SKUNK WORKS ROBOTICS

TEAM 1983

Business Plan 2015-2016

Created by:
Business Operations Sub Team
Prepared by
Alex Kanemasu

Mentors:
Gary Miller
Steve Burke
Connie Wood
Wendi Prekeges
Susan Huntington
Lydia Johnston

RAISBECK AVIATION HIGH SCHOOL

FIRST®

Executive Summary

Team Mission: To inspire and educate our students to prepare them for a career in STEM, to embody the message of *FIRST*, and spark and role model STEM for our community.
Date Team Started: September 2006
Founder: Robert Steele, Coach
Number of Team Members: 45 students, 25 mentors, 2 coaches
Team Location: Raisbeck Aviation High School, Seattle, WA
Major Sponsors: RAHS PTSA, Aerogo, Alaska Airlines, Barton, Boeing, CHEF, Electroimpact, Linda Becker-Bothwell, Lockheed Martin, North Coast Electric Co, OMAX, Oman Tek, Saltchuk Resources Inc.

Relationships and information about current sponsors: *FIRST* Team 1983 is established under the non-profit organization Raisbeck Aviation High School's Parent Teacher Student Association (PTSA). RAHS PTSA helps by providing funding and the structure to do our fundraising. In 2009, Boeing, Alaska Airlines and OMAX Waterjet Manufacturing became major sponsors of our team, contributing funds or in-kind donations annually. In 2013 a team member worked with the academic marketing department at Tableau Software in Seattle creating an internship to incorporate the use of data analysis in gameplay through their software Tableau Desktop, which resulted in five free licenses to every FRC team in their kit of parts. Since 2012 our Business Outreach program has brought in several other sponsors including BLR, Lockheed Martin, and Oman Tek. Just this year Skunk Works gained Aerogo, CHEF, and Electroimpact as new sponsors to the team.

What we do: We work to make *FIRST* a house hold brand and to get students and professionals excited about the intersection of STEM education and robotics throughout the Pacific Northwest (PNW) and nationally. We strive to be a role model as an excellent engineering organization. We accomplish this by showing up at every event we attend with a robot that reflects excellence in creative solutions, solid engineering execution, and team cohesion. We share organizational tools and our passion for robotics with other teams to help them perform their best and to reinforce *FIRST*'s culture of gracious professionalism and teamwork.

How we do it: At Raisbeck Aviation High School, our robotics team engages our students and reinforces the *FIRST* brand. Since 2006, we have focused on continuous learning and process improvement sharing our passion for embracing challenges and finding satisfaction in seeking solutions because it is a source of connection to everyone we talk to. Our original 18 FRC team members has grown to 45 members with a year-to-year 95% return of team members. It is a year-round class receiving academic science credit. To maintain an A grade in the class, each student must participate in outreach events, attend our annual spaghetti dinner, maintain passing grades in all classes, participate in our business outreach program, and have a year-round attendance that exceeds 80%. Students must also complete a Lessons Learned and Personal Reflection at the end of the year. September to December, and post competition we meet 2 nights a week for 5 hours. During build and competition season, we meet four evening meetings a week and every Saturday (20hrs per week min) and Friday and Sunday added as necessary.

- **Student engagement:** *FIRST* Team 1983's mission is to help students develop skills and guide them to find their passion. Our sub-team structure exposes each student to a wide

variety of team jobs. Mentors encourage students to explore work that enriches their talents and interests.

- **Student leadership:** Students are trained and challenged to develop skills and fill leadership positions. We identify student leads for each sub-team by their merit. These leads are part of a leadership council that has both advisory and execution roles. Students are encouraged to develop and lead outreach events in the PNW to grow and sustain the *FIRST* community. Specific efforts led by our students in 2014 include the following examples: Boy Scout/ Girl Scout Merit Badge workshop with 100 participants, eleven workshops at libraries around the region for 330 elementary and middle-school age kids, four workshops at Concord International School, four West Seattle Library workshops in Fall 2014, outreach with Northwest Harvest, hosting two FTC competitions, Challenge Air, and Vintage Air.
- **Sustainability:** Our sustainability plan has three key components: growing parent support, fundraising, and strong business relationships. We grow parent support through the student. An inspired student will spark the interest of parents and friends. Our diverse fundraising efforts keep us tied to our community and in contact with our roots. We have engaged local businesses and gained their support with outstanding results that continues to improve each year.
- **Competitive robot:** Building great robots inspires students. Not only do we build innovative robots, we deliver on the field: a consistent since our first victory at the 2006 Las Vegas regional. We have successfully competed around the PNW including: Portland 2009 and 2014, Spokane 2012 and 2013, Ellensburg 2013, Seattle 2008 and 2013, and Auburn 2014. We maintain an organizational structure designed to create an efficient, business-like environment to support our year-round activities, and train our students to function and succeed in a collaborative goal driven enterprise.
- **Business Outreach**: In 2012, the team initiated a new relationship and fundraising effort called Business Outreach. All team members are trained to do personal presentations, provided materials and contact lists of local aerospace and engineering firms. This effort resulted in 10 new business sponsors contributing mentors, materials & funds. In 2013 the effort was continued and 5 new business sponsors supported the team. This year, we have continued to increase and maintain partnerships with companies and we have reached out to more new companies with success.
- **Community Outreach:** is a large part of what we do to train our students to be leaders. (Boys and Girls Club Competition) We share what we've learned with other teams to help them be successful in their organization and operations. During the summer our team hosted 11 workshops for elementary students at libraries around the region. During the preseason we focus on business outreach, and workshops. During build season we hold sustainability workshops at competitions to support our fellow FRC teams. This year we built a Robot School program where mentors teach Boys and Girls Club employees to be confident running robotics activities. We secured $5,000 of financial support from three of our business partners to make this training possible. Our coach created his own FLL-style tournament in which 7 teams competed.
- **Educators and policymakers:** Skunk Works recently did the first ever *FIRST* Day in Olympia, Washington. Since 2009, Skunk Works assisted in forming three FRC teams, two FTC teams and three VEX teams in our district. Our goal is to put a *FIRST* team in every K-12 school in our district. As part of this goal, Skunk Works invited our district

Superintendent Dr. Enfield, principals, and teachers to one of our FRC workshops so they could see *FIRST* in action.

Why we do it: *FIRST* Team 1983 sees a future growing into a national role model and advocate for STEM education by illustrating the role *FIRST* plays in engaging and inspiring students to their passion. We share the organizational tools and our passion for *FIRST* with other teams to help them perform their best. These combined efforts allow us to expand our support of teams, engage new teams all over the world, and provide opportunities for our students to become leaders. We want to make *FIRST* the brand that brings our community together because we believe STEM is the future and we need to inspire the next generation with the support of business leaders to participate in STEM industries. We have moved from doing just workshops to engaging other teams and developing a robotics school to teach and train coaches and teachers about *FIRST* FLL and FTC.

Table of Contents

Section 1: Team Structure

FIRST Team 1983's organizational structure (see Figure 1) has been designed to create an efficient, businesslike environment to support our year-round activities, and train our students how to function and succeed in a collaborative goal driven enterprise.

Our leadership structure is relatively flat, with decision-making shared between our Coach and mentors, team logistical support from our parent group, and students organized into sub teams around critical functions. We have three major sub teams: Engineering Operations, Business Operations, and Marketing. Each sub-team has a student team leader and an assisting mentor. In this way, the team is able to more effectively assign and delegate tasks, making sure that no one task is over- or under-staffed. Each student leader, makes sure that every member of the team is on track and able to accomplish their task, much like a project manager in a business.

The Engineering Operations team is responsible for everything related to the robot, and includes smaller subgroups with different technical skillsets. The CAD/design team is responsible for producing a computer model of the plans with Autodesk Inventor. The programming team is responsible for training new programmers and coding the robot and operator interface (OI) using C++. The electrical team plans the wiring layouts, and works with the programmers to make sure the robot functions as planned. The build team is divided into robot-building and field-building teams. The safety team ensures that our team is following safe building and robot-handling practices in order to prevent any kind of mishap. Our team constructs two robots--competition and practice--and a full-scale practice field. The practice field is made available for other FRC teams so they can refine their robot/driver performance in a semi-competition setting. It also allows members of teams to share ideas and help each other as they prepare for the district competitions.

Business Operations and Marketing are also busy during Build Season. The marketing/media team is constantly improving and adding content to the team website and social networking sites such as Twitter and Facebook. They also design team apparel, pit banners, a wide variety of button designs, all of these helping to increase *FIRST* Team 1983's public presence. Business Operations is responsible for assuring the robot design and performance achieves KPPs, developing an on-field game strategy and competition scouting plan. It also assembles documentation of business plan, Outreach logs and effectiveness metrics, award submissions, and our Chairman's Award presentation.

Through Build and Competition season, all student sub-team leaders meet twice weekly and share critical information to make sure that the whole team is on track. We use an organizational tool called the "Skunkan Ban." It is a way for us to track all of the projects students are working on in two week intervals. Our team lead creates cards with the project description and due date that each sub team lead fills out. Sub team leads also are responsible for documenting best practices and procedures, and teaching an "apprentice". By following this model, *FIRST* Team 1983 is able to give students a better idea of real workplace situations, increase efficiency, minimize errors, and prevent the same task from being completed more times than it needs to be.

Section 2: Strategies for Success and Risk Management

FIRST Team 1983 manages risk from three perspectives: sustainability (includes parent support and fundraising), competitive robot design, and student team development and growth. Our SWOT analysis is under Figure 2 in the appendix.

Sustainability

FIRST Team 1983 is committed to sustaining the team's future for many years to come. We ensure our success by implementing and continuing effective team building, leadership development, and fundraising techniques. Most notable among these are our letter writing campaign, where students write letters to community members asking for donations, and our annual spaghetti dinner and dessert auction, where plates of cookies have been known to fetch four hundred dollars. *FIRST* Team 1983 is also supported by team parents, who help organize these events, plan event logistics, and manage fundraising strategies.

As our team has grown, we have expanded our Outreach and attended more competitions, and our team budget has increased. Fueling the need to grow new strategies for engaging and building relationship with new business sponsors, we developed Business Outreach model in 2012 to engage at least ten businesses, sharing the *FIRST* message and seeking support for our team and FIRSTWA. In 2013 we continued that program with great success reaching 5 new companies in the PNW. Our goal is to continue this effort with eight to ten new business contacts each year. We developed our media outreach efforts to secure a place in cyberspace and we have grown through having our team members help start an AV production system at district competitions in Washington.

Competitive Robot Design

FIRST Team 1983 knows a high-performing robot is a strong ambassador from draws students to STEM. Not only does it inspire them during competitions, it also extends to school and community outreach events. We work very hard to build a successful robot through team innovation, discipline, and collaboration throughout the build season.

Even though this process goes on year round with continuous training of new student skill sets, it becomes our primary focus immediately after the *FIRST* FRC kickoff. *FIRST* Team 1983 spends the first few days of build season identifying what we call Key Performance Parameters (KPPs), a list of important aspects of the game to be address during gameplay. After kickoff this year, Skunk Works and one other team went to Raisbeck Aviation High School to go over the rules and main parts of the game. The whole group broke up into sub teams to prototype a specific mechanism. This enabled student productivity resulting in a faster design selection. This was much more inclusive, involving students outside the design and build teams to participate in the prototyping process. Accelerating the prototype experience created effective strategies and robot designs.

Once the essential design decisions were made, the build, programming, and electrical sub teams finalized the detailed design. We use continuous manufacturing; as soon as one component of the robot is finalized, we build it even as we continue to work on other facets of the design. In

parallel, the scouting and business operations sub teams refine gameplay and strategy based on the evolving robot's attributes.

A large part of the robot's success in competitions is our ability to build two robots—one for practice, and one for competition. This enables us to test features and practice driving. We also build a full practice field each year to the new game specifications.

Team Member Development and Growth

Part of *FIRST* Team 1983's mission is to help students develop skills and leadership potential. One of Skunk Work's goals is for students to fill leadership positions. This is accomplished by establishing student leads for each sub team, and engaging students as active participant in design processes and award documentation.

During the pre-build season, *FIRST* Team 1983 has its student leads train new sub team members to prepare for upcoming competitions. Electrical workshops teach students how to build circuits and wire the robot. Shop safety workshops and machine certification process are held by the build lead and the Safety Captain to ensure builders can work safely and competently during the season. New programmers are trained in developing code by veteran student programmers, with mentors assisting as needed. The marketing team organizes archived photos, updates the website, and teaches website development software. Business Operations begins work on its management plan, business plan, Chairman's award, and outreach summaries.

Communication during build season is a challenge because our meetings are held across multiple classrooms and the shop. To facilitate better communication during build season, we hold our daily stand up meetings in our coach's classroom to allow student sub team leaders to inform the whole team about their status so that the team can respond quickly to any unexpected or unforeseen challenges. Our Student Team Lead also checks in with all subgroups once they have broken off to work.

One of the key elements in the students' success is providing them with mentors who can teach and inspire them in leadership positions. As our team has grown, we have identified a critical need to add new mentors at a pace that supports student growth. Existing mentors develop training and workshop presentations that provide a pathway for parents and interested adults to easily become engaged with Skunk Works. Mentors also deliver this information to other teams' potential mentors as part of our outreach efforts.

Section 3: Deployment of Resources

Many of our resources go toward improving our team members' *FIRST* experience through travel and having access to current technologies. We also use our resources to support other teams and reach out to our stakeholders.

FIRST Teams Support

FIRST Team 1983 collaborates with other teams to help perform their best, and reinforce *FIRST*'s brand of gracious professionalism and teamwork.

FIRST Team 1983 continues to mentor and collaborate with other teams. *FIRST* Team 1983 continues to meet new teams and help them get started. The team prioritizes the assistance of local teams, especially their success in the build season and competition. *FIRST* Team 1983 has worked to secure a site for a joint practice field and invites any nearby teams to use the practice field that is built for each game.

During the competition, *FIRST* Team 1983 uses a scouting plan developed to analyze the performance of robots in the game. This data is shared with other teams to help them pick their alliances effectively and play the game to their best advantage.

Outreach

Outreach programs at *FIRST* Team 1983 fall under three categories: business and industry, educators and policymakers, and our community at large. Our efforts in each area are described below.

Educators and Policymakers

Outreach events carried out with the school have helped *FIRST* Team 1983 spread the word about *FIRST* and its role in sustaining STEM education. Information nights are presented to 8th graders interested in attending Raisbeck Aviation High School. Skunk Works participates in greeting prospective students and families, along with informing them about *FIRST* and *FIRST* Team 1983' role in the organization. Through the school, team members have met with policymakers, and proponents of STEM education. From meeting Boeing CEO Ray Conner and Secretary of Education Arne Duncan, *FIRST* Team 1983 has always shared the *FIRST* vision.

Within the Highline School District, *FIRST* Team 1983 helped introduce local high schools to *FIRST* and encouraged the formation of three FRC teams: Evergreen High School's T.E.C. Robotics, the Highline High School's High Tekerz, and Mount Rainier High School's Rambotics. Skunkworks has worked with the Highline School District to create FTC teams and FLL teams.

Business and Industry

In 2012, *FIRST* Team 1983 identified a need for a focused business outreach program. What began as a need was changed into an opportunity to train our students, provide them with resources and contacts to initiate face-to-face outreach conversations with industry leaders. The goal was threefold: first to share the message of *FIRST* and its impact on the students, second to advocate for

their support of *FIRST*, and third was for them to become active advocates for STEM education in every school. During the pilot year, all 60 students were trained in presentations and Outreach. Since 2012, we have conducted over 67 business presentations with 47 monetary donations totaling over $70,000. Our team members participated in over 65 internships in the past 3 years.

Our goal is to refine this process and continue our focused Outreach and share it with other *FIRST*WA teams as a new Outreach and fundraising tool. We aim to grow our outreach efforts by 20% in the next three years. With this growth we want to be able to remove our Letter Writing Campaign from our fundraising program. The reason behind this is so that we can engage more businesses in the *FIRST* program as part of our fundraising effort.

Community Outreach

FIRST Team 1983 has a roadshow which includes information on *FIRST* as well as a drivable robot that we take for display and demonstration at Outreach events throughout the entire year. In 2012 we organized fourteen Outreach events, ranging from school demonstrations to Challenge Air and Vintage Air Shows, driving the robot in the Burien 4th of July Parade and at Boeing. Our program has expanded to 50 outreach events since summer of 2015, which includes over 1,000 volunteer hours.

Focused Media Outreach

FIRST Team 1983 seeks opportunities to link student inspiration and education to STEM and *FIRST* by writing articles and finding media opportunities to showcase the robot and the team. Since 2011, we have written six industry articles, and had our robot featured on the KING TV5 Morning Report, and the International Manufacturing and Technology show, reaching hundreds of thousands of viewers.

Digital Media Outreach

Since 2011, our award-winning website has been completely redesigned to support our media outreach and is now accessible on any mobile device as well as non-mobile devices. We also have an active blog, Facebook page, and Twitter, with students' continually updating and refreshing content. During the build season, the blog is produced daily by students. Every document that we produce, from business to robot plans are posted on our website so other teams can access and download copies for their own use.

Photo-Ops/TV Spots

We consistently seek new ways to achieve greater media visibility, using TV segments, magazine and news articles, and photo-ops to get our team seen by the most people possible. Since inception our team has been featured on the King 5 morning report, the Seattle Times, the Boeing frontier magazine, Hispanic newspapers, and the cover of SPEEA. We also include team pictures in all thank-yous to our sponsors and our website.

Section 4: Financial Plan

FIRST Team 1983 develops a financial plan each year to budget for the coming season scheduling fundraising opportunities to continue to operate as a high-performing, year-round business model. Our expenditures and income for the 2015-16 season are summarized in Figure 3 and Figure 4.

Our income comes from our fundraising program, which has four major pillars. The first pillar includes both the Spaghetti Dinner and Dessert Auction and RAHS PTSA Auction. The Spaghetti Dinner is primarily conducted by parents for friends and family. The RAHS PTSA hosts an annual auction where attendants may donate to individuals or the team. The second pillar is the Letter Writing Campaign. Team members send donation requests to members of the community that describe the impact Skunk Works has had on their life. The third pillar is the Business Outreach program, which was founded in 2012. All students are required to give at least one presentation about *FIRST* to a local business. At the end of the presentation, we leave the businesses with the sponsorship level form in Figure 5. The fourth pillar includes industry matching and grants applied for by mentors and Coach. Several of our mentors are Boeing employees. Boeing offers to donate an hourly rate for how many hours the mentor volunteers towards the team. Many other donations brought in by parents are matched by their employer. Combined this brought the team approximately 8,500 dollars.

The most significant expenses for the team are related to team competition entry fees and travel costs. Since *FIRST* Team 1983 is participating in 3 district competitions and the PNW Championship this year in order to maximize team experience, our expenses will be higher than the average team. We also plan to travel to St. Louis to either compete or volunteer based on the results of the district championship competition. Other significant expenses include robot manufacturing and shop tools and supplies. Further expenses include apparel with logos, which are largely reimbursed through concessions and student fees.

Appendix:

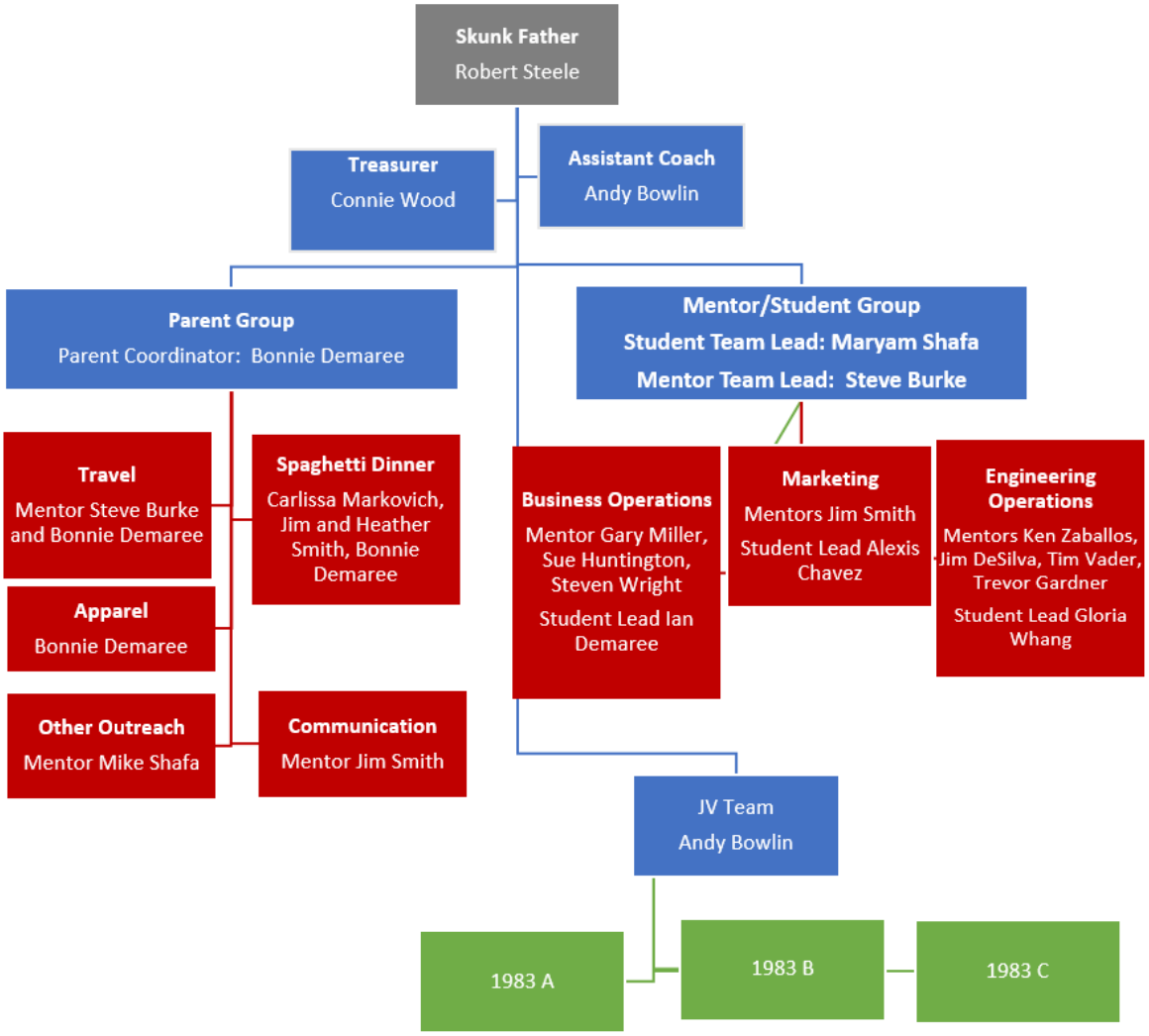

Figure 1 Team Organization Chart 2015-2016

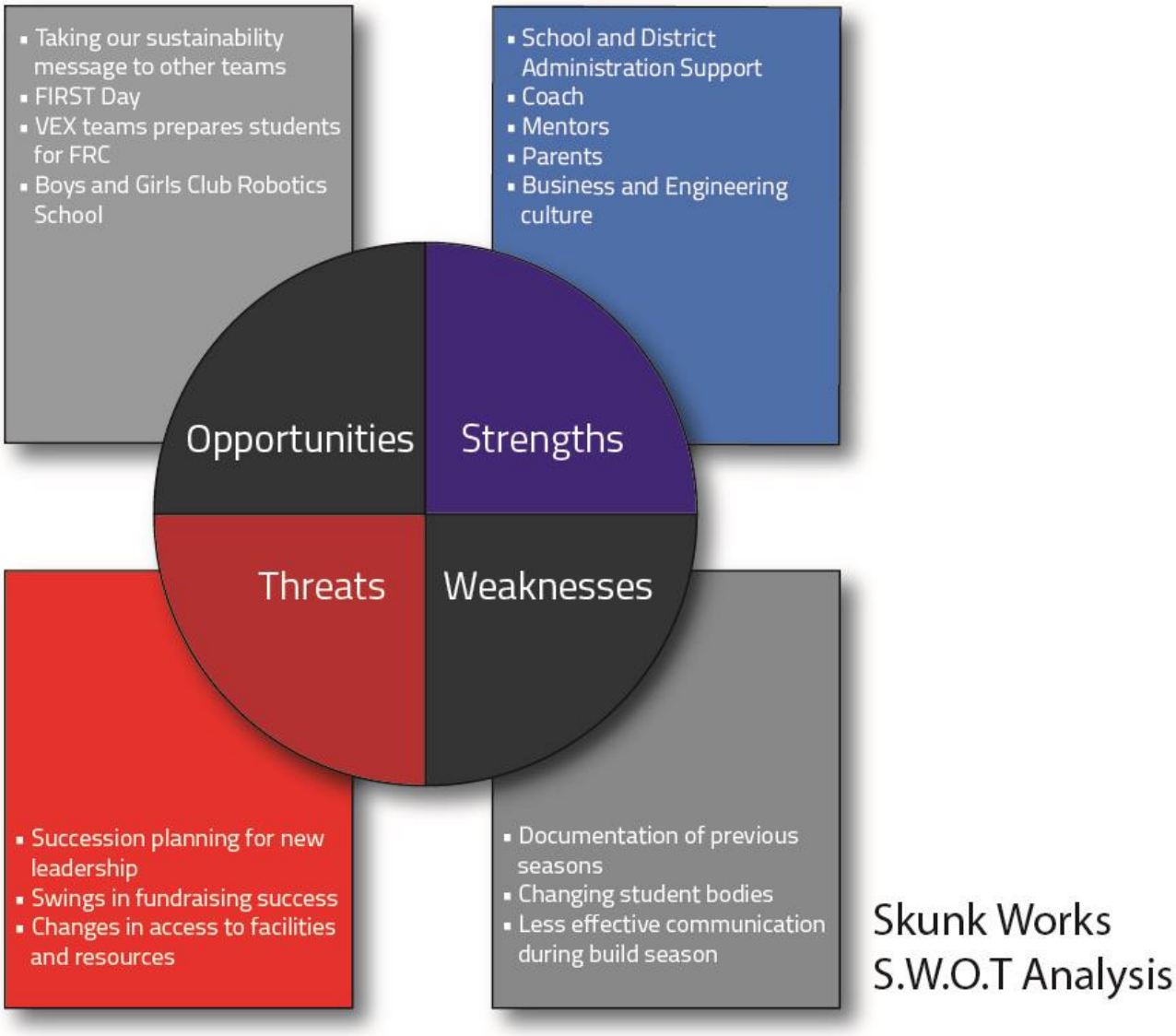

Figure 2 SWOT Diagram

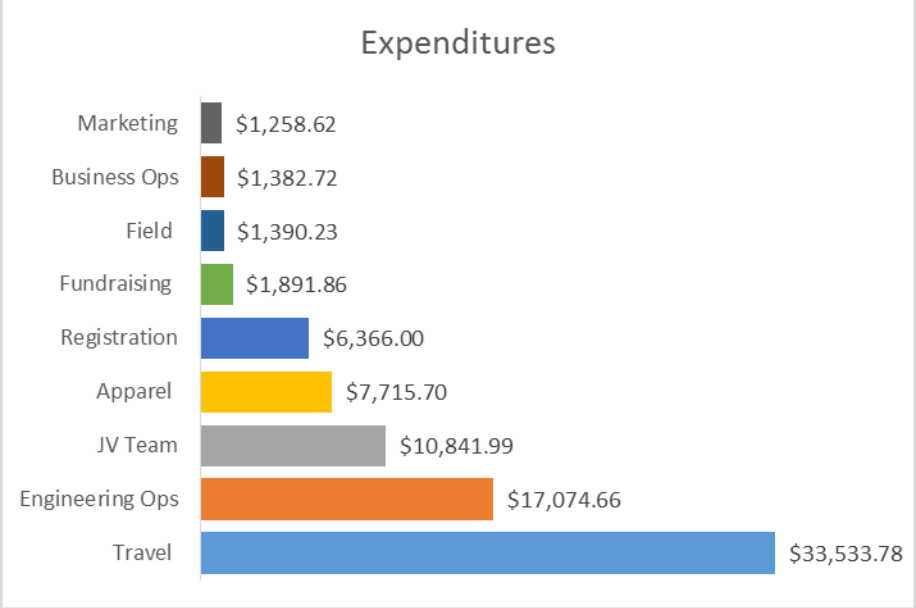

Figure 3 Expenditures for 2015-2016

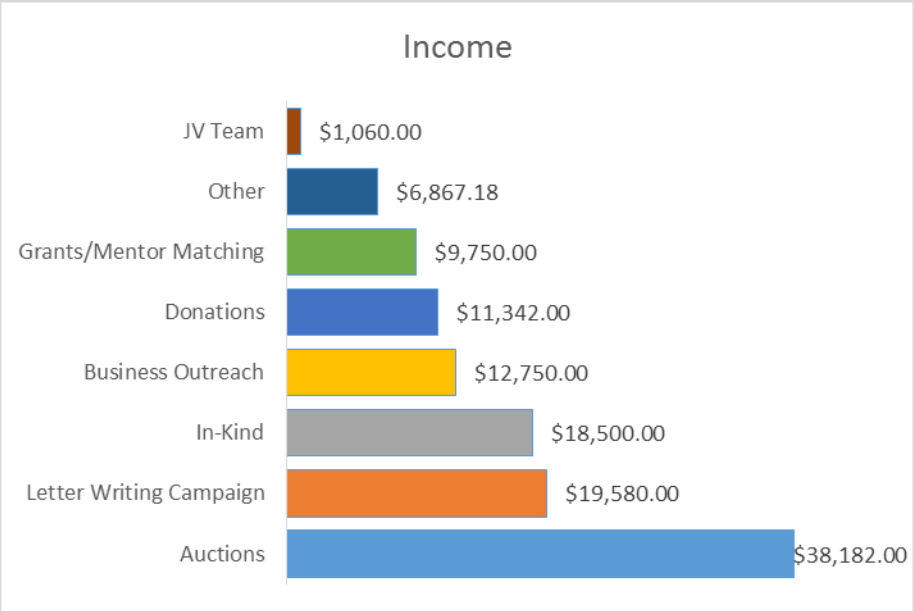

Figure 4 Income for 2015-2016

SKUNK WORKS ROBOTICS SPONSORSHIP

Regardless of which specific program is supported, all donations receive the following perks:

- Your Name announced at Competitions ... $5,000
- Your Name on Competition Robot ... $3,000
- Your Name on Banner ... $1,000
- Your Name on Team Practice Shirt ... $1,000
- Your Name on Website ... $500

Event Sponsors

- A plaque of your logo in our pit during the competition
- All Skunk team members wear a special pin with your logo at the event

District Competitions ... $2,000 per event
District Championship ... $3,000
World Championship ... $5,000

Pin Sponsor ... $1,000
- Your logo goes on the back of every pin

Pit Sponsor ... $5,000
- A banner with your logo is hung in our pit during every competition

Outreach Sponsor ... $2,500
- A banner about your partnership at outreach events

Pit Award Sponsor ... $2,000
- Pit awards feature "presented by your company"

Trailer Sponsor ... $1,500
- Your logo appears featured on the team trailer

Skunk-Tail Sponsor ... $750

All donations are tax deductible and handled through the Raisbeck Aviation High School PTSA which is a non-profit (501c3) organization. Make checks payable to **RAHS PTSA**. Send checks to:

Skunk Works Robotics
9229 East Marginal Way S
Seattle, WA 98108

(We can accept credit card donations through PayPal on our website: *www.ahsrobotics.us*)

Standard donations are also accepted.

The students who presented to you were:

Learn more about Skunk Works at ***www.ahsrobotics.us***
FIRST Robotics at ***www.usfirst.org***

Figure 5 Donation level form for sponsors

Revision Log

Rev #	Changes	Author	Mentor	Date
Rev New	Original Document	Stephanie H	Gary M	2008
Rev 1	Past, Present and Future Updated	Rebecca L	Gary M	2009
Rev 2	Past, Present and Future Updated, Graphics and Formatting, Budgeting Charts Implemented	Danny Z	Gary M	2010
Rev 3	Past, Present and Future Updated, Graphics, Formatting and Budget Charts Updated	Paula C	Gary M	2011
Rev 4	New Plan, Harvard-Based Business Plan Organization	Paula C	Gary M	2012
Rev 5	Edited Plan, Updated Information	Alex C	Gary M	2013
Rev 6	Edited Plan, Updated Information, Edited Executive Summary	Morgen S	Gary M	January 16, 2013
Rev 7	Edited all sections of plan, especially Team Structure, Outreach, and Strategies For Success	Morgen S	Gary M	January 26, 2013
Rev 8	Completely reorganized	Morgen S	Steven W	February 5, 2013
Rev 9	Continuing complete reorganization	Morgen S	Steven W	February 7, 2013
Rev 10	Checking for italics	Morgen S	Steven W	February 20,2013
Rev 11	Complete Overhaul	Ian D	Steven W.	2014

Rev 12	Edited Plan, Updated Information, Edited Mission Statement	Melissa W.	Steve Burke	2015
Rev 13	Edited Plan, Updated Information, Edited Mission Statement, Added Figures	Alex K.	Lydia J.	March 2, 2016