

2015 Business Plan



I. Introduction

Team 2537's 2015 business plan introduces the FIRST program, describes the history, philosophy and goals of the team, and details our business and technical processes, organization structure, relationships, team risks and mitigations and our budget.

The FIRST (For Inspiration and Recognition of Science and Technology) Robotics Competition (FRC) was founded to promote math, science, and engineering by engaging high school students in a "varsity sport for the mind." Atholton High School Team 2537, known as Space RAIDers, is one of over 5000 FIRST Robotics Competition (FRC) teams participating in this rigorous and exciting program. Our mission is to inspire young people to succeed in Science, Technology, Engineering, and Math (STEM) fields by providing an experience which inspires technical innovation and fosters well-rounded life capabilities, including self-confidence, communication, and leadership.

Each January a new competition is unveiled, and teams are given six weeks to design and build a robot which must function autonomously and semi-autonomously to accomplish a variety of tasks in a collaborative game. The robots are hand built each year and include student-designed arrays of motors, motor controllers, computers, and software to control them. The process includes requirements capture, design, prototype development, building, testing, and integration. Students apply academic skills such as calculus, geometry, physics, and software engineering, gaining experience in areas including business, project management, software development, systems, electrical and mechanical engineering, parts fabrication, and Computer Aided Design.

The 2015 game, Recycle Rush, is played by two alliances of three robots each. Points are scored by stacking totes, placing recycling bins on top of the tote stacks, or disposing litter. All pieces are reused or recycled materials so as to promote the recycling theme of the game. A large rectangular game field is set up with two identical sides in which an alliance.

There are two periods in the game, Autonomous and Teleop, in which robots try to score as many points as possible. During the fifteen seconds of the Autonomous period, the robots operate without the use of a driver in which the robot must be programmed to move independently. Points are scored by placing robots and yellow totes in the Auto Zone, the area in between the two scoring zones.

After the Autonomous period, the robots are taking over by the drivers for the remaining two minutes and fifteen seconds in the Teleop phase. During Teleop, the three robots in an alliance work together to create stacks of totes and then top them with green recycling bins. The tote stacks are not worth much by themselves, but when topped with recycling bins, the point values are multiplied.

Recycle Rush has three types of matches, practice, qualification, and playoff. In practice matches teams test their strategies and robots without impact on their points. However in qualification matches, points impact the team's rankings. Also during qualification matches, robots can stack yellow totes onto a step earning a large sum of points. However the points are not counted in playoff matches. During playoff matches eight alliances compete in a tournament to decide the winning alliance.

II. Team History and Evolution

Team 2537 was formed in 2007 with seven students and a handful of mentors. The modest wood shop at Atholton High School provided a place to meet and sufficient tools to build a basic robot. Half wood and chicken wire, the early robots were typical of a rookie team – reasonably functional and well intentioned. Through the years, the team continued, making progressively better robots and expanding in size, to about 50 students by competition season 2013. However, it remained as it had begun, essentially a robot building club.

Fall 2013 saw the birth of the new Team 2537. We wanted to become a true FIRST team, focus not just on engineering excellence but on FIRST values. We wanted to be a role model for other teams, expand our outreach, support other FIRST teams, and provide a well-rounded experience for all team members. We defined mission and vision statements, and set strategic goals. Winning the competition will always be a goal, but it is no longer our sole focus.

Today, Team 2537 includes 72 student members with diverse ethnic and socioeconomic backgrounds. Students on the team meet weekly during the non-build season, and meet for about 20-30 hours a week during the build season (early January through mid-March). Since this is a school sponsored program, a heavy emphasis is placed on “academics first”. Students are asked to commit a large number of hours to the build process, but must commit to focusing on their school work first. Students whose GPA is 2.0 or lower cannot participate in the competitions.

The large size of our team presents both challenges and opportunities. The number of students enables us to be a force multiplier that expands the impact of STEM in our community. We present at Girl Power, where more than a thousand young girls come every year to learn how they can succeed in STEM fields. In 2014 we attended three STEM Fairs, introducing hundreds of students and their parents to FIRST. We use these as opportunities to meet our County Council members and Board of Education representatives, and lobby for improved support for STEM.

However, with 20+ new students added to an already large team, it was a challenge to ensure that all team members got the most out of their FIRST experience. During the fall training season, we provided new team members with mechanical, software or electrical training, both hands on and student-led. The adult leadership also developed contests, such as a computer aided design contest and a simple mechanical design contest. Mixing training with friendly, fun

competition really engaged our newest team members. During build season we began an “apprentice” program, scheduling new students on a rotational basis. This allowed them to participate in the build process but not at the usual level of intensity.

Team 2537 has overcome many factors to make it to the competitions. This year has been especially challenging; with our school under renovation we did not have access to our lab for fall pre-season. Additionally we have our third faculty advisor in three years, and he is only able to support us part time, so we have worked closely with school administration to find other teachers willing to support our build hours.

Almost all graduates go on to major in STEM fields in college. Team alumni that have graduated from college are now working as software developers, mechanical engineers, and electrical engineers at places like the Federal Aviation Administration, Space Systems Laboratory, Epic Systems, and Dante Consulting. Team alumni still in college have had internships and co-op tours at places that include NSA, Microsoft, Amazon, Google, Naval Research Labs, Johns Hopkins Applied Physics Lab, and NASA.

To understand how our team designs, builds and competes our robot, watch the videos from our 2014 season on our YouTube Channel:

https://www.youtube.com/user/frc2537ahs/feed?activity_view=3

III. Team Awards

During the years from team beginning in 2007, through 2013, we won one award at a competition, an Innovation in Control Award in 2010. However, our team reinvention in the 2013-2014 season made a huge difference. 2014 was our most successful year ever. We won awards at all major competitions, described in greater detail below.

2014 Greater Washington DC Regional

The success of our rebranding and our improved financial controls and process were recognized by the judges when we won the Entrepreneurship Award at the Greater Washington DC Regional Competition. According to the first website, *“The Entrepreneurship Award Celebrates the entrepreneurial spirit of a team by recognizing a team that has developed the framework for a comprehensive business plan to scope, manage, and achieve team objectives.”*

We were proud to receive this award, because it highlights the changes we made last year to change ourselves from a robot club to a real FIRST team.

Additionally, we were part of the Finalist Alliance at that competition, missing an opportunity to go to the FIRST World Championship by one shot. (A student-made video showing highlights of this competition can be found on our YouTube Channel, called “Greater DC Regional”).

2014 Chesapeake Regional

At the Chesapeake Competition, one of our students won the Dean's List award, which recognizes student leadership, technical skill and service.

Offseason

At our two offseason competitions in the fall of 2014, we were the Alliance Captain for the winning alliance and the finalist alliance, respectively. These awards show the continued maturation of team process and capability as well as the success of our approach.

IV. Team Philosophy

Our philosophy is that this team is for all who want to join, so that we can introduce new students to the uses of applied STEM in a fun environment. We do not test or interview prospective team members. We fully embrace that the rookie member may not know how to code or work the tools. The only thing we ask is for them to dedicate their time to the team. We want to ensure we have the necessary equipment to provide every student with hands-on experience applying the latest in mechanical and software technology against real-world problems. Our preseason focuses on tool safety, and engineering principles. By the start of build season we are ready to launch.

As part of our team reinvention, we increased our efforts to support other FIRST teams, especially mentoring FLL teams. In 2013 we had one team member mentor one FLL team. This year almost 20% of our students mentor FLL teams, and we support ten FLL teams altogether. One team member was recognized with the "FLL Young Adult Mentor Award" at a recent FLL Qualifying Event and will compete for this title at the Maryland State FLL Championships later in February. The FLL team that he mentored also won the "Core Values" award at that event.

Additionally, our team takes great pride in our ability to maintain a well stocked pit at competitions to support other teams. Our pit equipment includes a band saw, drill press, and belt sander, which we use to help other teams repair their robots. This is part of our objective to embrace the FIRST values of "coopertition" and "gracious professionalism".

Team Vision, Mission Statement and Motto

Vision: Expanding the culture of engineering, leadership, and teamwork throughout the "space" of our community.

Mission Statement: Raiding "space" for innovative and new technological ideas to develop the future.

Slogan: Bright Stars. Bright Innovators. Bright Futures.

V. Team Organizational Structure

The Atholton Space RAIDers are sponsored by Atholton High School, as part of the Howard County Public School System. Mr. Brian Roache, the school's designated faculty advisor, has responsibility over the program. Mr. Roache is supported by the Atholton Technology Boosters Club who coordinates the administrative support to the team, including creating and managing the team roster, organizing the adult volunteer schedules, arranging meals, ordering uniforms, tracking financial information and team expenditures. The Boosters and the faculty advisor ensure compliance with FIRST, school and Howard County Public School System policies.

The Atholton FRC program is assisted by over 20 adult volunteers and mentors. While some mentors have students on the team, many do not; they find the opportunity to coach students in STEM to be so rewarding that they volunteer hundreds of hours in support. The team has had mentors that include professional engineers and computer scientists as well as project managers and doctors. Our current mentors include full time employees at NSA, NASA, Booz Allen Hamilton, Northrop Grumman, Johns Hopkins APL.

The 2015 Space RAIDers team organizational structure is shown below. Each student team lead and subteam has one or more mentors assigned to coach the students' work.



VI. Team Relationships

We are very proud of our new relationships with local FLL teams. This is an area of growth for us; we are in discussions with one of our feeder middle schools about beginning an FTC team there.

Much of our success in 2014 was based on a partnership we established with Team 1885, ILITE Robotics. This is a team we admire for their technical capability and their community outreach. In 2014, our robots' capabilities complemented each other and we were alliance partners in three of the four competitions. Additionally we built on our already strong relationship with Team 2849, Ursa Major, sharing build space, transportation to competitions, and help throughout the build season.

Every year the team demonstrates the robot to "feeder" middle schools and provides information about our team and about FIRST at New Student Orientation and Back to School Night. In the summer, the Tech Boosters organization sends flyers with team and FIRST information out to all the parents in the school. We also hold an Information Night early in the school year. This keeps a steady stream of new students coming in and it also helps us recruit new mentors.

Each fall our students contact last year's sponsors requesting continued partnerships, and reach out to new ones. This year we added two new sponsors to our list. We have visited our sponsor companies, and invited them to come into the school for a build session. Most of our sponsors support us year after year, and many of them also provide mentors. The money donated comes in to either the Boosters Club, the Howard County School System Office, or directly to the school.

Our business team creates newsletters each year for parents and sponsors. They contain pictures, status on build season activities, outreach events that we attended, team members and alumni bios, and more. These shows sponsors how their money is invested to improve the team and community. We have also added a blog to our website this year to keep our sponsors and followers informed about the design progress of our robot, and competitions we will be attending.

Finally, we are very fortunate in that several of the founding mentors are still with the team. Their children have long since graduated, but the mentors come back year after year, providing a rich history and extensive experience with FIRST. In 2012 we had eight active mentors, in 2013 that number rose to about 14, last year we had 20, and this year we have 25+.

VII. Team Facilities and Resources

Facilities

The Atholton Space RAIDers team uses school facilities located at 6520 Freetown Road, Columbia, MD 20144. The school features a fully equipped machine shop, CAD lab, large rooms such as the Gymnasium (for practice), and a computer lab. During the 2014-2015 school year, school renovations upgraded the facility; we moved back into the new lab spaces just in time for build season in January 2015. The actual FIRST competitions are held at a variety of venues nationwide, such as George Mason University and University of Maryland, College Park.

Resources

The Atholton High School Space RAIDers program has access to a number of resources provided by the school and by FIRST to aid in our program. The table below outlines those resources.

Resource	Description
Fully Equipped Machine Shop	Drill press, band saw, Grizzly, 3D printer, routers, CAD equipment, hand tools
Previous Year's Robots	Sample components, reusable parts, design principles
FIRST Resources	Every year at the Kickoff (first Saturday in January), FIRST Robotics provides a "kit of parts"—or a voucher for team selected parts—that can be used to help build the robot. They also provide or sponsor many online resources to help solve problems.
RAIDtech Website	Our website, http://first.raidtech.net , provides a forum for our team to post news, videos, and instructional material for and about the team. In 2014 we totally reengineered this site and have built upon that in 2015, with a small team of students and a mentor dedicated to the web work. Our goal is to better share our experiences, lessons learned and the outcomes from our program.
Documentation	The Atholton High School Technology Boosters Club, in collaboration with the school administration, has developed documentation to support team organization, team administration, and succession planning to reduce risk for future years as parents, faculty, and mentors leave the team. The team membership agreement and a draft team handbook have been completed; still under development is a parent volunteer handbook.

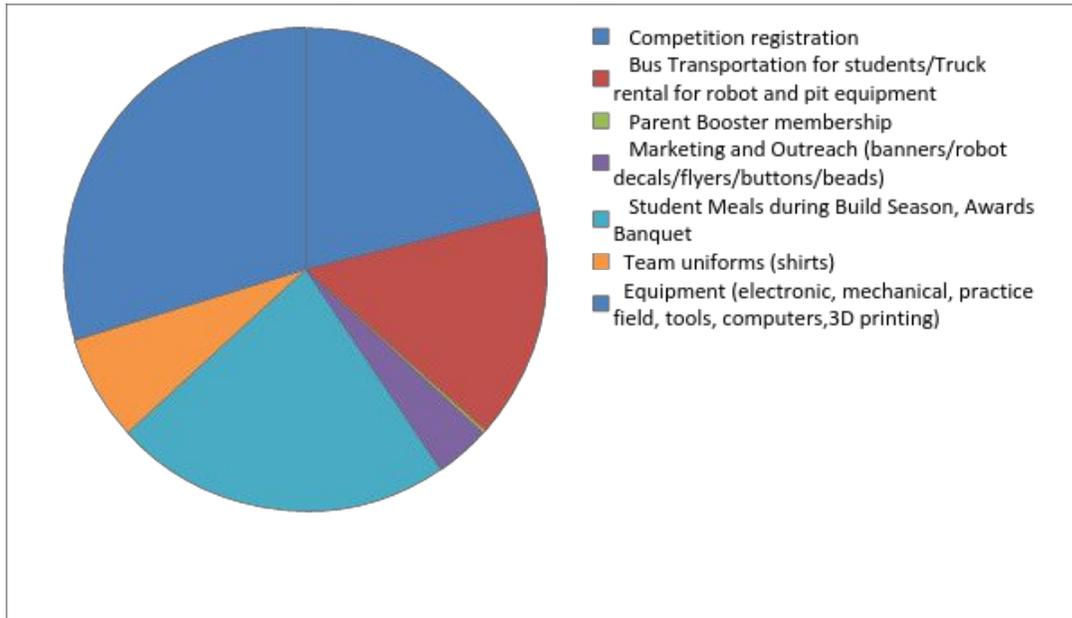
VII. Financial Statement

Our total budget in 2014 was over \$45,000, including competition registration, robot parts, transportation, marketing, meals, uniforms, etc. Expenses to date in 2015, with about the same sized team, are tracking similar to 2014.

In 2014 we cut our robot build costs in half, by limiting who can purchase robot parts and equipment, and by requiring prior approval from the Lead Mentor, the Faculty Advisor, the Tech Boosters president and the Tech Boosters treasurer for large purchases. The team Hardware Captain now performed a massive inventory of all tech lab spaces and discovered a great deal of equipment that we were able to re-use or share with other teams. We adopted a philosophy of "always try the least expensive thing first" and we now plan ahead to avoid

excess shipping costs. Other costs (meals, transportation, uniforms) have gone up due to the increase in team size, and are funded primarily by students and parents. Every year we document the final costs in each area, and then estimate next year's required budget based on those costs and changes in team membership.

Cost Categories for Annual Budget- 2014



EXPENSES	BUDGET	Comments
Registration Fees	\$9450	Chesapeake and DC Regional competitions, off season competitions
Parts/Equipment/Shipping	\$13310	for Protobot, Competition Bot, Pit and Upgrade of Drive/Development Computers (assumes reuse)
Transportation	\$6950	Bus: 6 days for competitions, truck for robot/pit transport
Meals	\$10150	Student and mentor weekend meals during build season, plus snacks, drinks, award banquet
Parent Booster Membership	\$95	Parent Booster for 501©(3) tax exempt status
Shirts/Uniforms	\$3180	
Marketing/Outreach	\$1660	Banners, buttons, brochures, handouts at competitions
TOTAL EXPENSES	\$44795	

The 2015 budget plan is based upon historical costs across the last several years, and expenses incurred during the 2013-2014 season, with approximately the same number of team members.

Activity/Estimated Cost	2015
Battle of Baltimore Offseason Competition Registration	\$150
IROC Offseason Competition Registration	\$300
FIRST Chesapeake Competition Registration	\$4000
FIRST DC Competition Registration	\$5000
Bus Transportation for students/Truck rental for robot and pit equipment	\$6950
Parent Booster membership	\$95
Marketing and Outreach (banners/robot decals/flyers/buttons/beads)	\$1660
Student Meals during Build Season, Awards Banquet	\$10150
Team uniforms (shirts)	\$3180
Electronic Equipment (Crio modules, motor controllers, sensors, lights, cabling, etc)	\$1500
Software (laptops, drivers, licenses etc)	\$500
Specific Robot Mechanism Equipment (Climber, shooter,etc)	\$3600
General Robot Parts/Equipment (second robot, practice field, shop expenses, tools etc)	\$5000
Drive Train	\$1000
Pit Equipment	\$500
Raw materials- aluminum, composite materials, non metallics, paint, etc	\$1000
Shipping	\$210
TOTALS	\$44795

VIII. Team Challenges and Risks

The Atholton Robotics team participation in FIRST Robotics faces a number of technical and administrative challenges. These are outlined in the following table.

Challenge / Risk	Mitigation
<p>It takes at least \$35,000.00 per year to successfully fund a Robotics program the size of Space RAIDers. This represents a significant fundraising challenge.</p>	<p>In order to ensure a continuing source of industry support for our program we've established a Fund Raising Committee to pursue all possible sources of funding, including grant applications such as this one.</p> <p>We have been remarkably successful in establishing and maintaining long-term partnerships with large and small regional technology companies. This is partly due to our communications and outreach to these companies, as well as the open invitations they have to visit us during build season, cheer us on at competitions and mentor our students.</p> <p>We are also planning and implementing fund raising opportunities such as concession sales, pizza sales, and sales of energy saving light bulbs.</p> <p>New in the 2014-2015 season is a "participation fee" , paid by parents or student members, which covers the costs of food during build season, as well as team uniforms.</p> <p>In addition, we completed a comprehensive hardware inventory last fall to ensure that we can reuse parts, and are creating Standard Operating Procedures to keep costs under control. Finally, we have begun working collaboratively with other FRC teams in Howard County to share fundraising ideas and opportunities. For example, in June 2013 we invited the Hammond High School FRC team to join us at the Howard County Tech Awards dinner, where we generated a great deal of interest in the program across Howard County technical companies. We also shared transportation with them to reduce costs.</p>

<p>Technical challenges to building complex robots for FIRST Competitions.</p>	<p>Atholton High School provides access to its shop resources—including a Computer Aided Design (CAD) laboratory, machining and manufacturing tools like 3D printers, Grizzly mill, drill presses, band saws and many hand tools.</p> <p>The team continues to recruit strong mentors from industry with backgrounds in fabrication, engineering, and software development to mentor the students. Interest in this is growing and we now have about 20 adult mentors.</p> <p>We are also working with the Hammond High School FRC team, the Howard County Board of Education, and the Howard County Council with the goal of establishing a county robotics lab where the six county FRC teams can share expensive lab equipment and resources.</p>
<p>Continued School Sponsorship</p>	<p>In order for the Atholton High School program to continue, we need support from the Howard County Public School System and Atholton High School in particular. Atholton continues to provide significant support to the team, viewing its members as the school’s “science athletes”.</p> <p>However, the time required to support the team during build and competition season makes it difficult for a single faculty advisor. Last year’s advisor, Mr. Sean Griffin, was promoted out of the school over the summer. Mr. Brian Roache has stepped in to assist, and he, as well as the AHS principal Ms. Jen Clements, are recruiting other school staff to ensure we can work through the necessary build season activities. The School Principal, Activities Manager, and the Howard County School board have gone on record as being dedicated to the long-term support of FRC Robotics activities at Atholton High School.</p>

	<p>The 2015 pre-season has been difficult as the school renovated the Tech Lab space where we work. This required creativity and flexibility to work through our normal pre-season team training. Luckily we are able to move into the renovated lab space just before build season 2015 starts.</p>
<p>Student Engagement</p>	<p>Continued student participation will be a vital component of the program's success. Due to the success of our student recruitment programs, the number of new students who joined the team in fall 2013 (39) was almost the total number of team participants in 2012. For the 2014 -2015 season we have about 50 returning members and 20 new ones.</p> <p>We expect continued growth in student participation as they see the value in enhancing their science and technology skills in preparation for college and careers in these fields. Team graduates typically receive academic scholarships, and are now pursuing engineering, math, and science degrees at Virginia Tech, University of Delaware, University of Maryland, Penn State, Rochester Institute of Technology, Case Western Reserve, Worcester Polytechnic Institute, Rose-Hulman Institute of Technology and UMBC, among others. In addition, our students participate in internships at places like Johns Hopkins Applied Physics Lab, NASDAQ, and NASA-Goddard, as well as in NSA summer programs.</p>

IX. Team Processes

We made many process changes during 2014 that contributed to our success. We are building upon these in 2015. These are described in more detail below.

2014 Technical Process Improvements:

Team 2537 has adopted a rigorous systems engineering and design process to build two robots each season, a prototype robot (dubbed “protobot”) and the actual competition robot, based on what was learned during the protobot build.

As soon as the game is announced, the students read the rules and start by playing the game in the gym, acting as robots, to understand the rules and the design tradeoffs, and develop the team’s game strategy. Next they develop requirements to meet that strategy, and break into subgroups to define different design approaches against these requirements. We have found that using inexpensive materials (wood, cardboard, Styrofoam, etc) to illustrate key design options is very useful to support the design decisions. We conduct a preliminary design review by the end of the first week or ten days, and began building “protobot”, using inexpensive materials to learn the details and prove the design approach. This process allows for iteration, lessons learned, and design tradeoffs to be evaluated before building the competition bot. With two weeks left in build season, we leave some team members continuing to build out protobot, while others start building the competition bot.

We believe there are multiple advantages to this approach:

1. It provides the team a platform for prototyping and experimentation, iterating through options that improve the design and performance of the final competition robot.
2. It provides more work for team members. With such a large team (70 members), building one robot does not provide enough work to keep all the interested students engaged.
3. It instills good engineering process in our students that they carry throughout their careers.

In 2014, we improved our robot design and build process in several ways, each of which was critical to our success.

- We used a Computer Aided Design (CAD) package to draw every robot component prior to building the final set of components. While in the past we have CAD’ed some subsets, we had never done it for the entire robot.

One team member made a video of this, showing the CAD drawing for each component and how it evolved into the final robot mechanism. This can be found on our YouTube Channel, called “From CAD to Bot”.

- We selected two designs for one of the key robot mechanisms, and assigned a team to develop each. The first of these was technically easier, the second we knew would be a challenge but if possible, would be very effective. Throughout the build season, these

were compared to determine which would be used on the final robot. Both worked well, making the choice difficult, but the more challenging one was selected. Not only did this provide an opportunity for an additional student leadership role and team, but the risk reduction approach provided a backup capability in the event of a hardware failure of the prime component.

- We took advantage of the school's 3D printer to print multiple parts of the robot, based on the CAD drawings. While we had to reimburse the school a few hundred dollars for the cost of the printer supplies that we used, this was much less expensive than custom fabrication.
- We used pneumatics on the robot. A small subset of team members and one mentor had taken on a summer project for a sponsor that required the use of pneumatics, so they learned about this and were able to teach others and apply that knowledge to the robot.
- We successfully and efficiently transitioned to using Java last year for all control software. This was led by an extraordinary group of students- the team lead who directed a large group of new programmers, and most surprisingly, two freshman, who developed and integrated the key software and became known as "the brains of the bot".

2014 Team Business Process Improvements:

Our Business and Outreach Captain defined and directed a total team reinvention. Her goal was to mature Team 2537 from a robot building club to a true FIRST team, focused not just on engineering excellence but on FIRST values. She directed her team to look towards the future while building on our past, hence the new name "Space RAIDers". She led a rebranding effort that included creating or updating the following:

- Team Mission Statement
- Team Vision Statement
- Motto
- Logo
- Team and mentor uniforms
- Pit Equipment and design.
- YouTube Channel to showcase the team activities and successes.

While this may appear to be form over function, in reality it created a new, very recognizable and distinctive team brand which enhanced the team reputation in the community and greatly improved the team spirit and enthusiasm.

Alongside the student-led reinvention effort, the Faculty Advisor, Lead Mentor and Tech Boosters officers instituted new processes for expenditures. We limited who can purchase robot parts and equipment, and large expenditures required prior approval from the Lead Mentor, the Faculty Advisor, the Tech Boosters president and the Tech Boosters treasurer. The team Hardware Captain did a massive inventory of all tech lab spaces and located equipment that we were able to re-use. We adopted a philosophy of "always try the least expensive thing

first” and we planned ahead to avoid excess shipping costs. These measures enabled us to reduce our robot building costs, which supported the decision to fund a new pit infrastructure. The old pit was rickety and unstable; the new one is modular so we can continue to add improvements in future years.

During build season, our solution to having such a large team was to create an apprentice program; we divided our rookies into the different sub teams, and the student team leaders scheduled shifts overlapping at Saturday lunch. By letting new students work shifts, we didn’t unsafely overcrowd our build space, and all of them were able to contribute in a meaningful way to the team.

X. Team Strategic Goals

Having achieved such success during the 2014 season, we defined a set of strategic goals to guide team activity during 2015 and beyond.

Supporting Other FIRST teams

We are known in the local FIRST community for our support to other teams during competition; we consistently provide parts, tools, fabrication and consulting services to help other teams get their robots back on the playing field. Additionally, as the team has matured, the proportion of the robot that is student built and programmed continues to increase. The mentors no longer do the majority of the work, but rather teach the principles and techniques that enable the students to build the robot and write the software to control it.

Team 2537 students are currently mentoring four local FIRST Lego League (FLL) teams within Howard County, and supporting six others with resources and consulting. One is in an elementary school and the other three are local middle schools. Our students provide technical experience and consulting, helping the younger students and the faculty advisors to build and program their Lego Robot. Studies have indicated that students who participate in these programs early on tend to continue to develop their interest in STEM fields, so this is something we would like to encourage.

We are in discussions with a local middle school about starting a FIRST Technical Challenge (FTC) team there, to take advantage of student and faculty interest. We would be providing consulting- both technical and business- as well as initial financial support. Given the level of interest in our program, we have also discussed starting an FTC team at AHS for incoming freshmen and possibly sophomores.

Additionally we have started to become more active in the local FIRST Robotics community, called the Baltimore Area Alliance (BAA). Team Mentors, students and alumni supported the BAA-run September 2014 off-season competition, as well as participating in panel discussions at BAA Education Day. We provided team experience, documentation and guidance to other teams that need help.

In June 2014, we joined other local FIRST teams at a Howard County Council/Board of Education joint meeting to lobby for additional support for FRC teams in the county. They offered suggestions and support for common work space, which has been a long term goal.

Competing in FIRST Competitions

Registration at these competitions is expensive but is integral to the FIRST experience, and we always use our sponsor logos on our robot and our pit banner to advertise their support for our team. One of our strategic goals is to build a cash reserve that would enable us to travel to compete at the World Championships.

Team Sustainability

We want to continue our focus on Team Sustainability. We began documenting processes in the 2013-2014 school year, formalizing a Membership Agreement, and developing a detailed Team Handbook that described the program, the commitment required, the processes, schedules, expectations, etc for new students and parents. In 2015 we are building on that by developing a Team Continuity Binder, including rosters, purchases, budgets, awards write-ups, etc.

Additionally, we are brainstorming approaches to build our sponsor base. In 2015, while we gained a few new sponsors, we lost several, mostly due to government spending cutbacks as many of our previous sponsors are government contractors. Team parents and the Tech Boosters are helping explore other avenues for funding and sponsors. The Tech Boosters have teamed with the AHS Music Boosters to support a stand at Orioles games, where the Tech Boosters receive a share of the profits earned whenever a tech Booster parent volunteers.

Alumni

We are improving our ability and processes to track our alumni. Currently they are a very active presence on our closed team Facebook page which is excellent for new members; they continue to provide guidance and advice from their college and/or workplace experience. However, we want to capture statistics on their post-Team 2537 experiences and how it has helped them. We are seeing this pay off already- we had nine alumni attend our kickoff this year, and seven alumni have come back to mentor the current team. Also, many of our alumni volunteer at local FIRST competitions, continuing to support the goals of the FIRST program.

Support to Other STEM activities

As the team grows and matures, so does our community involvement. We are starting to engage in more long term activities to help build and spread STEM principles. This is an area of growth for us; in the 2014-2015 season our business/outreach team is now about 15 students (up from one two years ago), so we have the capacity to do more, and are developing strategies for that.

We have discovered over the years that many students on our FRC team are also involved in other STEM clubs in the school. AHS offers multiple STEM-based clubs, including Mathematics Engineering Science Achievement (MESA), Science Olympiad, Rocketry, the Math Team, and a newly formed Cyber Security Club. We believe these clubs could benefit from our technical and fundraising experience and support. We hope to enable improved STEM experiences for AHS

students who do not participate in the robotics program, so are continuing to work with the Technology Boosters parents' organization to do this.

In 2013 and again in 2015, we demonstrated our robot to hundreds of young girls at JHU APL's GirlPower. In 2013 and 2014, we attended multiple STEM Fairs in the community. At the Howard County STEM Fair in June we partnered with other FIRST teams to illustrate the wide variety of programs that FIRST offers, and talked with Howard County Board of Education and Howard County Council members on the value of the program and on additional support need. This is where we want to focus, engaging decision makers and technology leaders in the community to improve community support for STEM initiatives.

XI. Summary

In 2014 we changed our team philosophy- from a robot building club to a true FIRST team. We rebranded, changing our name, our logo, our uniforms. We focused on expanding our outreach activities and on processes to ensure team sustainability. We continued to mature and build on these processes in 2015 and look forward to another successful competition season.