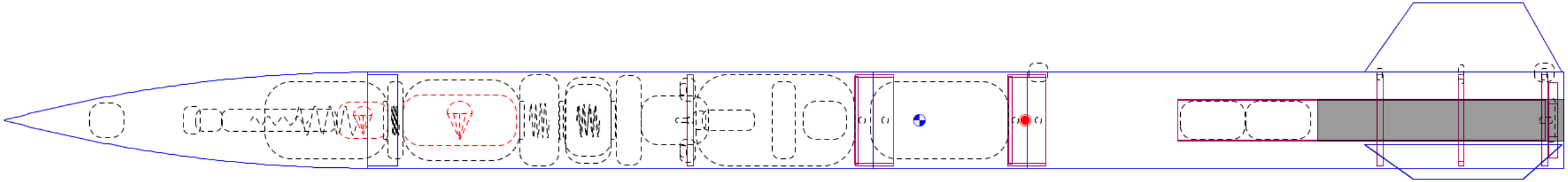


# STARMOON



STARMOON
Länge 203 cm, max. Durchmesser 12,5 cm
Masse mit Motoren 9649 g

Stabilität: 1,1 cal
CG:119 cm
CP:133 cm
bei M=0,30



Apogäum: 606 m
max. Geschwindigkeit: 104 m/s (Mach 0,31)
max. Beschleunigung: 46,5 m/s²

# Launchpad

- Entwurf und Bau eines eigenen Launchpads
- Führungslänge von 5 m
- Einklappbar und damit geringeres Packmaß und weniger Vorbereitungszeit





# Launch



# Launch

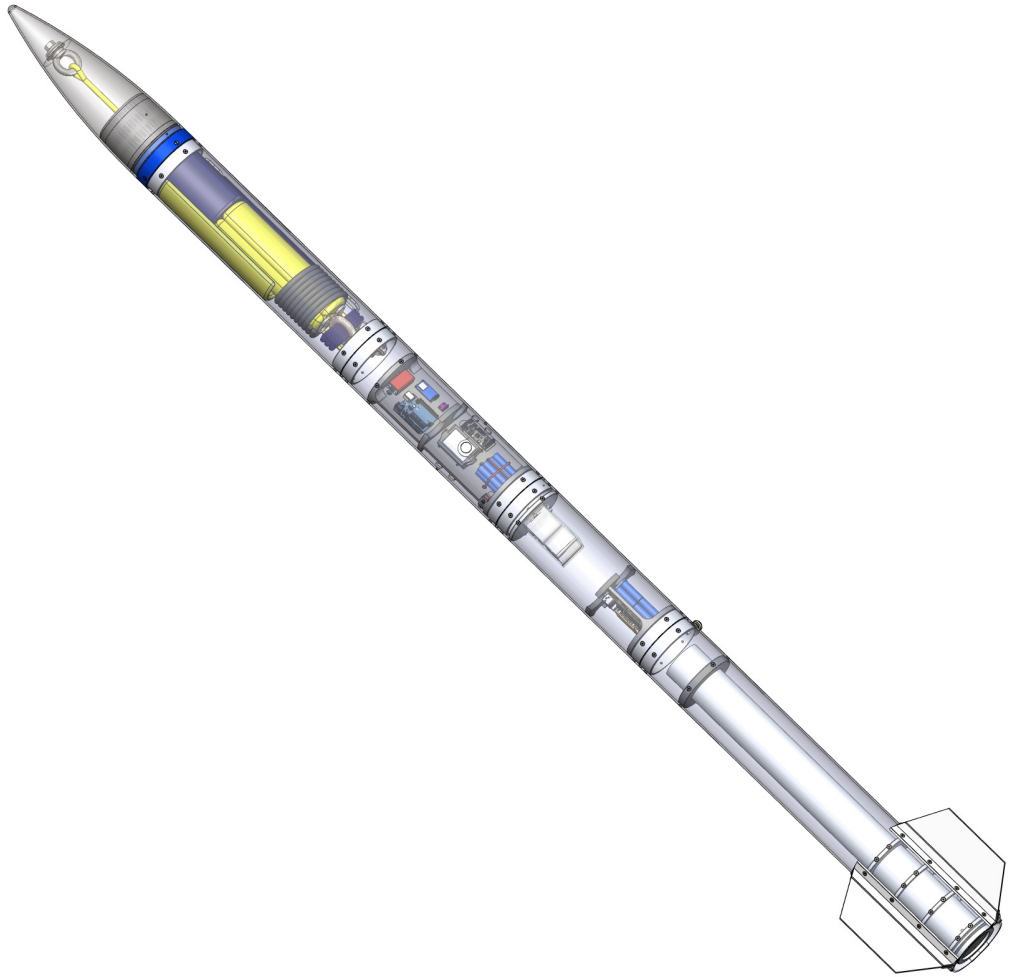


# Launch

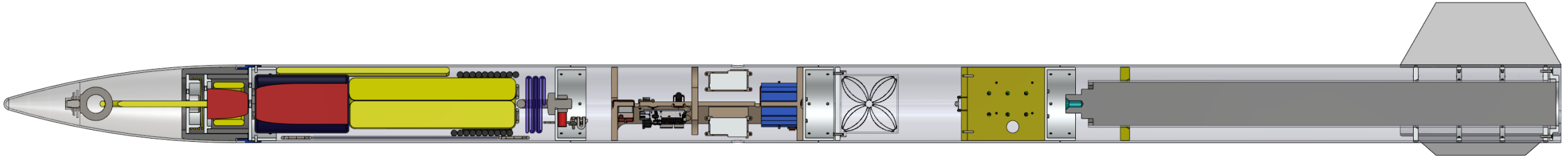


# STARDUST

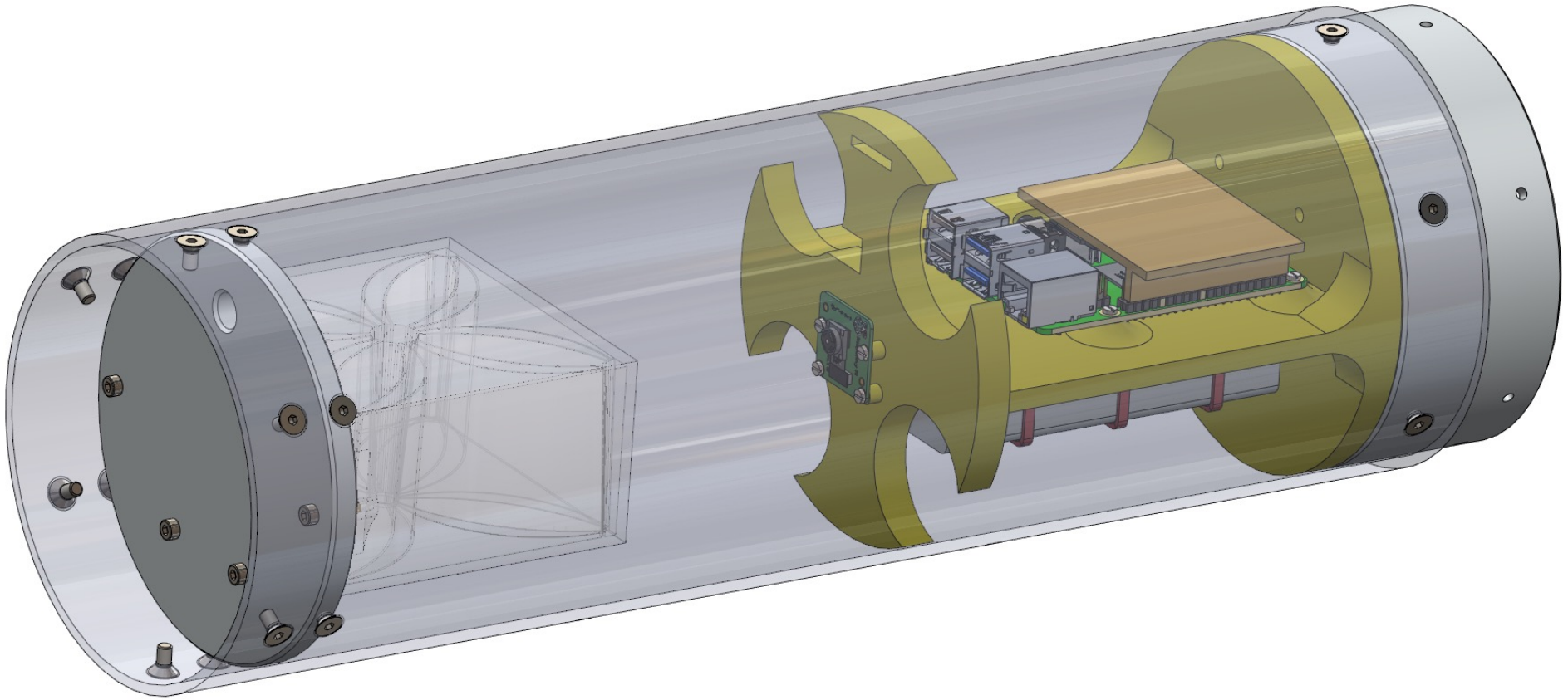
- Länge von 2,5 m
- Durchmesser von 125 mm
- 16 kg Gewicht
- Motor der Klasse M mit ca. 2 kN Schub
- 6 kNs Totalimpuls
- Maximalgeschwindigkeit Ma 1
- Höhe von 3 km soll erreicht werden
- Nutzlast ist ein µ-G Experiment



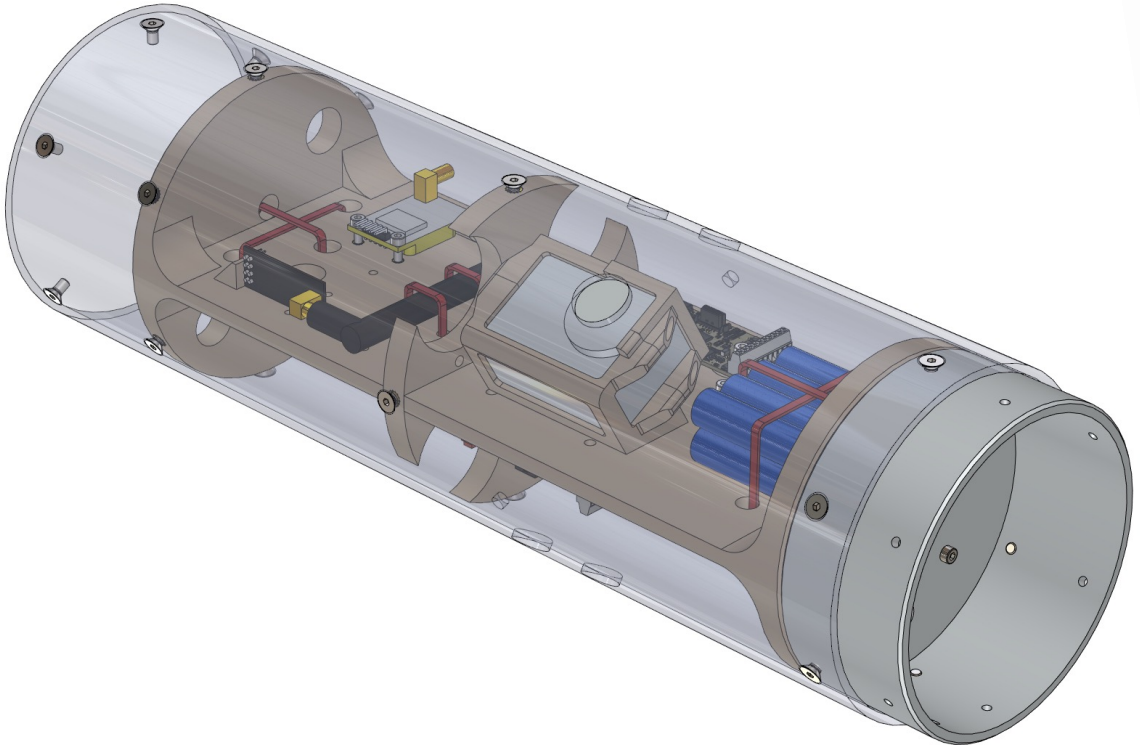
# STARDUST

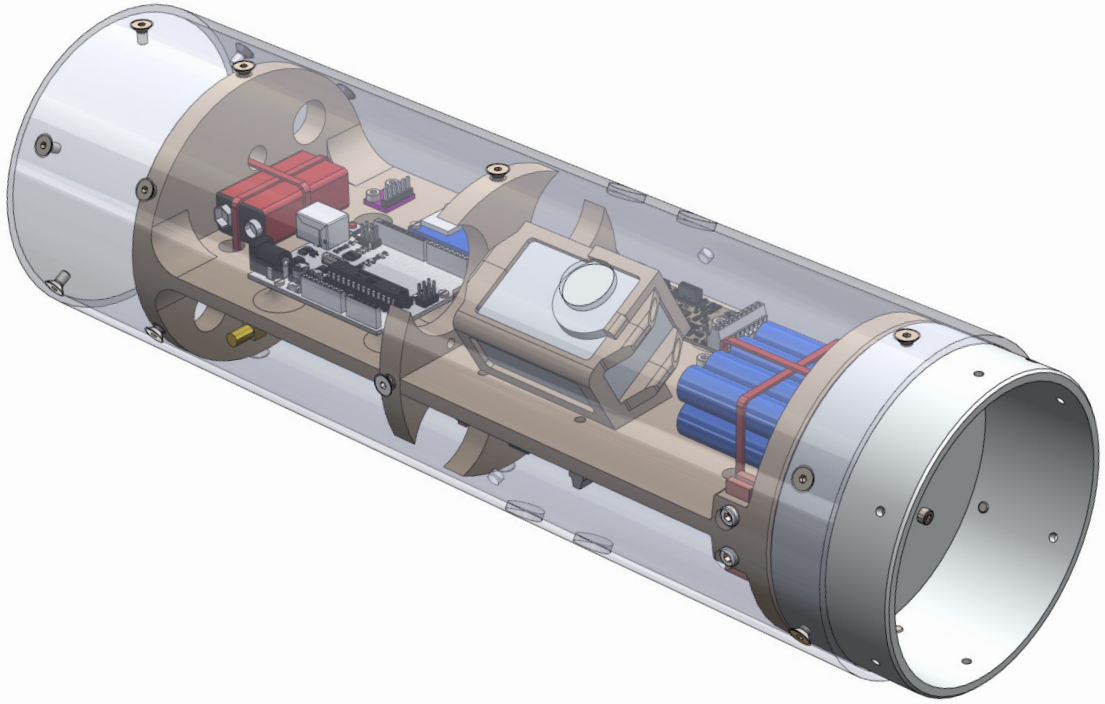


# WOBBLE

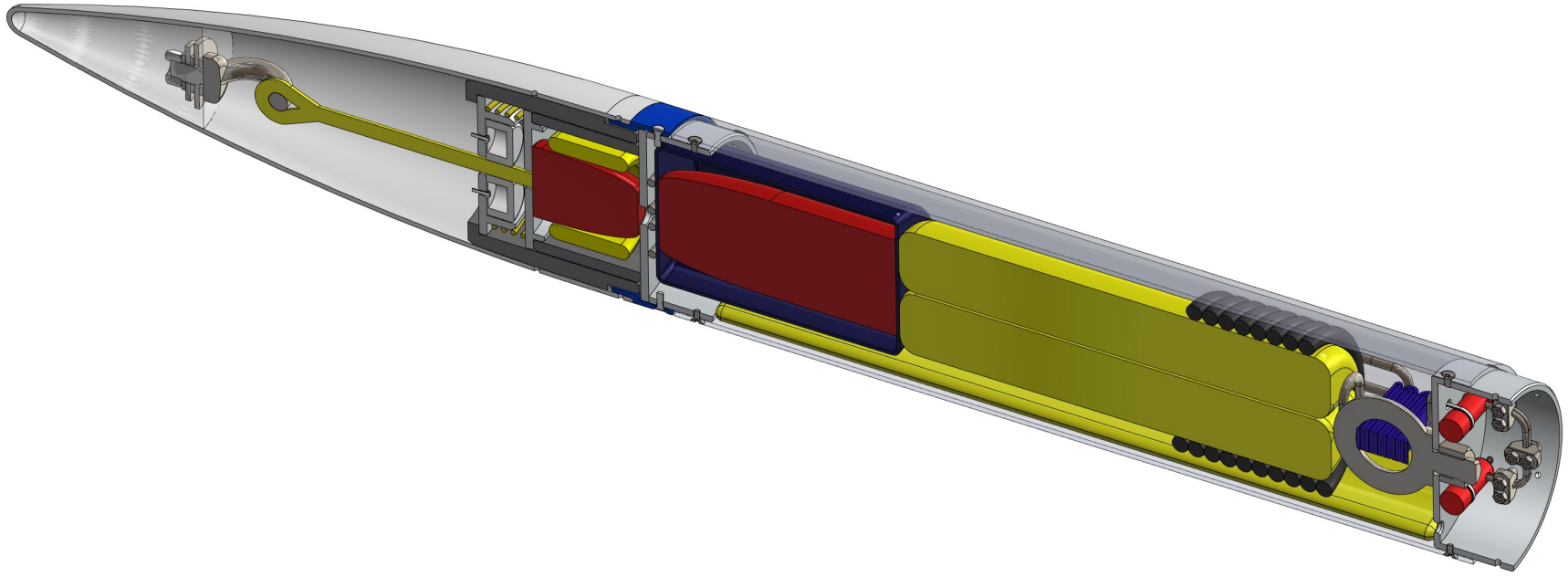


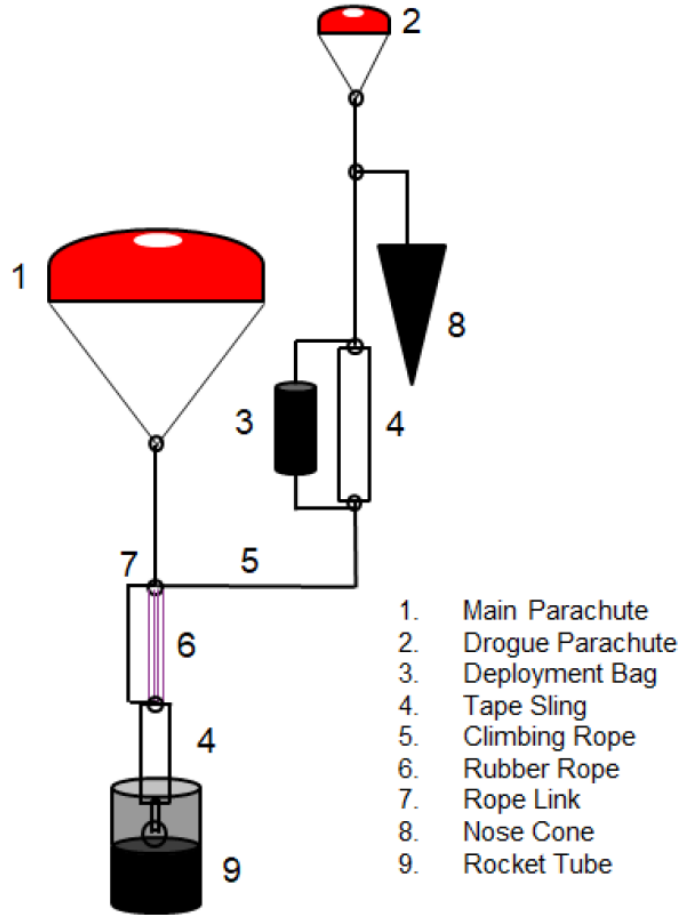
# Electronic Compartment





# Recovery System





# Rakete STARGAZE

- Nächste Rakete für EuRoC 2024
- Ziel sind ebenfalls 3 km
- Umbau auf Faserverbund Struktur
- Eigener Flugcomputer
- Kamerakontrollsystem
- Neue Nutzlast (TBD)





# Neugierig geworden?

# Neugierig geworden?

**Website** →



@bears.space

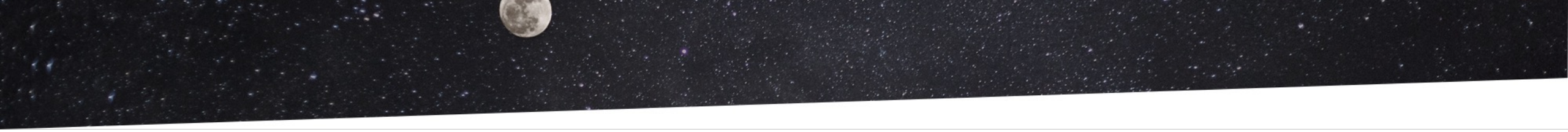
# Neugierig geworden?

@bears.space

# Ihr wollt mal vorbei schauen?

## Jeden Dienstag um 18 Uhr im F011 im ILR





# *Vielen Dank für eure Aufmerksamkeit!*

# *Fragen?*