Team Dominion

From Left to Right: Shawn McDowell, Alex Allen, Ben Bouche, Hoi-An Thai, Caitlin Goomey

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Meet The Team

Caitlin Goomey, Senior
First year in formula high school and has taken:
1 year of IED
1 year of AED

Alex Allen, Senior
First year in formula high school and has taken:
2 years of Welding/Painting
1 year Fabrication & Restoration
1 year IED

Ben Bouche, Junior
First year in formula high school and has taken:
1 year IED
1 year AED
1 year Architectural drawing/sketching
1 year Auto CAD Fundamentals

Shawn McDowell, Junior
First year in formula high school and has taken:
1 year IED
1 year AED
1 year Welding

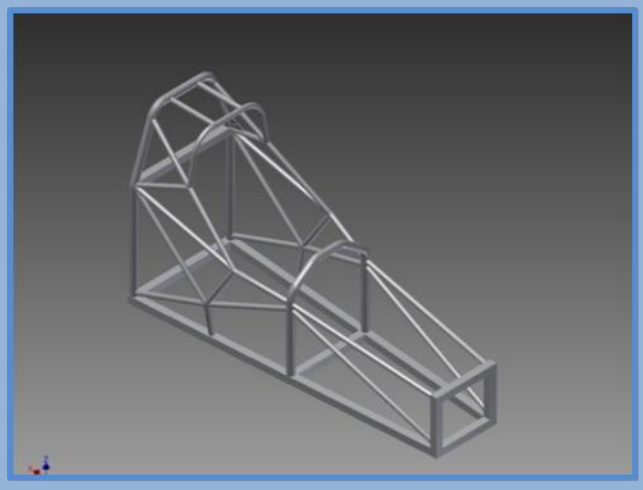
Hoi-An Thai, Junior
First year in formula high school and has taken:
1 year IED
1 year AED
1 year Auto Ownership

About Formula High School

Formula High School was created to give students who have interest in advancing their engineering skills. Through this program, students learn important skills such as using the CAD program, welding, milling, fabricating, meeting deadlines, and working with sponsors. Not only do the students further their knowledge of race cars, the students gain the opportunity to impress their sponsors with their professional and formal writing skills. During the year students use their engineering skills and resourcefulness to overcome problems in the design and construction process. Such problems include finding sponsors and figuring out the best way to construct the car outside the given chassis design to make it more efficient, faster, and safer. At the race track, if any problems occur students must demonstrate their ability to take charge and repair the car. Through Formula High School students prove that they can be responsible and can collaborate with other students.

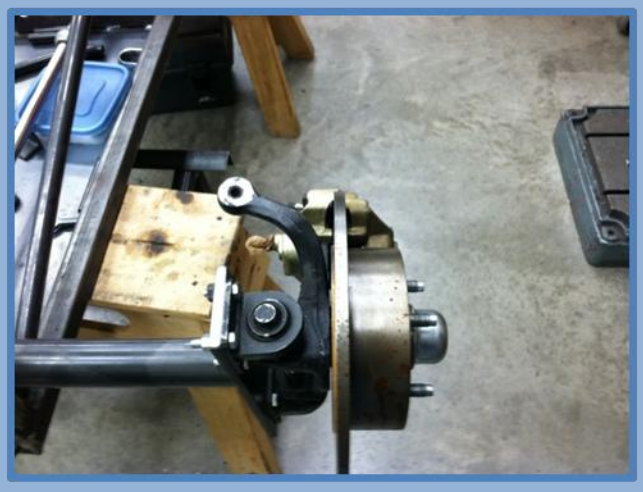
Building Process

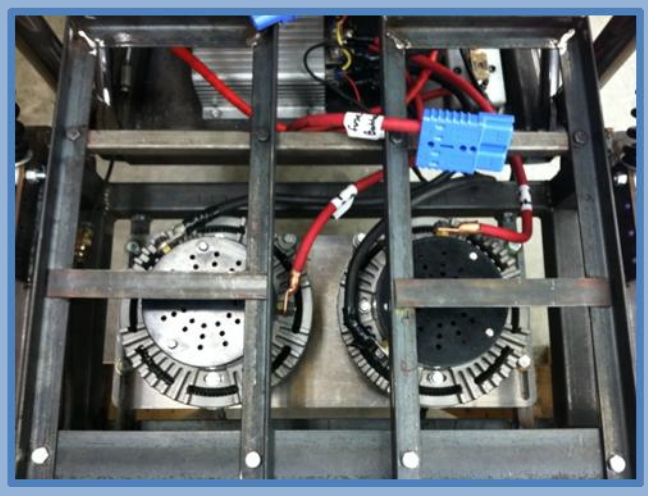
The first step that our team took in making our formula car was completing our design for the cassis. This chassis had to meet Formula High School's requirements for safety. Next we began building the chassis, using square and circular tubing and making a few bends for the roll bar and welding everything together our chassis base was complete. After that, we began work on our swing arm rear assembly held by two pivot bolts and a 6in 1200 psi spring. This assembly had to hold our differential, two electric motors, our rear axles, and four Optima yellow top 12 volt batteries.



Building Process

Our next step was to work on installing the custom made engine plate and engines. Our engine plate has an elongated bolt hole so the plate can easily be moved and the chain can be loosened and tightened. After the engines were placed the chain was placed on the differential and the two engines then tightened. Next the throttle controller, brake caliper, and brake fluid reservoir were place and connected to the pedals. Then the brake rotors and wheel brake assemblies were installed. From the brake caliper, the brake lines were run to the wheel brake assemblies. We then took the previous year's tires that were shaved down to save weight and installed them on our car.





Building Process

We then sent our body to Green Bay Auto Body where they graciously painted our body and applied a clear coat. Our final project before our car was complete was to install the electrical system. We connected our throttle controller to our fuse, we connected the fuse to the motor controller and with a quick disconnect to the Optima yellow tops for easy access and to make changing the batteries quicker. The batteries were run in series to save energy and allow for more laps on the track.

Formula High School Rules 2011-12

All Formula High School vehicles are to be completed before all track events.
Absolutely NO fabrication will be allowed at the track events.
FHS officials reserve the right to disqualify a team if the officials believe there is a safety hazard present on the team's vehicle.
Overall Sizes:
Wheelbase: 81" – 87" measured from center of front spindle axle to center of rear axle.
Width: 50" to 58" measured to the outside edge of the mounted tire.
Ground Clearance: 2" MIN – 6" MAX

Vehicles not within these measurements will not be allowed to compete, even as an exhibition. Vehicle widths and wheelbases are set to ensure a safe and stable vehicle for track day events. Specifications must be followed. There will be no exceptions.
Chassis: All teams must use the supplied chassis model as the base for their vehicle. Chassis MUST be constructed to the chassis model within 1" of specifications. All frame members shown on the model must be present in the completed chassis.
Roll Bar Tubing: 1 ½" round mild steel tubing, 0.083" (14ga) wall thickness. Roll bar tubing must be a single continuous piece. NO SPLICING ALLOWED. Driver's helmet should not be excessively forward of the roll bar protection when seated in the vehicle.
Bracing: 1" round mild steel tubing, 0.083" (14ga) wall thickness.
Floor: 0.0747" (14ga) mild steel sheet, stitch welded to the bottom frame rails. The minimum weld stitch pitch should be no more than 1-3.
Body Shell: Teams must use an approved FHS fiberglass body shell. If a team chooses to use an alternate body shell, that team must submit approval directly to FHS officials. The only approved body shell materials are: fiberglass, Kevlar, carbon fiber or 0.032" aluminum sheet. Aluminum must either be polished or painted.
Appearance: All FHS vehicles must be painted, gel coated, or powder coated with school and sponsor decals appropriately placed. Bare metal frames will not be allowed.
Mandatory Decal List (List may change at later date):

- ***Sugar Grove Custom Cars***
- ***Fiberglass Solutions***
- ***Road America***
- ***Briggs & Stratton***

Decals must be placed in a position where they are easily seen from both sides of the car. FHS officials reserve the right to add to the mandatory decal list at any time.

<u>Firewall</u>: .032" or thicker aluminum or mild steel sheet must be used for a firewall between the driver and the engine compartment. The firewall must extend all the way to the body shell. Teams must try to make all reasonable efforts to fully seal the driver's compartment from the engine compartment. Teams should try to keep all gaps to less than ½".

<u>Safety Harness</u>: All teams must use a 5-point safety harness, installed to safety harness manufacturer's specifications. Harnesses certification stickers must be within five years of event date. If harness is passing through the firewall, clearance the firewall to eliminate possible harness damage.

<u>Engine</u>: Briggs & Stratton 16 HP Vanguard V-twin ONLY. To further clarify, we are accepting engines in the 3034xx and 305xx (horizontal) and the 3037xx and 3057xx (vertical) model line. Provided the engine is designated as a 30 cubic inch, OHV, "V-twin" engine that is rated at 16hp, and falls in the range listed above, it will be accepted. No other engine will be allowed. NO power adders or modifications to the engine allowed, except for wiring extensions, throttle and choke connections. Engine must have a throttle return spring attached directly to the throttle shaft arm. Governor may be removed/disconnected. See suggestions in regards to RPM limit.

Teams have asked if they can use an engine other than the recommended Briggs & Stratton. The reasons why there is only one approved engine manufacturer:

Eliminates the need to use restrictor plates to equalize engine power levels.

Common parts which allows teams to help each other out at the track.

Limited availability of appropriate sized and capable engines from other manufacturers.

Simplifies the inspections process for track officials.

<u>Kill Switch</u>: Two paddle type kill switches are required. One switch shall be located in easy reach of the driver and labeled appropriately. The second switch shall be located on the left side of the rear roll bar

but above the body shell. This location is shown on the chassis model. The switch will be marked with a red vinyl or painted 3" equilateral triangle and labeled ON/OFF with .25" high contrasting color text. Both switches must be demonstrated to effectively shut off the engine.

<u>Fuel system</u>: Teams may relocate the stock Briggs and Stratton vacuum fuel pump to allow proper fuel supply to the pump. NO electric fuel pumps. Fuel tanks/cells must be commercially available, designed for fuel use and installed to manufacturers specifications. A fuel shut-off valve must be installed in the fuel supply line within 6" of the tank outlet.

Exhaust: Exhaust outlet(s) must extend past the body shell by a minimum of 1".

Transmission: Centrifugal clutch with a single overall gear ratio for first year teams. CVT or multiple gear transmissions allowed for second year teams with the following restriction: When the transmission is in its highest gear, the rear axle will spin no faster than 725 RPM when the engine is spinning 4500 RPM. Teams must supply transmission ratios from transmission manufacturer.

Overall Gear Ratio: Open. Teams are allowed to gear for various track configurations.

Tires: DOT rated tires. No racing slicks or trailer tires allowed.

Minimum Size: No tires narrower than 175mm (example: 175/70-13 would meet minimum width, 165/70-13 would not)

Overall tire diameter: 24" maximum

Suggested tires sizes: See Tire Selection Excel Sheet

Rim: 13 x 6 OR 14 x 6 steel rim, 2.5" back spacing suggested

Front Spindles: All teams must use standard or dropped VW Beetle spindles, ball joints, eccentric adjusters, rotors and disk brake calipers. No modifications allowed to these parts.

Rear Brake: All teams must utilize a standard VW Beetle brake caliper, actuating a single brake rotor keyed or splined to the rear axle. At least one rear tire must transmit braking power to the ground. This caliper will also be on a separate hydraulic circuit from the front brakes.

Suspension:

- ***All teams must have a minimum of 1 successful year of FHS experience before they may incorporate an IFS/IRS suspension.***
- ***Teams designing/building and IFS/IRS system must incorporate production spindles, brakes and uprights.***
- ***Teams must supply engineering drawings and or pictures of their design to FHS officials for approval before manufacturing their system.***

***Minimum Rear Axle Diameter*: 1 ¼"**
***Steering*: Rack and Pinion ONLY, no go-kart steering allowed.**
***Steering Wheel*: Steering wheel must be either a continuous round or "D" shaped wheel.No butterfly style steering wheels allowed.**
***Minimum Tie Rod Diameter*: ¾" steel tubing or 3/8" tap tubing (Coleman #16203) or equivalent**

***Driver Safety*: All drivers must use the following safety equipment:**

- **DOT or Snell rated full-face helmet, manufactured within 5 years of event date**
- **360 Plus Neck Collar (Pegasus Racing # 9308)**
- **Closed toe shoes**
- **Long pants**
- **Long sleeve shirt/jacket**
- **Gloves**
- **Impact rated eye protection, minimum rating of Z87.**

No sweats pants or windbreaker pants allowed.
***Safety Glasses*: All team members must be wearing safety glasses when actively participating in repair or adjustments to the team vehicle.**
Overall Rule of Conduct: Students must present themselves in a professional manner. Teams will be disqualified and removed from the track in any team member does not follow directions from the officials.
***SUGGESTIONS*:**
Rear axle bearings should be placed as close to the inner side of the wheel hub as possible to limit axle bending/twisting. Some teams have run up to a total of four bearings across the rear axle.
Chrome Moly Steel axles suggested. Low quality axles have bent under load.
***Gear ratios*: A good rule of thumb is to start with an overall gear ratio of 8:1 and then gear for the existing track conditions and individual vehicle response.**
Chain tensioning devices: Use a sliding engine base set-up to adjust chain tension. There was a much higher incidence of thrown chains when using idler sprocket assemblies.
Install shaft collars on both sides of the rear hub assemblies. This is extra insurance to keep the hubs in place on the axle.
Fasteners: Teams should try to use at least grade 5 or higher fasteners, with nylock nuts, when possible.
Standard Formula High School wheel bolt pattern: 4 on 4"B.C., 2.5" back spacing.

***Exhaust**: Teams have run both open pipes and mufflers. The engines seem to work the best with some type of muffler. Individual team chassis dyno testing is suggested.*

***RPM**: Engines should be limited to 4500 RPM. Teams run a risk a valve float above that RPM.*

NORAM Enforcer clutches have shown a much higher durability than the NORAM Mini-Cup clutch.

When using a NORAM Enforcer clutch, install a spacer behind the clutch to eliminate the chance of the clutch sliding towards the engine.

Use Loc-tite on the crankshaft bolt and torque to 95 ft/#. This reduces the chance the bolt will come out, dropping the clutch on the track.

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