



# The Robot Challenge

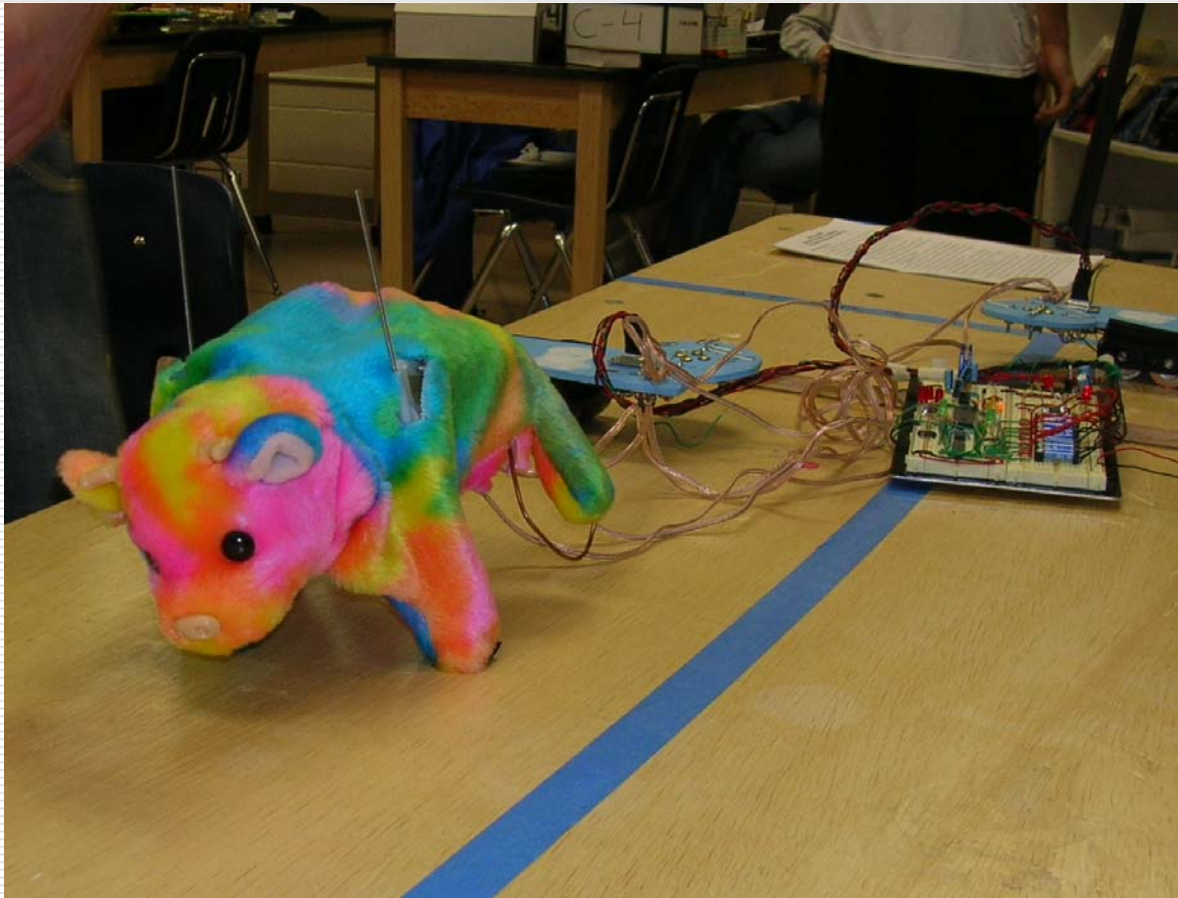
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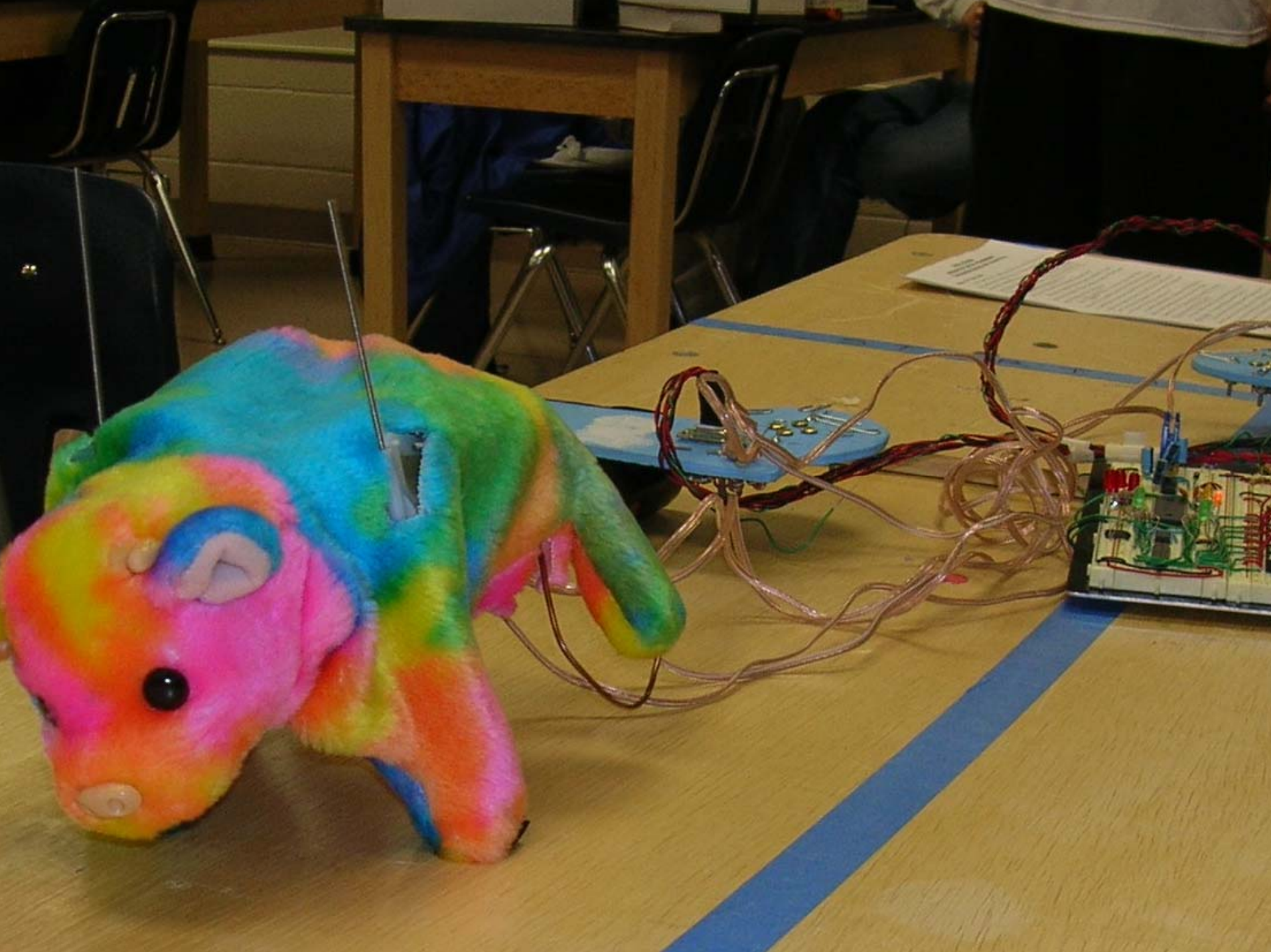
An Affordable hands-on Engineering  
Experience  
for High School students

March 24 2006

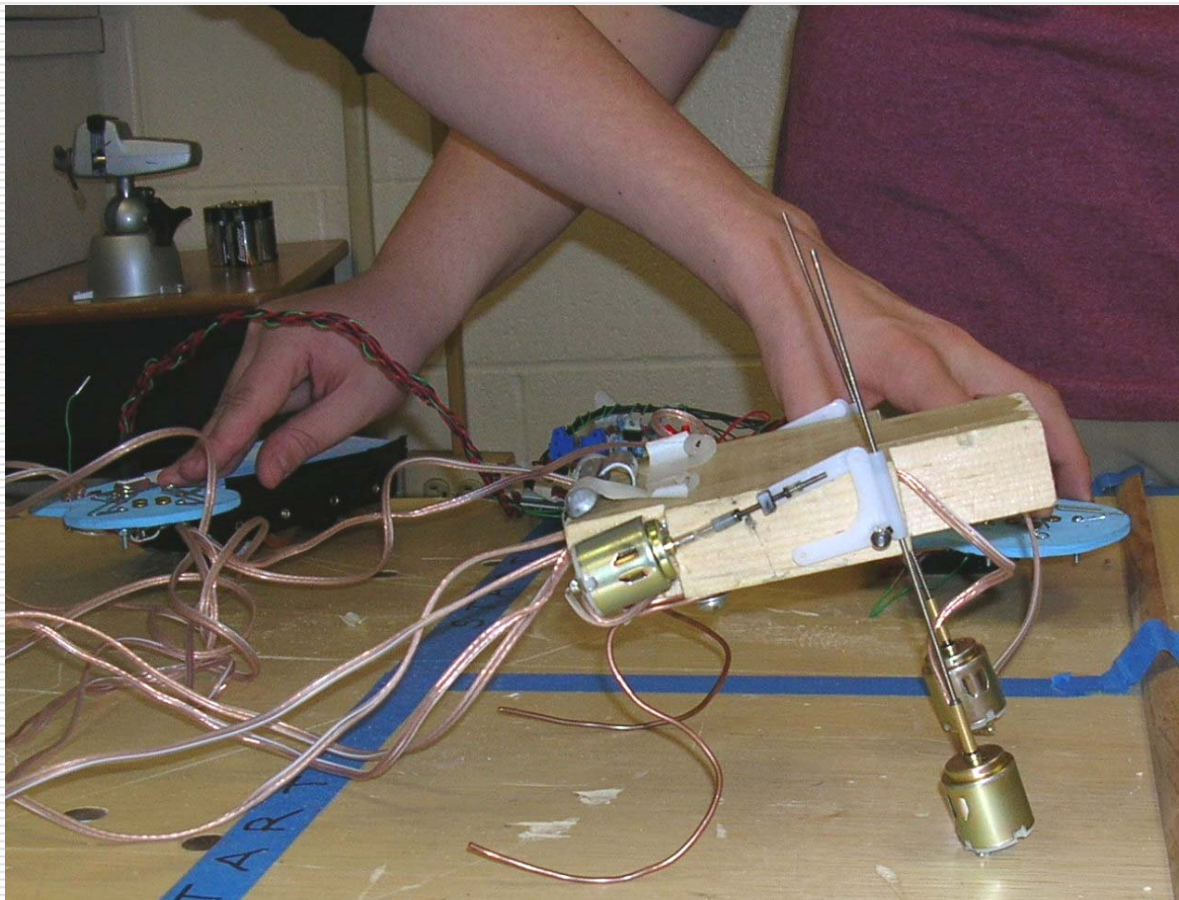
# FINISHED ROBOT IN AUTOMATED MODE

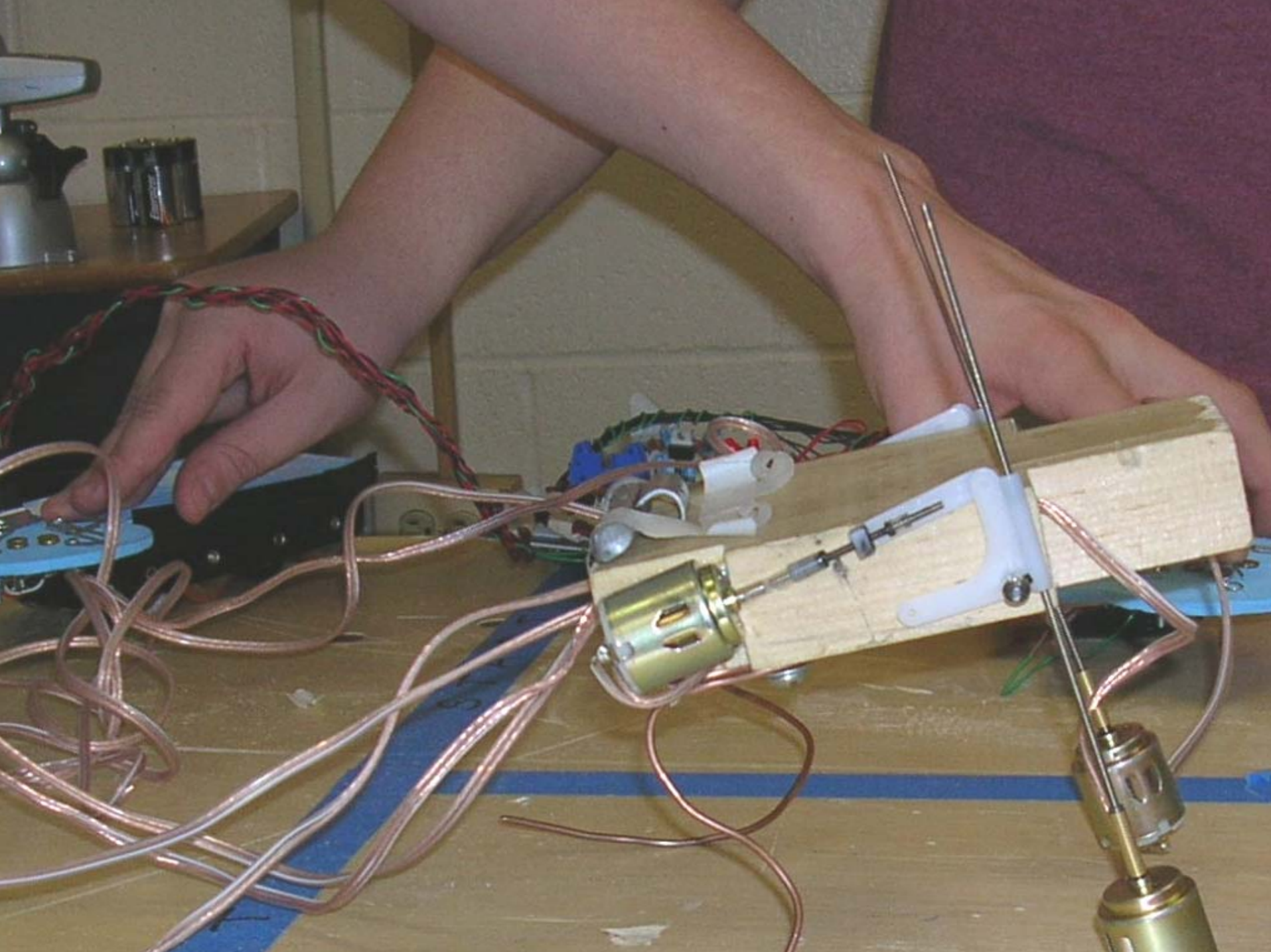
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# BASIC ROBOT IN MANUAL MODE







# TASKS

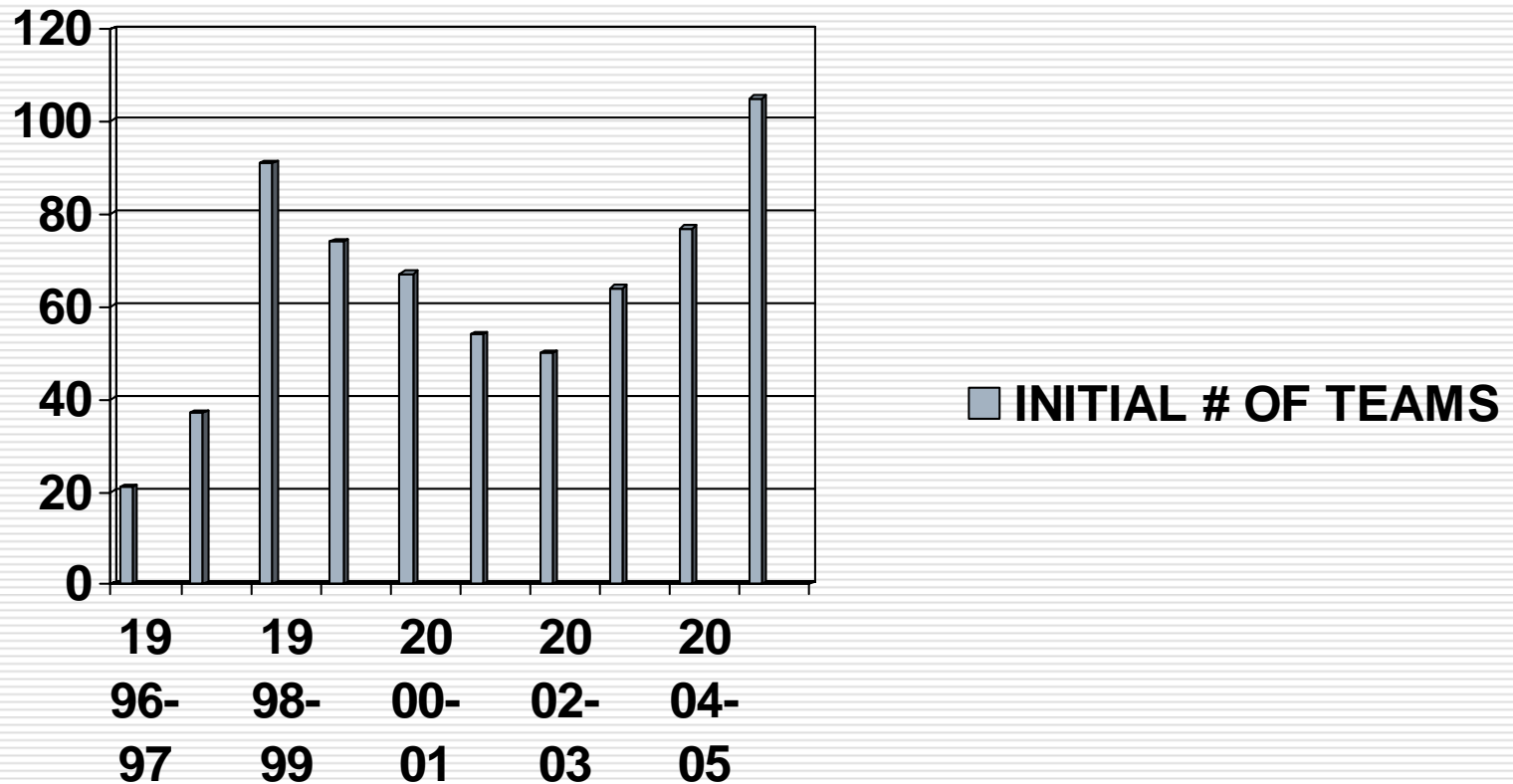
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- 1. Build a Robot, keeping a detailed log.
  - 2. Prepare a Written Report about the experience, including schedule, problems encountered, and solutions.
  - 3. Compete with teams from other schools over a course with hurdles.
  - 4. Make Oral Presentation to judges.
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# 10 YEARS EXPERIENCE

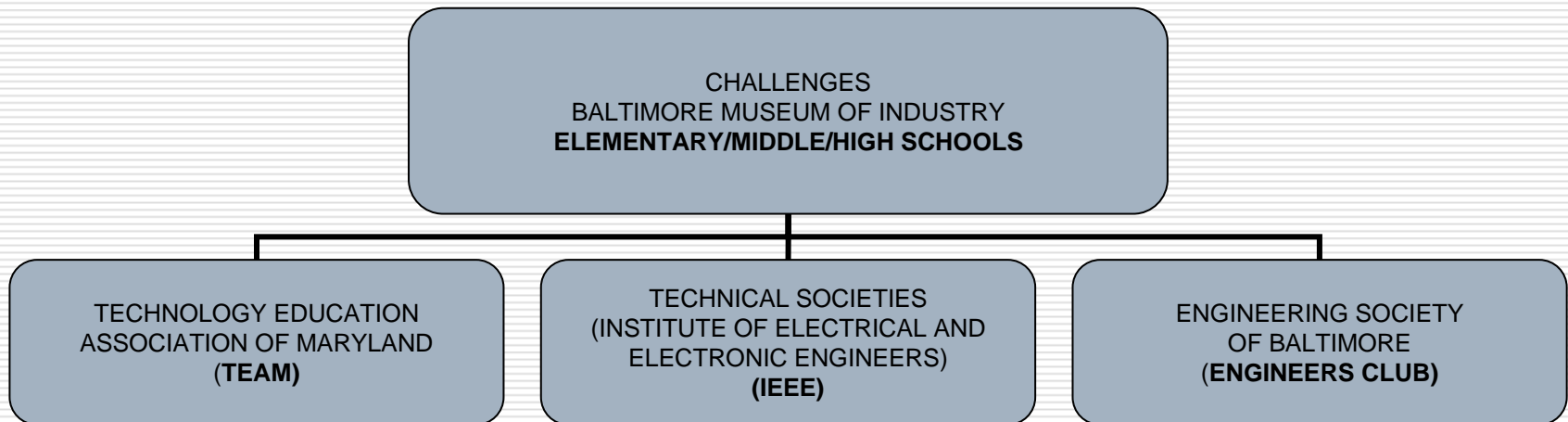
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# RELATIONSHIPS

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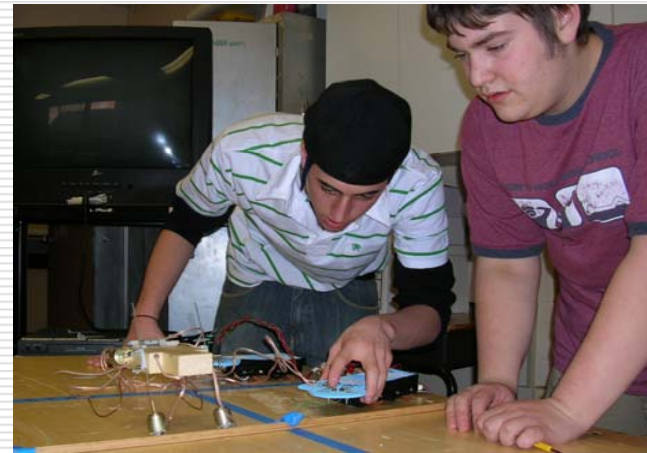


# BENEFITS

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## 1. Appeals to boys and girls

- typically over a third of the participants are girls





# BENEFITS

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## 2. AFFORDABLE

- By keeping the cost low (about \$12 a student for the basic Robot) we are able to reach all students - even those in Inner City schools. Non-USA schools may be able to reduce the cost even further (see later).
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# BENEFITS

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## 3. TEACHERS LIKE IT!

- It does involve more work for teachers, but teachers particularly like the discipline of the Written Report and the Oral Presentations
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# BENEFITS

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## 4. STUDENTS LIKE IT!

- The hands-on activity with tools gets the students out of their chairs, and is a good project for Seniors who sometimes begin to taper off as they reach the end of their high school careers. They also like the challenge of competing against other teams.
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# BENEFITS

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## 5. THERE'S SOMETHING FOR EVERYONE

- project calls for a variety of skills and talents: working with tools, writing, designing an attractive robot body that does not interfere with the mechanical operation, teamwork, organization, and electrical theory.
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# BENEFITS

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## 6. KIDS LEARN

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# BENEFITS

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## 6. KIDS LEARN

- They enjoy themselves as they learn
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# BENEFITS

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## 6. KIDS LEARN

- They enjoy themselves as they learn
  - They learn what its like to be an engineer
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# BENEFITS

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## 6. KIDS LEARN

- Even if they do not choose to become engineers, the skills they learn will serve them well in any profession.
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# TEAMWORK

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- ❑ Students work together as a team.
  - ❑ Mistakes by one affect the others.
  - ❑ Students learn from mistakes and not to blame other members of the team.
  - ❑ Each leg of the Robot is operated by a different member of team. They must learn to cooperate or the Robot will fail.
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# DETAILS

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- Teams are provided with a Manual and a kit.
  - The duration of the project will depend on the level of Challenge selected (4 levels are available) and the number of hours a week that they will spend on the project.
  - Students provide the D-cell batteries.
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# DETAILS

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- ❑ Students can work on the project during class time, or after school as an voluntary activity.
  - ❑ Typically they will spend 2 to 4 months on the project - based on about 3 hours a week of work.
  - ❑ A good teacher stimulates ideas but lets the students solve the problems.
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# TOOLS

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- ❑ Basic carpentry tool are required - saw, jig saw, electric drill, needle-nose pliers, vise, screw drivers, wire stripper, sharp knife, sand paper, 25 watt soldering iron, safety goggles.
  - ❑ A Dremel tool is advisable for cutting the threaded rods, and a bench drill press is helpful for aligning holes.
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# MANUALS

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- The Manual provides all the information the students will need to implement the project, and it can also be integrated into a teaching program on basic mechanics and electricity.
  - Teachers receive their own copy of the Manual, plus additional information.
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# MANUALS

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- ❑ The Basic Students' Manual contains all the information needed to build the robot, standard orthogonal 2-dimension-al drawings, and information on preparing the Written Report and getting ready for the Challenge event.
  - ❑ There is also background information on reading/understanding drawings.
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# MANUALS

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- ❑ The Teachers Manual also contains sketches of what the Basic robot will look like when built, as well as information on the body covering.
  - ❑ The Teacher may share this information with Students, or let them work this out by themselves.
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# LEVELS OF DIFFICULTY

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- The 4 levels of “Challenge” are
    - 2-leg Robot
    - 4-leg Robot
    - 2-leg Robot with Automation
    - 4-leg Robot with Automation
  - All Robots participate in the same event, but automated Robots run the course twice - first Manual, then Auto.
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# AUTOMATION

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- Automation requires an additional kit, has an additional Manual, and there is considerably more emphasis on electrical circuitry, electronics and programming. The kit includes the parts for a Stamp 2 with 16 I/O ports, a Bread-board, and all the hardware needed to operate the robot. It's a lot harder!
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# AUTOMATION

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- ❑ Students take what they have learned operating the robot manually, translate it into code, and program the controller to duplicate the 8 commands needed to operate the 2-leg robot, or the 16 commands for the 4-leg robot.
  - ❑ It turns out that every robot will be programmed in a unique manner.
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# RELATIVE COSTS

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2-leg Robot:	X
4-leg Robot:	2X
2-leg Robot w/Automation:	3X
4-leg Robot w/Automation:	4X

All kits include the Manuals

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# RELATIVE EFFORT

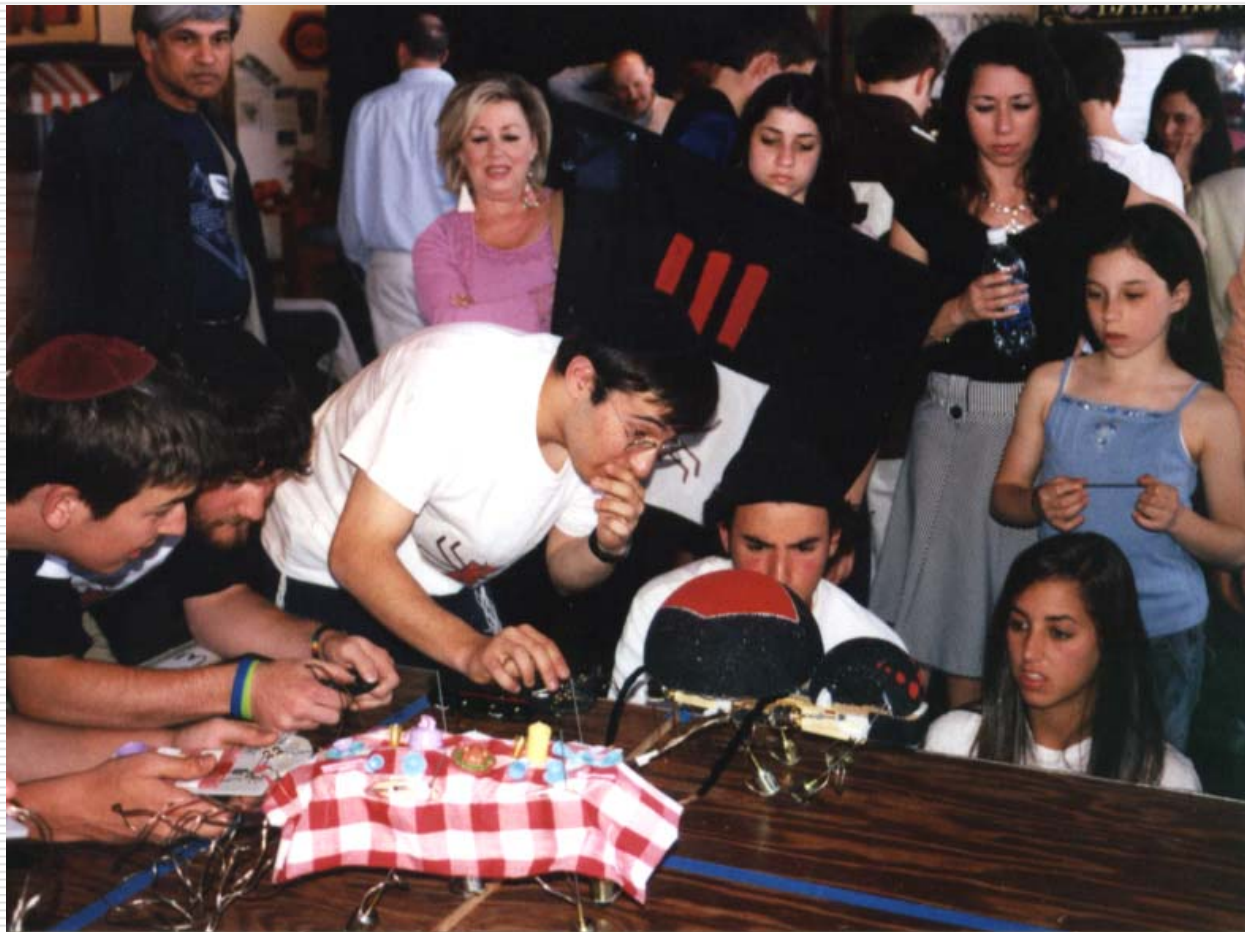
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2-leg Robot	X
4-leg Robot	1.5X
2-leg Robot w/Automation*	2X
4-leg Robot w/Automation*	2.5X

- Automation requires higher skill level  
Best for Grades 11 and 12.
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# THE CHALLENGE EVENT

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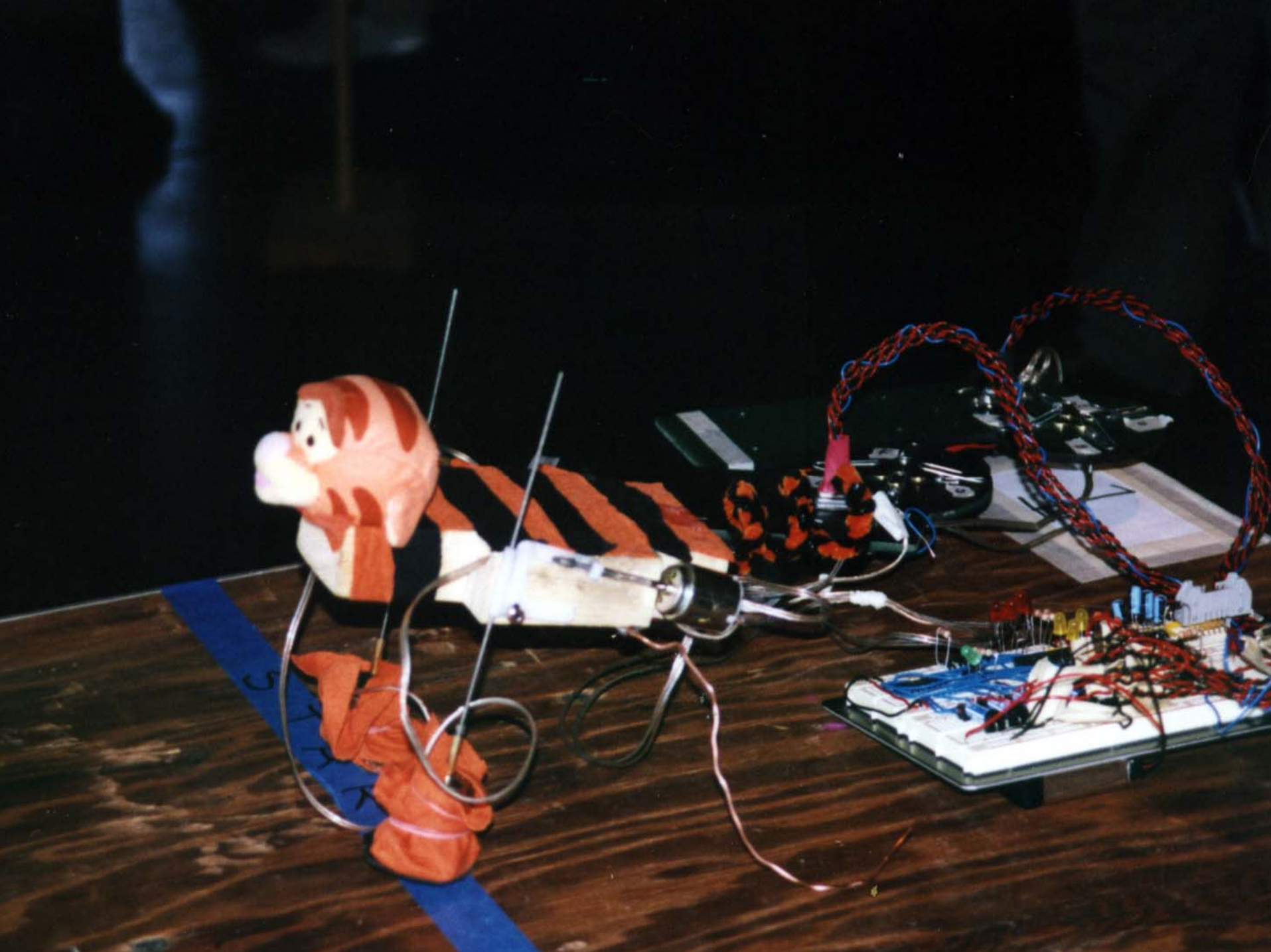










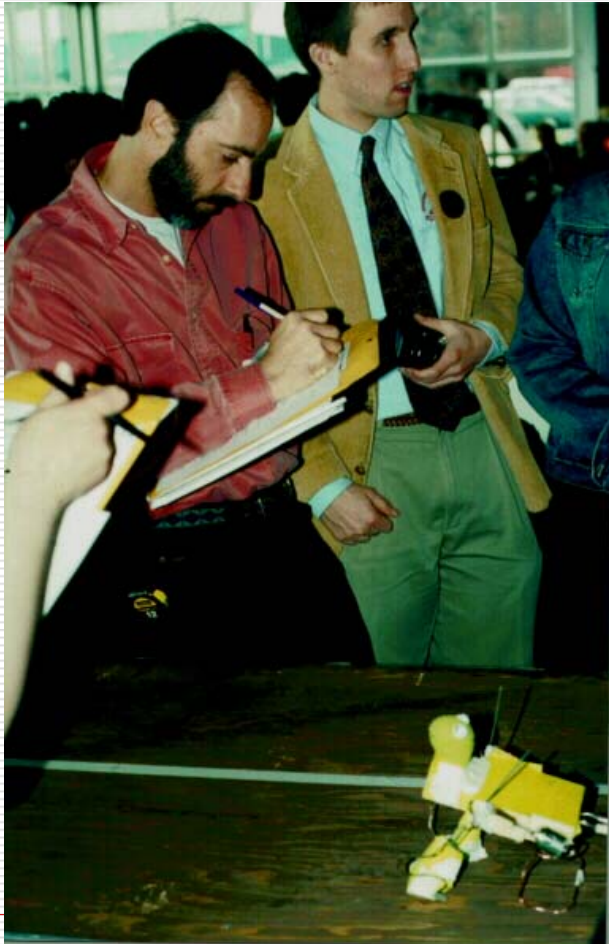






# THE JUDGES

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The Techno  
Challenge  
The Associate Eng  
City of Astor



# GETTING STARTED

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- Determine if you see a need.
  - Plan to start with a 2-leg Robot - about 70% of the our teams do that.
  - If teacher and students enjoy the experience, consider upgrading the following year.
  - Link with local IEEE section to obtain kits.
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# GETTING STARTED

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- ❑ A 2-leg Robot requires one basic kit, a 4-leg Robot requires 2 kits.
  - ❑ Each kit contains a large plastic bag, and 2 small plastic bags. The large bag contains most of the parts for the body of the robot, the small bags contain the parts for the two Control units.
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# GETTING STARTED

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- Read the instructions.
  - Start with the wood block - probably the toughest part of the project, and it gets students using tools and overcoming problems.
  - The motto needs to be: "Measure twice, cut once!"
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# MANUAL ROBOT KIT

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# MANUAL ROBOT KIT

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# AUTOMATION KIT

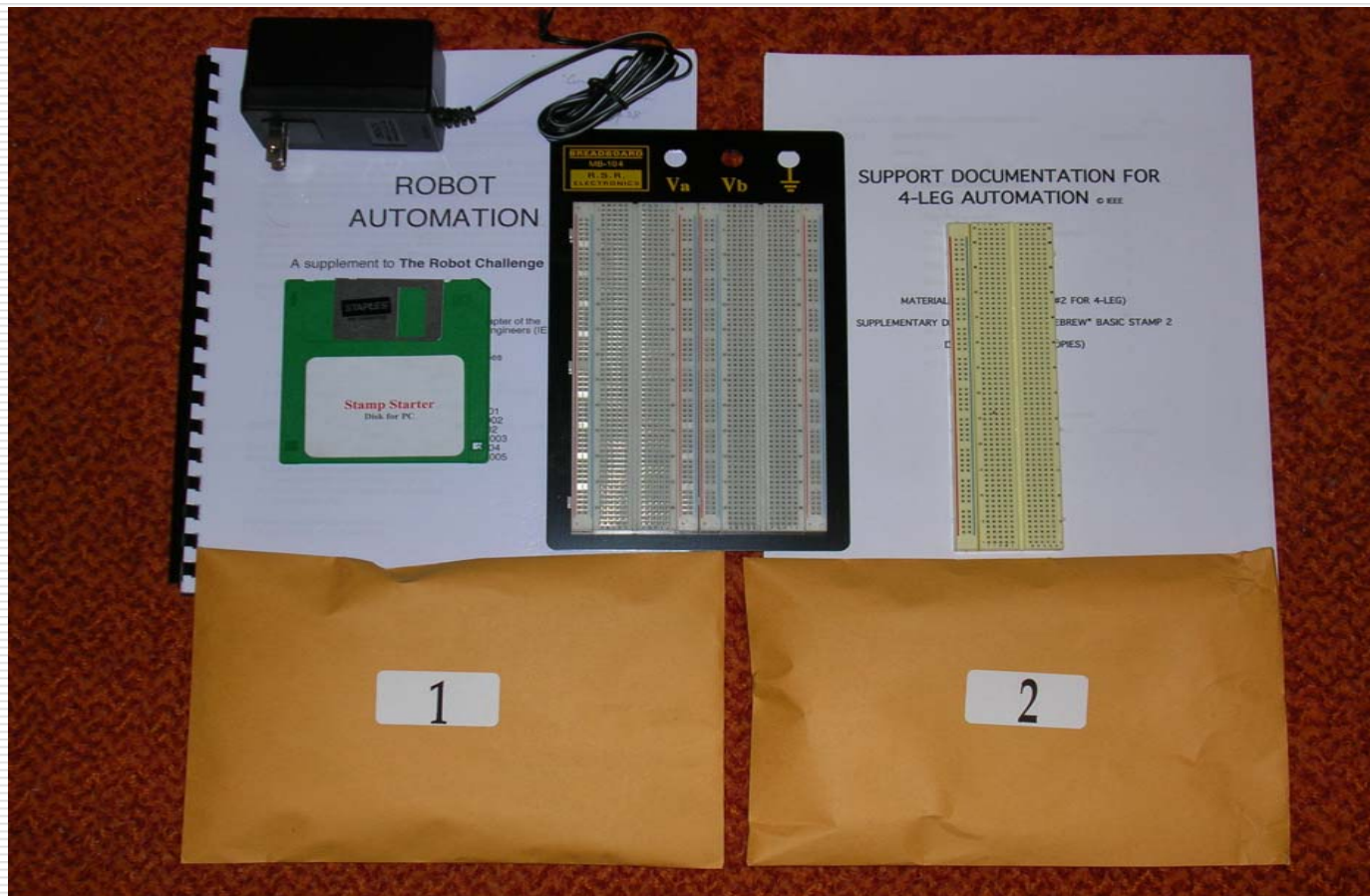
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# AUTOMATION KIT

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# OBTAINING KITS

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- ❑ Kits should be obtained through your local IEEE section - contact them.  
There may be discounts or grants.
- ❑ Kits can be obtained directly from us:  
Neville Jacobs, [Nevilleed@aol.com](mailto:Nevilleed@aol.com) or  
410-653-4176.

Schools located outside of the USA may wish to consider building their own kits.

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# WHAT IS IEEE

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- ❑ It's the largest technical society in the world.
  - ❑ It stands for the Institute of Electrical and Electronic Engineers.
  - ❑ Has initiated this project as a means of encouraging students to become engineers. It's a non-profit project.
  - ❑ Visit our web-site:  
[www.robotchallenge.com](http://www.robotchallenge.com)
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# FURTHER INFORMATION

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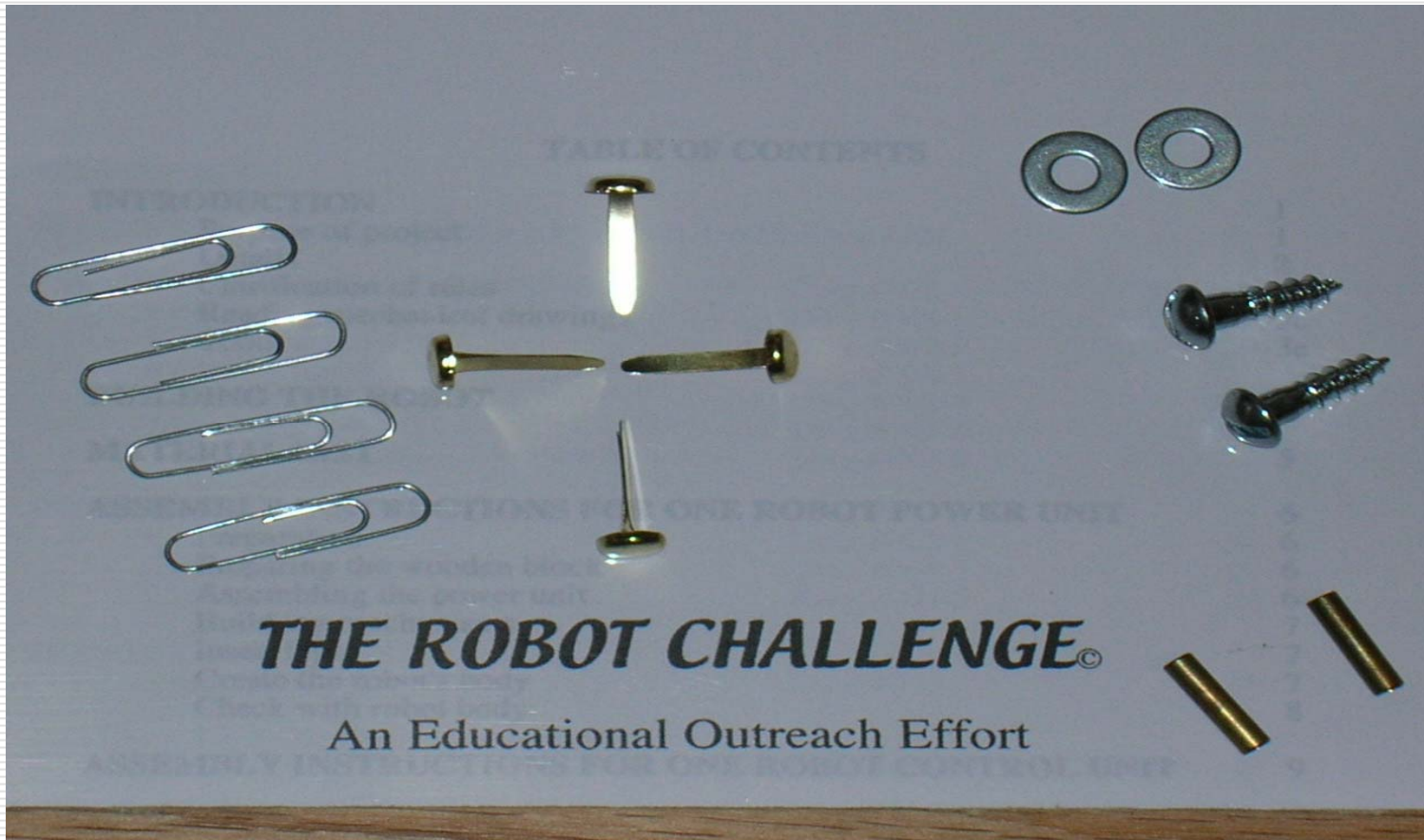
- If not in the USA, talk to us if you or your local IEEE section would like to consider building your own kits. A limited number of parts will be needed from the US, and these can be obtained through a distributor.
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PARTS YOU COULD PROVIDE LOCALLY  
(AS WELL AS WOOD BLOCK & PLYWOOD)

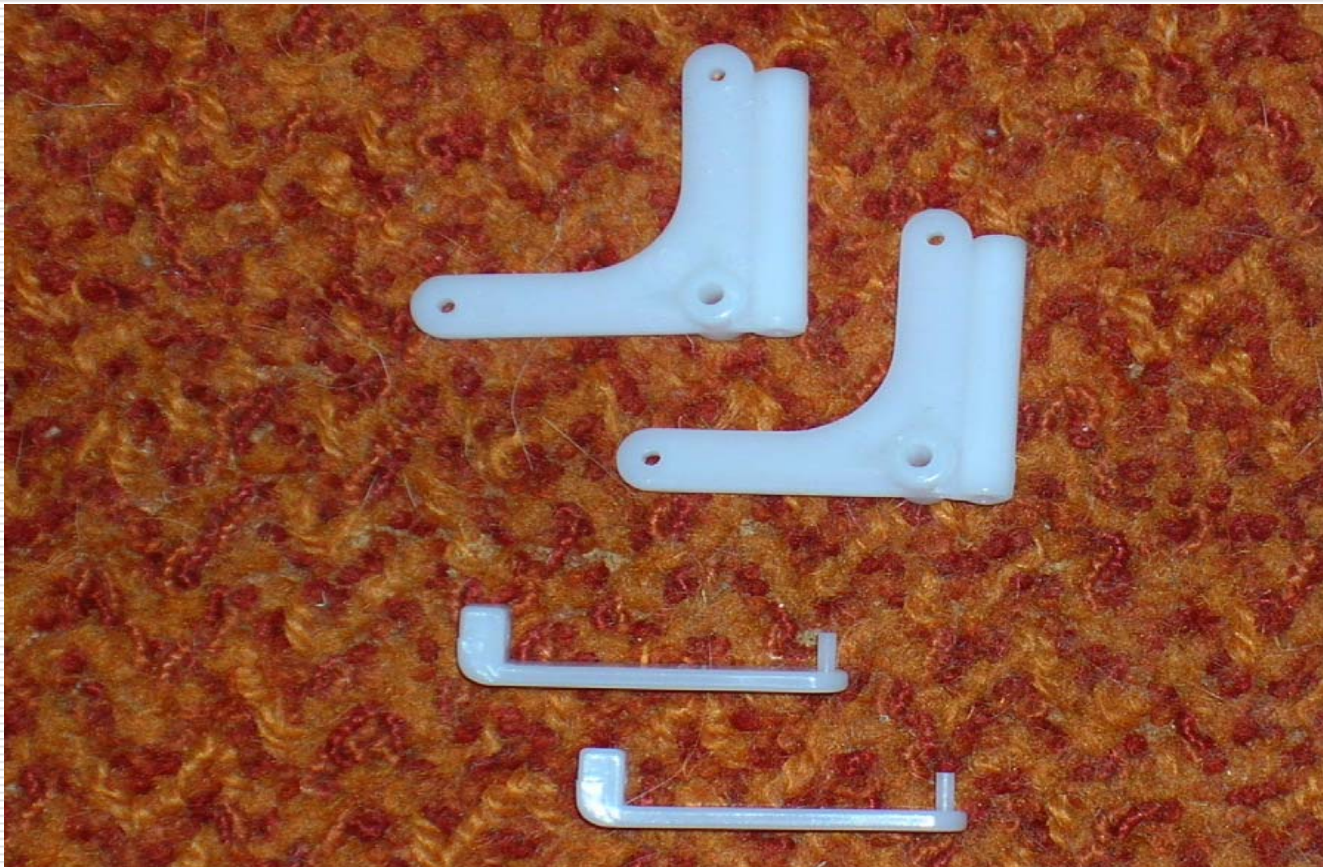
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PARTS OBTAINABLE FROM DISTRIBUTOR  
(ALSO THREADED RODS, MOTORS & TUBING)

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# Conclusion

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- We thank you for your attention, and hope you will consider this project for your students.
  - Please note that we are not in the business of selling kits - we are promoting a means of inspiring students to get acquainted with Engineering.
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