USU Mini Baja 2025

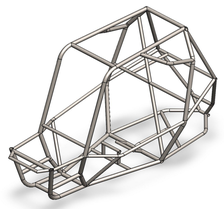
Project Description

The purpose of this project is to design a competitive off-roading buggy to compete in the Baja SAE Arizona 2025 competition. Competition success is determined by a combined score from the dynamic and static competition events including a cost reduction report, design review, acceleration test, sled pulling capabilities, and overall endurance.

Design Description

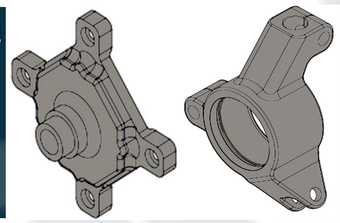
Frame

The frame was designed with a tilted rear roll hoop, flared-out side members, and a symmetrical rear frame.



Hubs and Spindles

The hubs and spindles were redesigned to remove rear outboard brakes and accept ATV ball joints.

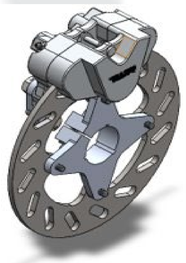


Drivetrain

The drivetrain was edited for better CVT spacing and ratios and featured a limited slip differential and dog clutch to improve/ engage or disengage 4WD.

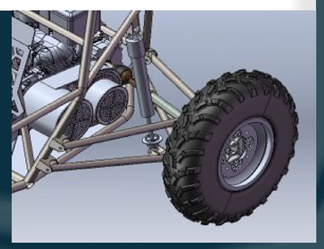
Brakes and Ergonomics

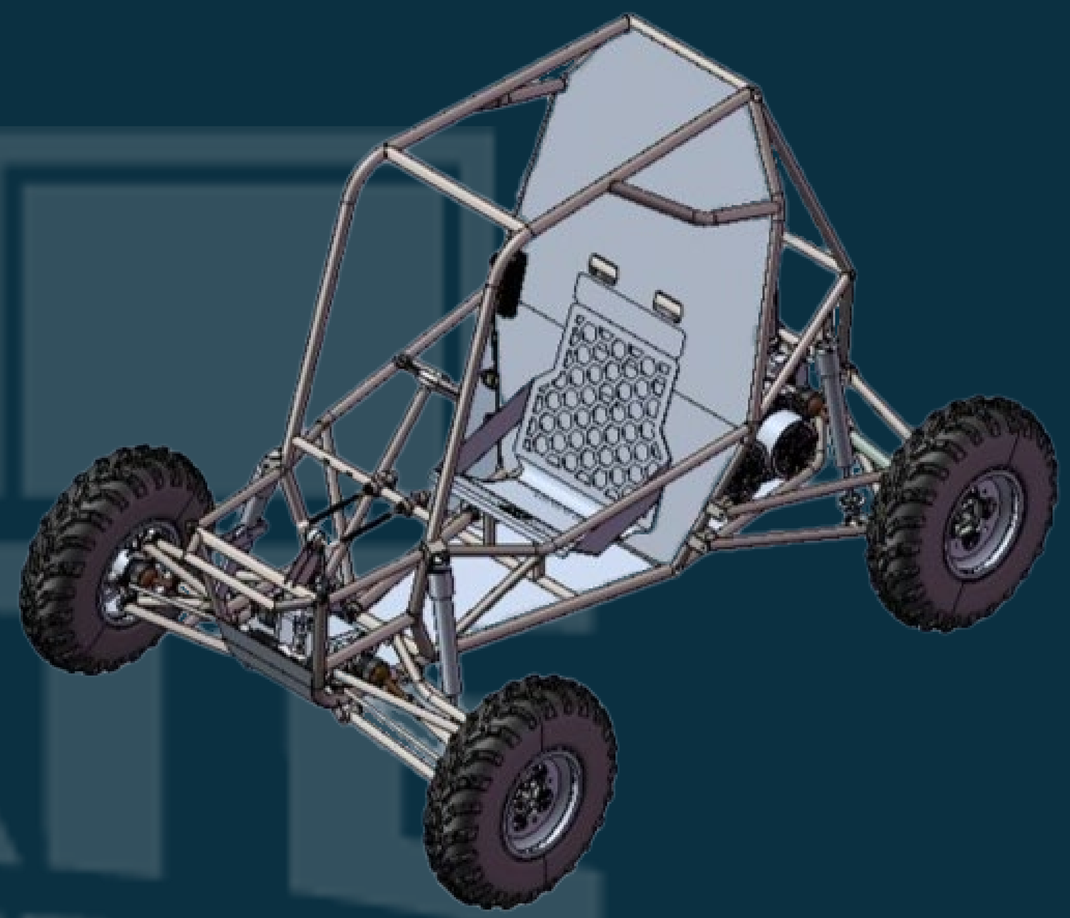
The rear brake was redesigned to incorporate a single, center-mounted rear brake. A new seat design allow for more lateral support to the driver.



Suspension

The Baja Buggy suspension consists of shocks, control arms, bushings, and ball joint connectors. The design focus this year was to redesign the suspension to utilize a double wishbone geometry, mount the shocks to the lower control arms, and remove Heim join connections.





Performance Review

Requirement	Target	Threshold	Method	Predicted Performance	Actual Performance
Time to accelerate to 100 ft	3.9s	4.4s	ΣF = ma	4.7 s	5.4 s
Vehicle Weight	380 lb	435 lb	SOLIDWORKS Scale	419 lb	435 lb
Turn Radius	85 in.	100 in.	SOLIDWORKS	95.5 in.	95 in.
Ground Clearance	10 in.	8.5 in.	SOLIDWORKS	10 in.	11 in.
Suspension Total Travel	12 in.	9.5 in.	SOLIDWORKS	10 in.	12.75 in. (limited to 11.5 in.)
Number of repairs required	0	3	FEA 	3	TBD

Conclusion

Although, we did not meet every goal set, the vehicle was completed with sufficient time to perform test driving which allowed us to optimally tune subsystems and improve weak points. Overall, the team produced a quality vehicle that handles well and behaves as predicted.

Lessons learned include integrating early with other sub-teams to ensure that everything fits together. Recommendations for future work would be to make minimal changes to successful subsystems (chassis and suspension). Focus your early design efforts on the drive train and CVT. Work hard to make time for testing.

College of Engineering
UtahStateUniversity

Alan Merritt, Matthew Hope, Ben Johnson, Ben Shunn, Travis Kunzler, Kale Vorwaller, Spencer Lorrigan, Victoria Kemeny, Tony Daniels, Eric Lapray, Brock Nielson, Henry Shaw, William Loveland

Special thanks to Josh Jackson, Sam Adams, Jackson Graham, and the USU Mini Baja Team