

# **Marketing the 2008 FSAE Racecar**

An Interactive Qualifying Project Report

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Degree of Bachelor of Science

**By:**

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Mark Nickerson

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Jared Renzullo

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**Approved:**

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Eben C. Cobb, Advisor

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## **Abstract**

The goal of this project is to develop a plan for the marketing and manufacturing of the 2008 WPI FSAE Racecar. This plan will be presented to the judges in Pontiac, Michigan as part of the annual FSAE competition. To prepare for the presentation, a market survey was conducted, automotive industry experts were interviewed, a business plan was written, and a video commercial was filmed. The marketing and manufacturing plan was modeled after several similar projects done at WPI in the past, including the one from 2001, which placed first in competition.

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## **Introduction**

Formula Society of Automotive Engineers (FSAE) is an annual competition held in Pontiac, Michigan, for which approximately 120 colleges from around the world compete to design and manufacture a single seat, open wheel racecar. WPI has participated in the event since 1986, with mixed results. Because the car has not finished successfully in several years, an extra effort has been made by this year's team to finish the car and to prepare it for all aspects of competition.

This year's car features several unique designs. As usual, the main frame is constructed from GTAW welded 4130 steel, which is normalized after welding. The new feature in the frame is a 7075 aluminum sub-frame which houses the rear differential and provides mounting points for the rear suspension, which is fully independent. The front and rear suspensions are mono-shock designs, with the front operating with pull-rods. Another special feature of the 2008 WPI FSAE Racecar is the body, which is a carbon fiber design featuring front and rear wings, a diffuser, and side-pods which were all analyzed in CFD. The front and rear wings were also scaled down and tested in a WPI wind tunnel to find the optimal angle of attack for the average vehicle speed seen during competition. The wheelbase of the car is 68 inches with a 43 inch track and a curb weight of 450 pounds. The powerplant is a Honda F4i which produces 90 horsepower (restricted) and runs on 93 octane gasoline.

In addition to the dynamic events, the FSAE competition also features several static events which factor into the final score. The focus of this IQP is on preparing for the “Presentation Event”, which is worth 75 points out of a total of 1000.

## **Marketing Presentation**

The Presentation Event (see Appendix A and Appendix B) is a 15 minute presentation intended to prove that the car can be manufactured, marketed, and sold as a real product to the amateur SCCA autocross racer or other customers. The judges are supposed to be executives from engineering, production, and marketing and finance, so the presentation must be tailored to be informative to all of these types of people. In this business case the quality of the prototype car will not be considered, only the quality of the presentation and its content. At the end of a ten minute PowerPoint presentation, five minutes are allotted for questions, so it is crucial for backup material to be available for answering the expected questions from the board of judges.

## **Schedule**

In order to maximize efficiency and assure that the final presentation was ready for competition, a schedule was created and followed throughout the year. The project was started during B term, as the MQP team designing and building the car was not far along enough at this point to allow much work to be done on the marketing presentation.

During B term, as the MQP team finished their design phase, most of the research was done, culminating with a visit to Factory Five and the production of a rough draft of a

business plan. During C term this plan was revised based on input from two WPI alumni, and a logo for the team shirts was developed. The shirts were ordered, leaving enough time for them to be delivered for project presentation day, the WPI car show, and finally competition. During D term financial numbers in the business case were revised based on the now available 2008 cost report, as previously an older version had been used to create a template Excel file to save time during the otherwise busy D term. During D term we focused mainly on preparing our PowerPoint presentation. This featured a short commercial, which we filmed at a SCCA autocross event. A survey was also taken at this time which helped support several ideas which are integral to the business plan itself. This plan proved to be overall successful, leaving the most time for the critical

## **Factory Five Visit**

After reading the rules for the first time we immediately thought of similar businesses to the one which we were challenged to create, and the most obvious was Factory Five.

Factory Five is a small, private company located in Wareham, Massachusetts. It was started in 1995 as a small garage that produced customized kit cars, mainly Shelby Cobra Replicas. In last ten years Factory Five has grown to produce around 3-4 kits per day, and they now have several Cobra models available in addition to the GTM Supercar. (1) These numbers are similar to the 1000 cars per year required in the FSAE rules, so we knew that a thorough study of Factory Five would be a tremendous help for our project.

The WPI Motorsports Club was invited to tour Factory Five in 2006, and the staff there was very helpful in answering all of our engineering questions. We hoped that they



would be just as helpful in a business related project, and we immediately contacted them for another tour, this time followed by a question and answer session with Jason Lavigne, a Factory Five Support Manager. For a copy of the correspondence with Jason, see Appendix C.

The tour and interview, which took place on November 28<sup>th</sup>, was as successful as we had hoped it would be. For a copy of our notes from the interview, see Appendix D. While they were unwilling to share too much specific financial information or anything about who their suppliers were, they were very open about how they make money when speaking in general terms. Their key to both profitability as a business and popularity in the market was “the kit concept”.

While most people assume that Factory Five is a manufacturing company when they hear the name combined with the fact that they sell cars, this is not entirely true. In the “factory” the only fabrication that happens is the welding of pre-cut steel tubing and the laying up of fiberglass bodies. The rest of the kit components are manufactured elsewhere (all around the world) and the parts only come to Wareham to be welded and/or assembled in boxes for the final shipment to customers. This business model is what allows Factory Five to remain competitive; they are continuously looking for new, better suppliers, and they are able to focus on what they do best- marketing, sales, customer service, and light manufacturing.

The visit to Factory Five spawned the idea of offering WPI's FSAE racecar design to investors and manufacturing firms as a kit. Not only would this have the advantage of lowering capital investment in machines for the new company (now any warehouse would work as a location), but this business plan also caters to what the customer wants. As survey data would later show (see Survey section), and as the employees at Factory Five told us, one of the biggest trends in the automotive industry is customization and "do it yourself" shows on television. Many customers, especially those who are currently racing their vehicles in autocrosses, like to work on their cars and would be very interested in one that they could build themselves with a typical set of tools and some spare time on weekends. Using the customers for assembly also makes the car cheaper to buy, another main driver in the automotive industry, and saves on shipping, as components can be sent in separate, smaller boxes instead of shipping an entire car.

The Factory Five visit was also helpful in terms of gaining more understanding of the market demographics and of what kind of facilities and workers we would need to start a similar business. We were surprised to learn that they employ 45 people. Overall, the Factory Five tour and interview was the most significant influence on our business plan.

## **Business Plan**

The FSAE Rules do not specifically call for the writing of a formal business plan. However, having one available to hand to the judges will only help our chances at competition, and it will also help us to prepare for the five minute question session after our presentation.

After we decided to copy Factory Five’s “kit concept”, we were left trying to fill in the holes where they were unable to give us proprietary information, some of which was necessary before we could start writing. Because both Jared and I were new to the subject of starting a business, we started by reading books. The most helpful of these was *How to Write a Winning Business Plan*. This book seemed more up to date than the others, and it also included a template which we decided to follow closely in the writing of our plan. (2) By using this book, we were able to avoid many common mistakes made by inexperienced business planners while still touching concisely upon our major points. Another book by the same author, *How to Prepare and Present a Business Plan*, was also used quite a bit in the formatting of our plan and of our presentation for Michigan. (3) For a copy of our completed business plan, *WPI Motorsports, INC, An Investment Opportunity*, see Appendix E.

## **Logo Development**

In order to convey a professional appearance at competition, we decided to design team shirts. The shirts needed a logo to make them stand out. To develop the logo, a picture of the car exported from SolidWorks was used as a starting point (see Figure 1). This image could not be used as is for several reasons. First, the picture is far too complex to be used as a logo for a shirt. It would require an unreasonable number of stitches which would make the price incredibly high, if it could even be done. Secondly, there are several bugs in the rendering of the image in SolidWorks, which caused a decrease in opacity in the body of the car. The decreased opacity caused parts of the frame to appear through the body, making the picture unusable as a logo.

An early draft of the logo, as seen in Figure 2, uses several shades of gray as well as black, white, and yellow. The goal of this draft was to create a simple, artistic logo. The color scheme of the logo was redone to try to more closely match the actual car, which is darker (see Figure 3). The logo also contains a simpler font and the text is displayed at an angle around the car. The next draft of the logo has the car as all black with shades of gray (see Figure 4). The text was straightened and the logo is surrounded by an ellipse. The final logo (see Figure 5) features an inverted color scheme. The team decided the logo would look best as an all white car on a black shirt. The text was moved below the car and the font was also changed to official WPI font as per the WPI Marketing Department website. (4) The final logo is the simplest of all designs and requires the fewest stitches for embroidery.

Once we had our logo design finalized, we needed to find a company to embroider the team shirts. The team wanted custom embroidered polo shirts in the 20-30 dollar range. We looked at several different companies to determine which company would have the best price, quality, and customer service. The first company we looked at was Custom Ink. (5) Custom Ink had a very well made webpage, good selection, and good prices. The webpage allowed you to view your custom logo over different color shirts to see how the final version would appear. In the end, the problem with Custom Ink is they mainly do screen printing for polo shirts. Screen printing is cheaper than embroidery, but it does not look as nice or as professional. The second company we looked at was University Fashions. (6) University Fashions had a large selection of shirts, but the majority of them

were high priced. In addition to the cost of the shirts, there were additional fees for designs with more than 4,999 stitches and also a one-time digitizing fee. The third company we looked at was Embroidery Superstore. (7) Embroidery Superstore had a good selection with low prices for custom embroidered polos. All of their shirt prices are final; there are no hidden fees for digitizing and stitching is free for up to 10,000 stitches. We ultimately decided on Embroidery Superstore because it was the best price for the quality and there were no hidden fees.

Once we decided on a company, we sent our logo to their graphic artist for evaluation. After we received an e-mail stating the logo was acceptable for embroidering, we placed the order. The total cost per person including shipping was only \$20.44. There was a total of fourteen shirts ordered, one of which was sized 5XL and increased the total cost by eight dollars. (Figure 11) Our logo required only 7,657 stitches, which would have resulted in extra fees at University Fashions, but not at Embroidery Superstore. (Figure 10) Figure 12 shows the final proof that was sent by Embroidery Superstore. It is our logo after being digitized to a stitch file.

## **Revision**

In addition to review of our completed business plan by several MQP team members, WPI graduate students, and faculty working on the project, we also forwarded it to two WPI alumni for review.

## **Al Smyth**

The plan was first sent to Al Smyth, a WPI graduate of 1976 in Mechanical Engineering who also has a degree in Management. Al has also started two manufacturing businesses, one in the automotive racing industry, which made him a perfect resource. For the correspondence with Al, see Appendix F: Correspondence with Al Smyth. Al's main comments had to do with our payroll- he did not think that a startup business should pay a custodian or so many "lower level employees". In his opinion and experience it is necessary for the CEO of a new company to be in the shop welding and cleaning if necessary. While we agree with this suggestion in practice, we think it would be unprofessional to include such a statement in a business plan presented to executives, so we have made the decision to leave our plan mostly in its original form. While Al's suggestions were not followed directly, his cost cutting and detail oriented attitude did have a large effect on the majority of our revised business plan. He made the excellent point that in order to impress the judges in only fifteen minutes we need to overwhelm them with information especially in the questions portion. We need to appear as professionals with complete knowledge of the material we are presenting, and we need to appear as if we have already run through all the details many times.

## **Kevin Luchansky**

The second WPI alumni to whom we forwarded our business plan was Kevin Luchansky of General Motors' DE Combustion Systems. While Kevin does not have the manufacturing startup experience as Al, he has been a judge in the FSAE competition and

is therefore perhaps a more relevant source, as our true goal is to place highly in completion, not necessarily to sell our business. Kevin took the time to use Microsoft Word's comments feature on our plan, and the comments are included in Appendix G. All of Kevin's suggestions were changed for the final version, and we were pleased that he approved overall of our work. After Kevin's input, we considered our concept finalized. The only subsequent changes would be those required by updates in this year's cost report, generated by the 2008 MQP, because we had used the 2007 cost report in our initial numbers. Luckily, the final cost of the 2007 and 2008 cars were similar, and only minor changes were needed.

## **Survey**

Initially, we had planned to make use of the surveys procured by similar IQP's at WPI in the past, as there were several adequate examples available. However, when we went to the first SCCA autocross of the spring on April 13<sup>th</sup>, there was so much interest in our car that we found it very easy to take our own. This has the advantage of being most up to date, which the judges will likely find important.

We decided to make the survey as informal as possible, with only four simple questions delivered orally. We recorded the answers ourselves on a clipboard, which encouraged conversation. This allowed us to collect qualitative in addition to the usual quantitative data from the typical survey, and we actually found the former to be most helpful.

We intended to make the survey as short as possible to minimize the time that people would have to speak to us, and to gather our necessary information from so few questions we needed to have clear investigatory goals. Because we had already started our PowerPoint slides, we knew what useful data we were missing. We wanted to prove that a target market existed in our price range of \$15,000 per car, and we wanted to see if our kit car approach was as good an idea as Factory Five had promised us. We also included a question to determine whether the strengths of the WPI FSAE racecar were likely to fill the current needs of the target market.

For the survey questions, see Appendix H: SCCA Autocross Survey Questions.

The survey results were favorable. As we expected, there is easily a market for the cars. Almost half of the 55 autocross drivers said that they would consider buying a formula style racecar in the next ten years (see Figure 6). 70% of those who replied “yes” to the first question thought that \$10,000 or more was a reasonable budget for such a purchase (see Figure 7). 80% of them said that they would prefer a kit if it were more than \$2000 cheaper than buying the complete car (see Figure 9), and the top area of dissatisfaction in their current vehicles was lack of power (see Figure 8) - something that has never been an issue with FSAE cars.

The most interesting qualitative result from the survey was that the younger crowd was extremely enthusiastic about the kit concept. A few of the older looking drivers said things like “I’m too old to be messing around with a kit”, but many of the younger ones



had the exact opposite reaction. A few mentioned that they already had plans to build a similar project from scratch, but that a base kit to help them in the process would very likely be something they were interested in. These younger racers are very much our target market in the \$15,000 price range, and it was very informative to talk to them. We were also impressed with the overall enthusiasm that people had for a vehicle with such performance. We did not advertise the car's performance or power to weight ratio unless we were asked, but we usually were, and the answers brought quite a few smiles to people's faces.

This sample of 55 autocross racers at an event which had 140 drivers can be extrapolated to give an idea of the opinions of our overall market. There are nine SCCA regions in the United States, and each of them hosts approximately fifteen autocross events per year. Each event has an average of twenty new drivers and 75 regular drivers in attendance. This gives a low estimate of 3400 drivers across the country, only including SCCA. There are many other smaller organizations which sponsor autocrosses such as NASA, PCA, and BMWCCA. The results of the survey combined with the numbers provided for extrapolation proved to be helpful for our presentation and to reinforce ideas which we originally presented in our business plan.

# PowerPoint Presentation

## Analysis of Previous Years

The PowerPoint presentation is the most important aspect of this IQP because it will be the main deliverable at competition. For this reason significant time was spent on its development, and it will be discussed here in detail.

The most successful FSAE Marketing IQP was from 2001, when the Marketing Team placed first overall in Michigan. In years since, the team has always used the winning PowerPoint presentation as a template for additional work. This strategy works well in most aspects, but there are several potential pitfalls which must be avoided. The most serious is that the FSAE rules change on a yearly basis. While the presentation event has remained similar in format to eight years ago, there have been some changes in the rules that should be reflected in the new presentations. Secondly, much of the data used in the presentation (such as survey results) can't be reused because it has become outdated. This year we did again decide to some ideas from the 2001 slides, but we remained aware of these potential problems.

In the making of our PowerPoint (Appendix I: PowerPoint Presentation Slides, we started off with a review of the general rules. There are fifteen minutes allotted for the presentation, with only ten of them used for the presentation itself. We knew that we wanted to include a one minute and thirty second video commercial, so that left eight minutes and thirty seconds of time to be filled. Typical recommendations for slides per minute range from one to two. (8) For this reason, we limited our presentation to twenty

slides. Because twenty is on the high side, we put the less interesting/less necessary slides towards the end. We can discuss them in depth if things are moving quickly and skip them almost entirely if we are running behind schedule.

The next step was to outline the important aspects of our business plan which we wanted to convey clearly to the judges. This was another good chance to consult the rules, which state that that presentation should prove that our product meets the needs of the SCCA Solo-2 customer and that it can be profitably manufactured and marketed (Appendix A). We decided that these two objectives were equally important, so we split the slides (and speaking time) up evenly between them.

### **This Year's Presentation**

The presentation begins with an image of the WPI FSAE logo, which is the same one used on the team polo shirts. This is followed by an introduction of the Marketing and Business Team and the two Senior Engineers who will also be present to answer any technical questions that the judges may have. After the introduction, we move into an immediate proof of market. The rules specifically state that the needs of the SCCA Solo-2 racer must be met, so we go through an estimate of how many of these racer's there currently are in the United States, as we do not plan to market outside of the country. Next we include our survey data in simple chart form. These two ideas combine to show that there is easily a market for 1000 cars per year to be sold for \$15,000, which while not specifically stated on a slide will be emphasized verbally.

After the proof of market, about three minutes have elapsed. The judges at this point may need something to keep them interested for the rest of the presentation, so we will briefly show the existing product options available to the autocross racer and then play our commercial, which is discussed in the next section. When the commercial is finished, the judges should be awake again and ready to digest the financial data to come.

Communicating our financial data is the most challenging part of the presentation, as there are many numbers which must be shown without losing the attention of the judges. We have chosen to break the financial data into three main chunks, expenses, revenue, and profit. The expenses and the profit are likely to be of most interest to the investor, so the sales and revenue slide can be skipped at our discretion. The same spreadsheet type format is used consistently in all the financial slides, which will minimize the effort required to process so much information at once. The most important numbers, like the most important data in all the slides, have been highlighted in yellow font, which stands out against the black background.

The last slide is a conclusion slide that re-emphasizes that WPI Motorsports, INC has met the needs of the SCCA Solo-2 customer and that there is profit to be made for the investor. The Return on Investment (ROI) of 110% has been highlighted in yellow as it is our most impressive statistic. After hearing this one final time, the floor will be opened for questions.

## **Commercial**

We created a short commercial for use in the presentation. The goal of the commercial was to show all the car's main features in video form, to keep the judges interested. The

first thing we did before planning the commercial was watch different car commercials from elite car companies (i.e. Porsche, Audi, BMW, etc). Viewing top commercials helped us get into the mindset of filming a commercial. It also gave us ideas for camera angles, music, etc. The first component of the commercial we planned was the music. We searched the Internet for several different songs, looking for something classic, but not overused. We ended up using the song “Electric Worry” by Clutch. “Electric Worry” has a slow, instrumental intro, a quick ramp up section, and an upbeat section. We decided to have introductory footage occur during the instrumental intro, the first footage of the car appear during the quick ramp up section, and the main portion of the video occur during the upbeat section.

The next step in planning the commercial involved drafting a detailed storyboard. For the introductory footage, we decided to include various shots around the WPI campus. The campus footage helps establish the car as an engineering feat. In the ramp up section, a 360 degree view of the car is shown. By showing the car when the music gets exciting, we get the viewer excited about the car. At the end of the ramp up, the car is started, the gas pedal is pressed and clutch pedal released, and the car is seen taking off from a standstill. Once the music kicks into high gear, the car is shown at full speed navigating an autocross course. The camera angle quickly changes to focus on the driver and then back to the car. There are various different angles shown of the car racing on the autocross. The car is next shown being worked on by various students. The commercial ends with the song dying down and the car is shown driving off into the distance. The total runtime of the commercial is approximately one and a half minutes.

The majority of the footage for the commercial was filmed at an autocross event in Devens, MA. The shots of students working on the car were filmed in the parking lot while waiting for the car's group to begin racing. Once the car began racing, three separate runs were filmed each from separate angles. The first run was filmed from the right side of the course. The second run was filmed from the starting point of the course. The third run was filmed from the left side of the course by the finish line. Each angle provided ample footage for editing together seamless race footage of the car for the commercial. The introductory shots used in the commercial were filmed on WPI's campus. Footage was filmed of the football field, various WPI signage and buildings, etc.

Editing the commercial began with editing the music. The original version of "Electric Worry" includes a brief instrumental intro, a brief vocal intro at the same pace as the instrumental intro, a ramp up section, an upbeat section, and then repetitions of the vocal intro and upbeat sections. In order to fit the storyboard of the commercial, the song was edited to only include the instrumental intro, the ramp up section, and the upbeat section, which together total approximately one and a half minutes. The audio editing program Audacity was used to edit the song. The video was edited using Adobe Premier. First, the music was added as an audio track. Second, the WPI campus shots were added. The best shots were chosen to fill the allotted 16 seconds of intro. All audio was removed from the campus footage so only the music can be heard. Footage of the 360 degree view of the car was added next for the ramp up section, also without any audio from the

camera. When the car is turned on, audio of the car's engine starting up and revving is included and played over the music. For the remainder of the shots, most of the original audio was removed from the video footage so the only audio present is the music.

Various car noises are included throughout the commercial in order to impress upon the viewer the sheer power of the car, its greatest asset.

## **Conclusion, Recommendations for Future Work**

Overall we are very pleased with the outcome of this project. When compared to other IQP's done at WPI in the past this project has taken a more thorough approach. In addition to the usual survey, logo development, and PowerPoint presentation, we have also collaborated with two alumni and one local business to create a professional business plan for the manufacturing and marketing of the 2008 WPI FSAE Racecar.

As a note to future teams, we think it is very important to do two things- start early, and speak to as many knowledgeable people as you can. The most useful information for us came from speaking to Jason at Factory Five and to people at the autocross races which we attended. We did read several books on business plans, but real world knowledge specific to the racing industry is far more important on a project like this. As for starting early, we feel that this allowed the entire project to move at a consistent and manageable pace. Our original timeline was used up to the writing of the final paper, and it was nice to have this guiding us during each term.

In retrospect, the main area for improvement on this project is derived from the fact that we did not use the Manufacturing Engineering department at WPI as much as we could

have. The most obvious weak-point of our business plan is that we assume many of the custom manufactured pieces for the vehicle can be sourced cheaply from various machine shops, but we do not have a strong confidence about this being true. There are probably professors at WPI who have experience with off-shoring and outsourcing parts and labor around the world, and real life examples of typical prices and organization from such situations would help our case. We also have several faculty who are experts in Lean Manufacturing, and while we did consider these principles when designing the business plan and factory layout, we could have given specific examples of how this would work for each part.

We have enjoyed our work on this project, and we look forward to competing in May.

## **Appendix A: Presentation Event Rules:**





## 4.4 Presentation Event

75 points

### 4.4.1 Presentation Event Objective – Business Case

The objective of the presentation event is to evaluate the team's ability to develop and deliver a comprehensive business case that will convince the executives of a manufacturing firm that the team's design best meets the demands of the amateur, weekend, autocross/Sports Car Club of America (SCCA) Solo II racing market and that it can be profitably manufactured and marketed.

The judges should be treated as if they were executives of the manufacturing firm. Teams should assume that the executives represent different areas of a corporate organization, including engineering, production, marketing and finance, and thus may not all be engineers. Presentations will be evaluated on the contents, organization and visual aids as well as the presenters' delivery and the team's response to questions. The presentation must relate to the car entered into the competition although the actual quality of the prototype itself will not be considered as part of the presentation judging.

### 4.4.2 Presentation Schedule

Presentations will be made on the static events day. Presentation times will be scheduled by the organizers and either, or both, posted in advance on the competition website or released during on-site registration.

Teams that fail to make their presentation during their assigned time period will receive zero (0) points for the event.

### 4.4.3 Presentation Format

One or more team members will give the presentation to the judges. All team members who will give any part of the presentation, or who will respond to the judges' questions, must be in the podium area when the presentation starts and must be introduced to the judges. Team members who are part of this "presentation group" may answer the judge's questions even if they did not speak during the presentation itself.

Presentations are limited to a maximum of ten (10) minutes. The judges will stop any presentation exceeding ten minutes. The presentation itself will not be interrupted by questions. Immediately following the presentation there will be a question and answer session of up to five (5) minutes. Only judges may ask questions. Only team members who are part of the "presentation group" may answer the judges' questions.

#### 4.4.3.1 Data Projection Equipment

Projection equipment is not provided by the organizers. Teams planning to use data projectors, or any type of projectors, as part of their presentation are responsible for bringing, or otherwise arranging for, their own projection equipment.



#### 4.4.4 Evaluation Criteria

Presentations will be evaluated on content, organization, visual aids, delivery and the team's response to the judges' questions. The scoring criteria are detailed in Appendix A-5 "Presentation Judging". The criteria are applied only to the team's presentation itself. The team that makes the best presentation, regardless of the quality of their car, will win the event.

#### 4.4.5 Scoring Formula

The scoring of the event is based on the average of the two or three presentation judging forms. There is a maximum of fifty (50) points from the Presentation Judging Form.

$$\text{PRESENTATION SCORE} = 75 \times P_{\text{your}}/P_{\text{max}}$$

Where: "Pmax" is the highest score awarded to any team  
"Pyour" is the score awarded to your team

It is intended that the scores will range from near zero (0) to seventy-five (75) to provide good separation. The Presentation Event Captain may at his/her discretion; normalize the scores of different judging teams.

# Appendix B: Presentation Judging

## PRESENTATION JUDGING

Score the following categories on the basis of 0-10 points each according to the following scale (any number or fraction along this scale may be used).

0.0 = inadequate or no attempt

2.5 = attempted but below expectation 5 = average or expected

7.5 = above average but still lacking 10 = excellent, perfectly meets intent

**CONTENT:** Were the concepts presented appropriate and adequate to explain how the car meets the intent of the customer? Were enough technical details presented without being boring?

**ORGANIZATION:** Were the concepts presented in a logical order progressing from basic concept and showing how the engineering accomplished the concept? Was it clear to the audience what was to be presented and what was coming next? Were distinct introduction and overviews as well as summary and conclusions given?

**VISUAL AIDS:** Were visual aids used or clear visual references made to the car? Were the illustrations visible for all of the audience?

**DELIVERY:** Did the presenter speak in a clear voice? Did the presenter show enthusiasm and promote confidence in the technical aspects? Did he maintain eye contact?

**QUESTIONS:** Did the answer illustrate that the team fully understood the question? Is there doubt that the team understood the answer? Did the team promote complete confidence in their response to the questions?

TOTAL = PRESENTATION POINTS (50 points maximum)

COMMENTS:

## **Appendix C: Correspondence with Jason Lavigne of Factory Five**

-----Original Message-----

From: Nickerson, Mark [<mailto:mark944@WPI.EDU>]

Sent: Monday, November 12, 2007 2:18 PM

To: info@factoryfive.com

Subject: WPI student requesting info about Factory Five

Hello,

My name is Mark Nickerson, I am a student at Worcester Polytechnic Institute. Last year I was lucky enough to participate in a tour of your facilities as a member of our Motorsports Club, which was a very memorable experience for everyone who participated.

This year I am working on the business plan portion of our school's FSAE racecar. The goal of this project is to prove to the judges in Michigan that a company could profitably manufacture and sell our product to autocrossers.

My first thoughts were to contact Factory Five, as your business is so similar to the one we are trying to plan. Any information that you are willing to share this year would be very helpful and interesting to us.

Our initial questions are: How many cars/day do you build on average? How many employees do you have, full and part time? Why was Wareham chosen as a factory location? Do you have any basic information on market demographics that could help in our research? Do you have any "non-private business plan type documents" that we could come and take a look at sometime?

As the best case scenario I see us doing a couple months of

research on our  
own and then having a one or two hour meeting with someone  
at factory five  
later in the year. We would use this time to review and  
add to our work  
based on your suggestions.

We understand that you are busy and that a lot of this  
information is  
private, but hope that you are willing to help in ways that  
you can.

Thanks so much for your time,

Mark Nickerson  
WPI class of 2008, ME

Jared Renzullo  
WPI class of 2008, CS

From: Jason Lavigne [jason.lavigne@factoryfive.com]  
Sent: Tuesday, November 13, 2007 1:11 PM  
To: Nickerson, Mark  
Subject: RE: WPI student requesting info about Factory Five

Hello Mark,

Thanks for your inquiry - FSAE is a great program!  
If you'd like, you can come in for a visit, and we can take  
a tour of the  
plant and go over some of those questions at the same  
time. Should only  
need an hour or so, and we can cover a lot of info.  
Just let me know when you'd like to come down, and we can  
schedule  
something.

Best regards,

Jason Lavigne  
Technical Sales  
Factory Five Racing, Inc.  
(508)-291-3443

[www.FactoryFive.com](http://www.FactoryFive.com)

## Appendix D: Factory Five Visit Notes

Notes from Factory 5 Interview with Jason Lavigne, November 28, 2007.

### **Market:**

Low emphasis on marketing until lately. With a company this small, it is important to get your name out there with forums/car magazines, but beyond that the car should sell itself through word of mouth. More emphasis on advertising in forums than magazines lately. Factory tour's are a very important marketing tool, hire engineers to give tours. 20/week average. Future plans are broadcast media (they are launching a new product soon, plan to increase sales, which are currently steady). Free info packs, 50-60 per day. Similar to "how it's made" shows.

Recent trends in customer needs: More emphasis on adjustability (seat). More emphasis on high end (fewer and fewer people want to buy used parts, would rather buy the whole package new even at a cost penalty.)

Why a kit? Emphasis on community, online forum and with regular events/meetings. The SCCA racing and high performance automobile market is largely made up of people who like to work on their cars, they are proud to drive something that they built from scratch, they like to understand their car. It keeps the pricing attractively low, saves 250 hours of assembly at \$20/hour = \$5000. Save money on shipping, the box can be smaller. Customer can easily add custom features since they are building the car themselves, example paint.

Less than 1% of customers are women, although many husband/wife pairs. 5% to Europe. Canada 9%. Most are 40-60 years old, newly retired. Business is spread out evenly in the country, with a small emphasis on East and West Coast where population is higher. Many people travel to Boston or New York at some point, for this reason Wareham, MA is a good location.

### **Paying-**

Production does not begin until full payment is received. Usually no changes to the order or customization is possible after payment. There is no financing available through Factory Five. Usually loans are hard to obtain from banks because you can not insure a pile of parts. Solution is to put it on a 0% APR credit card for one year, build it, then transfer the debt to a bank loan after the car is complete. This is risky, we should look into other methods of financing.

There is a 4-6 week delay to receive your kit, after ordering. 2-3 cars are made per day.

## **Profit-**

### Retail profit-

They have almost all parts pre-made by manufacturing or wholesale companies. Will not give specific prices, but they are making some profit on these parts (ex. Wheels, tires, shocks, wiring harnesses). They prefer to look at the profit on the entire car than to see how much is being made on each component, since they do not offer any pieces separately from the kit unless there are exceptional circumstances. Ex. The chassis alone would be \$8,500 to buy separate from the kit. They are sourcing parts and materials from around the world.

### Manufacturing Profit-

They will not give numbers on price/weld, price/bend, etc, but the ones we provided are "close". .30/lb mild steel, .60/lb 4130, .75/lb aluminum. \$35/hr gen labor. CNC 75. Robot control 70. Welds .35/inch. Cuts .40/inch. .75/bend. .75/end prep for welding.

800 welds/chassis. 1 person takes 1 full day to finish welding 1 chassis on the rotisserie jig. Only 1 jig/car. Tack 3/day on the jig, then weld up rest on the rotisseries. They have no TIG, no mills, no lathes, just a typical drill press, belt sander, grinder to touch up. All tubing comes pre-notched and pre-bent. Body takes 1.5 days to complete. There are rarely any problems with fitment, etc, the frame jig has never needed to be re-adjusted.

Instead of using Six Sigma, ISO 9000, etc in a strict way like a larger company, they prefer to keep these principles in mind along with common sense. They are too small a company to get bogged down with the details of record keeping and obtaining various certifications, but

No profit is made on shipping, always use Stuart Transport for domestic orders. Have contacted them for prices on several states.

Company's emphasis is on assembly of parts, efficient packaging, welding, and body. Box checklists.

Inventory control: By eye. Boxes of everything

Payroll:

45 total employees in house.

8-10 design engineers with engineering degrees. \$50,000

2 Assemble/Check chassis \$40/hr

10 Molding \$40/hr

12-15 welders \$40/hr

3 box assemblers \$20/hr

Rest is admin/tech/sales 7 \$30,000

2 owners \$ Profit

Profited right from the beginning in 1995. No loans were taken, no investors, all privately funded.

## **Appendix E: Complete WPI Motorsports Business Plan**



# **WPI MOTORSPORTS, INC.**

AN INVESTMENT OPPORTUNITY

December 10, 2007

WPI Motorsports, INC.

100 Institute Road

Worcester, MA

Telephone (508) 963-8327

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## **Introduction**

After many years of development work, WPI Motorsports, INC is ready to launch its revolutionary new concept, the build-it-yourself autocross racecar, to potential investors and manufacturers. 2008 will be the first year that Worcester Polytechnic Institute, a university known for excellence in engineering, will offer this investment opportunity to the business world.

The WPI racecar itself has been painstakingly optimized to fulfill the needs of the SCCA Solo-2 autocross racer, which stress high performance, low cost, and minimal maintenance requirements. Executive research suggests a fertile and growing market for such a product, especially one that compares so favorably in a competitive analysis with all existing racecars available today.

WPI Motorsports, INC, is an engineering (not a manufacturing) firm, and as such does not have the resources necessary to produce 1000 cars per year, which would maximize profit. As an engineering firm, they are offering their design, along with sound manufacturing and business advice, to potential investors and established manufacturers. This work comes at the cost of 15% of net profit for the first five years of production.

The enclosed financial projections show that if implemented properly, this plan will offer a multi-million dollar yearly profit for the manufacturer, investor.

## **Company Description**

As stated before, WPI Motorsports, INC is an engineering firm. Their engineering department includes ten senior level students, two graduate students, three professors, and four staff members, all of whom share a passion for engineering, competition, and Motorsports. Besides WPI student and employee engineers, the team is also supplemented by a manufacturing expert, a businessman, and numerous WPI alumni working in various fields. WPI Motorsports, INC is a diverse group but they have only one goal in mind, to design the best autocross racer for the SCCA Solo-2 market that can also be manufactured profitably.

WPI Motorsports, INC is currently looking for investment and manufacturing support because they have a concept but insufficient resources to realize it on their own. The business has a specific plan for success as a part manufacturer, part retailer of new racecars, but it will need additional capital and established manufacturing facilities. WPI Motorsports, INC would like to continue to be an engineering firm, and to profit from their current design for the next five years by sourcing out manufacturing operations. In addition, they would like to establish a working relationship with investors and a manufacturer and to birth a new class of autocross racecar. This class will revolutionize the way a car is made, as an assembly of conveniently pre-matched parts, each produced in efficient factories from around the world. These parts will come together in the

manufacturer's shop as a kit, to be partially pre-assembled and then completed and customized by the end user.

## **Product Description**

The product, the 2008 WPI FSAE Racer, is a single seat, open wheel, formula style car. Without the driver, the car weighs 450 pounds (wet) and has a wheelbase of 68 inches and a 43 inch track. The frame is constructed from 4130 steel (chro-moly) which is TIG welded and then annealed to ensure reliability. The front and rear suspension both use double, unequal length A-arms with pullrod monoshocks with fully independent roll damping. Power is delivered from a restricted 2004 Honda CBR600 F4i engine, which makes a peak of 90 horsepower at 13,500 RPM (giving the car a ratio of 50 pounds per horsepower). The differential is a Quaife Torsen-style limited slip unit, which has been optimized for the application. Custom CNC machined uprights, hubs, steering components, and a rear sub-frame have been utilized to save weight, all fabricated from various aluminum alloys. These CNC produced parts have been designed to be cast as the business plan sees fit. The 2008 car is the result of over twenty years of design iterations, as WPI is one of the oldest and most experienced schools to compete in the FSAE event.

The newest design, offered here, is nothing short of impressive when judged for mechanical, ergonomic, manufacturing, safety, and stylistic properties. The concept of offering the car as a kit makes it that much more affordable to customers; over 50 hours

of assembly time have been subtracted from the projected retail cost, which is \$15,000. Because of this savings, the WPI vehicle will be the obvious choice for entry level customers who do not want to race their commuter cars. The “kit concept” also allows for a high level of individual customization and customer involvement with the car, which are both currently strong market trends.

## **Competitive Analysis**

There are two racecars on the market today which will be WPI Motorsports’ closest competitors.

### *Formula Vee*

The Formula Vee class was conceived in 1963 as an entry level, single seat, open wheel autocross/road racer. Today, a new, fully assembled Formula Vee costs from \$10,000 to \$18,000 for a competitive example. The car can also be purchased in kit form for around \$8,000 plus the cost of Volkswagen parts, namely the suspension and engine, which must be sourced from junkyards. A typical Formula Vee produces 50-60 hp and weights approximately 1025 pounds (17 pounds per horsepower). Being based on a Volkswagen donor car, customers must use a Volkswagen Type 1 H-Beam suspension with minor modifications.

### *Formula 500*

Formula 500 racing began in the early 1980s. These cars (also open wheel, open cockpit) typically weigh 800 pounds and use the Rotax 494, Rotax 493 or AMW 250-2 R2c engines, which produce about 60 hp (13 pounds per horsepower). Formula 500 car modifications are strictly regulated and no engine modifications are permitted. The suspension cannot include anti-sway bars, springs or shock absorbers between the frame/chassis and axle.

A new Formula 500 car can also be purchased for around 18,000 dollars. A used car ranges from \$5,000 to \$15,000, with competitive cars costing between \$10,000 and \$13,000.

The WPI Motorsports racer compares very favorably to these existing options. The most obvious advantage is in performance, which is consistently the top ranked priority in surveys taken from SCCA members. The WPI car has almost double the horsepower and almost half the weight of a Formula Vee or Formula 500, meaning its performance will be far superior. Other advantages of the lighter car include cheaper maintenance costs (parts are smaller and designed for long life. Due to the light weight design and smaller size of the FSAE car the transportation costs are minimized, and this is important in a sport where traveling thousands of miles to compete is not infrequent. The WPI car is also unique in that it is designed from scratch for its purpose. Every part, including the suspension (the most important system in the autocross world) has gone through extensive analysis specific to this car, where the Formula 500 and Formula Vee are

making compromises with off-the-shelf or even used pieces. WPI Motorsports, INC will use cutting-edge manufacturing techniques and the latest engineering technology to offer a modern racecar at a price \$3,000 cheaper than the competition, with far better performance. The only advantages that the competitors have are in the availability of used cars and in the fact that the classes are already established, but these problems are manageable and expected by a new company. It has been twenty years since an innovative, small, formula style racecar has broken into the racing scene. Engineering, manufacturing, and market demands have of course changed drastically since then, and WPI Motorsports, INC is well prepared to fulfill these new demands.

## **Company Process, Facilities, and Management**

The elegance of WPI Motorsports' business plan is largely due to the unique approach taken to produce cars as kits. The components that make up the kit can be broken up into three categories, retail parts, custom parts manufactured by third parties, and assemblies constructed from raw material by WPI Motorsports. A large portion of each kit is the reselling of wholesale parts at retail prices. These parts include the battery, ECU, shocks and springs, seat, brake components, fasteners, etc. Many kit parts are also custom made for WPI Motorsports by other manufacturers. These include tubing which is pre-notched to fit and pre-bent, brackets that are cut to size, and finalized CNC'd aluminum pieces. The company uses third party manufacturers for two reasons- to reduce the cost of capital investment as well as rely on the expertise of a supplier to execute the day to day production. While it is initially tempting to say "all parts manufactured in house", this



goal is unreasonable for a new company. The easiest way to make a profit on the production scale of 1000 cars per year is to take advantage of companies that are already optimized for specific processes, like tube bending and cutting. Materials and labor rates vary greatly around the world, and by using this business model WPI Motorsports is able to take advantage of these variations (even under changing conditions), which eliminates risk. Outsourcing certain operations also allows the potential manufacturers to focus all of their attention on their specialty operations. These should include welding, carbon fiber body construction, kit assembly, sales, and customer service.

The facility that WPI Motorsports recommends for its manufacturer is a rectangular building of 40,000 square feet. For an example schematic see Figure One. The intent of the facility is to allow a continuous circular flow of materials into and then out of the building, which is a concept of Lean Manufacturing. Wasted time moving materials around is eliminated by having them travel the shortest distances possible. The focus of the company is also well illustrated in the schematic. The main manufacturing operations are welding and body molding, with warehouse and kit packaging taking up almost half of the facility. There should also be a showroom and space for offices. While this business certainly focuses on manufacturing, as a small company it must also take care of warehousing, sales, and customer support in the same facility. Care has been taken in designing the factory layout to provide maximum flexibility for potential manufacturers. Almost any standard warehouse can be made to work, with the only unique requirement being thirty foot or taller ceilings (to fit storage shelves).

WPI Motorsports plans for its manufacturer to have thirteen employees at a total cost of \$675,000 per year. This cost does not include welders and body molders, which in this report has been accounted for using cost of welding/inch and cost of fiberglass/weight. For a breakdown of payroll specifics, see Table One. The payroll, similarly to the factory layout, shows the innovative focus of our intended manufacturing firm. While this company will be labeled a manufacturer, equal attention (and money) should be spent on the business and administrative side of operations. Too many small engineering firms become overly focused on their product; WPI Motorsports' plan ensures that making profit and providing customers with a quality product remain high priorities.

## **Marketing Plan**

As a startup, marketing will be one of the most important aspects of WPI Motorsports, INC's business but also one of its challenges. Aggressive marketing is a necessity for the growth and prosperity of a new company, but it requires capital that may not be available initially. Also, because the effects of marketing are long term, a struggling company can become too focused on day to day activities and ignore the eventual importance of marketing.

In attempt to minimize these expected issues, WPI Motorsports, INC has made a compromise. They will implement a low-cost, very targeted marketing scheme. The company can also use to its advantage that the car itself is so well designed. While it will not "sell itself", there are features of the 2008 car that speak for themselves, for example

the power to weight ratio statistic, and the “build it yourself” idea. For a breakdown of the marketing costs see Table Two.

Some of the most important marketing tools will be factory tours and an online blog, which do not cost the company anything. These ideas work very well for the company not only because they are free, but also because of the current trend in the automotive world for the “do it yourself” type shows on television. Today’s customers love to feel like they are part of the shop that is building their car, and while visiting WPI Motorsports, INC or keeping track of its activities through a blog, the customers will develop a personal connection to the factory and the idea of the car. The visitors will also be the same type of people who like to work on/build their own vehicles, so the target market will be reached directly with these marketing strategies.

## **Sales and Revenue Forecast**

WPI Motorsports suggests building 1000 cars per year, but this goal will probably not be realized in the first year. It is likely that 500 cars will be sold in the first year, 750 in the second, and 1000 per year from thereafter. Production and sales will be assumed to be steady for the twelve months of the year; it is not practical to vary production of the cars while trying to keep a steady number of employees busy but also not require storage of extra finished products. Every car will be sold before it is made. To make up for natural variations in sales throughout the year, WPI Motorsports suggests varying the price of the car between \$13,000 and \$17,000 (maintaining an average price of \$15,000) until

monthly sales numbers are balanced. This is another concept of Lean Manufacturing, to standardize the labor and parts ordering processes over time to eliminate waste.

The revenue forecast for the first five years of the company can be seen in Table 3. Revenue after five years will be over 63 million dollars. A production rate of over 1000 cars/year may be possible in the future, but for this plan is limited by both factory size and the slowly growing market for a new class of racecar.

## **Profit and Loss Forecast**

The Profit and Loss forecast given in this report is detailed and accurate, but importantly it does not include the monthly cost of running a factory or the initial capital necessary to begin production.

It is assumed that the audience of this plan is familiar with the monthly expenses of operating a factory at their chosen location. These costs would include taxes, utilities, and maintenance. The decision to ignore this parameter is made due to the large variations in cost that can be found at different locations across the United States and to maximize the flexibility of the business plan.

It is also assumed that the manufacturing firm already has three TIG welders, the appropriate tall storage shelving, showroom, bathrooms, heating systems, hand tools, drill presses, jigs, etc. These parameters can be safely ignored because of the innovative way

the business is set up in the first place- the manufacturing done in house is limited to operations that do not require expensive machines. For estimation purposes, the cost of turning an empty, appropriately sized warehouse into a factory is between \$50,000 and \$75,000. This parameter is ignored because of the variability in what potential manufacturers already own, what tools employees will provide themselves, and other similar unknowns. Both the upfront capital and the operating costs of the factory can be easily subtracted from the yearly profits to find true profit, so these parameters are best saved for modification on an individual basis.

As far as other costs go, there are five main categories. These are cost of wholesale parts, cost of materials and labor from third party manufacturers, labor cost of in house operations, other payroll, and marketing. A breakdown of costs for the first year (500 cars manufactured) can be seen in Table 4. Table 5 shows the cost of items included in “cost per car” in table 4.

As can be seen in Table 6, the yearly expenses for the first five years are calculated, which subtracted from revenue will leave potential profit. From this number the manufacturer should subtract their plant operating costs and a yearly percentage to pay off initial capital investment (if applicable), plus the 15% kept by WPI Motorsports, INC for their services. Assuming no initial investment was necessary, the manufacturer per investor is looking at a profit increasing from over \$580,000 in the first year to an eventual 1.9 million dollars/year after three years. After five years WPI Motorsports, INC will forfeit any right to subsequent profit, and the manufacture and investors can expect over 2.2 million dollars per year of profit.

## **Future Trends and Long Term Goals**

For the manufacturers and investors, the expected value of this business is measured in a timeframe of much longer than five years. As the SCCA Solo-2 Competition grows in popularity, an exponential increase in sales can be expected, not just the linear growth predicted in the provided business model.

In addition, there are constant and unaccounted for long term profits to be made in the sourcing of materials and labor from even more efficient factories around the world. This business plan allows management to be constantly on the lookout for new suppliers, while manufacturing firms with too many expensive machines are limited by their technology. In today's world technology is only becoming outdated faster, and WPI Motorsports, INC has provided a business model which inherently adapts to these changing conditions.

In house manufacturing gains can be expected as well over the long term. Some of the profit can be reinvested in the business. Suggested additions include more manufacturing engineers who can improve efficiency, more salesmen, and a broadcast marketing campaign instead of just print and internet media. The popularity of our competitors, Formula Vee and Formula 500, both twenty and thirty years since being introduced, is in itself enough evidence of the long term value in building formula style racecars.

## **Conclusion**

WPI Motorsports, INC presents a lucrative business opportunity to investors and manufacturers. For the first time the combined engineering talent of students, professors, staff, and alumni is available publicly for commercial gain. As a competitive design has been taken care of by the engineers, this plan has focused on the manufacturing, marketing, and sales of the 2008 WPI FSAE racecar. A business model and detailed business plan has been developed, which if implemented will create multi-million dollar profits for years to come. The most important financial data is summarized in Table 6.

WPI Motorsports, INC would finally like to stress that while this plan has been carefully developed, it is only one possible solution for the manufacturing of these racecars. Flexibility is a principle emphasized in the design and manufacturing of the car itself and this same idea will carry over to forthcoming teamwork with businessmen. Thank you for your consideration and we will be happy to answer all inquiries.

WPI FSAE Business Team, December 2007

Mark Nickerson

Jared Renzullo

# Appendix

Figure 1: Factory Schematic

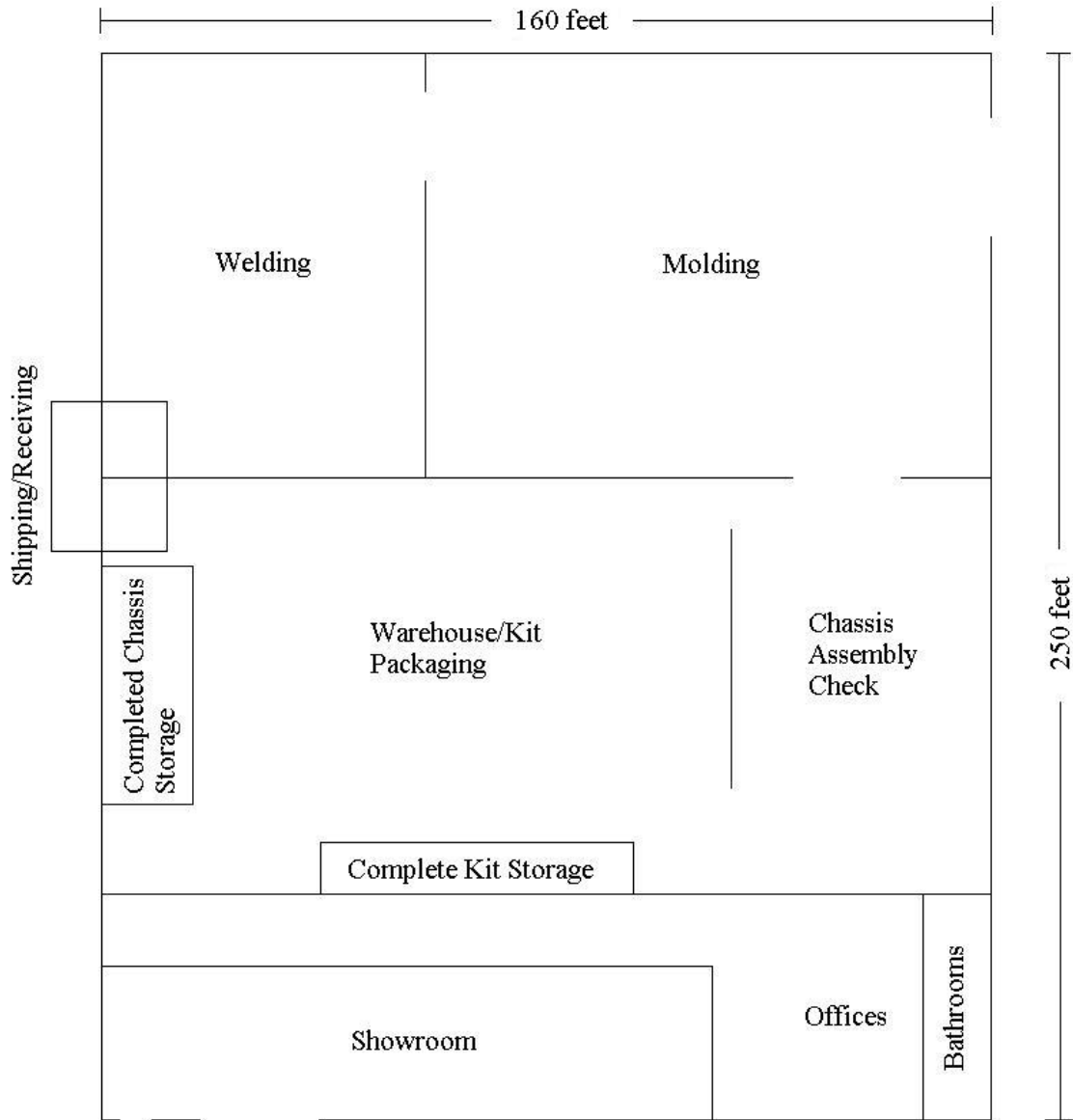


Table 1: Payroll Breakdown



Title	Salary (\$)	Total (\$)
2 Manufacturing Engineers	80,000	160,000
2 Salesman/Marketing	40,000	80,000
5 Admin	30,000	150,000
1 Custodian	25,000	25,000
2 MBA's	100,000	200,000
1 Kit Packagers	30,000	30,000
1 Shipping and Receiving	30,000	30,000
Total		675,000

Table 2: Marketing Costs

Media	Units	Cost (\$)	Total (\$)
Half page Mag. Ad	10 magazines, 12 issues each	1,000.00/issue	120,000.00
Banner on Website	20 websites, 1 ad each for a year	300.00/month	72,000.00
Media Packets	As demanded, est. 10/day	5.00/packet	18,250.00
Total			210,250.00

Table 3: Revenue for the First Five Years

Year	Cars Sold	Revenue (\$)
2009	500	7,500,000
2010	750	11,250,000
2011	1000	15,000,000
2012	1000	15,000,000
2013	1000	15,000,000

Table 4: 2009 Cost Breakdown

Item	Quantity	Cost (\$)	Total (\$)
Payroll	1	675,000.00	675,000.00
Cost Per Car	500	11,850.62	5,925,310.00
Marketing	1	210,250.00	210,250.00
Total			6,810,560.00

Table 5: Cost per Car Breakdown

Retail System	Cost (\$)
Brakes	1222.49
Engine	2722.88
Frame	48.95
Electrics	1317.18
Misc	293.28
Steering	633.88
Suspension	1,554.71
Wheels/Tires	1,790.00
Total	9,583.37

Operation In House	Rate	Quantity	Cost (\$)
Welding	0.35/inch	500	175
Body	50/pound	10	500
Body	35/hour	6	210
Total			885

3rd Party Supplied Operations/Material	Rate (\$)	Quantity	Cost
Saw Cuts	0.40	100	40.00
Tube End Prep	0.75	95	71.25
Tube Bends	0.75	12	9.00
CNC Time	70.00	6	420.00
Aluminum Stock	0.75	20	15.00
4130 Stock	0.60	45	27.00
Heat Treat	500.00	1	500.00
Shipping	300.00	1	300.00
Total			1,382.25

Table 6: Profit

Year	Revenue (\$)	Expenses (\$)	Profit (\$)	WPI Share (\$)	Investor Share (\$)
2009	7,500,000.00	6,810,560.00	689,440.00	103,416.00	586,024.00
2010	11,250,000.00	9,773,215.00	1,476,785.00	221,517.75	1,255,267.25
2011	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50
2012	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50
2013	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50

## Appendix F: Correspondence with Al Smyth

----- Original Message -----

From: "Nickerson, Mark" <mark944@WPI.EDU>  
To: <al@portatree.com>  
Sent: Monday, February 04, 2008 12:57 PM  
Subject: wpi student seeking help for FSAE

Hi Al,

Professor Cobb suggested that you would be a good person to review the rough draft of our FSAE team's business plan. This plan is presented to the judges in Michigan as part of the marketing/business case presentation, which is supposed to prove to the judges that a company could profitably manufacture and sell our prototype racecar.

If you could take a minute to glance it over we would appreciate any of your comments.

Thanks for your time,

Mark Nickerson  
Jared Renzullo

---

From: Al Smyth [al@portatree.com]  
Sent: Tuesday, February 05, 2008 7:26 AM  
To: Nickerson, Mark  
Subject: FSAE Report

Hello Mark,

I have read the plan from cover to cover. I will read it again and comment in detail. It will be difficult to give a thorough analysis of the report unless I have the guidelines that the SAE has set forth. If you have a copy, it would be beneficial for me to read.

It is difficult to read this report and try to

visualize the WPI  
faculty and students trying to engineer a race vehicle in  
the real world let  
alone design and build anything in the real world. When  
you bring an idea  
from concept into reality by making a business from  
scratch, all sorts of  
problems come up that take a business plan into ruins !  
The payroll and  
labor force that you project is way off the mark. Any  
start up company  
would not have a Janitor let alone administrators,  
salesman, and what the  
hell is an MBA ? Just kidding -- put \$0 next to their  
salary and then they  
can work for us. Everyone at a small business will be  
making product,  
selling product, and promoting the company.. even the  
President will be  
welding a chassis if need be. This only happens if the  
company really wants  
to be successful !

The payroll: Have you figured in the cost of FICA,  
workman's  
compensation insurance, Health benefits, employee benefits,  
employee  
operational costs, etc. You better DOUBLE your salary  
figures. How about  
the salesman's expenses with wining, dining, and traveling  
? Custodial  
supplies ? Administration Supplies (letter head, shipping  
boxes)? How  
about utilities ( electric, heat, etc ) ? How about  
shipping containers  
( or are they included in the \$15,000 price) ? There are  
many more areas of  
concern... these come to mind.

If you want to get a complete analysis on the cost  
of producing a  
vehicle to sell to market, then you start the project like  
any engineer  
would start a project and ask a lot of questions on every  
detail of the  
project trying to get answers. Then start to expand in  
every facet of the

project to try to get all costs figured into the project.

Sometimes you have to assume things. ( I know it makes an ASS out of U and ME ). If you assume (estimate) to the extreme (too High or too Low ), then you will give the project the kiss of DEATH. If you really want to make this a great report, it needs to be picked apart in great detail and then you should address every concern. The report will then be complete and ready for anyone to judge.

Kevin Luchansky (GM engineer -- Class of 2000 ) is also of great value. He knows what the SAE coordinators are looking for in this report. I will try to contact him today and see if he can review it as well.

Don't take this as a supression E-Mail. Take this as an opportunity to learn, expand, and WIN !!

My wife and I have started 2 manufacturing businesses from the kitchen table. It is the most difficult type of business to begin. We can help if you want the help.

Smyth

Thank you, Al

MSMG 1981

BSME 1976

Timing Systems, Inc.

Portatree

Al,

We suspected that real life would not look so pretty as our plan. We appreciate your suggestions and are going to revise accordingly - then forward to you for another look.

In the meantime, were there any specific resources that you found helpful when starting your businesses? The books we are using as guides are not specific to manufacturing (or anything at all really) and I think this shows in our results. We did interview a manager at Factory Five in Wareham, MA, as their business is similar to the one we are planning, but they were not willing to give us many details.

The FSAE rules are as follows:

#### 4.4.1 Presentation Event Objective - Business Case

The objective of the presentation event is to evaluate the team's ability to develop and deliver a comprehensive business case that will convince the executives of a manufacturing firm that the team's design best meets the demands of the amateur, weekend, autocross/Sports Car Club of America (SCCA) Solo II racing market and that it can be profitably manufactured and marketed. The judges should be treated as if they were executives of the manufacturing firm.

Teams should assume that the executives represent different areas of a corporate organization, including engineering, production, marketing and finance, and thus may not all be engineers. Presentations will be evaluated on the contents, organization and visual aids as well as the presenters' delivery and the team's response to questions. The presentation must relate to the car entered into the competition although the actual quality of the prototype

itself will not be considered as part of the presentation judging.

We have 10 minutes to give the judges a powerpoint presentation, and we are preparing this business plan as practice for what will eventually end up on our slides.

We had already sent this to Kevin, so thanks for the suggestion.

Mark Nickerson

Hello Mark,

Starting a business in 1 part and operating is a second part and the most critical. The problem is that it is a windy road and there are no road maps to success..... or every business and person would be successful. The problem with books and reading about it is that the author usually places focus on the ideas and problems that he or she thinks is important. Manufacturing is the most difficult of all as you are competing with oversea competition that works for pennies on the dollar. In order to be successful, you have to be way ahead of them, not a little.

I will take a look at your updated report and then sit down with you and try to break down the report in to many segments. Then take each segment into more detail and blend it into your report. The more detail, the more believable, the more chance of getting someone or some business to buy your proposal. This is the course that will sell the judges that your report is excellent. Remember, most of the judges have never started or operated a

business either. Someone told them what to look for in a report and that is exactly what they are doing. If you overwhelm them, you will get the "Gold Ring".

I look forward to seeing the updated version and will work with you.

Thanks,

Al

## **Appendix G: Kevin Luchansky's Comments**

Farming out- Use a better phrase source I think would be a better word

Kitting is nice this is the current direction of the auto industry I like this point

Insert power to weight ratios in "Competitive Analysis"

Cnc billet is probably not the most cost effective manufacturing process for 1000 a yr, you might want to say that the current design allows CNC billet and the design supports casting as the business plan sees fit.

Can you give a range for cost in the competitive analysis, min \$ 10,000 and a very competitive car would cost 18,000+

Wear out more slowly change to Are designed for long life

Due to the light weight design and smaller size of the FSAE car the transportation costs,

Every part, including the suspension (the most important system in the autocross world) has gone through extensive analysis specific to this car, where the Formula 500 and Formula Vee are making compromises with off-the-shelf or even used pieces. WPI Motorsports, INC will use cutting-edge manufacturing techniques and the latest engineering technology to offer a modern racecar at a price \$3,000 cheaper than the competition, with far better performance. --- Hit on this earlier too this is a big selling point to a investor

reduce the cost of capital investment as well as rely on the expertise of a supplier to execute the day to day production



Nice, how about Online bog type of marketing, look up LG motorsports, Lou dose this and sells a ton of parts. Maybe put in a case study like this, to prove to investors this type of stuff works!

Mark and Jared,

Sorry it has taken me so long to get though this but I have been really busy here at work.

I have added in my comments. This is very well thought out as well as written.

Please let me know if you have any questions or would like to discuss anything.

Feel free to give me a call if you like.

Thank you,  
Kevin Luchansky  
DE Combustion Systems  
248-255-2333

## **Appendix H: SCCA Autocross Survey Questions**

1. Would you consider buying a single seat, open wheel racecar in the next ten years- something that you would trailer to autocross competitions?
2. What would your likely budget be for such a vehicle?
3. What are you most dissatisfied with about your current vehicle?
4. If the formula style car was available as a kit for \$2000 or more less money, would you prefer this to buying the complete car?

## **Appendix I: PowerPoint Presentation Slides**

# WPI Motorsports INC

*An Investment Opportunity*

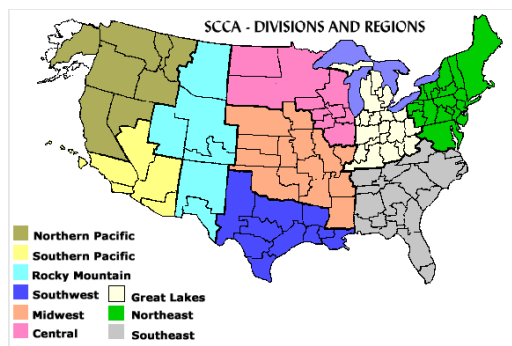


## Introductions

- Marketing and Business Team
  - Jared Renzullo
  - Mark Nickerson
- Senior Engineers
  - Brian Barnhill
  - Kyle Gauthier

- Does a market exist for FSAE cars?
  - Yes!
- WPI's solution – video commercial
- Investment Opportunity, Kit Concept
  - *\$2.39 MILLION profit/year for the investor*
- Questions

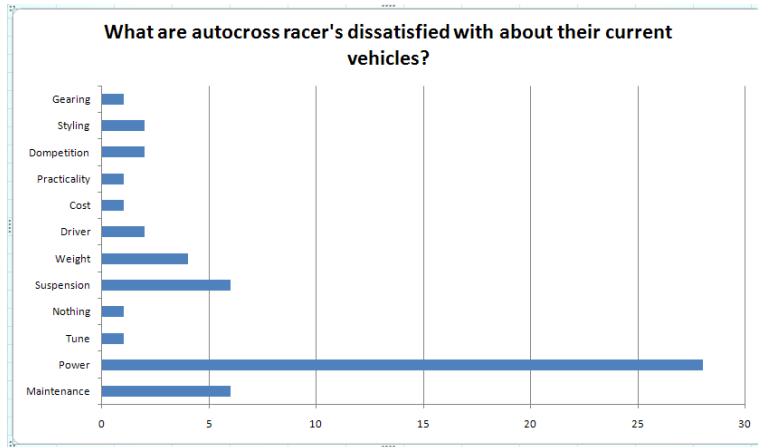
Target Market- 3400+ current SCCA Solo drivers



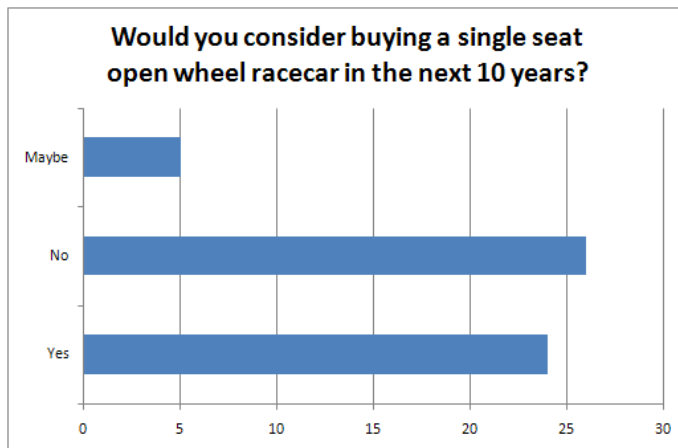
- 3400 drivers as a VERY LOW estimate (not including NASA, BMWCCA, PCA, CART, etc)

# Are they satisfied with their cars?

- Survey taken April 13, 2008
- 55 responses received, 140 drivers present

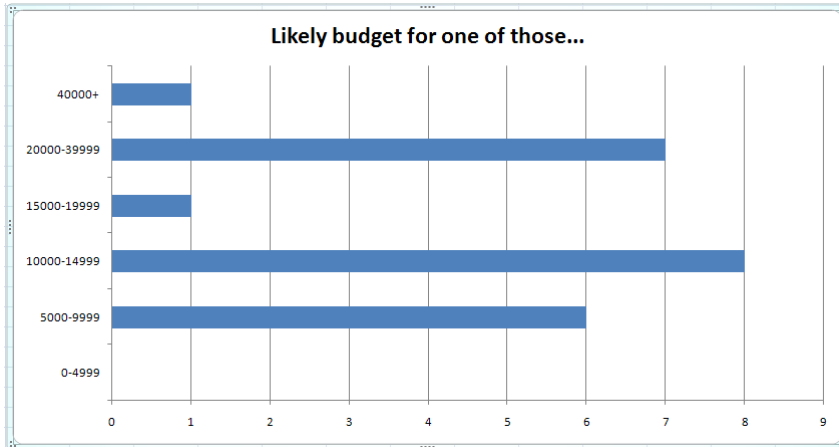


# Will they buy FSAE cars?



## Can they afford them?

- Of the people who responded "YES" the first question, 18 of 24 think that \$10,000 or more is a reasonable amount to charge



## Is the Kit Concept a good one?

- Overwhelming YES



## Existing Autocross Racecars

- Formula Vee
  - 1960s VW Parts hard to find
  - 17 pounds/horsepower
  - \$10,000-\$18,000



- Formula 500
  - Outdated Solid Axle suspension
  - 13 pounds/horsepower
  - \$10,000-\$15,000

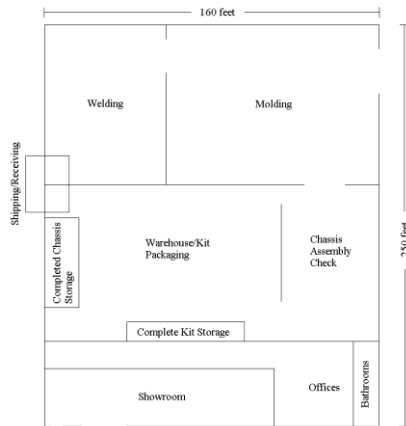


## The WPI \_\_\_\_\_

- Commercial on this Slide to prove our car is much much better- (0-60 filmed driver perspective, skid pad from middle, braking test from front, manufacturing pics with parts explained briefly, etc)
- would like to use this year's car for final version, but will do a practice run with 2001 car "soon"

# Investment Opportunity

- We seek both Investors and Manufacturing Firms with extra warehouse space



40,000 square feet of empty warehouse space

At least 1 garage size door

Electricity for 3 TIG Welders (220V)

\*\*\*No initial machines required\*\*\*

## Kit Concept

- New customer desires a unique, customized car
- Kit assembly saves labor and capitol on machines- car is \$2000 cheaper
- Community/ Sense of accomplishment



The most efficient way to PROFIT is to focus business on marketing, sales, and customer service. Manufacturing is limited to welding pre-cut tubing and body fabrication.

## Up front costs for you

### Investment Breakdown

Utilities, Taxes, Rent	???
Payroll	675,000
Marketing	210,250
Car Materials/Parts	5,925,310
3 Tig Welders	10500
Total Investment Required	6,821,060

## Payroll Breakdown

### Payroll Breakdown

Title	Salary (\$)	Total (\$)
2 Manufacturing Engineers	80,000	160,000
2 Salesman/Marketing	40,000	80,000
5 Admin	30,000	150,000
1 Custodian	25,000	25,000
2 MBA's	100,000	200,000
1 Kit Packagers	30,000	30,000
1 Shipping and Receiving	30,000	30,000
Total		675,000



## Marketing Cost Breakdown

Media	Units	Cost (\$)	Total (\$)
Half page Mag. Ad	10 magazines, 12 issues each	1,000.00/issue	120,000.00
Banner on Website	20 websites, 1 ad each for a year	300.00/month	72,000.00
Media Packets	As demanded, est. 10/day	5.00/packet	18,250.00
<b>Total</b>			<b>210,250.00</b>

## Cost Per Car Breakdown

<b>Retail System</b>	Cost (\$)		
Brakes	1222.49		
Engine	2722.88		
Frame	48.95		
Electrics	1317.18		
Misc	293.28		
Steering	633.88		
Suspension	1,554.71		
Wheels/Tires	1,790.00		
<b>Total</b>	<b>9,583.37</b>		
<b>Operation in House</b>	Rate	Quantity	Cost (\$)
Welding	0.35/inch	500	175
Body	50/pound	10	500
Body	35/hour	6	210
<b>Total</b>			<b>885</b>
<b>3rd Party Supplied Operations/Material</b>	Rate (\$)	Quantity	Cost
Saw Cuts	0.4	100	40
Tube End Prep	0.75	95	71.25
Tube Bends	0.75	12	9
CNC Time	70	6	420
Aluminum Stock	0.75	20	15
4130 Stock	0.6	45	27
Heat Treat	500	1	500
Shipping	300	1	300
<b>Total</b>			<b>1,382.25</b>

**Grand total \$11,850.62 per car**

## Predicted Sales and Revenue

Year	Sales (Cars)	Revenue (\$)
2009	500	7,500,000.00
2010	750	11,250,000.00
2011	1000	15,000,000.00
2012	1000	15,000,000.00
2013	1000	15,000,000.00

## Profit

15% WPI, 85% investor

Year	Revenue (\$)	Expenses (\$)	Profit (\$)	WPI Share (\$)	Investor Share (\$)
2009	7,500,000.00	6,810,560.00	689,440.00	103,416.00	586,024.00
2010	11,250,000.00	9,773,215.00	1,476,785.00	221,517.75	1,255,267.25
2011	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50
2012	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50
2013	15,000,000.00	12,735,870.00	2,264,130.00	339,619.50	1,924,510.50
<b>Total</b>	<b>63,750,000.00</b>	<b>54,791,385.00</b>	<b>8,958,615.00</b>	<b>1,343,792.25</b>	<b>7,614,822.75</b>

## Conclusion

- WPI FSAE Racecar meets market demands
- Kit Concept is most effective and flexible way to profit
- Result- Potential 7.6 million dollar profit on a 6.8 million dollar investment (110% ROI)
- Questions

## Figures

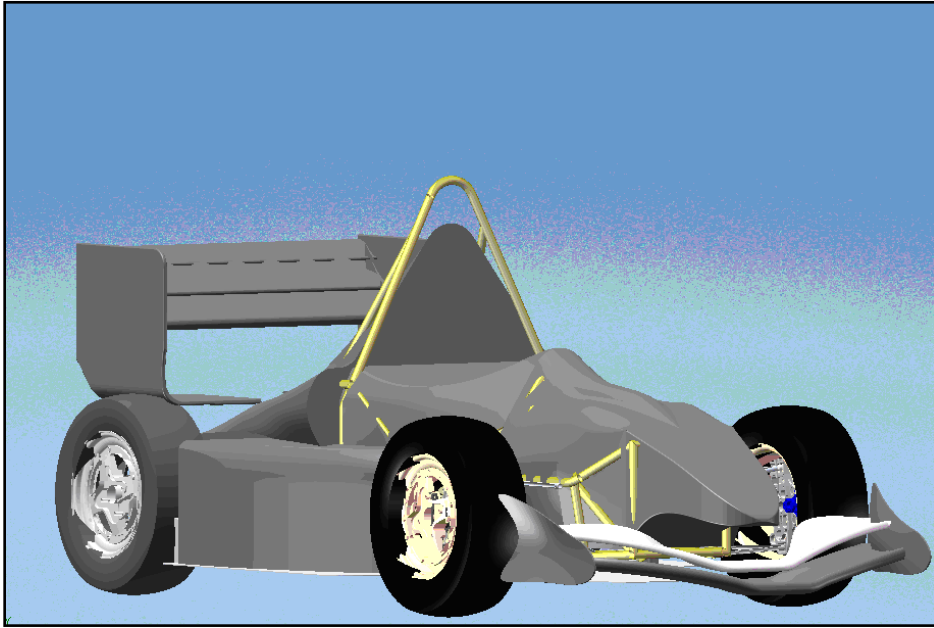


Figure 1: Logo CAD File

***WPI FSAE***

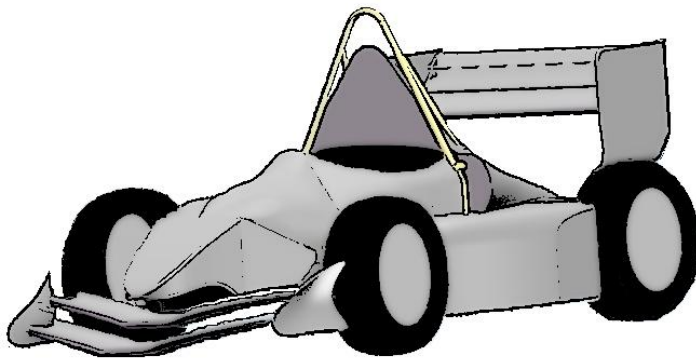


Figure 2: Logo Revision One

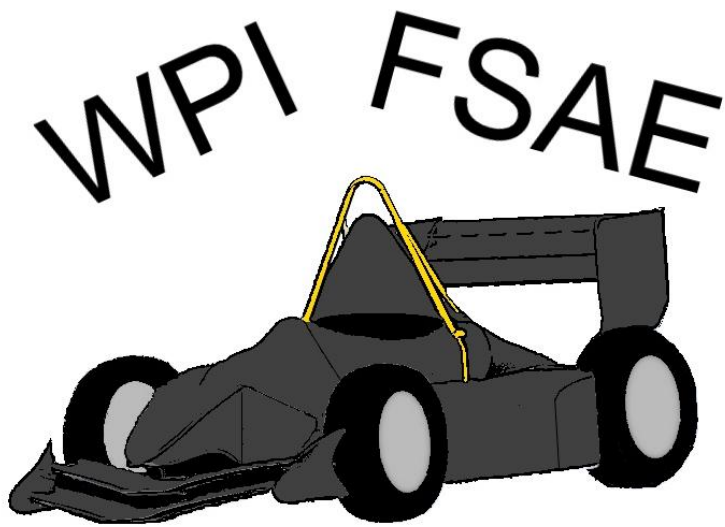


Figure 3: Logo Revision Two



Figure 4: Logo Revision Three



Figure 5: Final Logo

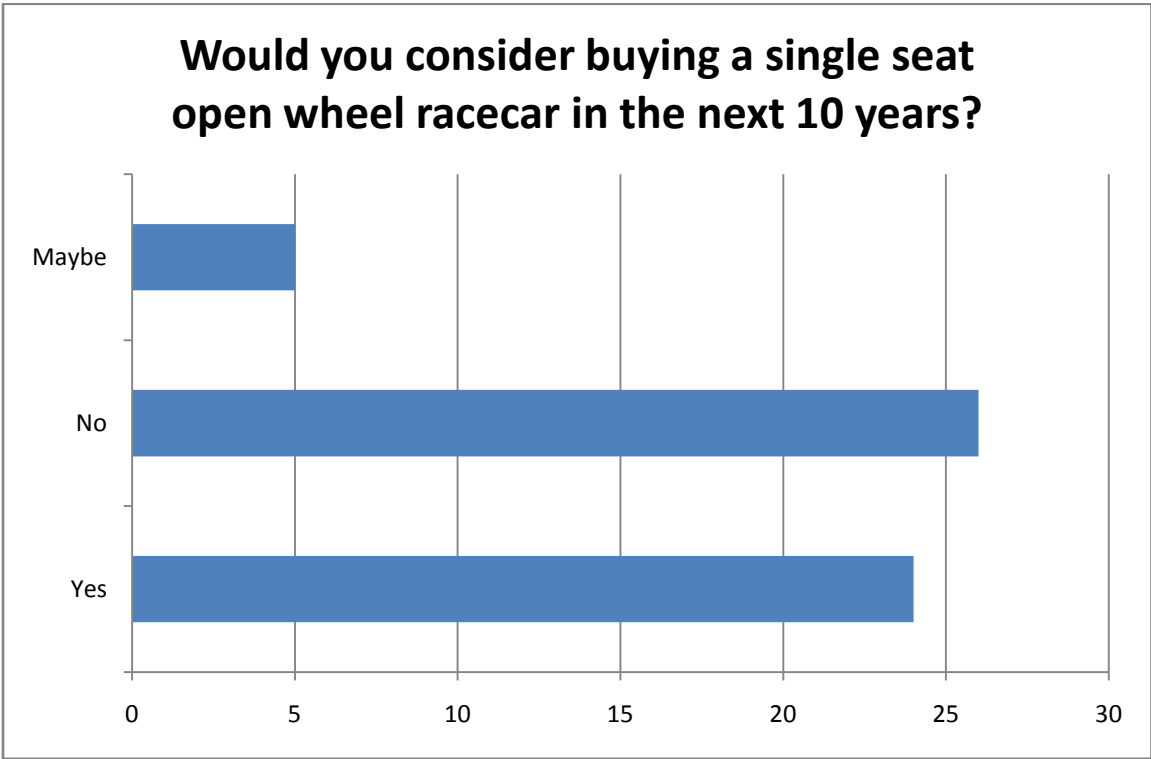


Figure 6

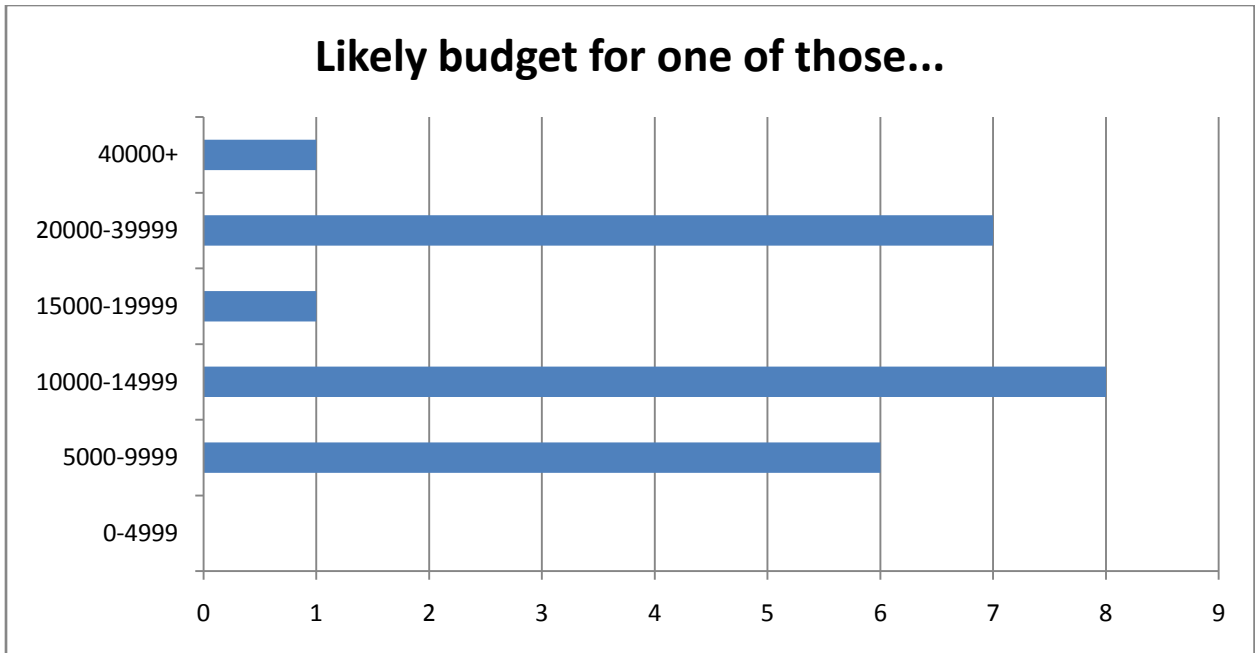


Figure 7

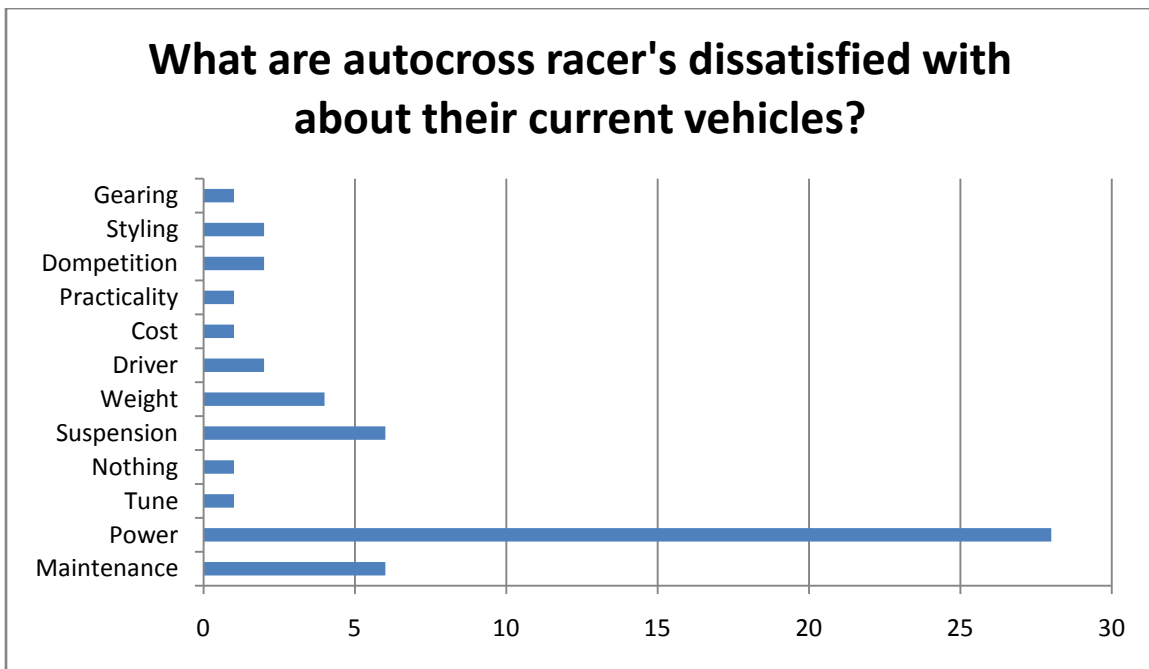
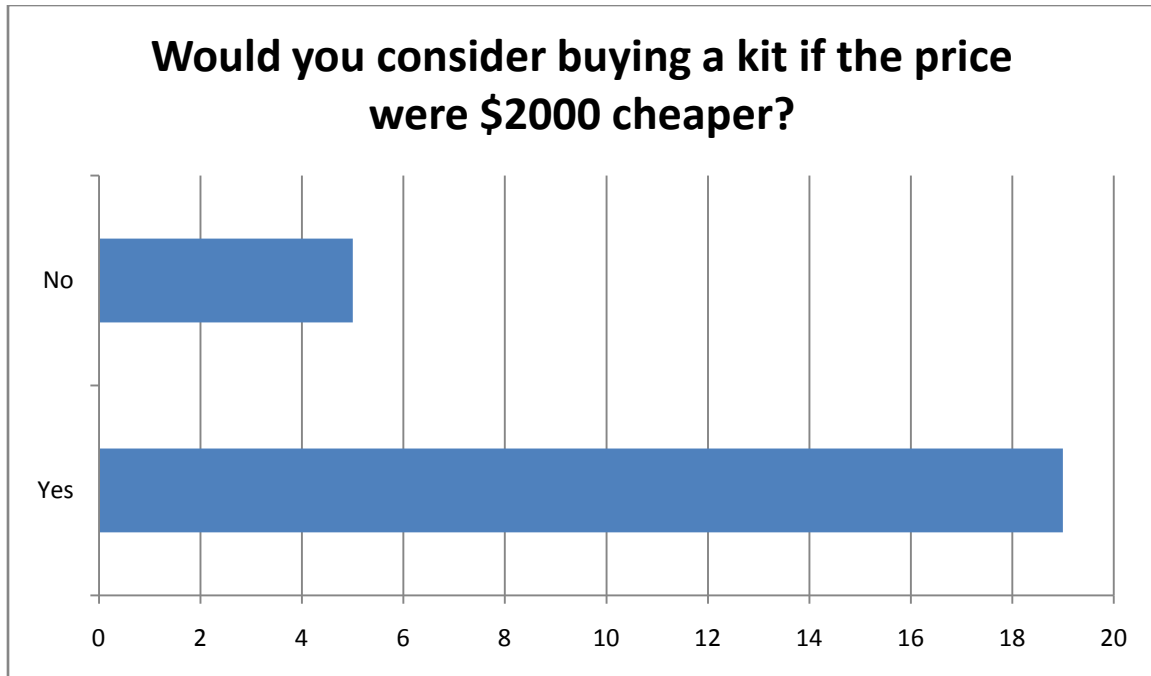


Figure 8



**Figure 9**

Hi Jared,

Attached for your approval is a scan of your embroidery. Please reply to this email with your approval or with any concerns you would like to address.

Your reply is needed as soon as possible as your order is ON HOLD until we have your approval. If you have any problems with reaching us by email, please call 770-537-4357.

46067-1:  
 Thread: White, Black  
 Location: Left Chest  
 Dimensions: 2.22"H 3.01"W  
 Stitches: 7657

Please evaluate the scan to make sure all details are correct, including thread color, typestyle and spelling.

Thank you and please let us hear from you as quickly as possible.  
 Heather Comer  
 Stitch America, Inc.  
 Ph 770-537-4357 ext 308  
 Fx 770-537-1048  
<http://www.embroiderysuperstore.com>

**Figure 10: Logo Approval E-mail**





Stitch America, Inc.  
 110 Cross Street  
 Bremen, GA 30110  
 770-537-4357  
 Fax: 770-537-1048

**Invoice**

Invoice No.	40134
Invoice Date	3/12/08
Order No.	46067

Billing Address	Shipping Address
-----------------	------------------

Jared Renzullo

Jared Renzullo

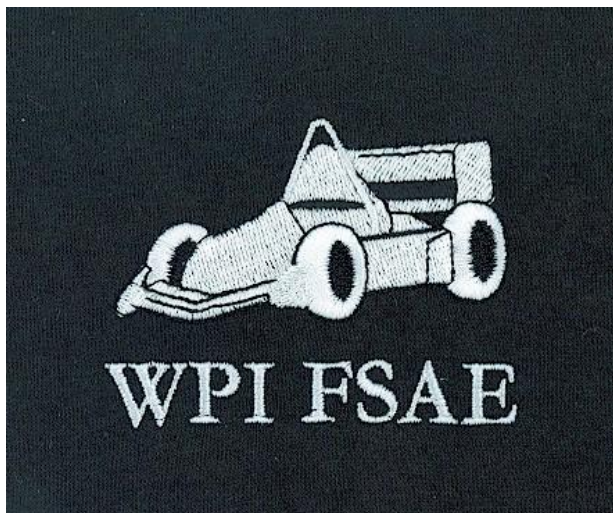
Ship Via	UPS Ground	Date Shipped	Wednesday, March 12, 2008
Tracking Number	1Z20E9E40354448154	Payment	MasterCard ending with 9845   11/09
		Purchase Order	Not Applicable

Embroidery Information					
Design Type	Description	Location	Design No.	Graphic No.	Stock No.
ExistingDesign	WPI FSAE	Left Chest	19907	30587	

Product Information						
Product No.	Description	Color (Location)	Size	Quantity	Price	Total
GL880	Gildan 5.6 oz 50/50 Jersey Polo	black	S	3	\$19.10	\$57.30
GL880	Gildan 5.6 oz 50/50 Jersey Polo	black	M	7	\$19.10	\$133.70
GL880	Gildan 5.6 oz 50/50 Jersey Polo	black	L	3	\$19.10	\$57.30
GL880	Gildan 5.6 oz 50/50 Jersey Polo	black	5XL	1	\$27.10	\$27.10

Invoice Summary		
Please remit to:  Stitch America, Inc. 110 Cross Street Bremen, GA 30110	Product Total	\$275.40
	Shipping	\$10.70
	Sales Tax	\$0.00
	Invoice Total	\$286.10
	Order Quantity	14

**Figure 11: Team Shirts Invoice**



**Figure 12: Final Embroidery Proof**

## Works Cited

1. **Factory Five Racing.** About the Company. *Factory Five Racing*. [Online] [Cited: 03 16, 2008.] <http://www.factoryfive.com/company.html>.
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