



1. Organizational Plan

1.0 Organizational Plan

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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’s (CAMS) Robotics team, Team 687’s, creates strategies based upon meeting its set goals. Its short-term goals are to perform well at the 2010 San Diego and Los Angeles regional competitions. This will be measured by two factors, robot performance and awards won. The strategy to meet these two goals is to reexamine last year’s performance and continue winning strategies. For instance, Team 687’s build sub-teams have increased the number of team meetings per week and addressed structural problems in the design process that impaired the robot’s capabilities in previous years. The build team began prototyping parts of the robot before the season to increase productivity. Furthermore, the administration sub-team updates its award-winning Business Plan and *Guide to EntrepreNERDship* to keep up with a more competitive 2010 roster of FIRST teams.

Team 687’s teams have achieved more success in the 2009-2010 Season than any other previous season. For example, at this season’s CSUDH/CAMS VEX Tournament, Team 687B won the Creativity Award. Team 687B, along with Team 687D, were the Tournament Champions. Team 687B was awarded the Judge’s Award at the CSUN Competition. Team 687 K was awarded the Excellence and Programming Awards earlier this season. Team 687J won both Amaze and Energy Awards at VEX Competitions. Team 687J was awarded with Robot Skills at the Beach Cities competition.

The team had greater success with awards during the 2008 season, winning the Kleiner Perkins Caufield & Byers Entrepreneurship Award, Woodie Flowers Award, and Website Excellence Award. The Entrepreneurship victory was a result of a new, comprehensive business plan and a complete renovation of Team 687’s *Guide to EntrepreNERDship*, a guide targeted at rookie FIRST teams for team finances and sponsorship. Team 687 edits both the *Guide to EntrepreNERDship* and this business plan each year in order to help other FIRST teams while remaining competitive for awards.



Team 687's website has been renovated to improve accessibility problems to make the site more user-friendly. Last year's website contained a simple layout and practical utility similar to 2007's multi-award winner website. Team 687's 2009-2010 design has been redesigned, conforming to new CSS and Javascript standard. It is easier to navigate with a horizontal menu and navigation bar, includes more interactive content, and showcases an animated interface.

Community Service

Team 687's long-term goal is to increase the general public's interest in math, science, and engineering fields while reaching out to future engineers and scientists in the community. To address these long-term goals, Team 687 has made every team member an active member of CAMS Robotics's outreach program. The Outreach team coordinates middle school mentoring, summer robotics camps, and other community outreach projects. Members must contribute ten hours of service learning to any robotics mentoring program. Currently, the team has done over 2000 hours of community service.

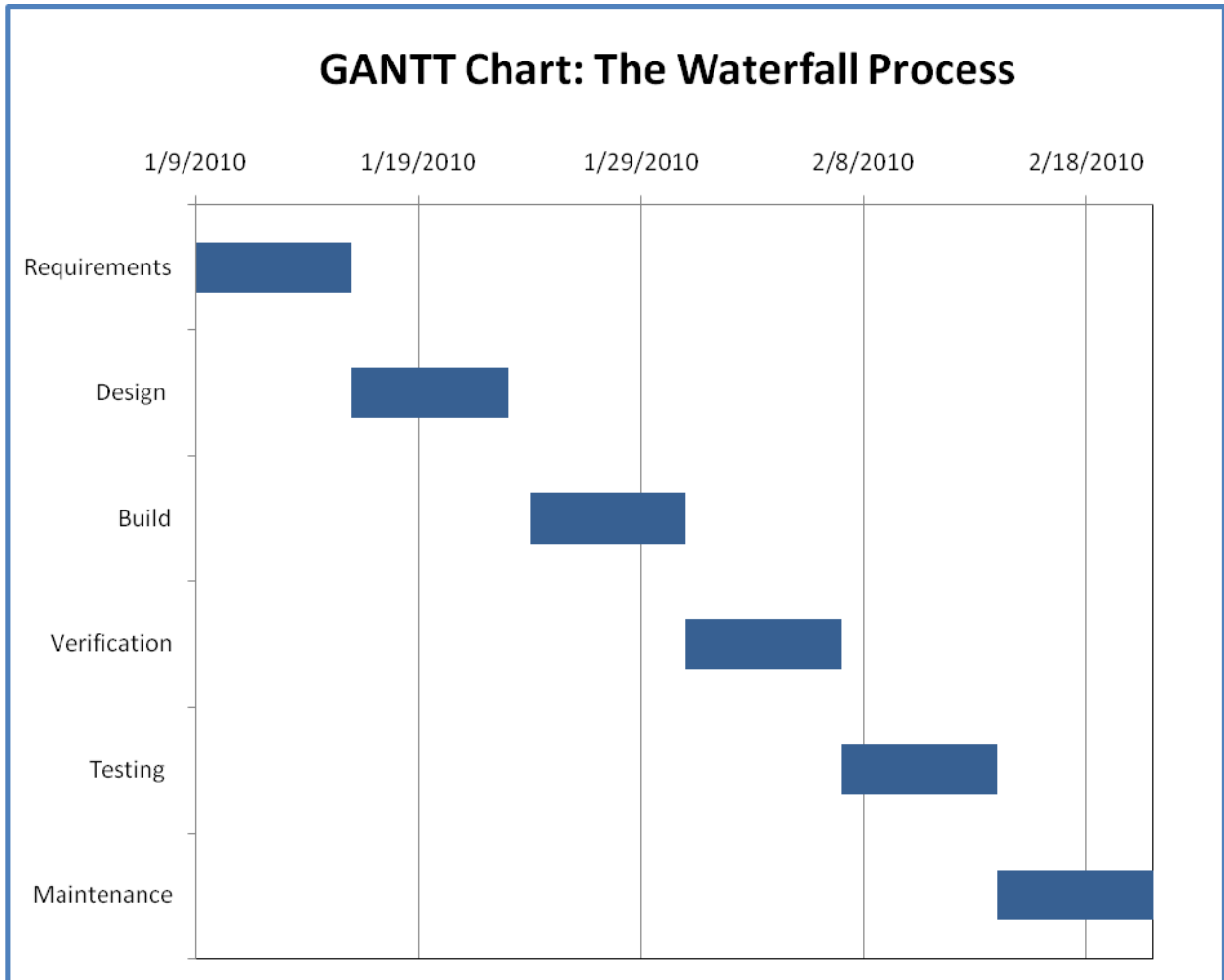
Outreach operations grew tremendously in the 2008-2009 season. The team obtained a \$94,500 grant from State Farm to go directly towards its mentoring program. Through these funds, Team 687 teaches over 180 middle school students from six middle schools in Southern California. Team 687 mentors students in VEX robotics. Team 687's grant allows them to host two VEX tournaments, one for high schools students and one for the middle school students. One middle school team from St. Luke's School qualified to compete at the VEX World Championships in Dallas, Texas last year.

In the 2009-2010 Season, Outreach was able to attain a \$30,000 grant from the Norris Foundation. The team will use the money donated by the foundation to continue mentoring middle schools in Robotics. The team plans to expand its mentoring program to middle schools in the cities of Hawthorne and Lakewood. It plans to continue its summer workshop 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 math and science.

Championship Qualification

Another of Team 687's long-term goals is to qualify for the 2010 FIRST Robotics Championship. The aforementioned goals and operations all contribute to achieving this goal. Each section of the team has gained new members and worked longer hours in the 2009-2010 season. The Build sub-sections implemented a VEX program in the off-season to properly prepare members for the rigorous build season. During the build season, Team 687 members reduced the time allotted for the robot design process to spend more time on robot construction and verification. In order to complete their overall goal, Build members plan to adhere to the Waterfall Strategy. They are given six weeks to complete their goal and plan to use their time efficiently by working seven days each week.

In order to complete their overall goal, Build members plan to follow the Waterfall Method. They are given six weeks to complete their goal and plan to use their time efficiently.



Team 687 has applied for the Chairman’s Award for the third year in a row. The team has received increasingly prestigious awards, winning the Judges Award in 2008 and the Engineering Inspiration Award in 2009. Team 687 hopes to finally win Chairman’s this year, qualifying the team for the Championship in Atlanta.

Financial Success

Team 687 has annual goals that involve its biggest events outside of the regional competitions: Halloween Night and the Summer VEX Camps that the team organizes and hosts. This year Team 687 increased its revenue by \$400 (refer to financial plan). The goal this year is to increase its revenue to \$2400. The team will continue to increase publicity for the event and expand the types of meals sold during events. To continue success with the Summer VEX Camps, Team 687 will continue its strategic relationship with Northrop Grumman, which provides scholarships for many campers. It will work to publicize the event on a greater scale through the website, social networking sites, and flyers. It will attract local media attention to report on the camps and gain more publicity.



Strategic Relationships

Team 687's most important relationships are those with Northrop Grumman, Boeing, Raytheon, CAMS Parent-Teacher-Student Organization (PTSO), State Farm, and Rhodia. These companies and organizations are key sponsors whose investments in the team allow it to continue its operations. Northrop Grumman and CAMS PTSO are instrumental in maintaining important events such as Halloween Night and the CAMS/CSUDH 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 Team 687 events.

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

Team 687 uses the SWOT analysis to examine our internal and external environments. Using the SWOT Analysis, both crucial and subtle information is laid out for the team. This analysis can identify 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: Team 687's highly structured team can tackle several different jobs simultaneously while keeping great communication between all sub-teams.
- Strategic Relationships: The relationships that help the team keep its operations running help provide financial support to the team but some provide mentors and parent support, such as the relationships between Northrop Grumman and CAMS PTSO.
- Financials: A fundraising track record is used to show Team 687's financial growth.
- An awards track record is kept in order to show versatility, particularly in the non-build sectors of the team. The team has won at every regional it attends since 2007.
- Location: The school's location in Carson, California allows the team to have quick access to supplies. The team has new facilities available at the school, particularly a new engineering room that was donated by Northrop Grumman.
- Mentors: The team is always finding ways to help increase mentorship. Team 687 has acquired six new, dedicated mentors who work in several math, science, and engineering fields. These mentors are an addition to the ones the team had previously.

Weaknesses:

- Time Constraints: There is a lack of leisure time for the members of Team 687, since these are students that are working on a rigorous curriculum at a highly demanding school.
- Extracurricular Activities: 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 500, meaning less potential attendance at Robotics sponsored events. Revenues have a major possibility of being cut down.



Opportunities:

- FRC 2010: The team's participation in FRC will allow it to win more awards and improve the robot's performance from last year's.
- Community Outreach: Outreach opportunities are always available. Team 687 takes full advantage of mentoring middle school students and educating the community on robotics, mathematics, science, and engineering. CAMS robotics will seek more middle schools to mentor throughout the year in order to expand the fundamentals of FIRST. Opportunities are constantly sought after, such as showcases and open houses.
- New Fundraising Opportunities: CAMS Robotics plans to expand its fundraising events beyond Halloween Night. Funds are raised by annual VEX Competitions held at the Cal State Dominguez Hills University.
- New Experiences: Being a part of Team 687 broadens the horizons of its members by providing experience for future potential careers. Scholarships are available to members through FIRST Robotics.

Threats:

- State Regulations: New state regulations that restrict food sales on school grounds reduce fundraising revenues for Team 687.
- 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 and increasing their awards potential.

1.4 Services

Community Service/VEX Competition

One of Team 687's main priorities is to serve the community. It works to establish a positive image in the community and while increasing interest in math, science, and engineering. Team 687's services to the community include the mentoring program, the CAMS/CSUDH VEX Tournament, and the Summer Robotics Workshops. The mentoring program has been successfully implemented in six middle schools in Southern California.

Through this program, Team 687 conducts two weeklong summer workshops in which team members are able to directly interact with middle school students, teaching them how to build VEX Robots. At the end of the camp, each school builds a robot which can compete in the FIRST Tech Challenge. Team 687 hosts the FIRST Tech Challenge where several teams from Southern California can compete, including teams mentored by Team 687. Several scholarships are awarded to students who are not able to pay the workshop price. 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, Team 687's biggest fundraiser. This event is held on the last Friday of October each year, lasting about four hours, from 4:00-8:00 P.M.

The biggest attraction is the Haunted Maze, which is adorned with special sound and lighting effects with monsters protruding out from each dark corner of the room. There were other



attractions as well, including the Video Game Room which is filled with many popular video games, such as Halo 3, Dance Dance Revolution, Rock Band 2, and Guitar Hero 3. The video gaming experience is enhanced through surround sound and screen projection. The Movie Room is actually a popular hangout at Halloween Night despite the fact that most of the movies played have been watched many times over. Similar to the Video Game Room, the movie watching experience is enhanced through surround sound and screen projection.

Two of the school's biggest clubs, BioMed Club and National Honor Society, are directly involved with the popular event by hosting a themed room each year. The two clubs offer valuable and fun learning experiences for the students. Many look forward to the amusement that these clubs have to offer each year for an affordable price.

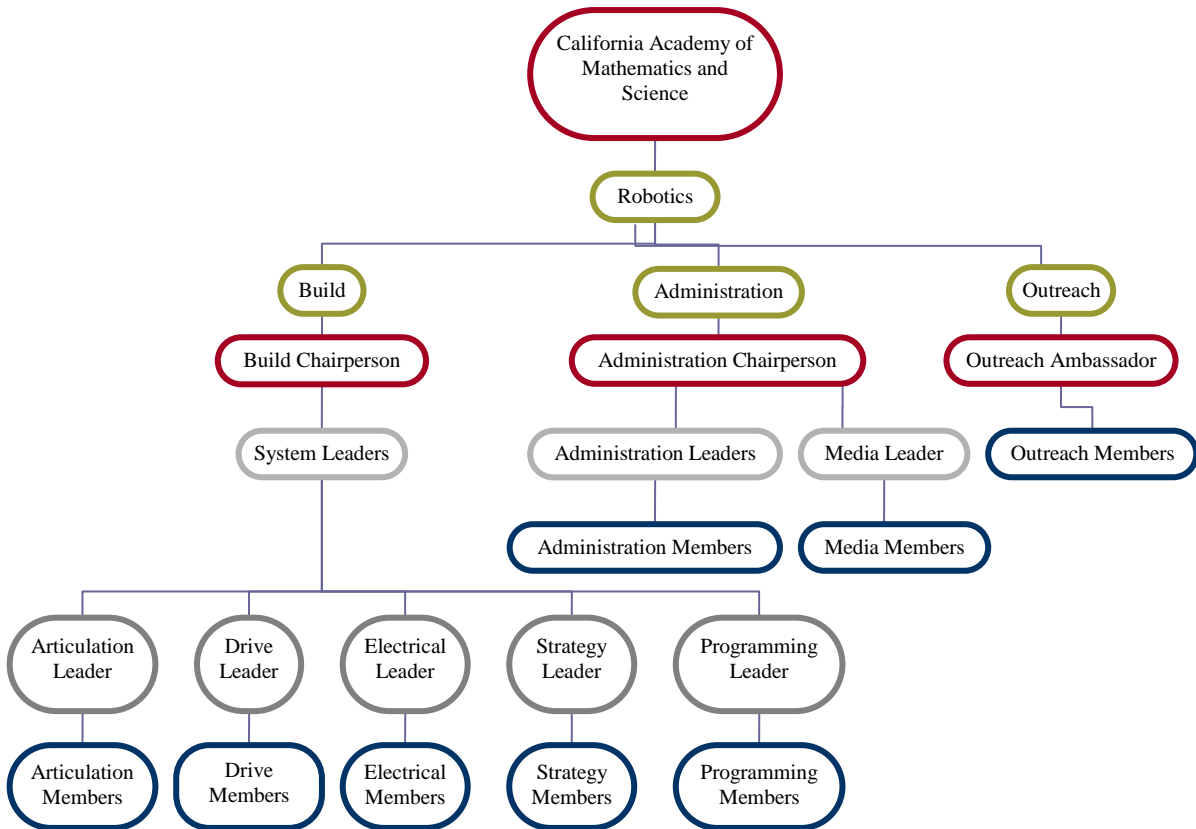
A new attraction which was introduced to 2009's Halloween Night, was the 'Pie a Teacher' event. After paying for admission, attendants paid one extra dollar to enter the draw and receive a chance to pie a teacher in the face. In this case, the generous volunteers were 12th grade Physics teacher and Team 687 advisor Mr. Harder, 11th grade English teacher Mr. Marquez, and Team 687 leaders. Approximately, five lucky winners were chosen for the draw.

Team 687 sells pasta and pizza for the event attendees. Selling pumpkin pies has proven to be a success this year as well. This service is aimed for CAMS students and the community to enjoy a safe night of Halloween fun.

1.5 Location

The location and facilities used to prepare our service and/or products are donated on behalf of the California Academy of Mathematics and Science. The Build sub-teams work in the engineering lab/room, a new facility especially designed to meet the needs of Team 687. The machine contains new machines such as CNC mills and lathes which students learn to safely operate. Students have access to the engineering computer lab, which is equipped with computer programs to meet the design needs of members. The non-Build or Administration sub-teams meet in the main computer lab, which is adjacent to the engineering lab.

1.6 Management



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

The Build Chairperson must coordinate weekly meetings, call emergency meetings, provide leadership to the club, work with team coordinator, 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 to the club, provide support for the development of club activities, ensure 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 are acting chairmen if a chairperson is not available to fulfill his or her duties.

The Director of Outreach (Outreach Chairperson) creates and organizes outreach opportunities, provides mentorship to students interested in robotics and/or engineering, and communicates with the team coordinator to discuss outreach plans.

There are nine 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 Website/Media. Administration handles the team's accounting, team registration, travel plans, and written works. Website/ Media creates Team 687's award-winning website and designs 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 Strategy sub-team finds alliances at competitions and collaborates with them to find the best possible strategy to win the game. The role of Programming is to create the "brain" of the robot, so to speak. 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 more suitable for the job.

1.7 Personnel

Members are recruited once a year through an application process. To apply for membership in Team 687, a student must have a GPA of at least 3.0 and maintain good standing with their teachers. The team never declines acceptance to anyone who has no previous experience in a robotics-related subject. Team 687 will allow all applicants to attend a training week in the summer that allows members to get a taste of what it is like to be on the team.

During the summer training sessions, Administration applicants are expected to learn notable dates and accomplishments in Team 687's history, as well as have an understanding of FIRST. Administration sub-team applicants are responsible for creating a mock business plan and for preparing a presentation about Team 687, which is presented to the Administration leaders. Website/ Media applicants begin work on Team 687's website and designs 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 in the team's machining facilities.

Outreach is the only branch of CAMS Robotics that does not have a summer training session, owing to the fact that they are informed of their roles and responsibilities at the beginning of the new school year.

All members who complete the training week and who still wish to join the team are accepted. Members are then expected to attend all meetings and pay team dues. New members choose their sub-teams under the guidance of an experienced team member.

1.8 Accounting

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



1.9 Current Status

Awards

Success has come to the team in recent years, when the team was a semi-finalist at the Los Angeles regional competition in the 2005-2006 Season. 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. Subsequently, 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. During the 2008-2009 Season, the team won the Engineering Inspiration Award and the regional Entrepreneurship Award, qualifying it to go to the World Competition in Atlanta. There the team won the Entrepreneurship Award again.

Team 687 has expanded its outreach operations to serve the community and develop an interest in math, science, and engineering fields. For the past four years, Team 687 holds Summer VEX Camps for over 100 middle school students. Team 687 has hosted four CAMS/CSUDH VEX Invitational Competitions for the past three 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, where 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 six middle schools and several Boy and Girl Scout troops.

Current Status

Team 687 currently consists of 92 members, and resides on the campus of the California Academy of Mathematics and Science (CAMS). Team 687 hosts Halloween Night and the CAMS/CSUDH VEX Tournaments on the CAMS campus. As active FRC participants, Team 687 is going to compete at the San Diego and Los Angeles Regional Competitions in March 2010. The team continues to mentor six middle schools as well as Boy and Girl Scouts. The team will also hold its annual robotics workshops in the summer.



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

2.10 Target Market

CAMS Robotics Team 687 seeks to appeal to many such as Team 687 sponsors: the Carson Advisory Panel, the Parent Teacher Student Association (PTSO), middle school students around the Carson area, and the California Academy of Math and Science student body.

Sponsors

Sponsors make the largest financial contributions, providing machinery, administration supplies, and engineering facilities. In return, Team 687 promotes these sponsors through logos which display their brand while providing links on the team website to sponsors. Sponsor logos are also used on our current robot.

Carson Advisory Panel

Team 687 makes an annual presentation to the Carson Advisory Panel (CAP) that includes representatives from large corporations such as Shell, Rhodia, and Boeing. CAP provides insight, instruction, and assistance for Team 687 as well as prospective sponsors. In addition, CAP helps us spread the message of FIRST.

Parent Teacher Student Organization (PTSO)

Apart from PTSO helping fundraise for Team 687, they include the team in community newsletters. Additionally, PTSO assists with events such as VEX competitions held on the school campus and fundraisers like Halloween Night.

Middle School Students

One way Team 687 spreads the FIRST message is through mentoring six middle schools consisting of more than 180 students. Another way is by showcasing its robots at events such as Bots by the Bay and Open House to attract students to apply to CAMS and join our robotics teams.

CAMS Students

Team 687 is comprised of approximately 92 CAMS students. Additionally, the majority of the CAMS student body provides financial support at Team 687 fundraisers such as Halloween Night.



2.20 Marketing Strategy

Every aspect of CAMS 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
	Participation in Las Vegas Regional	
<i>Registration</i>	Kit of Parts	\$ 6,000
	Associated Materials and Support	
	Los Angeles Regional	\$ 4,000
<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>	Peripherals	\$ 1,000
	Software	\$ 2,000
	Cameras	\$ 500
<i>Office Supplies</i>	For Administration, and Events	\$ 2,000
Total		\$ 34,300

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

2.30 Method of Sales and Distribution

CAMS Robotics has three main events: the annual Halloween Night, the VEX competition, and middle school mentoring.

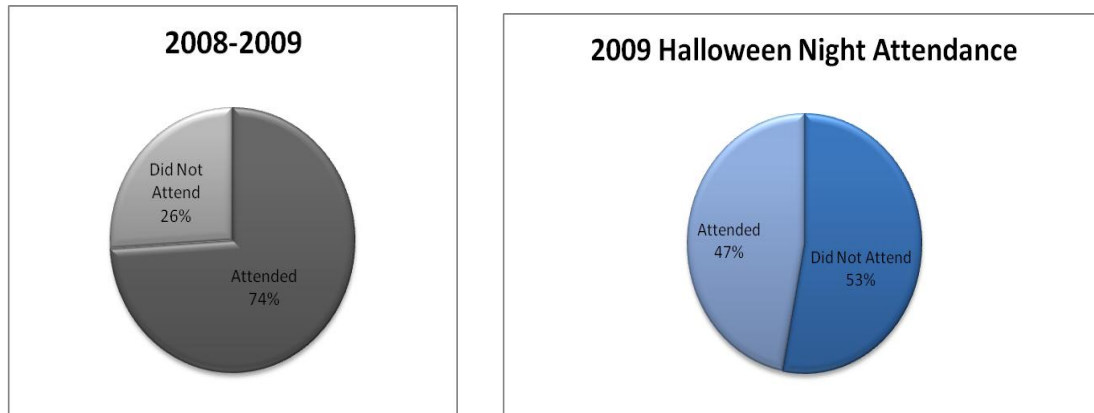
Halloween Night

Halloween Night is the team’s primary fundraiser. This event involves Team 687 members, CAMS students, and members of the community. Halloween Night helps Team 687 inform the student body and the community, while attracting prospective members.

The chart above shows the net profit increase of Halloween Night in comparison to the previous seasons, as well as the projected profit for the next year. The team made \$2400 from Halloween

Night this year. According to the chart, the team will continue to make even more next year. Team 687, like many other teams, 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. This will be sustainable through increased publicity and incentives for team members.

VEX Competition

The VEX competition is a CAMS Robotics-managed event for students from six local middle schools that they have mentored. It is an excellent opportunity for the students to test the robots they have designed through Team 687’s mentoring program, to meet other robotics-oriented students, and to 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 Mathematics and Science. It is Team 687’s goal to increase middle school and student participation by 25% each year.

2.31 Distribution of Sales

Halloween Night

Members of Team 687 sell tickets to CAMS students and others in the community. Presale tickets cost \$7.50 while tickets bought at the door cost \$10.00.

VEX Competition

For the VEX competition, the participating teams pays a \$50.00 registration fee. More information regarding the competition is found on the www.camsrobotics.org website.

2.32 Pricing

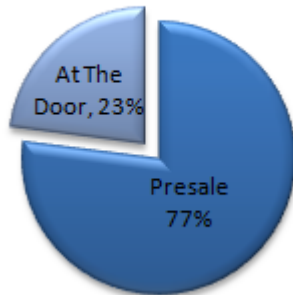
Considering that the population of CAMS is comprised of full-time students, CAMS Robotics assigned an affordable price for each ticket to produce sufficient profit for the team. Therefore, the pricing of \$7.50 presale and \$10 at the door helped achieve this goal. \$985 revenue was from presale tickets, while \$726 revenue was made by at-the-door sales.

Food was sold to improve fundraising at Halloween Night but still at an appropriate price, ranging

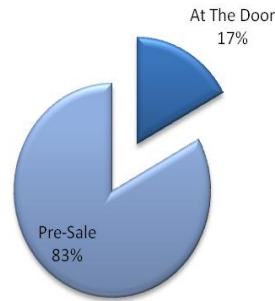
from \$1 to \$5. \$675 profit was made from food sales during this event.

Halloween Night Ticket Sales

2008-2009



2009 Halloween Night Ticket Sales



2.33 Sales Strategies

Halloween Night

Sales transactions begin with each team member selling two presale tickets. If members sell these tickets before the event, they will receive free admission. If not, they will have to pay for their own ticket. CAMS Students can buy tickets from members of Team 687 at the discounted price of \$7.50 before the event. This benefits the team because it reduces the wait to enter the event and allows check-in to run more smoothly.

The pre-sale period ends two weeks before the event takes place. Tickets are then sold at the door for the increased amount of \$10. This is an incentive for the students to buy tickets beforehand. Strategic ticket pricing results in increased profit for the team.

Pasta and pizza are sold from 4:30pm until nighttime due to new food regulations. Affordable food items such as drinks, pie, and 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 or website for any interested teams. The funds raised by the registration fees are used to pay for the competition venue. In 2010, Team 687 will advertise Halloween Night to middle school students

2.34 Sales Incentives/Promotions

Halloween Night/Game 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. The aforementioned attractions motivate people to come to the event and support the team. In 2010, Team 687 will advertise Halloween Night to middle school students.

2.35 Advertising Strategies

Team 687's advertising strategies consists 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 will advertise during the middle school workshops and summer camps.

2.36 Customer Services

CAMS Robotics Team 687 prides itself on its dealings with students involved in the team, mentored middle school students, the community, and its sponsors. Team 687 bases its customer service on the principle of *gracious professionalism*. Team 687's gracious professionalism encourages students to be helpful and polite, however still ambitious. The team's ultimate goal is to be a guide 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

Administration team implements effective communication, role model characteristics for middle school students, 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 collapse due to the lack of structure. With the compliance of the rules set by the Marketing Plan of the *Team 687 2009-2010 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.



3. 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 Hiring Time Table	Application Calendar

3.1 Current Product/Project Status

The robot for the 2009-2010 Season was officially completed and shipped on Tuesday, February 23, 2010. 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 at CAMS Robotics.

Design Process

Haley Costigan and Shan Kim, Team 687 Systems Engineers, worked in conjunction with the Build chairperson, Shivam Desai, and Ted Harder to create and execute an effective build schedule. The team met four days a week, which decreased to two days a week later in the season.

Regardless, the combined efforts of multiple dedicated members made allowed the team to ship a complete, working robot. A key part of this year's design process was prototyping of 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 our team with a list of constraints and missions. Following this input, a combined effort by the Systems Engineering team, Strategy team 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 updated actively to fit new rules and constraints.

The design loop is the second stage of the Nerd Heard Build Season. Upon completion of a brainstorming, or Functional Analysis, each function identified should be traceable back to a requirement. The second stage of this product, sketching, CADing, prototyping, mapping code etc. is the Design Synthesis Process. 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 was produced to maximize functionality within the time and fiscal budget. The final stage of this loop is the synthesis of the complete robot. This is the longest part of the Engineering Process for Team 687, over four weeks, and will provide a complete System, Technical Data Package and Engineering Notebook.

The verification process occurred on all levels of the team: Articulation, Drive, Electrical, 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.

VEX

Another event hosted by the CAMS Robotics team was the VEX Competition. Four CAMS Robotics teams participated in this regional alongside the teams we had mentored. Five CAMS Robotics VEX teams made it to the finals of the competition; however, the CAMS Robotics teams were not easily defeated despite their skilled competitors, and didn't leave empty-handed.

In 2008, at the CSUDH/CAMS VEX Tournament, the team led by Build Chair German Om won the Excellence Award recognizing their talents as a whole. The team also had the opportunity to compete in the Pan-Pacific Tournament where they won the Build Award for quality in craftsmanship and construction. At the LA Regional, the team led by Ian Goegebuer won the Think Award recognizing their contributions to autonomous programming and the uniqueness of their design. Though many teams won Tournament Championship, there are two that won the Creative Award and the Stem Award instead.

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

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 (2x4 - 5ftx5ft 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 tarp that was used during Halloween Night is kept in a storage room on the CAMS campus along with various other materials that are only used seasonally. VEX competition items are kept in the storage room when not in use.

3.3 Information and Communications Technology Plan

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

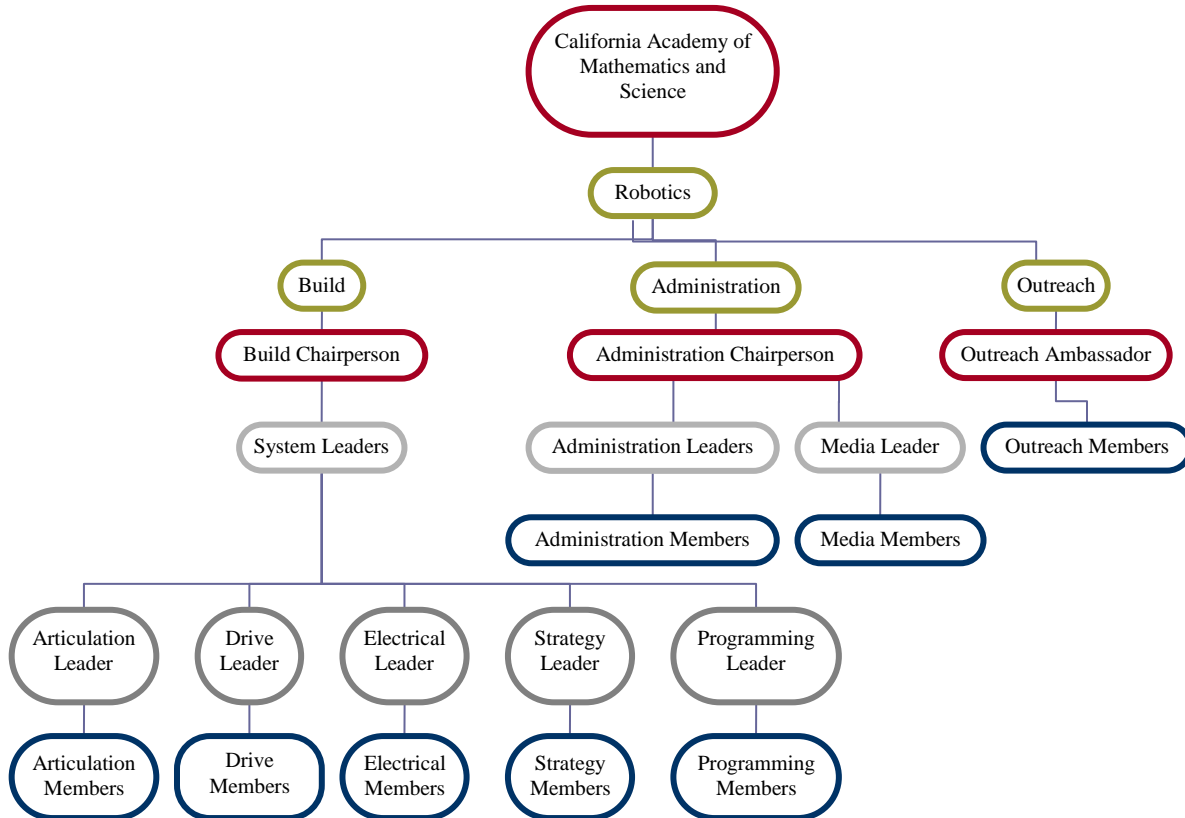
Most importantly, the CAMS Robotics website, camsrobotics.org, enables other FIRST teams, especially rookie teams, to contact Team 687 if there are any questions regarding the website, or our award-winning Guide to EntrepreNERDship.

The CAMS Robotics team purchased the website's domain from Network Solutions. The CAMS Robotics team website is kept up-to-date using school provided software, mainly Macromedia Dreamweaver and Microsoft Office.

3.4 Staffing Plan

The CAMS Robotics management team consists of two team leaders: the Build chair and the Administration chair, Engineering Systems, build and non-build team leaders, as well as their respective club members. Robotics members, along with parent and student volunteers, were utilized as organizers and workers for Halloween Night. These members and volunteers also assisted the team during the VEX Competition.

Team 687 Staffing



Build/Administration Chairs

The CAMS Robotics team has a management structure in which the chairs order, systems leaders oversee, and the leaders execute the plans designated by the systems leaders. Being chair, 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 to see if they are qualified for the position.

Systems Engineering/Administration

There are two Systems leaders in the CAMS Robotics team, Engineering and Administration. The Systems' jobs are to communicate the decisions that the Chairmen decide as well as oversee each sub-team. Since there are only two positions open, depending upon the amount of sub-teams they 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-team members.

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.

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 into CAMS Robotics, Experienced team members train new members throughout the season.

However, in order to be prepared for the upcoming season, new members must undergo a training week, gradually exposing the members into possible fields they may be interested in. 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 would handle machinery, it is necessary for all members to undergo safety training. This training ensures that the members know how to operate machinery and work in the workroom while maintaining safety practices. A test is taken at the end of the training to ensure that the proper information is attained.

3.6 Hiring Time Table

New members for the CAMS Robotics team are recruited near the end of the 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, and applicants are notified of their acceptance two weeks later.



Hiring Timetable for 2010-2011 Robotics Season (May)

Sun	Mon	Tue	Wed	Thu	Fri	Sat
						1
						Application Distribution Informational Mtg.
2	3	4	5	6	7	8
9	10	11	12	13	14	15
					Applications Due	
16	17	18	19	20	21	22
23	24	25	26	27	28	29
					First Team Meeting	



4. 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 relies on 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 educate them about Team 687's activities. 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, guarantees more support.

Additionally, members of the CAMS administration board and PTSO help promote and fund CAMS Robotics through fundraisers and promotional events. Consequently, corporations such as State Farm donated \$94,500 to CAMS Robotics to fund its middle school mentoring program.

Due to our success, CAMS 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	"
	Boeing	"
	Norris Foundation	"
Gold	CAMS PTSO	\$ 1000+
	Raytheon	
Silver	Rhodia	\$ 500+
Bronze	Allegra Print and Imaging	\$ 250 - \$ 499
	Alphabet City	"
	FedEx/Kinko's	"

These are companies, businesses, and organizations categorized by their range of endowment that fund CAMS robotics to promote learning in fields of engineering and business.

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>	Participation in San Diego Regional	
	Kit of Parts	\$ 6,000
	Associated Materials and Support	
	Los Angeles Regional	\$ 4,000
<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>	Peripherals	\$ 1,000
	Software	\$ 2,000
	Cameras	\$ 500
<i>Office Supplies</i>	For Administration, and Events	\$ 2,000
Total		\$ 34,300

4.3 Attaining Financial Support

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

Team 687 merchandise as well as food is sold during robotics events. These events include competitions and fundraising events held in our facilities such as Halloween Night and VEX Competition. Nerd Herd T-shirts 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 petty cash for team use. This year's lunch revenue was \$300.00 which goes towards the end-of-the-year banquet.



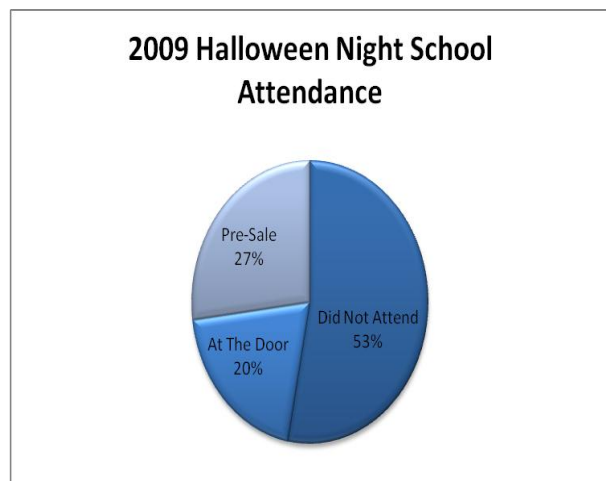
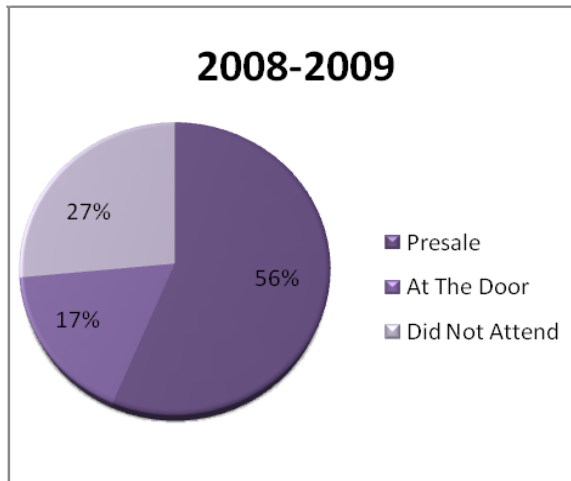
Halloween Night Profit

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	
Lomelli's Pasta + Drink*	\$ 0	\$ 0	
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 inclined from previous years due to increased donations from parents and students. Also, students were encouraged to attend by the success of previous Halloween Nights as well as new attractions, such as the Pie-A-Teacher event. Increased incentives, such as extra credit from teachers and popular game systems also played a role in increasing the attendance, as seen by the following:

Halloween Night School Attendance History





4.4 Financial History

As the CAMS Robotics team has grown, so have its finances. In the past, over \$38,000 was made from member dues, \$9,000 during the 2005-2006 season, \$13,500 during the 2006-2007 season, \$15,500 during the 2007-2008 season, and \$26,750 during the 2008-2009 season. The amount of money collected for member dues this season (2009-2010) was \$14,440. Last year's Halloween Night raised \$2,300 whereas over \$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 our team 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 team has grown at an average of 37 members per year. Therefore, 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 will pay \$150, and the Build members will pay \$250 because of their use of team equipment. It is our prediction that there will be a possible revenue of \$30,000 made from member dues in the upcoming year if the team continues to grow, as seen by the graph below:

Profit for Halloween Night has steadily increased for 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 \$300.00 in revenue. This money will go towards the end-of-the-season CAMS Robotics banquet.

4.7 Valuation

The CAMS Robotics team has grown from 62 members last season to 92 members this season. This year there was \$14,440 collected in member dues. Halloween Night was the most successful to date. Approximately \$2,400 was made from Halloween Night. The food sold at Halloween Night was donated, and other materials were brought in by the members of the CAMS Robotics team, which increased our profits.

CAMS Robotics funding has steadily increased over the past few seasons, showing that the team is growing financially. If this rate continues, the CAMS Robotics team 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. Appendix

5.0 Appendix

5.1 Club Constitution	Robotics Club Constitution
5.2 Team 687's 2010 Robot Statistics	Summary of Robot Features

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 at 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 1991 – 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, Electrical Leader, Drive Leader, 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 2010 Robot Statistics

General

- Weight: 110.46 lbs
- Width: 28 in.
- Length: 38 in.
- Height: 17.75 in.

Drive/Chassis

- Mecanum Drive System
- 4 6" Mecanum wheel
- Chassis is made of 1/8" aluminum angle stock that is connected by a 1/4"-20 bolts with nylon lock nut
- Omni directional movement
- 17:1 Gear ratio
- 4 CIM motors
- Interchangeable to crab drive

Articulation

- Kicker (20' kick)
- Surgical tubing and winch
- Roller ball magnet
- 4 CIM motor
- 1 CIM motor for the kicker connected to a super shifter
- 2 Fischer Price motors for the roller

Programming

- Speed control on Drive System
- Controlled by Xbox controllers
- System that tracks the line through the funnel

Other

- Additional Foam board used for decoration and sponsor logos