

1994 U.S. FIRST COMPETITION RULES MODIFICATION

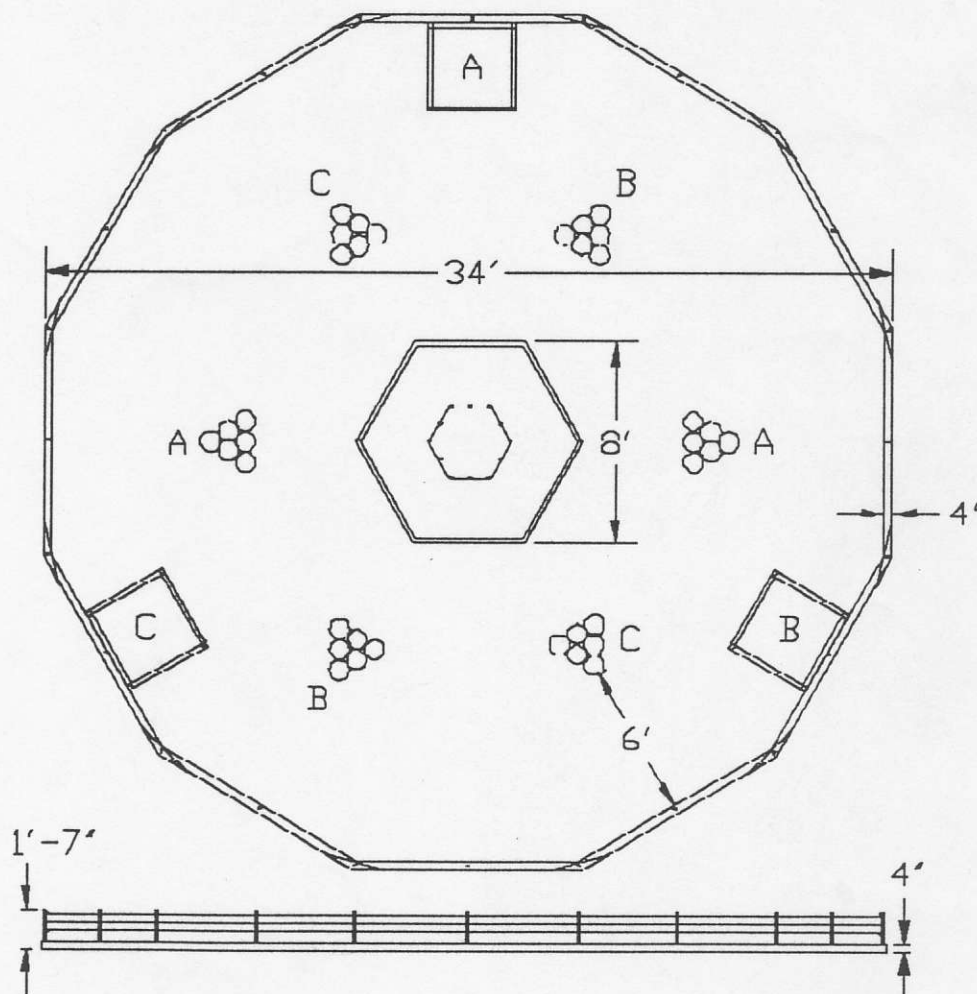
We want to make the contest exciting. However, after listening to your comments on Friday, and spending the weekend discussing the options, we realized that one particular strategy dominated over the others. We hope the changes described below ensure that the machines are diverse, and that each round is exciting to the finish.

1) In the Rules, replace Page 2 paragraph 5 with the following:

Size At the start of each match the machines must fit, unconstrained, inside a cylinder that is **36 inches** in diameter and **30 inches** long. We suggest using a 36" diameter Sonotube® for sizing. At the start of the competition, your machine may be placed in any orientation within the starting area.

2) In the Rules, replace page 8, paragraph 2 and the diagram with the following (this change regards ball placement only):

There are 36 balls total on the playing field, 12 of each color: pink/black, purple/yellow, pink/green. 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 will be placed 90° to each side of their starting position. The starting area will be a 42" square, 2" from the curb.



U.S. FIRST UPDATE: 1/18/94

Below are answers to many of the questions that have been asked. Be sure to read this carefully and reference The Rules you received at the Kickoff Workshop. This will also be posted on the Bulletin Board.

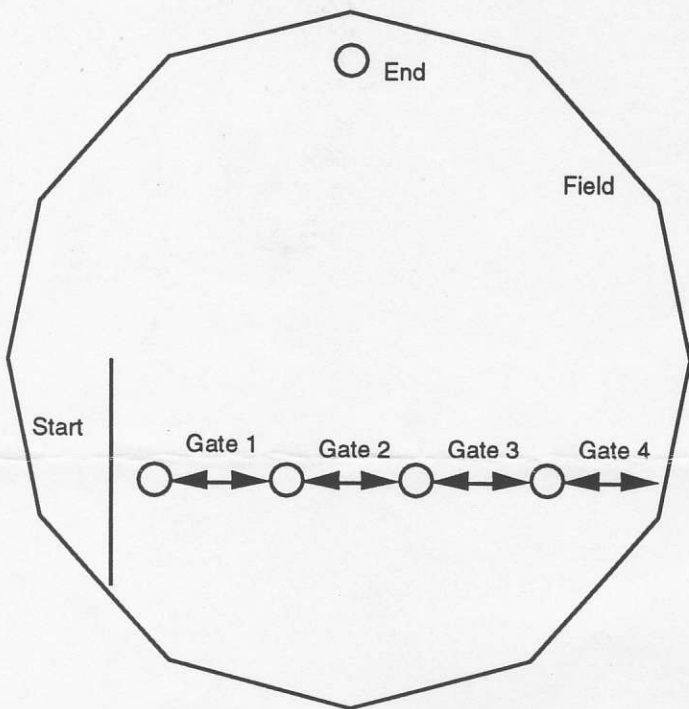
Reading messages on BBS	Currently, there are only 3 messages addressed to ALL--everyone should be able to read them. There is a glitch in the system preventing us from renumbering the messages; however, this year's messages start with #89. All prior messages have been deleted. You can "cut and paste" messages from the Bulletin Board, if you have the right software.
Small Parts	You may only use up to \$300 of SPI parts in your final machine. To build prototypes you may exceed this limit, but you will be billed for any amount over the \$300 credit they have provided.
Switch modifications	No internal modifications are allowed for either the rocker or limit switches. These switches are too small to handle the motor currents, therefore they cannot be used on the machine. They can only be used as part of the controller system. The blue boxes should be used in conjunction with the unmodified switches to make a control box. However, the addition of external levers is okay.
Timing belt/chain	See Rule K5, page 6. There are no restrictions regarding pitch or width of the timing belt/chain, but you may use no more than 15' total. "Commercially available" means strictly <i>off the shelf</i> only. No custom or special orders.
Use of Power / Drive Train components	See Rule K5, page 6. Timing belt/chain may be used with either motors at any stage of a power train, including the final one (i.e., treads of a Caterpillar-like vehicle). Power train is defined as components transmitting the output of provided motor to any of the vehicle's mechanisms, including propulsion, arms, projectiles, etc.
Netting	See Rule T5, page 6. Nets are allowed, but if they are used to entangle opponents machines, the referees may disallow them.
Removing opponents balls	See Rule T6, page 6. If one team's balls are removed from the playing field by an opposing team, those balls are placed back onto the field near the balls' original exit point.
Disqualification	See Rule T9, page 6. If, in an attempt to remove an opponents balls from the field, a part of your machine drops or is intentionally removed outside of the playing area, then your team's machine is turned off, and any points scored will count. If a machine is disqualified by a referee, any points scored during that match will be forfeited.
Shipping	See CONSTRAINTS, page 2 and Rule Sh2, page 4. The shipping rule stands as written.
Springs	In addition to those provided in The Kit, additional springs may be purchased from Small Parts Inc. You may not fabricate your own. The springs may be pre-wound prior to power up.
Fiberglass cloth	You may purchase and use fiberglass cloth, up to 1/8" thick and up to a 4'x4' overall size.
Goal dimensions	See diagram, page 9. The goal dimensions are as stated on the diagram, with a tolerance of $\pm 1/2"$.
Modifying motors	All motors must be controlled through the transmitter/receiver. The motors cannot connect directly to the battery. The Delco motors may not be modified; however, the drill motors may be modified as long as the electrical connections are not changed.
Design	For anyone interested in trying, flying vehicles are allowed as long as they meet all restrictions outlined in The Rules.
Projectiles	See Rule S4, page 3. Competition soccer balls are considered safe projectiles.
Team Communication at Competition	We must prohibit the use of microphones or hand-held radios for team communication at the Competition to avoid interference with the U.S. FIRST staff and event managers internal communications and the control systems.
Two-part machines	See Rule C9, page 5. Two part machines are okay, however you cannot change the battery holder and you can only use the wires that are provided in the kit to extend power between motors. You MAY NOT use the wires that are in the printer.
Team Box	See Rule F5, page 4. The Team Box is a 6' x 4' marked area adjacent to the 18" high playing field fence.
Internet	We do not have direct access to Internet and not all teams have a subscription, so we are currently posting updates via fax and on the Bulletin Board.

Driving Competition Rules:

- 1) Each driver gets two runs. The driver gets to choose which run to score. Low times are better.
- 2) There will be no makeup runs for disqualified runs.
- 3) The vehicle will be placed behind the start line. The driver may determine how the vehicle is oriented behind the start line. Time starts when the official timer tells the driver to "Go." Time ends when the "End" ball is bumped (see diagram).
- 4) Each driver is allowed one (1) false start per run. The second false start will disqualify that run.
- 5) The driver must pass through all of the gates. A gate is defined as the space between balls, except for the last gate which is the space between the last ball and the edge of the playing field. It doesn't matter which direction you go through the gate.

Warning: Failure to pass through a gate will disqualify that run.

- 6) Each gate ball moved will add three (3) seconds to the time of that run. (All of the balls excluding the "End" ball are gate balls.) A ball has been moved if it is rolled off of the mark. (There will be a mark on the carpet under each ball.)



Note: The exact orientation and placement of the Start Line, Gate Balls and End Ball may be different than this diagram. However, it will be the same for all drivers.



AGENDA
1994 U.S. FIRST COMPETITION WORKSHOP
January 7, 1994

9:00 a.m.	Welcome and Introduction	Dean Kamen Founder, U.S. FIRST
	About the Design of Design Contests	Dr. Woodie Flowers Professor of Teaching Innovation MIT
10-10:20 a.m.	Break	
	The Challenge	Dr. Woodie Flowers
	Competition Kit and Preview	
	Program Update	Miriam Dumaine Director of Development U.S. FIRST
	Description of "PVC Insanity" Texas Instruments/Sherman High School competition	Bill Berghauser Sherman High School
	Presentation of 1994 Competition Playing Field	Dean Kamen
12:10 p.m.	Lunch	
12:55 p.m.	Discussion of Controllers, Drills	Tony Norman Principal Engineer E-Systems; Kurt Heinzmann, Bill Ormerod DEKA R&D
	Presentation of Kits	Dr. Woodie Flowers
	Questions and Answers	
	Closing Remarks	Dean Kamen
2:45 p.m.	Adjourn	

FOR INSPIRATION AND RECOGNITION OF SCIENCE AND TECHNOLOGY

U.S. FIRST Competition

S C H E D U L E

Practice Sessions

Thursday, February 24, 1994

10:00 a.m. - 9:00 p.m.

Nashua High School
36 Riverside Drive
Nashua, NH 03062

Seeding Competition

Friday, February 25, 1994

9:00 a.m. - 5:00 p.m.

Nashua High School
36 Riverside Drive
Nashua, NH 03062

Vehicles compete in several rounds for position in the National Championship.

Awards Celebration

Friday, February 25, 1994

Award Celebration & Dinner

6:30 p.m.

Center of New Hampshire
700 Elm Street
Manchester, NH 03101

National Championship

Saturday, February 26, 1994

9:00 a.m. - 3:00 p.m.

Nashua High School
36 Riverside Drive
Nashua, NH 03062

Playoffs for the National Championship. National Champion and Chairman's Award will be presented following the competition. The contest hall will be open by 8:00 a.m. and rounds will begin by 9:00 a.m.

For any questions regarding this schedule please call U.S. FIRST at (603) 666-3906.

February 8, 1994

To: All Teams
From: Jessica Forbes, U.S. FIRST
Re: Updates/Clarifications

A message from our Director, Miriam Dumaine: We need help!

A major sponsorship commitment of our Annual TV Show for ESPN has been postponed until 1995. That leaves us all without significant quality footage for broadcast this year. Procter & Gamble has offered a challenge commitment of \$10,000, plus the offer to make sure the show airs on ESPN if other teams match their pledge. The total left needed is about \$75,000. Please let us know as soon as possible if you would like to participate in this project.

Parts updates

Anything in the Small Parts catalog is "fair game"--if it's in there it can be on your machine--within the \$300 limitation, of course.

Sprockets and Pulleys There is no restriction on the total number of sprockets/pulleys (and chain/belt) on your machine, if bought from SPI or machined from official Kit parts. The eight sprockets/pulleys (and 15' of chain/belt) listed on the "Additional Hardware" list may be purchased from a source other than SPI (i.e., bike shop, hardware store, etc.). Spur gears do not qualify as sprockets/pulleys.

Wood Due to the numerous questions from teams and discussions here at U.S. FIRST, we feel it is necessary to re-address and clarify the plywood/chipboard/particle board allowance on the "Hardware List." You may use one of the types of wood listed, in any thickness up to 1/2", with a total area of 4' x 4'. You may not recombine the remaining area once a piece has been cut, i.e. if you cut a 4' diameter circle you may not "add up" the remaining 4 corner pieces into one equaling 3.5 sq.ft. You may, however use two or more pieces of plywood of different thicknesses (up to 1/2"), as long as the total original area and shape of the pieces does not exceed the 4' x 4' restriction. We apologize for any confusion or contradiction this causes.

Fasteners Fasteners, washers, and adhesives are not included in your \$300 limit on Small Parts Inc. equipment on your machine. Bolts used to attach pulleys will be considered fasteners.

Printers Printer parts may be used on your machine as long as they are not used electrically or to conduct electricity. We cannot guarantee the quality of these parts, thus this limitation.

The Tournament

Seeding Round Friday, February 25: each team will play six matches, lists will be distributed to each team that morning. After all matches, teams will be ranked by place totals (not points); ties will be determined by total score, last match score, and flip of a coin, in that order. Results of seeding will determine the first round matches of Saturday's competition.

Competition Saturday, February 26: double elimination, every team will be able to lose at least two matches before being eliminated. Competition concludes when there are only four teams left.

Finals Saturday, February 26: following the Competition, the final four will play 1-on-1, best 2-of-3.

JACK DAVIDSON
KOKOMO HS.

February 14, 1994

To: All Team Members [REDACTED]
From: Jessica Forbes, U.S. FIRST
Re: Upcoming administrative deadlines

Thursday, February 17, 1994

Team Guest Lists

Please send us a list of your attendees for the Awards Celebration on Friday night, February 25, at the Center of New Hampshire in Manchester. We have sent an invitation to your Chairman (and possibly other executives); however, we are planning on each team bringing up to 30 key team members, not including these executives. If your number of team members planning to come exceeds 30 please call us. We are trying to be inclusive in every way, but we do need to be on top of how many folks we need to feed!

If your team is using buses, please let me know when you send in your team list. Buses will need to park in designated areas and we want to be sure we plan on enough room for everyone, as well as provide instructions for your drivers.

Friday, February 18, 1994

Chairman's Award Materials

The Chairman's Award is presented to the team which is judged to have created the best partnership effort between a school and university or between a school and business. Documentation may consist of any combination of video footage (30 minutes maximum), photos or written chronicle. This material need not be professionally produced, but should clearly convey the effort made to develop a successful school/university or school/business partnership, and must be in our offices by end-of-business this Friday.

Thursday, February 24, 1994

Official Weigh In

Thursday, February 24, will be the check-in and practice day. Your machines must arrive by 11:00 am at Nashua High School (36 Riverside Drive, Nashua, NH, 03062). Your machine will be released to you when you arrive and surrender your RNETs and a pair of batteries. U.S. FIRST staff will be on-site all day to weigh your machine, but the official weigh-in will begin at 2:00 pm.

Team Photos

U.S. FIRST will have a photographer on-site during the Competition and official team photos will be taken on Thursday. Reprints may be ordered directly from the photographer—details will be available at the Competition.

February 16, 1994

To: All Teams
From: Bill Ormerod
U.S. FIRST
Re: Controllers

Warning: drill wires can cause failure

You must be more careful to not allow the drill wires coming out of the battery boxes to touch anything. The wires short-circuit against the controller cases, which are grounded, damaging the the control system and causing it to fail.

Despite multiple warnings on different media, this is still occurring at a steady rate and several teams have had to have their controllers replaced. We are rapidly running out of spare parts.

Replacements are limited

In order to be able to provide back-up at the Competition next week, I am putting a deadline on requests for replacements. As of Friday, February 18, 1994, at 5:00 pm U.S. FIRST will not be replacing any failed control equipment through direct shipments to your team. Your next opportunity will be Thursday, February 24, 1994, at Nashua High School.

Thank you for your careful attention to this matter. I'm looking forward to meeting you at the contest.

February 17, 1994

To: All Teams
From: Jessica Forbes
U.S. FIRST
Re: Competition Schedule for Teams

Please be sure to share this information with all team members, including students and parents.

Team Schedule

Thursday, February 24th

Nashua High School and the U.S. FIRST Pit area will be open and available to teams from 8 am to 9 pm. Sign-up for practice times will begin at 9:30, with practice in 1/2 hour sessions from 10 am to 8 pm. There will be an official weigh-in beginning at 2 pm; teams will be called alphabetically. Team photos will be taken this day and reprints may be ordered--see below.

Friday, February 25th

The school will be open to teams at 7:30 am and seeding matches will start at 9 am. Because of the number of teams this year, and in order to finish with enough time for everyone to catch their breath before the Awards ceremony, we have changed the number of matches per team to five. The Pit will be open until midnight.

Saturday, February 26th

The school and pit will be open to teams at 7 am with matches starting at 9 am. We are hoping to finish all play and present the National Champion and Chairman's Awards at approximately 3 pm.

General Information

Pit Area

Each team will have a table and power outlet in the pit area. We suggest you bring an extension cord (heavy duty and at least 25') and a power strip to make best use of your power drop.

Team Photos

Bill Fish, of William N. Fish Photography will be taking team photos on Thursday, February 24th beginning at 11 am. Color prints (8 x 10) may be ordered at the time of the shoot for \$15 each. Payment must be collected at this time, so please be sure your team members are prepared to pay. All photos will be mailed within 3 weeks to the leader of each group.

Food and T-shirts

There will be food concessions available on Friday and Saturday in the school. Limited edition "Tower Power" t-shirts will also be for sale for \$12 each. This year's design can be seen on the blue team shirts--the shirts available for sale will be black with the design on front.

February 21, 1994

To: All Teams
From: Jessica Forbes
U.S. FIRST
Re: Last-minute reminders

The Competition is this weekend! In preparation, just a few reminders:

Check-In

Time Thursday: Beginning at 10 am

Kit parts We will be collecting your RNETs and two batteries. Please also bring us your unused kit parts and the Rubbermaid container. We must recycle some of these parts and we use the containers from year-to-year. Thanks, in advance, for your help with this.

The Pit

Hours The times for access on Thursday have changed. Please make note of the new times, listed below. Thank you for your cooperation.

Thursday: 10* am - 9 pm
Practice sessions will begin at 10:30 am.

Friday: 7:30 am - 12 midnight
Saturday: 7 am - 3 pm approximately

Equipment One power drop provided; bring extension cord and power strip.

Access Please help us by limiting your pit crew to six team members. If additional assistance from another team member is necessary, let us know.

Concessions: cash required!

Food Food concessions (hot dogs, pizza, etc.) will be available on Friday and Saturday in the school.

Shirts "Tower Power" t-shirts will be on sale Friday and Saturday for \$12.

Team photos

Team photos Thursday, beginning at 11 am. Team banners are encouraged. Reprints (8x10) may be ordered for \$15. Cash and checks accepted.

FREEPHOTO! In order to assist Bill Fish with team shots, a pre-paid order list can be presented to receive a free 11x14 color photo for your school to proudly display. Here's how to get your free photo:

1. Collect pre-paid orders from at least half of your team participants.
2. Present your list of orders and payment at the time of photo.

January 24, 1994

To: All Team Members
From: Jessica Forbes
U.S. FIRST
Re: Program Information, Controller Update, Rules Clarifications

TEAM PROFILES

U.S. FIRST will publish short profiles on each team in the event program. By **Monday, January 31, 1994** please send or fax us your profile--you may use the following questions as guidelines when you write your description. Keep in mind that we are on deadline and that a quick turnaround is necessary.

Important: please spell out the following as you would like them printed:

Company/University:

School(s):

Team and/or vehicle nickname:

You may send us a copy of your team logo (black & white, camera-ready if possible, no larger than 8 1/2 x 11)

- 1) How many students and engineers are involved in your effort? How is it organized?
- 2) Is there anything unique about your team?
- 3) Give a brief history of how your team has gone about working on the project.
- 4) Describe any special aspects of your design or intended design that you want the event audience to appreciate (this will remain confidential until the first day of the competition).

CONTROLLERS

- Be sure to use the ribbon cable from your bag of switch parts for the receiver RNET. The molded cable will not work there.
- Use the molded cable with the tether, not the ribbon cable.
- Be careful not to short the red and white wires from the battery boxes to anything.
- Please DO NOT modify the circuits in any of the boxes.
- Do not remove the transorbs from the drill motors or Delco motor cables. The relays will not last long without them.

RULES CLARIFICATIONS

Drills	Drill motors cannot be altered electrically in any way. This includes connecting leads to the drill motor. Changes to the casing or removal of the motor from the casing are permitted.
Parts & Pieces	Pulleys and sprockets can be combined. You may only use "off-the-shelf" springs. (eg: compression, tension, torsion, constant force and any spring washers. Connectors (tees, reducers, elbows, and angles) for PVC (pipe only), conduit and copper pipes may be used without limit in linking sections of these materials. Endcaps may also be used. Flanges may not be bought but you can construct your own from official kit materials. No electronics from the printer, including the stepper motors, may be used. See rule #K2 You can only use the string supplied in the kit.

January 26, 1994

To: All Team Members
From: Jessica Forbes
U.S. FIRST
Re: Page 2 of yesterday's fax.

Hydraulics Water may be used. However, any compression must come from motors and/or springs. Fluids may not be pre-compressed.

Fasteners Rivets are considered fasteners. Welding is considered a fastener and can be used. Fasteners must be non-functional, they cannot add structure to your machine. The parts they connect can rotate against one another.

The play The pit area will be located in the kitchen of the High School and your Pit crew is limited to 6. The actual team box is located at the playing field and only 4 people can be in the team box at a time.
See Rule T10. Tipping of the goal will be controlled by the referee who will interrupt if necessary.
The lower goal will provide 1 point per ball in the entire 8' hexagon. The lower portion of the central hexagon also provides 1 point per ball. The interior lower goal is considered a "safe house" for your 1 point balls, i.e. it is more difficult for an opponent to knock your 1 point balls out.
If a ball goes out of bounds a reasonable effort will be made to retrieve that ball and return it to the playing field at its point of exit. If a ball is rendered inaccessible while out of bounds, as a result of distance or entrapment, additional balls will be available for substitution. It is not the responsibility of the referees if they damage trapping devices while attempting to retrieve balls. A trapping device may be disqualified if, in the opinion of the refs, it is considered unacceptable. This could include inaccessibility or destructiveness. If detachable mechanisms cause permanent damage, judges may decide to take action against your team. Limited amounts of ramming will be allowed, however, if you consistently damage opponents machines, referees may take action against your team.
If a team's machine is damaged and therefore can not complete a round on a fair basis, that team may be eligible for a rematch. It is up to the referee's discretion.
If one team intentionally damages another team's machine, it may result in disqualification. However, if the damaged team's machine is considered too flimsy to begin with, the other team may not be disqualified. Again, referee's discretion.
The goal can be tipped by hooking and pulling. See T10.
Out-of-bounds is anything past the plane of the inside edge of the 4x4 boundary.
Balls will be started halfway between the edge of the goal and the curb.
The Goal Please use diagrams for dimensions of the goal. There is a typo in the text.
The goal posts are a standard closet rod, 1 1/4" nominal diameter.

Getting Hardware Parts that can be purchased through SPI may not be purchased anywhere else. Only those parts that are listed on the "Additional Hardware" list *and are not available through SPI*, may be purchased at your local hardware store. You may not purchase 'nearly equivalent' parts. Parts purchased at your local hardware store are in addition to parts purchased through SPI, but are limited to those things listed in "Additional Hardware."
If you spend more than \$300 at SPI (say to build prototypes, etc.) you are responsible for paying the difference.
Only \$300 worth of parts from SPI may be actually used on your final machine. If you show up with a Cadillac and everyone else has an Escort, your SPI records may be subject to an audit. You should be prepared, however you see fit, to verify your SPI parts.
Your account at SPI will be debited for the actual purchases you make. You cannot pro-rate unused quantities of products you purchase. You decide what you need and make wise purchasing decisions based on how the product is purchasable and at what price.

Communication No remote communication devices, such as air phones, walkie-talkies, cellular phones, etc. may be used at the competition site.

Battery Roughly, the capacity is 1.2 Ahr per battery. There are two of them in parallel. Batteries are your responsibility. However, US First will have a supply on hand and you will be able to recharge them.

Orientation There are no restrictions on the orientation of the machine within the defined 36" X 30" cylinder specified in the rules.