

U.S. FIRST

The COMPETITION

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TEAM

W

E
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E-SYSTEMS



MOTOROLA

Procter & Gamble

Paul Praterich © 1994



WORK To WIN

Dear Competitors and Guests:

America's young people today inhabit a world of popular television. In that world, lawyers are heroes, recording artists are idols and athletes are superstars. Scientists barely exist. Technological achievement is unknown. It's no wonder that kids today dream of MTV stardom or making millions playing basketball, but not of building a better microchip or winning a Nobel Prize.

Games are fun, and the arts are enriching. But we've got to show that the worlds of science and technology are also worlds of wonder and excitement, richly rewarding and immensely fulfilling. We've got to make the next generation see and feel the challenge of science and the joy and value of mastering its mysteries.

That's what U.S. FIRST is about.

It's about changing the way the kids of America think about science and technology.

One way we do that is through competitions like MAIZE CRAZE, RUG RAGE, and TOWER POWER—competitions that present science as a made-for-television sporting event, complete with cheering squads and banners and play-by-play announcers. The competitors learn by doing, but even more important is the excitement they generate in their schools and communities and ultimately all across America.

In all that U.S. FIRST does, our corporate participants hold the key to success. This is partly because we are deliberately a private sector organization, even though our franchise includes helping meld together public and private efforts. But more importantly, it is because corporate America is expert at persuasion, and already spends billions of dollars each year on changing the way people think—through advertising, promotion and the sponsorship of sports, cultural and other events.

We expect corporate America to join with us in honoring the heroes of science and technology. And we expect the leaders of corporate America to take the lead, with us, in using the talent and resources with which they now so successfully sell their products, to sell the next generation on developing the skills that make those products possible.

Thank you for being here—and enjoy.

Dean Kamen
Founder, U.S. FIRST

COMPETITION WINNERS HONORED AT WHITE HOUSE

Each year the National Champions of The U.S. FIRST Competition, and the Chairman's Award winners, have been invited to the White House Rose Garden to be honored by the President of the United States. The following excerpts are taken from President Clinton's and former President Bush's remarks to the members of the winning teams:

May 28, 1993—President Bill Clinton

"Today, it is my pleasure to welcome the winners of the U.S. FIRST Competition to the White House with great enthusiasm because this effort combines three principles in which I deeply believe: it demonstrates the power of partnerships between schools and corporations, it illustrates the effectiveness of empowering our students with modern skills, and it represents the need that we all have in this country to retool our work force and to rebuild our companies to develop the kinds of skills and the products we need to compete in the global economy..."

"U.S. FIRST is a four-year-old national non-profit organization aimed at exciting the next generation about science and technology using all the modern techniques of mass-marketing and media....Our children have the energy and the ability to be the best in the world. The challenge we face is how to best harness that ability and that energy..."

"Today we honor two winning teams....I'm proud of these teams, their teachers, and advisors. All of you have set a real example for other students around our nation, and for teachers and companies as well. With your help we can insure that every American student will be a winner in math and science education..."

June 23, 1992—President George Bush

"There's a church in Sussex, England that bears a wonderful inscription which captures the pioneer spirit of innovation. It says: 'A vision without a task is but a dream; a task without a vision is drudgery; but a vision with a task is the hope of the world.' The hope of our world lies with individuals who asked why and then followed wherever the question led..."

"You all proved that America's greatest resource is the genius of our people. We must encourage—we must support it. ...The world economy of the 21st Century will demand a new age of American competitiveness in a fiercely challenging global marketplace. In order to compete we must make immediate, drastic changes beginning with the need for the best-educated, the most well-educated workers. ...The terrible fact (is) that in some math and science studies we rank last—almost last—among the industrialized nations..."

"...I was enormously impressed...by how this Maize Craze teams high school students with high-powered engineering teams from major universities and corporations, a great example of the private-public partnership that will lead us to excellence in the next century. ...Maize Craze is part of U.S. FIRST, a national alliance of business, education and government working to reverse the declining student interest and performance in science and math..."

"...We're honoring today a spectrum of achievers that goes from the high school to the pinnacle of research. And in turn we need to nurture every step of the educational ladder. ...Congratulations to all of you...who show the triumph of the human mind and the unfolding drama of the human imagination."

U.S. FIRST Advisor Woodie C. Flowers

Woodie Flowers is a professor of mechanical engineering at the Massachusetts Institute of Technology and currently holds a School of Engineering Professor Chair of Teaching Innovation.

He received a B.S. degree from Louisiana Polytechnic University and S.M., M.E., and Ph.D. degrees from M.I.T. His current research activities include work on microcomputer-controlled artificial legs, the creative design process and computer-aided design systems. Teaching engineering design is a major part of his career.

Dr. Flowers has started several new design courses including one of the most famous courses at M.I.T., "Introduction to Design (2.70)." He is director of M.I.T.'s New Products Program. For his teaching he has received The Goodwin Medal, The Baker Award and The Den Hartog Distinguished Educator Award from M.I.T. He also received The Western Electric Award from The American Society of Engineering Education.

He is currently a member of the board of directors of The General Scanning Corporation, a member of the Board of Advisors of The Meitec U.S.-Japan Friendship House, an Overseer for Boston's Museum of Fine Arts, and a national advisor to U.S. FIRST. Dr. Flowers served as a host for the PBS television series *Scientific American Frontiers*.

U.S. FIRST Founder Dean Kamen

Dean Kamen is president and owner of DEKA Research & Development Corporation, a Manchester, NH-based company specializing in advanced technologies in medical equipment. He is also chairman and owner of Teletrol Energy Systems, Inc., a manufacturer of electronic climate control systems for large commercial and industrial buildings.

A physicist, engineer and inventor, he holds more than 30 U.S. patents. He was an undergraduate at Worcester Polytechnic Institute when he founded his first company, Auto-Syringe, Inc., in 1976 to produce the wearable infusion pumps on which he was awarded his first patents.

He is both an airplane and a helicopter pilot, and from 1985 to 1990 he was owner and chairman of the Enstrom Helicopter Corporation.

In 1985 he established Science Enrichment Encounters (SEE), a hands-on science museum for children in Manchester, NH. In 1989 he founded U.S. FIRST.

In 1988 he was named Entrepreneur of the Year by the New Hampshire High Technology council, and in 1992 received an honorary doctorate in science from Worcester Polytechnic Institute.

In addition to his own companies, SEE and U.S. FIRST, he serves on the boards of the Enstrom Helicopter Corporation and the New Hampshire Industrial Heritage Commission. He is also a member of the Government-University-Industry-Research Roundtable.

Chairman's Award

The Chairman's Award is presented to the team which achieves excellence by working well together. Judging criteria include the level of student participation, teamwork, team spirit, creativity of effort and overall cooperation and effectiveness between school and partner. The judging panel reviews materials submitted by teams prior to the national championship. Documentation may consist of video footage, photos, and written chronicles. The travelling trophy for this prestigious honor is a high-tech, custom crafted Dean Kamen clock, which the *New York Times* called "Art That Ticks." Winners are invited to the White House Rose Garden for presidential honors.

Founder's Award

The Founder's Award is presented to the organization or individual that best promotes the ideals and goals of U.S. FIRST. In 1993, Motorola was presented the Founder's Award for its outstanding contribution to the U.S. FIRST Competition, a custom built control system.

The Founder's Award, like the Chairman's Award, is a high-tech, custom crafted Dean Kamen clock.

Judges' Awards

The U.S. FIRST Competition list of winners extends well beyond the ultimate points winner. The Judges will present the following awards at the Awards Celebration:

• Motorola Quality Award •

Awarded to the team displaying the most robust design, that is, the project that best exhibits the relationship between quality of design, quality of construction and quality of performance.

• Procter & Gamble Creativity Award •

Awarded to the team displaying the most creative use of a component or the most creative and unique strategy of play.

• E-Systems Best Play of the Day •

- Most Creative Design •
- Best Offensive Round •
- Outstanding Defense •
- Best Sportsmanship •
- Best Team Spirit Display •
- Number One Seed •
- Most Photogenic •

T O P O W E R

The Game

Three radio-controlled devices battle one another and the clock in a contest of speed, strategy and dexterity. Contestants attempt to place as many of their soccer balls inside one of two goals. In each match, the three teams compete to place 12 balls of their team color inside either the high goal, worth 3 points per ball, or the low goal, worth one point per ball. The winner is the team that has the highest total point value of soccer balls within the two goals at the end of the 2 minute match. In the case of a tie, the team with more balls in the upper goal wins.

The Field

The TOWER POWER playing field is a carpeted, 12 sided symmetrical polygon, 34 ± 0.5 feet across. The surface consists of a closed looped, low pile carpet. The perimeter of the carpet is defined by a curb of pressure treated 4" x 4" boards.

There are 36 balls total on the playing field; 12 of each color. At the beginning of each match, they will be arranged in six piles of six identical balls each. All piles will be placed half-way between the center of the goal and the curb. For a given team, piles of their color balls will be placed 90° to each side of their starting position.

The Rules

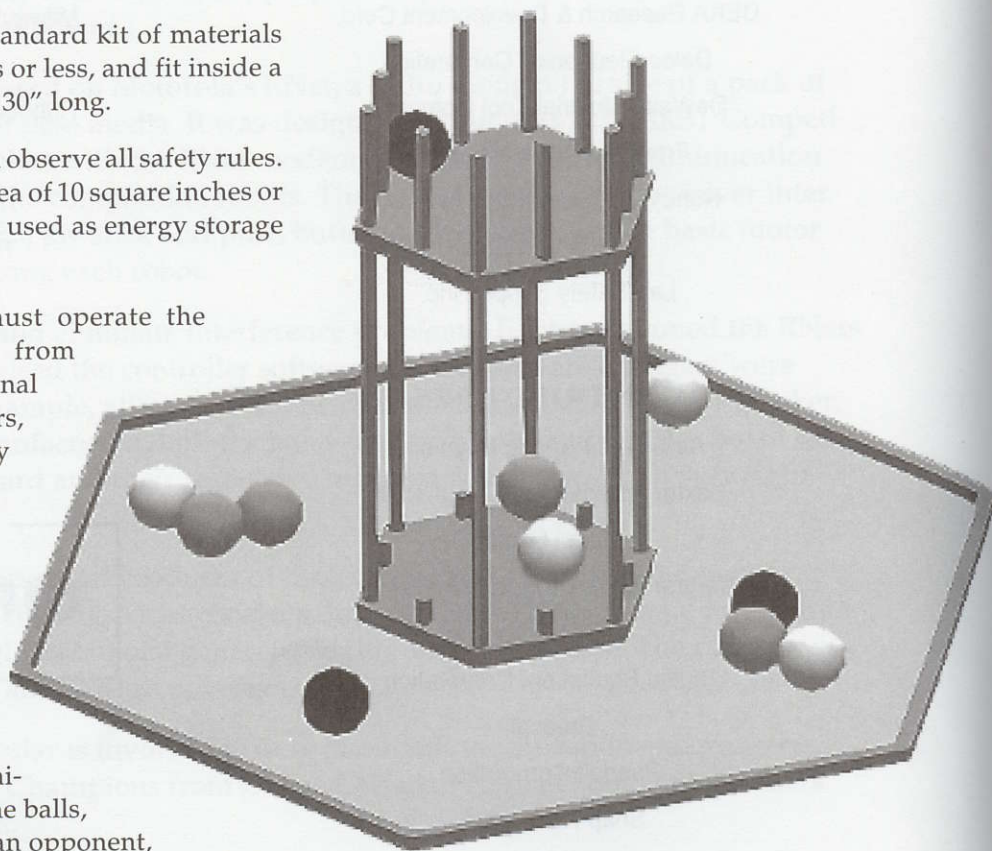
Note: This is an abridged synopsis of the rules.

The devices must be built from a standard kit of materials supplied by U.S. FIRST, weigh 65lbs or less, and fit inside a cylinder that is 36" in diameter and 30" long.

Players must wear safety glasses and observe all safety rules. All projectiles must have a frontal area of 10 square inches or more, and rubber bands may not be used as energy storage devices.

Two students from each team must operate the devices with wireless equipment from within the team box. Two additional people, usually coaches or engineers, are allowed in the team box, but only as observers and advisors. All other team members must remain away from the playing field during the competition.

Strategies aimed only at destruction of an opponent's machine, such as stabbing or cutting, are not allowed. No contestant may intentionally contaminate or damage the playing field, the balls, or other contestants. Turning over an opponent, however, is not considered damaging.



Devices must operate only by reacting against the surface of the playing field, the innermost face of the curb, the goals, the balls, the other machines, and the air. The fence is a safety feature and is not part of the playing field. Traction may not be gained with the use of adhesives or by abrading the surface. Machines that touch the area outside the rim will be considered "out of bounds" and disqualified for the remainder of the round. This includes machines that are pushed out of bounds.

Each match will be two minutes long. To receive one point for a ball, its geometric center must be within the vertical planes defined by the outside edge of the hexagonal lower goal. To receive three points for a ball, its geometric center must be above and within the vertical planes defined by the outside edge of the upper hexagonal goal. If a ball is wedged between the posts of the pper goal, and remains there unsupported, it is considered "in." Referees' determinations will be final.

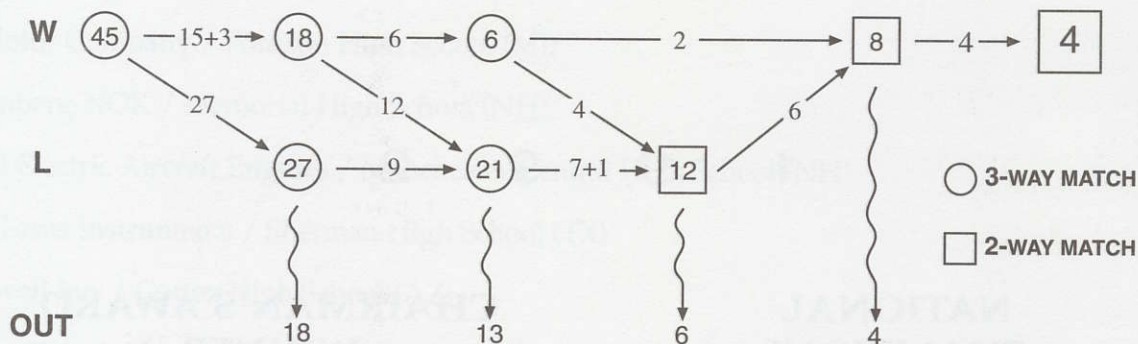
Scoring Structure

Seeding Round—Friday, February 25, 1994

In the Seeding Round, each team will play five matches, with three competitors per match, against as many different teams as possible. The Seeding Round match list will be distributed to each team on Friday morning.

After all of the seeding matches are completed, the teams will be ranked by place totals (not point totals). Place totals for each team are determined by adding up their places for all rounds. In the event of a tie in place total, the order will be determined by total score, last seeding match score, and flip of a coin, respectively.

The results of the Seeding Round will be used to determine the first round matches of the Competition.



Competition and Finals—Saturday, February 26, 1994

The Competition is based on three player matches, with one winner (and two losers) per match. In order to maintain the tree structure, some rounds may have additional winners (which will be chosen from the second place teams according to their scores for that round). Also, some matches in the loser's bracket will have only two competitors.

The Competition is double elimination; every team will be able to lose at least two matches before being eliminated. The Competition concludes when there are only four teams left.

The Finals follow the Competition, and allow the final four teams to play 1-on-1 matches. These matches will have only one winner, but are best 2 out of 3.

During the course of the Competition and Finals, the judges reserve the power to make any adjustments or modifications to the structure and rules of the Competition and Finals.



CHAMPIONS



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**NATIONAL
CHAMPIONS**

E-SYSTEMS, INC.

Dallas Christian High School
Mesquite TX

**CHAIRMAN'S AWARD
WINNER**

AT&T BELL LABORATORIES

Science High School
Newark NJ

1 9 9 2

**NATIONAL
CHAMPIONS**

NYPRO, INC.

Clinton High School
Clinton MA

**CHAIRMAN'S AWARD
WINNER**

XEROX COPORATION

Joseph C. Wilson Magnet School
Rochester NY

Advanced Integrated Systems Ltd. / University of the West Indies / Jamaica College (Jamaica, West Indies)

Alliant Techsystems, Inc. / Washburn Senior High School (MN)

Alliant Techsystems, Inc. / Kamiak High (WA)

AT&T Bell Laboratories / AT&T Global Information Solutions / NCR Microelectronic Products / Harrison High School (CO)

The Boeing Company, Commercial Airplane Group / Bellevue High School (WA)

Bose Corporation / Assabet Vocational Technical High School / Framingham High School (MA)

Delco Electronics Corporation / Kokomo High School (IN)

E-Systems, Inc. / Dallas Christian High School (TX)

E-Systems, Inc. / Greenville High School (TX)

Eastman Kodak Company / Edison Technical School (NY)

Ford Motor Company / Fordson High School (MI)

Freudenberg-NOK / Memorial High School (NH)

General Electric Aircraft Engines / Manchester Central High School (NH)

GTE / Texas Instruments / Sherman High School (TX)

Honeywell Inc. / Cortez High School (AZ)

Honeywell, Inc. / North High School (MN)

Honeywell Microswitch Division / Freeport Senior High School (IL)

Ingersoll-Rand Company / Bishop Guertin High School (NH)

Johnson & Johnston / Astro Precision Machine, Inc. / Brooks Automation / Salem Vocational High School (NH)

Lockheed Sanders / Nashua High School (NH)

Mann-Horton & Associates, Inc. / K. Albert Associates / Stevens Institute of Technology / Dwight Morrow High School (NJ)

Markem Corporation / Keene High School (NH)



The TEAMS



MITRE Corporation / Hanscom Air Force Base / Bedford High School (MA)

NASA Lewis Research Center / Cuyahoga County Schools (OH)

Navi Dowty & Associates, Inc. / D.C. Everest High School (WI)

Northeast Utilities Company / U.S. Coast Guard Academy / New London High School / Waterford High School (CT)

NYNEX Corporation / Newburgh Free Academy (NY)

NYNEX Corporation / Somerville High School (MA)

NYNEX Corporation / St. Bernard's Central Catholic High School (MA)

NYPRO, Inc. / Clinton High School (MA)

Powersoft Corporation / Massachusetts Institute of Technology / Boston Latin High School (MA)

The Procter & Gamble Company / Aiken High School (OH)

The Procter & Gamble Company / Walnut Hills High School (OH)

Public Service of New Hampshire / Manchester High School West (NH)

Rensselaer Polytechnic Institute / Shenendehowa High School (NY)

SMC Pneumatics, Inc. / Ipswich High School (MA)

Southern Methodist University / St. Mark's School of Texas (TX)

Stanley Works / Stanley Access Technologies / Stanley Hardware / Berlin High School (CT)

Summa Four / Derryfield High School (NH)

Symbiosis Corporation / Miami Springs High School (FL)

Texas Instruments, Inc. / Denison High School (TX)

University of New Hampshire / Bailey Corporation / Winnacunnet High School (NH)

Worcester Polytechnic Institute / Doherty High School / Mass. Academy of Math & Science (MA)

Xerox Corporation / Joseph C. Wilson Magnet High School (NY)

The Boeing Company, Seattle, WA
Bellevue High School, Bellevue, WA
The Sonic Boom

With the guidance of three highly dedicated Boeing Engineers, over 30 students worked extremely hard on their entry for this year's U.S. FIRST Competition. Participation from all grades (9-12) and all cultures enhanced the experience for everyone involved as well as the overall productivity. Many areas of Bellevue High School have contributed to the success of this project, for example, the school and local newspapers, video production class, and a bulletin board created by a student to communicate ideas.

On January 10, the Boeing engineers and Bellevue High students began the brainstorming process. Holding meetings five days a weeks, the team narrowed down the many creative possibilities, through extensive discussion, mock-ups, and prototypes, to one design with hopes of a winning machine. Our machine is one that will be able to quickly accomplish the basic task of putting balls in the goals.

Bose Corporation, Framingham, MA
Assabet Valley Regional Vocational High School, Marlborough, MA
Framingham High School, Framingham, MA
Hot Shots

The students at Assabet Valley Regional Vocational High School in Marlborough, Massachusetts, and Framingham High School, a comprehensive public school, have joined forces along with Bose® Corporation of Framingham, Massachusetts, to form the Hot Shots. We feel that working with two schools gives us a broad scope of talents, including but not limited to engineering, industrial design, media communications, and management.

On Sunday, January 9, we held our kick-off meeting at Bose. We brainstormed many different ideas and possible machine configurations. Our first prototype machine was not a success, but our design team collaborated with Bose engineers and collectively, they came up with a new game plan. The Student Engineering Division has been working on a daily basis with Bose engineers.

Our Marketing Group is working to produce a video to show the beginning-to-end process of how the machine was constructed. We are producing a brochure about the machine and the team itself. Students have met with various departments at Bose, such as Audio/Visual, Advertising, and Marketing to come up with a team image. Next week we will issue the Mass. Challenge to all Massachusetts schools involved.

Delco Electronics Corporation, Kokomo, IN
Kokomo High School, Kokomo, IN
Science KATS/KATapult

Our team consists of 22 sophomore through senior students who meet every weekday after school. Two shop classes are building a full-sized field at school; an art class is designing logos and artwork; the AV department is making a video tape as a class project; and the school newspaper is reporting our progress. Three high school teachers, three Delco Electronics engineers, and two Delco Electronics skilled tradesmen are guiding and helping the team design and prototype the machine. The total number of students involved is more than 100.

The whole team met after the competition and started to brainstorm a solution. During the next week, many different ideas were reduced to three and the final solution voted on. The team then broke into small groups to solve different problems. The building was done at Delco Electronics with regular team visits to check on progress. Driving practice was held at the school which created lots of student interest and questions. Team members going to the competition in New Hampshire will be chosen by driving ability, attendance, sportsmanship, and the ability to be a good ambassador for the school.