Introduction
Team Crucible SRT, a part of SASTRA’s Racing Team, participated in the prestigious BAJA 2013 conducted by SAE India for the second consecutive year. The selection of teams for the endurance race took place after three stages of eliminations, which are based on Virtual presentations, College level technical inspection and On-site technical inspection at NATRAX. This event being the maiden event of the newly formed SASTRA RACING TEAM (SRT), the team was highly determined to bring in the best results they can and inspire juniors to take up such events with more confidence and a better approach.

Virtual BAJA
Virtual BAJA is a national level presentation event, in which the teams are to present their design of the vehicle to a panel of well experienced judges from eminent companies. It took place in the month of August, 2012 in Bengaluru. Around 300 teams all over India registered
for the event. Of which, 120 teams were selected for the next level of the competition. Team Crucible SRT was one among those team selected for the next level of the competition.

**Fabrication phase**

Having been selected for the next level, all the teams were asked to fabricate the vehicle according to the design presented in the Virtual event. The team went through several hurdles during the fabrication phase. Initially, funds required for the registration process were shared between the team members. Then the fabrication phase went ahead with major contribution from the team members, the college and a few private players.

Fabrication of the vehicle took place day and night continuously during the months of December – January which included making of a prototype, checking part compatibility, modifying accordingly and finally going ahead with the primary metallic design. The vehicle was tested rigorously in the rough terrains behind the college and in the college grounds for around three weeks for various aspects that could fail, due to the design being completely done by students without any professional assistance. The team effectively did the troubleshooting during all failures and optimized the vehicle for better performance during the competition.

**College level Technical Inspection**

College level Technical Inspection was fixed on the 27th of January for which officials from Mahindra representing BAJA SAE INDIA visited the campus to inspect all the facilities used during fabrication and to check whether the vehicle is being fabricated as per the rules provided by the organizer. The fabricated vehicle had a rulebook compliance of 98% and cleared the Technical Inspection with ease, and also had an impressive performance in terms of sturdiness, dynamics and handling. From the 120 colleges selected for fabrication, only 105 colleges were cleared for the next level of the competition. After this phase more testing was done and the vehicle was beautified with proper body panels and painting. All the last minute touch ups and tests and checks were done in the last 4 days, making the vehicle ready to be shipped to the event site at NATRIP, in Pithampur, Madhya Pradesh. The same was done by a car carrier along with few other vehicles from other colleges.

**BAJA 2013**

BAJA 2013 was a four day event, in which the vehicles were tested for 100% rulebook compliance, engine condition and various sample tracks and tough conditions for the first three days. After completing the On-site inspection, teams adhering to the norms were shortlisted for the endurance run. The policies followed were very strict to ensure the event goes on uninterrupted with proper safety precautions. The event witnessed 120 cars at the event site. The experience was completely exhilarating for the team to see so many more vehicles like the one made by us. The varying designs and gave a lot of learning for the team members.
Engine test

Engines were checked and certified by the officials from Briggs and Stratton (the official engine supplier for BAJA’13). Vehicles whose engines were tampered or adjusted to some other setting other than the one specified were disqualified from the event straight away as the engine is the major factor that gives this event a sense of competition among the teams.
Go – No go gauge

Vehicles were made to pass through a standard gauge as per the rulebook. The gauge was set at a width of 64 inches, which means the vehicles can be only 64 inches wide at the maximum points. Vehicles whose size exceeded the limit were rejected from the event. Our vehicle being, 72 inches long and 58 inches wide cleared the test with ease.

Tilt test

Vehicles were driven over a 45 incline slope from the side giving a proper tilt facilitated the judges to examine them for leakages from various systems of the vehicle. Our vehicle cleared both the tilt tests on either sides with no leaks. Generally the leaks come from the gearbox setup, the engine oil, the brake fluid reservoir etc.

Safety Scrutiny

This is one of the most crucial inspections at the event site where the experts examine the vehicle for its safety aspects and the settings of all major operating and controlling systems, failing which the vehicle will be directly rejected with no excuse whatsoever. Even the rulebook compliance is checked at this station. Our vehicle passed the same with very minor modifications required.
**Figure of 8**
The vehicles are to be driven over a very precise figure of 8 on the ground. Our vehicle having a good steering system and an efficient driver finished the test with ease, without any penalties. Our team was one of the 4 out of 120 cars to clear this test with a speed of over 25kmph.

**Brake test**
Vehicles are made to accelerate for a particular distance and after achieving a speed of min. 35 kmph are stopped by applying brakes. All the 4 wheels are supposed to lock on the application of brakes. On failing to comply with this condition a vehicle will be declared fail in this test. Our vehicle cleared this test effortlessly.

On clearing the above tests, vehicles are issued with Technical Inspection OK sticker. Of the 120 teams 91 teams were cleared for the next level, our college being one among them.

**Hill Climb**
The vehicles have to tread over a distance of 40m on a 37deg incline which has a compacted stretch. The terrain is pretty slippery with lose gravel and sand. Our car was one among the 22 cars that cleared the test among the 120 cars present.

**Acceleration test**
The cars have to accelerate over a specified distance on a specially made patch. The acceleration is measured by a transponder fitted to the vehicle by the ARAI authorities. The transponder sends in data to the computers in the mobile labs present at that station. The vehicles clocked an average time of 7.5 to 8.5 seconds for covering the distance specified.

**Manoeuvrability**
This is claimed to be the super tough event before the endurance where the driver has to manoeuvre the car on a track with width equivalent to the width of the car. The track has varying terrains like types of sand, lose sand, mud, gravel, logs and slush. The track also has very sharp turns, inclines on turns, sharp turns, pits bumps etc. The cars are supposed to clear the track in the least possible time with no penalty. Our car cleared the manoeuvrability with zero penalty, which was done by less than 5 teams among 120 teams in total.
**Endurance Run**

The most looked after and the most fascinating part of the event, the final endurance for which every car is built, the ultimate stage of competition and rough terrains. The problem statement is to drive the car continuously for 4 hours on this custom built track. The track is 4 km long with all types of twists, turns, inclines, bumps, lose sand, hard patch, gravel, fine sand, troughs, ridges and two hill climb regions. The point that keeps the teams all active and determined during the fabrication phase is about making the vehicle last all 4 hours without any damage or part failure. This event can be termed as the major driving force for all the teams. Our team had the same motive without any exception. The complete process was amazing and when the vehicle gets qualified to be a part of the final endurance, the thrill and happiness is of no bounds. The car built by us, started the endurance with everything fine, and lasted on the track for around 3 hours out of four, before we started experiencing a minor fault due to a stiff suspension. This led to further faults in the same area, forcing us to stop the racing. 91 cars in total had started the endurance run, and at the end of 4 hours close to 28 cars remained intact. We are proud to say, our car was one among the cars that came out of the endurance without any major failure / damage.

The complete experience of the participation in an event of this magnitude where teams come with a very high budget and a lot of expertise was thrilling. Our team had taken the maximum pains and had given the maximum dedication towards this event, which led to a phenomenal success, relatively based on the parameters under which the team had to function. The want of more experience was realized as a major drawback in our team, which simply conveys the point that the next year will be even more exciting, interesting and successful for SAstra UNIVERSITY in BAJA SAE-INDIA 2014.

**Tests cleared by Team CRUCIBLE**

1. Engine Inspection
2. Go-No-Go Gauge
3. Tilt Test
4. Safety Scrutiny
5. Figure of 8 test
6. Brake test
7. Static event
8. Go Green presentation
9. Marketing Presentation
10. Acceleration test
11. Hill Climb test
12. Manoeuvrability test
13. Through to Endurance Run
Major achievements by Team CRUCIBLE

1. One of the fastest and precise teams at the Figure of 8
2. One of the very few to clear Hill Climb
3. One of the 5 cars to clear Manoeuvrability with zero penalty.
4. Nominated for BEST AESTHETICS & Build Quality
5. One of the few cars to come out of endurance w/o any repairs.

Major Costs incurred by Team CRUCIBLE

<table>
<thead>
<tr>
<th>S.No</th>
<th>Description</th>
<th>Cost (INR)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Preliminary Registration</td>
<td>15 000</td>
</tr>
<tr>
<td>2</td>
<td>Secondary/Final Registration</td>
<td>35 000</td>
</tr>
<tr>
<td>3</td>
<td>Vehicle Fabrication</td>
<td>3 20 000</td>
</tr>
<tr>
<td>4</td>
<td>Travel to event and back</td>
<td>20 000</td>
</tr>
<tr>
<td>5</td>
<td>ATV transport to event and back</td>
<td>60 000</td>
</tr>
<tr>
<td>6</td>
<td>Team Accommodation</td>
<td>90 000</td>
</tr>
</tbody>
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Total 5 40 000

The expenditures were managed by funds from college and the team members themselves. There was also a little contribution from friendly industries and a former professor from SASTRA.
**Flow of events in BAJA**

1. Preliminary Registration  
2. Design Phase (The Design is started, analysed, tested, tried and finalized - DFMEA)  
3. The VIRTUAL BAJA (The Design Presentation - Bangalore)  
4. Preliminary Results  
5. Final Registration  
6. Engine Procurement  
7. Marketing (For funds)  
8. Prototype Making (To check all aspects of modification if required)  
9. Market evaluation (To find the availability of parts reqd. as per design)  
10. The Main Purchase phase  
11. Fabrication (Physically the ATV starts taking shape)  
12. Testing (Initial – To find out major faults and correct them)  
13. Intensive Testing (To try and push the ATV to the max limits after for any minor/major fault that may occur)  
14. Aesthetics  
15. Finishing Touches  
16. ATV Shipping  
17. BAJA @ NATRIP – Pithampur, Indore_ MADHYA PRADESH.

**Team members**

1. Manush S Rowaine (Captain)  
2. Shreyas Hande K (Vice-Captain)  
3. Ajay Kumar K S  
4. Shrinath Krishnan S  
5. Sharad Dhar Dwivedi  
6. Devanand L  
7. Sriraman R K  
8. Gowthaman K  
9. Arun Giridhar R  
10. Padmanabhan G S  
11. Dinesh Kumar S  
12. Vivekanandan D  
13. Vignesh M  
14. Shajahan I  
15. Eshwar Sondhi  
16. Aniruadh M M  
17. Kaarthick B  
18. Rohit M  
19. Rohit K  
20. Prasath Krishnaswamy V  
21. Goutham Balaji C
Final Verdict

The event BAJA SAE INDIA, is truly the best platform basically for petrol heads and students who are very interested to make their learning have some practical application before the completion of their course. The event gives you expertise in a lot of aspects like

Team Management; Understanding the practical world; Challenges faced by the AUTO Industry; Price Escalation; Meticulous Planning; Alterations from major plans; Innovations; Morale killing challenges to name a very few of them.

Team CRUCIBLESRT looks forward to establishing a strong foundation and to go ahead with bringing the trend of participating and winning in prestigious SAE related and other automotive events in the National & International Levels. The event BAJA also has placement opportunities for the participating final year students and internships for 2nd and 3rd year students. The companies that offer the same are CHEVROLET ; FIAT ; ARAI ; CUMMINS ; MAHINDRA; ICAT ; ANAND ; EMITEC ; ANSYS ; TATA ; SAE INDIA etc. Participating in BAJA gives the students all major benefits and experience which a normal college going student can never get in the whole of college. We expect to bring up the name of SASTRA UNIVERSITY to new heights among the youth in the country.