FIRST® Beach Cities Robotics

Executive Summary

Team Number: 294

Regional Selection: Los Angeles

Team Name: Beach Cities Robotics

Corporate/University Sponsors: Northrop Grumman Aerospace Systems, Boeing Corporation

Figure 1: Elementary and middle school students tackle the Climate Connections challenges at our fall FLL program.

Impact of FIRST program on team participants: Being involved with the FIRST team has helped students grow as individuals, learn team leadership and communication skills, select majors and colleges, learn about careers, and understand the value of community involvement. For the past six years, one hundred percent of our graduating seniors have gone on to college. Using their technical and leadership skills, our mentors help the team to find ways to become engaged with the community, while obtaining the satisfaction of helping society.

Examples of role model characteristics for other teams to emulate: We help teams at competitions with parts, tools, and programming. We talk with schools and school boards and local, state, and national politicians, and we hold outreach events to help spread the word about FIRST and promote cultural change. We educate students and the public with online robotics instructional materials, summer robotics workshops, support to the local FIRST community, and with mentoring of rookie FRC and FLL teams. We assisted in the beta testing of the new control system.

Figure 2: Elementary and middle school students build robots at our summer FLL program.

Impact of FIRST program on team and community, especially in recent years: We have demonstrated our robots in open houses at the Jet Propulsion Laboratory, Northrop Grumman, and at local high schools Mira Costa and Redondo Union, in order to get the community interested and involved in the team, generate interest in FIRST, and in science and technology. The team has also demonstrated robots at local elementary schools as well as at the El Camino College Science Exhibition, having a positive impact as indicated by our increased student enrollment and mentor support.

Figure 3: A student decorates our new crate in the 2009 build season.

Team's innovative methods to spread the FIRST message: Team members have spoken directly to the community at demonstration events, used Internet media, and sent letters on our team letterhead to potential sponsors, community groups, clubs, news media, and politicians. We demonstrate our robots and team spirit to younger students, not only at middle schools, but to elementary school children, with very rewarding responses.

Figure 4 FTC and FLL student team members show our stuff at Washington Elementary School using our World Championship robot, Squeaky.

Strength of partnership: The Redondo Beach school district and principal's support have recently led to our use of a dedicated robotics laboratory on campus. Last year, Northrop Grumman, our primary corporate sponsor, donated a lathe, a mill, a band saw, and several smaller machines which the high school maintenance staff assisted us in installing in our laboratory's machine room. Northrop Grumman also hosted the FRC kickoff event at their forum facility allowing us to invite all FIRST teams in the area to attend. El Camino College, the local community college, has opened its machine shop to FIRST teams in the area. Several of our students and mentors have taken the college machining course and seized that opportunity.

Team's communication methods and results: Student members of the team have made presentations to local merchants and have successfully gained their financial support as well as their interest in our team and the FIRST program. We have a dedicated Web team of students who keep our site up-to-date, not only with our build and competition progress, but with resources that can be of use to other teams. We use both electronic and physical mail to inform news media and politicians about FIRST and to invite them to the regional competition. This year we are using our partnerships with Northrop Grumman, El Camino College, and others, to use electronic calendar systems to invite their employees to the local (Los Angeles Regional) competition.

Figure 5 The team makes a major redesign decision in week three of the 2009 build season.

Other matters of interest to the FIRST judges, if any: We do our homework! Last year we contacted every politician, from school board members to the President of the United States. Several politicians have actually visited us in our laboratory on campus at Redondo Union High School. This year, we are continuing our relationship with politicians, and we are inviting radio, TV, and newspapers to come to the competitions and promote them to the public. Politically active mentors talk to our AD 53 Assemblymember and our CD 36 Congresswoman regularly.

Our Team

Beach Cities Robotics' (BCR's) mission is to change society and motivate young people to become leaders in science, engineering, and technology. Mentor-guided challenges encourage teamwork and innovation and inspire an appreciation for real-life rewards and future careers. The FIRST program has motivated team members to rise to the challenge of spreading the message throughout our community. BCR demonstrates its worthiness of the Chairman's Award by being a role model for other FIRST teams.

History

BCR's history began in 1996 when four South Bay high schools, Hope Chapel Academy, Hawthorne High School, Mira Costa High School (MCHS), and Redondo Union High School (RUHS), joined forces to form one of the first Southern California FIRST teams, Team 61 (Circuit Breakers). In 1998 Hope Chapel split off to form Team 330 (BeachBots) and in 1999, Hawthorne split off to form Team 207 (Metal Crafters). MCHS

and RUHS stayed together, becoming Team 294 (BCR). These latter two secured our reputations as world-class teams when in 2001 BCR was on the FRC World Championship winning alliance, as were BeachBots in 2005. In 2004, we (BCR) won the 2004 Los Angeles Regional Chairman's Award.

Our team is comprised of students from two rival South Bay high schools: MCHS and RUHS. Students on our team work together, putting aside school rivalries, demonstrating leadership and gracious professionalism.

Organization

Our team is guided by adult mentors and student team captains. Students elect their peers to be leaders in the technical and "impact" areas. These teams are divided into sub-teams led by students and mentors. Impact sub-teams include: Public Relations, Recruitment, Art, Fundraising, Spirit, Awards, Outreach, Special Events, and Website. Technical area sub-teams include: Management, Strategy and scouting, System Integration, Tools and Parts, Base and Control System, Manipulators, Sensors and Electronics, Operator Control Board, Fabrication, Field Crate and Booth, and CAD and Programming. Competitions sub-teams are: Crate Crew, Pit Crew, Safety Crew, Public Relations Crew, and Field Crew and Scouting.

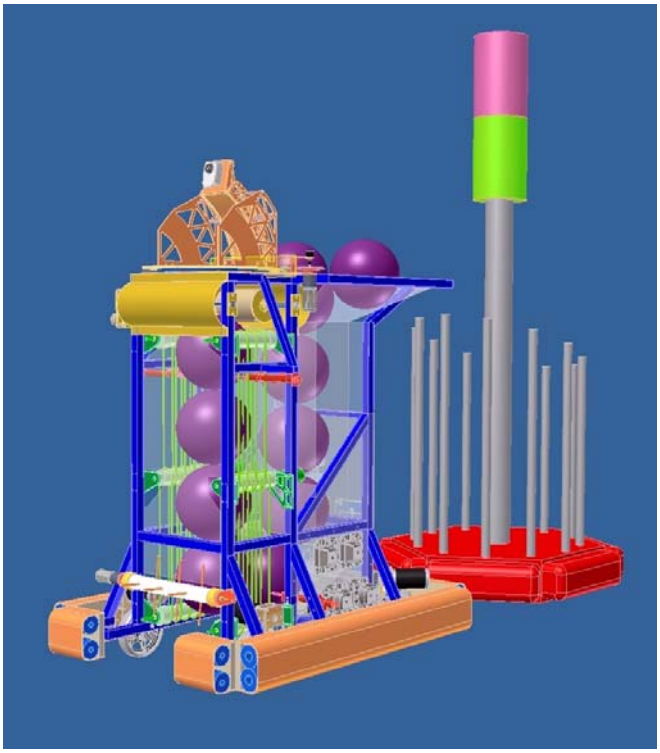

Figure 6: Our 2009 robot, Orange Force, was designed by students and mentors using Inventor before fabrication began. CAD training was a part of our Summer Workshop curriculum and now half a dozen students are proficient in CAD.

Senior mentors, school personnel, and student co-captains form a steering committee that makes all major team decisions. While there is an organizational hierarchy of student leaders and mentors, major strategy and design decisions are made by the student membership at large.

Our Web team has been very active and innovative and hopes to again win recognition for their efforts. Information on the site includes robotics instructional materials and support to the local FIRST community.

The primary goal of our team is for students to learn and benefit from their experience with robotics with their mentors. This goal encapsulates our sub-goals to work cohesively as a team, increase community awareness, be a role model of gracious professionalism, recruit and motivate new members, expand involvement in FIRST at all levels, continuously improve our robots, mentor and inspire rookie teams, and assure that each student has the motivation and support to graduate from high school and continue on to college.

Figure 7: The students, who do the bulk of the design, fabrication, and assembly work, are very proud of their 2008 FRC robot.

Activities

BCR has conducted year-round activities since 2002. We participate in four levels of robotics: FIRST's FLL, FRC, and FTC, and VEX's VRC. We have competed in the FIRST Tech Challenge the past three years, winning the San Diego Regional FTC Competition (December 2007) and the World Championship (April 2008). Our team also won first place in the San Diego FRC Regional (2008), first place VRC at Walnut, CA (November 2008), the VRC Excellence Award at Granada Hills, CA (November 2008), FRC Championship Pit Safety Award at Atlanta (April 2008), and Website Excellence Award (Spring 2008).

Figure 8: At the September Open House at Northrop Grumman in 2008, the team demonstrated FRC, FTC, and FLL robots.

Our in-house summer workshops prepare students for the technical challenges they will face during the FRC build season and throughout the year. Summer 2008 workshops included: Systems Engineering, Mechanisms and Manipulators, Drivetrain Fundamentals, CAD, Fabrication, Electronics, Programming, and Scouting. Our summer workshops are open to all and were attended by non-members of BCR including students from another FRC team (597, Foshay Robotics).

Participating in VRC and FTC with their smaller, less complex mechanisms and modular technology provides a stepping stone in preparing the students for FRC and the team has produced world class robots for these competitions.

This year we formed a LEGO League team, Team 992, in our robotics lab. As these middle school students grow, they will become welcome additions to Team 294. Team 992 is a testament to our dedication to spreading the ideals of FIRST and helping others mature and flourish.

We know that building and competing with robots is only a small part of what FIRST is about. Community outreach is an integral component of our program where we demonstrate what we are, what FIRST is, and the capabilities of our robots. We participate in diverse community events including El Camino College Science Day, presentations at local schools (Washington, Tulita, Alta Vista, and Grand View elementary, Adams Middle School), local aerospace events, and the Manhattan Beach Home Town Fair.

Figure 9: Younger visitors to our 2006 Fall Open House are fascinated with our VEX robots.

These activities have generated a very positive response. After a presentation at one of the local elementary schools, a student recognized one of our mentors at a store, came up to her and thanked her for visiting his school. We have participated in charitable activities: Northrop Grumman Adopt a Family--team members donated items needed by a family, and Cheer for Children-- team members collected and helped wrap toys, books, and personal items for needy youth. We collect plastic bottles for one of our mentors to recycle and purchase items for her Special Ed classes.

Innovation

We are always looking for new ways to increase community involvement. During the Manhattan Beach Home Town Fair, team members spoke to the public about team goals and the ethos of FIRST. Our students also set up robotics demos at their high schools to promote FIRST and our team.

We welcome students and mentors with interests in disciplines other than science, engineering and technology as a rich atmosphere results in a blending of ideas and creative solutions. We appreciate people with talents in art, advertising, carpentry, and

business because of the essential contributions they make to the team. Our most successful recruiting has resulted from team members inviting people to our lab; once they visit us in action, they are hooked.

Partnerships

We raise funds by holding yard sales, selling tickets for comedy nights, washing cars, running snack bars, selling products, applying for grants, and soliciting support from local businesses. Student team members present the team's charter and the principles of FIRST to business management to gain support for our team.

Figure 10: Demonstrating the 2006 FRC robot at Tulita Elementary School Science Night. Some of the students later joined our FLL team.

We have a long term relationship with Northrop Grumman Aerospace Systems who lent us high performance computers for CAD and hosted FRC kickoffs, allowing us to invite local FIRST teams. Over 150 attendees from teams around the Southern California area attended this year's kickoff, representing teams 207, 330, 606, 687, 812, 973, 1197, 1759, 2150, 2919 and 3020. Teams cooperated in game simulations, with simulating robots and goals.

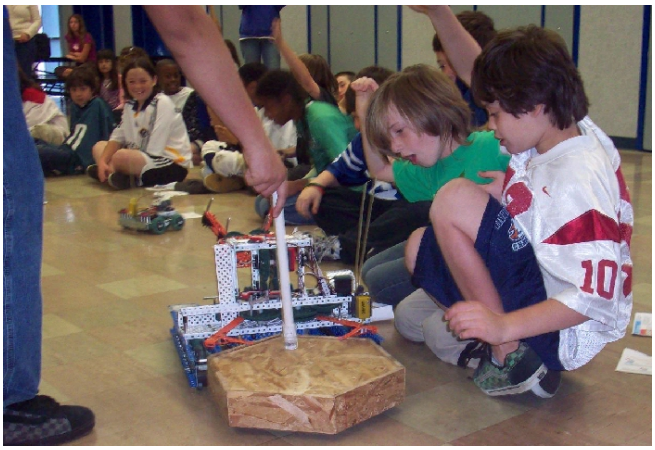

Figure 11: Demonstrating our World Champion FTC robot, Squeaky.

In addition to our primary supporters, we partner with community businesses including Primo Power Coating, Somerville Plywood Corporation and a number of local restaurants. This year we also received a generous grant from Boeing and part fabrication from GKN Aerospace.

The Redondo Beach school district, with support from the RUHS principal, has provided us with a dedicated robotics lab on the high school campus. Several elected officials have visited our lab, including School Board Member Carl Clark, California State Assemblymember Ted Lieu, California Secretary of

State Debra Bowen, and State Superintendent Jack O'Connell. We continue to contact elected officials to keep them up to date on our team and promote the benefits of FIRST.

The Machine Tool Technology program at El Camino College has allowed team members to use their facilities to fabricate parts. Students learn the proper use of machinery and machining techniques, with emphasis on safety.

During competitions, we work with other teams to create partnerships for outreach opportunities at and beyond competitions. We help teams at competitions with parts, tools and programming. We collaborated with BeachBots to beta test the 2009 FRC control system, resulting in team mentor, Peter Johnson, receiving recognition during the 2009 FRC kickoff. Over the years we have mentored several FRC teams, including 851, 1115, 1197, 1669, and 2150. This year we mentored the new Will Rogers Middle School FLL team, presented workshops and demonstrations at the Orange County Robotics League kickoff, and are mentoring FRC rookie team 3020.

Results

Figure 12: The team works together to repair the robot at the competition.

We are proud of the fact that for the last six years all of our graduating seniors have gone on to college and most have pursued a scientific or engineering major, proving our ability to inspire students in the areas of science, engineering and technology. We currently have alumni at Northeastern, Princeton, UC Berkeley, and many other highly respected institutions. Many of our mentors come from the aerospace industry and they share information on space technology. Northrop Grumman has been particularly supportive, providing summer internships to our juniors and seniors for the past four years.

Several of our alumni have gone on to mentor FIRST teams (100, 125, 812, 973, etc.). Some of our current mentors are FIRST alumni from other teams. All are continuing the tradition of guiding a new generation through obstacles to achieve intellectual growth. We are in the process of contacting our alumni to learn their current status. We are looking forward to hearing about their accomplishments and how they continue to pursue the ideals of FIRST.

Business Plan

Mission Statement

Our team inspires science and technology in our community by creating a cooperative learning environment for growth and knowledge which allows students and professional mentors to interact with each other and the community.

Date the team began

Beach Cities Robotics grew out of a team (61) that was established in 1996 and included four South Bay schools--Hope Chapel Academy, Hawthorne High School, Mira Costa High School, and Redondo Union High School. Three highly successful teams grew out of that beginning--330 (BeachBots--Hope Chapel), 207 (Metalcrafters--Hawthorne High School), and 294 (Beach Cities Robotics--Redondo Union High School and Mira Costa High School).

Names of founders and the functions they perform

Our founders are Beverly Rohrer (current superintendent of Manhattan Beach Unified School District), K.G. Englehardt, Rob Steele (Raytheon), and Pat Hosken (retired Redondo Union HighSchool Technology Director and current team treasurer).

Number of team members

We are 28 students and 15 mentors strong.

Location of team and who our sponsors are

We are located in Redondo Beach, California. Our primary sponsors are Northrop Grumman and Boeing, but we have also worked hard to involve our parents and community businesses.

What you do/services rendered

We mentor LEGO League and FRC teams; visit elementary and middle schools to excite them about science and technology through robotics; demonstrate robots at college and corporate events celebrating science and engineering; reach out to our member high school campuses; and connect to our communities through summer workshops, volunteer opportunities, and team open houses in our Robotics Lab.

Relationships and information regarding current sponsors

We enjoy a long term relationship with Northrop Grumman dating back to original TRW sponsorship; support includes financial backing, mentor support, provision of meals and

fabrication assistance for our FRC build, and hosting of annual FRC kickoff. In return we participate in Northrop Grumman Family Day, volunteer recruitment, and engineering week events. This year, due to the efforts of one of our team parents, we also received a grant from Boeing. We seek to strengthen our partnership with Boeing by inviting their employees to attend our competitions and visit us at work in our Lab. In the future, we hope to participate in Boeing employee events.

Summary of team growth

We expanded our exclusively high school program that operated during the academic year to a year round program that includes students from elementary through high school. Through workshops for students age 9 through 18 and participating in local schools' science nights and other special events, we expanded our outreach efforts.

Summary of team's future plans

We continually seek new sponsors to assist us with funding and volunteers. With this we plan to expand our summer workshops and competitions to polish and prepare potential, new, and continuing students as well as members of other teams in our area. We will continue to work with our surrounding middle schools to establish LEGO League teams and robotics classes. As always we aspire to strengthen our role in the community through more public events and other outreach opportunities.

Proven Inspiration

For the last six years (since we started keeping track), 100% of our graduating seniors went on to college, as shown in the table below:

Name	High School	Year	College	Major
Armin Balg	RUHS	2003	CSU Monterey Bay	Unknown
Angela Barron	RUHS	2003	CSU Dominguez Hills	Unknown
Greg Nelson	MCHS	2003	UC Irvine	Political science, economics
Kevin Nelson	MCHS	2003	Rose Hulman Institute of Technology	Mechanical engineering

Name	High School	Year	College	Major
Rebecca Wagner	RUHS	2003	Rochester Institute of Technology	Mechanical engineering.
Richard Mills	MCHS	2004	Amherst	Economics, Asian Studies
Breanne Munoz	RUHS	2004	Sonoma State University	Undeclared
Aaron Miller	RUHS	2005	University of Texas	Computer science.
George Chen	MCHS	2005	UC San Diego	Bioengineering
Jared Niemiec	MCHS	2005	UC Berkeley	Mechanical engineering
Daniel Brim	RUHS	2006	Northeastern University	Mechanical engineering
Bryan Campbell	MCHS	2007	University of Southern California	Mechanical Engineering
Andrew Cole	MCHS	2006	CSU San Francisco	Mechanical engineering
David Litwak	Santa Monica HS	2006	UC Berkeley	EE and CS
Ryan Tupper	MCHS	2006	El Camino College	Mechanical engineering
Stephan Brown	MCHS	2007	Cal. Poly., SLO	Mechanical engineering
Adam Heard	RUHS	2007	Cal. Poly., SLO	Mechanical engineering

Name	High School	Year	College	Major
Greg Robinson	MCHS	2007	UC Davis	Electrical engineering
Rene Rotberg	RUHS	2007	UC Riverside	Law
David Tsao	MCHS	2007	Princeton	Computer science
Thomas Wilson	RUHS	2007	CSU Long Beach	Aerospace engineering
Steven Ortiz	MCHS	2008	UC Riverside	Mechanical engineering
Jason Osman	Westchester High	2008	El Camino College for transfer to Cal Poly San Luis Obispo	Electrical engineering