TEXAS STATE UNIVERSITY
Ingram School of Engineering

# ME 1.04 – Drivetrain for TXST Formula SAE Vehicle

BOBCAT RACING

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## Problem Description

The 2026 Formula SAE vehicle requires a high-performance Final Drive System (FDS) to effectively transfer power from the Yamaha FZ6 engine to the rear wheels. We have been tasked by Bobcat Racing to design and develop a reliable, lightweight and Formula SAE rule compliant FDS for efficient power delivery.

## Background

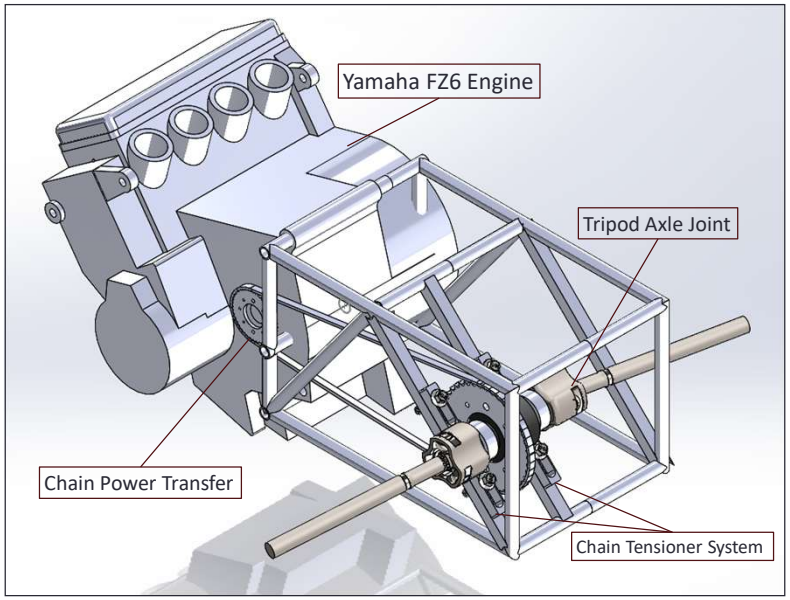
Texas State University's Bobcat Racing is a Formula SAE student team with the goal of competing annually at Michigan International Speedway. We have been tasked with designing the next drivetrain system for Bobcat Racing.

## Key Customer Needs

Through interviewing stakeholders and external research roughly 50 customer needs were identified with the most important below.

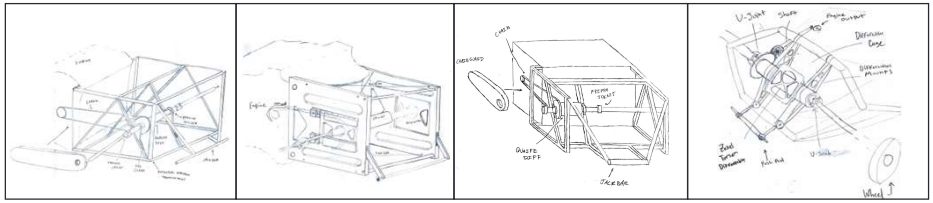
- Safety and Formula SAE Compliant Design
- Minimized Mass and Rotational Inertia
- Reliable Torque Transfer
- Manufacturable Within Team Constraints
- Packaging and Integration

## Selected Concept




## Concept Generation

- External Search: Benchmarked FSAE designs and automotive patents.
- Internal Search: Sketched critical subproblems and concept combinations based on critical subproblems leading to roughly 20 concepts to be considered for selection



## Concept Selection

By weighting our selection criteria against customer needs, we identified the best design elements and combined them into a final concept that addresses all primary objectives.

| | |
|---|---|
| Reliability | Mass |
| Structural Integrity | Power Transfer Efficiency |
| Cost | Fabrication |

## Key Benefits of Proposed Concept

- Efficient power transfer using a chain
- Adaptable to future vehicle designs
- Ability to adjust chain tension for installation and removal
- Utilizes lower cost Quaife differential
- Allows for rear upper and lower control arm mounting
- Minimizes rotational inertia using CV tripod bearings
- Sliding differential centerline for tensioning chain when driving

## Product Constraints

- The FDS complies with rule T.5.2.2b cover the chain and belt
- Jacking point provided
- Withstand testing and competition season (1year)
- Use of positive locking mechanisms
- Integrate with future vehicle iterations
- Withstand peak torque (>95Nm)
- Utilizes existing FZ6 engine hardpoints
- Distribute suspension loading
- Integrate with suspension mounting
- Minimize rotational mass
- Fabricated within IHM

## Critical Subproblems

- Differential
- Axle Joints
- Packaging
- Preload Methods
- Power Transfer

## Next Steps

- Integrate BR25 suspension mounting locations
- FEA of structural members and key components
- Vehicle dynamics analysis
- System-level Design
- Detail Design
- Testing and Refinement