UCI Baja Racing

Thesis

The goal of the UCI Baja Racing project is to design and build a competitive Mini-Baja car for the 2004 Mini-Baja West competition. The Mini-Baja car must embody the principles of a good, competitive car, such as being lightweight, maneuverable, powerful, and most importantly, *drivable*. Overall, the UCI Baja Racing project seeks to provide participants with the opportunity to work in an organized, tiered, team structure in order to put engineering and management skills into practice.

The SAE Mini-Baja competition is an annual competition for student members of the Society of Automotive Engineers (SAE). This program encourages creativity and innovative thinking. In designing the car, the students are to assume that they have the opportunity to produce a prototype off-road vehicle for public consumption. The students conceive, design, and fabricate a scaled-down off-road vehicle. The car is built with team effort over the course of one year. The team will compete against approximately 125 other schools across the US, in their respective regions. Winners will compete in a worldwide competition.

Purpose

The intent of SAE Mini-Baja is to provide University students the opportunity to take knowledge fostered in the classroom and apply it to a real-world project. Students may benefit from this program by gaining valuable hands-on experience, knowledge, and social skills essential for a successful career in Engineering. A member of the SAE Mini-Baja team will be able to learn such skills as team management, time management, organization, public relations, engineering design, fabrication, and the unique chance to develop a product from concept to implementation.

Objective

The goal of the SAE Mini-Baja competition is to challenge SAE student members in designing and manufacturing a small-scale off-road vehicle. SAE Mini-Baja is an annual competition, divided into three regions, that is sponsored by the Society of Automotive Engineers and by Briggs & Stratton Motorsports. The experience of conceptualizing and producing the SAE Mini-Baja vehicle promotes engineering spirit amongst teams from United States and other schools worldwide.

This academics year, competition will be held in Portland, Oregon from April 22-24, 2004. At the competition, each SAE Mini-Baja vehicle is judged in following categories:

Static Events	300 points
Dynamic Events -Racing Aspects, Vehicle Performance	700 points
Total Points	1000

Approach

Below is a current sample of our Standard Operated Procedures (SOP):

SOP, Configuration Management

PN: MAE195-rev A

ORIGINATOR:

DEPARTMENT: Engineering

UCI BAJA RACING

Rev
ECO #
Description of Change
Approved By
Date

A
195
Initial Release.

11/02/03

APPROVALS	
EXECUTIVE REP/DATE:	*QUALITY MANAGER/DATE:*
DEPT. MANAGER/DATE:	*Other/Date:*

1. Purpose

1.1 The purpose of Standard Operating Procedures is to establish proper protocols for the development of the Mini-Baja and its sub-systems.

2. Scope

2.1 The procedures will encompass any activity that will contribute to the development of the Mini-Baja and its sub-system.

3. Responsibilities

3.1 The Engineering Manager and the Configuration Manager are responsible in maintaining the integrity of the procedures for the further development of the Mini-Baja and its sub-systems.

3.2 The Configuration Manager is responsible for the configuration management system and its procedures. Yet, the manager is also responsible for the quality assurance of a product.

3.3 The Manufacturing Manager is responsible for the manufacturing of components that have been processed and approved by a Responsible Engineer and the Configuration Manager.

4 Reference Documents

4.1 Quality Manual of SAE Mini-Baja.

5 Definitions

5.1 Bill of Material- A list of components that are located on the final production vehicle.

5.2 Engineering Manager- An authority that finalizes a design, and overseers the development of a project.

5.3 Project- The development of the Mini-Baja and its sub-systems.

6 Procedures

6.1 An Executive Officer will authorize a project and assigns the Project Manager.

6.2 The Project Manager will delegate authority among managers.

6.3 Engineers will contact the Configuration Manager to request part numbers.

6.4 The Configuration Manager will assign part numbers.

6.5 Before a part is released to the Bill of Materials (BOM), the part must be reviewed by the Manufacturing Manager.

6.6 If change of a design is required after a part has been released to the BOM, the new design must be approved by Engineering Manager.

6.7 All changes must be documented in an Engineering Change Order.

6.8

7 Records

7.1 The Configuration Manager maintains original copies and designs/parts history.

8 Attachments

8.1 Organization Chart

8.2 Engineering Chart

Responsibility

The team members of the UCI Mini-Baja have organized in the project similar to that of a small-type business/company. We have defined roles for all members of our team including managers for four different aspects of our project: Engineering, Manufacturing, Configuration, and Finance.

Weekly meetings are held with our faculty mentor, to update him on our progress and seek advice when needed. A majority of the Mini-Baja team are enrolled in the course MAE195, Engineering Product Design, where we are given weekly lectures by Professor McCarthy to help familiarize us with some of the important engineering aspects in the everyday working environment.

Timeline:

ID	Task Name	Duration	Start	Finish	Predecessors
1	***Chassis***	**49 days?**	**Wed 11/5/03**	**Mon 1/12/04**	
2	Parts Lists of Inventory Goods for use	9 days	Wed 11/5/03	Mon 11/17/03	
3	**Engineering**	**21 days?**	**Wed 11/5/03**	**Wed 12/3/03**	
4	Engineer Cockpit	7 days	Thu 11/13/03	Fri 11/21/03	
5	Design Front-End	7 days	Fri 11/21/03	Mon 12/1/03	38
6	Design Rear-End	9 days	Fri 11/21/03	Wed 12/3/03	38,7
7	Human Interface	6 days	Thu 11/6/03	Thu 11/13/03	
8	Parts Lists of need Materials	20 days?	Wed 11/5/03	Tue 12/2/03	
9	**Manufacturing**	**42 days**	**Fri 11/14/03**	**Mon 1/12/04**	
10	Mock up Cockpit	7 days	Mon 11/24/03	Tue 12/2/03	4
11	Mock up Rear, Hub/Upright	7 days	Thu 12/4/03	Fri 12/12/03	6
12	Mock up Front	7 days	Tue 12/2/03	Wed 12/10/03	5
13	Chassis Jigs	13 days	Mon 11/24/03	Wed 12/10/03	
14	Actual Chassis	21 days	Mon 12/15/03	Mon 1/12/04	10,11,12
15	Human Interface	7 days	Fri 11/14/03	Mon 11/24/03	7
16	***Engine-Drivetrain***	**39 days?**	**Wed 11/5/03**	**Mon 12/29/03**	
17	Parts list with Drawings of inventory	9 days?	Wed 11/5/03	Mon 11/17/03	
18	**Engineering**	**38 days**	**Thu 11/6/03**	**Mon 12/29/03**	
19	Rear Drivetrain	7 days	Thu 11/6/03	Fri 11/14/03	
20	Rear Axel Final	7 days	Thu 11/6/03	Fri 11/14/03	
21	Rear Axel Transfer	7 days	Thu 11/6/03	Fri 11/14/03	
22	Rear Upright/Hub	7 days	Mon 12/1/03	Tue 12/9/03	37
23	Engine Mounts (Engine, CVT)	7 days	Thu 11/6/03	Fri 11/14/03	
24	Guards	7 days	Thu 11/6/03	Fri 11/14/03	
25	Engine Aspects (Throttle Spring)	7 days	Thu 11/6/03	Fri 11/14/03	
26	Gas tank	7 days	Thu 11/6/03	Fri 11/14/03	
27	Parts list of needed material	38 days	Thu 11/6/03	Mon 12/29/03	
28	**Manufacturing**	**31 days**	**Mon 11/17/03**	**Mon 12/29/03**	
29	Rear Drivetrain	7 days	Mon 11/17/03	Tue 11/25/03	19
30	Rear Axel Transfer	21 days	Mon 11/17/03	Mon 12/15/03	21
31	Rear Axel Final	21 days	Mon 11/17/03	Mon 12/15/03	20
32	Rear Upright/Hub	14 days	Wed 12/10/03	Mon 12/29/03	22
33	Engine Mounts	7 days	Mon 11/17/03	Tue 11/25/03	23
34	***Suspension***	**31 days?**	**Thu 11/6/03**	**Thu 12/18/03**	
35	Parts List with Parts Drawings	6 days	Thu 11/6/03	Thu 11/13/03	
36	**Engineering**	**17 days**	**Thu 11/6/03**	**Fri 11/28/03**	
37	Rear Hubs/Uprights	7 days	Thu 11/20/03	Fri 11/28/03	
38	Suspension Front/Rear	7 days	Wed 11/12/03	Thu 11/20/03	
39	Suspension Mounts, including shocks	7 days	Thu 11/13/03	Fri 11/21/03	
40	Steering	7 days	Thu 11/13/03	Fri 11/21/03	
41	Braking System	7 days	Thu 11/6/03	Fri 11/14/03	
42	Parts list of Suspension for Manufacturing	17 days	Thu 11/6/03	Fri 11/28/03	
43	**Manufacturing**	**20 days?**	**Fri 11/21/03**	**Thu 12/18/03**	
44	Suspension Jig F	7 days	Fri 11/21/03	Mon 12/1/03	38
45	Suspension Jig R	7 days?	Fri 11/21/03	Mon 12/1/03	38
46	Suspension Mounts(including shocks)	14 days	Mon 11/24/03	Thu 12/11/03	39
47	Steering	14 days	Mon 11/24/03	Thu 12/11/03	40
48	Braking System	14 days	Mon 11/24/03	Thu 12/11/03	
49	Rear Uprights	14 days	Mon 12/1/03	Thu 12/18/03	37
50	Finance	1 day?	Wed 11/5/03	Wed 11/5/03	
51	**Integrations**	**28 days**	**Tue 1/13/04**	**Thu 2/19/04**	
52	Milestone 1- Chassis F/R/Cockpit	7 days	Tue 1/13/04	Wed 1/21/04	14
53	Milestone 2- Engine	7 days	Thu 1/22/04	Fri 1/30/04	52
54	Milestone 3- Suspension Arms	7 days	Mon 2/2/04	Tue 2/10/04	53
55	Milestone 4- Everything else	7 days	Wed 2/11/04	Thu 2/19/04	54
56	Testing	1 day?	Wed 11/5/03	Wed 11/5/03	

Itemized Budget:

Power-Train		Price
	U Joints	$ 300.00
	Pillow Block Bearings	$ 400.00
	Differential	$ 300.00
	Shafts	$ 100.00
	Misc. Hardware	$ 300.00
	Subtotal	$ 1,400.00
Suspension		
	Steering	$ 0.00
	Upright/Hubs	$ 100.00
	Brake System	$ 100.00
	Springs/Shocks	$ 0.00
	Wheels/Tires	$ 0.00
	Rod Ends	$ 300.00
	Suspension	$ 100.00
	Misc. Hardware	$ 100.00
	Subtotal	$ 700.00
Chassis		
	Pedal Box/Cockpit/Engine Compartment	$ 0.00
	Body Panels	$ 0.00
	Misc. Material (Tubing)	$ 300.00
	Subtotal	$ 300.00
Misc. Parts		
	Vehicle Safety	$ 200.00
	Seat	$ 250.00
	Clothing & Helmet	$ 500.00
	Subtotal	$ 950.00
Tools		
	Specialty Automotive Tools	$ 500.00
	Welding Supplies	$ 300.00
	Specialty Machining Tools	$ 500.00
	Subtotal	$ 1,300.00
Display Materials		
	Banners, Uniform, T-Shirts	$ 500.00
	Printed Materials, Photographs	$ 700.00
	Subtotal	$ 1,200.00
Track Testing		
	Gasoline	$ 150.00
	Subtotal	$ 150.00
Travel (Hotel, Airfare)	**Subtotal**	$ 1,000.00
Car Trailer	**Subtotal**	$ 0.00
	Total	$ 7,000.00