

SELECTED WORK

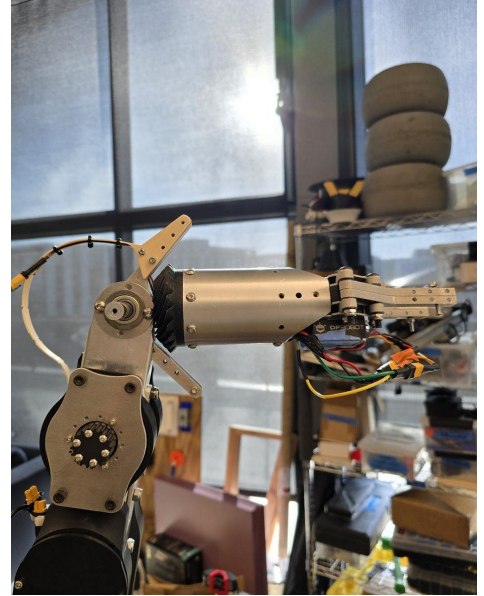
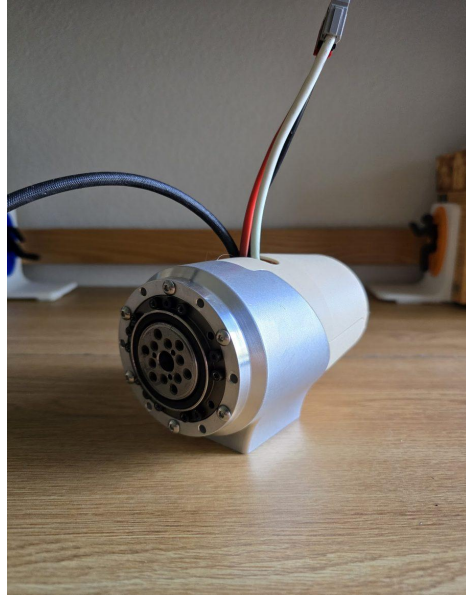


AARON AVILES

MECHANICAL · ROBOTICS ENGINEERING

Aaron Aviles

MECHANICAL ENGINEER · UC SAN DIEGO



ARM 2.0 · MOTOR MODULE · HAND 2.0

CAD / CAM

SOLIDWORKS · ONSHAPE

MACHINING

CNC · WATER-JET · 3D PRINT

CONTROLS

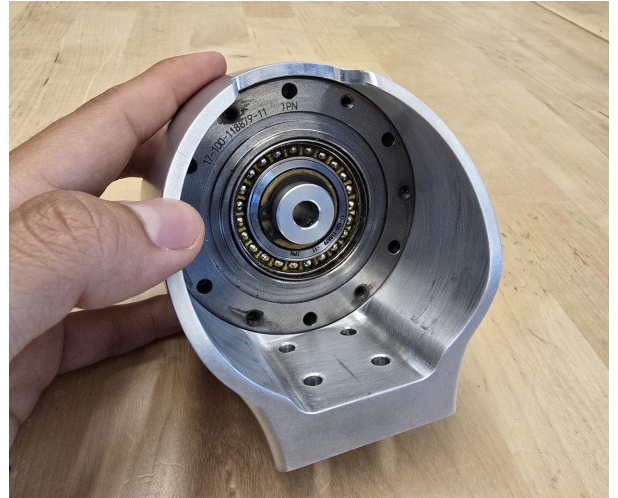
ODRIVE · HARMONIC · MOTION

SYSTEMS

ARCHITECTURE · V&V



COMPETITION ROVER, URC · HARMONIC DRIVE JOINT



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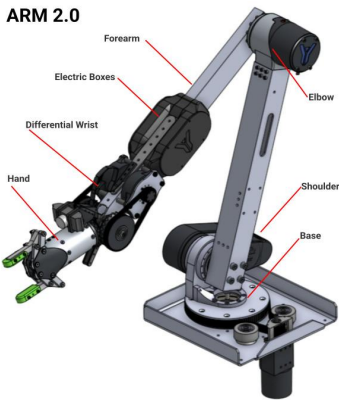
Yonder Dynamics

UC SAN DIEGO · UNIVERSITY ROVER CHALLENGE · LEAD MECHANICAL



FIELD DEPLOYMENT — COMPETITION ROVER

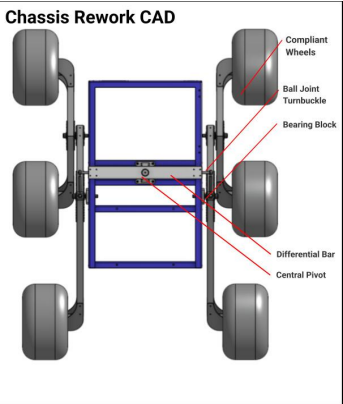
ARM 2.0



ARM 3.0



Chassis Rework CAD



ARM 2.0 · ARM 3.0 · DRILL ELEVATOR · CHASSIS

SCIENCE

SOIL SAMPLING

DELIVERY

WAYPOINT DROPS

SERVICING

TERMINAL TASKS

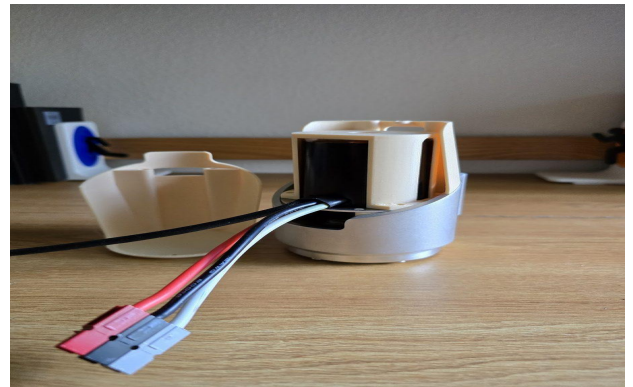
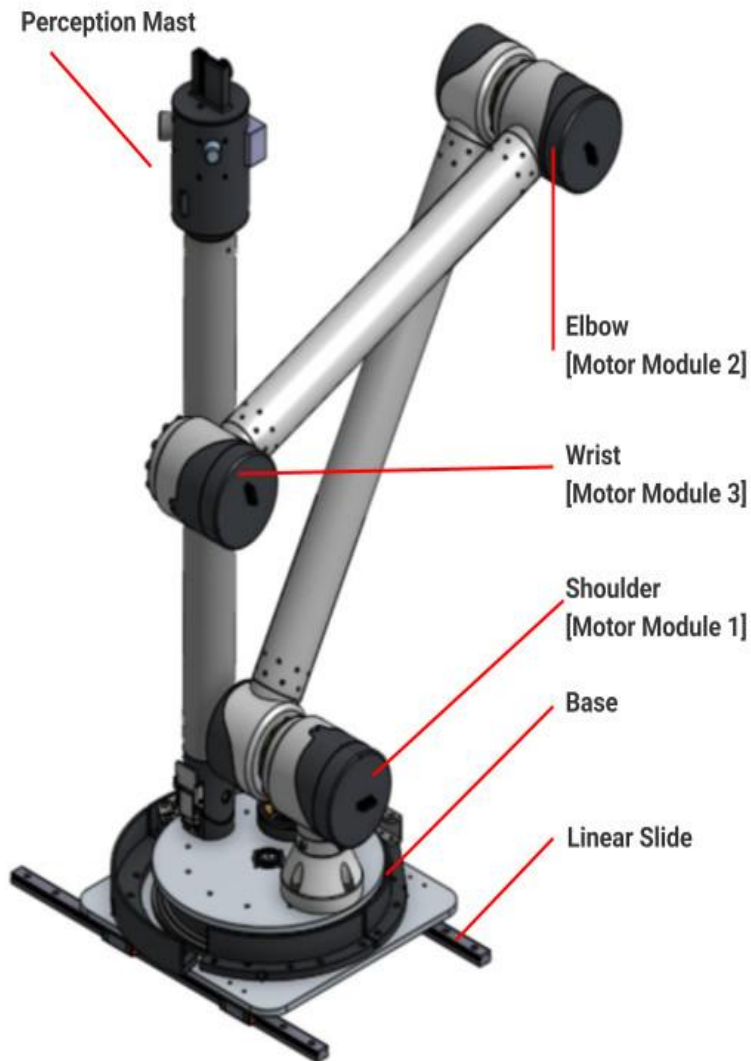
AUTONOMY

WAYPOINT NAV

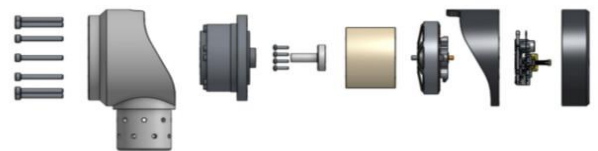
6-DOF Rover Arm

LINEAR SLIDE · BASE · SHOULDER · ELBOW · WRIST

ARM 3.0



Motor Module for ARM 3.0



MODULE · WIRED · ARM 3.0 EXPLODED

LABELLED ASSEMBLY

6 DOF

5 REVOLUTE + SLIDE

MODULAR

SHARED JOINT UNIT

COLLAPSIBLE

STOWS HORIZONTAL

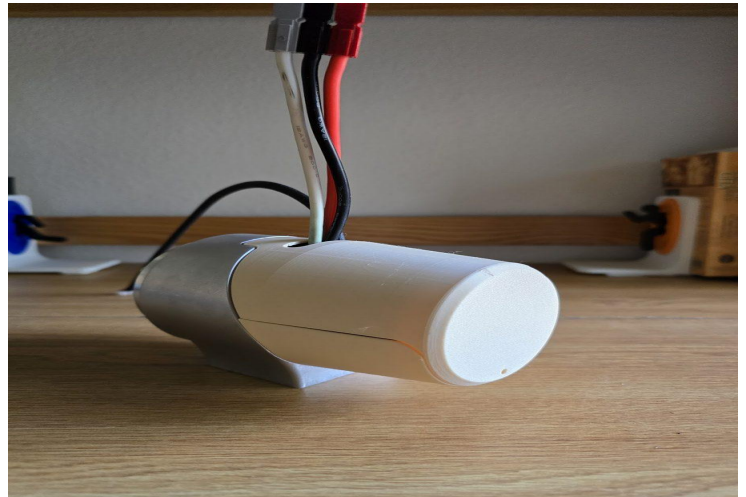
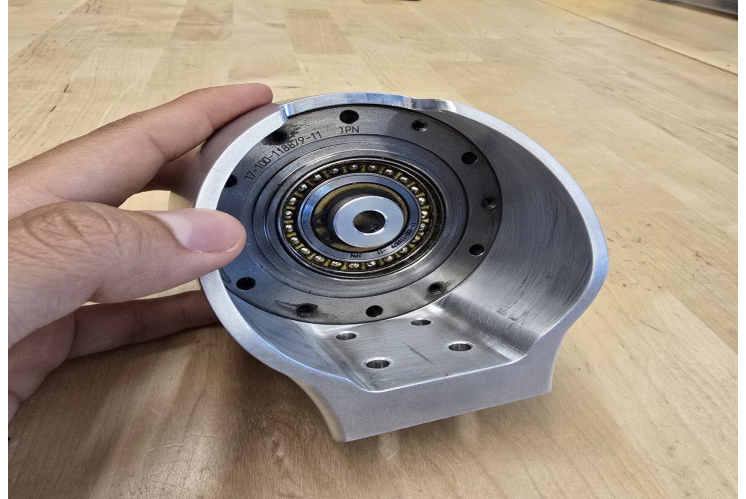
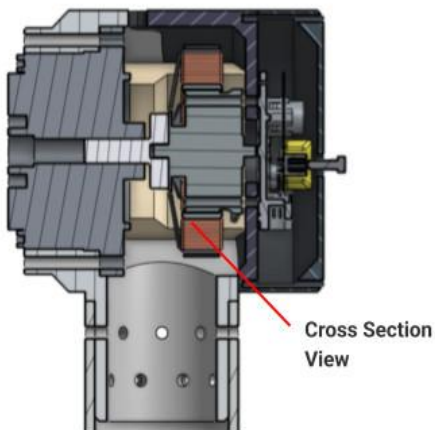
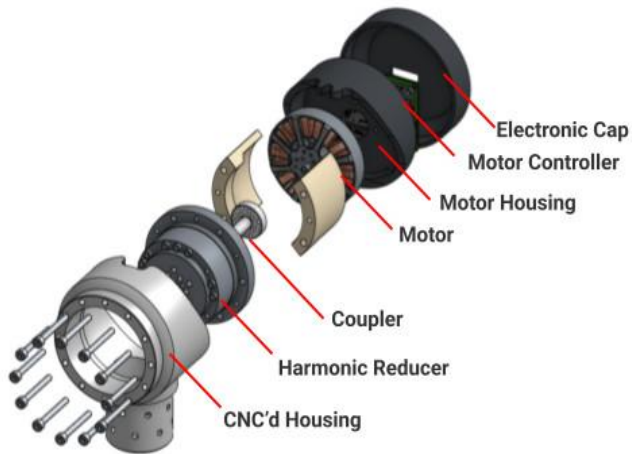
CARBON

PLANNED TUBING

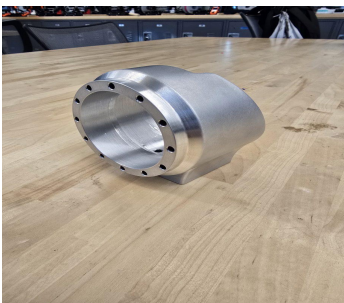
Modular Robotic Joints

MOTOR + HARMONIC REDUCER + ENCODER + CONTROLLER, ONE UNIT

Motor Module



EXPLODED & SECTION · HARMONIC DRIVE · ASSEMBLED



100 : 1

HARMONIC REDUCTION

ODRIVE

MAGNETIC ENCODER

1-PIECE

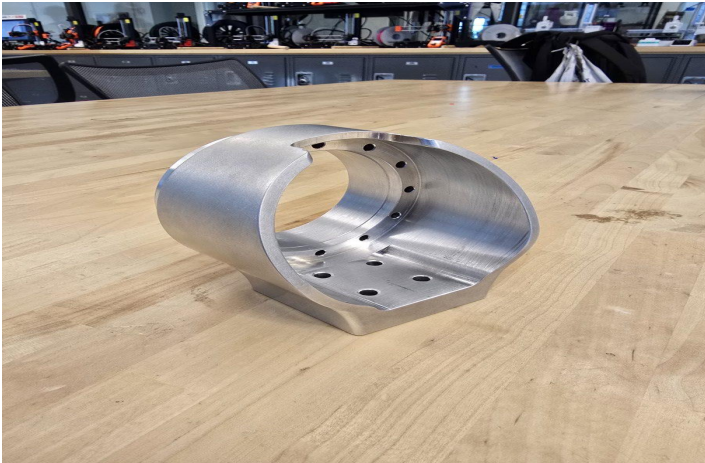
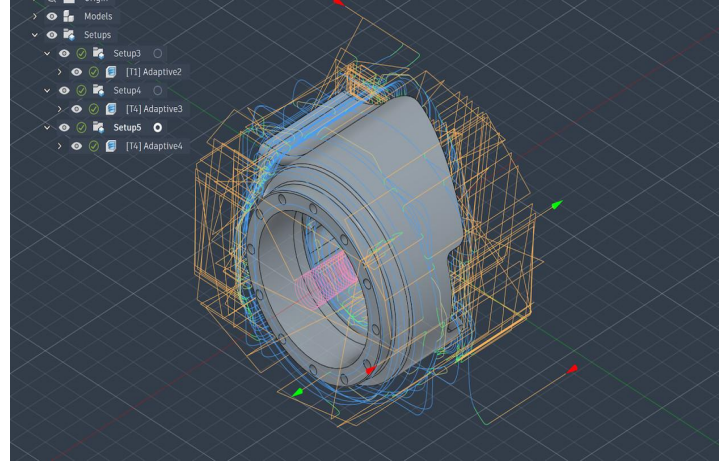
CNC ALUMINUM

SWAPPABLE

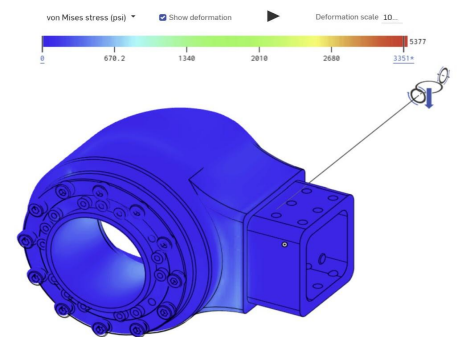
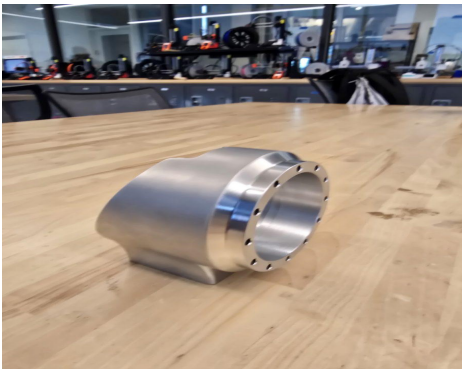
MOTOR-AGNOSTIC

Prototype → Production

FDM FITMENT · FUSION 360 CAM · 3-OP TORMACH · FEA 2.5 FoS



FDM PROTOTYPE · CAM SETUP · MACHINED HOUSINGS



FINISHED PARTS · FEA — WORST-CASE TORQUE & SHEAR

2.5 FoS

VERIFIED IN FEA

3 SETUPS

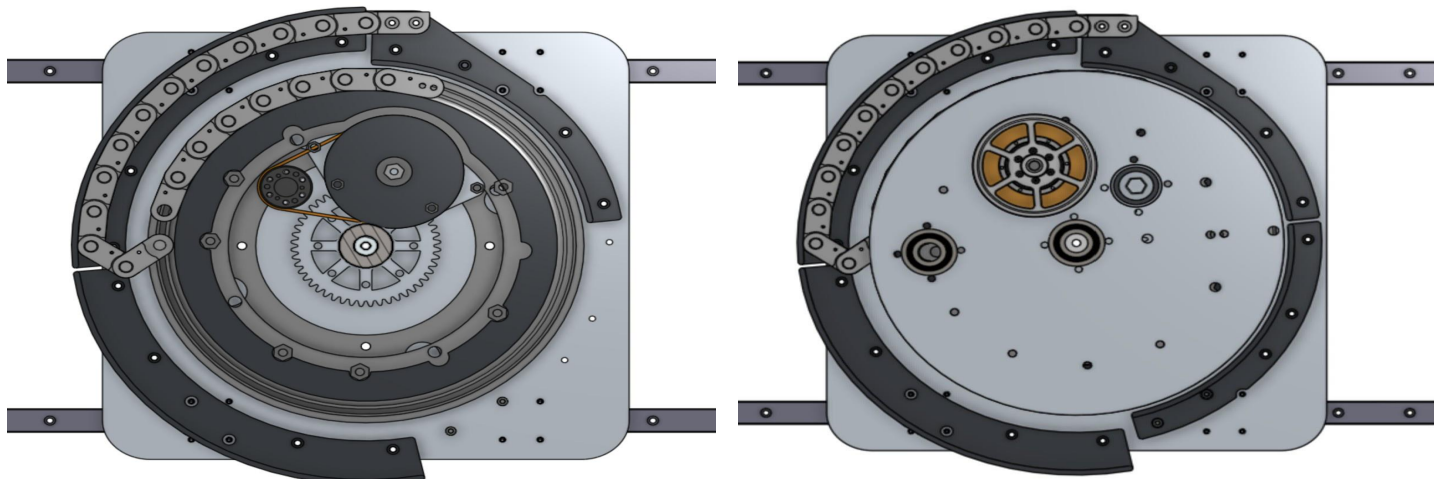
TORMACH MILL

FILLETED

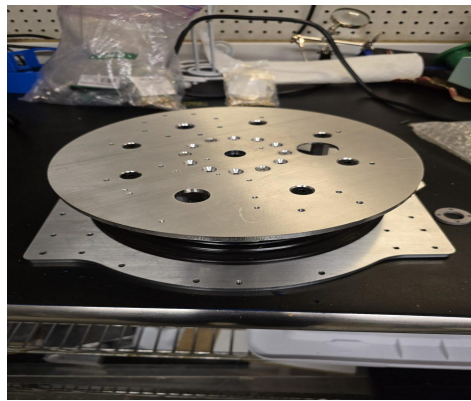
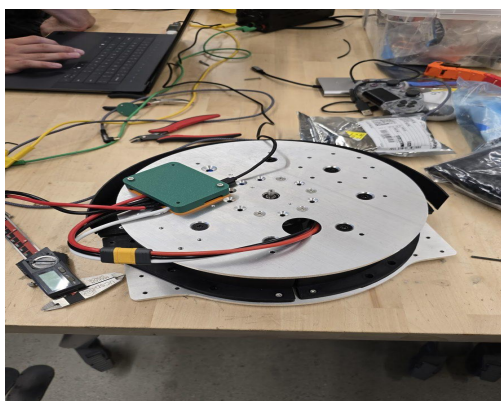
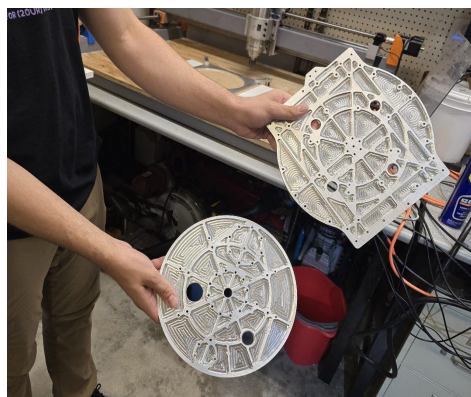
CORNERS OPTIMIZED

360° Continuous Base

COMPOUND PLANETARY DRIVE · CUSTOM E-CHAIN



EXTERNAL & INTERNAL — LABELED ASSEMBLY



POCKETED PLATES (519 g) · BENCH ASSEMBLY

6.75 : 1

BELT + PLANETARY

5052 AL

0.25" WATER-JET

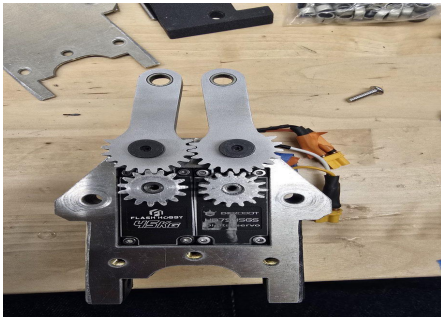
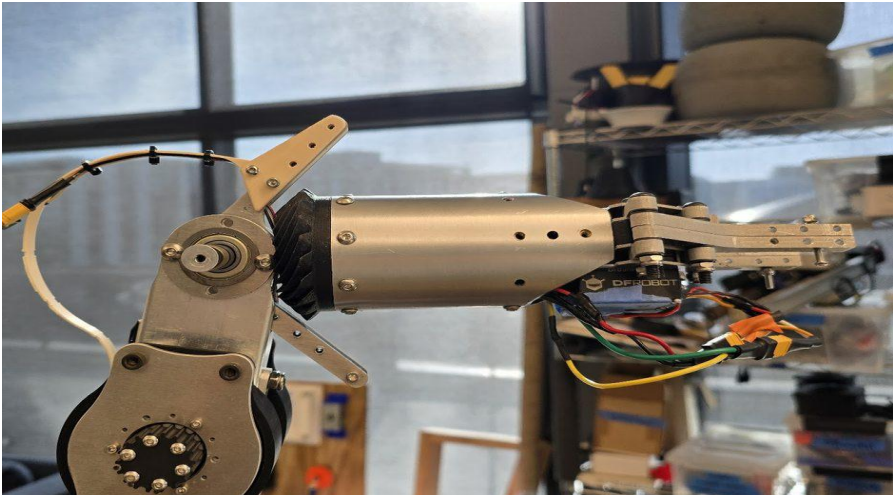
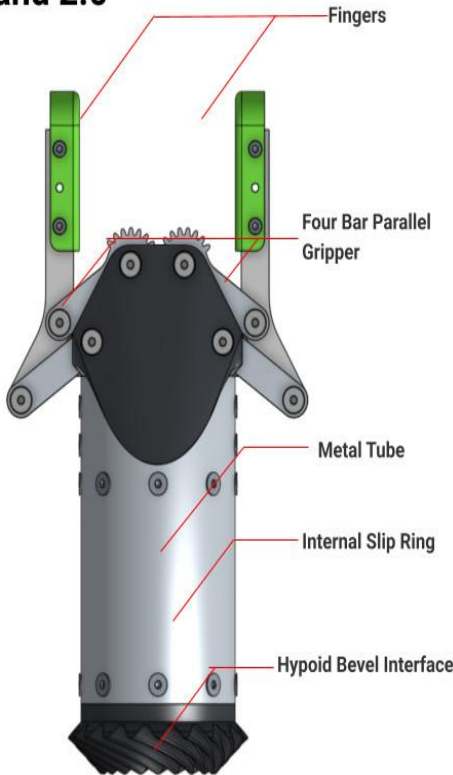
360°

PRELOADED TURNTABLE

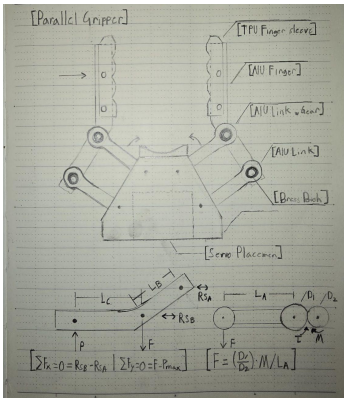
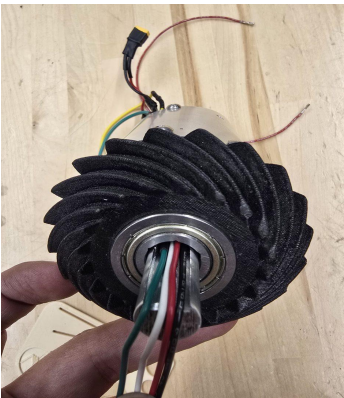
Parallel Gripper + Wrist

MODULAR END-EFFECTOR · INFINITE ROTATION

Hand 2.0



LABELLED ASSEMBLY · ON ARM · GRIPPER · DUAL SERVOS



HYPOID BEVEL · STAMPED GEAR · LINKAGES · DESIGN CALC

181 N

GRIP · 3.5 FoS

4-BAR

PARALLEL CLOSURE

INFINITE

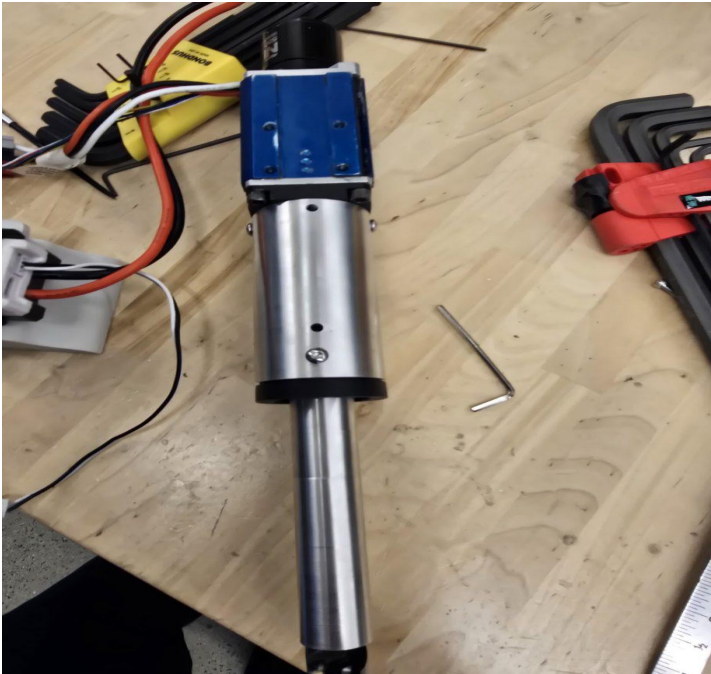
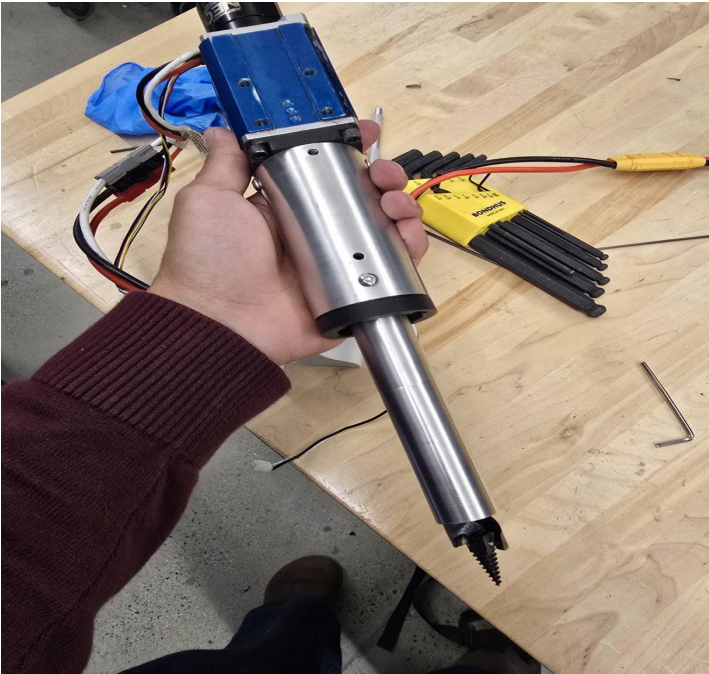
SLIP-RING WRIST

MODULAR

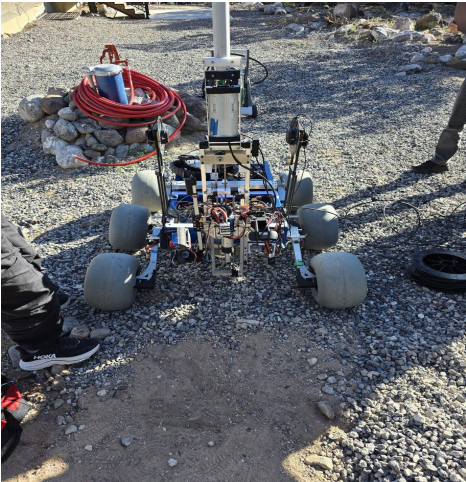
SWAPPABLE FINGERS

Depth-Sorted Sampling Drill

AUGER COLLECTION · SELF-PLUGGING CACHE



ASSEMBLED DRILL — AUGER BIT & CACHE BODY



CACHE TUBE · ACTUATION · ROVER-MOUNTED

NEO 550

48:1 REDUCTION

11,000 RPM

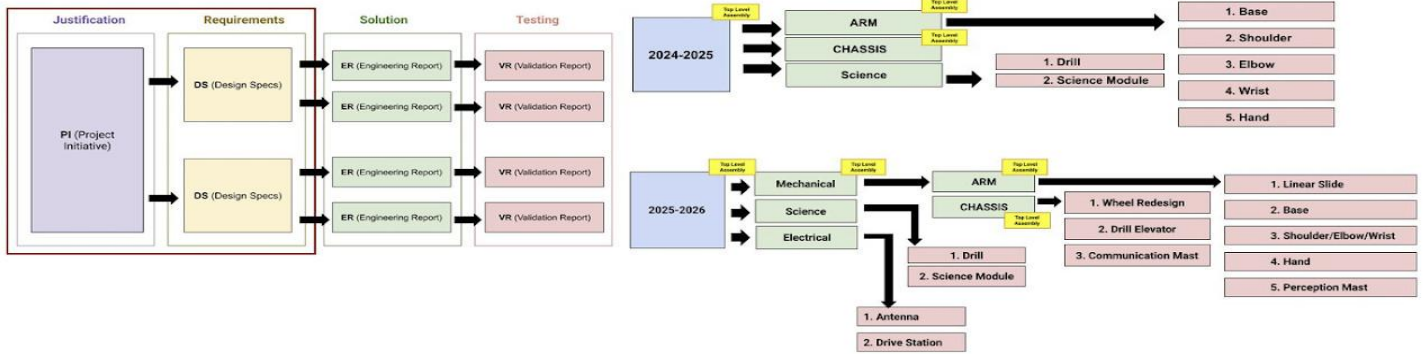
FREE SPEED

10 cm

DEPTH-SORTED CACHE

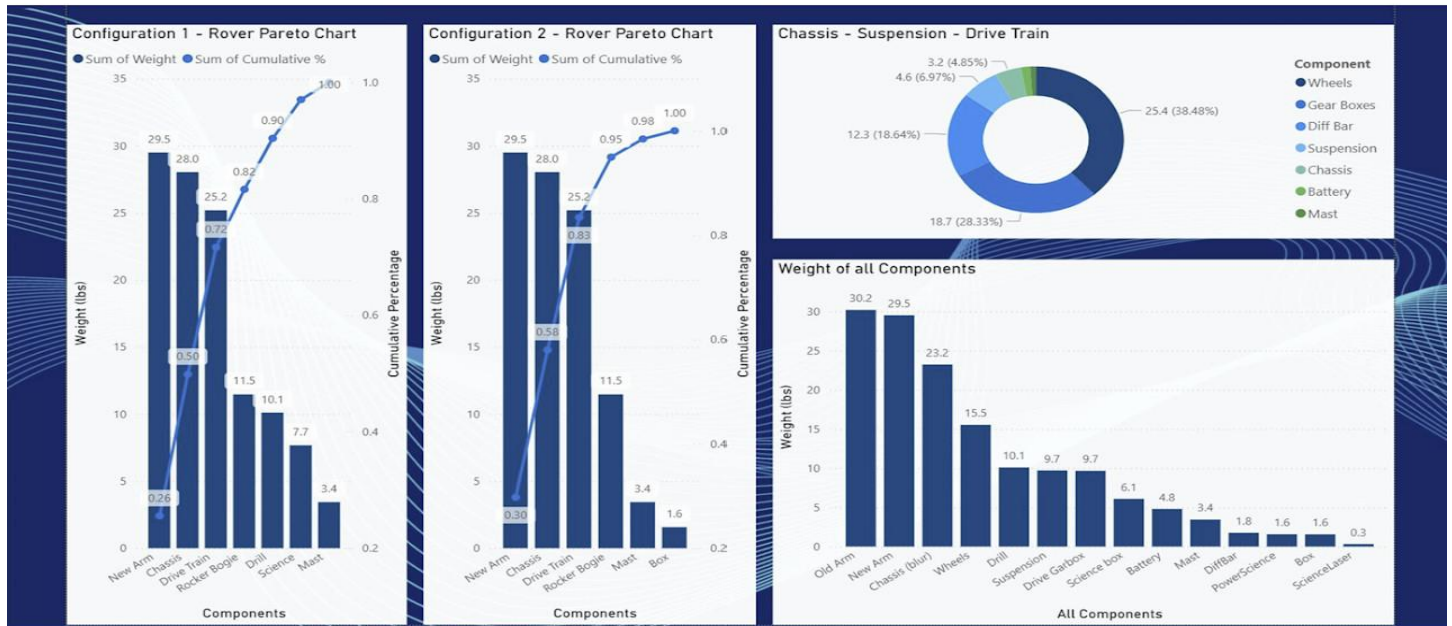
Systems Engineering & V&V

CAD LIBRARY · ARCHITECTURE · PI · DS · ER · VR

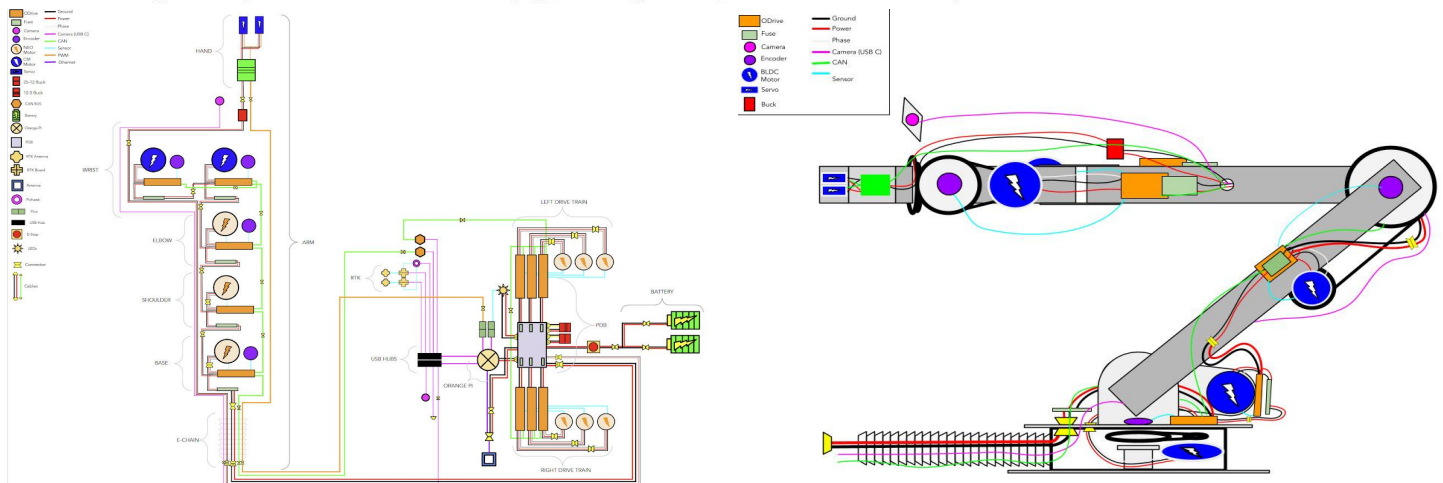


Quantity Control Database Diagram - AAViles

Onshape Architecture Flow Diagram - AAViles



PowerBI Weight Analysis DashBoard - AAViles - (Highest weight components ID'd for rework)



More on the Site

FULL WRITE-UPS, VIDEO & PHOTOS AT AARONLAVILES.COM

01 ARM 3.0

6-DOF · MODULAR JOINTS

03 MOTOR MODULES

HARMONIC · ODRIVE · CNC

05 HAND 2.0

GRIPPER · INFINITE WRIST

07 DRILL ELEVATOR

2-STAGE CASCADE

09 PERCEPTION MAST

SENSING PLATFORM

02 ARM 2.0

5-DOF · DIFFERENTIAL WRIST

04 ROTATING BASE

360° · CUSTOM E-CHAIN

06 SCIENCE DRILL

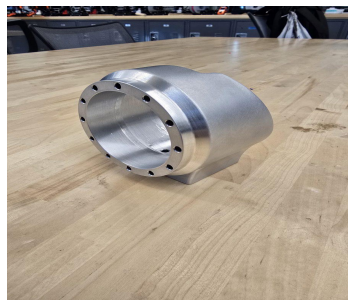
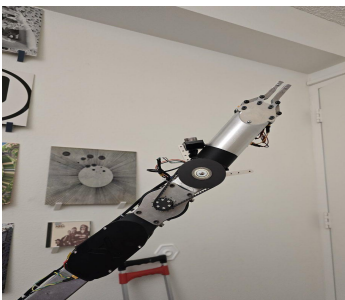
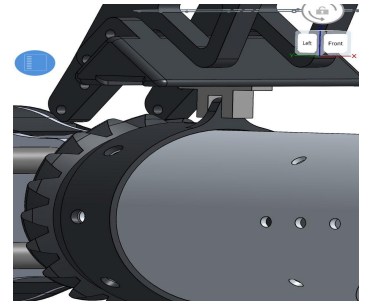
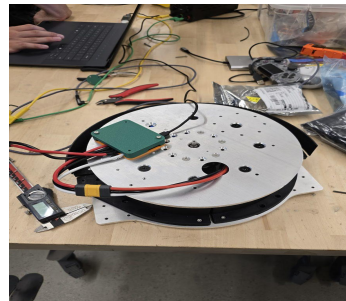
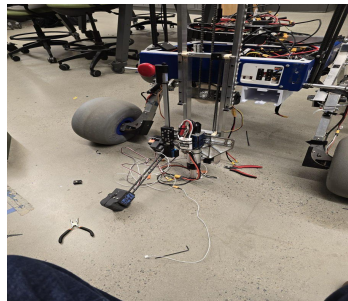
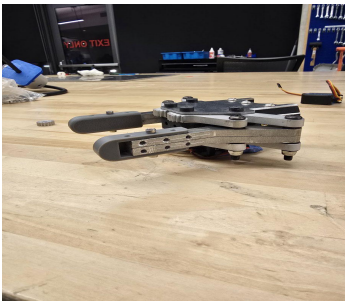
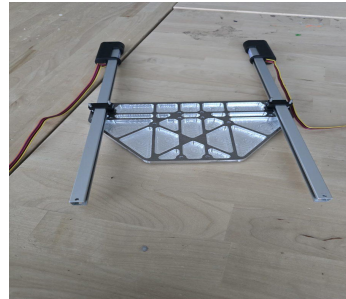
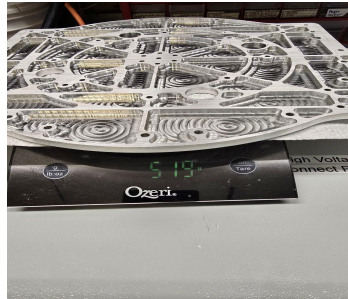
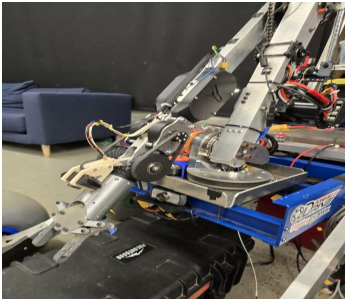
AUGER · DEPTH-SORTED

08 CHASSIS RE-CAD

SUSPENSION · MASTER ASSY

10 SYSTEMS / QCDB

V&V · ARCHITECTURE



SELECTED HARDWARE



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THANK YOU