

Team 2537

2016 Business Plan



The Space RAIDers

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Introduction

The Point

Space RAIDers' 2016 business plan introduces the FIRST program, describes the history, philosophy and goals of the team, and details the team's business and technical processes, organizational structure, relationships, team risks and mitigations, and the team 2537's budget. It captures the team's past, present, and future.

The FIRST Program

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 the Space RAIDers, is one of over 3000 FIRST Robotics Competition (FRC) teams participating in this rigorous and exciting program.

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, wiring, 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 computer programming, gaining experience in areas including business, project management, software development, systems, electrical, and mechanical engineering, parts fabrication, and Computer Aided Design.

The 2016 Game

The 2016 game, Stronghold, is played between two alliances of three teams each, with each team controlling a robot. Each alliance works on damaging the opposing alliance's defenses by crossing over them. Additionally, each alliance can weaken the opposition's tower by shooting "boulders" into the goals located on the tower. The game is played on a rectangular field with each team having a side. Each side has a set of defenses as well as a tower.

The game is split into two time periods: Autonomous phase and Tele Operational phase. During the fifteen second Autonomous period, the robots operate without the aid of a driver. Instead, robots must be programmed to operate solely on their code. Points can be earned during this phase by reaching or crossing defenses as well as shooting boulders into goals.

After this fifteen second period, the drivers take over. This Tele Operational phase lasts the remaining 2 minutes fifteen seconds of the match. During this time, alliances work together to score goals as well as to weaken defenses. At the end of the match, robots can sit on the base of or climb the opposing team's tower to earn endgame points.

Team Philosophy

Team Mission Statement

“Raiding ‘space’ for innovative and new technological ideas to develop the future.”

This statement conveys how the team is focused on crafting new ideas to continue to evolve and progress in multiple areas. Examples include training new students in technical areas, expanding our presence on social media, and learning new technologies; for example, 2014 was the first time the team used pneumatics on the robot.

Team Vision Statement

“Expanding the culture of engineering, leadership, and teamwork throughout the ‘space’ of our community.”

This vision describes the team's values and how it works to spread these through community outreach activities such as demonstrating our robot at STEM Fairs, starting and assisting other FIRST teams, and working with elected officials to increase access to STEM programs.

Team Slogan

“Bright Stars. Bright Innovators. Bright Futures.”

This slogan illustrates the value that the Space RAIDers place on each individual on the team and how the team, the mentors, and the FIRST program helps to encourage students to set and achieve their goals.

General Philosophy

The team's philosophy is that the team should provide first- hand experience in STEM to anyone who wishes to join. When members wish to join, Team 2537 does not require an interview or a test. The Space RAIDers are willing to teach anyone who will dedicate their time, even if said person does not have prior knowledge. Instead of

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cutting inexperienced members, the team utilizes the fall preseason to train all team members via a new training initiative. By holding classes for team members that teach them the skills they will need, the Space RAIDers ensure that everyone will be able to participate fully during build season. However, encouraging STEM is not only for those who are already on the team; therefore, Team 2537 has placed emphasis on community outreach as well as on supporting other FIRST teams.

Team History and Evolution

Inception

Team 2537 was founded in 2007 with seven students and a handful of mentors. The team's early robots, while well-intentioned, weren't exactly picturesque. Over the years, however the team grew in both numbers and engineering prowess, eventually reaching about 50 student members in 2013. Yet, it remained what it had begun as: merely a robot building club.

Reinvention

However, during the fall of 2013, Team 2537 reached a turning point. The team underwent a reinvention, during which the team's philosophy and mission morphed from its previous viewpoint to a well rounded, full fledged FIRST team. While building a successful robot would remain an important goal, it would cease to be the only goal for the team. From then on, the team would make it their mission to spread FIRST values and aid other FIRST programs, holding them as every bit as important as just building a robot.

Today

This new philosophy has fully imbedded itself into the culture of Team 2537 during the past three seasons. The team has fully completed its alignment with FIRST values. The past season, for example, the team had 20% of its members mentor FLL teams. This year, the team started another team and participated in 14 separate outreach events.

Team Accomplishments

Dean's List

Dean's list award "celebrates outstanding student leaders whose passion for and effectiveness at attaining *FIRST* ideals is exemplary." Team 2537 is proud to have had Dean's List Finalists two years in a row.

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Entrepreneurship Award

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. The Space RAIDers are proud to have received this award two years in a row at the Greater Washington DC Regional.

Battle O' Baltimore.

The Battle O' Baltimore offseason competition which has about 30 teams, takes place every year in the fall. For the past two years, the Space RAIDers' alliance has won this competition.

The Team Today

Team Relationships

Relationships with team members, mentors, other teams, and the community are of the utmost importance to the Space RAIDers. This year, Team 2537 has strengthened its ties with its new team members by implementing the training program in the fall, which prepares them for the rigorous build season that awaits them and quickly integrates them into the team.

However, Team 2537 doesn't cease to care about its members when they graduate. The Space RAIDers actively attempt to keep in touch with their alumni, both inviting them to an alumni facebook group and inviting them back to mentor whenever they can.

One of the most important relationships the team has is with its mentors. Most of the team's mentors joined when they had students in the program, but many stay with the team even after their children graduate. Some are so enthusiastic that they recruit other mentors, who have no ties to the school. When asked why they stay, many mentors will mention particular students, who they continue to advise and support long after the student graduates. These relationships have brought several team alumni back as full time mentors - this year we have five alumni mentors.

The team has excellent relations with its sponsors - many of whom are long-term supporters. The team send out newsletters regarding our accomplishments which they greatly appreciate as it keeps them informed of the team's successes and the value of the FIRST experience for our student participants. Additionally, Team 2537 give back to our sponsors by supporting their community outreach events and festivals. Finally, one of the priorities for Team 2537 is to have relationships within the community. The team has accomplished this by attending 14 separate outreach events during 2015,

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where the Space RAIDers demonstrated the team's robot to audiences ranging from elementary school students to members of Congress. It is this relationship that allows the Space RAIDers to maintain consistent support every year.

Team Structure

The Atholton Space RAIDers program is sponsored by Atholton High School, as part of the Howard County Public School System. Mr. Greg Friedman is the school's designated faculty advisor and has responsibility for the program. Mr. Friedman is supported by the Atholton Technology Boosters Club, which consists of parents who have students on the team, and coordinates the administrative support to the team. In conjunction with the Lead Mentors, the Boosters and the Operations team oversee all team financial activities, track income, approve expenditures, and set the budget for each subteam.

In addition to these people, team 2537 is supported by over 30 adult volunteers and mentors. Many of these mentors and volunteers have students on the team, while others don't, choosing to volunteer hundreds of hours solely because they find coaching students in STEM to be incredibly rewarding.

In order to raise funds, the students reach out every fall to the previous year's sponsors to request continued support. Additionally, students research and contact new sponsors every year in order to expand the team's funding sources, and work with parent volunteers to coordinate fundraisers.

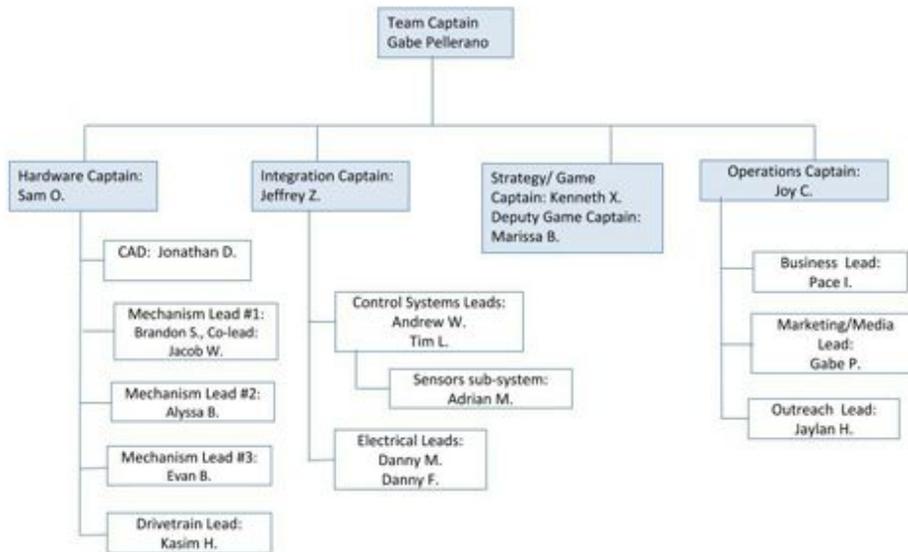
The team recruits new students each year by demonstrating the robot at New Student Orientation and Back to School Night. Team members also actively mentor FLL teams at feeder middle schools, encouraging them to join the team once they reach high school.

Team 2537 underwent multiple structural changes this year. The first of these changes was the creation of the control systems subteam. This subteam combined software and sensors in order to encourage integration between those two groups.

This year the Space RAIDers further fleshed out the Operations wing of the team via greater role specification. In addition to the previous Business and Outreach teams, a Marketing team was added to handle the creation of specific marketing materials. These subdivisions were then placed under the general group of Operations, which was elevated to an equal level as Integration and Hardware.

The specific separation of roles amongst the team is detailed in the chart below.

Team Structure 2015-2016



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. Table 2 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.
Team 2537 Social Media	Team 2537's brand new website www.team2537.com was rolled out in January 2016 and provides a forum for our team to post news, videos, and instructional material for and about the team. Led by a an alumni mentor, the team rehosted in Wordpress, to separate the site framework from the content management. Additionally in January 2016, team 2537 launched our Instagram account and a public facing Facebook page (the Space RAIDers

	continue to use the team’s closed Facebook page for internal team updates and communications).
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 team handbook were completed in 2014, and we now have a first draft of a parent volunteer handbook, with the goal of engaging more parents by defining specific and time-bound tasks that they can do to help the team.

Financial Statement

Team 2537’s total budget last year was over \$40,000, including competition registration, robot parts, transportation, marketing (including uniforms), meals, etc. To keep the costs low, Team 2537 continued its cost effective processes for purchasing parts. The team continued its philosophy of “always try the least expensive thing first” and planning ahead to help avoid excess shipping costs. These measures enabled the team to continue to maintain their trend of keeping robot building costs low. The general decrease in costs across the board from the 2014 season to the 2015 season reflects a general improvement in spending efficiency. The increase in competition budget includes funding that is allocated in case the team qualifies for attending District Championships and World Championship.

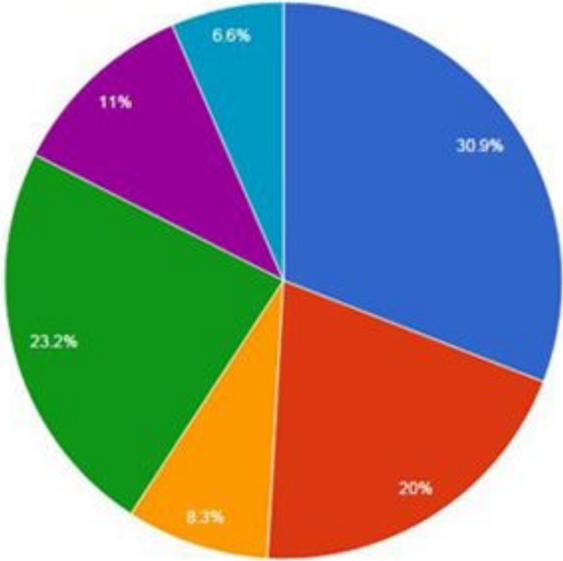
Comparison of Budget Distribution Between Years

Activity	Cost for 2013-14	Cost for 2014-15	Cost for 2015-16
Competition Registration	9450	10000	13450
Transportation	6950	4725	4725
Marketing	4840	3572	5000
Meals	8995	8603	10150
Parts	15944	13297	14500
Other	95	2819	100

Totals	46274	43016	47775
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Total Spending Breakdown

- Parts - \$13,297.48
- Meals - \$8,602.58
- Marketing - \$3,571.53
- Registration - \$10,000.00
- Transportation - \$4,725.00
- Other - \$2,818.72



Cost Categories for Annual Budget

EXPENSES	BUDGET	Comments
Registration Fees	\$13450	Includes two District competitions, two off season competitions, one Regional and Championship. Note that depending on team performance, we may not qualify to attend the Regional and the Championship.
Parts/Equipment/Shipping	\$14500	for Protobot, Competition Bot, Pit and Upgrade of Drive/Development

		Computers (assumes reuse)
Transportation	\$4725	Buses for competitions, truck for robot/pit transport
Meals	\$10000	Student and mentor weekend meals during build season, plus snacks, drinks, award banquet
Shirts/Uniforms	\$2500	
Marketing/Outreach	\$2500	Banners, buttons, brochures, handouts at competitions
TOTAL EXPENSES	\$47675	

Actual Expenditures from 2014-2015 Season

EXPENSES	2015 actual cost
Registration Fees	\$10000
Parts/Equipment/Shipping	\$14097
Transportation	\$4725
Meals	\$9721
Shirts/Uniforms	\$2209
Marketing/Outreach	\$2622
TOTAL EXPENSES	\$43014

Risk Analysis

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>The team has been remarkably successful in establishing and maintaining long-term partnerships with large and small regional technology companies. This is partly due to the team’s communications and outreach to these companies, as well as the open invitations they have to visit us during build season, cheer the Space RAIDers on at competitions and mentor the students.</p> <p>Team 2537 is also planning and implementing fund raising opportunities such as concession sales, pizza sales, and profit sharing with local restaurants.</p> <p>The team established a “participation fee”, paid by parents or student members, which covers the costs of food during build season, as well as team uniforms. This separation of funding and expenses ensures that grants and sponsor funding goes strictly towards robot build costs, competition registrations and transportation.</p> <p>In addition, the Space RAIDers maintain our inventory list to ensure that we can reuse parts, and continue to use our Standard Operating Procedures to keep costs under control.</p> <p>One new challenge for the 2016 season will be the changed approach to FIRST competitions in the Maryland/Virginia/DC region. They have</p>

	<p>moved from a Regional Model to a District Model. This means there are more, smaller competitions at which the team will compete. While the Space RAIDers can attend two District competitions for the cost of one Regional, the financial challenge is that the team must maintain the cash reserve needed to attend the Regional, even though the team will only go if the team qualifies based on the results of the District competitions.</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, bandsaws and 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 the team now has more than 20 adult mentors.</p> <p>The move from FIRST’s Regional Model to a District Model also presents technical challenges. The competitions at which the team will compete are earlier than we have been used to competing in the past. This means the team have less time to prepare for the competitions, so our build process must be more rigorous.</p> <p>The Space RAIDers were excited to support the establishment of STEMAction’s Shared STEM space in the Columbia Gateway office park in Fall 2015. Team 2537 was honored to be the team selected to demonstrate the team’s robot at the grand opening, where Congresswoman Donna Edwards</p>

	<p>not only met many team members but was able to drive the robot!</p>
<p>Continued School Sponsorship</p>	<p>In order for the Atholton High School program to continue, the team 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. The Space RAIDers continue to work closely with the school’s leadership and Tech Ed faculty to ensure the team have the staff support necessary so that the team can use the school as needed. 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>Managing Student Engagement</p>	<p>This is one area where the team has no issues; while some schools struggle to recruit students, the team has the opposite problem. The Space RAIDers’ challenge is how to give the large number of interested students a meaningful experience. The team eliminated the requirement for full time participation, enabling students to be a part of the team but not requiring them to be at every meeting. This tradeoff enables students to pursue other activities, while also having the FRC experience, but it requires more work for the mentors, who must define part-time tasks for these students.</p>

	<p>Once again this season the team has more than 70 students total on the team. The Space RAIDers continue to explore approaches to managing such a large team. Team graduates are now pursuing engineering, math, and science degrees at Virginia Tech, University of Maryland, Penn State, Rochester Institute of Technology, Case Western Reserve, Worcester Polytechnic Institute, and UMBC, among others. In addition, the team's students participate in internships at places like Johns Hopkins Applied Physics Lab, NASDAQ, and NASA-Goddard, as well as in NSA summer programs.</p>
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Future Outlook

Team Goals

As has been shown through this plan, Team 2537 has evolved and progressed considerably during recent years. However, this is not the peak for the Space RAIDers. Rather, this is a point of continued growth for Team 2537. In the coming years, the team will strive to accomplish greater goals such as hosting a summer school and creating a documentary. The team is creating a five year plan to document its strategic goals.