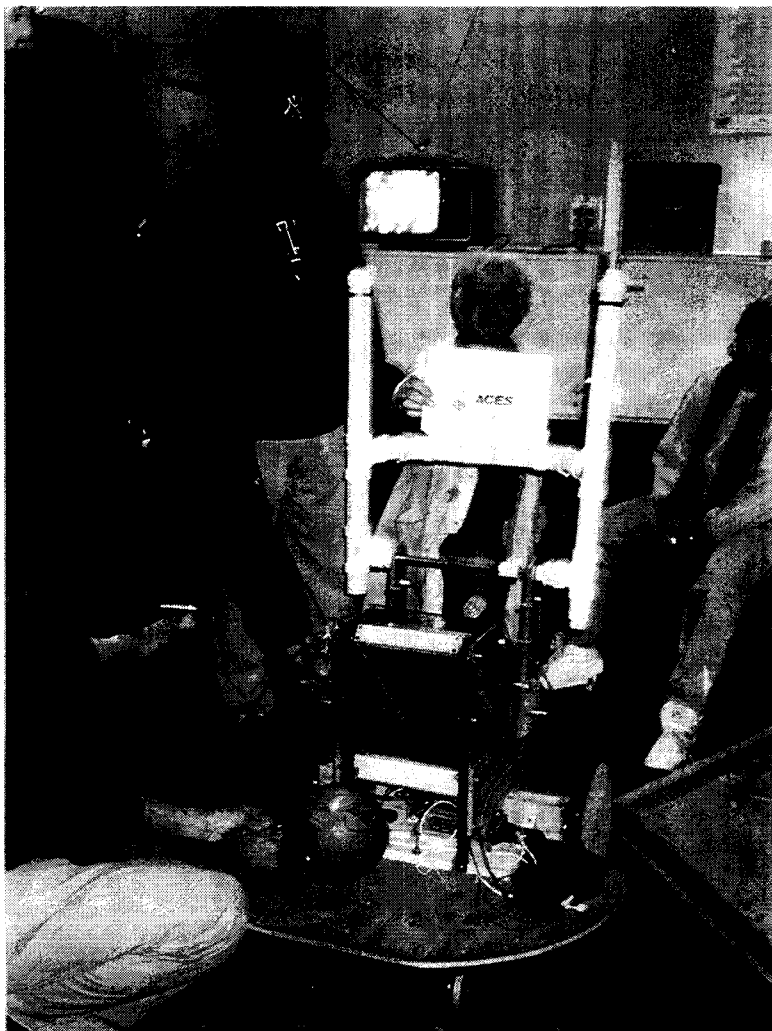


ACES (Atlantic Coast Engineering Staff)

Mann-Horton & Associates, Inc. Dwight Morrow High School
Englewood, New Jersey

(The vehicle build) progressed steadily...as students, teachers, and others worked 7 days a week 'til late at night to finish our project. It was during these marathon sessions that our team joke evolved. It seemed as though all we ever got to eat was bagels and butter. For variety, sometimes we would have butter and bagels, or bagels and bagels or bagels with extra butter. If you were really desperate you could have butter and butter. Long days have their effect on your sense of humor.



Little Ace had to be shipped via UPS in less than 3 days and it still wasn't finished. Our telescoping lifting mechanism, designed to score in the high goal, was only partially complete and never tested. Late Saturday night (2 days left) our entire vehicle was finished. However, the telescoping arms proved unreliable. ...If we had another week, we could have solved all the problems and proceeded with our original plan. ...We quickly had to alter our design to score only in the low goal. We were greatly disappointed, but still hopeful and competitive. We finally got Little Ace in the 'mail' and felt much relieved.

...(Practice day,) we went to Nashua High School at 9 a.m. to rendezvous with our robot, to check out the facility, and practice (we never had time to practice before we left.) We were shocked when we opened our shipping carton to find our vehicle had been badly damaged, literally broken in half during the UPS shipment. A day we thought would be leisurely and light turned out to be a marathon as we scrambled to rebuild our entry. We didn't get back to our hotel until almost 10 p.m. that night, but Little Ace was up and running.

On Friday, with our spirits much improved, Little Ace performed well, finishing in first or second place in each of the five seeding competitions we entered.

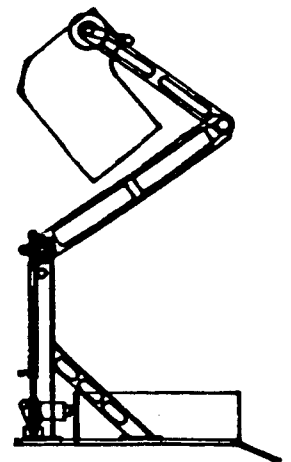
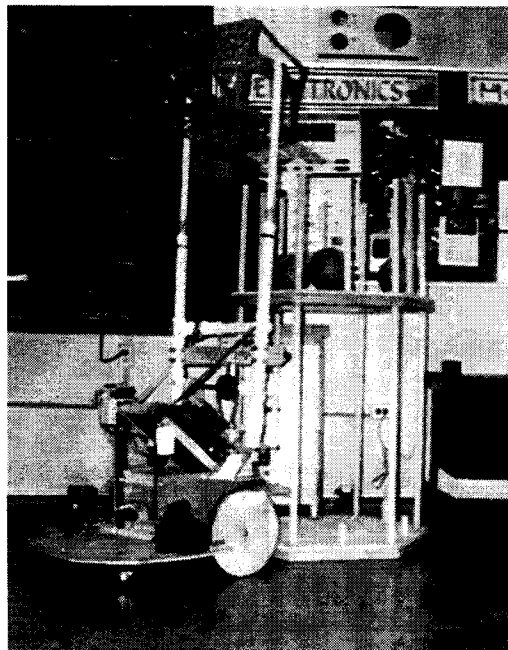
We were seeded 25 out of 44 teams. Considering some of the high tech machines we were up against, we felt really good.



“...and it is clear that the excitement is slowly growing into a mental frenzy. As the Superintendent of Englewood Public Schools recently wrote, ‘this creative, technical endeavor will, no doubt, have a long term, positive impact on all...’ We’re excited!”

Saturday, competition day, we were excited about being in our first U.S. FIRST competition. Our machine was performing really well. We managed to place second in the first couple of rounds.

...It was a tremendous experience for our entire team and now that it’s over, a very fond memory. We survived U.S. FIRST! Would we do it again? Don’t ask yet, we still haven’t caught up on our sleep!



JC Pirates

Advanced Integrated Systems University of the West Indies Jamaica College
Jamaica, West Indies



"We thank U.S. FIRST for the opportunity of being a part of this adventure."



"(We) had to do most of the construction with hand tools and very limited school workshop facilities."



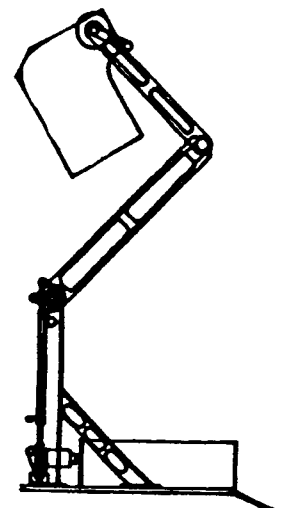
"THE JAMAICAN SPIRIT - the spirit of working at solving problems that others consider insurmountable. Customs detained our kit of materials for a week; 1/2 " aluminum plate and Lexan of any size is unavailable in Jamaica. We cannot get 1 1/4" closet rod anywhere. And so on. For people in the U.S.A. it may seem strange that these things are unavailable, for us in Jamaica it is the norm. We solved some of these problems by flying to Miami and buying the material needed.



They're Here!



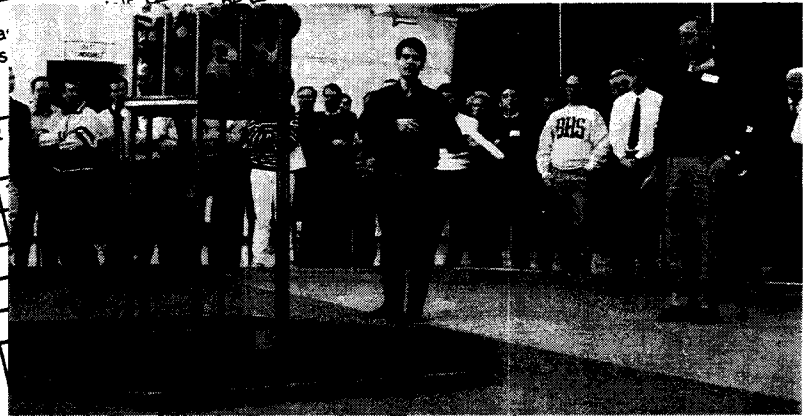
Unusual North Eastern snow storms in the New England coast area made travel difficult for most, but the J.C. Pirates from Jamaica were forced to miss the entire day of Seeding Competition. Their absence was felt by all. They worked as long and as hard as everyone else. In what other competition would you find team members and fans so concerned for an opponent. The cheer of welcome was deafening.



1994 U.S. FIRST The Kit: Parts Checklist

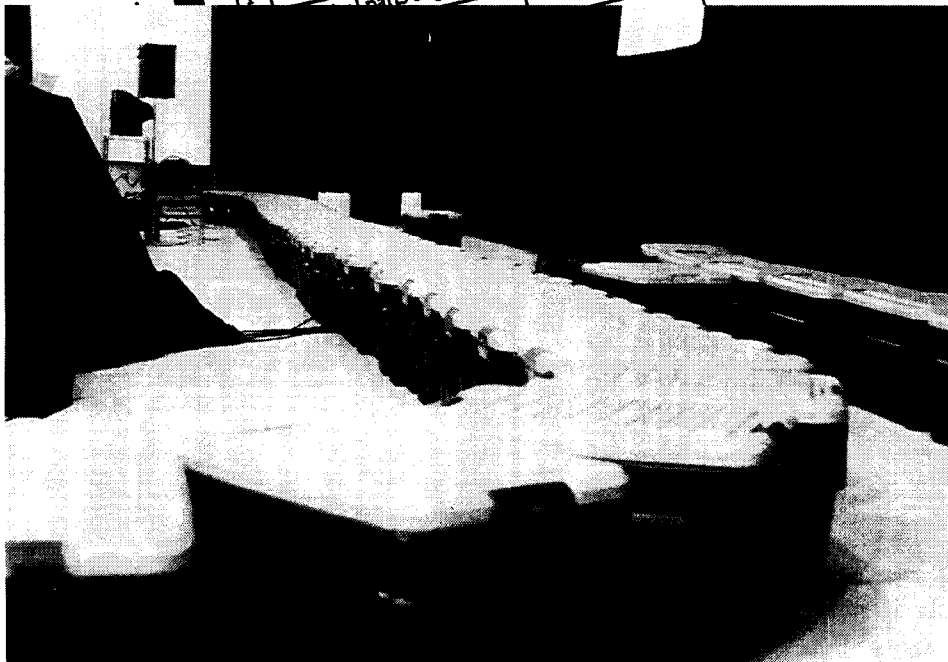
Everything in The Kit, except the Rubbermaid container and packa-
construction of your vehicle. Some of these items are also samples
quantitiaccording to the restrictions on the Hardware List.

... can be used in the
... be used in larger

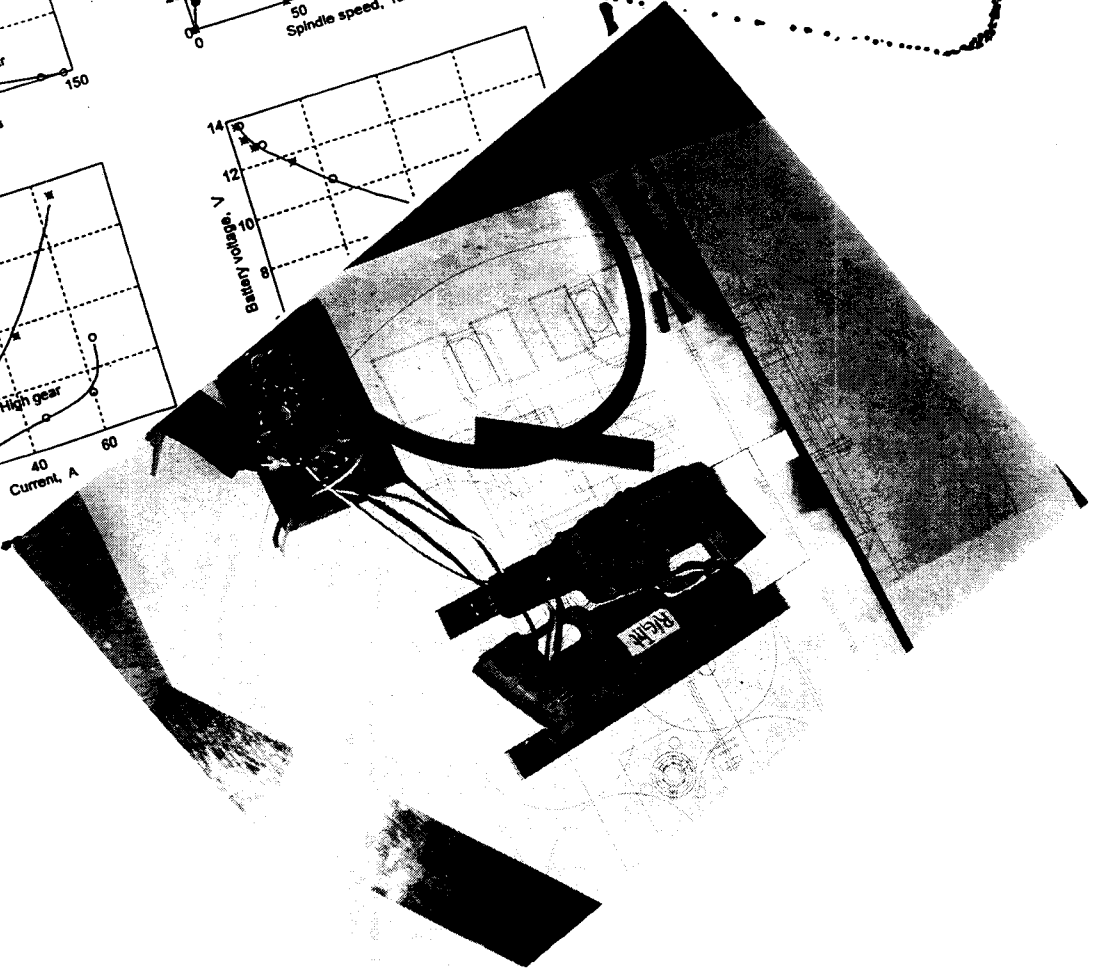
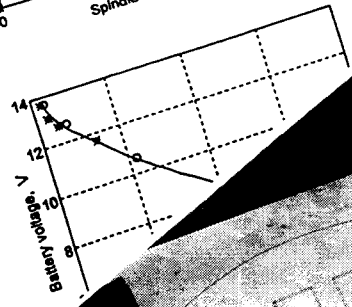
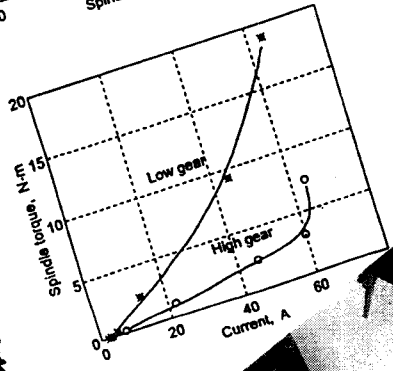
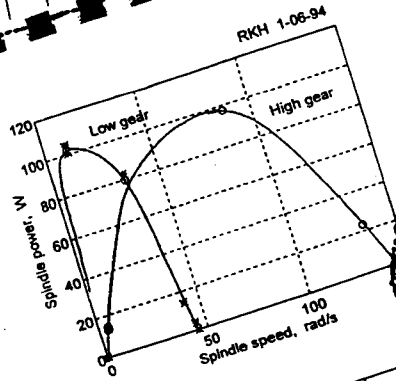
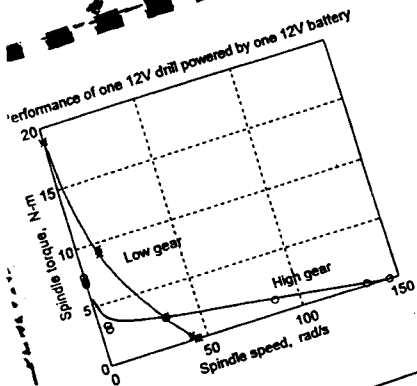
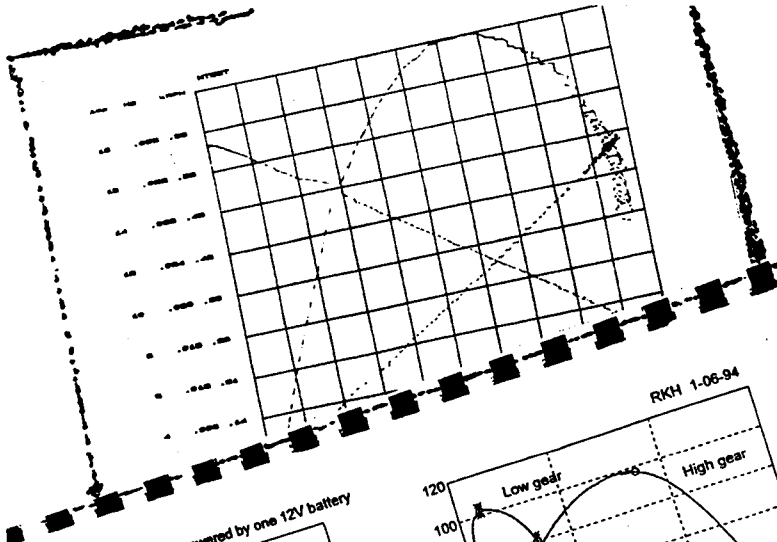


1	Aluminum Sheet	1/16", 12" x 18"
1	Masonite board	12" x 18"
1	Lexan Sheet	1/16" x 12" x 12"
1	Carpet sample	1' x 1'
1	Chipboard	1/2" x 6" x 12"
1	Particle Board	1/2" x 6" x 12"
1	Plywood	1/4" x 6" x 12"
1	Plywood	1/2" x 6" x 12"
1	Digital Eq. Corp. Printer	
1	Pine boards	1" x 3-1/2" x 9"
1	Pine boards	1" x 2-1/2" x 9"
1	Pine boards	1" x 1-1/2" x 9"
1	Bundle: Drill Rod (2) Drill Rod (2) Welding Rod (2) Welding Rod (6)	1/2" Ø x 18" 1/4" Ø x 18" 1/16" x 18" 1/8" x 18"
1	Bundle: Aluminum Rod (1) Wooden Dowel (1) Oil hardened shaft (1)	1/2" Ø x 12" 1/4" x 12" 1/2" x 12"
4	Delco seat motors	
4	Flexible motor shafts	
1	Aluminum Bar	1/4" x 3" x 12"
1	HDPE	1" x 2" x 6"
4	Milwaukee rechargeable batteries	
2	Chargers	bag
1	Sample/small parts bag	bag

1	Mushroom	
1	Plastic Wire Wrap	
1	Co-Polymer Gutter Guard	6" x 24"
2	Small Parts Catalog	140cc
1	Syringe	
1	Joystick	
1	Transmitter/Receiver box	
4	9 conductor shielded drill/drivers	
2	Black & Decker or DeWalt drill/drivers	
1	Battery relay boxes	
1	7.5V power supply	
1	R-net Receiver / Transmitter / Antenna	
1	Rubber Sheet	
1	Soccer Ball	
1	3mm Climbing Rope	
4	Delco motor harness	
1	55-gallon HDPE drum	To Be shipped direct



Testing,.. testing,.. 1.. 2.. 3...



Evaluation of drill motor

$\omega_{rad} = 1REV$

$\frac{95 \text{ rpm}}{sec} \times \frac{1 rev}{2\pi rad} \times \frac{60 sec}{1 min} = 430 \text{ rev/min low gear}$

$\frac{145 \text{ rpm}}{sec} \times \frac{1 rev}{2\pi rad} \times \frac{60 sec}{1 min} = 1385 \text{ rev/min high gear}$

rpm	7°	10°
430	10.5 (1.1)	18.8 (1.8)
1385	32.3 (3.2)	60.7 (6.1)

Balls weigh approx .61 lb
 Assume 10 balls
 Add 6 lbs to an 65 for an load.

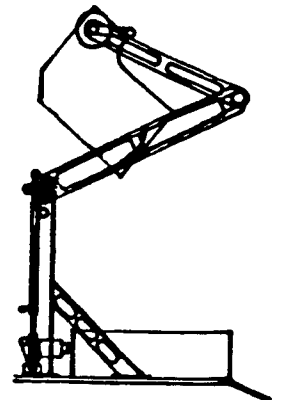
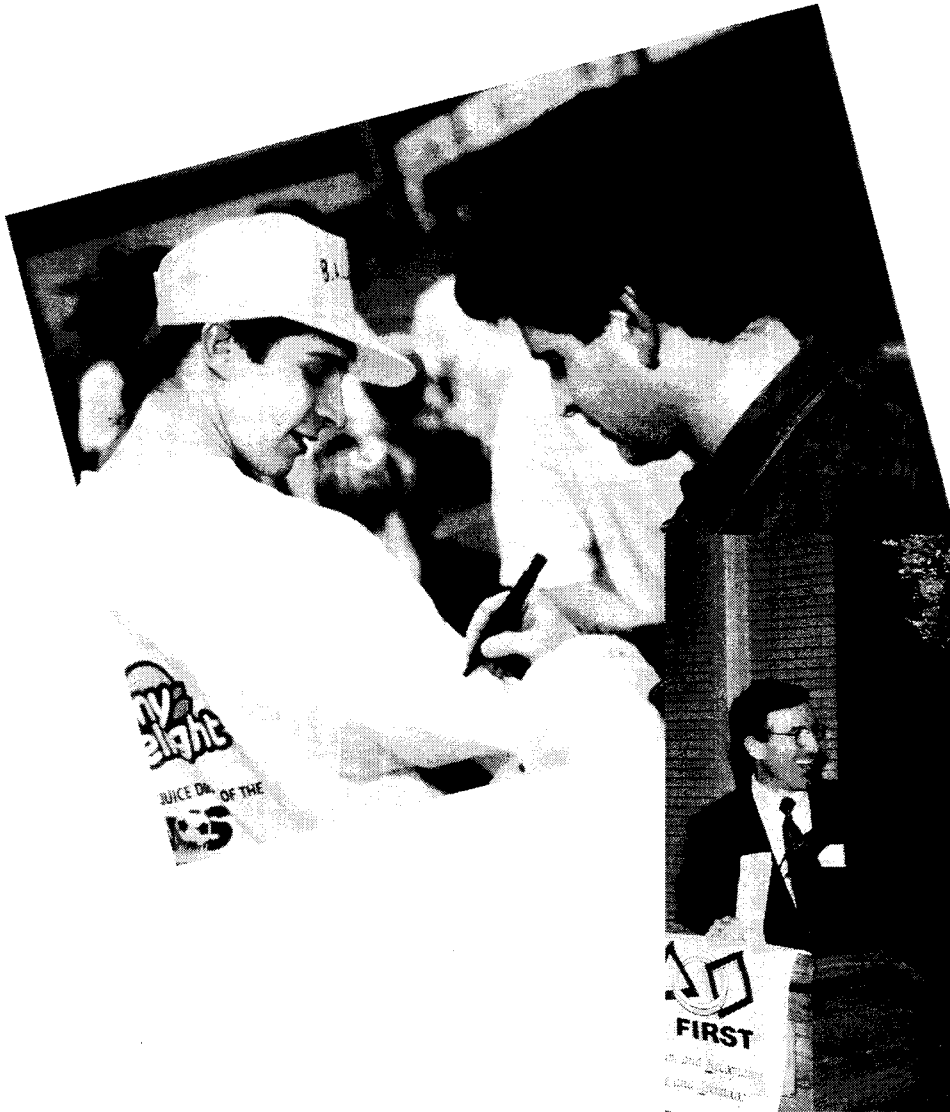
Torque:

$(1 \text{ ft} \cdot \text{lb}) \left(\frac{12 \text{ in}}{1 \text{ ft}} \right) \left(\frac{1}{r} \right) = F \cdot l_r$

$1.355 \text{ ft} \cdot \text{lb}_r = 1 \text{ N} \cdot \text{m}$

62 $\frac{\#}{\text{ball}}$

"Everybody looks up to Somebody!"



The Fighting Falcons

Procter & Gamble Company Aiken High School
Cincinnati, Ohio

Chairman's Award Finalists Rookie All-Stars

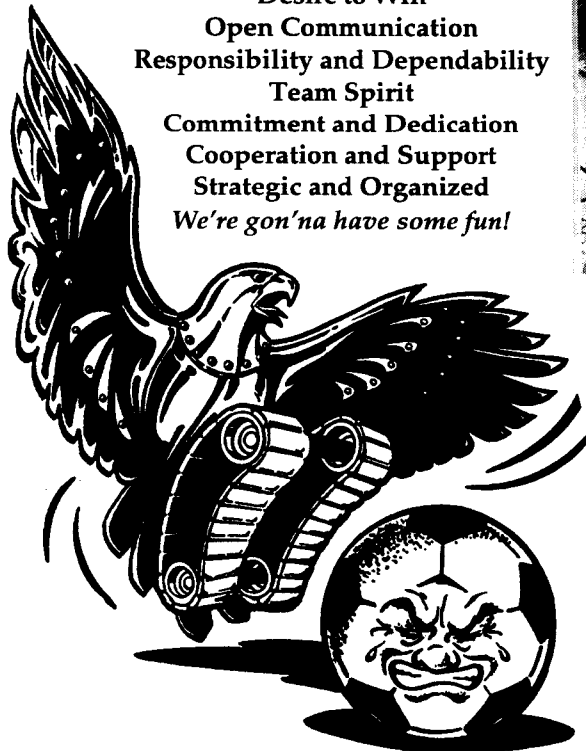


"I thought that engineers were people who made a lot of money for doing a little bit of work."

Louis Ferguson, Student

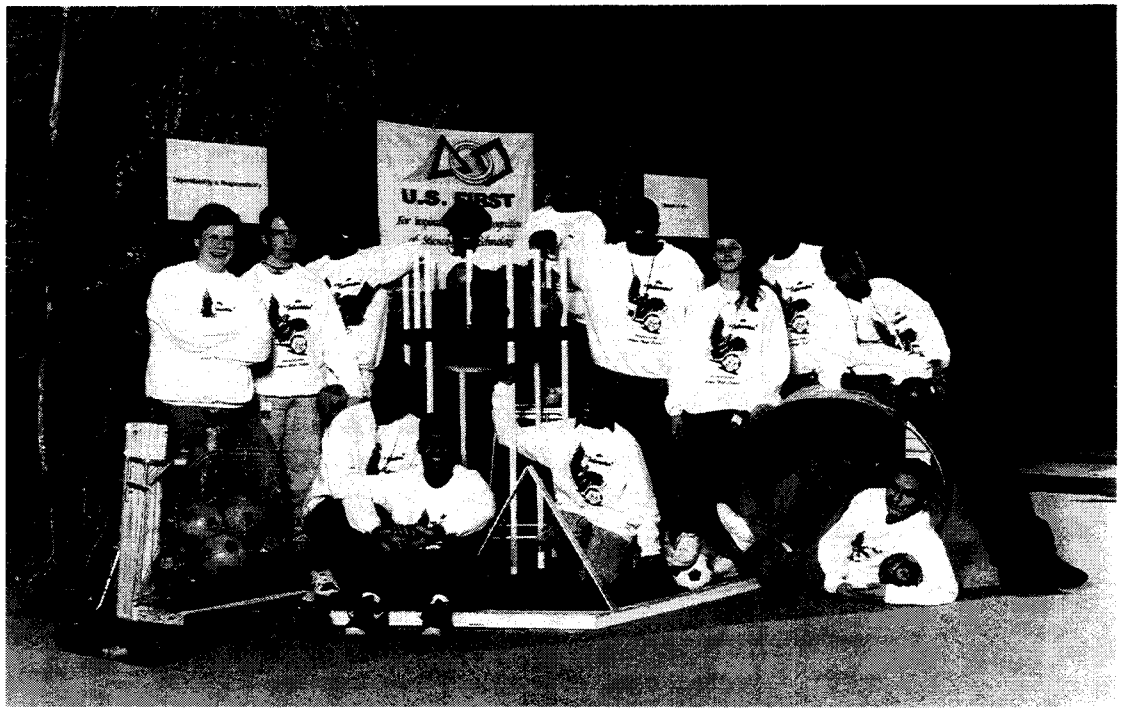
"This is how we are going to build our machine:

- Have Fun
 - Recognition and Respect
 - Be Bold in Our Thinking
 - Partnership
 - Honesty
 - Desire to Win
 - Open Communication
 - Responsibility and Dependability
 - Team Spirit
 - Commitment and Dedication
 - Cooperation and Support
 - Strategic and Organized
- We're gon'na have some fun!*



"We get the students' & engineers' ideas. We put them together. When we put them together we don't know if it's a student's idea or an engineer's idea. We just vote on which idea is best. So, if your idea is going to ride, we're going to let your idea ride."

Eugene Wilburn, Student

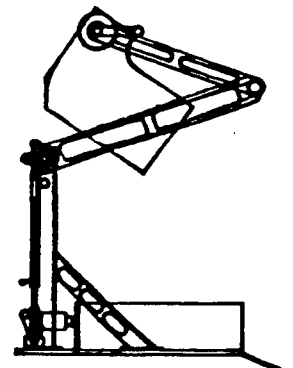


Students learned to appreciate engineers and engineers to appreciate students, not just for their skills, but as people. As the weeks progressed we saw the students blossom. Students who initially were afraid to speak were now afraid to be quiet. They didn't want to miss an opportunity to share an idea. We heard over and over again 'how amazed they were that we listened to them, then acted on what they'd said.' The more we listened the more it energized the kids. Two and one-half weeks into the project, the excitement was contagious.



"We're starting to learn that we can be a big family here, with everyone working together."

Ritchie Hall, Student



"The most important things the students learn are not to be afraid to say what's on their mind and to dream: To exercise that dream and see how it can be turned into reality with teamwork. They see they can't do it alone, they need other people in their lives."

Linda Close, Parent

"I never expected engineers to look like real people."

Ritchie Hall, Student



"The kids have taught me to be free spirited, and to think broadly, then collapse and converge on a solution, but don't overlook the obvious; the simple things."

Earnie Womak, Engineer

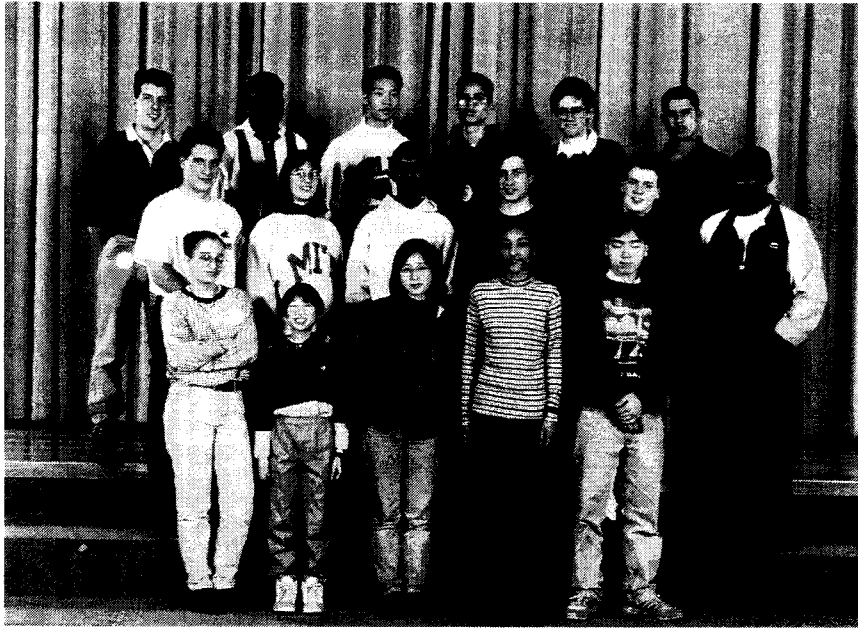
"There were people who reached back for me. I feel compelled. I've got to reach back also."

Chris White, Engineer



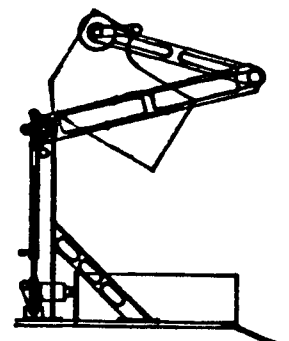
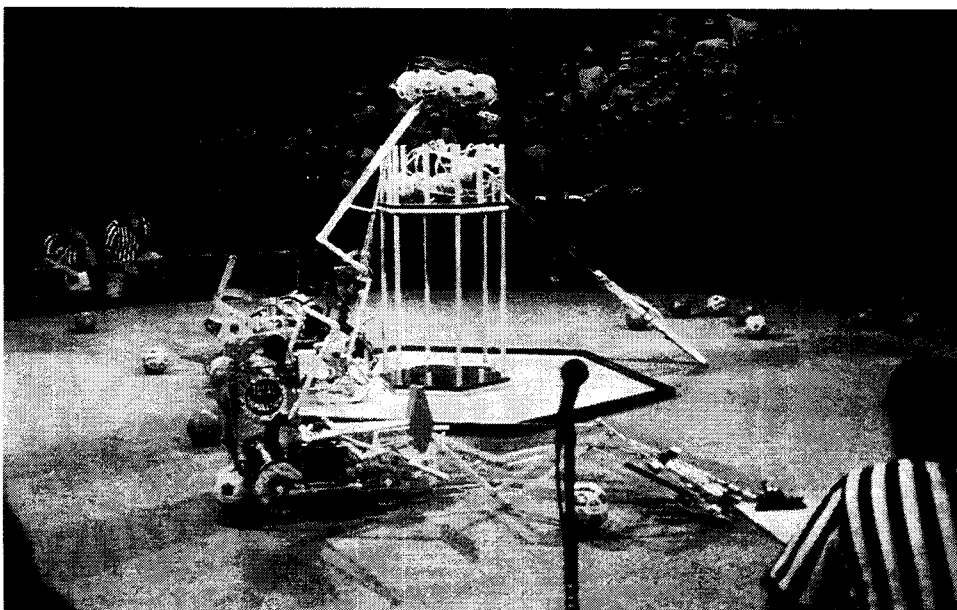
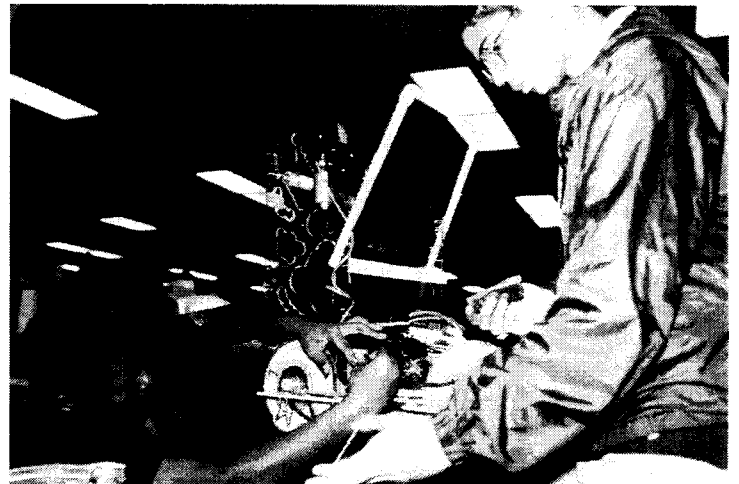
S2D (Strive to Dominate)

Powersoft Corporation Massachusetts Institute of Technology
Boston Latin High School Boston, Massachusetts



The total team of 28 MIT students and 20 Boston Latin High School students began the brainstorming/best design selection process at the high school and then brought concept to hardware at MIT's mechanical engineering facilities. Powersoft representatives praised the S2D team efforts highly.

Under the support of the Powersoft Corporation, MIT, and Boston Latin High School, students have worked together to create their machine design. Employing new techniques in product design, sub-groups of a combination of MIT engineers and high school students have created a machine to accomplish several detailed tasks.

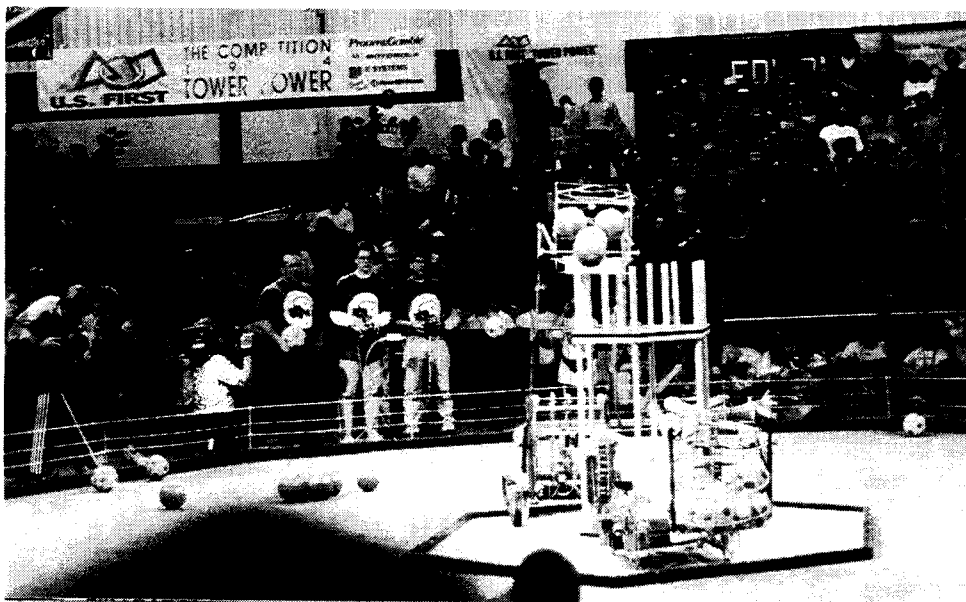
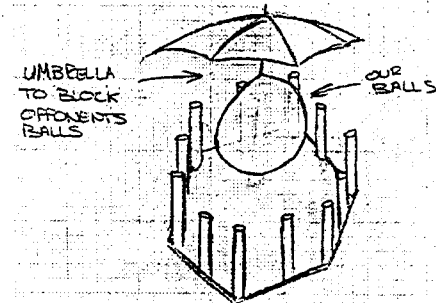
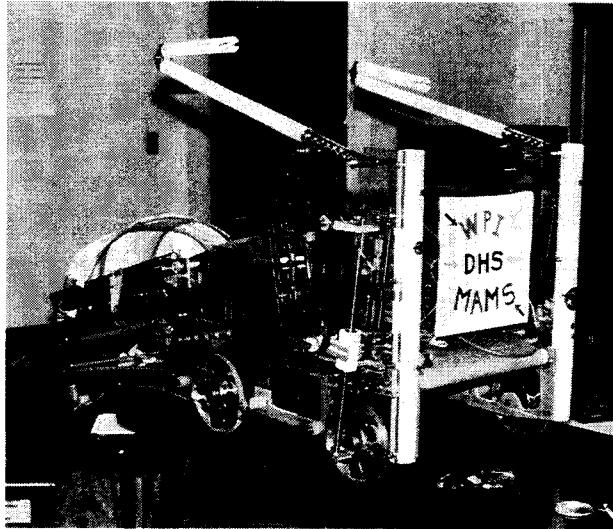


Scorpion

Worcester Polytechnic Institute
Massachusetts Academy of Mathematics & Science
Doherty High School
Worcester, Massachusetts



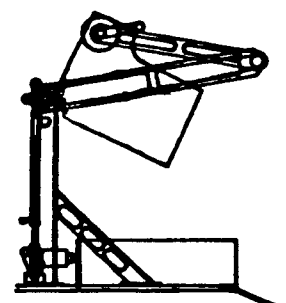
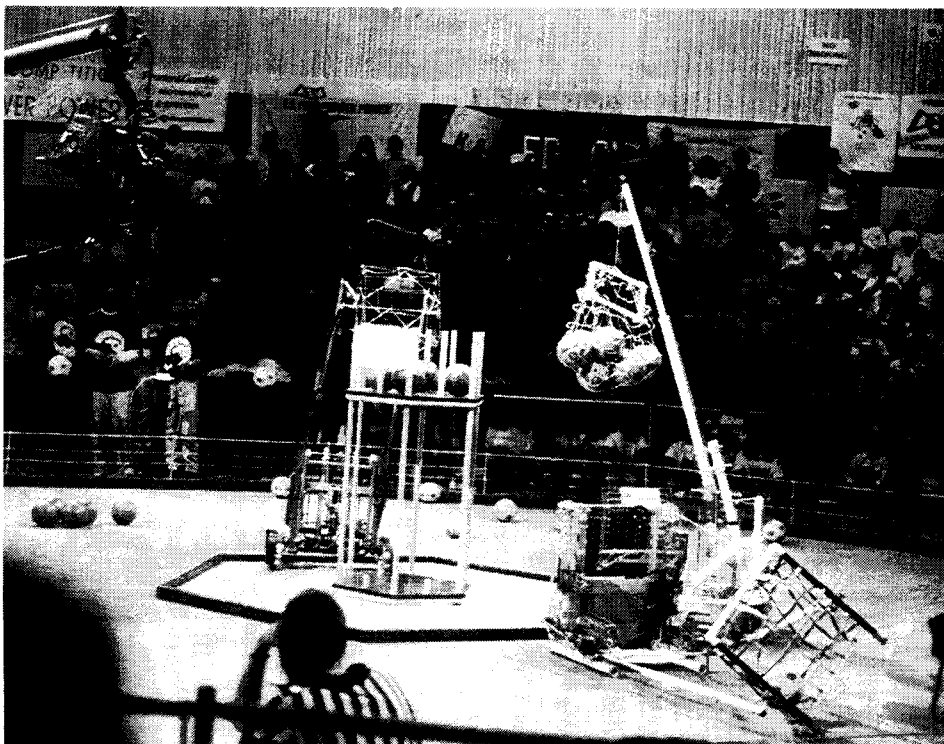
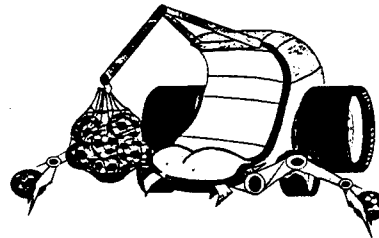
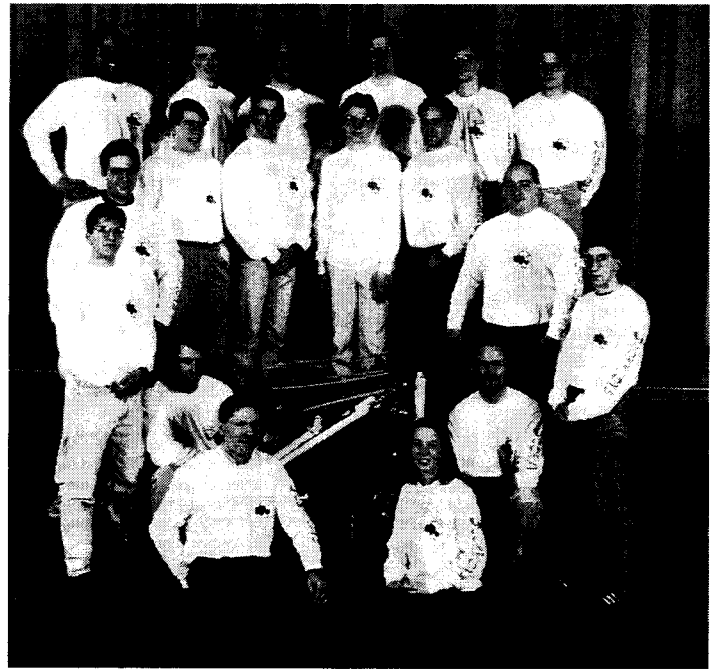
No ball can escape the sting of our SCORPION!



Worcester Polytechnic Institute, Doherty High School and the Massachusetts Academy of Mathematics and Science have participated in the U.S. FIRST games since their inception. However, this is the first season that this celebration of design spirit was merged with WPI's educational goals and qualifying projects yielding over 40 team members! Each WPI student completes a Major Qualifying Project, MQP, which dominates most of their senior year. This capstone design activity truly embodies the challenging problems encountered in one's career.

The U.S. FIRST design competition is synchronized beautifully with WPI's project system. Both activities envelope the student (college and high school) in an atmosphere charged with the excitement of competition, the knowledge that they have built, with their hands and creative minds, an instrument of purpose and design.

Professor Sullivan capitalized on the harmony between these activities and recruited fifteen WPI students to share in the excitement of the design and the joy of watching high school students learn and live the events of the competition...the events of a design engineer. The U.S. FIRST 'Rug Rage' video was all it took to overflow the high school slots. Fortunately, high school teachers were also drawn into the spirit of the competition and signed on to help with the twenty high school students. These new recruits forgot that they were planning to be attorneys, rock musicians, and business managers. They signed on the dotted line with their hearts pounding in anticipation of the games, in the challenge to design an instrument of purpose. This instrument has become the SCORPION.



SM-U Shooter

Southern Methodist University St. Mark's School of Texas
Dallas, Texas

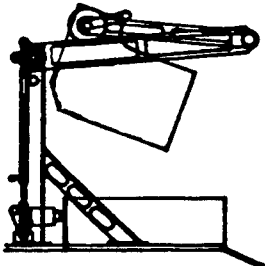
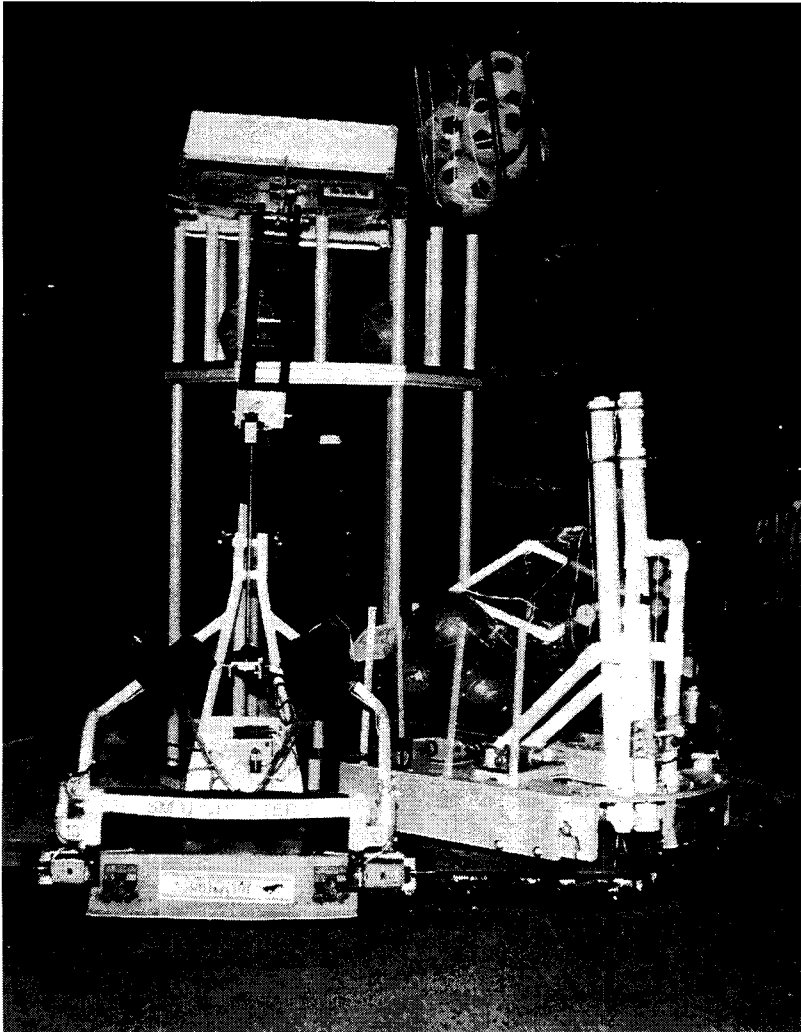
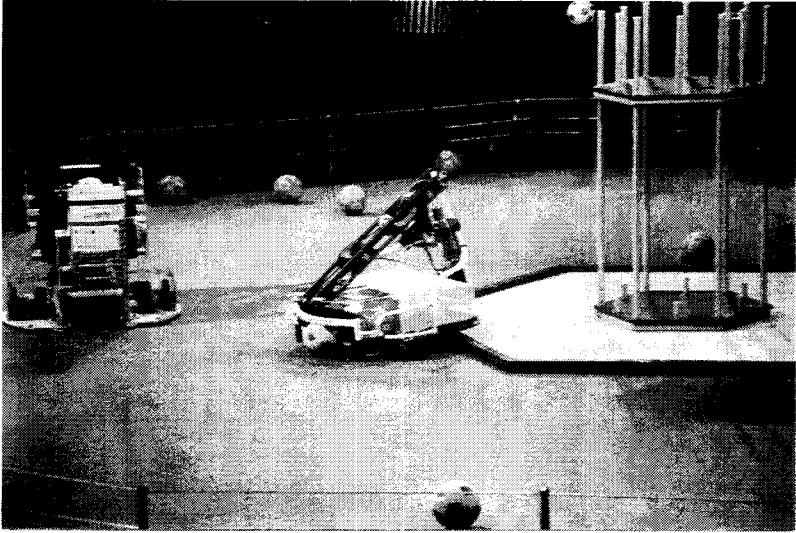
Rookie All-Stars



The St. Mark's School of Texas and Southern Methodist University team is composed of three engineers from the Engineering School at Southern Methodist University and approximately twenty-five students and one science teacher from the St. Mark's School of Texas. Three student leaders planned and organized the meetings with the engineers and teachers.

Prior to receiving the kit, we had two meetings at which we elected leaders and practiced brainstorming techniques. Once the kit arrived, one student who had a great deal of woodworking experience was assigned to build a practice goal and a partial field. During the next two weeks, the rest of the team met six or seven times to brainstorm, and eventually we finalized a design.

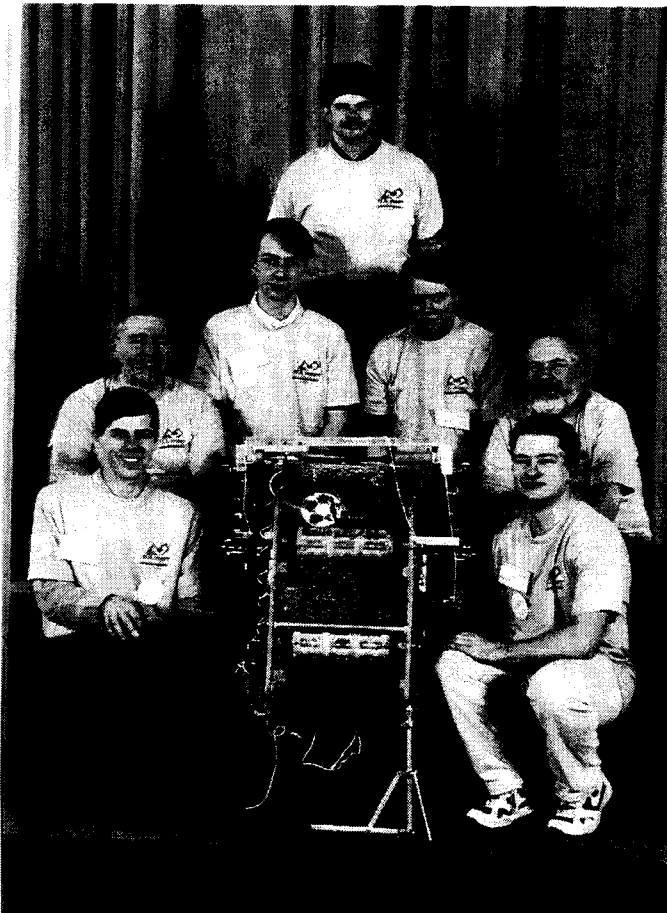
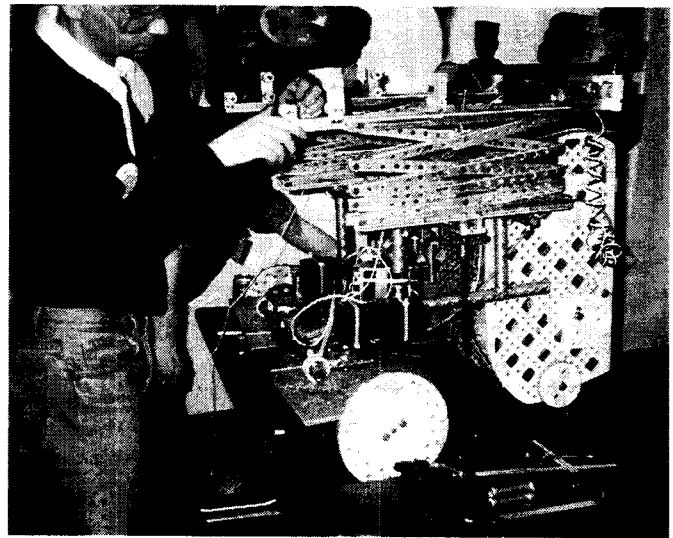
Our SM-U-Shooter was built in one of the university machine shops.

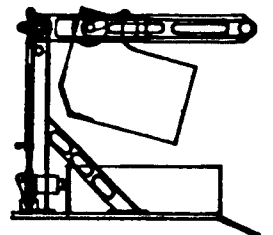
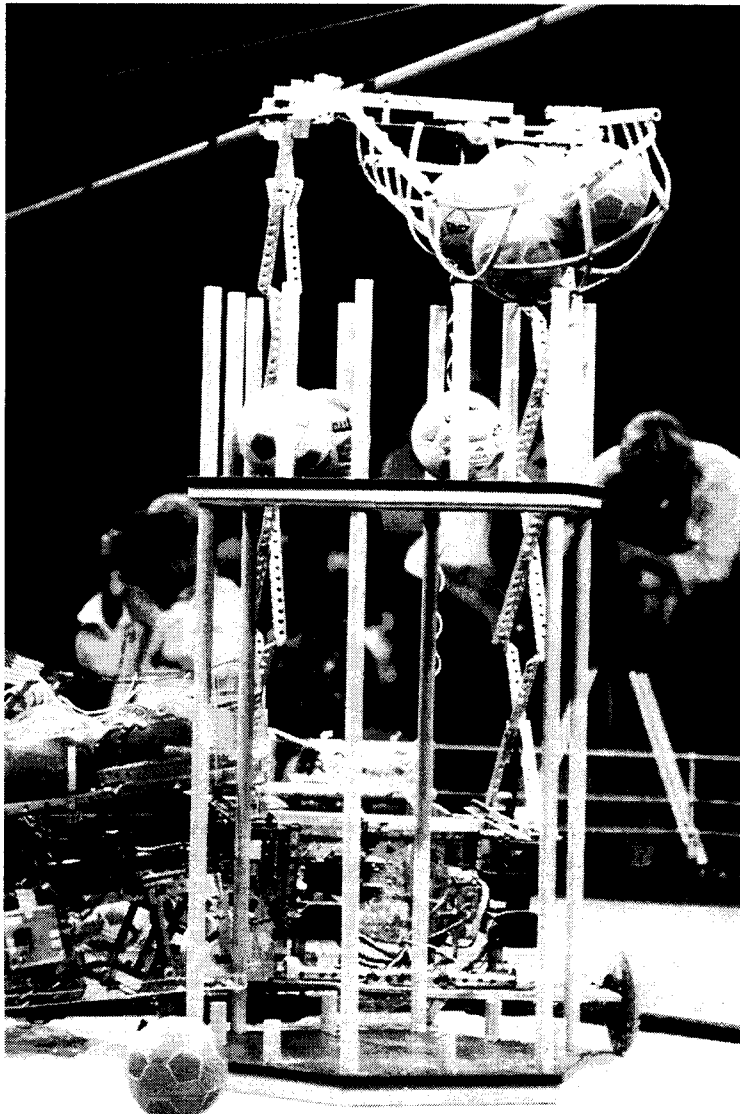
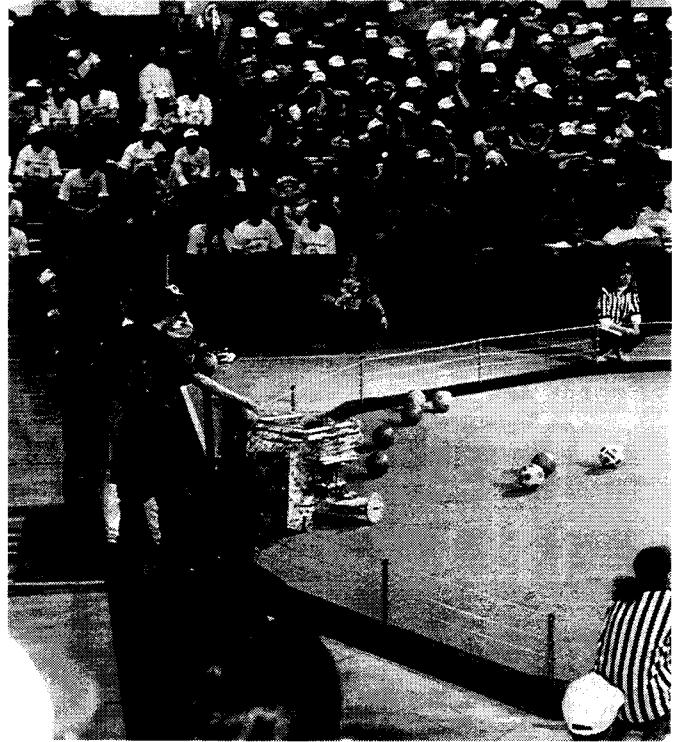
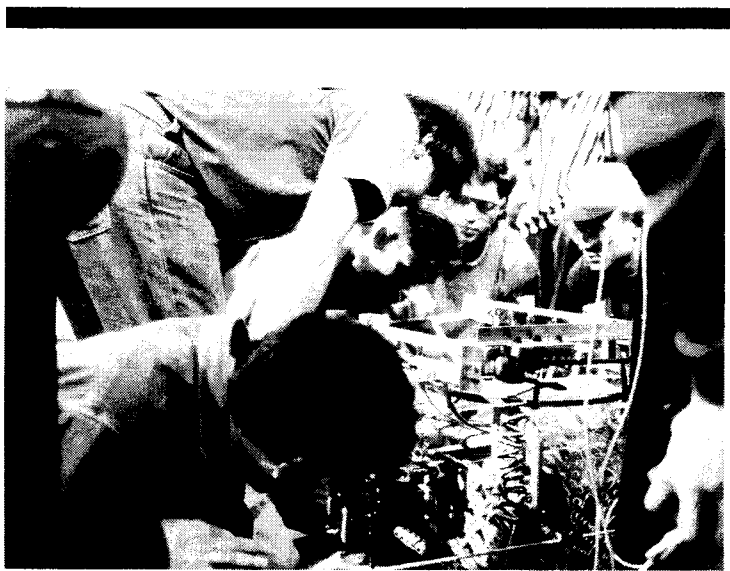


The Power Shopper

University of New Hampshire Bailey Corp Winnacunnet High School
Hampton, New Hampshire

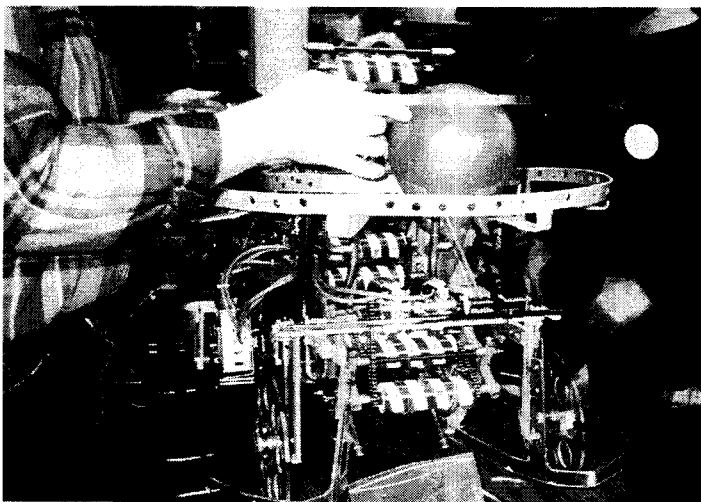
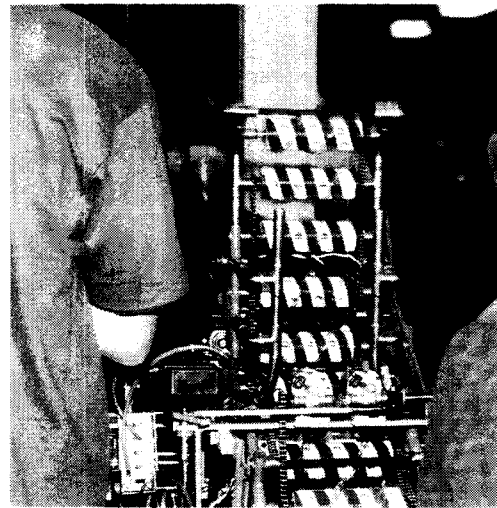
Our team consists of fifteen students and three faculty members of Winnacunnet High School, two students and one professor from the University of New Hampshire, and six engineers of Bailey Corporation. Winnacunnet, known in the seacoast area for its outstanding achievement in math and science, is gaining first-hand experience in an engineering environment.





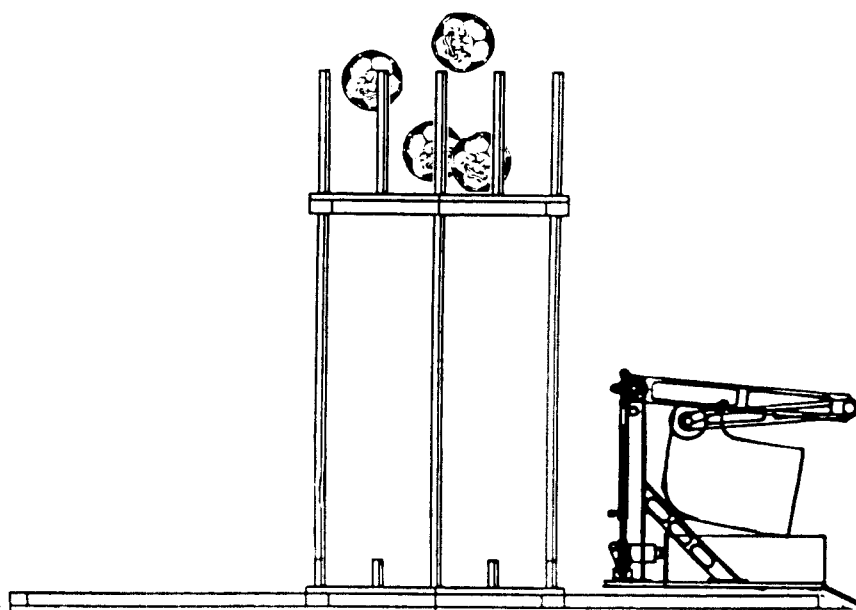
H.O.W. (Hell on Wheels)

Rensselaer Polytechnic Institute Shenendehowa High School
Clifton Park, New York

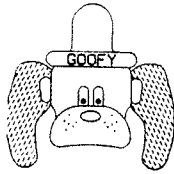


The core of our design team was assembled in January 1993, when students signed up for the Automation and Robotics class, a course which culminates in the U.S. FIRST Competition. The Automation and Robotics class is the final course in an Engineering Sequence which includes College level courses such as Digital Electronics, Principles of Engineering, and Autocad. This past January, 35 Shenendehowa students were joined by an Engineer/professor from RPI and 24 RPI students from his Introduction to Engineering Design class. The flux design concepts that came from this mass of combined brain power was amazing!

*We're
gon'na
have
some
fun!*



"Time is short, and no fun is too much work."
Warren Lohr, Xerox



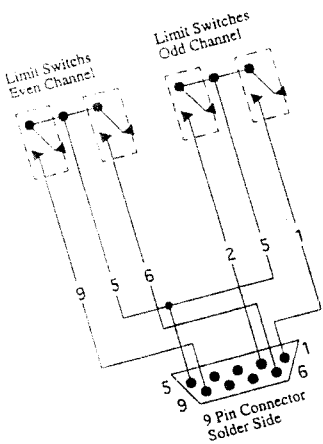
DRAWING NO. _____
CALCULATIONS FOR _____

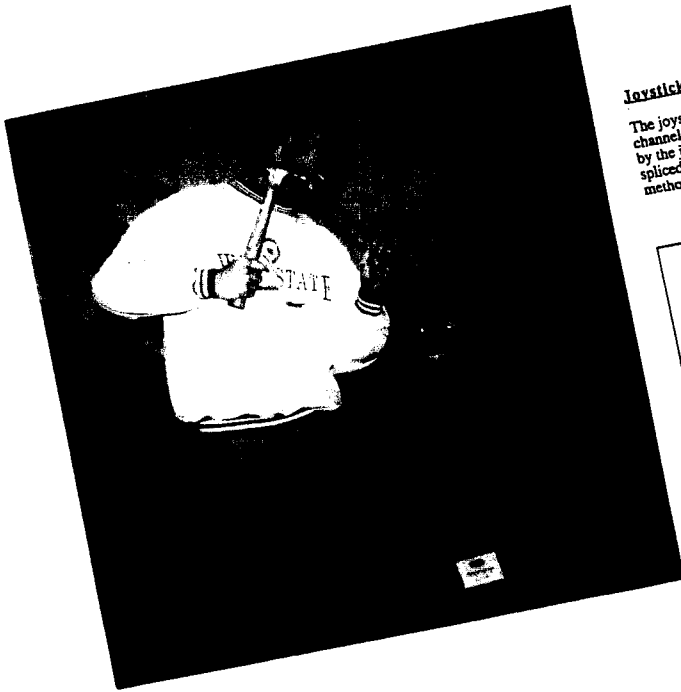
SUBSTITUTE EQ 4
 $v_x = 0 + (32.2 \text{ ft/sec}^2) t$
 $v_x = 13.85 \text{ ft/sec}$

HORIZONTAL MOTION
 $s = v_x t$
 $2.5 \text{ ft} = v_x (0.43 \text{ sec})$
 $v_x = 5.8 \text{ ft/sec}$

VECTOR VELOCITY
 $v = \sqrt{v_x^2 + v_y^2} = \sqrt{5.81^2 + 13.85^2} = 15.02 \text{ ft/sec}$

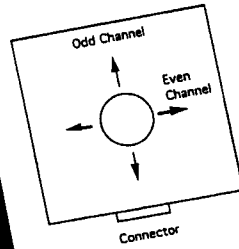
ANGLE
 $\alpha = \frac{5.81}{13.85} = 22.75^\circ$





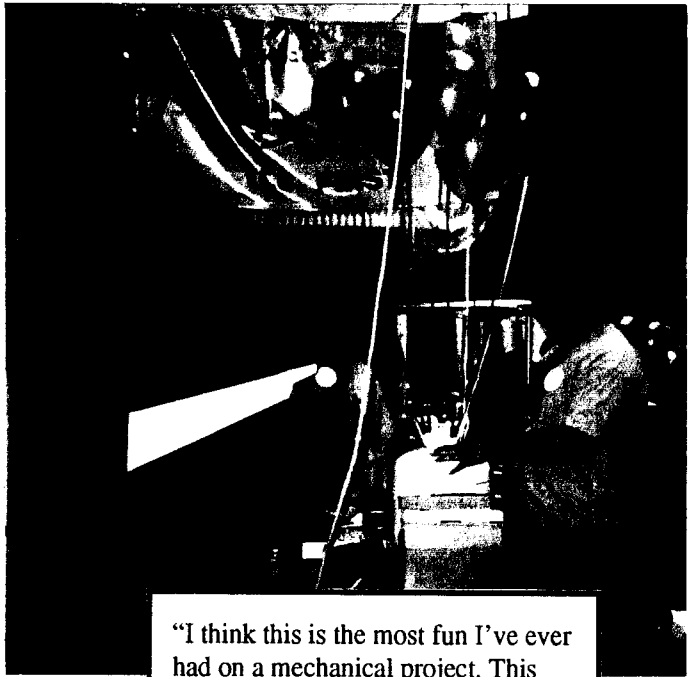
Joystick

The joystick, like the switch box, controls a pair of the channels. To change the polarity of a motor controlled by the joystick, the wire harness must be cut and spliced accordingly. Please consider alternative methods instead of cutting and splicing wire harness.

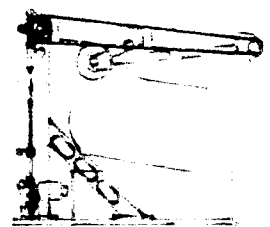
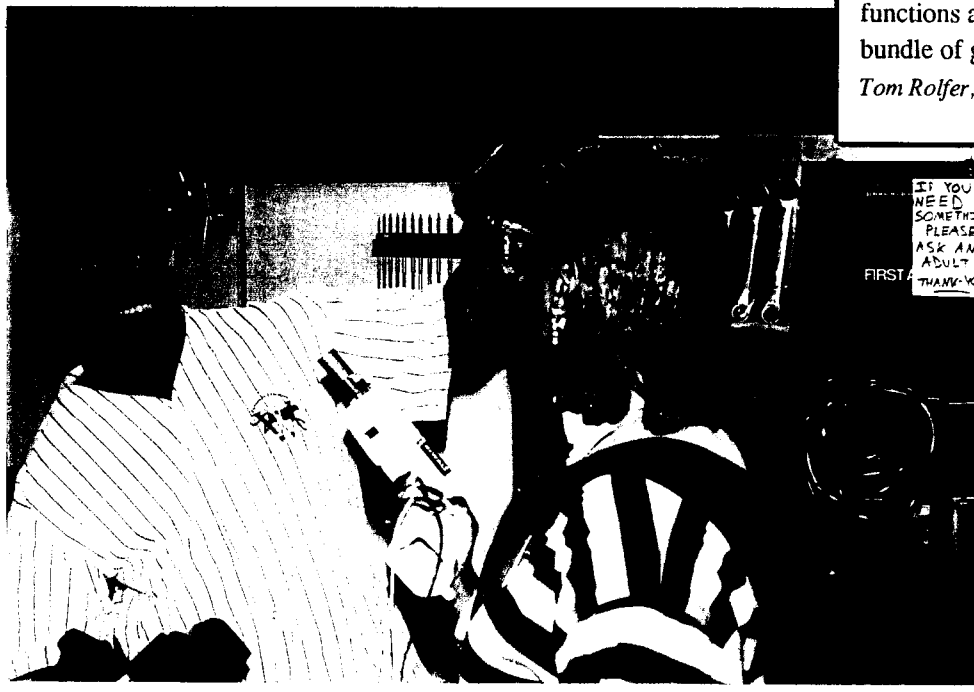


"It was a blast, so I signed up for another year."
Jeremiah Bohn, Junior
North Community H.S.

"When I was in high school, I wished that I could see what engineers really did. (If I had been able to do so, I would have become a pharmacist...just kidding). I joined the U.S. FIRST team because I wanted to share some of the excitement, fun parts of the essence of engineering—starting with an idea and a challenge, and making something that works!"
Don Foreman, Honeywell

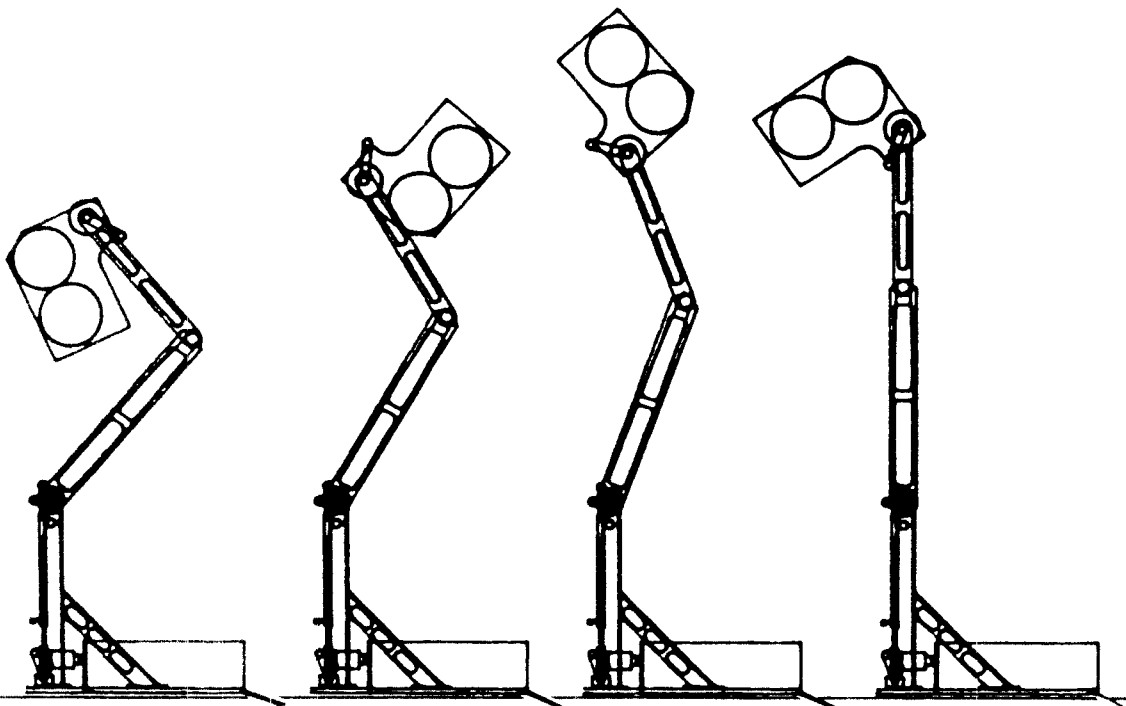


"I think this is the most fun I've ever had on a mechanical project. This machine has got some very complex functions all wrapped in one fun bundle of gizmos."
Tom Rolfer, Honeywell



"Floriferious and uhm cn'delic" See and understand

Zheng Lin, North Community H. S.





"I'm not a very 'mechanical' person. Being able to exchange what knowledge I do have for the knowledge of others is what attracted me to U.S. FIRST. No one expected me to know what Bogie Wheels were; they taught me, and I helped them to spell it."
*Jahana Berry, Junior
North Community H.S.*

