



Executive Summary

“To offer students and the community the experience of exploring real world engineering and business opportunities while cooperating with one another to produce a winning robot and inspiring an appreciation for science and technology.”

FIRST Team 687, The Nerd Herd, joined FIRST in 2001, two years after it was founded by three students at the California Academy of Mathematics and Science (CAMS) in Carson, California. The team has grown to become the powerhouse club at CAMS with a 20% school participation that allows for competing in FIRST and VEX World Competitions, mentoring 36 VEX teams and completing over 3000 service hours this year alone.

The team is entirely student run, allowing members to gain and develop leadership skills and hands-on experience in engineering and business. FIRST Team 687's structure allows it to tackle multiple tasks at once. The entire team is led by the Build and Administration Chairpeople and is further subdivided within the respective Build and Administration teams. The Build team consists of Articulation, Electrical, Drive, Programming, and Strategy sub-teams. The Administration team consists of the Administration and Media sub-teams. Student leaders and mentors oversee each sub-team. Every member actively participates in Outreach and Strategy in order to get more involved with the community.

FIRST Team 687 has won the KPCB Entrepreneurship Award every year since 2006. In 2008, Team 687 received the Judges Award and Woodie Flowers Award. Two years ago, the team won the Engineering Inspiration Award in Los Angeles and the Entrepreneurship Award at the Championship competition in Atlanta. At the Championship event in Atlanta, the team won the Entrepreneurship Award. The team won the Website Award in 2007 and has been commended with the Website Excellence Award every year. Due to continued success, Northrop Grumman, Raytheon, Boeing, Shell, Rhodia, Norris Foundation, and CAMS PTSO sponsor the team by providing supplies, mentors, and other useful resources. Beyond sponsors, FIRST Team 687 also hosts events such as Halloween Night, its yearly Halloween fundraiser, movie nights, and VEX competitions.

The team received a \$94,500 grant from State Farm in 2008 and a \$30,000 grant from the Norris Foundation in 2010 to fund its middle school mentoring program. Team 687 mentors a total of 36 teams, which consists of eight local middle schools and several Boy and Girl Scout troops. For the past two years, the team has mentored over 240 students in robotics and culminating each year with a middle school robotics competition. The team also holds annual robotics summer camps for over 100 students. Through mentoring, Team 687 promotes FIRST ideas and STEM fields in the community in hopes of inspiring motivated students to pursue careers in science and engineering.

FIRST Team 687 promotes FIRST through the media attention it receives. It promotes FIRST to the community through its events and emphasizing the importance of fundraising for FIRST programs to the local government. The team has been interviewed by the KTLA News twice and has been featured in several local newspapers and television programs. It also hosts annual events such as Bots by the Bay, a robotics showcase at the Cabrillo Marine Aquarium, where FIRST is introduced to the general public.

FIRST Team 687 always works towards achieving its goal of spreading enthusiasm for FIRST Robotics and the spirit of gracious professionalism while preparing students for careers in the fields of science, engineering, and business. Every year, Team 687 welcomes new members, sponsors, and the community to the FIRST family. Team 687 is an innovative team that demonstrates entrepreneurial spirit and has developed into a leader of FIRST that demonstrates



competence on many fronts. Team 687 has accomplished many goals since its inception eleven years ago. Through hard work, dedication, and innovation, CAMS FIRST Robotics Team 687 continues to strive towards new goals with a distinct strategy and drive.



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1. Organizational Plan

1.0 Organizational Plan

1.1 Mission Statement	FIRST Robotics and CAMS Robotics mission
1.2 Strategy/Strategic Relationships	Goals, Mentoring, Financial Success, Sponsors
1.3 Services	Community Service, VEX Competitions, and Fundraisers
1.4 Location	Build and Administration Meeting Locations
1.5 Management	Build, Administration, Outreach and Sub-team Responsibilities
1.6 Personnel	Requirements, Responsibilities and Training
1.7 Accounting	Incoming/Outgoing Capital and Expenses
1.8 History/Current Status	Description of CAMS 687 Robotics (1999-2011)

1.1 Mission Statement

“To offer students and the community the experience of exploring real world engineering and business opportunities while cooperating with one another to produce a winning robot and inspiring an appreciation for science and technology.”

1.2 Strategy

FIRST Competitions

The California Academy of Mathematics and Science (CAMS) FIRST Robotics team, Team 687, creates strategies based upon meeting its set goals. Its short-term goal is to perform well at the 2011 San Diego and Los Angeles Regional competitions, as well as at the FRC World Championship, which will be measured by two factors: robot performance and awards won. To do this, the team will re-examine performances and adjust strategies from previous years, as needed.

For instance, FIRST Team 687 Build sub-teams increase productivity throughout the season by increasing the number of meetings per week and addressing structural problems in the design process that impaired the robots capabilities in previous years. They also conduct pre-season FRC exercises to simulate similar experiences to the build season. These exercises often fine-tune the integration, design, testing, and implementation processes that will occur throughout the build season, therefore creating more design efficiency in creating the robot. Furthermore, the Administration sub-team revisits and revises its award-winning Business Plan, Guide to EntrepreNERDship, Guide to Media and Promotion, and Guide to Halloween Night, along with creating the new Guide to Fundraising. Creating new documents and updating existing guides allows the FIRST team to keep up with a more competitive 2011 roster of FIRST teams by adding entrepreneurial edge and exemplifying FIRST Team 687’s concern for sustainability. In addition to conceiving the guides, the Systems Engineers, with the help of Build leaders, also create a new Technical Data Package every year, prior to competition. The Data Package, which documents all of the robot’s parts, must be redone every year to fit with the new team robot. The Package helps other teams’ understand FIRST Team 687’s robot and helps future 687 members learn from our trials and successes so that they know how to build a functioning robot.

In the 2008-2009 VEX Season, Team 687 won second place at the VEX World Championship. The following season, four VEX teams qualified for the World Championship in Dallas, Texas.



Team 687 teams were continually acknowledged for their organized engineer's notebooks, innovative robot designs, and outstanding sportsmanship in the 2010-2011 VEX Season. For this reason, team members are encouraged to carry on good habits in keeping their notebooks updated and being creative with designs, with the hope that they will continue these habits during the FRC season.

The team had great success with awards during the 2008 FRC season, winning the Kleiner Perkins Caufield & Byers Entrepreneurship Award, Woodie Flowers Award, and Website Excellence Award.

The team's entrepreneurial victories in the past few years are the result of a new, comprehensive business plan and a complete renovation of FIRST Team 687's Guide to EntreNERDship, a guide created to outline team finances and sponsorship for new members and rookie FIRST teams. FIRST Team 687 Administration members and its business mentor edit the Guide to EntreNERDship, Guide to Fundraising, Guide to Media and the Business Plan annually. The team documents serve as a form of sustainability by prompting the team to record processes, clarify mistakes, analyze the budget, and re-evaluate the team goals. The team documents are also used as a strategy to accurately portray the team on paper at competitions, inform sponsors of the team's activities, and spread the word of FIRST to everyone who reads them.

Team 687's website has been renovated to improve accessibility problems, making the site is more user-friendly. Last year's website contained a simple layout and practical utility similar to 2007's multi-award winner website. The 2010-2011 website has been redesigned to conform to new CSS and Javascript standards, as well as to have a competitive entry for the website category at FIRST competitions. The website is designed to fit this year's FIRST Team 687 theme: The Nerd Network. It is intentionally designed to fit the latest trend of social-networking, Facebook, showcasing the team's desire to spread the word of FIRST to the community. It is easier to navigate with a horizontal menu and navigation bar, which includes more interactive content, and displays an animated interface. The website includes team events, current news, team profile, a media gallery, and more.

Community Service

FIRST Team 687's long-term goal is to increase the general public's interest in mathematics, science, engineering, business, and media while reaching out to future engineers and scientists in the community. To address these long-term goals, every team member actively participates in the Outreach program. Outreach coordinates middle school mentoring, summer robotics camps, and other community and media events. The FIRST team also presents their latest robot designs and promotes FIRST ideas at every event possible, such as Bots by the Bay, Univision's "Feria Deja Huella" hosted by Univision, and CAMS Showcase. All members must contribute at least ten hours of service learning to any robotics mentoring program each year. The team has completed over 3,100 hours of community service in the past year.

In the 2009-2010 Season, Team 687 received a \$30,000 grant from the Norris Foundation and has received more donations from the Foundation due to our growth, progress, and continuous outstanding performance. The team uses the money to continue the mentoring program, as well as to expand its mentoring program to middle schools in the city of Hawthorne. Furthermore, Team 687 plans on expanding the mentoring program to the city of Lakewood. It plans to continue its summer workshops to increase interest in robotics among middle school students who may want to pursue FIRST programs in high school or start programs at their middle schools. By reaching out to the community through the workshops, Team 687 has influenced a number of schools to start their own robotics teams. Most importantly, CAMS Robotics has



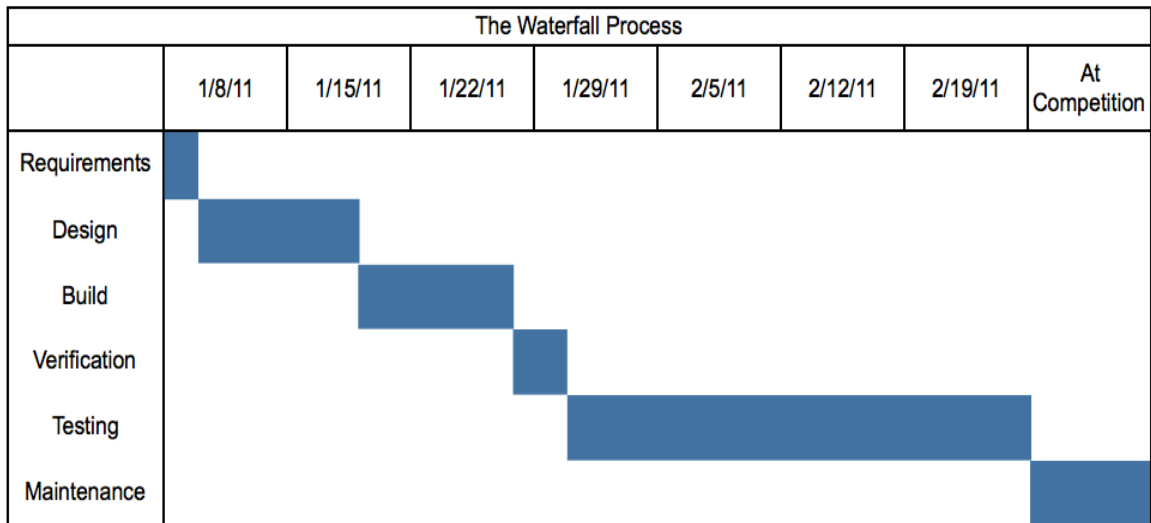
inspired hundreds of middle school students to pursue careers in engineering, mathematics and science.

In the 2010-2011 season, Team 687 founded a VEX robotics team at Magruder Middle School in order to spread the ideas of FIRST and VEX. Team 687 continues to spread the ideas of FIRST Robotics in the community. Casimir Middle School, with mediation from Team 687's current Build Chair, is in the process of implementing a robotics program.

Outreach operations grew tremendously in the 2008-2009 season. The team obtained a \$94,500 grant from State Farm, which went directly toward its mentoring program. Through these funds, Team 687 teaches the fundamentals of VEX Robotics to nearly 200 middle school students from 36 middle schools and several Boy/Girl Scout troops in Southern California. Team 687's grant allows it to host two VEX tournaments: one for high school students and one for middle school students. St. Luke's' VEX team, a middle school team that Team 687 helped create in 2006 and currently mentors, competes at CAMS VEX Competitions annually and has competed at the VEX World Championship since 2008.

Championship Qualification

Another one of Team 687's long-term goals is to qualify for the 2011 FIRST Robotics Championship. The aforementioned goals and operations all contribute to achieving this goal. Each sub-team gained new members and worked longer hours in the 2010-2011 season. The Build sub-teams implemented a VEX program in the off-season to get members to think creatively for the rigorous build season. In order to complete the overall goal, Build members plan to adhere to the Waterfall Strategy (refer to graph below). They are given six weeks to complete their goal and they plan to use their time efficiently by working six days each week.



FIRST Team 687 has applied for the Chairman's Award since 2006. The team has received increasingly prestigious awards, winning the Judges Award in 2008 and the Engineering Inspiration Award in 2009. FIRST Team 687 strives to win Chairman's this year, qualifying the team for the Championship in St. Louis.

Financial Success



FIRST Team 687 has annual goals that involve its biggest events, aside from the regional competitions: Halloween Night, Movie Night, and Summer VEX Camps. By hosting these events, FIRST Team 687 increased its revenue by \$400 during 2010 (refer to Financial Plan). The goal this year is to increase its revenue to \$3,000. The team will continue to increase publicity for the events and expand the meal options sold during events. To continue with the successful Summer VEX Camps, Team 687 will prolong its strategic relationship with Northrop Grumman, which provides scholarships for many campers. The team will work to publicize the event on a greater scale through the website, hosted events, social networking sites, and flyers. It will attract local media attention to report on the camps in an effort to gain more publicity.

Strategic Relationships

FIRST Team 687's most important relationships are those with Northrop Grumman, Boeing, Raytheon, CAMS Parent-Teacher-Student Organization (PTSO), State Farm, Rhodia, the Norris Foundation, and the Carson Advisory Panel. These companies and organizations are key sponsors whose investments in the team allow it to operate. Northrop Grumman and CAMS PTSO are instrumental in maintaining important events, such as Halloween Night and the CAMS/SMI VEX Tournament. As a sponsoring company, Northrop Grumman has donated funds to middle school teams mentored by Team 687. CAMS PTSO offers both sponsorship and parent volunteers for FIRST Team 687 events.

1.3 Services

Community Service/VEX Competition

One of FIRST Team 687's main priorities is to serve the community. The team works to establish a positive image in the community while increasing interest in mathematics, science, engineering, business, and media. Team 687's services to the community include the mentoring program, the CAMS/SMI VEX Tournament, and the Summer Robotics Workshops. The mentoring program has been successfully implemented in eight middle schools in Southern California and has resulted in the creation of 36 teams.

Through the mentoring program, Team 687 conducts three weeklong summer workshops in which team members are able to directly interact with middle school students and teach them how to build VEX Robots. Scholarships are awarded to students who are not able to pay the workshop price. Throughout the week, each team builds a robot that competes in a VEX Design Challenge. Beyond providing community service, CAMS Robotics offers an educational, safe environment for young students to engage in robotics.

Halloween Night

Another service CAMS Robotics provides is Halloween Night, FIRST Team 687's biggest fundraiser. This yearly event is held on the last Friday of October from 4:00-8:00 P.M.

The biggest attraction is the Haunted Maze, which is decorated with special sound, lighting effects, and protruding monsters in each dark corner of the room. The Video Game Room is filled with many popular video games, including *Halo 3*, *Dance Dance Revolution*, *Rock Band 2*, and *Guitar Hero 3*. The Movie Room is a popular hangout at Halloween Night because the showings are of recently featured movies. Both the Movie Room and the Video Game Room offer Halloween Night attendees an enhanced experience through surround sound and screen projection.



The team collaborates with two other popular CAMS clubs: BioMed Club and the National Honor Society. They host fun, unique, and educational themed rooms in order to fundraise for their organizations.

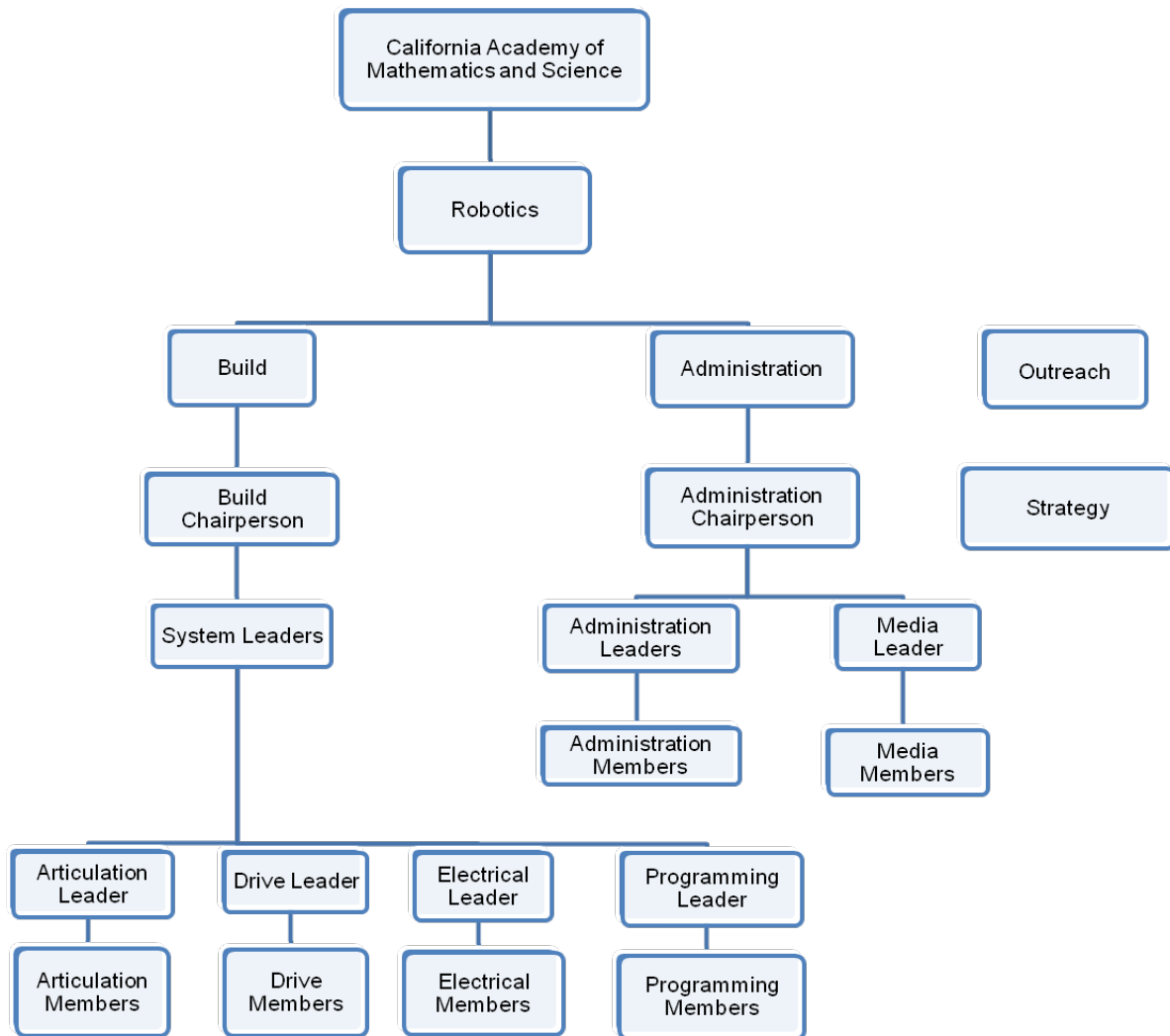
A new attraction, which was introduced to Halloween Night 2010, was the Psychic Reader. After paying for admission, attendants paid two extra dollars to get their fortunes told by a psychologist who is a Tarot Card Reading specialist. The Psychic Reader attraction replaced Halloween Night 2009's featured attraction, the Pie-in-the-Face event. The attendants paid an extra dollar for a raffle ticket and the winners were selected by a lottery-based system. The winners had the opportunity to throw a pie at one of the volunteered teachers or chairpersons. Due to new school regulations, FIRST Team 687 was not allowed to continue on with the Pie-in-the-Face attraction for 2010's Halloween Night.

This year, FIRST Team 687 sold a variety of Mexican cuisine provided by Chile Verde, pizza provided by Pizza Hut, and a variety of drinks. This appealed to a variety of people. CAMS PTSO and other generous parents donated desserts, such as pumpkin pie, a variety of cookies, Oreo cheesecake, and brownies.

1.4 Location

The location and facilities used to prepare our service and/or products are donated on behalf of CAMS. The Build sub-teams work in the machining room and engineering lab, a new facility specifically designed to meet the building needs of FIRST Team 687. The machining room contains new machines, such as CNC mills and lathes, which students learn to safely operate through machining classes. Students have access to the engineering computer lab, which is equipped with the latest computer programs to meet the design needs of members. The Administration sub-teams meet in the main computer lab, which is adjacent to the engineering lab, to work on team documents.

1.5 Management



The top positions in Team 687 are the Build and Administrative Chairs.

The Build Chairperson must coordinate weekly meetings, call emergency meetings, provide leadership to the club, oversee production, be an expert on design, work with team coordinators, and work with all leaders and the Administrative Chairperson.

The Administrative Chairperson must assist the Build Chairperson in fulfilling his or her duties, provide a vision and goal for each of the Administrative sub-teams, act as chief spokesperson for the club, provide support for the development of club activities, ensure that all Administrative sub-teams are on task, organize team documents, and submit all awards to FIRST.

The System Engineers ensure that all sub-teams meet the goals of the chairpersons. They direct Leaders and act as Chairperson if a Chairperson is not available to fulfill his or her duties. They also provide a means of communication between the sub-teams and branches of the team.



The Outreach Director creates and organizes outreach, service, and volunteer opportunities, provides mentorship to students interested in robotics and/or engineering, and communicates with the team coordinator to discuss Outreach plans. He or she also keeps track of the team's community service hours.

There are eight sub-teams, each with its own leader that oversees his or her respective sub-team and ensures success in meeting goals set by Chairmen and Systems Leaders.

The Administration branch has two sub-teams: Administration and Media. Administration handles the team's accounting, registration, travel plans, and written works. Media creates FIRST Team 687's award-winning website and designs the team paraphernalia.

The Build branch has five sub-teams: Articulation, Drive, Electrical, Strategy, and Programming. Articulation's responsibility is to manipulate the robot to surpass its obstacles. Drive designs and tests the drive mechanisms of the robot. Electrical is responsible for the electrical wiring and powering of the robot. The role of Programming is to create the "brain" of the robot, so to speak. The Strategy Director finds alliances at competitions and collaborates with them to find the best possible strategy to win the game. All five of the Build sub-teams use the Waterfall strategy and work simultaneously in order to achieve the highest level of proficiency.

In order to be eligible to apply for any management position, a member must have been on the team for over one year. Outgoing leaders review each applicant and decide which applicant is most suitable for the job.

1.6 Personnel

Members are recruited once a year through an application process. To apply for membership in FIRST Team 687, a student must have a GPA of at least 3.0 and maintain good stature with his/her teachers. Previous experience in a robotics, business, or media-related subject is not necessary for acceptance. FIRST Team 687 encourages all applicants to attend a training week in the summer so that each member gets a glimpse of what it is like to be on the team and what is expected.

During the summer training sessions, Administration applicants are expected to learn notable dates and accomplishments in FIRST Team 687's history, as well as gain an understanding of FIRST. Administration sub-team applicants are responsible for creating a mock business plan and preparing a presentation about FIRST Team 687 that is later presented to the Administration Leaders. Website/Media applicants initiate work on FIRST Team 687's website and design during this summer session.

During Build training week, the five sub-team leaders and team mentors train new members in the basics of articulation, drive, electrical, strategy, and programming, respectively. Additionally, they are taught safety regulations in the team's machining facilities. Lecture workshops are set up to help the new members better construct their robot in time for the mock tournament at the end of the week.

Outreach and Strategy are the only branches of CAMS Robotics that do not have a summer training session. The Directors are experienced members with regards to communicating on behalf of FIRST Team 687.

All members who complete training week and who still wish to join the team are accepted. New members choose their sub-teams early on in the school year under the guidance of an



experienced team member. To gain more experience, the members form teams and compete in VEX Robotics under the supervision of a current FRC leader.

Members are then expected to attend all meetings and asked to pay DUEnations. DUEnations are used for student transportation expenses and result from the team's inability to require members to pay a membership fee due to new state regulations.

1.7 Accounting

The Administration sub-team handles day-to-day accounting. The sub-team uses a ledger to keep track of incoming and outgoing capital. Furthermore, the Administration sub-team manages both the FIRST Robotics Team 687 account, which is kept through the school, and the team moneybox, which holds petty cash used for small purchases, expenses, and materials refunds.

1.8 Current Status

Recent Awards

Last season, FIRST Team 687 won the Entrepreneurship Award at both the San Diego and the Los Angeles Regionals. During the 2008-2009 Season, the team won the Las Vegas Regional Entrepreneurship Award and the Las Vegas Regional Engineering Inspiration Award, qualifying it to go to the 2009 World Competition in Atlanta. There, the team won the Entrepreneurship Award again. In the 2007-2008 season, Team 687 won the Entrepreneurship Award and the Woodie Flowers Award at the Arizona Regional and the Judge's Award at the Los Angeles Regional where the team robot came in third place overall. In the 2006-2007 Season, Team 687 won the Entrepreneurship Award at the Los Angeles Regional and the Sportsmanship and Website Awards at the San Diego Regional. In total, Team 687 has won over 50 awards with FIRST Robotics and VEX Robotics.

Current Outreach Operations

FIRST Robotics Team 687 has expanded its outreach operations to serve the community and develop the community's interest in mathematics, science, engineering, business, and media. Since 2006, Team 687 held Summer VEX Camps for nearly 200 middle school students. FIRST Team 687 has hosted six CAMS/SMI VEX Invitational Competitions in the past four years. In the 2007-2008 Season, Team 687 visited 6 middle schools during a two-month period. The number expanded to 10 middle schools in the 2008-2009 Season, when the team provided transportation for over 240 middle school students to receive mentoring for a three-month period in the fall. Currently, the team mentors eight middle schools and several Boy and Girl Scout troops, which totals to 36 teams.

Current Status

FIRST Robotics Team 687 currently consists of 110 members and resides on the campus of the California Academy of Mathematics and Science (CAMS). Team 687 hosts Halloween Night and the CAMS/SMI VEX Tournaments on the CAMS campus. As active FRC participants, FIRST Team 687 will compete at the San Diego and Los Angeles Regional Competitions in March 2011. The team continues to mentor eight middle schools as well as Boy and Girl Scouts and has 11 active mentors. The team will also hold its 6th annual robotics workshops in the summer of 2011.



2.0 Marketing Plan

2.0 Marketing Plan

2.1 Target Market	Team 687's Sponsors and Supporters
2.2 Marketing Strategy	Season Budget
2.3 Methods of Sales and Distribution	Fundraising Revenue
2.31 Distribution of Sales	Unitary Prices
2.32 Pricing	Reasons for Pricing
2.33 Sales Strategies	Transaction Methods at Fundraisers
2.34 Sales Incentives/Promotions	Incentives for Attendance
2.35 Advertising Strategies	Methods of Publicizing Events
2.36 Customer Services	Services Offered to Sponsors
2.37 Implementation of Marketing Strategy	Using the Business Plan
2.4 SWOT Analysis	Strengths, Weaknesses, Opportunities, and Threats

2.1 Target Market

CAMS FIRST Robotics Team 687 seeks to appeal to many sponsors, such as, but not limited to, the Carson Advisory Panel, the Parent Teacher Student Association (PTSO), the middle school students of the Carson area, and the California Academy of Mathematics and Science student body.

It is the goal of FIRST Team 687 to acquire the support of these groups, and with their assistance, spread the word of FIRST by means of their financial support and personal participation.

Sponsors

Sponsors make the largest financial contributions, providing machinery, administration supplies, and engineering facilities. They are a target group in terms of the team's need for a Business Plan to inform them about the team. In return, FIRST Team 687 promotes these sponsors by displaying their logos on the team website, apparel, robot, and display board. The team provides a new avenue of publicity that reaches to students, families, future engineers, and organizations like FIRST.

Carson Advisory Panel

FIRST Team 687 makes an annual presentation to the Carson Advisory Panel that includes representatives from large corporations such as Shell, Rhodia, and Boeing. The Panel provides insight, instruction, and assistance, as well as prospective sponsors for Team 687. In addition, the Panel helps us spread the message of FIRST to the city of Carson. By offering their support, they are acknowledging the importance of the FIRST message, and allowing the team to spread it to other schools and students.

CAMS Parent Teacher Student Organization (PTSO)

Apart from helping fundraise for the team, PTSO includes information and updates about the FIRST Team 687 in community newsletters. Additionally, PTSO assists with events and fundraisers, such as VEX competitions and Halloween Night held on the school campus.



Middle School Students

One way FIRST Team 687 spreads the FIRST message is through mentoring eight middle schools and several Boys and Girl Scout troops, totaling over 200 students. The team also showcases its robots at events, such as Bots by the Bay, Univision’s “Feria Deja Huella”, and CAMS Open House, to attract prospective students to apply to CAMS and join 687’s robotics team or to start a robotics team at their own middle or high school.

CAMS Students

FIRST Team 687 is comprised of 110 CAMS students. Additionally, the majority of the CAMS student body provides financial support at Team 687’s fundraisers.

2.2 Marketing Strategy

Every aspect of CAMS FIRST Robotics has a set budget. This allows the team to supply what is needed without excessive spending. The team’s budget is as follows:

Team Budget

Category	Description	Amount
<i>Registration</i>	San Diego Regional	\$ 4,000
	Los Angeles Regional	\$ 5,000
	+ Kit of Parts	
	+ Associated Materials and Support	
<i>Building Equipment</i>	Tools	\$ 5,000
	Materials	\$ 5,000
<i>Shipping</i>	Robot	\$ 500
	Building Equipment	\$ 500
<i>Travel</i>	Transportation	\$ 3,100
	Accommodations	\$ 3,000
	Dining	\$ 1,000
<i>Media</i>	Paraphernalia	\$ 900
	Cameras	\$ 500
	Poster	\$ 200
<i>Office Supplies</i>	Printing	\$ 100
Total		\$ 28,800

Travel expenses, such as transportation and hotels, also affect the budget. Money must be allocated for robot parts and the cost of registration for competitions. Promotional items that will be distributed at these events – buttons and alliance gifts – are accounted for as well.

2.30 Method of Sales and Distribution



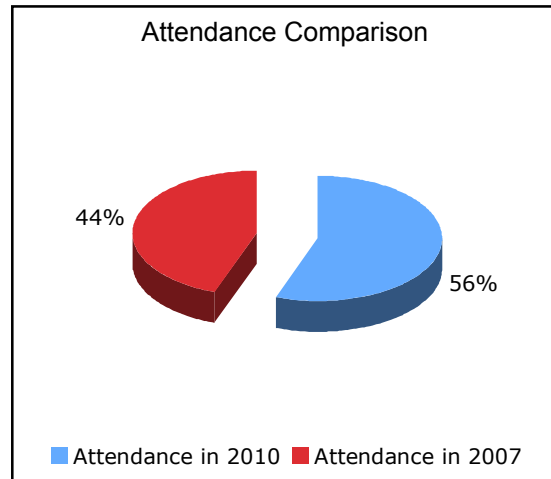
CAMS Robotics has three main types of events: Halloween Night, VEX competitions, and middle school mentoring.

Halloween Night

Halloween Night is the team's primary fundraiser. This event involves FIRST Team 687 members, CAMS students, parent volunteers, and members of the community. Halloween Night gives FIRST Team 687 the opportunity to inform the student body and the community about the team, while simultaneously attracting prospective members.

The chart on the next page shows the net revenue increase of the 2010 Halloween Night in comparison to the previous seasons, as well as the projected revenue for the next year. The team earned over \$3000 from Halloween Night this year. According to the pattern, the team will continue to make even more next year. Team 687 is constantly growing and will need additional revenue to support growth plans.

Halloween Night Attendance



The increase in profits implies an increase in attendance and financial support. The team has also seen that there was an improvement in marketing leading to an increase in sales. This will be sustainable through increased publicity, an increase in Halloween volunteers, and incentives for team members and attendants.

VEX Competition

The VEX competition is a CAMS Robotics-managed event for students from the eight local middle schools that Team 687 has mentored and any other interested middle school VEX teams. It is an excellent opportunity for the students to test the robots they have designed through Team 687's mentoring program, meet other robotics-oriented students, and learn how to improve their own design and build process. The opportunity introduces the students to the annual VEX game, the atmosphere of a competition, and Team 687. The VEX competitions are held on the campus of the California Academy of Mathematics and Science. It is Team 687's goal to increase middle school and student participation by 25% each year.



The VEX competition also includes a high school division, but this is limited to 32 teams. The winning teams of the CAMS hosted VEX competitions can qualify for the VEX Robotics World Championship, helping the teams gain knowledge and experience with robotics tournaments.

Mentoring

Team 687 mentors over 200 students and 36 teams at eight middle schools in the area, as well as several Boy and Girl Scout troops. Students, along with their robots, come to CAMS to meet with the team members and learn about engineering and publicity. Team 687 teaches the students about gear ratios, torque, speed, and other subjects vital to an efficient robot.

2.31 Distribution of Sales

Halloween Night

Members of Team 687 sell tickets to CAMS students and other members of the community. Presale tickets cost \$7, presale tickets including food cost \$10, and tickets bought at the door cost \$9. Additional food tickets cost \$5.

VEX Competition

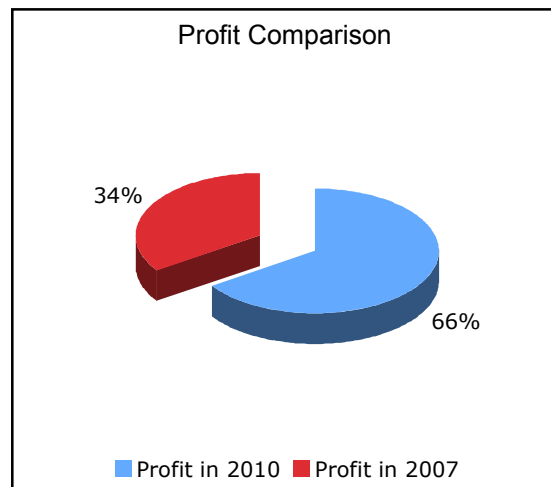
For the VEX competition, each competing team pays a \$50 registration fee and \$5 per student for lunch. More information regarding the competition can be found on the team's website: www.camsrobotics.org.

2.32 Pricing

The population of CAMS is comprised of full-time students, the majority of whom do not work. Taking that into consideration, CAMS Robotics assigned an affordable price for each ticket to produce sufficient income for the team. Therefore, the Halloween Night pricing of \$7 presale and \$10 at the door helped achieve this goal. \$985 was made from presale tickets, while \$726 revenue was made from at-the-door sales.

Food items were sold from \$1 to \$5 to acquire more revenue. \$675 was made from food sales during this event.

Halloween Night Ticket Sales





2.33 Sales Strategies

Halloween Night

CAMS students can buy tickets at the discounted price of \$7 before the event. This benefits both the team and the attendees because it reduces the waiting time to enter the event and allows check-in to run more smoothly.

Additional tickets are then sold at the door for the increased amount of \$9. This is an incentive for the students to buy tickets beforehand. Strategic ticket pricing results in increased income for the team.

Pasta and pizza are sold starting at 4:30pm due to new food regulations in schools. Affordable food items such as drinks, pie, and other snacks are also sold throughout the night.

VEX Competition

The middle schools that wish to participate in the competition are required to pay a \$50 registration fee for their first team and \$25 for any additional teams. This payment may be made online or by check. This event is usually advertised via flyers and websites for any interested teams. The funds raised by the registration fees are used to pay for the VEX kits needed for the new seasons.

2.34 Sales Incentives/Promotions

Halloween Night

As an incentive, CAMS teachers offer extra credit to students that attend Halloween Night. Furthermore, attractions such as video games, movies, and the famous Halloween Maze increase event attendance.

2.35 Advertising Strategies

FIRST Team 687's advertising strategies consist of the team's website, announcements in the school bulletin, flyers and posters posted throughout the CAMS campus, and word-of-mouth. These social networking methods allow CAMS Robotics to reach a wide audience. Additionally, the team advertises during the middle school workshops, summer camps, and showcase events.

2.36 Customer Services

FIRST Team 687 prides itself for its dynamic relationships with students on the team, mentored middle school students, the community, and its sponsors. The team bases its customer service on the principle of *gracious professionalism*[™] and *coopertition*[™]. FIRST Team 687's gracious professionalism encourages students to be helpful and polite, while maintaining ambition. The team's ultimate goal is to open the door for future generations of engineers, scientists, and business people. As a result, the team's interactions with the youth help foster lasting bonds, cooperation skills, team development, and good will between all teams.

2.37 Implementation of Marketing Strategy

The Administration sub-team implements effective communication and overall project planning and management for all business transactions. Implementation is one of the most essential qualities of CAMS Robotics. If the team does not accomplish the goals of the business plan, then the team will struggle due to the lack of structure. With the compliance of the rules set by the



Marketing Plan of the FIRST *Team 687 2010-2011 Business Plan* as well as the CAMS Robotics Constitution (refer to Appendix), CAMS Robotics effectively utilizes its marketing strategies and thrives as an organized team.

2.4 SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats)

FIRST Team 687 uses the SWOT analysis to examine our internal and external environments. By using the SWOT Analysis, both crucial and subtle information are laid out for the team. This analysis can identify FIRST Team 687 resources and capabilities to the competitive environment of the FIRST Robotics competitive program. The SWOT analysis is a fundamental tool that is used to develop our strategy for marketing, financial planning, community services, and sponsor interaction.

Strengths:

- **Communication:** FIRST Team 687's highly structured team can tackle several different jobs simultaneously while keeping great communication between all sub-teams.
- **Strategic Relationships:** The relationships, such as the relationships between Northrop Grumman and CAMS PTSO that help the team keep its operations running, help provide financial support as well as mentors, mentor support, and parent support.
- **Financials:** A ledger and portfolio are used to keep track of FIRST Team 687's financial growth and expenses.
- **Versatility:** An awards record is kept in order to show versatility, particularly in the non-build sectors of the team. The team has won an award at every regional it has attended since 2007.
- **Location:** The school's location in Carson, California, allows the team to have quick access to supplies. For example, delivery is not needed since the team can pick up supplies from Torrance Electronics and McMasters Carr. Additionally, the team has new facilities available at the school, in particular, a new engineering room that was donated by Northrop Grumman houses the team's machines and provides a building space.
- **Mentors:** The team is always finding ways to help increase mentorship. FIRST Team 687 has acquired eleven dedicated mentors who work in several mathematics, science, and engineering fields.
- **Experience:** FIRST Team 687 has participated in FIRST Robotics for 10 years and has grown to be one of the largest competing teams. The team's years of participation signify that there are experienced mentors that come back season to season, as well as many generations of Chairmen and Leaders to pass on the team's fundamentals and strategies. The team's experiences in competing in the build and non-build categories allow it to have a general knowledge of what is expected.

Weaknesses:

- **Time Constraints:** There is a lack of leisure time for the members of FIRST Team 687, since these are students that study a rigorous curriculum at the 22nd best high school in the nation, according to the U.S. News and World Report.
- **Extracurricular Activities:** FIRST Team 687 members take part in many extracurricular activities, resulting in reduced attendance at team meetings.
- **School Size:** The school does not have a normal public high school population. The population at CAMS is slightly over 600, meaning that there is less potential attendance at Robotics sponsored events, thereby reducing potential revenue. The school size also results in a smaller team.



- **Lack of Experience:** The team does not require new members to have any previous experience in engineering, business, or media. As a result, the team spends time training its members which could otherwise be used to help the team.

Opportunities:

- **FRC 2011:** The team's continued participation in FIRST Competitions will give it an opportunity to win more awards and to improve the robot's performance.
- **Community Outreach:** Outreach opportunities, such as showcases and open houses, are always available. FIRST Team 687 constantly searches for opportunities to talk to middle school students and educate the community about robotics, mathematics, science, and engineering. CAMS Robotics will seek more middle schools to mentor throughout the year in order to expand the ideas of FIRST.
- **New Fundraising Opportunities:** CAMS Robotics plans to expand its fundraising events beyond Halloween Night and Movie Night. Funds are raised by annual VEX Competitions held on the CAMS campus.
- **New Experiences:** Being a part of FIRST Team 687 broadens the horizons of its members by providing experience for potential careers. Scholarships are available to members through FIRST Robotics.

Threats:

- **CAMS Clubs:** Due to the dedicated involvement of team members in other school organizations, there is often less time that can be dedicated solely to the team. Event ideas, meeting times, and fundraiser attendance are compromised.
- **Financial Downturn:** The state of the economy plays a role in students, parents, and organizations that can donate to the team in order to keep it running. It also influences participation in events and fundraisers.
- **State Regulations:** State regulations that restrict food sales on school grounds reduce fundraising revenues for FIRST Team 687. New state regulations also prohibit school organizations from collecting member's dues, which has played a detrimental role in decreasing the team's funding.
- **Other FIRST Teams:** There is a constant threat of competitors at FIRST competitions. Each year, teams improve on their previous performance by building better robots, which will increase their potential of winning awards.



3.0 Operational Plan

3.0 Operational Plan

3.1 Current Product/Project Status	Season Summary
3.2 Manufacturing and Deployment Plan	Equipment and Machining
3.3 Information and Communications Technology Plan	Team 687 Website
3.4 Staffing Plan	Team Structure
3.5 Training	Teaching New Members
3.6 Selection Time Table	Application Calendar

3.1 Current Product/Project Status

The robot for the 2010-2011 Season was officially completed and shipped on Tuesday, February 22, 2011. Below is the design process used, uniquely different from the previous years in order to ship the robot by its deadline. Also listed below are the statuses of other projects by CAMS Robotics.

Design Process

FIRST Team 687 Systems Engineers, work in conjunction with the Build Chairperson and team advisor to create and execute an effective build schedule. The team meets two days a week during the preseason, which increases to six days a week after FRC kickoff in order to ensure faster productivity and ample time for the team to redesign any flaws found in the system.

Regardless, the team's combined efforts allow the team to ship a complete, working robot by the deadline. A key part of this year's design process is prototyping two major designs.

The CAMS Robotics design process follows a traditional systems engineering approach, dividing the process into three main tasks:

- The Requirements Analysis (Game Analysis)
- Functional Analysis
- Design Loop and Synthesis

The entire Engineering Process begins with a Process Input. In this case, FIRST Robotics acted as the customer providing the team with a list of constraints and missions. Following this input, a combined effort by the Systems Engineers, Strategy and mentor David Gaydosh resulted in the Nerd Herd's most thorough Requirements Analysis. Mr. Gaydosh, a System Engineer in practice, assisted the group in distributing every rule and requirement into a specific problem. The problems affected either the robot or the game play, including human and robot actions. The visual matrix, displayed proudly to the design team, guided the design process as a reference and inspiration. The Requirements Analysis Breakdown took only one day to complete and was actively updated to fit new rules and constraints.

The Design Loop is the second stage of the Nerd Herd build season. Upon completion of a brainstorming, or Functional Analysis, each function identified should be traceable to a requirement. The second stage of this product, which includes sketching, CADing, prototyping,



mapping code, etc., is the Design Synthesis Process. FIRST Team 687 created this detailed synthesis of only two designs by ruling out other systems via the Design Loop. The Design Loop process permits reconsideration of how the system will perform its mission, optimizing our synthesized design. After further prototyping and CADing, a single system is produced to maximize functionality within the time and fiscal budgets. The final stage of this loop is the synthesis of the complete robot. This is the longest part of the Engineering Process for FIRST Team 687, as it covers four weeks and will provide a complete System, Technical Data Package and Engineering Notebook.

The verification process occurred on all levels of the Build sub-team: Articulation, Drive, Electrical, Strategy, and Programming. In this phase, the solution is simply compared to the requirements previously stated. This includes anything as simple as robot dimensions to the ability to score on moving targets. Although each component is tested individually before attaching it to the system, this process includes testing the system as a whole. The majority of this period was given to the Programming team to calibrate the system to work with the camera, optical encoder, and other sensors. The Verification Phase was allotted less than one week due to overshooting the schedule for the Synthesis of the robot.

3.2 Manufacturing and Deployment Plan

The tools are centered on the new machining workshop, a recently built annex to the CAMS office as a result of Northrop Grumman's recent donations. This workshop contains tools such as:

- Screwdrivers
- Wrenches
- Chain breakers
- Saws
- Electric grinders
- Sanders
- Drill press
- CNC Mills
- Lathe Machines

Materials are stored in a large storage room located at the edge of the campus. Materials located within that vicinity are as follows:

- Various sizes of wood (2 x 4 - 5ft x 5ft sheets of plywood)
- Growing collection of 80-20 industrial erector set
- Extensive amounts of hardware
- Extra wheels
- Axles
- Robot parts
- Various parts from previous years

An assortment of robotics materials is stored throughout the CAMS campus. For example, the maze tarps used for Halloween Night, VEX Competition items, and various other materials that are only used seasonally are kept in a storage room on the CAMS campus.

3.3 Information and Communications Technology Plan



The CAMS FIRST Team 687's website, winner of the Website Excellence Award at the 2008 San Diego and Arizona Regional competitions, is open to the public. It contains general announcements for the CAMS Team 687 along with announcements for upcoming VEX Competitions and fundraisers. The website also has downloadable documents and flyers available to the team members or other FIRST teams.

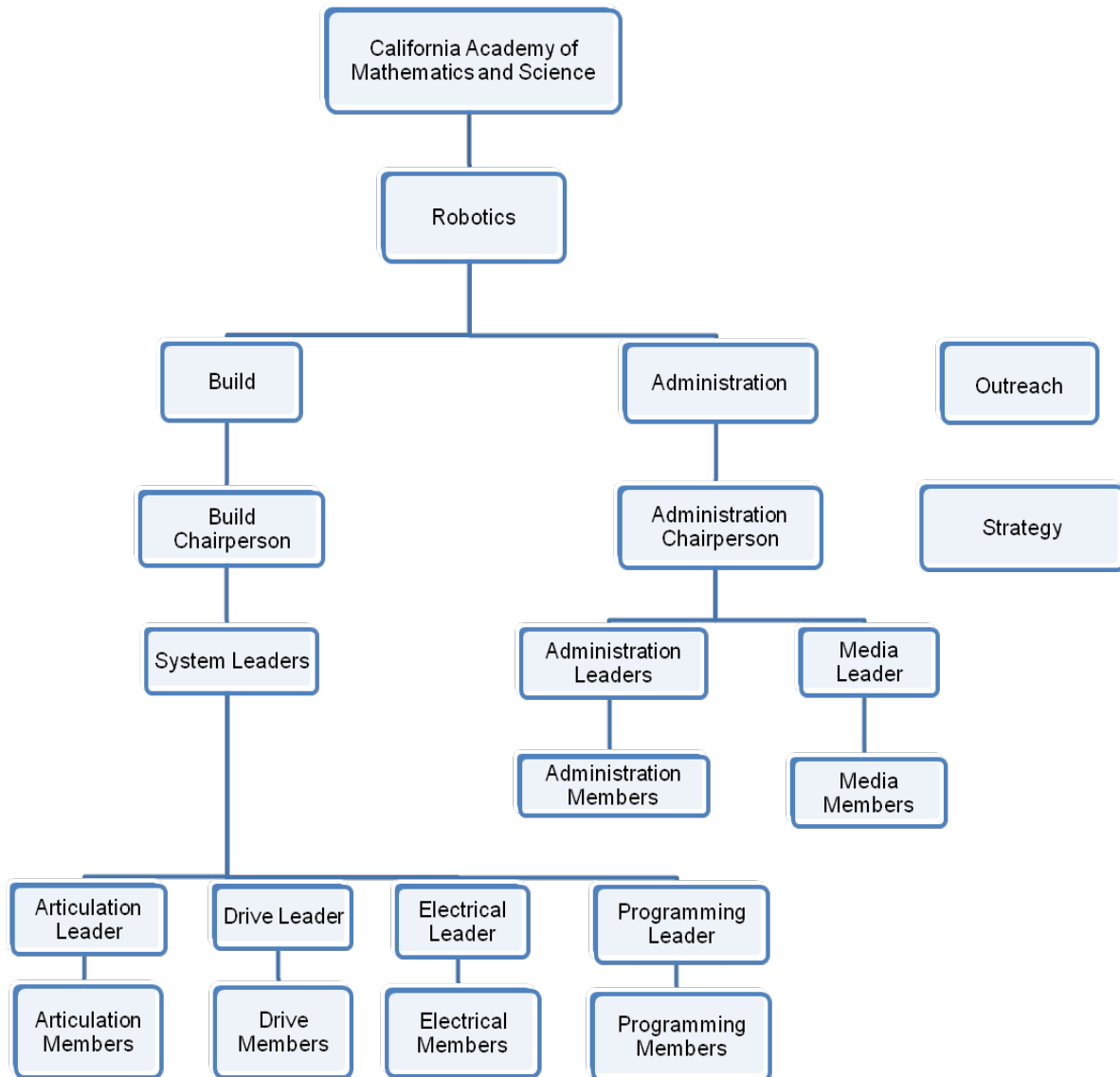
Most importantly, the CAMS Robotics website, www.camsrobotics.org, enables other FIRST teams, especially rookie teams, to contact FIRST Team 687 if they need help or have questions regarding the website and our award-winning Guides and Business Plan.

The CAMS Robotics team uses the website's domain from Wordpress. The CAMS Robotics team website is kept up-to-date using school provided software, mainly Wordpress, Microsoft Office, and Microsoft Project.

3.4 Staffing Plan

The CAMS Robotics management team consists of the Build Chair and the Administration Chair, System Engineers, Build and Administration Team Leaders, as well as their respective club members. Robotics members, along with parent and student volunteers, are utilized as organizers and workers for Halloween Night. These members and volunteers also assist the team during the annual VEX Competitions.

Team 687 Staffing



Build/Administration Chairpersons

The CAMS Robotics team has a management structure in which the Chairmen/women order, Systems Leaders oversee, and the Leaders execute the plans designated by the Systems Leaders. Being Chairperson, the most valued position on the team, entails making executive decisions in order to lead the team to success. Since there are only two positions available, chairs are chosen once a year through an exceedingly selective process. In this process, members apply for positions and their applications are reviewed by the previous season's Leaders to see if they are qualified for their desired position.



Systems Engineering/Administration

There are two Systems leaders in the CAMS Robotics Team. The Systems' job is to communicate the decisions that the Chairpersons decide as well as oversee each sub-team. Since there are only two positions open, depending upon the amount of sub-teams they must manage, the candidates must undergo a highly selective process. There is one systems leader for every three sub-teams in their respective category.

Build/Administration Leaders

CAMS Robotics sub-team Leaders are important because they instruct the members in completing specific tasks designated by the systems leader and chair. There are eight to sixteen positions available. Leaders in the CAMS Robotics Team are chosen once a year as well. In order to function, sub-teams must have a minimum of three members within their team. There is one leader for every three sub-teams.

Members

The member's job is to execute the tasks designated by the team leaders, system leaders, and chairs. Members must maintain a strong dedication to the team and maintain their efficiency in order to become a leader the following year. Members are chosen every year through an application process, as well as an interview by the team Leaders.

3.5 Training Requirements

There is no prior training required to join the CAMS Robotics Team. Prospective members who exhibit a high interest in robotics and dedication to the team are accepted. Experienced team members train new members throughout the season.

However, in order to be prepared for the upcoming season, new members must undergo a week of training during the summer, gradually exposing the members into possible fields in which they may be interested. These fields may range from programming and electrical work to business administration and website design.

Although the Build Team's members are the only members who will handle machinery, it is necessary for all members to undergo safety training. This training ensures that the members know how to operate machinery, behave in the workroom, and maintain safety practices. A test is taken at the end of the training to ensure that the members are properly prepared.

3.6 Selection Time Table

New members for the CAMS Robotics team are recruited near the end of each school year. The CAMS Robotics Team holds an informational meeting where prospective team members are introduced to the team. Applications to join the team are handed out and are due within two weeks of distribution. Applications are reviewed by the current leaders, and applicants are notified of their acceptance two weeks later, in time for the first official team meeting.



Selection Timetable for 2010-2011 Robotics Season (May)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					29	30
						Application Distribution Informational Mtg.
1	2	3	4	5	6	7
8	9	10	11	12	13	14
					Applications Due	
15	16	17	18	19	20	21
23	23	24	25	26	27	28
					First Team Meeting	



4.0 Financial Plan

4.0 Financial Plan

4.1 Key Investors	Team Sponsors
4.2 Funding Needs	List of Team Expenses
4.3 Attaining Financial Support	Increasing Sponsorship, Fundraisers
4.4 Financial History	Team 687's Past Expenses and Funds
4.5 Projected Cash Flow	Expected Revenue
4.6 Financial Forecasts	Projection of Future Revenue
4.7 Valuation	Summary of Current Team Finances

4.1 Key Investors

Most of the funding for the team comes from donations from sponsoring corporations. The Administration Team is responsible for raising money by making presentations to prospective sponsors. The Administration Team makes phone calls to businesses to inform them about FIRST Team 687's activities and get them interested in the team. For a more effective persuasion, the Administration Team presents to the contacted businesses. Although scheduling for presentations is difficult, the team displays a positive and professional appearance and, consequently, gains more support.

Additionally, members of the CAMS Administration Board and PTSO help promote and fund CAMS Robotics through fundraisers and promotional events. Corporations, such as State Farm, donated \$94,500 to CAMS Robotics to fund its middle school mentoring program. In 2010, the Norris Foundation donated \$10,000 to CAMS Robotics.

Due to our success, the team has key investors such as Northrop Grumman, Boeing, Raytheon, CAMS PTSO, and Rhodia, among others.

	Sponsors	Range of Endowment
Diamond	Northrop Grumman	\$ 3,000 +
	Shell	\$ 3,000 +
	Boeing	\$ 3,000 +
	Norris Foundation	\$ 3,000 +
Gold	CAMS PTSO	\$ 1000+
	Raytheon	\$ 1,000 +
Silver	Rhodia	\$ 500+
Bronze	Allegra Print and Imaging	\$ 250 - \$ 499
	Alphabet City	\$ 250 - \$ 499
	FedEx/Kinko's	\$ 250 - \$ 499



4.2 Funding Needs

The CAMS Robotics team needs funds for seasonal expenses and events such as Halloween Night and the robotics competitions it hosts. Money is needed for robot materials, travel expenses, and event registrations, as shown by the list below:

List of Expenses

Category	Description	Amount
<i>Registration</i>	San Diego Regional	\$ 4,000
	Los Angeles Regional	\$ 5,000
	+ Kit of Parts	
	+ Associated Materials and Support	
<i>Building Equipment</i>	Tools	\$ 5,000
	Materials	\$ 5,000
<i>Shipping</i>	Robot	\$ 500
	Building Equipment	\$ 500
<i>Travel</i>	Transportation	\$ 3,100
	Accommodations	\$ 3,000
	Dining	\$ 1,000
<i>Media</i>	Paraphernalia	\$ 900
	Cameras	\$ 500
	Poster	\$ 200
<i>Office Supplies</i>	Printing	\$ 100
Total		\$ 28,800

4.3 Attaining Financial Support

Although a majority of the funding is gained through sponsorship, it is also generated by holding fundraising events, by requiring a \$50 registration fee for VEX competitions, and by selling CAMS Robotics merchandise.

Some events include competitions and fundraising events held on our campus such as Halloween Night, VEX Competitions, and showcase events. Nerd Herd T-shirts, accessories, and meals are often sold during such occasions.

For small purchases, the team raises money through lunch orders during meetings each week. By selling low-priced meals such as pizza and a drink, the team is able to keep minor cash amounts for team use in the team's moneybox. This year's lunch revenue was \$300 which goes towards the end-of-the-year banquet.



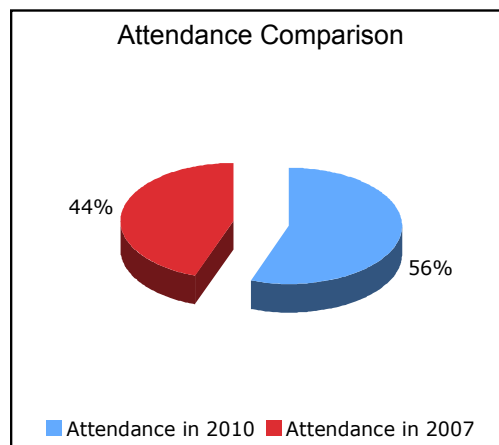
Halloween Night Profit

Item(s)	Withdrawal	Deposit	Total
Ticket Sales			
Ticket Materials*	\$ 0	\$ 0	
Tickets (Presale Week 1)	\$ 0	\$ 130.00	
Tickets (Presale Week 2)	\$ 0	\$ 855.00	
Door Ticket Sales	\$ 0	\$ 726.00	
Food Sales			
10 Boxes Pizza*	\$ 0	\$ 0	
Ice	\$ 10.00	\$ 0	
Chile Verde	\$ 0	\$ 0	
Burrito/Enchiladas*			
Desserts*	\$ 0	\$ 0	
Food Sales	\$ 0	\$ 675.50	
Miscellaneous			
Electrical Equipment*	\$ 0	\$ 0	
Tables/Chairs*	\$ 0	\$ 0	
Room Use*	\$ 0	\$ 0	
Maze Equipment*	\$ 80	\$ 0	
Advertising/Promotions*	\$ 0	\$ 0	
Total Profit			\$ 2,400

**denotes donated/rented items*

The profits from Halloween Night have increased from previous years due to increased donations from parents and students. Students were encouraged to attend by the success of previous Halloween Nights, in addition to the establishment of new attractions, such as Psychic Readers. Increased incentives, such as popular game systems and extra credit from teachers, also played a role in increasing the attendance, as seen by the following chart:

Halloween Night School Attendance History





4.4 Financial History

Having members pay dues in order to help pay for travel and material expenses has greatly helped FIRST Team 687. In 2010-2011, due to new district policies, the team is no longer able to enforce members to pay dues. To compensate for this, the team asks members for DUEnations, which are encouraged, but not enforced. In the past, over \$38,000 was made from member dues: \$14,440 during the 2009-2010 season, \$26,750 during the 2008-2009 season, \$15,500 during the 2007-2008 season, \$13,500 during the 2006-2007 season, and \$9,000 during the 2005-2006 season. Last year's Halloween Night raised \$2,300 and \$2,400 was raised this year.

4.5 Projected Cash Flow

Cash flow is the most critical indicator of business success. At no point does FIRST Team 687 run out of funding. All future growth is based upon a debt-free internally funded process. Attainment of targeted sales revenues for Halloween Night as well as assistance from sponsoring businesses will ensure the accumulation of required cash to execute expansion plans as presented. Plans can always be curtailed or postponed in the event of future sales shortfalls.

4.6 Financial Forecast

The CAMS Robotics has grown at an average of 37 members per year. Therefore, it is estimated that the team will reach at least 140 new applicants next year. Due to budget restrictions, CAMS Robotics will emphasize the importance of recruiting hardworking, dedicated members when selecting new members.

The Administration members' DUEnations are \$150, whereas the Build members' DUEnations are \$250 because of their use of team equipment and machinery. It is our prediction that there will be a possible revenue of \$30,000 made from members dues in the upcoming year if the team continues to grow.

Profit for Halloween Night has steadily increased in the past several years. Therefore, assuming a consistent rate of increase, the team will receive \$3,000 in total profit in the upcoming season.

Money is also attained through lunch dues taken every Saturday during Robotics meetings. This season, the Robotics team made \$300 in lunch revenue. This money will go towards the end-of-the-season CAMS Robotics banquet.

4.7 Valuation

The CAMS Robotics has grown from 92 members last season to 110 members this season. Halloween Night was the most successful to date, raising approximately \$2,400. The food sold at Halloween Night was donated, and the members of the CAMS Robotics, which increased income, brought in other materials.

CAMS Robotics funding has steadily increased over the past few seasons, showing that the team is growing financially. If this pattern of fiscal growth continues, CAMS Robotics will be financially stable. Therefore, decreasing the need to fundraise and increasing focus on the robot. More funding also ensures greater success and enables the team to extend its mentoring efforts.



5.0 Appendix

5.0 Appendix

5.1 Club Constitution	Robotics Club Constitution
5.2 Team 687's 2011 Robot Statistics	Summary of Robot Features
5.3 Mentoring	List of Mentored Schools
5.4 Awards	Past Awards
5.41 FIRST Awards	List of awards since 2007
5.42 FIRST Tech Challenge Awards	Awards for the FTC Competition
5.43 Remotely Operational Vehicle Awards	Awards for the ROC Competitions
5.44. VEX Awards	Awards from VEX Robotics Competitions

5.1 CAMS Robotics Constitution

PREAMBLE

We, the members of the California Academy of Mathematics and Science Robotics Club, in order to establish a foundation of engineering and business in students, educate members in said fields, expose members to real-world engineering design process, promote teamwork and cooperation, and provide a corporate atmosphere for administration, do ordain and establish this constitution for the California Academy of Mathematics and Science Robotics Club.

Article I. NAME AND LOCATION

Section 1. The name of this club shall be the "CAMS Robotics Club."

Section 2. Club meetings shall be held on a weekly basis in Room 1006, as well as the 5000 Machining Room and Computer lab, on Monday and Wednesdays, from 4:00 P.M. to 6:00 P.M.

Article II. OBJECTIVES AND PURPOSE

The purpose of CAMS Robotics shall be to offer students the experience of exploring real world engineering problems while cooperating and communicating with one another to produce a winning robot. CAMS Robotics will work towards its goal by:

- A. Enhancing skills in specific areas by designating members to specialized sub-teams
- B. Working in small groups, thus promoting teamwork and cooperation, and
- C. Competing in the FIRST Robotics Competition (FRC).

Article III. MEMBERSHIP REQUIREMENTS

Section 1. Membership for the CAMS Robotics Club is open to students in grades 10 and up, provided they are not on academic probation.

Section 2. Prospective members must submit applications the CAMS Robotics Chairs at the end of each year.



Section 3. Adults with expertise in engineering and/or business may join the CAMS Robotics clubs as “Mentors.” Mentors do not have to submit applications, but must consult the Team Coordinator in order to obtain mentorship. Mentors are not eligible for club offices.

Section 4. Members are required to inform their respective sub-team leaders directly of a planned absence at least 24 hours prior to the next meeting. Methods to contact leaders include, but are not limited to, phone calls, e-mail, instant messages, text messages, or in person.

Article IV. CLUB DUES

Section 1. It is not mandatory for members to pay Club Dues in order to gain membership into the CAMS Robotics Club. However, donations in the form of dues from the previous years (from 1999 – 2009) are accepted.

Section 2. Donations are greatly appreciated, but shall be non-refundable.

Section 3. Donations shall cover costs for members to attend FRC regional events.

Article V. OFFICERS, ELECTIONS, ELIGIBILITY, AND PRIVILEGE

Section 1:

The officers of the CAMS Robotics Club shall be the Build Chairman, Administration Chairman, Systems Engineer(s), Director of Outreach, Director of Engineering Strategy, Administration Leader(s), Media Leader, Articulation Leader(s), Electrical Leader, Drive Leader(s), and Programming Leader.

Section 2: Only students may serve as officers. Officers must have been a member of robotics for at least one full season.

Section 3: Officer Elections will consist of the following two-step process:

1. Application - Prospective officers shall complete the Application for CAMS Robotics Leadership. An application deadline shall be established, announced, and written on the Application for CAMS Robotics Leadership.
2. Deliberation - The application is due for review by the current CAMS Robotics Club Officers. Club Officers shall hold a meeting to discuss the candidates and their applications. Only Club Officers shall cast votes, and only these votes shall count toward the computation of the 50% required margin for election to office.

Section 4. Club officers shall be elected by the month of May and will serve a term lasting one year.

Section 5. In order to be recognized as a sub-team leader, each qualified member must have at least three sub-team members to mentor.

Article VI. DUTIES OF OFFICERS, TERMS

Section 1. The duties of the Build Chairman shall include:

- A. Overseeing all engineering aspects and operations of the team



- B. Coordinating the weekly meetings of the club with the Administration Chairman
- C. Co-chairing all meetings of the club
- D. Calling emergency meetings, pursuant to Article X, Section 3
- E. Acting as the co-chief spokesperson of the club
- F. Working directly with the Team Coordinator to ensure the club is operating within the expectations of CAMS and FIRST
- G. Ensuring that all Build sub-teams are on task and meet all deadlines
- H. Providing a vision, set of goals, and guidance for each of the sub-teams
- I. Working directly with the Administrative Chairman to ensure that the team consistently meets expectations on both sides of the team

Section 2. The duties of the Administration Chairman shall include:

- A. Overseeing all non-engineering aspects and operations of the team
- B. Coordinating the weekly meetings of the club with the Build Chairman
- C. Assisting the Build Chair with all meetings
- D. Calling emergency Administration meetings, pursuant to Article X, Section 3
- E. Acting as the co-chief spokesperson of the club
- F. Working directly with the Team Coordinator to ensure the club is operating within the expectations of CAMS and FIRST
- G. Providing a vision and goals for each of the Administration sub-teams
- H. Ensuring that Administration sub-teams are on task and meet all deadlines
- I. Working directly with the Build chairman to ensure that the team consistently meets expectations on both sides of the team

Section 3. The duties of the Systems Engineer(s) shall include:

- A. Supervising build teams to ensure that all tasks are completed in a timely manner.
- B. Communicating directly with build team leaders to develop plans and goals for each of the sub-teams.
- C. Ensuring that all leaders are informed of the activities and progress of other sub-teams.
- D. Creating an inventory of tools and robotic parts.
- E. Understanding the rules of the season's game.
- F. Understanding all aspects of the robot.
- G. Reporting all information to the Build Chair.

Section 4. The duties of the Director of Strategy shall include:

- A. Aiding sub-team members in the formulation of strategies for robotic gaming.
- B. Reviewing game rules and procedures with all sub-team members.
- C. Communicating with the Systems Engineer to maintain a unified working experience.

Section 5. The duties of the Director of Outreach shall include:

- A. Creating and organizing outreach opportunities.
- B. Providing mentorship to students interested in robotics/engineering.
- C. Communicating with the Team Coordinator to discuss outreach plans.

Section 6. The duties of the Administration Leader(s) shall include:

- A. Executing plans provided by the Administrative Chairman
- B. Acting as a liaison among administrative teams to promote teamwork and cooperation.
- C. Documenting the activities of all sub-teams.



- D. Aiding the Administrative Chairman in reviewing award entries.
- E. Handling and organizing all paperwork.
- F. Distributing secretarial tasks among sub-team members.

Section 7. The duties of the Media Leader shall include:

- A. Updating the club website regularly.
- B. Teaching sub-team members the necessary knowledge to edit and manage a website.
- C. Providing the club with forms of media for presentations, publicity, and/or historical records.
- D. Creating animations for an animation award entry submission
- E. Producing videos of club members and activities

Section 8. The duties of the Articulation Leader(s) shall include:

- A. Constructing the articulated components of the robot
- B. Mentoring all sub-team members in the building process.
- C. Communicating with the Systems Engineer to maintain a unified working experience.

Section 9. The duties of the Drive leader(s) shall include:

- A. Creating and maintaining the drive system of the robot.
- B. Calculating how much torque and speed is necessary to prepare the robot for competition.
- C. Mentoring all sub-team members in the building process.
- D. Communicating with the Systems Engineer to maintain a unified working experience.

Section 10. The duties of the Electrical leader(s) shall include:

- A. Teaching Electrical sub-team members how to strip, crimp, and solder.
- B. Designing, configuring, and wiring a space-efficient electrical board.
- C. Supplying the robot with power.
- D. Communicating with the Systems Engineer to maintain a unified working experience.

Section 11. The duties of the Programming leader(s) shall include:

- A. Teach object-oriented programming language C, C++, Java, and LabVIEW
- B. Implement the concepts to write and test code that executes autonomous and formatting operator control actions.
- C. Communicating with the Systems Engineer to maintain a unified working experience.

Article VII. IMPEACHMENT OF OFFICERS

In the event that an officer is judged to be deficient in his/her duties (as decided by a unanimous agreement of the three other club officers and advisor), he/she may be removed by a two-thirds vote of the club's membership. The Advisor shall oversee the impeachment process to ensure a fair and speedy trial.

Article VIII. VACANCIES IN OFFICES

In the event that an officer takes a leave of absence from the Club, his/her position will be assumed by the co-leader. If there is no co-leader, a qualified sub-team member may assume the position. If there are no qualified sub-team members, the respective Systems leader shall oversee the sub-team.



Article IX. BUDGETING AND FUNDRAISERS

Section 1. The budget shall be determined in the beginning of each year by the Chairmen and the Administrative Systems leader(s). Approximately half of the club's budget will be allotted to the Build teams, with the other half being allotted to the administrative teams.

Section 2. Reimbursements shall be issued by the Administrative Chairman, Administrative Systems leader(s), or Administration Leader. In order to receive reimbursements, members must show proof of purchase by providing a valid receipt.

Section 3. Prospective fundraisers must be approved by the Administrative Chair and Administrative Systems leader(s) before seeking approval by the Associated Student Body.

Section 4. All fundraisers must follow the guidelines set by the Associated Student Body and the Long Beach Unified School District.

Section 5. All transactions are to be recorded by way of receipts and ledgers.

Article X. CLUB MEETINGS AND MINIMUM NUMBER QUORUM

Section 1. The club shall meet on a weekly basis. General meetings shall be held every Monday and Wednesday from 4:00 P.M. to 6:00 P.M. Leader meetings shall be held every 7th period during Physics 195 taught by Dr. Jim Hill. Meeting dates are subject to change at any time.

Section 2. The Team Coordinator and at least one leader for every seven members must be present at every general meeting.

Section 3. In the event that an emergency meeting needs to be held, the chairmen of the club shall have the authority to arrange such meetings. The chairmen shall inform the club of the meeting using at least one of several methods, including, but not limited to, e-mail, public announcement, conversation, phone calls, and text messages. The chairmen reserve the right to appoint a Systems leader to announce news of emergency meetings. The chairmen also reserve the right to limit emergency meetings to specific audiences.

Article XI. PARLIAMENTARY AUTHORITY

The rules of parliamentary practice set forth in *Robert's Rules of Order* shall govern all proceedings of this organization, subject to any special rules which have been or may be hereinafter adopted.

Article XII. AMENDMENTS

Section 1. Amendments may be made to this constitution at any time by a two-thirds vote of the Club officers and approval from the Team Coordinator.

Section 2. Members interested in proposing amendments to the constitution must submit the proposed amendment to the Administrative Chairman.

Section 3. The proposed amendment shall be presented at the following Leader Meeting where the amendment will be debated.



Section 4. Upon receiving a two-thirds affirmative vote in favor on a constitutional amendment and approval from the Team Coordinator, the Administrative Chairman shall submit the amendment in writing to the Associated Student Body for approval.

5.2 Team 687's 2011 Robot Statistics

General

- Weight: 119.5 lbs.
- Width : 27.25 in.
- Length: 37.25 in.
- Height: 56.5 in.
- Height with arm extended: 106 in.

Drive/Chassis

- Mecanum Drive System
- Double Kit-bot Chassis
- 4 8" Mecanum wheel
- 4 CIM motors
- Direct output from Toughboxes
- 12.75: 1 Gear ratio
- Omni directional movement

Articulation

- Double jointed arm: elbow and shoulder
- Gas Spring
- 2 Banebot motors: RS-550
- Claw with pneumatics
- Deployment system with drawer sliders and pneumatics
- Minibot with 2 DC Drive motors

Programming

- Speed control on Drive System
- Controlled by Xbox controllers
- Line trackers
- Camera
- Limit Switches

Other

- ABS Plastic used for electrical board
- Vinyl protects electrical components from damage
- Polycarbonate used for decoration and sponsor logos

5.3 Mentoring

Carnegie Middle School – 1 team
Casmir Middle School – Unofficial team
Hamilton Middle School – 5 teams
Lindsey Middle School – 6 teams
Powell Middle School – 5 teams
St. Luke Middle School – 2 teams
Stephen M. White Middle School – 5 teams

5.4 Awards



5.41 FIRST Robotics Competition

	Award	Year	Location
1	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2007	Los Angeles, CA
2	Sportsmanship Award	2007	San Diego, CA
3	Website Award	2007	San Diego, CA
4	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2008	Phoenix, Arizona
5	Woodie Flowers Award	2008	Phoenix, Arizona
6	Judge's Award	2008	Los Angeles, CA
7	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2009	Los Angeles, CA
8	Engineering Inspiration Award	2009	Las Vegas, Nevada
9	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2009	Atlanta, Georgia
10	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2010	Los Angeles, CA
11	Kleiner Perkins Caufield & Byers Entrepreneurship Award	2010	San Diego, CA

5.42 FIRST Tech Challenge

1	LA Connect Award	2009	1st
2	Finalist Alliance Award	2009	

5.43 Remotely Operated Vehicles (ROV)

1	International Competition Explorer	2008	3 rd
2	International Competition: Poster Display	2008	1st
3	9th Annual Southern California Fly of 2009	2009	1st
4	RANGER	2010	1st

5.44 VEX

1	Woodie Flowers	2009-2010
2	Engineering Inspiration	2009-2010
3	Excellence Award	2010-2011
4	Excellence Award	2010-2011



5	Design Award	2010-2011
6	Robotics Skill Champion	2010-2011
7	Elevation Tournament	2008-2009
8	Elevation Tournament	2008-2009
9	Robotic World Championship	2009-2010
10	Robotics Competition: Excellence	2009-2010