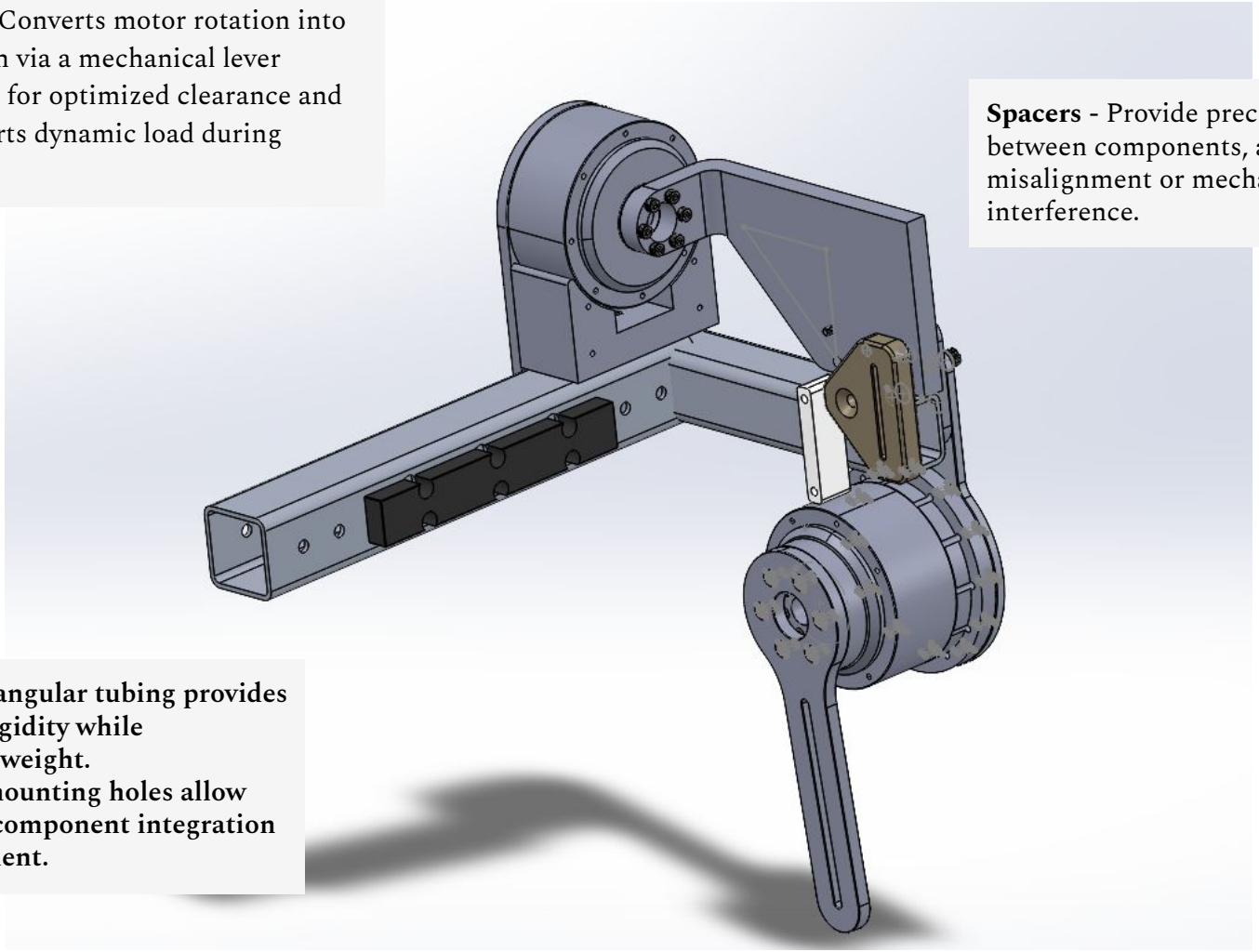
Exoskeleton - Design Extension

Neuromuscular Controls and Rehabilitation Lab, NC State University

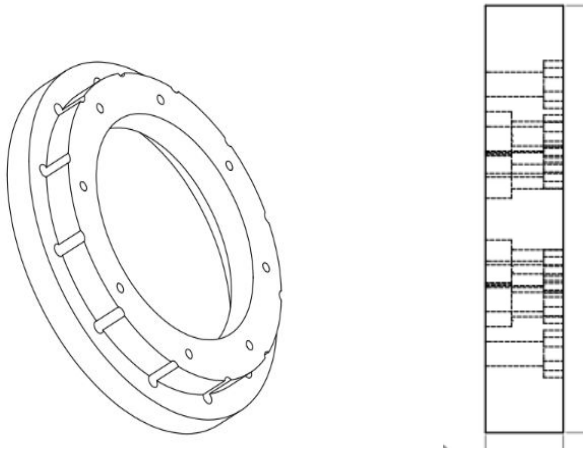
Rotating Link Converts motor rotation into limb articulation via a mechanical lever system. Profiled for optimized clearance and strength, supports dynamic load during walking.

Spacers - Provide precise offsets between components, avoiding a misalignment or mechanical interference.



Hollow rectangular tubing provides structural rigidity while minimizing weight.
Machined mounting holes allow for flexible component integration and adjustment.

Connectors designed to accommodate for 2 different motor sizes, according to the project testing requirements and transition b/w structural and tubing elements. Provide modularity for quick assembly, testing, and field replacements.



Screw holes are designed to accommodate both the shank and head of standard fasteners, enabling flush and secure joining between mating components.
Integrated hex nut pockets provide a reliable fastening method, especially in 3D printed parts, where direct threading is impractical or weak.

Fixtures for Mitral Heart Valve Replacement Catheter

Tioga Cardiovascular

VDS steering Inspection Fixture (Pass/Fail Inspection Functional test)

Requirement

VDS bends at 120 degrees for valve deployment

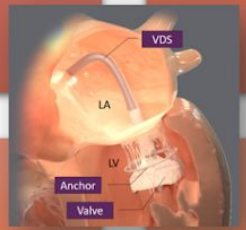
Obstacles

Printing time

Radius of curvature measurement

Catheter alignment

Fixture Stability



Solution

SLA Printed fixture

Sturdy

Easy to use

Repeatable design and Process

Create AR, ES and EQ for documentation

Impact

Easy Inspection

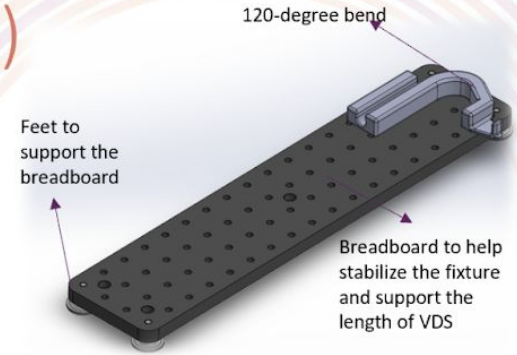
Learnt the functioning of VDS Assy

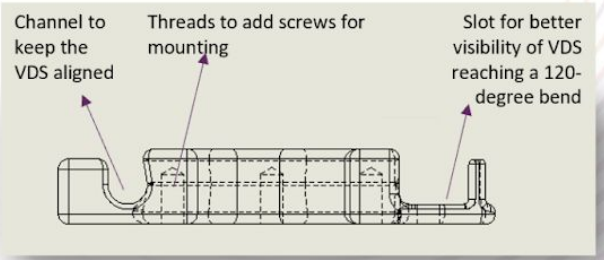
Learnt about different printing materials

First Fixture Printed ☺

Successful manufacturing on time implementation for use in CER

Picture of the fixture





TIOGA CARDIOVASCULAR

Carriage Yoke Assembly

Problem

Yoke didn't clamp to lock Carriage handle assembly to prevent catheter handle assy clock/counter-clock

Obstacles

Cam dimensions incorrect

Time Constraint

Unknown inspection dimension

Supplier part

Solution

File the current lot

Add inspection dimension

Change print orientation to avoid warpage at assembly location

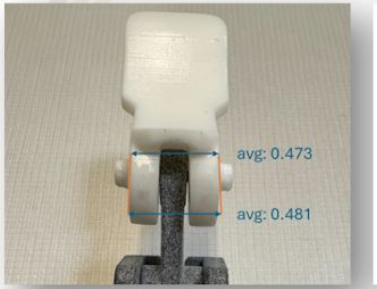
Create MPI for rework

Impact

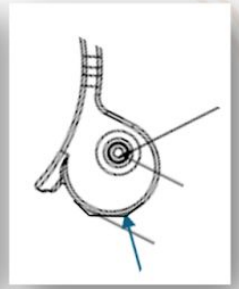
Saved future re-work requirements

Understood factors affecting 3D printing

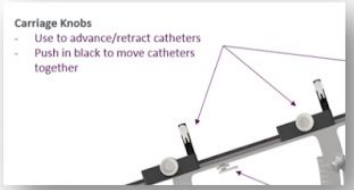
Redefined cam profile inspection requirement



Flanged cam



Incorrect cam profile printed



Restricted cam movement

TIOGA CARDIOVASCULAR

Vertical Braiding Machine Fixture

Problem

Incorrect Braid Pattern due to Oscillation of long mandrels

Obstacles

Printing time

Dimensions and Cups

Silicone gripping mechanism

Diameter change

Space constraints

Solution

Dynamic Fixture to grip mandrels

Fixture to correct Wire Alignment

AR, EQ, ES for documentation purposes

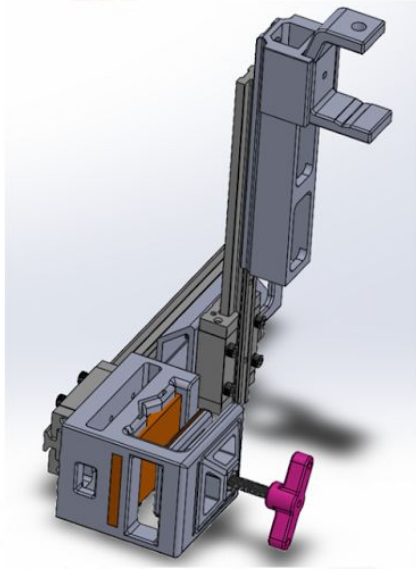
Impact

Cost lesser than supplier's quote

Reduced rework/ rejects for braid PPI

First communication with equipment supplier

Reduced reprint time

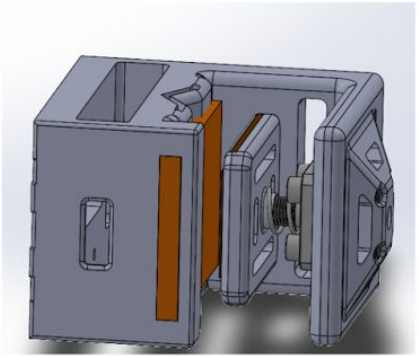


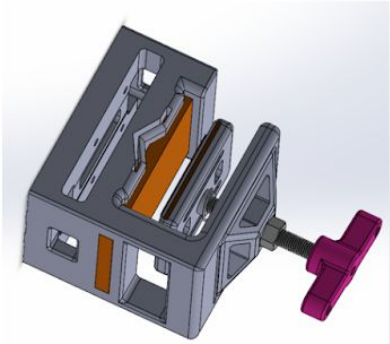
Vertical Braiding Machine Fixture

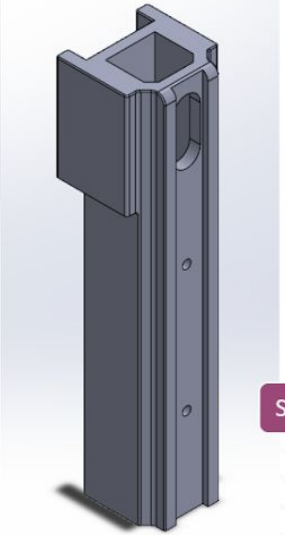
Slotted design to hold silicon without the need to gluing it

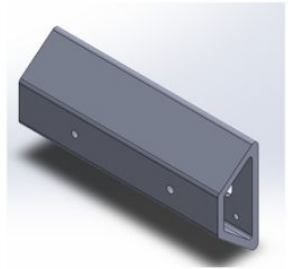
Slots to reduce material consumption and print time

Dimensioned to assure correct assembly









Slots to prevent cup formation

Springs and adjustable knob to accommodate diameter change over length

Slots for better visibility during assembly

Linear coupling to facilitate sliding motion

Recesses to prevent vibrations

Bamboo Bicycle Frame Design

Bamboochi Bicycles

Bamboo Bicycle Frame

Geometric Design and Analysis