



# AZTEC BAJA FOUR-WHEEL DRIVE DRIVETRAIN



## Problem Statement

The Baja SAE rules require that all vehicles be 4WD by the 2021 season. However, all vehicles using 4WD will be granted up to 150 bonus points per competition in the 2020 season. Since the implementation of 4WD significantly affects the overall score, Aztec Baja Racing has decided to pursue this option for the 2020 season.

## Project Goals

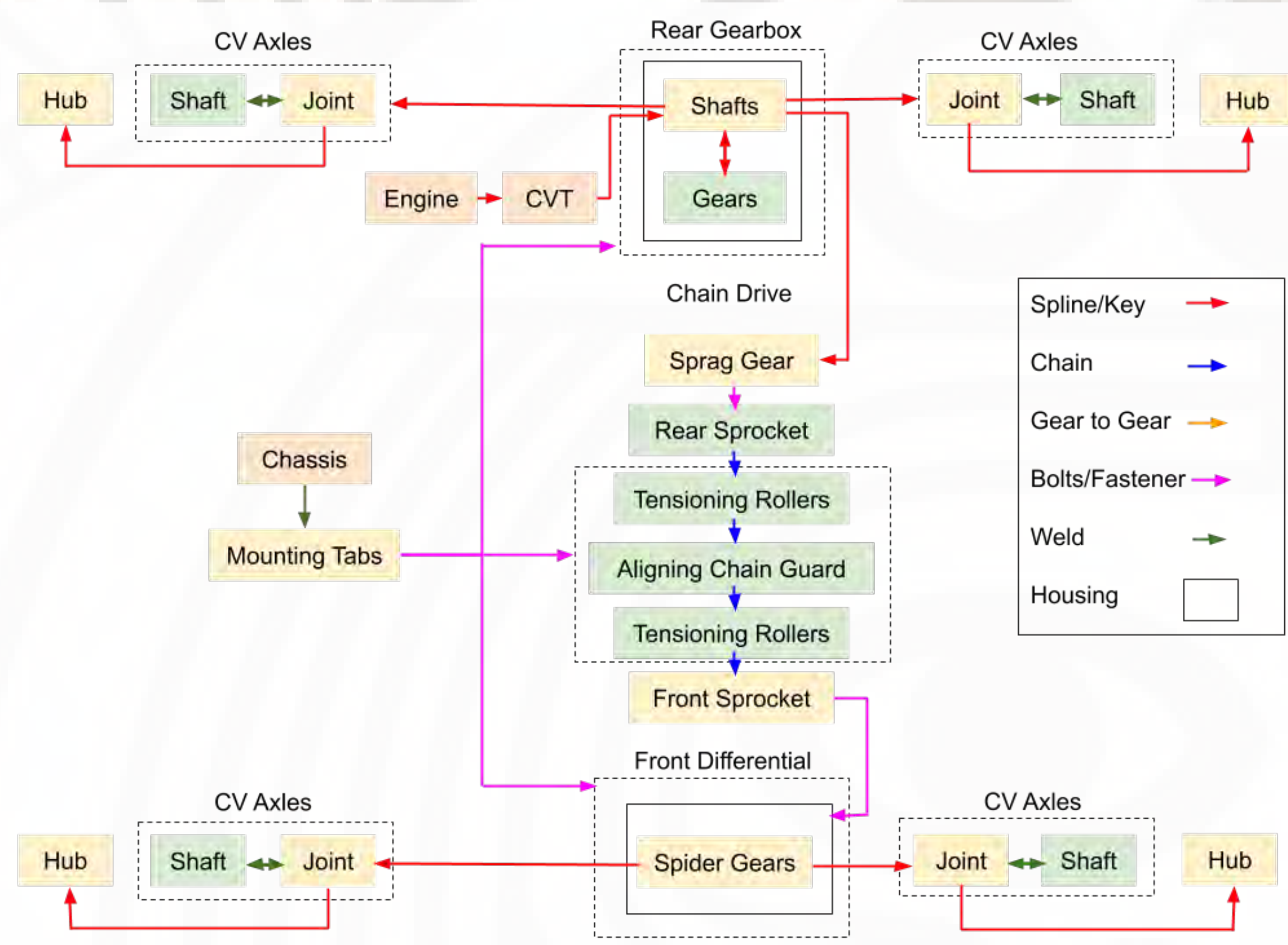
Our goal was to design a 4WD system that would successfully integrate with all other systems of the car, withstand 3 competitions and testing, and abide by all Baja SAE rules.

## Meet the Team



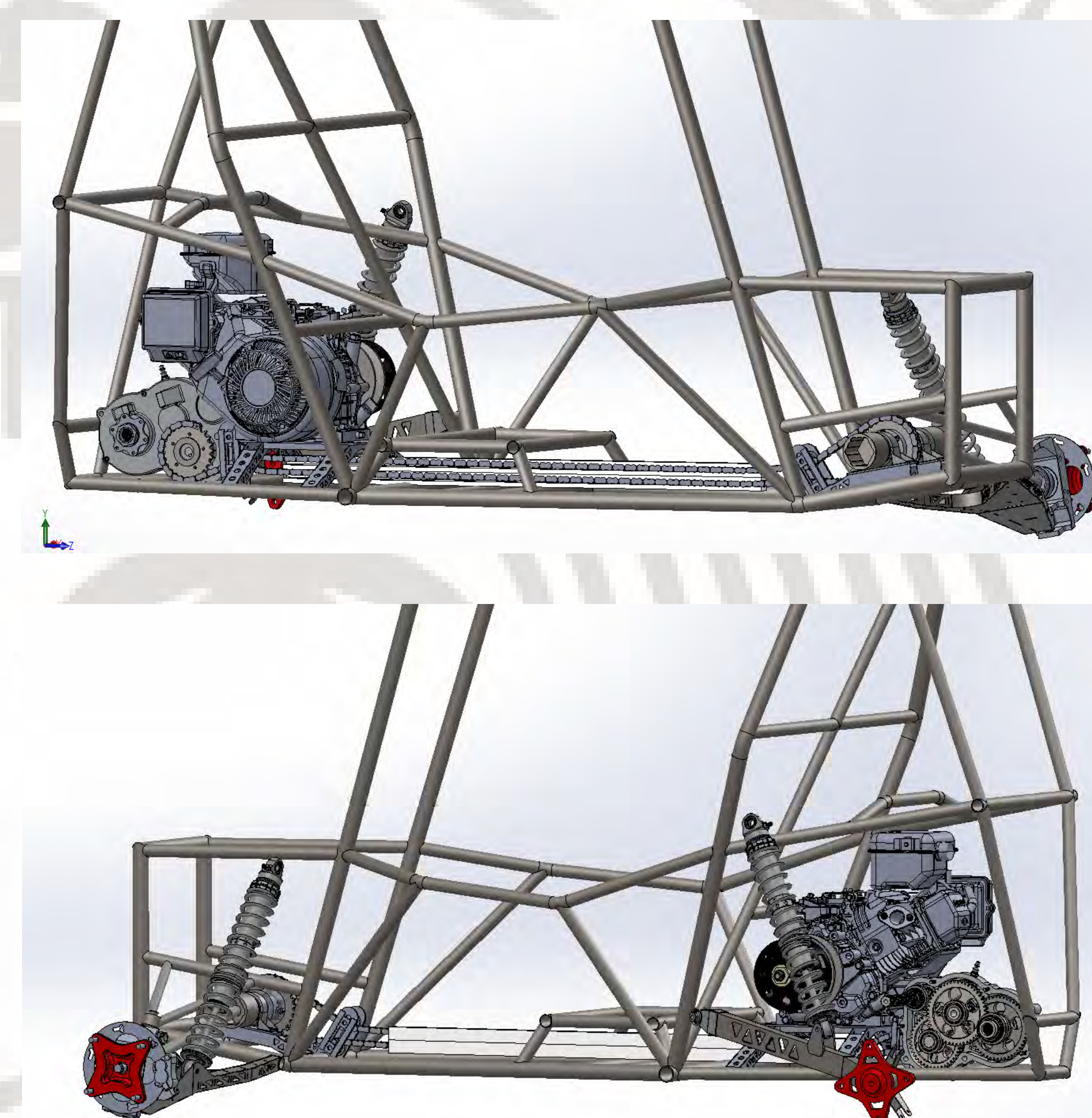
**Team name:** Baja Blast  
**Team members** (left to right): Matthew Heywood, Kyle Soto, Paige Trevisan, Jacob Hicken, and Andrew Kenton

## Project Overview



System Level Diagram

In most racing scenarios, 2WD is more advantageous than 4WD. Therefore, the team decided to implement a chain drive mechanism with a sprag gear. This allows the car to be driven in 2WD until the rear wheels slip and 4WD needs to be engaged.



Final Assembly of the 4WD Drivetrain

## Analysis

	Gear 1	Gear 2	Gear 3	Gear 4	Gear 5	Rr Sprock	Fr Sprock	Chain Ten
Load (W <sub>i</sub> ) (lb*ft)	12.74	34.68	34.68	89.44	76.66	76.66	87.62	440.40
Velocity Factor (K <sub>v</sub> )	2.50	2.50	1.58	1.58	1.57	2.16	1.08	
γ	0.31	0.41	0.31	0.41	0.36			
Lewis Tooth Bending Factor of Safety	34.89	16.92	32.04	16.14	16.69			

Gear Calculator (Condensed Version)

An excel sheet was used to calculate the expected loads, while FEA was used to ensure that the components would be able to withstand these loads. Testing was performed to verify this analysis.

## Tests & Evaluations



Fitment Test of the CV Spline

The team used a 3D printer to rapid prototype spline patterns and a housing to ensure that the 3D models were correct. A torque test was also completed to confirm that the sprag will withstand its expected loads. Both tests were successful.



Torque Test for Sprag Gear

## Fabrication



Haas in Operation



Gears Prior to Wire EDM

The team used the Haas, Prototrak Lathe, Waterjet and many other machines in the shop to create all the components of the drivetrain. Gears and shafts were sent out to for Wire EDM. Cryo-treatment was also used.



Prototrak Lathe