# SAE Baja Front Suspension Design

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**Union College Mechanical Engineering 2012 Senior Project**

## Introduction

The SAE Collegiate design series was started in 1976 under the pretense that students learned engineering stress analysis in school, but could learn the importance of industrial design, manufacturing, cost analysis, and time constraints by designing and building an off-road vehicle that compete in a market. Union college entered the series several years ago and has had some years of great success and some with unfortunate results.

## Project Background

During 2012, the Union College Baja team traveled to Pittsburg Kansas. The vehicle performed well, except in the areas of dynamic maneuverability. The front suspension used on the vehicle was not properly tuned or designed for the frame because the suspension built for the frame didn’t fit. For this reason a new suspension needed to be designed for the 2012 competition in Auburn Alabama. Research was done in the area of vehicle/suspension design and an unequal length double A-arm design was created.

## Suspension Design

The unequal length A-Arm design incorporates several features key to the dynamic success of the vehicle:

- **Dynamic Ability:** Ideal camber curves and adjustable toe make the A-arm suspension a great fit for Baja.
- **Strength:** The links attach to the frame in short segments adding to the strength of the design.
- **Manufacturing:** The design is symmetric from one side of the vehicle to the next and down the longitudinal axis of each A-arm making the design easy and quick to build.

## Future Plans / Competition

This year the competition in Auburn Alabama will include:

- Acceleration test, land maneuverability, suspension testing, and sled pulls.
- Design report, cost report, technical inspection, engine inspection, break inspection.

## Tuning and Testing

The team often overlooks the importance of tuning the vehicle before competition. For a front suspension the tuning is the most important component. The static toe needs to be adjusted for best riding conditions. The camber needs to be adjusted for the best traction and the shocks need to be adjusted for the correct ride height. The car will be tested in the early spring.

## References

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## Acknowledgements

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