



# Team #9: Portable Lightweight Wheelchair

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## Background Information

Our primary customer is the mother of an 11-year old girl with **Cerebral Palsy (CP)** which is a neurological disorder impairing the voluntary control of muscle movement.

## Objective Statement

Design a wheelchair that increases convenience for the handler when traveling with the occupant while maintaining a high level of safety, support, and comfort for the occupant.

## Safety Considerations

### Manufacturing Safety:

- Follow LSU's Equipment Specific Safety Rules and General Machine Shop Policy.

### Clients' Medical Safety:

- Secure occupant safely, incorporate an ergonomic design to prevent injuries to the occupant, and use hypoallergenic and moisture resistant material selection.

## Engineering Specifications

Objectives/ Specifications	Target	Achieved
Weight	≤ 30 lbs.	34 lbs.
Collapsed Dimensions	46 x 30 x 16 (inches)	44 x 28 x 16 (inches)
Collapse Time	< 30 seconds	25 seconds
Assembly Time	< 30 seconds	36 seconds
Number of Steps	< 4 steps	7 steps
Load Bearing Capacity	120 lbs. Satisfies RESNA WC-1: Section 8	120 lbs. (S.F. of 1.5) RESNA WC-1: Section 8

## Prototype Architecture & Overview

### Operating Position

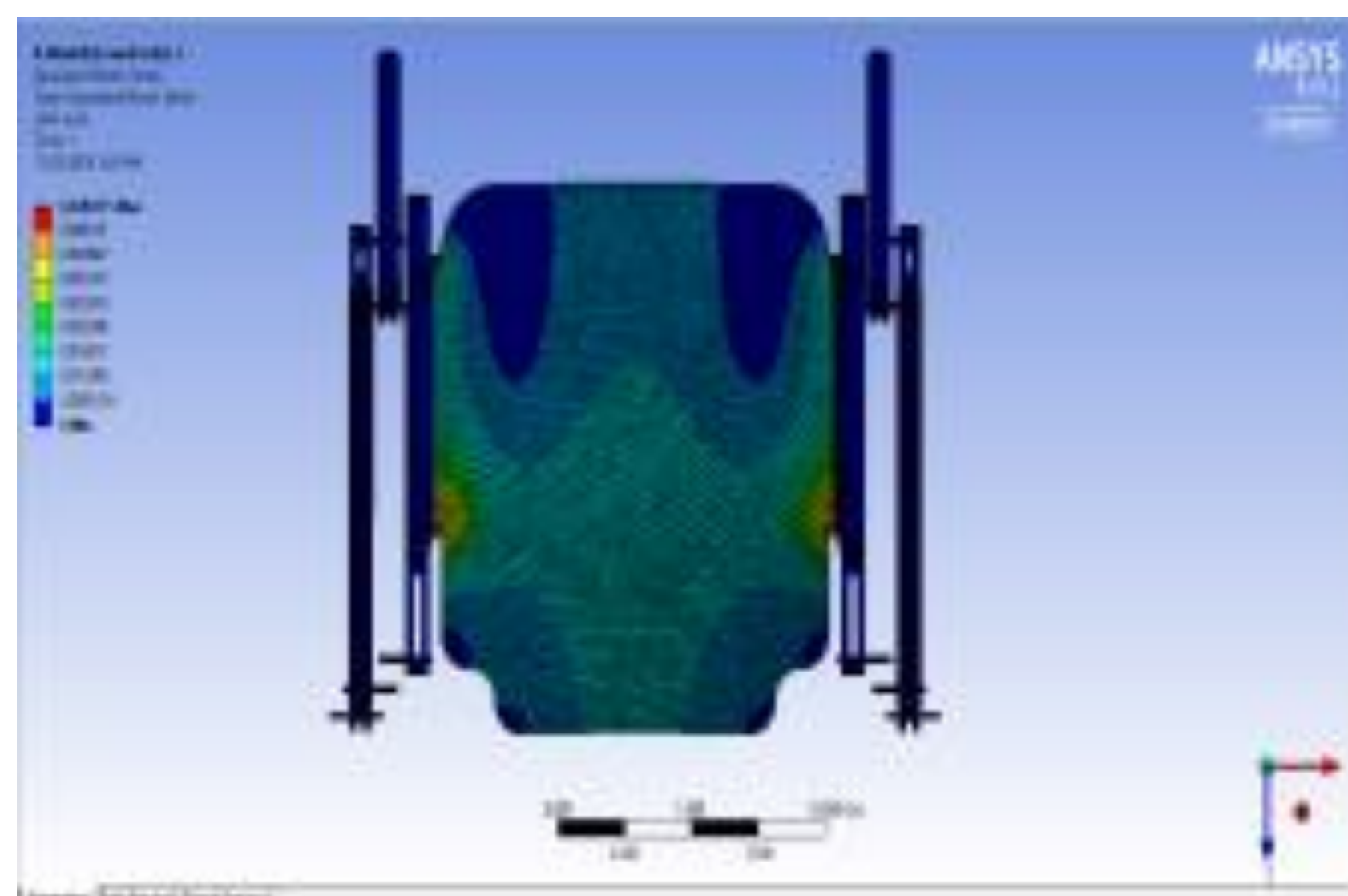


- Push Button Ratchet Joints
- Cup Holder
- Brakes
- Lateral Supports
- 4-pt. Harness
- Knee Pommel
- Lab Belt
- Locking Mechanisms
- Footplates

### Collapsed Position



## Engineering Analysis



### Maximum Deflection: 0.05 in

- The maximum deflection in the seat base will never exceed 1/16 in based on ANSYS deflection analysis. It was required to add stiffeners to strengthen the seat base and back.

## Testing



### Individual Component Testing:

- Individual members were tested under tensile, bending, and torsional loading conditions.

### RESNA Testing:

- 120 lb. test dummy was used to imitate body centers of mass for dynamic testing.

## Testing Results

RESNA:	Component:	$\theta_{tip}$
Load Capacity: Pass	Tension: 140 lb-f	$\theta_f$ : 20.7°
Drop Test (2 in): Pass	Bending: 300 lb-in	$\theta_b$ : 28.9°
Impact (25 kg): Pass	Torsion: 100 lb-in	$\theta_s$ : 24.2°

## Manufacturing

### Turning



### Welding



### Water jetting

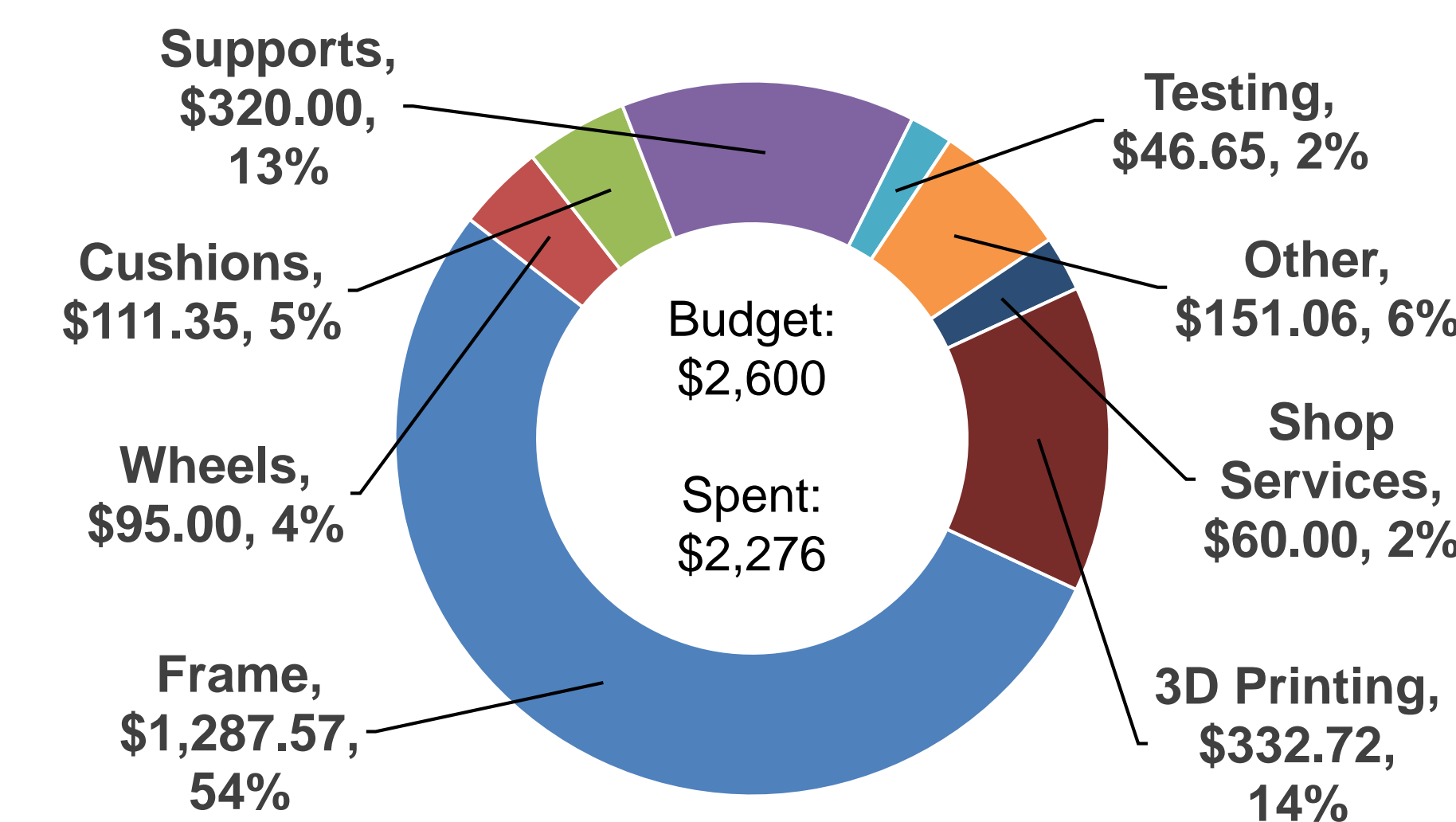


## Human Subject Feedback

LSU IRB Approved Surveys were conducted to evaluate the qualitative components of our design.

Aesthetics:	4.6/5
Comfort:	4.8/5
Ease of Use:	4.4/5

## Project Budget and Spending



### August

- Met with Client

### September

- Engineering Specifications

### October

- CAD Modeling Analysis

### November

- Testing Methods
- Manufacturing Plans

### December

- Conceptual Design
- Order Parts and Materials

### January

- IRB Certification
- Build Testing Apparatus

### February

- Begin manufacturing Prototype

### March

- Manufacture and Assemble

### April

- Prototype Testing

### May

- Deliver Product to Client

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