
CONTROL PHASE

PALM HARVESTER TEAM

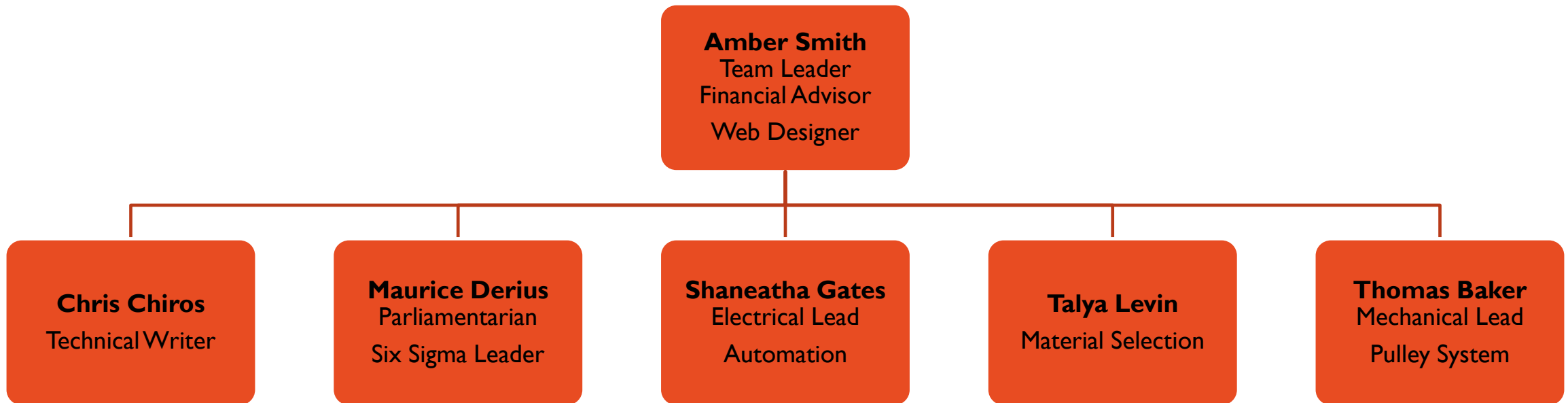
SPONSOR: DR. OKOLI

ADVISORS: DR. CHUY, DR. FRANK, DR. EDRINGTON, DR. GUPTA, AND DR. SHIH



PRESENTER: AMBER

TEAM ORGANIZATION



OVERVIEW

- GOAL
- RECAP OF THE DEFINE PHASE
- RECAP OF THE MEASURE PHASE
- RECAP OF THE ANALYZE PHASE
- RECAP OF THE IMPROVE PHASE
- CURRENT: CONTROL PHASE
- WHAT IS NEXT?

GOAL

- Improve last year's design
- Create mechanism to harvest palm fruits
 - **Affordable**
 - **Safer**
 - **Efficient**

[2]



RECAP OF THE DEFINE PHASE

- Palm fruit has essential economical impact
- Current method of harvesting is inefficient and dangerous
- Previous year's project had few design flaws:
 - Wheels
 - Material
 - Lack of Automation

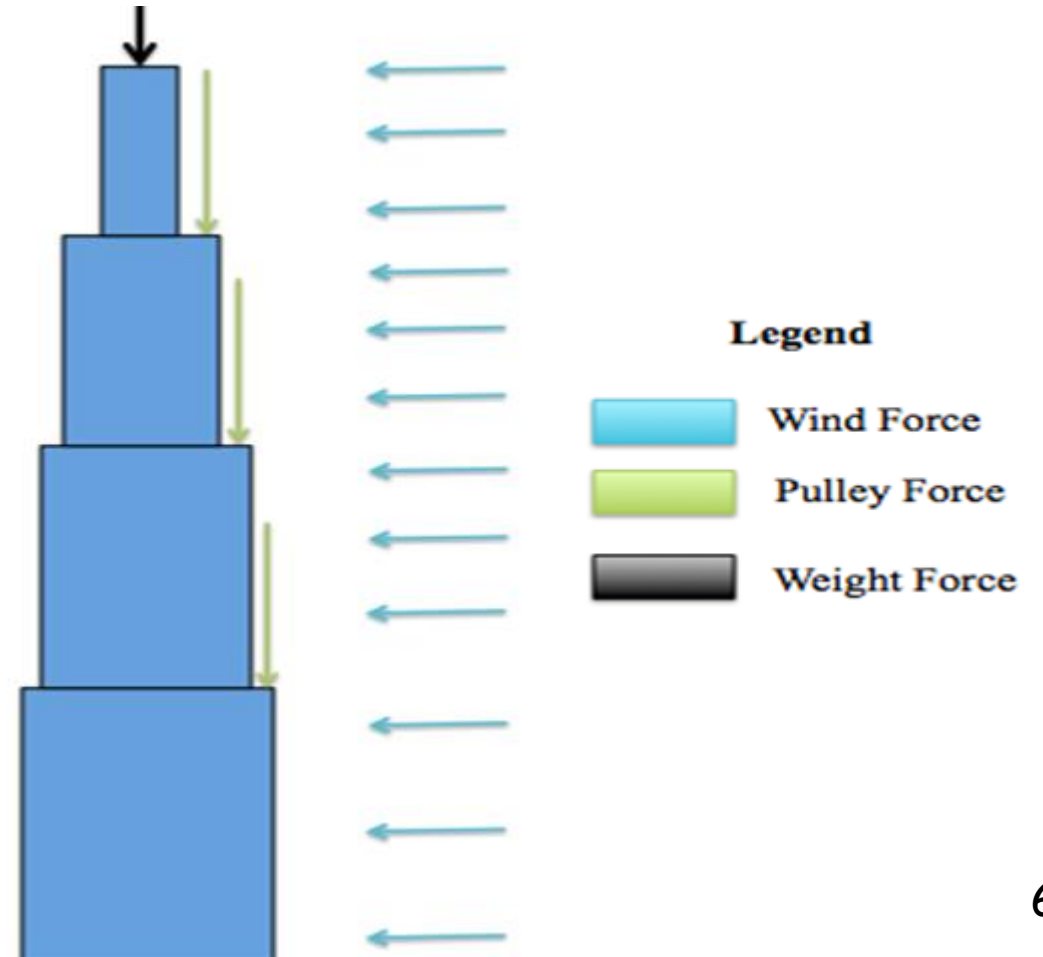
[3]



RECAP OF THE MEASURE PHASE

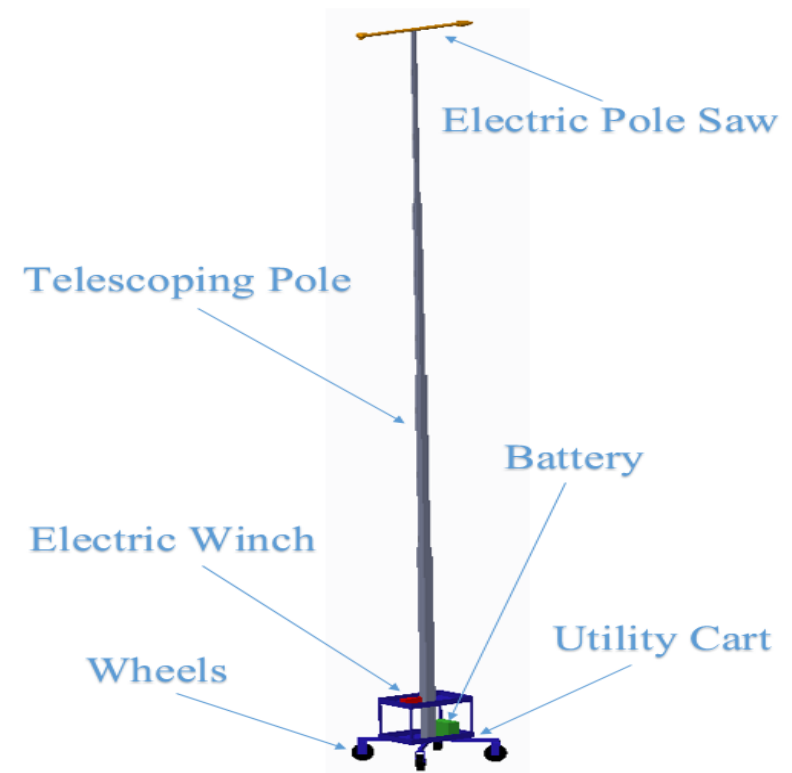
- Measured assembly time
- Simulated forces for analysis on cart and pole
- Planned material order

Steps	Assembly Time Interval (min:sec)	Disassembly Time Interval (min:sec)
1	0:39	0:40
2	0:36	0:32
3	1:00	1:10
4	0:20	0:28
5	0:45	0:15
6	0:40	0:15
Total	3:50	2:20



RECAP OF THE ANALYZE PHASE

- Ordered Aluminum 6063 poles
- Design of assembly
- Completed stress analysis
- Completed deflection analysis
- Ordered never flat polyurethane wheels
- Redesigned pulley system
- Ordered Trakker electric winch
- Ordered super start deep cycle marine battery



RECAP OF THE IMPROVE PHASE

- Generator out of commission
- Camera from previous years wires were damaged
- Wheels arrived on February 3rd
- Wheels were installed and tested on different terrain
- Center of gravity was lowered
- Nuts recessed in buffer strips





CONTROL PHASE

TESTING THE MECHANISM

- Pulley System
- Cutting Mechanism
- Camera Mechanism
- Maneuverability

TIME ANALYSIS

SAFETY PRECAUTIONS

CUSTOMER'S NEEDS

BUDGET

GANTT CHART

TESTING THE MECHANISM: PULLEY SYSTEM

13 ft



25 ft



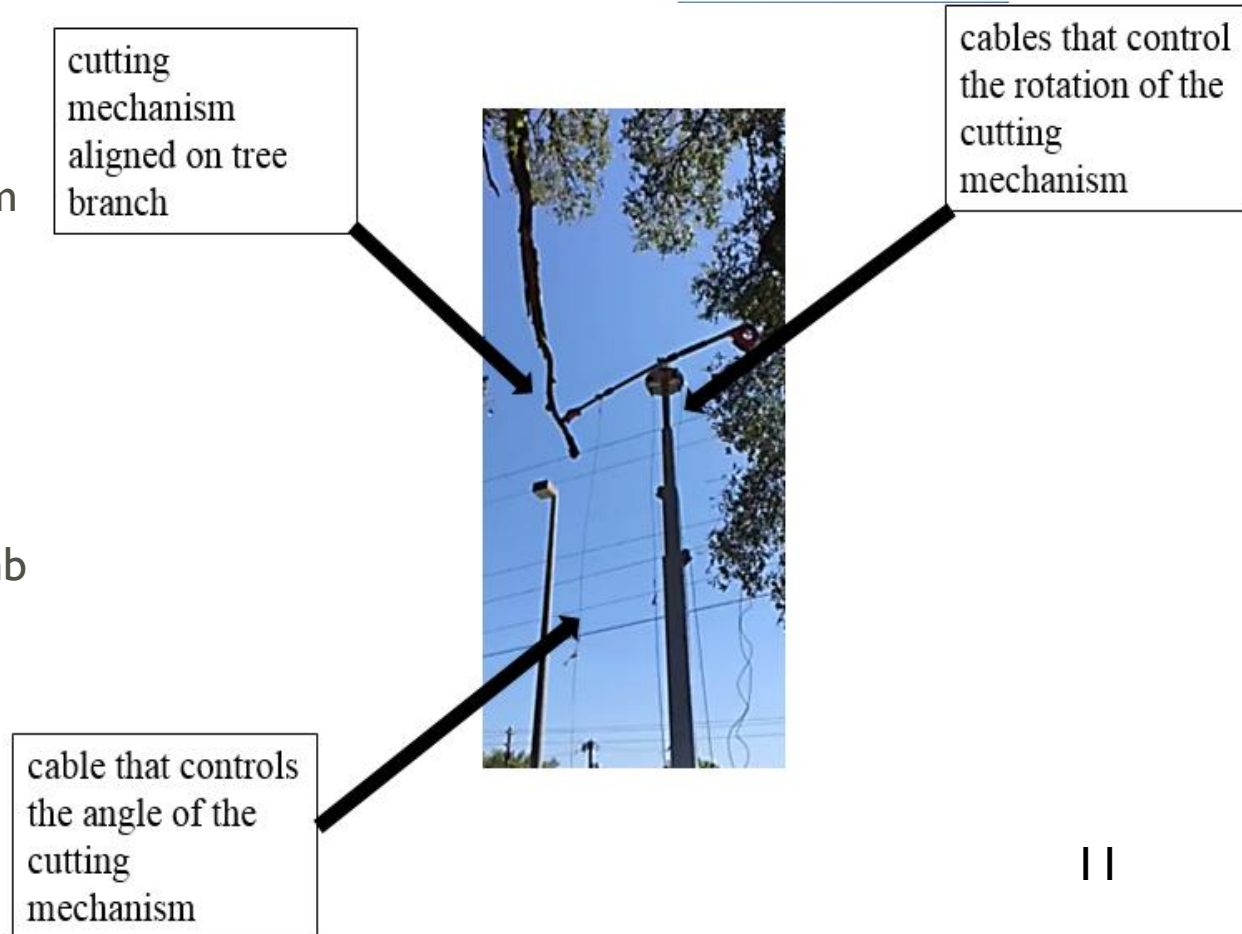
35 ft



PRESENTER: TALYA

TESTING THE MECHANISM: CUTTING MECHANISM

- Wired to operate at the push of a button
- Saw is aligned using the preexisting lazy susan mechanism
 - Cables attached to both sides of the saw allow for vertical alignment
 - Pulley system attached to lazy susan allow for rotation
- Due to low battery saw blade became lodged in tree limb



TESTING THE MECHANISM: CAMERA MECHANISM

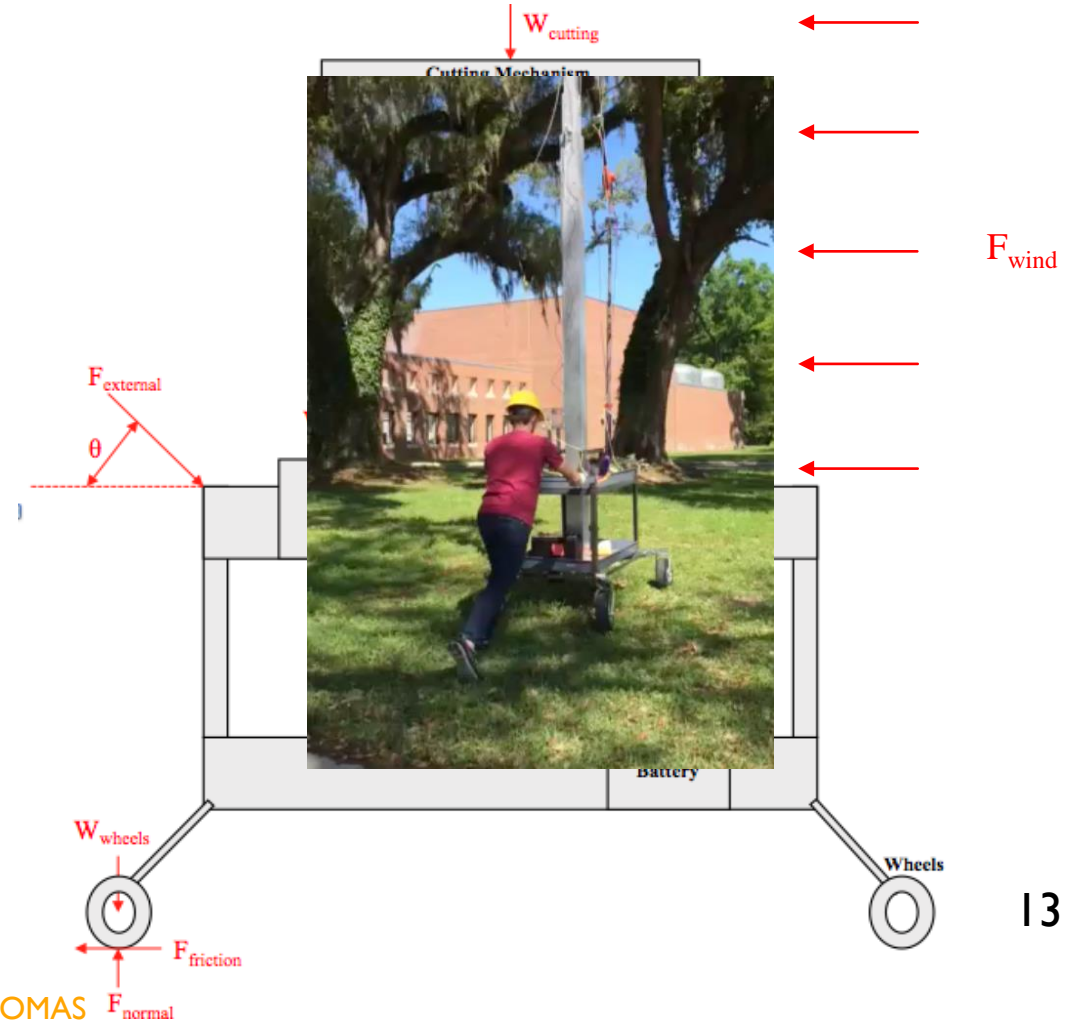
- Camera is not able to send signal to monitor
- Multiple attempts to fix this mechanism
- Cabling ruled out as the cause of malfunction
- Suggested improvement for next year's team

[2]



TESTING THE MECHANISM: MANEUVERABILITY

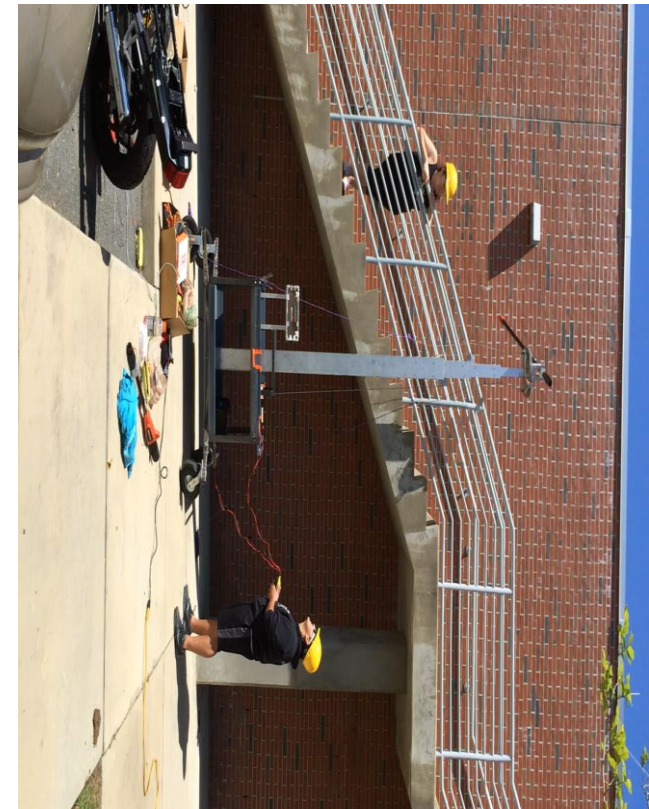
- Unknowns are F_{normal} and F_{external}
- μ_s was assumed to be 0.35 [4]
- θ was found to be 41.4° using the average Malaysians males arm length
- Force required to push cart is 246.6 lbf
- This force is equivalent to that of a human bite



TIME ANALYSIS

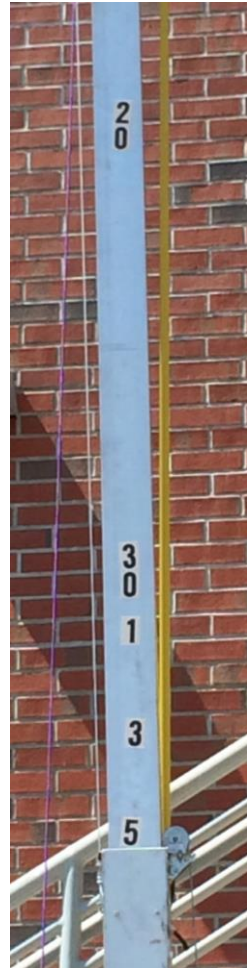
- Assembly and disassembly only necessary for transportation and maintenance purposes
- Rise time (to 25 feet): 16 seconds
- Fall time (from 25 feet): 12 seconds

Process	Old Mechanism (min:sec)	New Mechanism (min:sec)	Time Difference (min:sec)
Assembly	3:10	0:00	-3:10
Disassembly	1:40	0:00	-1:40
Rise to 25ft	0:40	0:16	-0:24
Lower from 25ft	0:40	0:12	-0:28
Total Saved Time			5:42



SAFETY PRECAUTIONS

- Number system implemented
- When the top of the bottom pole reaches the bottom of the number
- The mechanism will not be operated over 35ft



SAFE	13 ft - 30 ft
CAUTION	31 ft - 35 ft
DANGER	> 35 ft

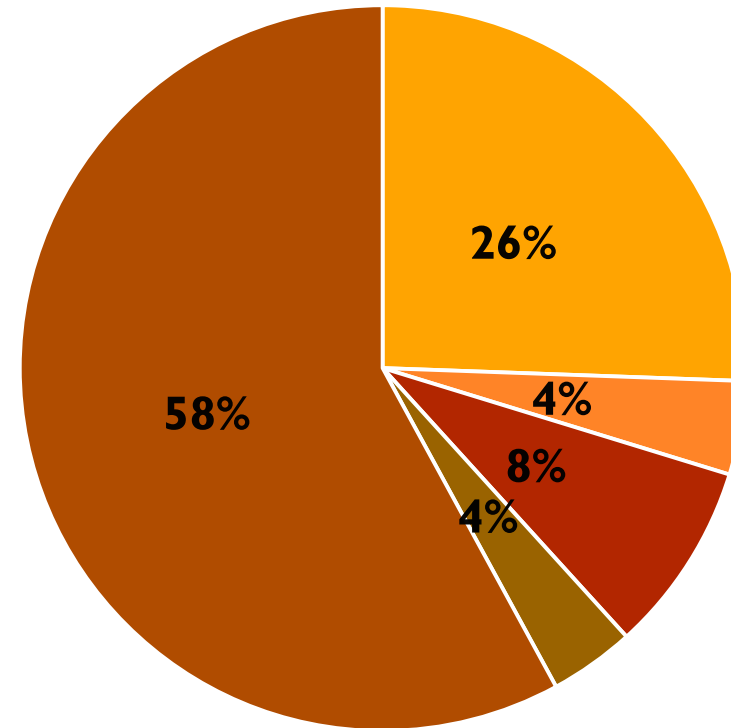
CUSTOMER NEEDS

- Reaches desired height with minimal effort and time
- Insignificant deflection at maximum height
- Stability improved by lowering the center of gravity
- Saves time by eliminating the need to assemble and disassemble
- Environmentally friendly as no exhaust gases were emitted

BUDGET

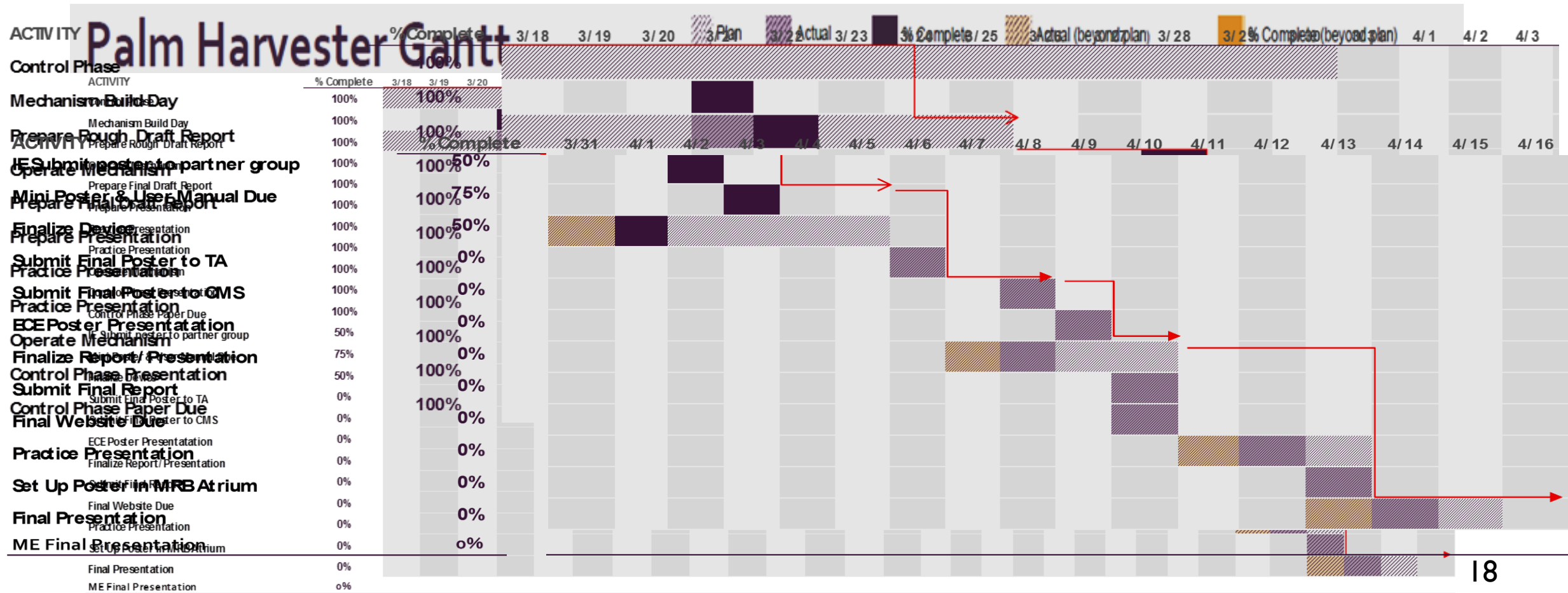
Item	Company	Description	Cost
Wheels	Grainger	(4) Never Flat Wheel, 10-1/4 in, 350lb	\$213.12
Motor	Lowes	Trakker 1-HP 2,000-lb Universal Winch	\$104.26
Aluminum Pole	Discount Steel	6063 AL TUBE 5 X 5 X 1/4 X 120"	\$225.60
Aluminum Pole	Discount Steel	6063 AL TUBE 4 X 4 X 1/8 X 120"	\$85.77
Aluminum Pole	Discount Steel	6063 AL TUBE 3 X 3 X 1/8 X 120"	\$61.21
Aluminum Pole	Discount Steel	6063 AL TUBE 3 X 3 X 1/8 X 120"	\$41.66
Shipping	Discount Steel	-	\$225.00
Battery	O'Reilly Auto Parts	12 V Super Start Marine- Deep Cycle	\$94.99
			Total : \$1,051.61

Budget



■ Aluminum Poles ■ Motor ■ Wheels ■ Battery ■ Remaining

GANTT CHART



WHAT IS NEXT?

- Continuation of testing
 - Cutting mechanism
 - Longevity of batteries
- Final webpage
- Prepare for final presentation
- EE Senior Design Fair
- IME Final Presentation
- ME Senior Design Open House



QUESTIONS?

REFERENCES

[1] (Cover Photo) <http://www.soapqueen.com/business/on-palm-oil/>

[2] "Palm-harvester." *Palm-harvester*. Web. 3 Feb. 2015. <<http://davidlboswell.wix.com/palm-harvester#!deliverables/cubz>>.

[3] "Bon Appetit." *Bon Appetit*. Web. 3 Feb. 2015. <<http://www.congo-pages.org/livingbdd.htm>>.

[4] Web. 31 Mar. 2015. <<http://saferroads.org.uk/2005Papers/Peter-Cenek-Frictional-Characteristics-Roadside-Grass-Types.pdf>>