

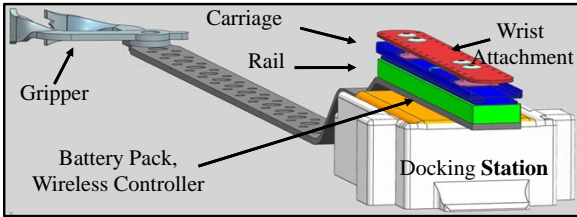
# Aids for People with Physical Challenges

## Background

- Specific quadriplegic customer
- Improving Fall 2016 technology

## Purpose

- Improve customer ease of life
- Increase access to tools by developing custom wrist braces



Existing Left Hand Integrated Systems [1]

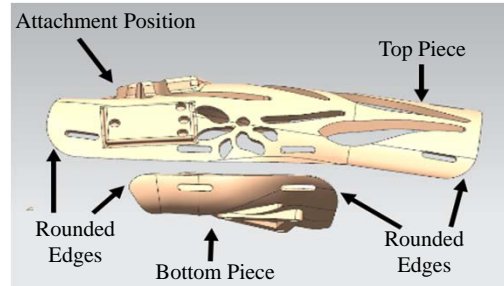
## Objectives

- Create new right and left hand braces
  - Increase comfort – custom fit
  - Decrease weight and profile
- Improve left hand attachment system
  - Increase ease of attachment
  - Reduce weight
- Create right hand attachment system
  - Interchangeable attachments

References:  
[1] D. Anderson; E. Chan; A. Griffing; S. Hess; E. Honeyman; D. Nisbet; K. O'Dell, 'Final Report for Aids for People with Disabilities', Design Lab, Troy, NY, 2016.

## Braces Design Methods

- 3D point scanned arm model → CAD
- Lap shear testing – Foam/PLA
- Surface finish RMS measurements
  - Improve safety and aesthetic



Right Brace CAD

## Braces

- Right Brace
  - Smaller tools (utensils)
  - Joystick & phone operation
  - Increased flexibility
- Left Brace
  - Larger tools (gripper)

## Engineering Requirements

- Brace volume  $\leq 5.1 \text{ in}^3$
- Left brace weight  $\leq 2.1 \text{ oz}$
- Right brace weight  $\leq 3.8 \text{ oz}$
- Increase angle allowable misalignment (yaw  $\pm 6^\circ$ , pitch  $\pm 5^\circ$ , roll  $\pm 15^\circ$ )
- Precise engagement and disengagement time  $\leq 25\text{s}$

## Alternate Rail and Carriage

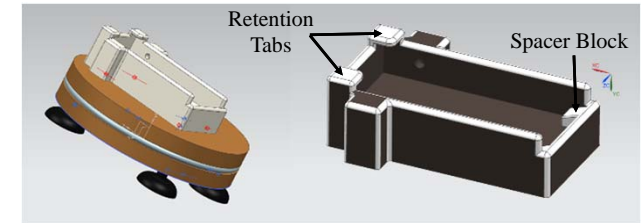
Assist yaw, pitch, and roll engagement alignment

- Tapered rail/carriage – guided alignment
  - XY plane alignment
- Single rail – increase alignment
  - Reduce manufacturing tolerance requirement
- Cylindrical carriage – roll alignment

## Alternate Docking Station

Assist yaw disengagement alignment

- Add rotating bearing in the base
- Add retention tabs and detents



Isometric Views of Docking Station

