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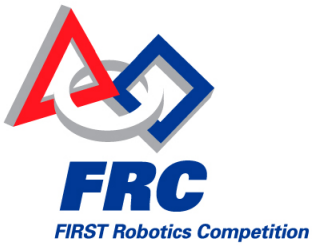
Introduction



© *FIRST*® *Robotics Competition (FRC®) 2012*

1 Introduction

1.1 What is the FIRST® Robotics Competition (aka FRC)?

Take dedicated, enthusiastic students, teachers, engineers and other professionals, add six weeks for design and fabrication and you get a wide range of amazing machines that are competition ready.

The *FIRST* Robotics Competition (FRC) is an exciting program that assimilates teams, sponsors, colleges and technical professionals with high school students to develop their solution to a prescribed engineering challenge in a competitive game environment. The competitions, combine the practical application of science and technology with the fun, intense energy and excitement of a championship-sporting event. The program results in life-changing, career molding experiences for its participants and is a lot of fun.

In 2012, FRC will reach nearly 55,000 students representing approximately 2,300 teams. FRC teams come from every state in the United States, as well as from Australia, Bosnia, Brazil, Canada, Chile, China, the Domincan Republic, Germany, Israel, Mexico, Spain, Taiwan, Turkey, and the United Kingdom. FRC has become an international program and is continuously growing. FRC teams will participate in 52 Regional Competitions, 9 Michigan District Events, the Michigan State Championship, 5 Mid-Atlantic Robotics District Events, and the MAR Region Championship. Approximately 300+ deserving teams will qualify to go to the *FIRST* Championship at The Edward

Jones Dome in St. Louis, MO.

This year's challenge will be presented at the 2012 FRC Kickoff on Saturday, January 7, 2012. At the Kickoff event, all teams:

- see the 2012 game field for the first time;
- learn about the 2012 game rules and regulations; and
- receive a Kit of Parts (KOP). The KOP includes, but is certainly not limited to, motors, sensors, chassis hardware, transmissions, software packages, control systems and batteries. The intent of the kit is to provide a level starting point for all teams.

1.2 Gracious Professionalism™, A FIRST Credo

Dr. Woodie Flowers, *FIRST* National Advisor and co-founder of FRC, asks:

"Why do *FIRST* folks talk so much about that phrase?"

Dr. Flowers elaborates on the significance of Gracious Professionalism™ in *FIRST*, at work and in life, below.

"*FIRST* does not celebrate being an incompetent jerk. *FIRST* does celebrate high-quality, well-informed work done in a manner that leaves everyone feeling valued. Gracious Professionalism™ seems to be a good descriptor for a big part of the ethos of *FIRST*. It is one of the things that makes *FIRST* different and wonderful.

Gracious Professionalism™ has purposefully been left somewhat undefined because it can and should mean different things to each of us. We can, however, outline some of its possible meanings. Gracious attitudes and behaviors are win-win. Gracious folks respect others and let that respect show in their actions. Professionals possess special knowledge and are trusted by society to use that knowledge responsibly. Thus, gracious professionals make a valued contribution in a manner pleasing to others and to themselves.

In *FIRST*, one of the most straightforward interpretations of Gracious Professionalism™ is that we learn and compete like crazy, but treat one another with respect and kindness in the process. We try to avoid leaving anyone feeling like they have lost. No chest-thumping barbarian tough talk, but no sticky sweet platitudes either. Knowledge, pride and empathy comfortably blended.

Understanding that Gracious Professionalism™ works is NOT rocket science. It is, however, missing in too many activities. At *FIRST*, it is alive and well. Please help us take care of it.

In the long run, Gracious Professionalism™ is part of pursuing a meaningful life. If one becomes a professional, and uses knowledge in a gracious manner, everyone wins. One can add to society and enjoy the satisfaction of knowing that he or she has acted with integrity and sensitivity. That's good stuff!"

1.3 Prominent FRC Awards

FIRST recognizes both on-field and off-field team performance that promotes *FIRST*'s mission to change culture. Several awards celebrate team competencies including, but not limited to, technical expertise, community involvement, and safety practices. The two most prominent FRC awards are described below (however, for a complete list and description of awards available to teams, please reference *The FRC Administrative Manual, Section 6*).

1.3.1 The Chairman's Award

Every year, veteran FRC Teams have the opportunity to compete for *FIRST*'s most prestigious award; i.e., the Chairman's Award. This Award was created to maintain focus on changing culture in ways that would inspire greater levels of respect and honor for science and technology, as well as encourage more of today's youth to become scientists, engineers and technologists. It represents the spirit of *FIRST*. The Chairman's Award honors the team that best embodies the goals and purpose of *FIRST* and is a model for other teams to emulate.

Teams who have won the Chairman's Award at the Championship are entered into the *FIRST* Hall of Fame. Past Hall of Fame inductees are listed below.

Year	Team	Official Team Name
2011	359	NASA/Castle & Cooke, Inc. Dole Plantation/McInerny Foundation/University of Hawaii-Melvin Matsunaga/Randy Wood/Hawaii Space Grant Consortium/Ted's Bakery/AFCEA Hawaii/Waialua High School Foundation/Friends of Hawaii Robotics/North Shore Hanapa'a Club/BAE Systems/Waialua Federal Credit Union/Waialua Lions Club/Hawaiian Dredging/University of Hawaii-College of Engineering/Iron Horse Development/Dole Food Company of Hawaii/Hawaii Visitors and Convention Bureau/Aloha Gourmet Products/GT Pies/Islander Group/KTM Services Inc./Maui Divers of Hawaii/Pioneer Hi-Bred International/Gone Tropo, LLC/Kai Media & Marketing/Coca Cola Hawaii/Learning Train LLC/Oils of Aloha/The Duck Company/GAK Enterprises/H&W Foods/Sharpshooter Spectrum Venture/Sunset International/Pacific Jobbers Warehouse/Gordon Kuwada/CMKLV/Charles Nakoa III/Hawaii State Federal Credit Union/Kenneth Koga & Waialua High School & HI DOE
2010	341	DOW Chemical/Lockheed Martin/Cobham Defense Electronics/Comcast Cable/BAE Systems/Centocor Ortho BioTech/Johnson & Johnson PRD/JCPenney/PJM Interconnection/DeVry University & Wissahickon High School & North Montco Technical Career Center
2009	236	Dominion Millstone Power Station & Lyme-Old Lyme (CT) High School
2008	842	Honeywell / Arthur M. Blank Foundation / Science Foundation Arizona / Intel / Vegas Fuel / Wells-Fargo & Carl Hayden High School

Year	Team	Official Team Name
2007	365	DuPont Engineering/DuPont CCRE/First State Robotics & MOE Robotics Group
2006	111	Motorola & Rolling Meadows High School & Wheeling High School
2005	67	General Motors Milford Proving Ground and Huron Valley Schools
2004	254	NASA Ames Research Center/Laron Incorporated/Unity Care Group/Line-X of San Jose/PK Selective Metal Plating, Inc. & Bellermine College Preparatory
2003	103	NASA/Amplifier Research/Custom Finishers/Lutron Electronics/BAE Systems & Palisades High School
2002	175	Hamilton Sundstrand Space Systems International/The New England Air Museum/Techni-Products/Veritech Media & Enrico Fermi High School
2001	22	NASAJPL/Boeing/Rocketdyne/FADL Engineering/Decker Machine & Chatsworth High School
2000	16	Baxter Healthcare Corporation & Mountain Home High School
1999	120	NASA Lewis Research Center/TRW, Inc./Battelle Memorial Institute & East Technical High School
1998	23	Boston Edison & Plymouth North High School
1997	47	Delphi Corporation & Pontiac Central High School
1996	144	Procter & Gamble & Walnut Hills High School
1995	151	Lockheed Sanders & Nashua High School
1994	191	Xerox Corporation & JC Wilson Magnet High School
1993	7	AT&T Bell Labs & Science High School
1992	191	Xerox Corporation & JC Wilson Magnet High School

1.3.2 The Woodie Flowers Award

The Woodie Flowers Award celebrates mentors who lead, inspire and empower their team. Woodie Flowers Award winners demonstrate effective communication in the art and science of engineering and design. Founded in 1996 by Dr. William Murphy, the Woodie Flowers Award is presented to an outstanding engineer or teacher participating in FRC who lead, inspire, and empower using excellent communication skills.

Students submit an essay that nominates one mentor from their team for consideration. Past winners of this award are listed below.

Year	Name	Title
2011	Mr. John Larock	Staffing Manager. Dupont
2010	Mr. Chris Fultz	Program Director - RR500 and New Product Introduction, Defense Sector, Rolls Royce
2009	Mr. John Novak	Engineer, Baxter Healthcare Corporation
2008	Mr. Mark Breadner	Vice Principal, Toronto District School Board
2007	Mr. Dan Green	Director, New Technology Business Operations, Motorola
2006	Mr. Rob Mainieri	Teacher, The Preuss School at UCSD
2005	Mr. Paul Copioli	Staff Engineer, FANUC Robotics America
2004	Mr. David Kelso	Teacher, Central High School
2003	Mr. Andy Baker	President, AndyMark, Inc.
2002	Mr. David Verbrugge	Engineer, GM Proving Ground
2001	Mr. William Beatty	Beatty Machine & Manufacturing Company
2000	Ms. Kyle Hughes	Teacher, OSMTech Academy

1999	Mr. Ken Patton	Engineer, GM Powertrain
1998	Mr. Michael Bastoni	Teacher, Plymouth North High School
1997	Ms. Elizabeth Calef	Teacher, Bridgewater-Raynham Regional High School

1.4 Safety: A FIRST Culture

Safety is critical within *FIRST* and must be observed continuously by all participants. As a part of the Safety Awareness and Recognition Program, teams are observed and evaluated at many different levels and by many individuals at the event.

“Safety Advisors” evaluate team safety behavior and practices at Regional Competitions.

“Referees” observe safety on the playing field as well as adherence to the game rules.

“Judges” evaluate how teams have integrated safety into their robot designs when considering the team for technical awards.

Safe practices at the competitions are required. Teams are urged to adopt safe habits throughout the entire competition season including during travel to and from events and while working in their shops at home.

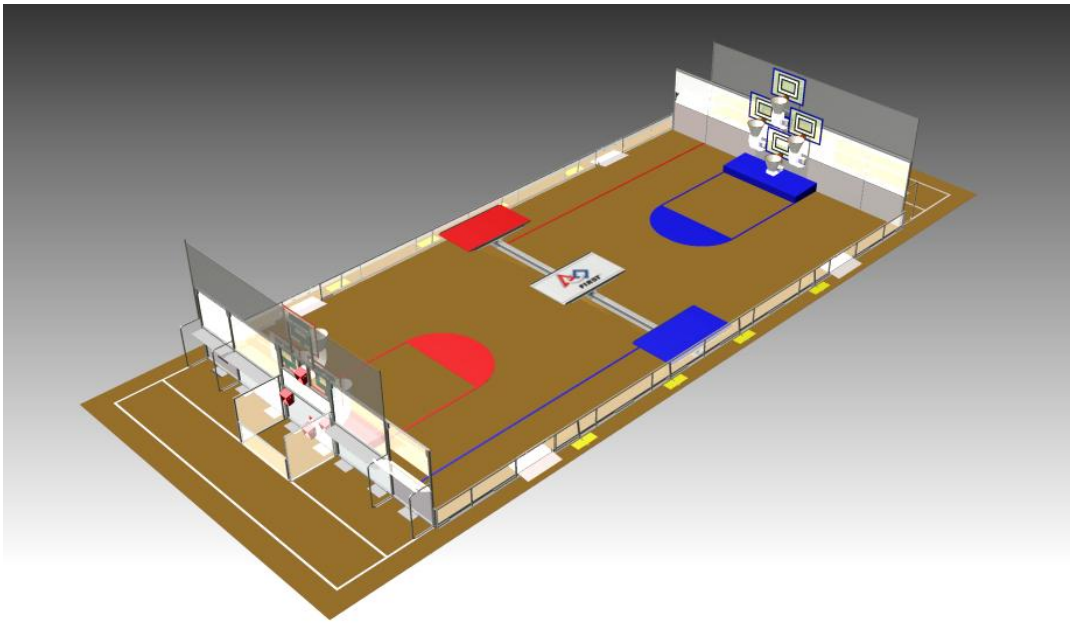
1.5 Robot Design and Build Schedule

One of the purposes of the FRC is to provide team members with the experience of conceiving, designing, and constructing their solution to the annual competition challenge. We want each student to have the experience of creating a new system each year. As the team considers the creation of their machine, this aspect of the program should be kept in mind. Solutions that merely bolt together a minimum number of externally-designed COTS subsystems may not offer the students the opportunity to understand the “why” or “how” of an item’s design. Likewise, solutions that are merely minor modifications of a design utilized for a previous competition does not offer the current students complete insight into the full design process. Purchasing optimization and design re-use are both important concepts, however teams must be cautious not to over-utilize them to the point that the student’s experience is compromised.

This intent is clearly met when a team obtains a Mechanism or COTS items that was designed for non-*FIRST* purposes, and then modifies or alters it to provide functionality for the Robot. For example, if a team obtains a gearbox from a power drill and modifies it to use on the Robot, they gain insight into the design of the original gearbox purpose, learn to characterize the performance of the original design, and implement the engineering design process to create their customized application for the gearbox.

However, COTS items that have been specifically designed as a solution to part of the FRC challenge may or may not fit within the FRC intent, and must be carefully considered. If the item provides general functionality that can be utilized in any of several possible configurations or applications, then it is acceptable (as the teams will still have to design their particular application of the item). However, COTS items that provide a complete solution for a major Robot function (e.g. a complete manipulator assembly, pre-built pneumatics circuit, or full mobility system) that require no effort other than just bolting it on to the Robot are against the intent of the competition, and will not be permitted.

1.6 Rebound Rumble Summary



Rebound Rumble is played by two competing alliances on a flat, 27 x 54 ft field. Each alliance consists of three robots. They compete to score as many basketballs into their hoops as they can during a 2 minute and 15 second match. The higher the hoop in which the basketball is scored, the more points the alliance receives.

The match begins with a 15-second Hybrid Period in which robots operate independently of driver inputs. During this Hybrid Period, one robot on each alliance may be controlled using a Microsoft Kinect. Baskets scored during this period are worth extra points. For the remainder of the match, drivers control robots and try to maximize their alliance score by scoring as many baskets as possible.

The match ends with robots attempting to balance on bridges located at the middle of the field. In Qualification Matches, a robot from each alliance will also try to balance on the white Coopertition™ bridge to score additional ranking points for each alliance. Scoring for the match is summarized below.

Hoop	Hybrid	Teleop

	Points	Points

Top	6	3
Middle	5	2
Bottom	4	1

# of Robots on Bridge	Qualification Points	Elimination Points
1	10	10
2	20	20
3	20	40

1.7 Revision History

Revision	Release Date	Changes
-	1/3/12	Initial Release