SRM INSTITUTE OF SCIENCE AND TECHNOLOGY

MECHANICAL AND AUTOMOBILE DEPARTMENT

TEAM DIRT RANGERS

(DRC)

“ Hustle, Strength and Perseverance ”

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ABOUT THE TEAM

Team Dirt Rangers or DRC is the oldest functional motorsports team of SRM IST Delhi-Ncr campus which emphasise on off-road racing events like ESI Enduro, SAE BAJA, Quadro etc.

The team comprises of students of all the years from mechanical and automobile department, testing their skills and putting their talents in front of them and the world. It gives a platform for students to show what they are capable of. The team currently has 25 members.

DRC has always been in the limelight with its embarking achievements which include:-

- Clearing dynamic and static events in SAE Baja 2018 in the first attempt.
- Competing in Mega ATV 2016
- Competing in Quadro 2016.
- Ranking in top 100 teams for SAE BAJA 2019 qualifying event.
- Competing in SAE BAJA 2019
- Competing in ESI 2019
- Competing in MEGA ATV 2019

Future endeavours of the team are:-

- Participating in SAE BAJA PITHAMPUR, 2020(January), an international level event.
- We are planning to participate in ENDURO STUDENT INDIA PUNE 2020(February),a national level event
- We are planning to participate in MEGA ATV GOA, 2020(March), a national level event

DRC has been captained previously by Sumit Bajaj, Saurabh Tiwari, Kushagra Sharma, Prakhar Kumar, Amit Rana, Abhilash Gupta and Divyam Sharma, of which, the foundation stones were led by Sumit Bajaj and fellow members in 2016.

The team is currently led by Parth Jain (captain) and Sumedha Gupta (Team manager). The team is divided into Primary departments and Secondary departments.Each member of the team is required to choose one area of interest from both the Primary and Secondary departments.

Primary Departments present in the team are Steering, Suspension, Power transmission, Braking and Vehicle dynamics.

Secondary departments are manufacturing, designing and promotion and sponsorship. DRC has been consistent and has been actively taking part in every major event held since the team was founded.

We believe theteams that work well together can greatly increase workplace productivity and create a more cohesive company culture. This is because good teamwork creates synergy – where the combined effect of the team is greater than the sum of individual efforts. ... As well as enhancing team's performance by good teamwork benefits individually.

"Hustle, Strength and Perseverance."

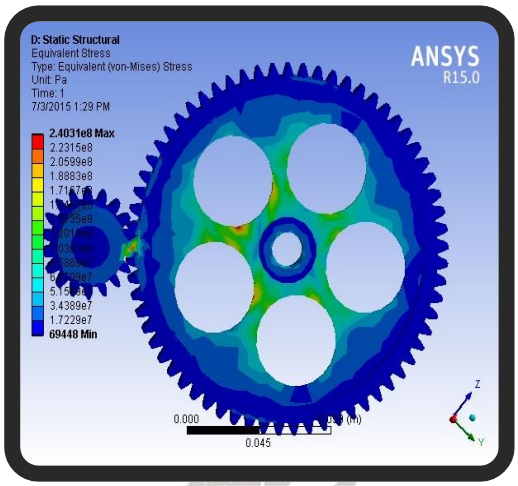
ABOUT THE VEHICLE

Engineering students are tasked to design and build an off-road vehicle that will survive the severe punishment of rough terrain.

Particulars	Proposed
Overall Length	72 Inches
Overall Width	60.5Inches(F) 60Inches(R)
Ground Clearance	11Inches(F) 10Inches(R)
Wheelbase	57Inches
Track Width	53Inches(F) 50Inches(R)
Roll Cage Material	AISI 4130-Carbon Steel
Overall Weight	240kg
Engine	Briggs & Stratton 305 cc 10HP
Transmission	Custom single speed reduction gear box with CVT
Tires	25x7-10(F) 25x7-10(R)
Maximum Speed (Kmph)	56.73 KMPH
Maximum Acceleration	1 m/s^2
Grad ability %	41 Degree
Stopping Distance	4.25Meters
Kerb Weight	140Kg

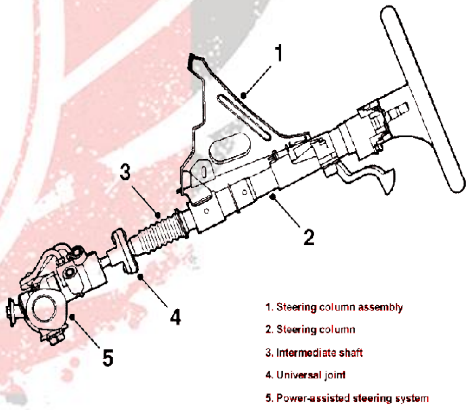
- **ENGINE:-**

1. The buggy will have BAJA specified engine BRIGGS AND STRATON VANGAURD 19L.
2. The engine produces 10 BHP and 14 lbs-ft @2800 RPM.
3. Custom Gearbox With CVT – CV tech
4. Engine and Gearbox coupled using a CVT with a V-BELT.



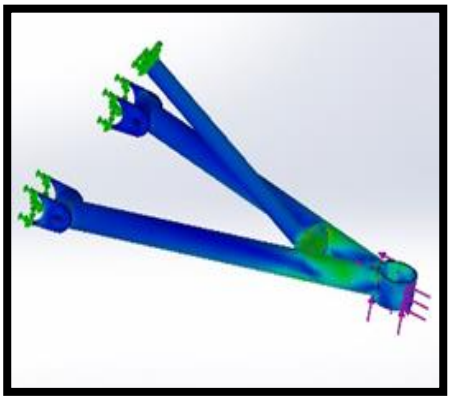
- **STEERING:-**

1. Steering system used – Rack & pinion
2. Turning angles – interior 44.5 degree /outside 24.5 degrees
3. Camber - (less steering effect)
4. Steering wheel torque -8764N-mm
5. At turns Ackerman geometry followed.



- **SUSPENSION:-**

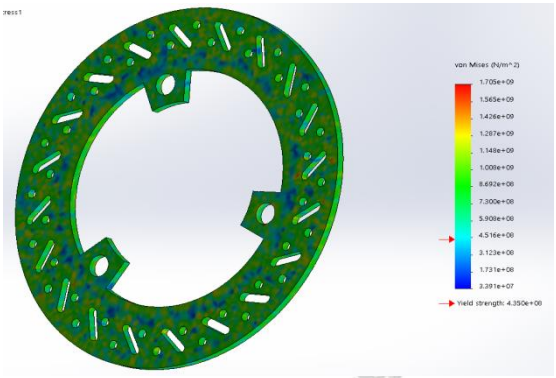
1. Double Wishbone Independent
2. **FOX AIR SHOCK 2.0** ***Suspension***
3. Caster-3 degree
4. KPI-5.4 degree
5. Scrub radius-1.92 inches
6. Toe-0
7. Kerb weight- 190 kg



- **BRAKING:-**

1. Braking system :-diagonal split
2. Disc brakes
3. Dot4 braking fluid
4. Weight transfer ratio during braking- 70:30
5. Static rolling radius of tyre is 12.303 inch

System



SAE BAJA DETAILS

Baja SAE is an intercollegiate design competition run by the Society of Automotive Engineers (SAE). Teams of students from universities all over the world design and build small off-road cars. The cars all have engines of the same specifications. As of 2018 the engine has been an unmodified Briggs & Stratton Model 19 Vanguard engine single-cylinder with a displacement of 305cc and power output of approximately 10 bhp (7.5 kW).

The goal in Baja SAE racing is to

design, build and race off-road vehicles that can withstand the harshest elements of rough terrain. The vehicles used in Baja SAE racing are often similar in appearance to dune buggies. Before 2007, the events were called "Mini Baja."

Each year as many as 141 Baja cars are entered in the Baja SAE events across the US and around the world where events are held including India, China, Brazil, South Africa and Korea. In India, this event is run by SAE India. All cars must adhere to SAE's rules, and pass SAE's technical inspection and judging; a car may not race until all safety inspections are passed. Small engine manufacturer Briggs & Stratton sponsors Baja SAE teams by providing the SAE sanctioned engine free of

charge, at a replacement rate of one engine for every two years in competition.

There are multiple dynamic events, usually four per event, as well as a single four-hour endurance race. The dynamic events include hill climbs, sled pulls, manoeuvrability events, rock crawls, and suspension & traction events. Previously the cars had to be able to float and propel itself on water under its own power. This was changed from the 2012 competitions onward due to safety concerns.

Static events, such as written reports, presentations and design evaluations are provided by participating teams. This is when the teams are judged on ergonomics, functionality, and producibility of their cars; ensuring that the final placement of the team does not rest solely on the vehicle's performance but rather on a combination of static and dynamic events. Required reports detail the engineering and design process that was used in developing each system of the team's vehicle, supported with sound engineering principles.

Also, a cost report that provides all the background information necessary to verify the vehicle's actual cost is used to rate the most economically feasible for production. These reports are submitted weeks in advance of each event, where the presentations and design evaluations are given on site in the presence of SAE design judges.

ENDURO STUDENTS INDIA

Enduro Student India is an off-road student design competition bred from the need to train engineering students on practical aspect of building something with their own hands and also train them on science of team management.

Enduro Student India is an exclusive student design competition which focuses on safety, good engineering practice, engineering design, education and creating opportunity for participating students & is being organized by SplitSecond Engineering & Performance Pvt Ltd.

The rules and regulations for the competition are based on materials prescribed by International standards which are publicly available in the public domain and these are the universal standards adopted by other similar events across the globe.


DIRT
RANGERS

MEGA ATV DETAILS

"**Mega ATV Championship**" is well known for one of the most challenging and treacherous events that check the breaking point of the teams. It's out of the edge and typically designed events create thrill for the performers that can only be recognized by the drivers.

This season the challenges and essence will be different and are going to be more speculative with added zeal and zest. This season brings a new essence to the championship based on "Mountain Riders" and "Night races" which would distinguish this event from the world of the adventure.

The purpose this season will be to focus more on innovation and research of new automotive technologies and produce enthusiastic and skilled rally drivers through its extraordinary rally format and rally tracks.

PROJECT BUDGET

The expected budget for the overall project of the BAJA vehicle, including the cost of material procurement, fabrication and registration of each member charges is **9,60,000 INR**.

Registration for the events

It comprises of a total of **1,95,000 INR** just for the registration of the three events, SAE BAJA PITHAMPUR,MEGA ATV GOA and ESI PUNE.

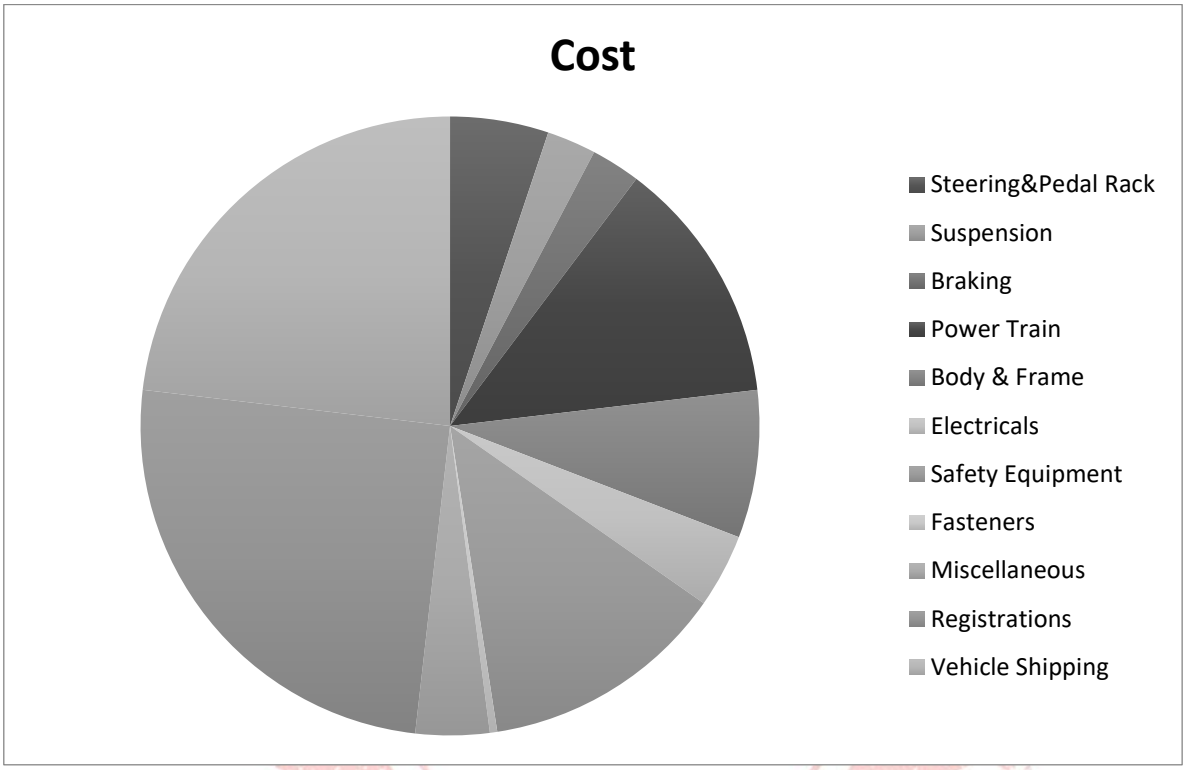
Material procurement and fabrication

Department	Expected Expenditure(INR)
Steering & Pedal rack	40,000
Suspension	20,000
Braking	20,000
Power Train	1,00,000
Body& Frame	60,000
Electricals	30,000
Safety Equipment	1,00,000
Fasteners	3000
Miscellaneous	30,000

Departmental division of cost is explained as follows:

- Steering System: It majorly comprises of tie rods, steering rack and steering wheel, along with their machining charges.
- Suspension System: Major expenditure in this department is of custom knuckles and hubs, along with their machining, damping arms, BAJA recommended rear spring and dampers and Fox Air Shock 2.0.
- Brake Assembly: Expenditure in this department majorly comprises of, custom calipers and discs, along with their machining, friction pads, housing, splitters, brake fluid and hoses.
- Engine: This comprises of BAJA specified, engine, fuel tank and exhaust system.
- Transmission: It comprises of couplings, custom gear box, and CVT.
- Drive Train: It includes axles, rims, their machining and tires.
- Frame: It includes the cost of AISI 4130 hollow tubes, Sparco seat and Firewall sheet.
- Body: It includes the cost of body fendors, paints, shock absorbing plates and other MS sheets.

- Electricals: It includes the cost of brake lights, front lights, fog lights, battery, and connecting wires.
- Safety Equipment: This department, which is of utmost priority, comprises majorly of, Safety Harness, Fire Extinguisher, Kill Switches, Driving Gears and Drake Mounts
- Fasteners: It comprises of all sizes of nuts, bolts, and spring washers.
- Miscellaneous: It comprises for the cost of publicity, team uniform, posters, banners and other small expenditures.



INNOVATION

The team DRC of our very own prestigious institute SRM is taking part in all-terrain vehicle making events which are well known for being the most challenging and treacherous events and this season the challenges and essence will be different and are going to be more speculative with added zeal and zest. It will be putting emphasis upon focusing more on innovation and research of new automotive technologies which will produce enthusiastic and skilled rally drivers through its extraordinary rally format and rally track as per their perspectives.

The DRC team is capable to deliver the required amount of efforts and ideas required to conquer the battle so it has come up with an idea and are viewing innovation as the application for better solution that meets new requirements and unarticulated needs.

- Since innovation is the result of solving a problem, even if the problem wasn't identified. So to the same we have proposed the following modernizations To induce sliding joints in the arms of the vehicle, thus resulting in shock absorbing arms. It will not only assist the suspension assembly, but also will cover wider spectrum of vibrations enhancing the shock absorbing by the suspension unit and ride quality. Not

only that but it also ensures higher tyre contact duration with the ground, thus improving the performance.

- We plan to install tracking equipment and induced transponders, which will always keep us updated of vehicle's location, speed and travel time. It will also help us to maintain good database for the vehicles performance
- We have a strategy to implement fuel level measuring using piezoelectric material, as no tampering is allowed within the fuel tank. Crew members can constantly monitor the fuel on the screen. This type of fuel measuring apparatus is yet to be tried in off-road motorsports events.
- One of our key innovations is supposed to be an unmanned aerial vehicle what we usually call as a Drone. A drone monitored track report and assisted view via drone mounted lights. In this mini yet highly effective project, we plan to run an automated drone over the vehicle during the event time, which will monitor the track using camera and display live view to the crew using screen, over which, fuel meter is also available. Also, since our event includes, endurance race in the dark, the drone will also provide extra lights on the track, thus assisting the driver, to get a better view. This is a sure shot booster for our performance and to top it all this is an original innovation exclusively thought by the team.

ALL THESE INNOVATIONS IN JUST ONE VEHICLE IS A HUGE X-FACTOR FOR WINNING THE COMPETITION.