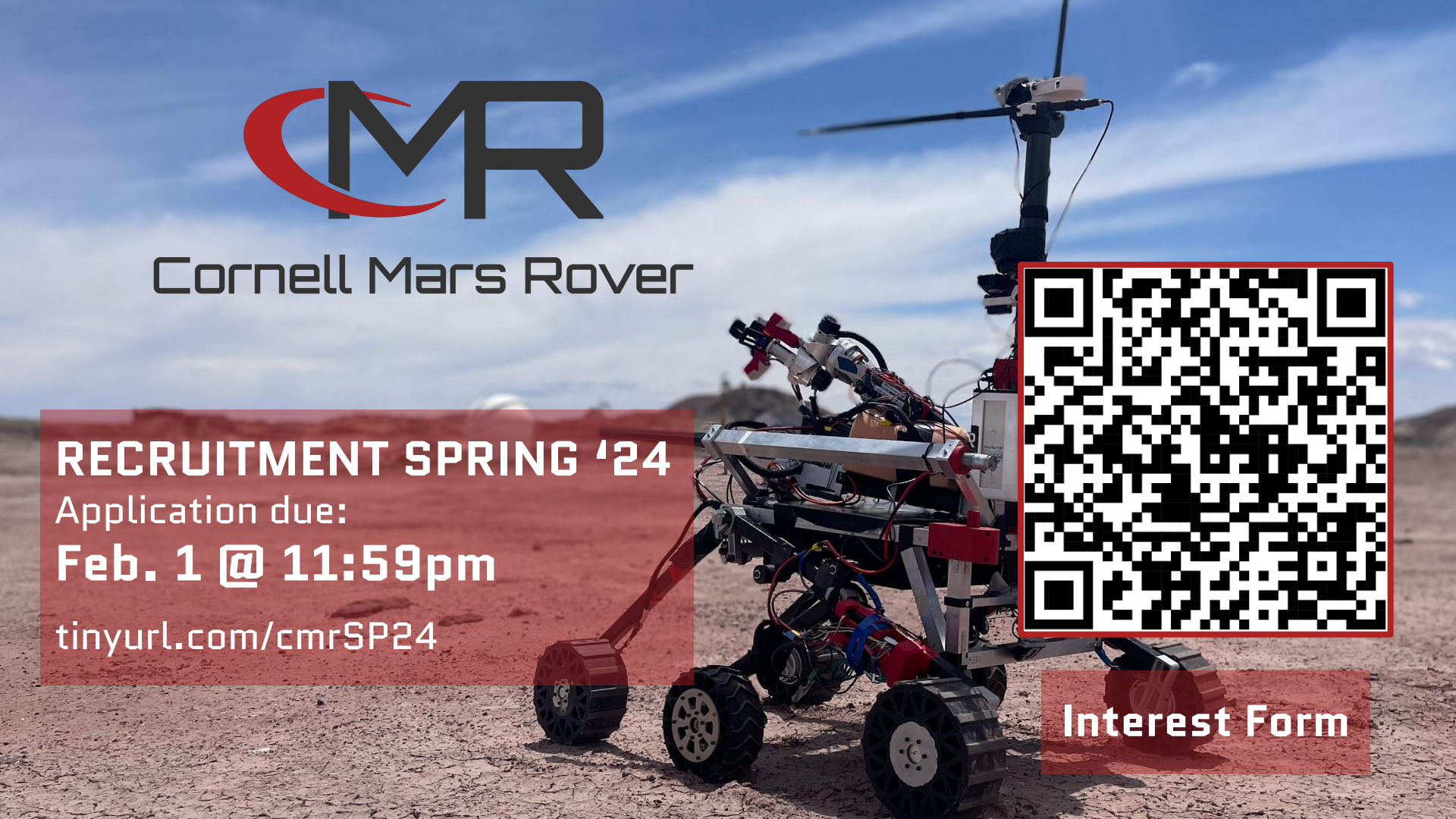
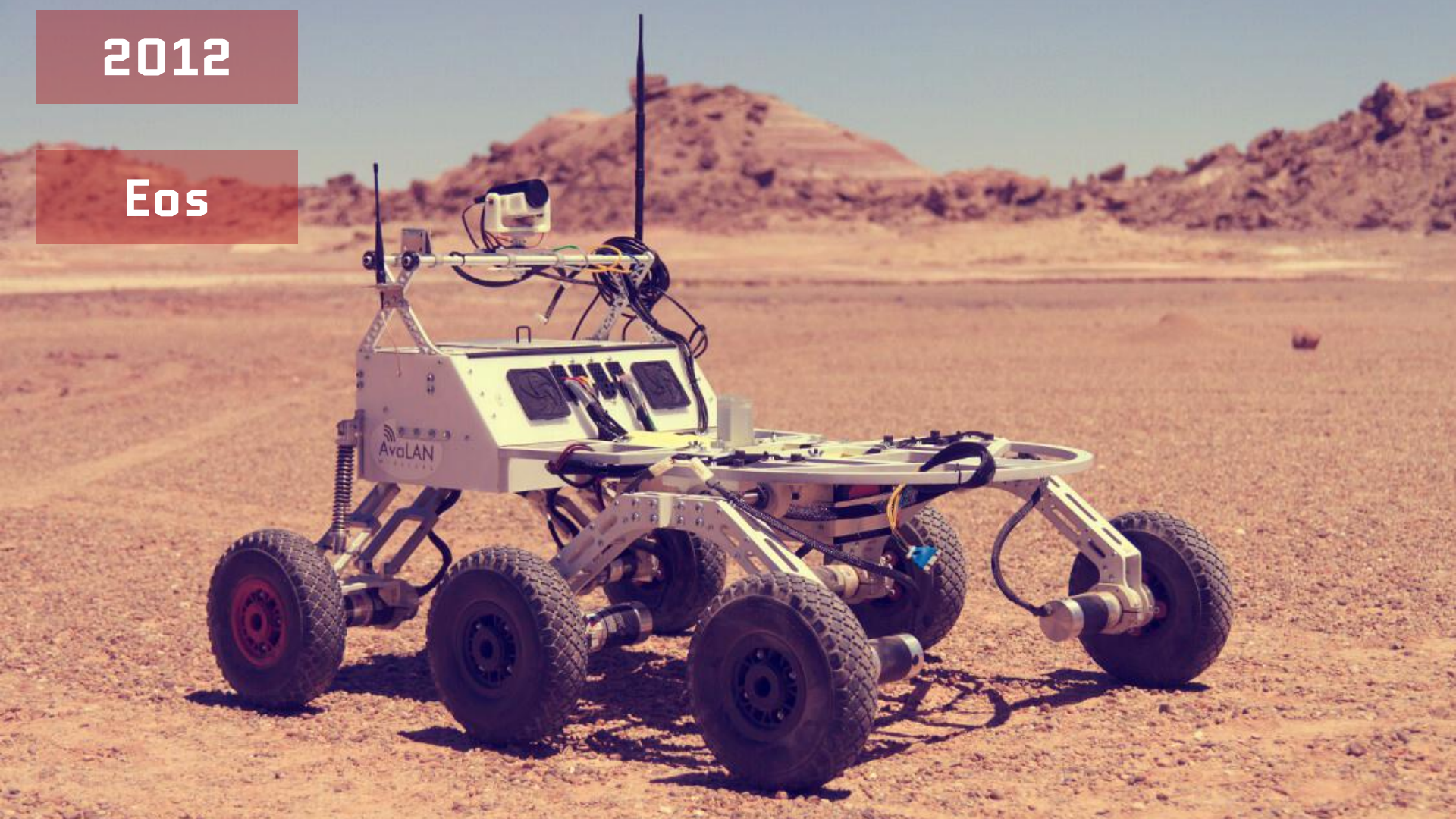

CMR
Cornell Mars Rover
RECRUITMENT SPRING '24
Application due:
Feb. 1 @ 11:59pm
tinyurl.com/cmrSP24
Interest Form

6 ~70 13

SUBTEAMS MEMBERS ROVERS

2012

Eos




2013
Helios


2014
Ares


2015
Garcia
CORNELL


2016
Chronos

2017

Athena

2018

Valkyrie

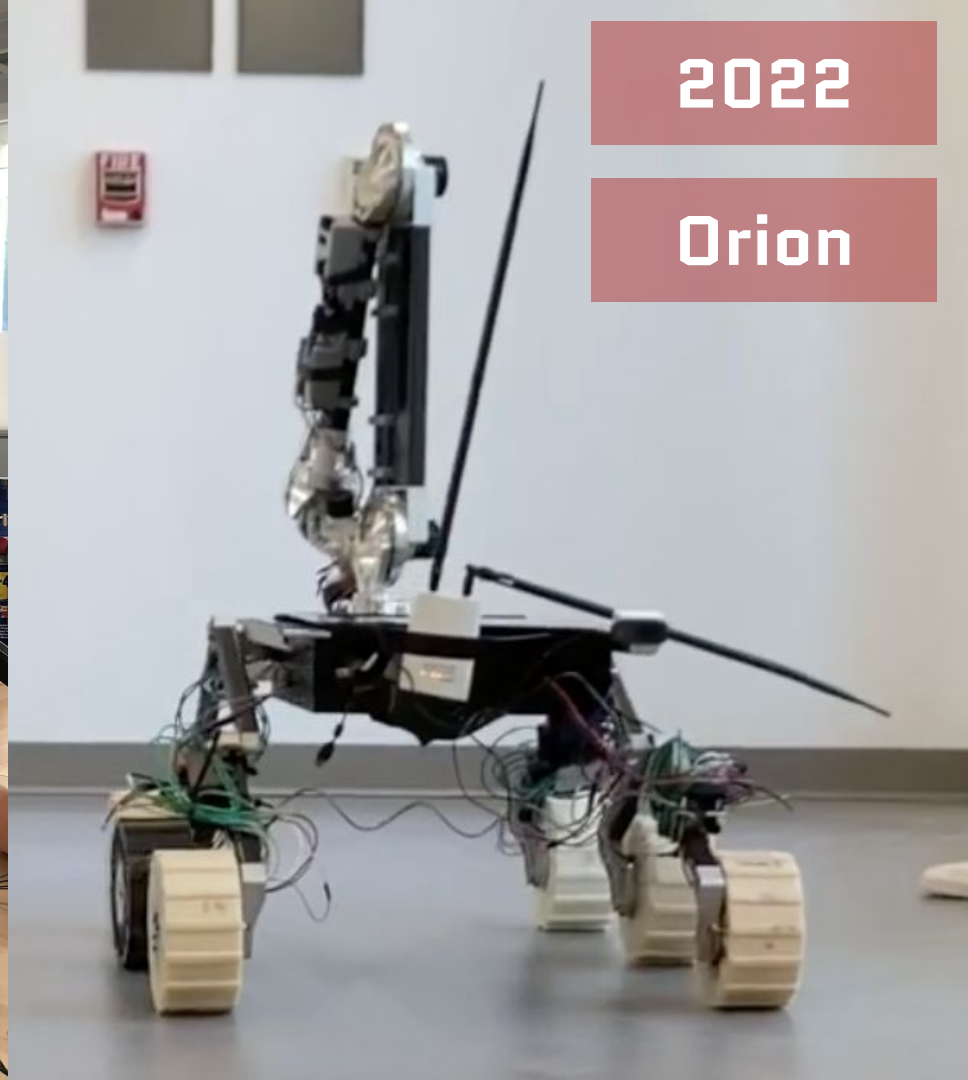
2019

Artemis

2020

Argos

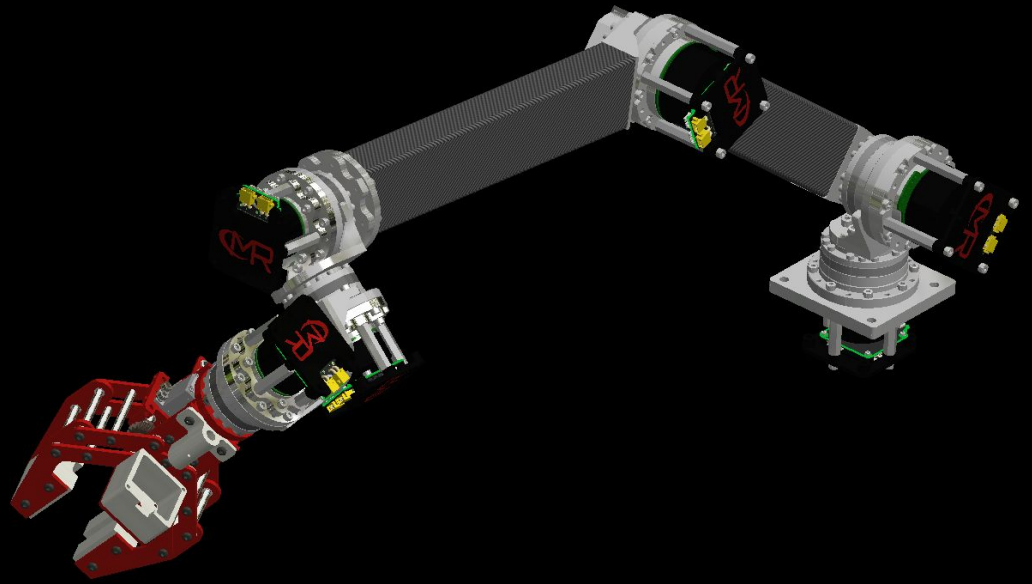

2021
Odyssey


2022
Orion

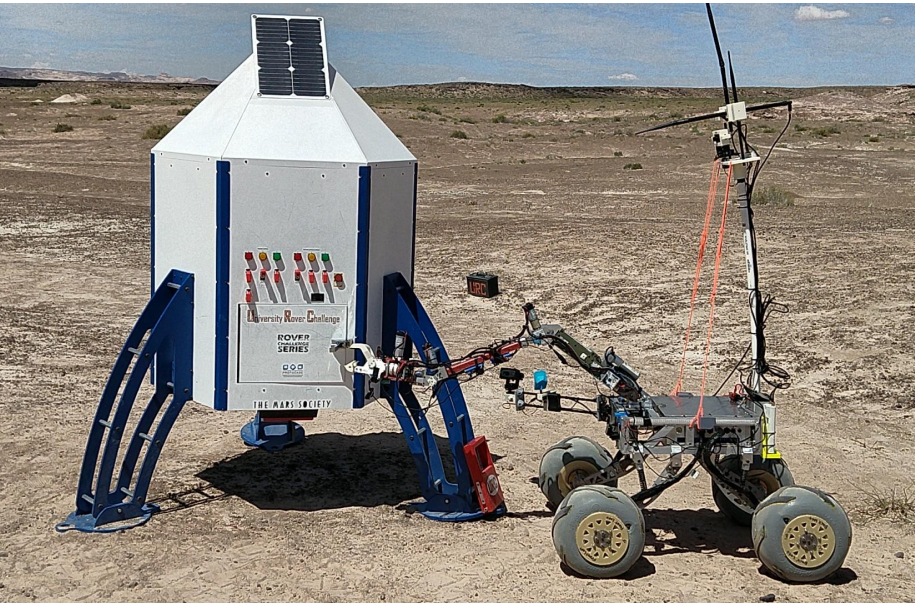

2023
A
6
1
2
Atlas

2024

Hyperion & Juno



UNIVERSITY ROVER CHALLENGE



Equipment Servicing

“perform several dexterous operations on a mock-up equipment system"

Rover must:

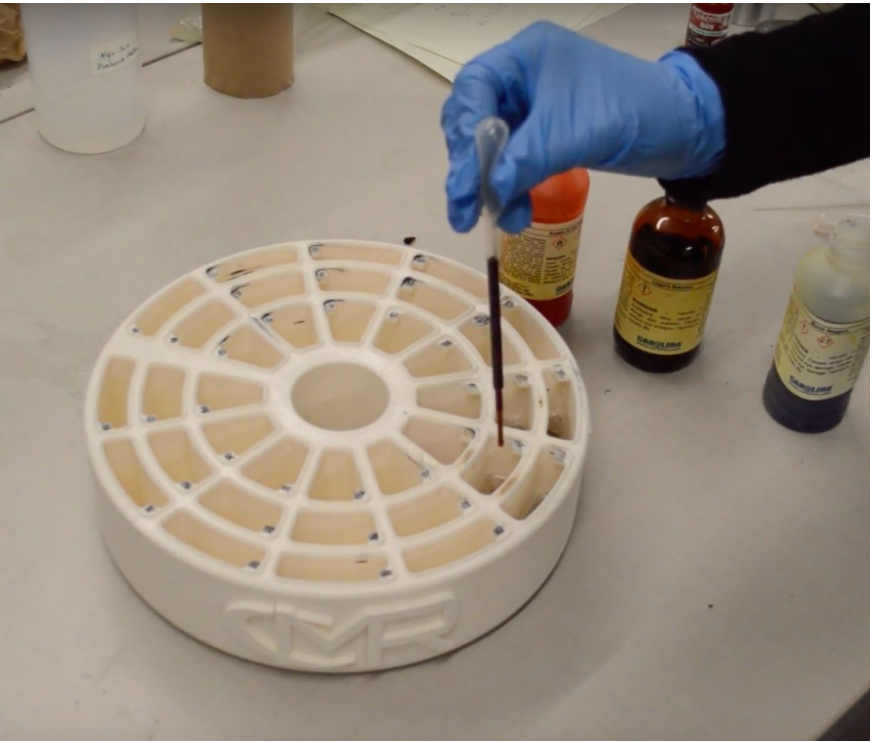
- Push buttons
- Flip switches
- Turn knobs
- Operate a screwdriver
- Type on a keyboard
- Open latches

Extreme Delivery Mission

"pick up and deliver objects in the field, and deliver assistance to astronauts"

Given GPS coordinates needed to:

- Pick up and deliver objects (ex. screwdrivers, hammers, toolboxes, rocks)
- Traverse a wide variety of terrain (ex. soft sandy areas, rock and boulder fields, vertical drops)



Science Cache

"conduct in-situ analysis with the rover, including life detection testing of samples"

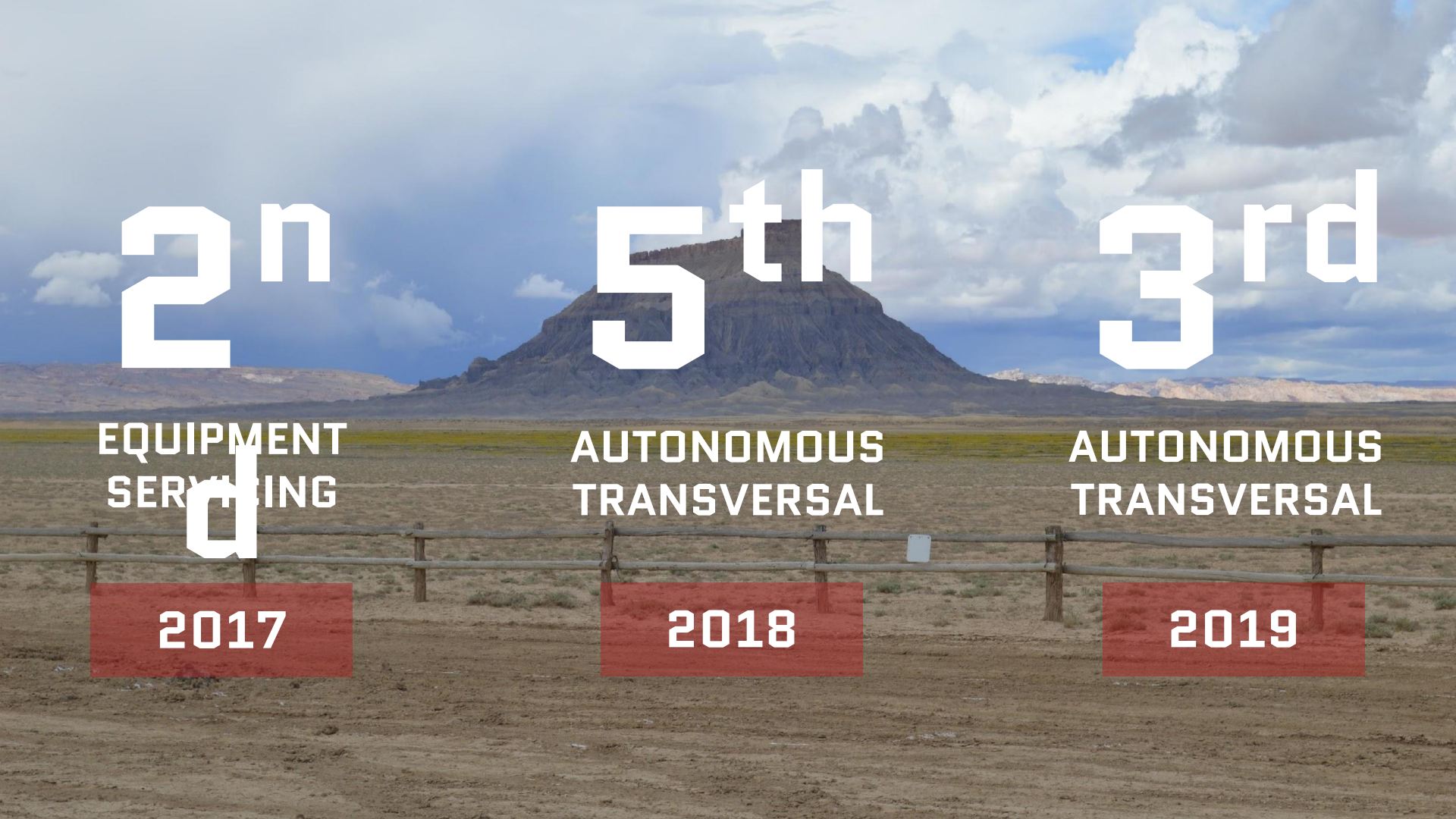
- Investigate sites of biological interest
- Conduct analysis of samples entirely on board the rover
- Determine the presence or absence of life at designated sites
- Present results, analysis, and conclusions

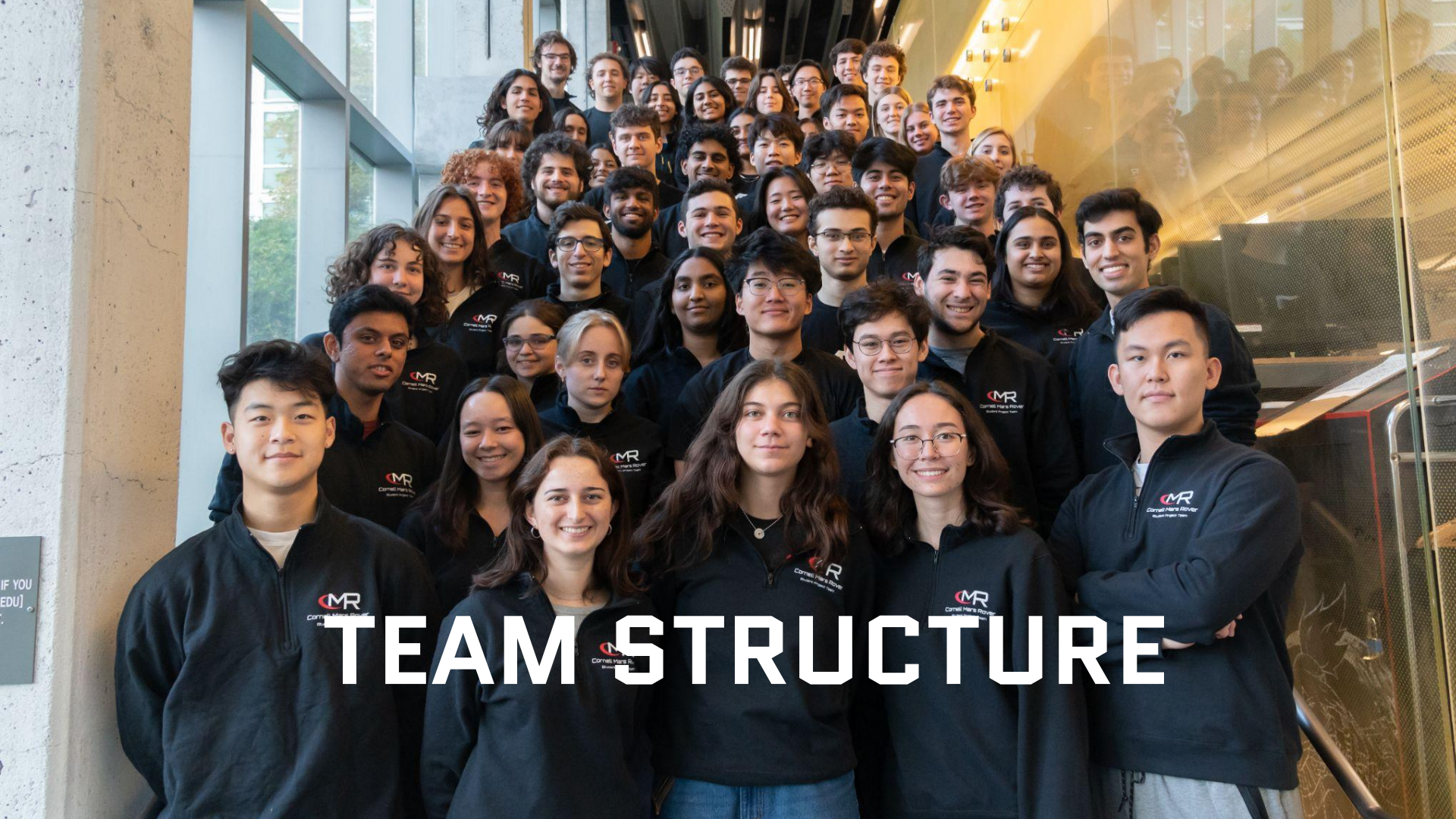
Autonomous Traversal

"autonomously traverse between markers in this staged mission across… difficult terrain"

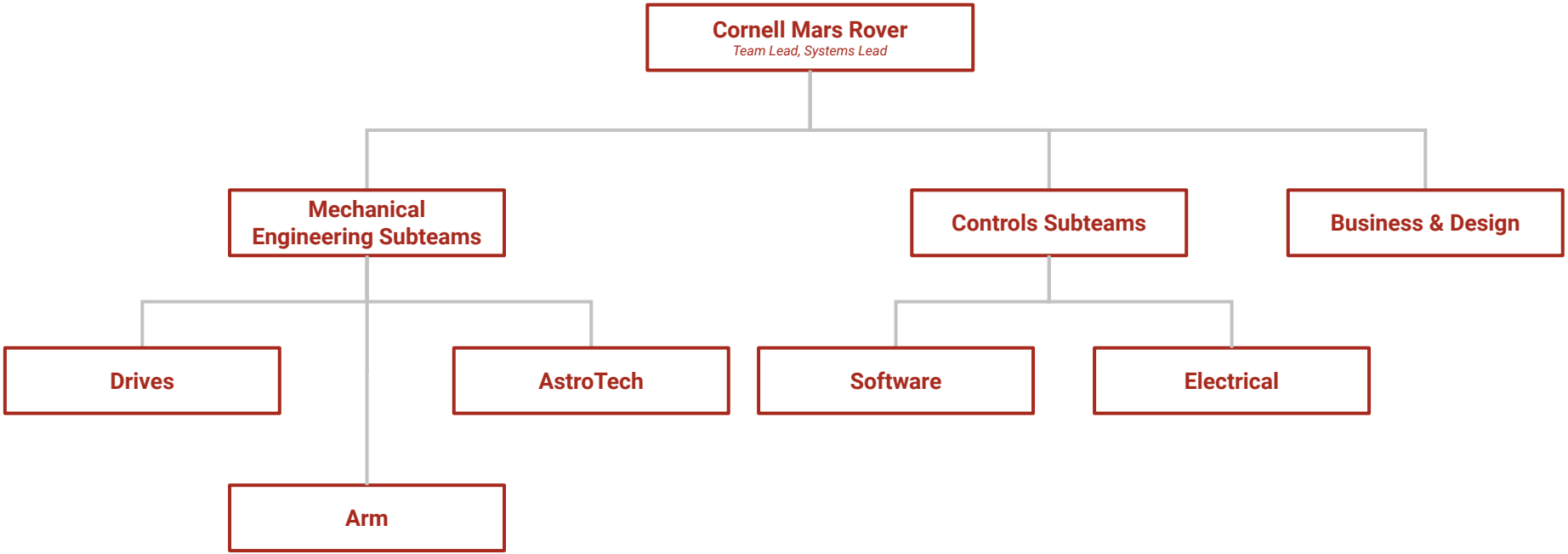
As given GPS coordinates get increasingly vague, operators give commands from the base station to:

- Locate AR Tags
- Avoid obstacles


2nd
EQUIPMENT SERVICING
2017
5th
AUTONOMOUS TRANSVERSAL
2018
3rd
AUTONOMOUS TRANSVERSAL
2019

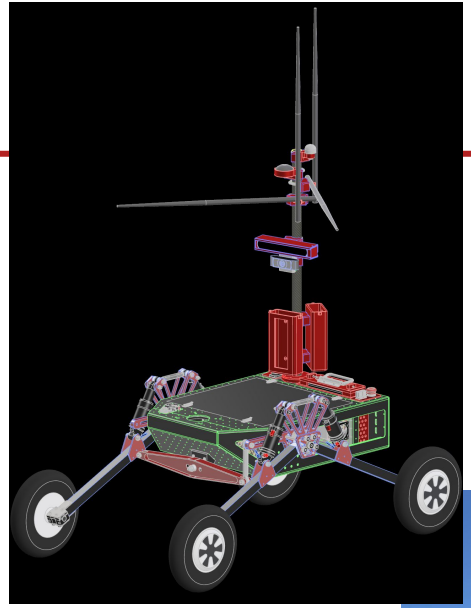

TEAM STRUCTURE

Overall Structure

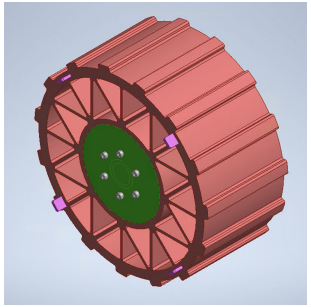


Drives

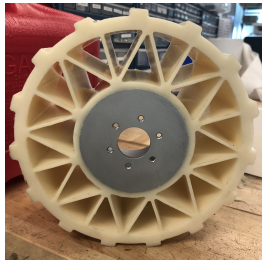
- **Suspension:** Damped Rocker Suspension
- **Wheels**
- **Frame/ECore:** Bent Sheet Metal frame/ECore
- **Camera Mast**



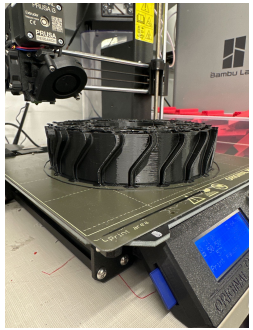
Drives system CAD



Urethane wheel cad



Urethane wheel



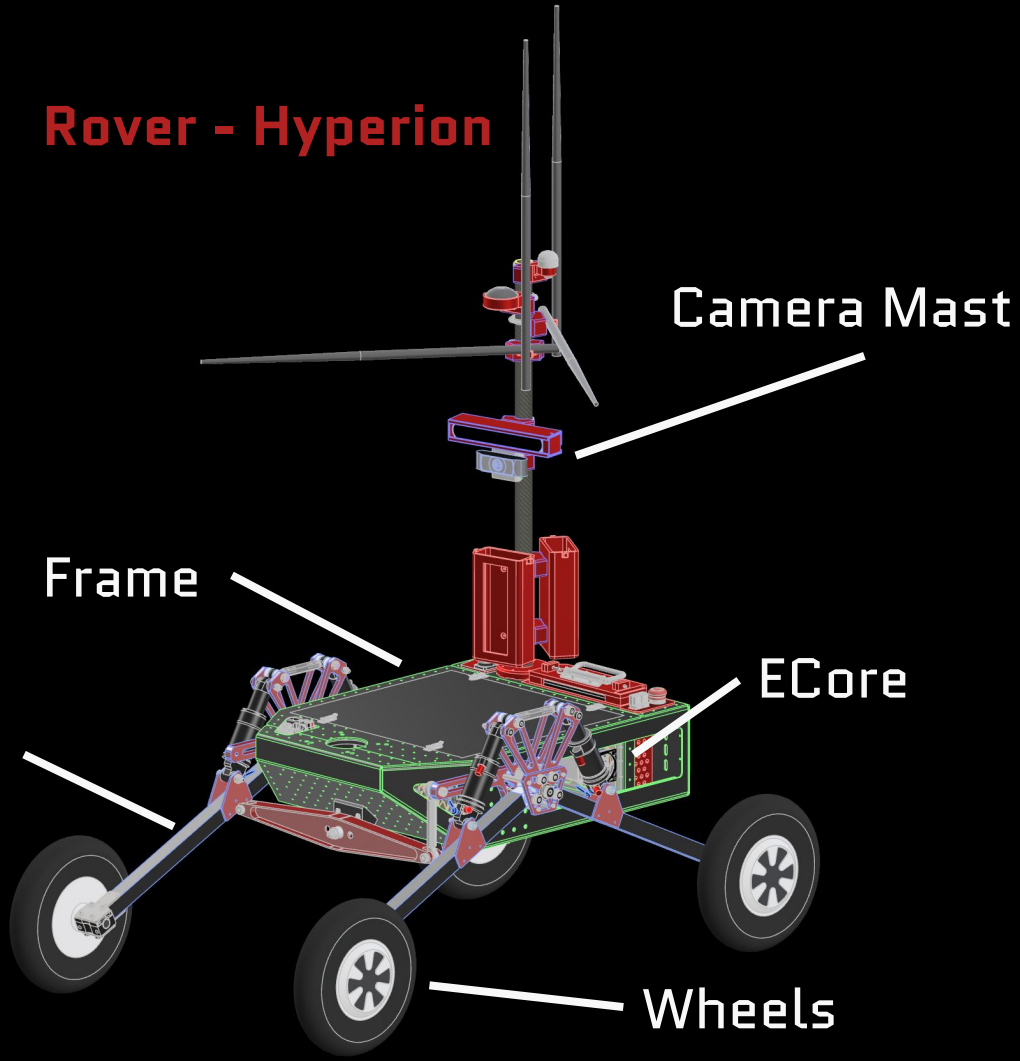
3D printed wheel printing

3D printed wheel CAD

Suspension frame assembly

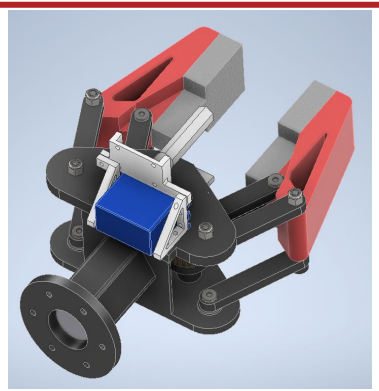
Drone - Juno

Rover - Hyperion

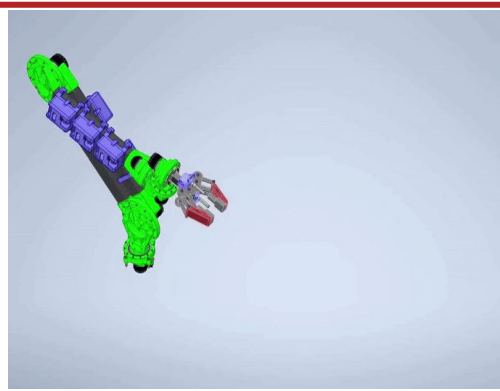


Arm

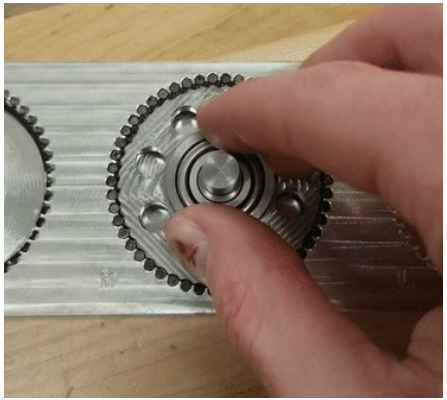
- **Structure** - Lightweight and stiff supports
- **Joints/Gearboxes** - Power/move the arm while achieving zero backlash
- **End Effector** - Allow arm/rover to grip and manipulate a variety of objects



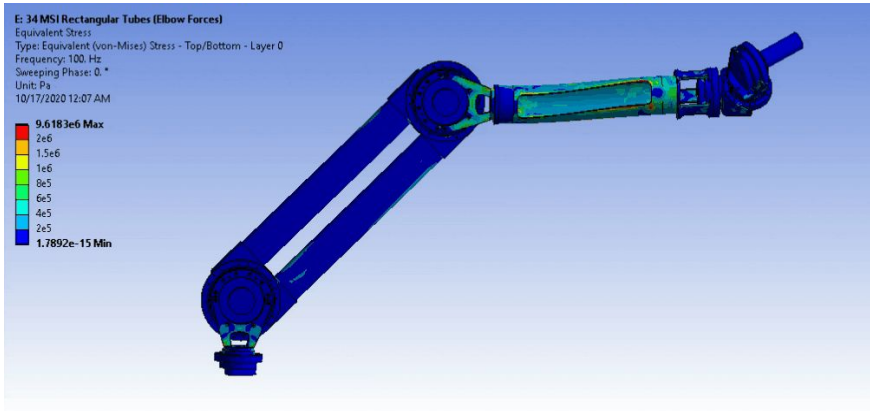
Parallel End Effector



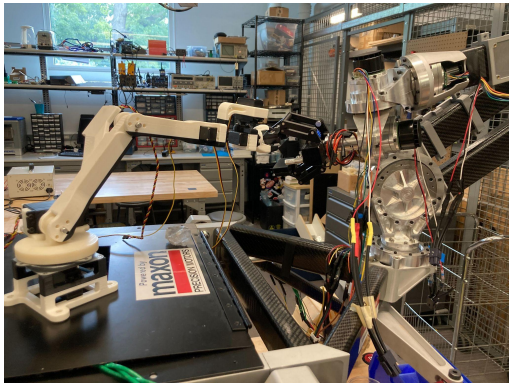
Arm Extension Animation



Custom Cycloidal Gears

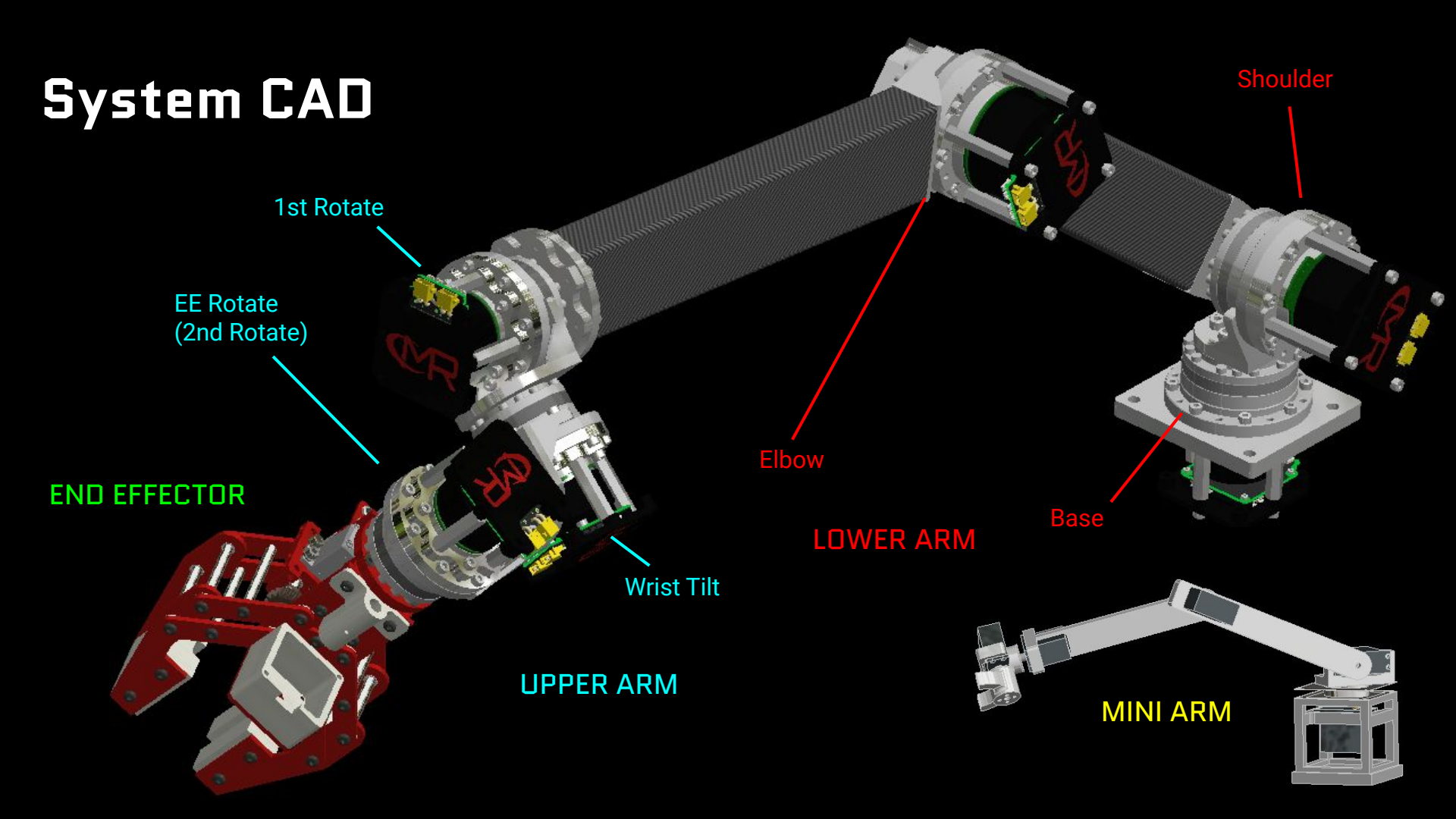


ANSYS Modal Analysis



Big/Mini Arm Holding End Effectors

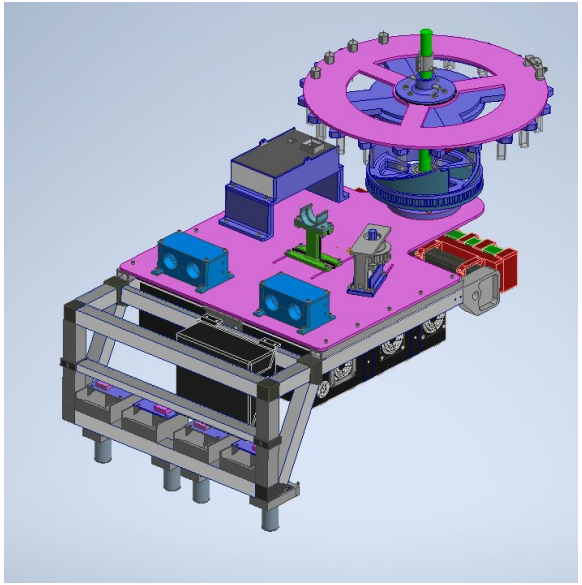
System CAD


1st Rotate
EE Rotate
(2nd Rotate)
END EFFECTOR
Wrist Tilt
UPPER ARM
Elbow
LOWER ARM
Shoulder
Base
MINI ARM

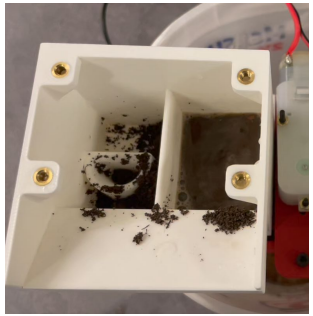
AstroTech

Note: this subteam is not recruiting for Spring 2023, but we will be recruiting in the Fall!

- Short for “Astrobiological Technology”
- Developing an on-board life-detection lab for the science mission
- Collection, mixing, centrifuge, and analysis subsystems

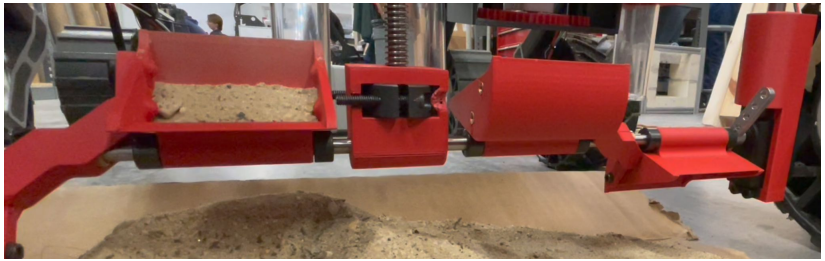


Collection
Rotating scoop array



Mixing
Magnetic stir bars and compartmentalization

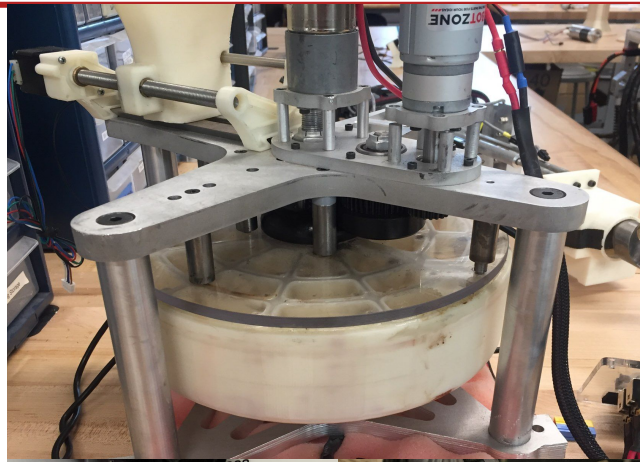
Analysis
On-board test tubes and sensors

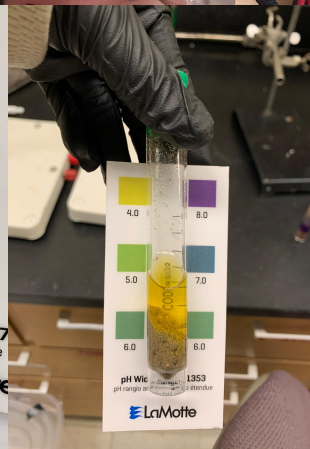


AstroTech Research

Note: this subteam is not recruiting for Spring 2023, but we will be recruiting in the Fall!

- Focus is to look for extinct, extant, and present life!
  - Soil analysis for organic compounds coupled with
  - Geological analysis for essential inorganic minerals
- Explore the presence of a potential biosphere using
  - Surface geology
  - Atmosphere
  - Biomolecules
- Experimental testing and data analysis to which knowledge about chemistry, biology, and geology, can be applied!

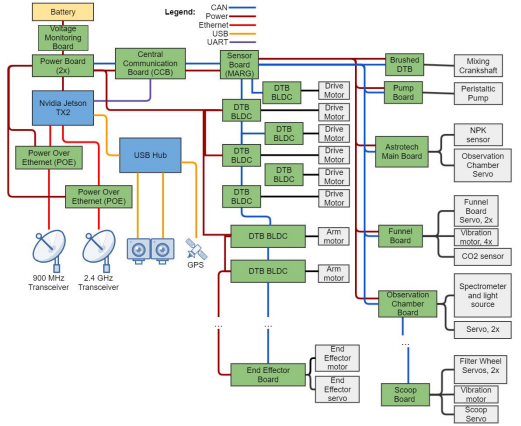


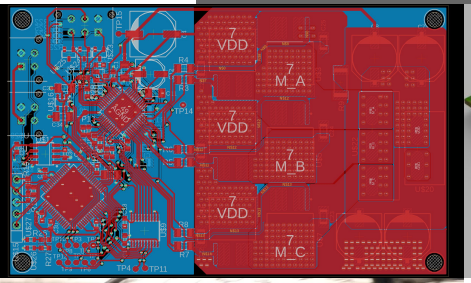


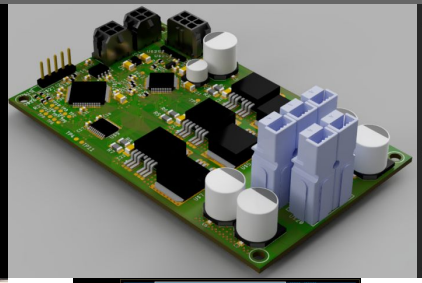
Electrical

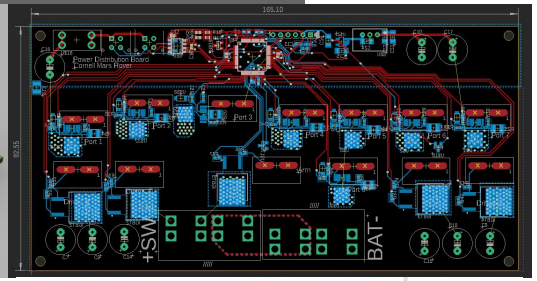
Note: this subteam is not recruiting for Spring 2023, but we will be recruiting in the Fall!

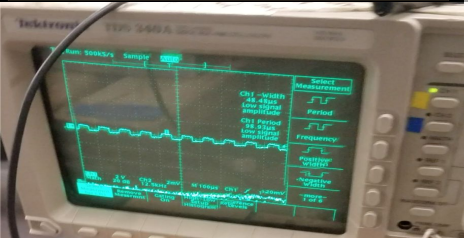
- Develop rover electronics from the ground up
- Build flexible systems to meet a wide range of mechanical and CS requirements
- Circuit Design and Analysis, PCB Design, Microcontroller Programming, Motor Control, Sensors, Embedded communication protocols

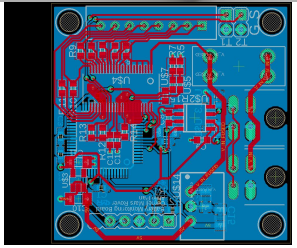


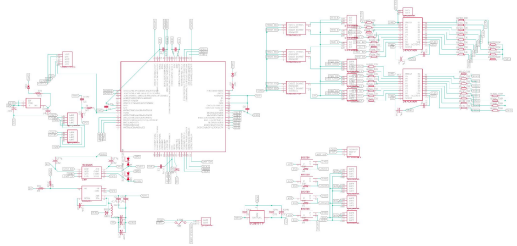










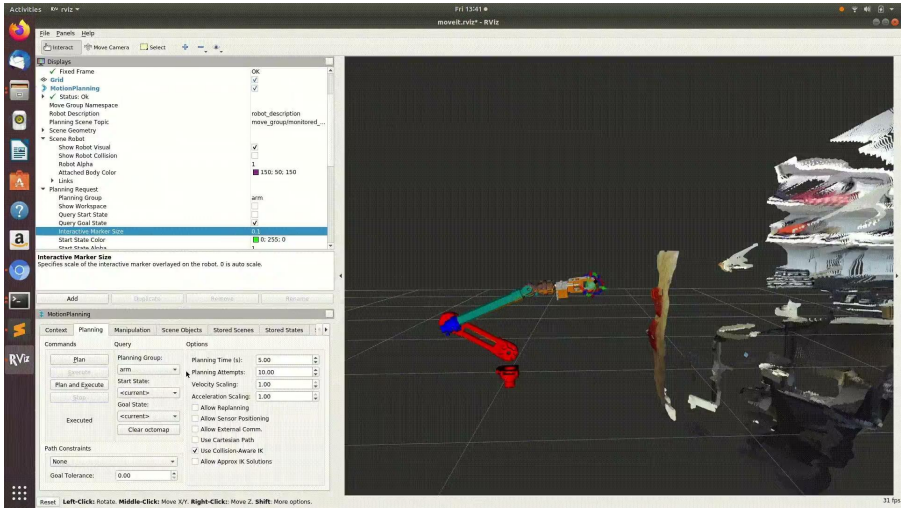


Software

We work with a variety of languages and frameworks to design and implement controls software for operating the rover.

- Autonomy Stack: AR Tag detection system using LIDAR for obstacle detection
- Arm control via inverse kinematics
- Design and implement interfaces for controlling the rover and its various functionality
- ROS - the industry standard [meta] OS for robotics
- Building controls interfaces in React
- Initialization & operation scripting in Python

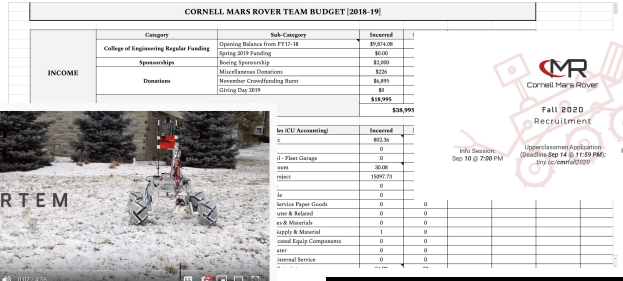
Note: this subteam is not recruiting for Spring 2023, but we will be recruiting in the Fall!



Business & Design

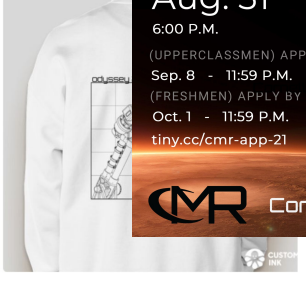
Note: this subteam is not recruiting for Spring 2023, but we will be recruiting in the Fall!

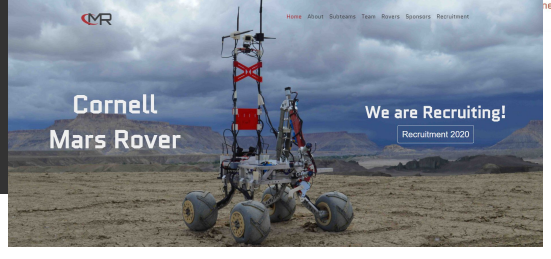
- Web design, graphic design, social media, video editing, and finance
- Fundraise, budget, market, work with large scale sponsors, and reach out to other students and the local community



Cornell Mars Rover - URC SAR 2019

2,469 views • Published on Mar 1, 2019





CMR Order Form 2020-2021

If you need to cancel any orders or have questions, email or slack the Business subteam ASAP! (Krishnan and Rory)

* Required

Your Name *

Your answer

Subteam *

Arm

CS

Our Sponsors:


Where We Work:
BOEING
LOCKHEED MARTIN
Johnson & Johnson
MOOG
PHILLIPS 66
Schlumberger
SPACEX
Virgin
GALACTIC
Sensata
Technologies
workday.
BLUE ORIGIN
Orbital ATK
Virgin
ORBIT
GRC
GLENN RESEARCH CENTER
at Lewis Field
ASML
Panasonic
Qualcomm
zipline
JPL
Jet Propulsion Laboratory
mongoDB
verizon
LUTRON
Raytheon
BAE SYSTEMS
NASA
SLAC
yelp
amazon
CERN
MITRE
Microsoft
Morgan Stanley
TWO SIGMA
CapitalOne
Bloomberg
Relativity
DISCOVER
FINANCIAL SERVICES
TESLA

FAQs

Q: What experience do you look for in applicants?
A: We expect applicants to have some technical experience (CAD, previous design work, etc). We are especially looking for passionate and driven individuals who are excited to build a rover!
Q: How many applicants do you expect to bring onto the team this cycle?
A: We don't know! We don't go into recruitment with a set number of spots to fill, the number of applicants that we bring onto the team depends on the applicant pool.
Q: What does the time commitment look like?
A: When onboarded in the spring you would enroll CMR for 2 credits (about 4-6 hrs of work a week). You would also enroll in ENGRG 1400 for 1 credit which equates to 3 hrs/week.
Q: What does the recruitment process look like?
A: We read through the applications name blind, then about a week after applications close we send out invitations for interviews. Interviews are about 20 mins where we ask a series of behavioral questions and technical questions. Don't stress too much about getting the right answer, we care more about seeing how you think through problems.
Q: How many subteams can I apply to?
A: Up to 2, you rank your first and second choices (second choice optional)

APPLICATION

RECRUITMENT SPRING ‘24

Application due:

Feb. 1 @ 11:59pm

tinyurl.com/cmrSP24

Application

THANK YOU!
Any Questions?

@cornellmarsrover

cornellmarsrover@gmail.com

cornellmarsrover.org

Cornell Mars Rover Team