Problem Formulation & Project Plan

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Overview

- **Introduction**
- **Needs**
- **Project Goal**
- **Objectives**
- **Operating Environment**
- **Constraints and QFD**
- **Project Schedule**

Introduction

Customer:

- SAE International

What do they do:

- Organization for international design standards that also holds collegiate automotive design competitions

Why they are sponsoring the project:

- To test engineering students abilities

Need Statement

NAU has not won an event at the SAE Mini Baja competition in many years.

- **Hill Climb**
- **Acceleration**
- **Presentation**
- **Maneuverability**
- **Endurance Event**

Project Goal

- **Design and build the lightest possible frame to win an event.**

- **Ensure vehicle conforms to all safety guidelines outlined in the SAE rule book**

Objectives

Minimize:

- **Frame weight**
- **Cost**
- **Damage from collisions**

Ease of manufacturability

Driver safety

Operating environment

The Vehicle must be able to traverse:

- **Rocks**
- **Sand jumps**
- **Logs**
- **Steep inclines**
- **Mud**
- **Shallow water**
- **Handle large drop offs**

Operating environment

Endurance Event

Rock Crawl

www.cens.nau.edu/~jtt3/Minibaja06

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Operating environment

Maneuverability Course   **Hill Climb**

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Constraints

- **AISI 1020 tubing or equivalent strength**
- **Frame length less than 108 inches**
- **Frame width less than 40 inches**
- **Frame height less than 41 inches above seat bottom**
- **Frame geometry must conform to all SAE Baja Rules**
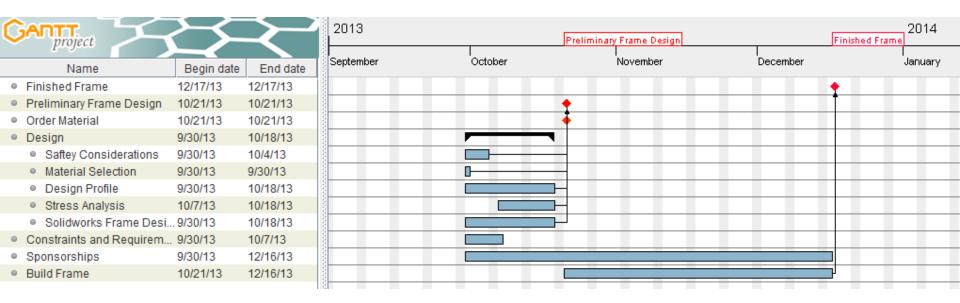- **Vehicle must comply with all the safety regulations**

QFD

Customer Needs	Customer Weights	Length	Width	Height	Weight	Bending Strength	Bending Stiffness	Tubing Wall Thickness	Conform to Safety Regulations	Cost	Man-Hours to Build
Light weight	10	3	3	3	9	3	3	9		3	
Easy to manufacture	6	1	1	1				3	3		9
Inexpensive	5				9	9	9	3		9	
No damage after impact	8	3	3	3		9	9	3	9		
Safe	10					9	9	1	9		1
Raw score		60	60	60	135	237	237	157	180	75	64
Relative Weight		5%	5%	5%	11%	19%	19%	12%	14%	6%	5%
Unit of Measure		in	in	in	lb	N-m	N-m^2	in	T/F	$	hr
Techical Target		108	40	41	200	395	2789	0.062	TRUE	300	40

Project Plan

- **Frame design will be completed by October 20th, 2013**

- **Construction will begin immediately following the design finalization**

- **Frame construction will be done by December 16th, 2013**

- **Baja vehicle will be completed by March 15th, 2014**

Gantt Chart

Conclusions

- **Project Introduction**
- **Need – NAU hasn't won a Baja event in many years.**
- **Project Goal – Construct lightest possible frame to win an event.**
- **Objectives – Comply with safety regulations while minimizing weight.**
- **Operating Environment – Off road**
- **Constraints – Specific geometry and strength requirements**
- **Project Schedule**

References

1. NAU Student Chapter of SAE "2006 Mini Baja," www.cens.nau.edu/~jtt3/Minibaja06, April 2006

2. Tester, John T., PhD, Associate Professor Northern Arizona University, personal communication, Sept. 2013.

3. SAE International, "2014 Collegiate Design Series Baja SAE Rules," 2014.