



EPFL Xplore

Swiss Federal
Institute of
Technology

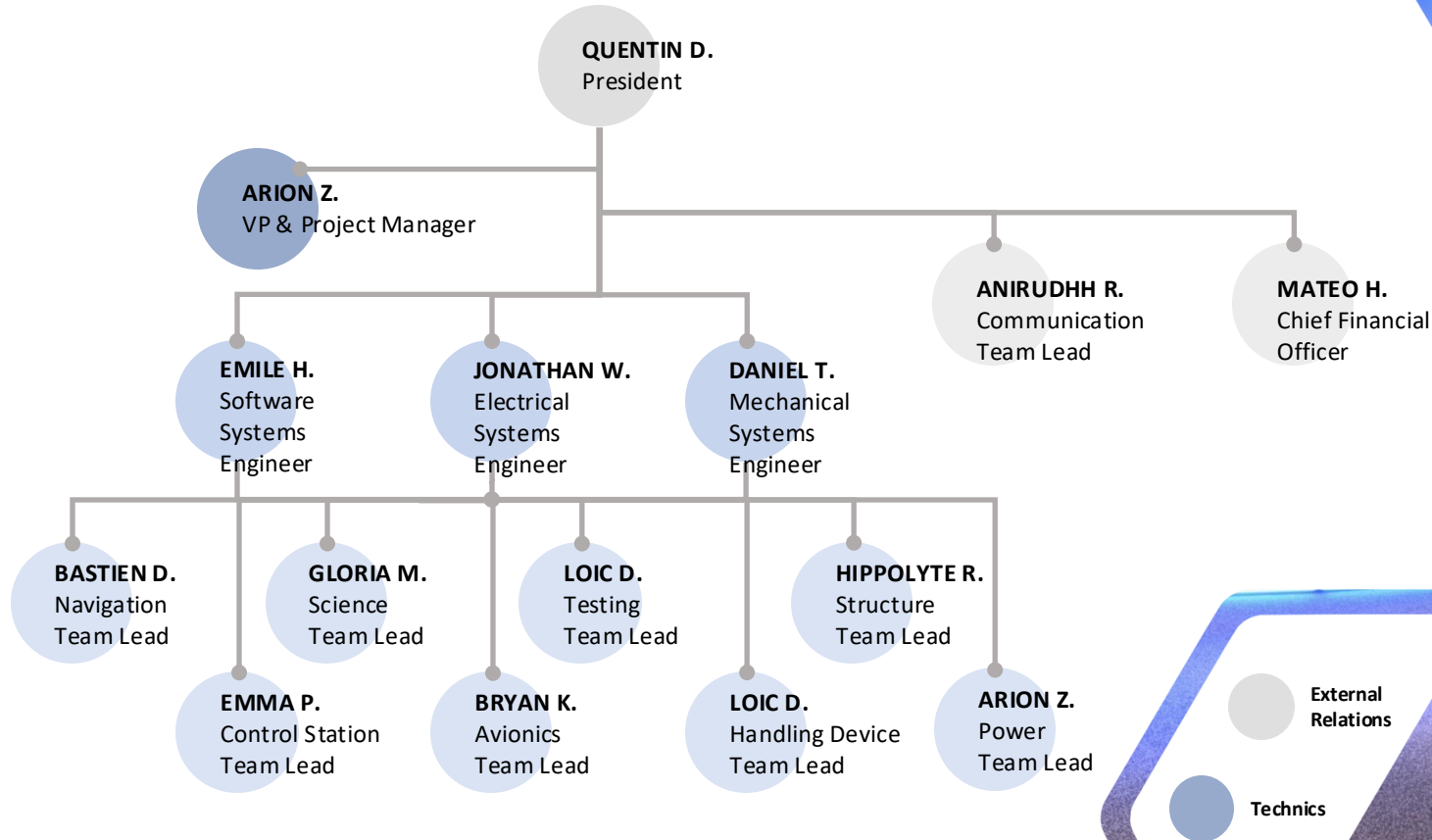


2021 - 2022

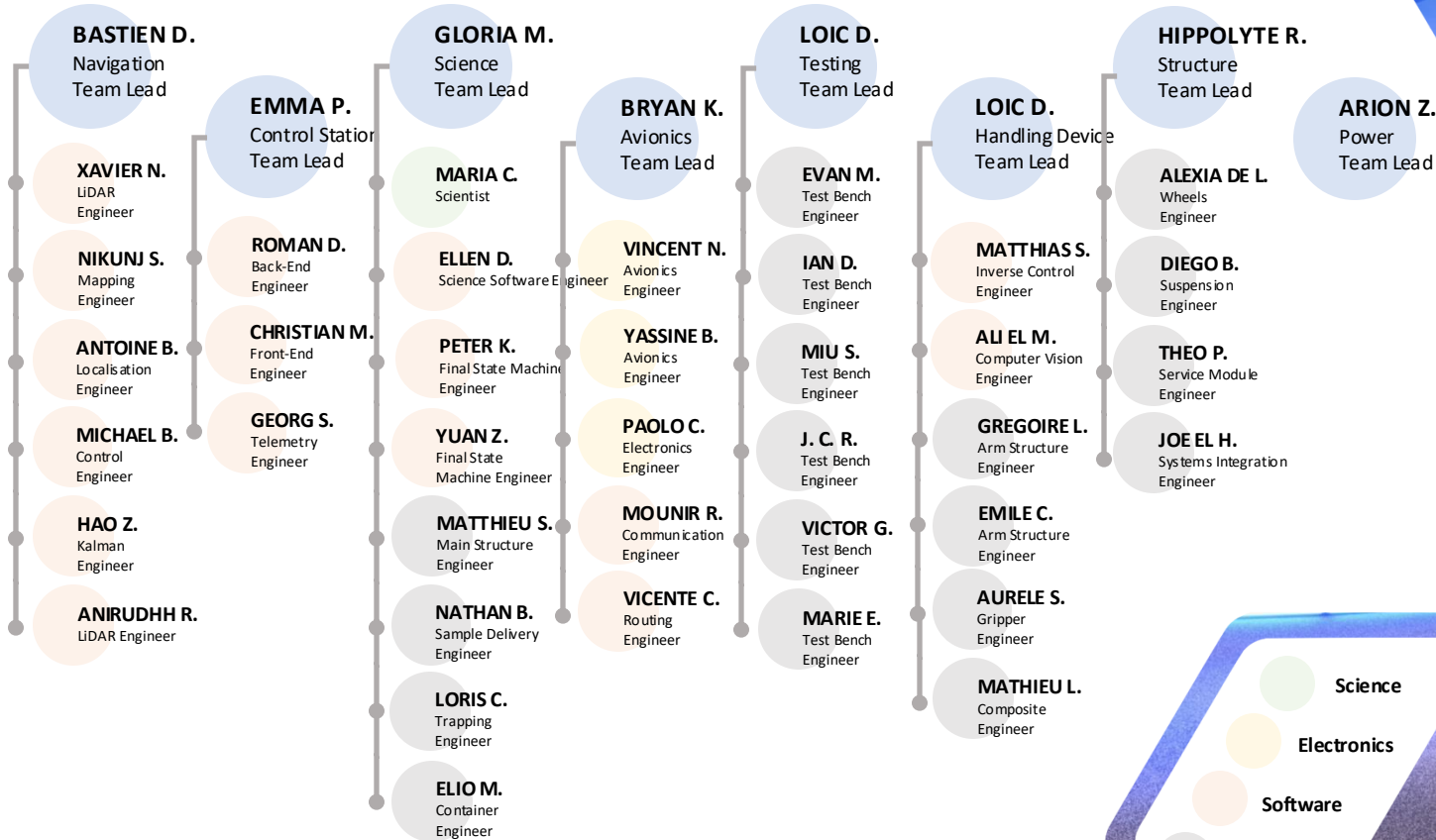
Team Introduction



Management Team Organization



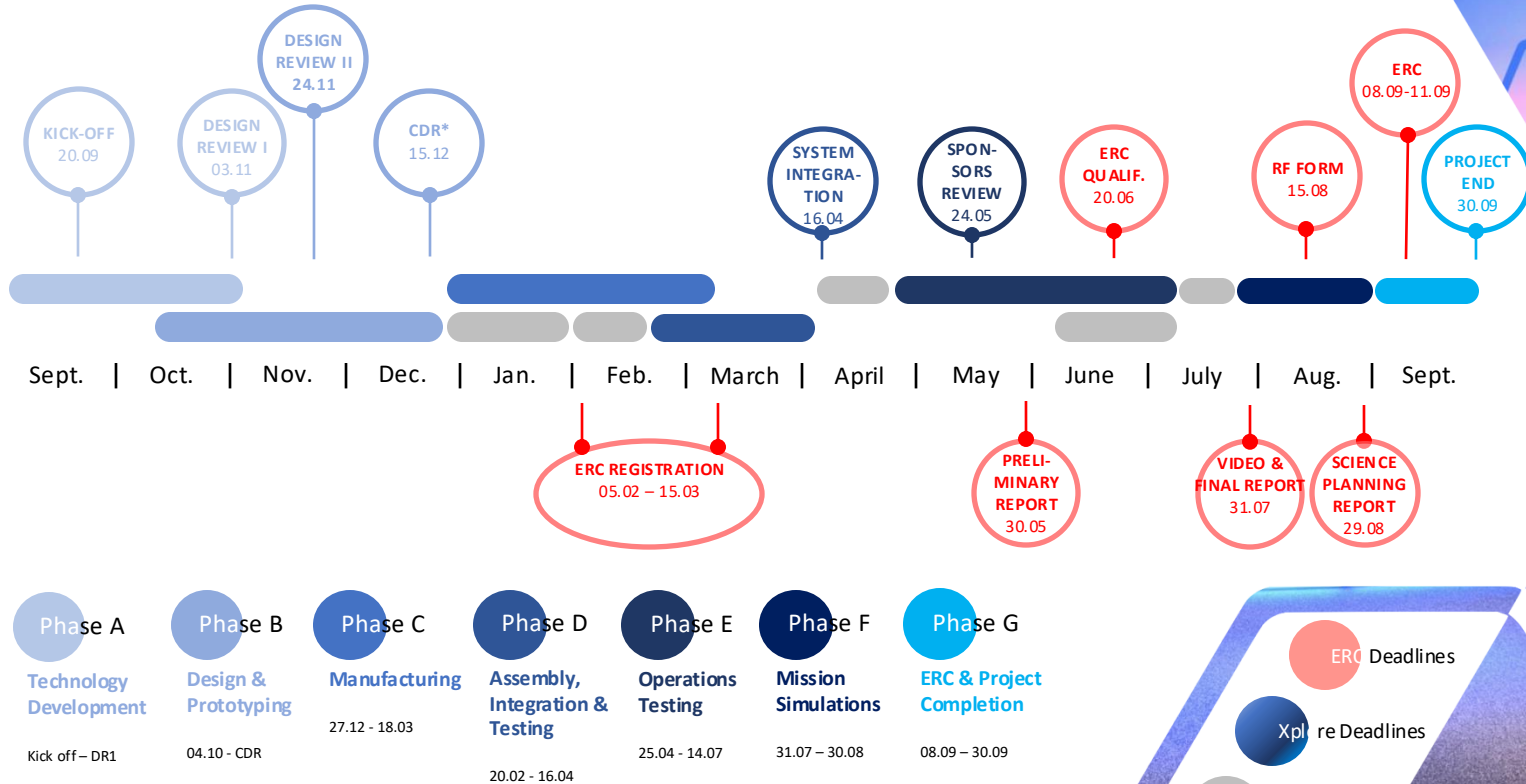
Technical Team Organization



Project Management



Timeline

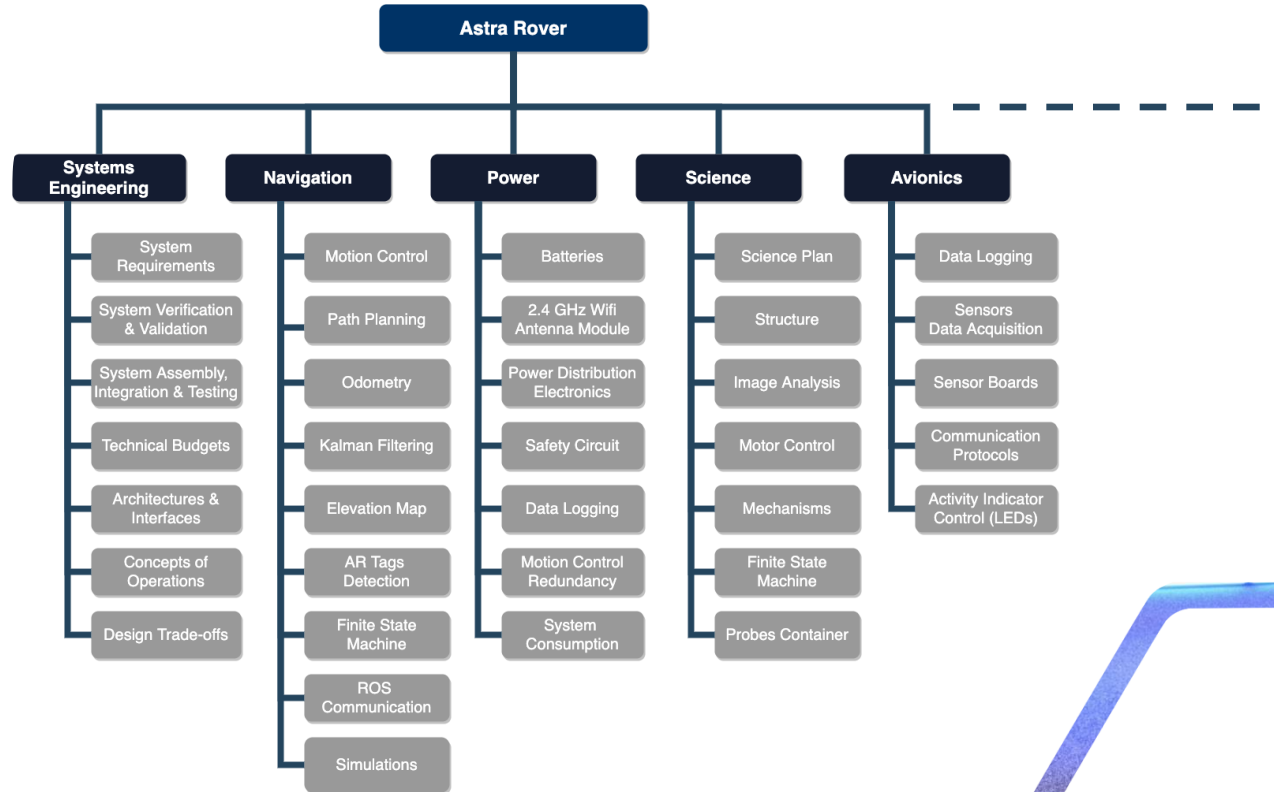


* Critical Design Review

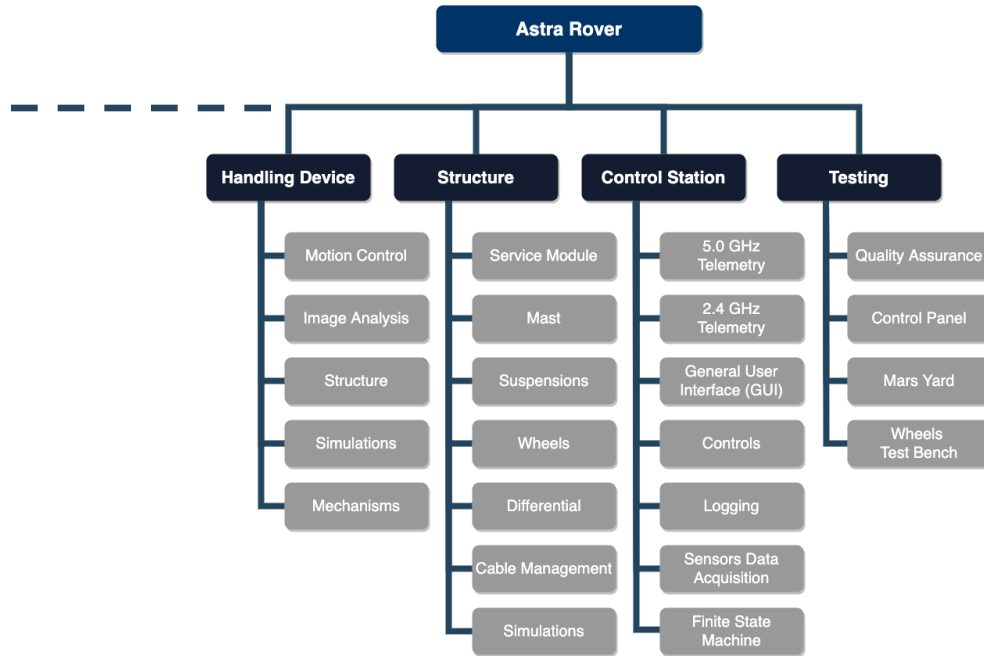
Engineering Approach



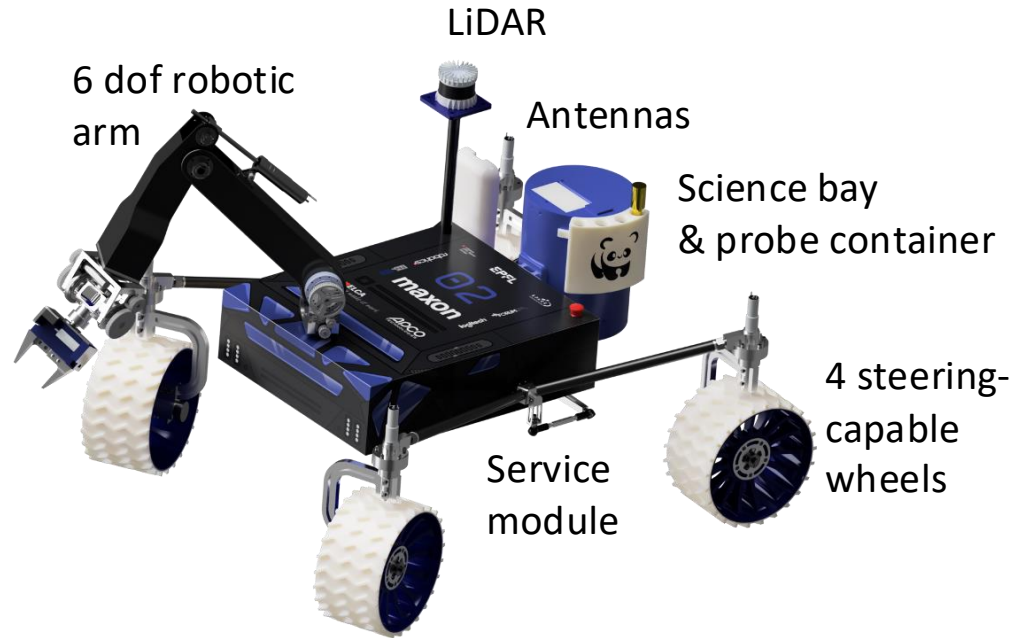
System Breakdown Structure



System Breakdown Structure



Selected Solutions



Approach to ERC Tasks



Navigation Task

Task

Ability to
localize
itself

Navigate rough
terrains

Avoid obstacles

Approach

LiDAR mapping
& odometry

Carbon fiber
structure

Rocker suspension
with differential bar

Steering mechanism

Polyurethane
coating

In-wheel
drive motor

Issues

Structural rigidity

Software integration

Solutions

Improve
differential joints

Development
branches &
iterative unit tests



Science Task

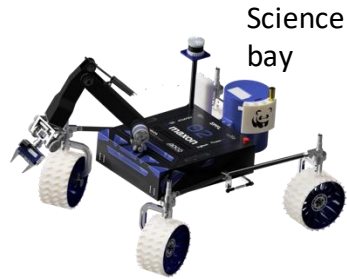
Task

Collect a sample

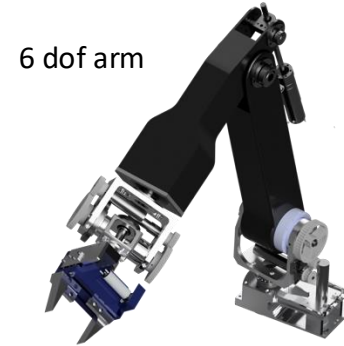
Take pictures of the terrain

Define and verify a science plan

Approach



Rotating platform with Integrated sensors



Issues

Cable management on rotating platform

Avoiding experiments contamination

Solutions

Use a slip ring

Use adaptive flexible structures to avoid inter-mechanisms gaps



Probing & Collection Task

Task

Place & Collect
4 probes

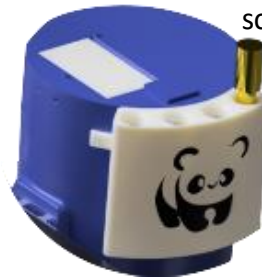
Collect 3 surface samples

Approach

Science bay &
probe container

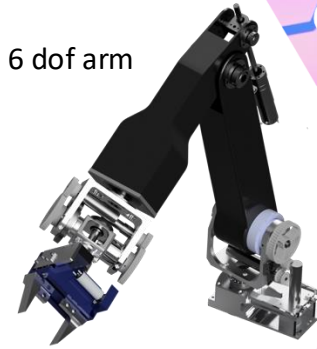


4-samples
science bay



4-probes
container

6 dof arm



Issues

Sample collection & probing
adaptive mechanism

Loss of sample material
during arm delivery

Solutions

Flexible interface on the
scoops



Maintenance Task

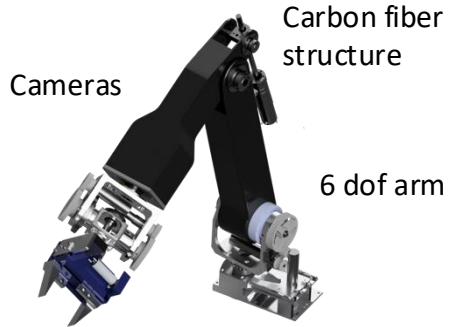
Task

Manipulate switches, buttons and objects on a control panel

Approach



Robotic arm



Cameras

Carbon fiber structure

6 dof arm

Issues

Precise autonomous arm positioning

Overall structural rigidity

Arm overheating

Solutions

Computer vision to detect AR Tags

Piston to preload the chassis

Fans



Outreach & PR Activities



Outreach & PR Activities

Events

Educational
Workshops



Public
Events



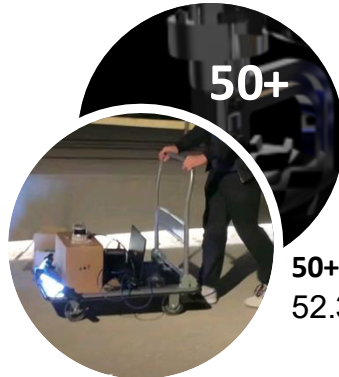
Design
Presentations



Social Media



2 Series
31.7K views



50+ Posts
52.3K views

Results



84K views
5.4K likes



156K impressions
2.9K likes

2000 combined
followers +100%



Anirudhh Ramesh

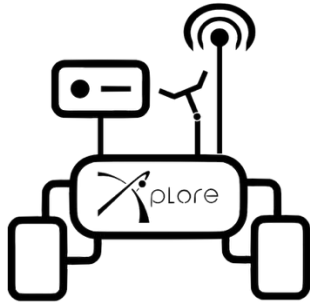
Presentation Task

ERC 2022

Conclusion



Conclusion



A first attempt at autonomous control

A strong basis for future improvements

A high pedagogical impact

An increasing external impact



Thank you for
your attention!





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