P14006
Bath Tub Lift MSD II

Amos Baptiste
Jeremy Czeczulin
Andrew Hughes
Richard Prilenski

Introductions

Name	Major/Role
Amos Baptiste	Industrial & Systems Engineer/Team Leader
Jeremy Czeczulin	Mechanical Engineer
Andrew Hughes	Mechanical Engineer
Richard Prilenski	Mechanical Engineer

Agenda

- MSD II Overview
- Problem Tracking
- Budget
- Schedule

Problem Statement

- Bathtub lift – a device that provides assistance to an individual with physical disabilities, including limited balance, coordination, or mobility
- Can reduce the difficulties of raising and/or lowering an individual into the tub by utilizing a powered seat and a simple control module
- As population grows the number of aged individuals will greatly increase making demand for assist devices increase

- Project motivation – Theresa Loce
- Improve the current design
- Current device does not meet her needs
- Powered lift that is sturdy, comfortable, easy to use/clean, makes minimal noise, and takes into account physical limitations of user
- Ultimate goal – user maintains autonomy and privacy

Deliverables

- Effectively assist the user for bathing purposes
- Device is easy to access from starting position
- Minimized operating time
- Provide a comfortable and supportive seating area
- Accessible to 10^{th}-70^{th} percentile for both genders, regardless of age
- Reasonably lightweight and portable, able to be transported

Current and Desired State

Current

- Unstable
- Out of production
- Damaged
- Difficult access
- Obstructions prevent full use

Desired

- Easy use
- Easy access
- Portable
- Lightweight

Stakeholder(s)

- **Primary Customer**: Theresa Loce
  - Contact: 585-647-2329
- **Secondary Customer (s)**: Wheel chair users/handicap public & Elizabeth DeBartalo, Hospitals (RGH), Nursing Homes, suppliers/vendors, individuals recovering from knee surgeries, Linak, & Acrylix.
  - Contact: eademe@rit.edu
- **Faculty Guide**: Art North
  - Contact: ajnddm@rit.edu
- **Sponsor (financial support):** RIT & Theresa Loce

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Problem Tracking

Project Name: Bath Tub Lift Date: 9/2/2014

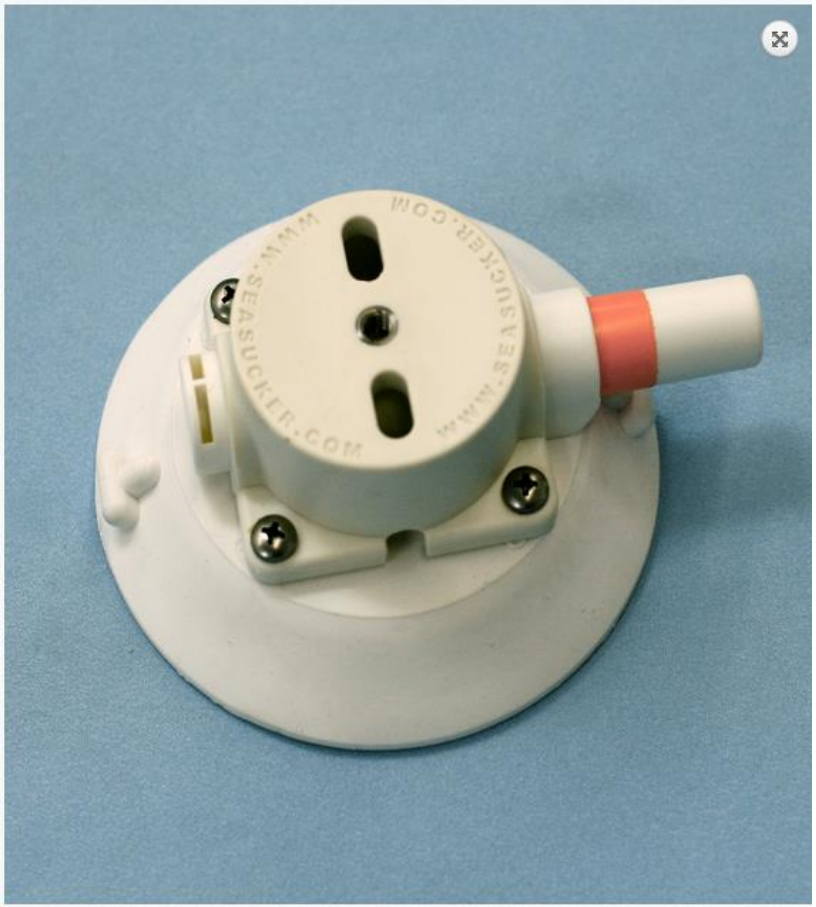
Project Number: P14006 Revision:

Problem Number	Identifying & Selecting Problem PSP 1	Analyzing Problem PSP 2	Generating Potential Solutions PSP 3	Selecting & Planning Solution PSP 4	Implementing Solution PSP 5	Evaluating Solution PSP 6
	R1	R2	R3	Y4	Y5	G6
1	Device legs buckling while raising the user up	Material and surface area of the beam	•Check previous drawings and calculations from stress analysis. •Assign new material property and conduct a stress test.	Richard run stress calculation and confirms material and suface area		
2	Actuator failing to operate	Actuator not waterproof	•Cover the actuator with the bag. •Create and use accordion design to cover actuator. •Apply a lubricant to make the actuator waterproof.			
3	Device secured to the tub	Exceed load capacity or unleveled surface on the tub.	•Get industrial suction cups. • Side arm attachment to help prevent tipping of the bathtub lift.	Jeremy look into suction cups		
4	Can't tell if the battery is charging	Depending on position/eye level with battery you can tell if it is charging.	•Mount the charger eye level to the user. •Attach a plastic piece in from of the LED light to increase the brightness.			
5	Actuator won't start	Battery is dead due to user negligence.	• Have the battery making a sound when it is low on battery. •Have the battery not operate if it is low on battery for user safety.			
6	Weight of the battery	User has limited strength/arm capabilities	•Have the charging station and battery not above the users shoulders. •Place the battery and charging station where is can be installed while sitting. •Have someone help user charge the battery once a month.	Amos look into ergonomics of the weight of the battery		
7	Mounting bracket won't install correctly	Mounting bracket is bent	•Bend the mounting bracket back at the Brinkman Lab. •Contact Linak and have a new one sent.			

Budget

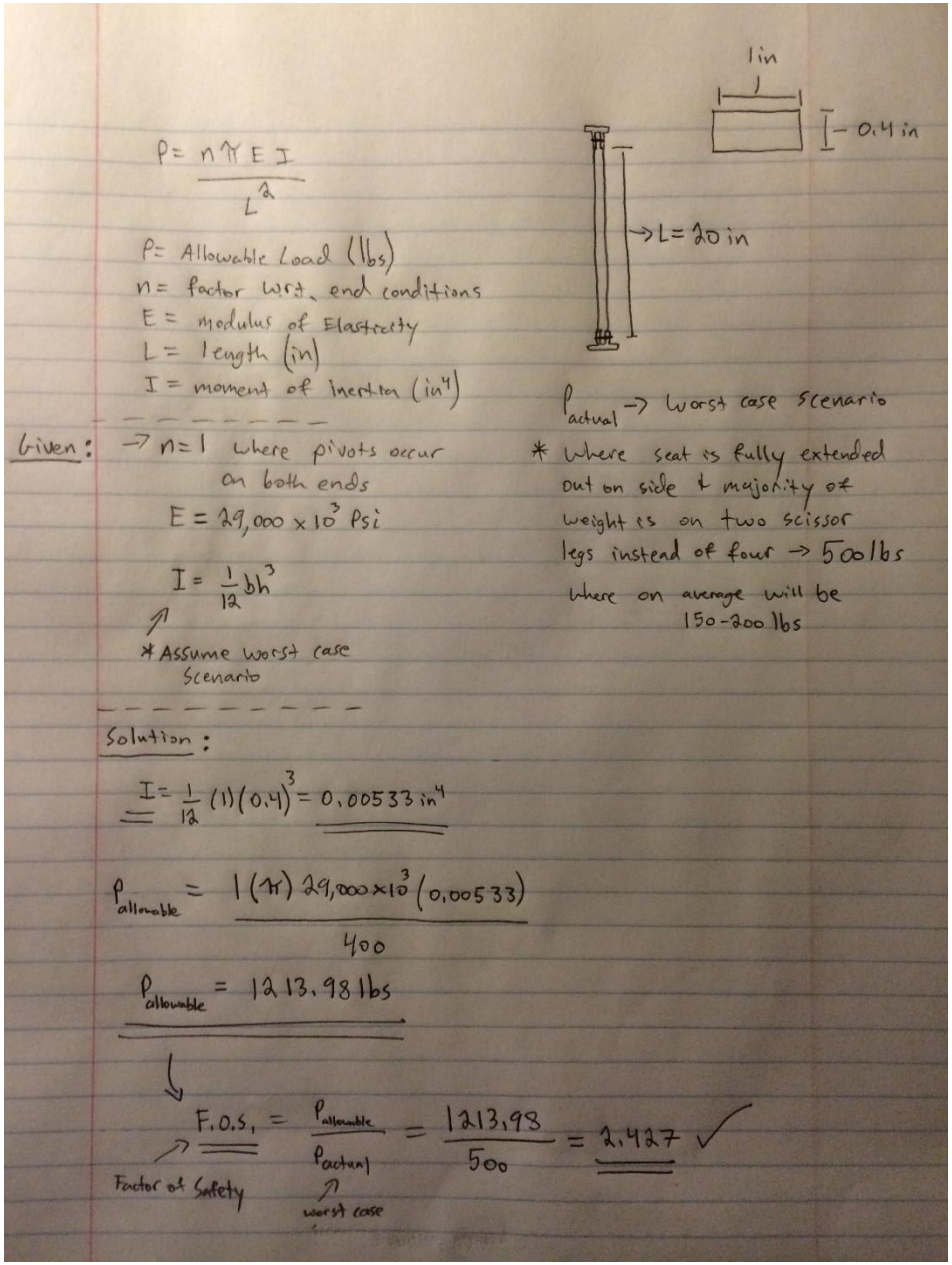
Budget		$1,800	
Material Purchased	Cost		Amount Left
Turn Table	$	72.79	$1,727
Electrick Linear Acutator	$	193.95	$1,533
Rechargeable Battery	$	63.96	$1,469
Electric Control Box	$	107.51	$1,362
Battery Charger	$	151.37	$1,210
Remote Handset	$	84.05	$1,126
Control Box Mounting	$	9.76	$1,117
Charger Bracket	$	11.59	$1,105
Main Cable	$	15.77	$1,089
4 1/2" SeaSucker	$	191.96	$897

Suction Cups



The 4½” SeaSucker vacuum cup is rated to pull up to 120 pounds. Two slotted holes for back-plating accessories or mounting hardware and one center stainless steel insert for mounting anything with a standard ¼-20 machine screw. All metal parts are high grade stainless steel, even the springs inside our pump, for extra durability in the saltwater environment. Protective cap included.

Buckling Analysis for Legs



Buckling Analysis Results

- The new dimensions of the legs will now be 0.4” which is 0.15” thicker than the older design.
- This will allow for an acceptable Factor of Safety of the structural legs/base.
- Acceptable F.O.S range is 2-4
- The type of material used in this section will be A36 Steel.

Action Items

- Complete wood demo
- Order suction cups
- Implement solutions from Problem Tracking
- Review material with DeBartolo and John Bonzo
- Order material or parts to be made for seat and scissor legs

Schedule

	Task Name	Duration	Start	Finish	Predecessor
1	**MSD II Phase I**	**26 days**	**Tue 8/26/14**	**Tue 9/30/14**	
2	Revisit the detailed design	6 days	Tue 8/26/14	Tue 9/2/14	
3	Develop test plan for sunction cups and actuator	3 days	Wed 9/3/14	Fri 9/5/14	2
4	Purchase sunction cups	6 days	Wed 9/3/14	Wed 9/10/14	2
5	Test acutator	5 days	Wed 9/3/14	Tue 9/9/14	2
6	Test waterproof housing on actuator	6 days	Wed 9/10/14	Wed 9/17/14	5
7	Submit inquiry to manufacture the different components	4 days	Wed 9/3/14	Mon 9/8/14	2
8	Test a demo for rollers	6 days	Wed 9/10/14	Wed 9/17/14	5
9	Build wood demo	9 days	Thu 8/28/14	Tue 9/9/14	
10	**MSD II Phase II**	**16 days**	**Tue 9/9/14**	**Tue 9/30/14**	
11	Build Lever	10 days	Tue 9/9/14	Mon 9/22/14	7
12	Test Lever	6 days	Tue 9/23/14	Tue 9/30/14	11