CONVENERS NOTE

Mr. Ajay Ghai  
Plant Head,  
Mahindra Swaraj Engines Limited, Punjab  
Convener, BAJA SAEINDIA 2019 - IIT Ropar

At the outset, let me congratulate the 251 teams who have successfully qualified for the final showdown in the 12th Edition of BAJA SAEINDIA which witnessed 363 colleges registering from all over India. The meteoric rise in the participation of teams compelled the BAJA Organizing Committee to provide a fair chance to all the competent and aspiring teams. IIT Ropar graciously welcomes all the participating teams, the judges and the jury as well as all the sponsors from the industry.

We are as excited as the teams who are eager to usher into the automobile and allied industries with fresh perspectives and novel innovations. BAJA is just the right platform to connect the academia with the industry. Our efforts are dedicated to augmenting the knowledge and technical insight of the participants by moulding the challenges in the competition to global standards. This has been only possible with the aid of the judges, sponsors and the volunteers. I express my gratitude towards them and appreciate their association with BAJA.

This year’s motto of BAJA - “Adventure Reloaded” truly captures the pulse of this generation and calls them to action in exhibiting their very best across the multiple categories of the event. I wish them all the best for a successful BAJA 2019.

JOINT CONVENERS NOTE

Dr. Himanshu Paliwal  
Assistant Professor - Dept. of Chemical Engineering,  
IIT Ropar  
Joint Convener, BAJA SAEINDIA 2019 – IIT Ropar

Let us start with the most famous quotes of the world-famous physicist, Richard Feynman; “If you are not having fun, you are not learning. There is a pleasure in finding things out.” “What I cannot create, I do not understand.” “Study hard what interests you most, in the most undisciplined, irreverent and original manner.” BAJA 2019 offers a unique opportunity to put all three quotes of Mr. Feynman into practice. BAJA 2019 is not just a race but a unique learning opportunity. It is a quest where teams will have to use engineering principles taught in the class as well as scattered outside the class to build a machine with their own hands and minds. In the process, every team member will undoubtedly have to break free from their usual academic discipline to find hours to brainstorm ideas and devour tens and hundreds of books to gather relevant knowledge. Win or lose the race, the sense of camaraderie and the skills acquired during the team exercise will be an award achieved by each and every team member. Wishing all the teams the very best! See you on the road to glory!
CO-CONVENER’S NOTE

Mr. Shaan Varma  
Director  
Carmate (Varmech Mobility Pvt Ltd)  
Co-Convener  
BAJA SAEINDIA 2019 - IIT Ropar

Automotive industry across the globe is currently on a rapid disruption mode and it is no different in India. Technology-driven trends will revolutionize how industry players respond to changing consumer behavior, develop partnerships, and drive the transformational change. That said, car-makers today are reaching deep into universities to find the best student talent, as the budding engineers are playing a vital role in shaping the cars of tomorrow. BAJA SAEINDIA is a great platform that gives the industry exposure to the students right at their university level. It is an out-of-classroom-education system which gives the students a pragmatic exposure to real world challenges as faced in the industry. For the past 11 years the BAJA has been successful in giving the students a chance to put to test their capabilities and lean immensely from the experience. To give the learning experience to maximum number of colleges we have started the second BAJA event at IIT Ropar since 2018. The first edition saw the participation of 60 teams while for the current second edition we have 80 teams battling it out at IIT Ropar. In future, we are confident that event grows to an even more larger scale, providing a podium to young engineers from the colleges across the country to showcase their talent and fuel the growth of the Indian automotive industry.

Ms. Charu Goyal  
Engineer, Advance Engineering Department  
Mahindra Research Valley, Chennai  
Co-Convener  
BAJA SAEINDIA 2019 – IIT Ropar

BAJA SAEINDIA has, since its inception in 2007, been the most coveted contest for the engineering undergrads of India to prove their mettle. It is a competition for students from all engineering disciplines to showcase their skills and pursue glory for their respective teams. It is this amalgamation of engineering prowess, teamwork and a bundle of varied emotions that draws not just me but the enthusiastic participation from industry experts and sponsors. Not to forget the hoard of volunteers who are ably supported by the passionate BAJA Organizing Committee.

The competition has been growing every year among the teams and this puts the onus on us as organizers to raise the level of competition with even tougher challenges across various events. Once again I welcome the 83 mBAJA teams to IIT Ropar. I would like to wish the teams all the best for the event and appeal them to hustle together in making this edition of BAJA a grand success. Kindly use this opportunity to enhance your knowledge and build upon the work ethos of your team that will go a long way in delivering success in your careers.

What is the name of Mahindra’s yet to be unveiled EV hypercar?

New Teams’ Performance in BAJA SAEINDIA

Every year, new teams register for BAJA SAEINDIA with the aim of excelling and competing the veterans of this event. The key reason behind this could be sheer weight of expectations they gain looking at the laurels of the well-established teams which have proved their mettle both at national and International levels. The event is challenging on many fronts right from designing phase to the actual manufacturing of the entire vehicle. It acts as a breath of fresh air to all budding engineers exposing them to all facets of the life cycle of vehicle and act as a stepping stone to their foray into the industry.

Historically, we have had an addition of about 10-20% of new teams every year and BAJA is achieving the vision of expanding the event to all reaches of the country. Talking about the previous event, approximately 40% of new teams which registered for the main event have participated and completed the endurance race which shows the sheer amount of hard work and passion these new teams are bringing to this event. The new teams are now giving tough competitions to the old teams and making them to evolve at a faster rate.
Design Tips for Dynamic Events

While designing a BAJA vehicle, there are lots of factors which a team must consider ensuring that the design is correct and will not fail during the main event. The vehicle must be designed to overcome the challenges offered by every dynamic event and the Endurance race at the end. Critical dynamic events comprise mainly of acceleration, land manoeuvrability, suspension, traction and handling, as well as the ultimate culmination into the endurance race. Each of such event, demands optimization of suspension and steering geometry parameters commensurate with track requirements. The important factors to which teams must pay attention during design are — ground clearance should be over 250 mm, the turning circle should be as short as possible with proper steering effort and rotations and bump steer control to ensure optimum manoeuvrability, total wheel travel should be higher than 250 mm. Motion ratios must be correct with some cushion. Considering the road friction coefficient varying from 0.4 to 0.7 on the tracks, weight distribution must be correct to get adequate traction. Similarly center of gravity and roll center heights play an important role in vehicle manoeuvrability. There should not be a large variation in camber/toe during the entire travel of the suspension. Transmission ratios and CVT tuning does play an important role to provide seamless traction and high belt life.

Boost up Your Vehicle Performance

Q1: Since most of the teams fail to complete all the events in a stretch, can you give any suggestions while designing vehicle for the same?

Teams fail to complete all events at a stretch mainly due to noncompliance to the rule book and inadequacy/non-flexibility in the design. The design must conform to the rulebook and be simple and provide the ability to tune and adjust and optimize parameters like ride height/ground clearance/camber/caster/toe/wheel travels during vehicle validation process at the college level. The design must be robust though tunable. Only small tweaking should be required during the events.

Q2: How to overcome the challenges while manufacturing the vehicle and utilization of technological advancement?

Simplicity in design automatically leads to simplicity in manufacturing. Manufacturing processes selected must give the required accuracies to achieve design tolerances. Customized components/subsystems to reduce weight and optimize performance must have due justification in respect of tradeoff between cost/weight/performance. Use of technological advance features must be commensurate with the user profile, customer needs and premises of the competition as given in the rulebook.
As proud sponsors of BAJA SAEINDIA, we are delighted to continue our association in its 12th edition this year. The commitment shown by the participating teams each year only encourages sponsors like us who anticipate a large footfall of talented engineering students, ready to enter into the industry with renewed vigor. This regenerates our excitement and commitment because we see the potential these young participants have to take India forward in the engineering and manufacturing sectors. BAJA becomes an ideal diaspora where industry personnel can interact with academia and gauge their understanding and expectations of the industry. Trim India has forayed in the automobile sector for quite a long time now and each year in BAJA brings with it a splurge of new ideas and innovations from the students. We endorse this aspect of the competition and believe in nurturing these nascent ideas for the benefit of the industry and the country at large. It is also great to see that the participation of girls has increased, and we are seeing even more numbers of all girls’ team. This is a promising sign for the industry and the nation in general. We would like to express our best wishes to all the participating teams and I hope they excel in all facets of the competition.

Mr. Rakesh Sood
Managing Director
Trim India
BAJA SAEINDIA 2019

MSC Software has been associated with SAE BAJA for a number of years. In India, SAE BAJA competition has come a long way during the last decade. It is now one of the most popular national competitions showcasing the talent of upcoming Indian engineering students. Most of the teams participating in this year’s competition use the popular MSC Adams software to work on their car designs. This year the vehicle designs are quite evolved and the competition is also opening up to some international teams.

Mr. Kaustubh Nande
Director Marketing - Indo pacific Region
MSC Corporation Ltd
BAJA SAEINDIA 2019

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Mr. Kaustubh Nande
Director Marketing - Indo pacific Region
MSC Corporation Ltd
BAJA SAEINDIA 2019

ROCK CRAWL: THE SUPRISE ELEMENT

Team Aryans: Government College of Engineering, Aurangabad

The event atmosphere was extremely energetic due the passion and immense confidence to drive the vehicle on a thrilling track. Every track surprised us with something new that we have never thought of but this year we were prepared for the surprises. One of the biggest change we observed was inclusion of a new challenge in the event. Rock Crawl event was included in place of Hill climb or Sled Pull. The approach towards rock crawl was to utilize the 1200km worth testing we did and use a perfect combination of suspension and wheel assembly. Having air shocks, we tuned the suspension to hard setting with higher ride height. The track was attempted with higher tyre pressure and more focus was on which track line to follow. After observing a few team’s attempts, we were ready to take on the challenge and we did it with excellence.

SPONSOR ARTICLE

Mr. Kaustubh Nande
Director Marketing - Indo pacific Region
MSC Corporation Ltd
BAJA SAEINDIA 2019

Working beyond our potential limits and watching the vehicles conquer the challenging terrains was magnificent. Roaring of the vehicle, repairing the breakdown and again driving vehicle on tracks has its own zeal. The experiences and lessons learned at the event cannot be learned through books.
Q1: Would you like to give any tips and suggestion on how to make the best use of track to get the victory?

Ans: The key to lasting in any endurance race is meticulous preparation. It is about how you should prepare yourself before an endurance race rather than preparing a vehicle with technical aspects. At least two team members should know the rulebook like the back of their hand. This will hold you in good stead always as you will know how the game is being played and will help avoid histrionics when emotions are running high. Careful preparation of the vehicle will help you avoid ‘unforeseen’ calamities during the race.

For making the best use of the track to win, follow these tips:

WALK THE TRACK

- Walking should be done by at least both the drivers and if possible also by another team member, preferably one who follows motorsport and can give you some tips on driving lines. Maximum 3 members should be on track during the walk.
- Draw the track and mark your driving lines.

PRACTICE

- Remember, practice time given is not for you to have fun with your car.
- Vehicles should be tested in your college, not on the track.
- Leave the practice run only for the most essential, last minute tests.
- Use the practice time to get used to the vehicle’s behavior on the track.
- It’s not about going fast - it’s about practicing your lines.
- Be safe when you’re driving - you and your team have worked hard for a year to make this happen.

The complete BAJA event is a provocation for enthusiasm, diligent efforts and unbounded passion within the driver and the team. So, whether the task is to drive through the obstacles or efforts taken for weight loss, nothing seems impossible. In the testing phase try various tracks built for the manoeuvrability, suspension and the endurance track, for tuning the suspension and transmission accordingly. Mock endurance runs should be conducted of different time slots starting from 2 hours, then 4 hours and then stretch the vehicle to complete a 6-hour run. Try out all the possibilities calculated by you, hit all the extremes while you are practicing on your home ground so when you are in the event, you are not afraid of “What if I...” You must learn by heart how's your buggy at each corner, every type of hurdle only then you can see your name on the top of the fastest lap. Above all is the most important fact which must be on everyone's tip of tongue - DISCIPLINE. No matter how hard you work for the whole year, how smart every individual is unless there’s team discipline you’re not going to be on that Podium.

Message for new drivers -

Prepare with your heart and soul and develop courage as much as you can in your house. BAJA is like a glimpse of Hell if you are not tuned with your vehicle.

Which Indian teams had participated in the Dakar Rally of 2019?
First, list the expenditure for the whole year and make a tentative budget. This budget should be marked as target and accordingly start to find sources of sponsorship. Getting sponsorship is not a one-day process; it goes with a series of meetings. Try to plan dates for approaching each of them. Whole team should start searching for companies which are potential enough to become your title sponsor. First meeting is only an introduction type wherein you just get connected with their personnel. You should never clear your perspective in very first meeting. First, try seeking their knowledge in technical fields. Second meeting try to call them in your pit and showcase your vehicle, your awards and latest innovations. Third meeting is the decision making one where you get an idea whether to continue meetings with them or not. Now directly put forth your point that how you are in great need to raise funds and why they should sponsor our team. Catching them on basis of emotions and your caliber rather than making false promises like their publicity in the event, logo etc. All these things are very small for them like publicity at event and logo but things which matter is your caliber. If you are first in event their company would be publicized. Just prove them how you are going to achieve a podium finish.

Sources for raising funds:
1) Companies (56%)
2) ATV workshops (32%)
3) Fundraising sites (5%)
4) Educational institute (7%)

**mBAJA WINNER BITES**

**TEAM NEMESIS RACING - College Of Engineering Pune**

The success in the BAJA SAE INDIA 2019, Pithampur event was the result of a yearlong of hard work wherein each member of the team puts in to reach the podium. This victory marked our 5th consecutive winning of the BAJA SAE (2015-2019) championship.

On Day 1&2, we had a technical evaluation with brake test and had some great presentations. Day 3&4 was full of dynamics and we faced the rollover of our vehicle during the suspension and traction test which resulted in wheel assembly failure. But the team came back with an even stronger fight and witnessed one of the fastest rock crawls ever.

We started the race at 2nd position on the grid. In the first half of the race we were not at the top but among first 3 constantly. The critical second-half temperament and pressure was handled beautifully by our team as the car didn't have a single failure in the race which resulted in our car collecting the chequered flag and winning the race by 1 lap lead.

**eBAJA WINNER BITES**

**TEAM STALLIONS - Institute of Technology, Nirma University**

It was not just a name for Team Stallions, but a feeling. As we proudly say, "One Team One Dream", achieving this dream was no less than a roller coaster ride. The event spanned for four days included grilling technical and safety inspection, static events which had a design, sales and cost evaluation to name a few, and dynamic events which demanded the ATVs to be pushed to their maximum limits to endure the difficult terrain and emerge victoriously. Team Stallions performed exceedingly well in the said events by winning a galore of awards. We bagged 5 first awards for CAE, Sales, Acceleration, Durability and the National Championship Trophy.
ALUMNI SPEAK

Tushar Methi
Anand Group

A journey of passion, motive and tenacity to design and build my own vehicle which was just a trailer for the big picture when I landed up in the Alumni Committee of BAJA SAEINDIA 2019. BAJA has had a massive impact on what I'm today, be it personal or professional aspect and I will forever be grateful to it. It helped me realize the importance of several qualities such as a teamwork, soft skills, leadership skills, decision making, time management, etc. which are a proud addition to my personality. Cheers to more years of togetherness!

Shivam Gupta
Lucid Holdings India Pvt. Ltd.

BAJA is a cumulative experience of true leadership where each member gets the chance to start from the mud and rise to the clouds of fame. It's an event to show how one's knowledge is developed into a real thing. The kind of moral and the motivation given by BAJA is immense. Organizing an event like BAJA is helping me in building a good community even in my professional life.

C.H. Bala Subrahmanyam
ARAI

I have been associated with BAJA since 2016 and it has been an important life experience in an engineer's life. BAJA concretes basic knowledge in developing a vehicle. It's a platform which has enhanced my abilities in the technical field and management as well. I came across situations of action, of vision, priorities for the best of my knowledge while participating in BAJA. There were moments that turned me into a real engineer. It's a great opportunity for engineering students to prove their passion for auto-mobility.

Rohan M Dekate
MRV Chennai

As a student working on the vehicle, my perspective about BAJA was concentrated on building a strong vehicle with sound engineering knowledge and practices. But as an Alumni Committee member, I have come to realize the huge responsibility that the teams and the organizers have entrusted us, to deliver a successful event as well as an enriching experience for all the stakeholders. And there's always something to add from the work that I do in terms of communication skills, time and work management, people skills, technical know-how and the creative pursuit to make the event challenging and fresh for the participants. For me, being a part of the Alumni Committee has brought back the excitement, dynamism and camaraderie of college time and I'd also like to urge you to join us and see BAJA through a different lens.

Sarnab Debnath
VE Commercial Vehicles Ltd.

From being a participant in 2015 & 2016 to an Alumni Committee member, I can confidently say that BAJA is a platform where individual talents and strengths are recognized. Over the years we can see the competition develop and the improvement in the teams to tackle the various obstacles thrown by the event. Furthermore, being an Alumni Committee member has made me see the management view of the event which is a different challenge in itself. I feel privileged to be a part of such a wonderful and hard-working team and I am grateful for the development BAJA has inculcated in me as an individual.

ALUMNI COMMITTEE

BAJA SAEINDIA 2019 - ADVENTURE RELOADED
The world is moving towards Advanced technologies and so is the automotive sector. With a strong push towards improving the vehicle quality coupled with fierce competition in the industry to provide more out in class features, the dire need of advancing the manufacturing processes has arrived. The industry is surely moving towards Digital manufacturing and IoT with the implementation of tools such as industrial robots, virtual reality, additive manufacturing. Digital manufacturing is the use of computer-based systems comprised of simulations, 3D visualization and analytics to create products and manufacturing processes simultaneously. The industry is now moving towards the concept of Design for manufacturing, Computer integrated manufacturing and lean manufacturing. Also, the use of advanced materials such as Advanced high strength Steel, CFRP, UHSS etc has aided this move.

Even in BAJA, as compared to previous events, the designs now are more complex and teams are now focussing more on how to reduce the weight without compromising with the performance. Use of aero standard materials has become common amongst the teams. With complex design coming into the picture, the teams now have to focus more on how to design for manufacturing and careful choice of the manufacturing process will also play a crucial role in the overall performance of the buggy. The team should design the components keeping in mind the manufacturing processes involved in its manufacturing and the ease of availability of those processes around and thereby reducing the manufacturing time. This way teams might get more time to test their vehicles and to ensure the performance of the vehicle as per the design.

What is the name of the platform unveiled by Mahindra at last year’s Auto Expo for EVs?

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