DIALED
ARC SYSTEM

Alignment Recovery and Correction

Build Progress & Design Portfolio

Team DIALED

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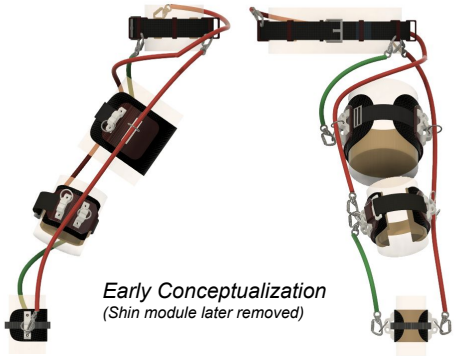
April 2026

THE MISSION

Project Overview

DIALED developed the **Alignment Recovery** and **Correction System** (ARCS), an assistive leg brace for stroke patient rehabilitation. The modular system uses resistance bands and adjustable anchor points across waist, thigh, and ankle modules to apply controlled therapeutic loads that improve gait alignment and trunk stability.



Early Conceptualization
(Shin module later removed)

Key Objectives

- Support gait alignment
- Adjustable resistance & assistance
- Comfortable for 1 hour sessions
- Fast equip & unequip
- Fits wide range of leg sizes
- Durable across therapy cycles
- Material cleanability rating

EXISTING SOLUTIONS

TheraSuit	KAFO (Knee-Ankle-Foot Orthosis)	FES (Functional Electrical Stimulation)	Cable-Driven Body Weight Support ("Puppet" Systems)	TheraTogs
				
• Bulky and time-consuming to set up • Limited trunk stability support • Requires clinic-based frame, not portable	• Heavy, bulky and uncomfortable • Restricts natural knee and ankle movement • Not ideal for long-term daily use	• Complex setup and requires training • Dependent on battery and electronics • Wires and electrodes can be inconvenient and intrusive	• Large, expensive, and space-intensive • Complex to set up and operate • Limits natural movement and over-reliant on external support	• Limited adjustability of resistance • Can be uncomfortable and restrictive • Not suitable for all patient populations (e.g., post-stroke adults)

SYSTEM OVERVIEW

10+

Manufacturing Processes

6

Material Alternatives (SHIELD)

Waist Belt

Neoprene and nylon tactical belt with aluminum quick-release buckles and carabiner mounts.

Thigh Brace

Upper leg brace with (5) attachment points and removable neoprene padding. Hook-and-loop fasteners allow easy adjustment and prevent slippage.

Ankle/Foot Brace

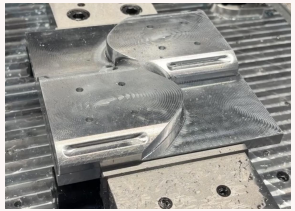
Neoprene sleeve with nylon straps, hook-and-loop fasteners, and carabiner mounts. Fully sewn of soft goods.

Band-Cleat

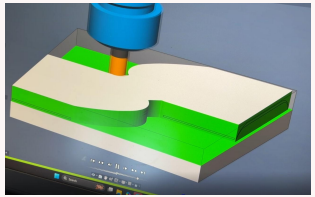
Aluminum cleat connects resistance bands to anchor points, enabling physician-adjustable loading.

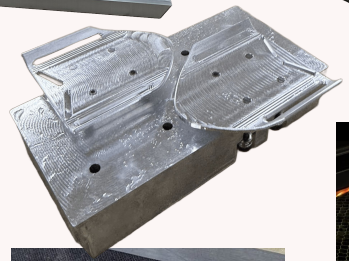
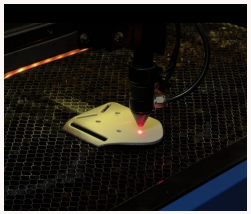
Quick-Release Hardware · Modular Brace Segments · Customizable Attachment Points · Adjustable Load Path · Color-coded Resistance Band-Cleat System

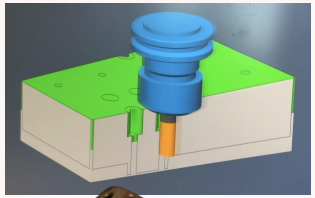
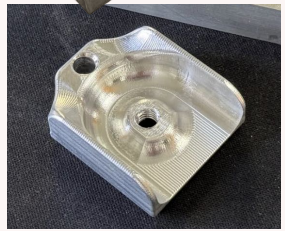
MACHINING & ANODIZING



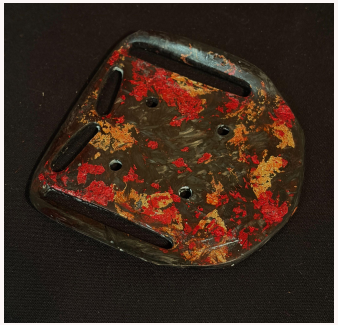



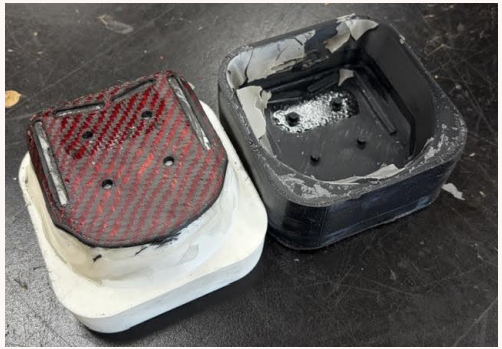



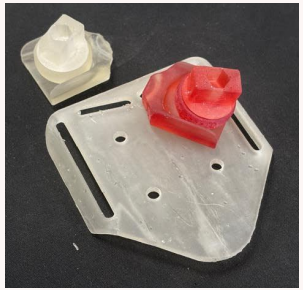



FORGING CARBON FIBER

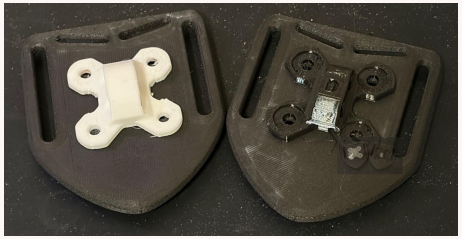




3D PRINTING

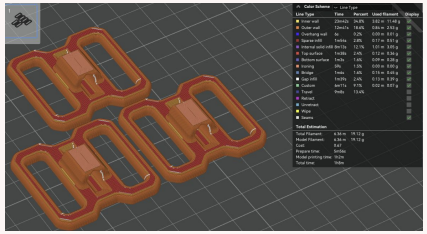


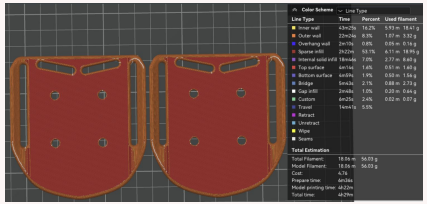
Resin (SLA)

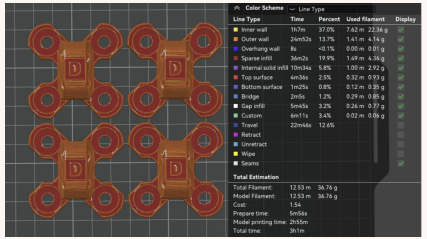


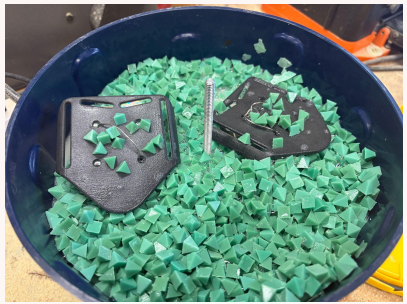
PETG CF

ABS









NYLON 12 (SLS)

ABS (Vapor Smoothed)

MY CONTRIBUTIONS

PM & Mechanical Design Lead

Iterative Development with CAD, CAM, FEA, & 3DP

CAD designer (Fusion 360) responsible for mechanical components in the system: Shields, Band-Cleats, Anchors, compression mold tooling, billets & workholding, and full assembly integration across waist, thigh, and ankle modules.

Designed and redesigned parts across three generations and three material processes, adapting geometry for printed plastic, forged carbon fiber molds, and machined aluminum. Ran all 3D printing operations as the team's only member with a printer, turning around prototype iterations same-day to keep pace with sponsor feedback.

Spent extensive hours operating the Langmuir MR-1 CNC mill, writing and revising custom G-code, swapping endmills between roughing and finishing passes, and designing and redesigning workholding fixtures as we learned the machine's tolerances and limitations.

Performed in-house Type II anodizing on finished aluminum parts. Developed and managed the process including degreasing, etching, sulfuric acid anodizing baths, dyeing to match the team’s color scheme, and sealing for corrosion resistance.

Conducted destructive and non-destructive testing with a force gauge, authored the DFMEA, conducted FEA to validate anchor and shield assemblies, and maintained documentation of test data to guide design priorities. Developed a clinical trial questionnaire to evaluate corrective torque effectiveness during patient sessions.