Competition Overview

Business Logic Plan
Cost Report
Design Review
Technical Inspection

Track Events
- Skid pad
- Acceleration
- Endurance (Fuel Efficiency)
- Autocross
Project Overview

- Aerodynamics
- Controls
- Electronics
- Frame
- Powertrain
- Suspension
Aerodynamics
Nosecone

Goals

• Funnel air into **diffuser**

• Create **laminar** flow over the length of the car

• Enclose front of frame and impact attenuator

• Redesign nose cone for **reduced drag**
Aerodynamics
Sidepods

Goals

• Accelerate airflow through the radiator
• *Streamline* for low drag
• Designed to funnel air into the intake
Aerodynamics
Diffuser and Wings

Goals

• Utilizes the Venturi effect to create \textit{down force} with the Diffuser

• Investigate the feasibility of front and rear wings using Computational Fluid Dynamics software
Controls

Goals

• Development of controls: Braking, shifting, steering, & throttle

• Ergonomics of the car

• Pedal Designs

• Paddle Shifters

• Incorporate Paddle shifting with spark kill under wide open throttle
Controls – Pedal/Brake Assembly
Controls–Shifter

Paddle Shifters

• Research of Formula 1 designs

• Driver compatible and ergonomic

• Ignition Kill during shift (~50ms) to allow for clean gear shift. Integrated kill module for added safety

• Reliably under harsh racing conditions
Custom built *data acquisition* system
- Over 40 Sensor channels
- Live data streaming via wireless
- Stored high bandwidth data via SD card

Data analysis software
- View and plot live and saved data

Steering Wheel Display
- RPM display, Customizable Data Displays, Gear indicator

Lightweight, weatherproof wiring harness
Frame

Design Goals

- Optimize *torsional rigidity*
- Accommodate 95\textsuperscript{th} percentile male
- Redesign rear box
  - Push rod suspension
  - Simplified A–arm geometry
  - Anti–sway bar
Design

Torsional Rigidity and frequency analysis testing using FEA
Power Modifications

• Rebuild 2011 Yamaha YFZ 450R

• *Port and polish* heads:
  • Increased flow for higher efficiency

• *High compression ratio* kit
  • Increase ratio from 11.4:1 to 13.0:1
  • Replace 93 octane with 100 octane

• More aggressive *cam shafts*
Intake/Plenum

• Redesign intake plenum for RAM air induction
  • Direct flow of side pods directly to throttle body

• Induced air/fuel mixing:
  • Develop fins in plenum before fuel injection to create vortex swirling

• High density (ABS) plastic
  • 3D printed, carbon fiber reinforced
**Improved Rear End**

- Replace Rear differential

- Calculate proper taller gearing
  - Car #49 gears to close together
  - Smaller sprocket $\rightarrow$ optimize power through gears

- Slipper clutch
  - Eliminates need for clutch at idle and possibility of stalling

*Pictures supplied by Taylor Racing*
Design Goals

• Maintain *independent rear suspension*

• Maintain turning radius similar to 2013 car 49 (best finishing car in UNH FSAE history)

• *Decrease overall weight* throughout all components

• Durable: torsion and fatigue stress to keep driver *safe*
Suspension

• Incorporate *push rod suspension* in rear, maintain pull rod in front

• Introduce *sway bar* system to rear end

• Improve cornering, optimize spring rates and ball crank ratios

• Design new uprights to accommodate for changes

http://dejeka.wz.cz/fsae-rear-suspension
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