To Predict ▶ To Design ▶ To Perform

College of Engineering
Department of Mechanical & Industrial Engineering

ME, ECE, BE Capstone Design Programs

Team 8: Bath Chair for Child with Cerebral Palsy

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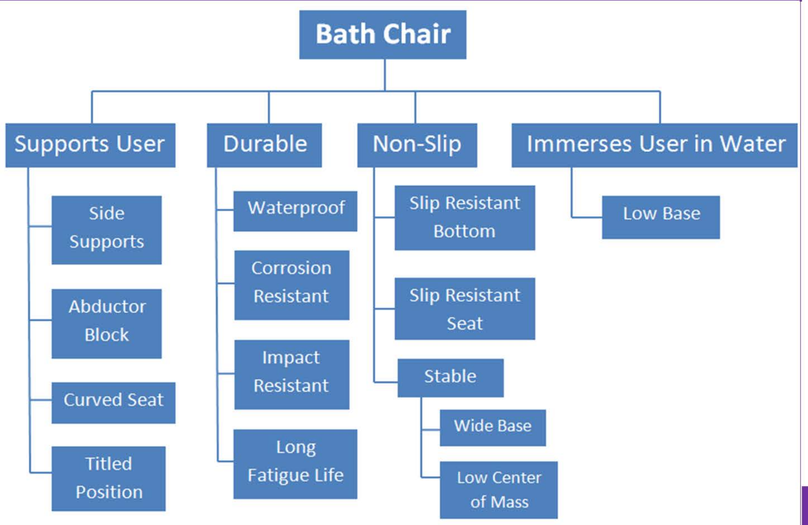
Background

- Customer: Emerson, child with cerebral palsy
- Cerebral palsy: a condition in which brain damage has disrupted normal muscle function

Objectives



Engineering Specifications

- Weight Capacity: 120 pounds
- Safety Factor: 4
- Chair Weight: 15 pounds
- Fatigue Life: 10 years

Engineering Analysis

- Buoyancy: $F_b = g\Delta\rho V = g(\rho_{object} - \rho_{fluid})V$
- Stability: $\Sigma F = M_1 g + M_2 g = F_n = F_f/\mu$

  $\Sigma M = F_1 r_1 + F_2 r_2 = 0$
- Draw Ratio: $R_A = A_{part}/A_{sheet}$

Material Selection

- ABS seat, back, base
- UHMW Polyethylene struts
- PVC abductor block with rubber cover
- Polycarbonate track

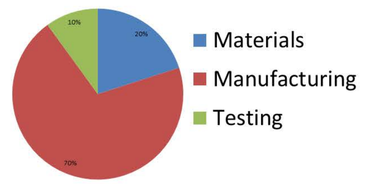
Manufacturing

- Carve molds with CNC machine & thermoform

Safety

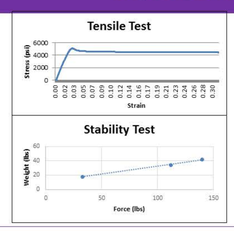
- Tipping
- Breaking
- Entrapment
- Submersion

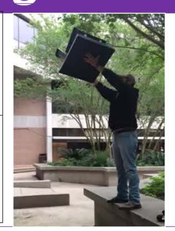
Budget



Testing

- Tensile
- Stability
- Impact
- Human





September
- Chose chair design
- Found expired patent

October
- Chose to purchase & modify car seat
- Solid works models & FEA

November
- Chose carve & thermoform
- Finalized materials

January
- Purchased materials

February
- Tested materials

March
- Began manufacturing

April
- Completed manufacturing
- Tested prototype

Sponsors: St. Lillian Academy, KC Kayaks

Advisers: Dr. Sunggook Park, Dr. Dorel Moldovan