FRC Handbook

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ABOUT *FIRST*

"…to create a world where science and technology are celebrated… where young people dream of becoming science and technology heroes."

Dean Kamen, Founder, *FIRST*

FIRST (For Inspiration and Recognition of Science and Technology) was founded by inventor Dean Kamen to inspire young people's interest and participation in science and technology. Based in Manchester, N.H., *FIRST* is a 501 (c) (3) not-for-profit, public charity organization incorporated in the State of New Hampshire.

A volunteer-driven organization, *FIRST* is built on partnerships with individuals as well as businesses, educational institutions, and government. Some of the world's most respected companies provide funding, mentorship time and talent, and equipment to make *FIRST*'s mission a reality. There are over 45,000 committed and effective volunteers who are key to introducing 100,000 youths to the joy of problem solving through engineering.

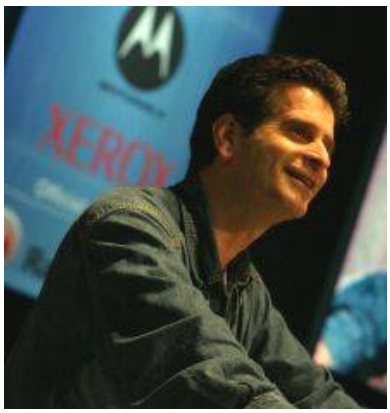
FIRST provides two well-known programs, the *FIRST* Robotics Competition (FRC) for high-school-aged young people and *FIRST* LEGO® League (FLL) for 9 to 14 year-olds, and has recently added the Junior *FIRST* LEGO® League (JFLL) program for 6 to 9 year-olds. The pilot program, *FIRST* Vex Challenge (FVC), is a mid-level robotics competition that offers students the traditional challenge of a *FIRST* Robotics Competition but with a more accessible and affordable robotics kit. Also located at *FIRST* headquarters is the research and development facility called *FIRST* Place. *FIRST* Place is integral to FLL game design, new program development, evaluation, and professional development of *FIRST* mentors.

Since 1992, the *FIRST* Robotics Competition (FRC) has challenged high school students — working with professional mentors — to solve an engineering design problem in an intense and competitive way. The program is a life-changing, career-molding experience — and a lot of fun. In 2006, the competition reached more than 28,000 students on 1,133 teams in 33 regional competitions and one Championship event. Our teams come from Brazil, Canada, Ecuador, Israel, Mexico, the United Kingdom, and almost every U.S. state.

In 1998, *FIRST* Founder Dean Kamen and The LEGO Group's Kjeld Kirk Kristiansen joined forces to create *FIRST* LEGO League (FLL), a powerful program that engages younger children in playful and meaningful learning while helping them to discover the fun in science and technology through the *FIRST* experience.

As of 2005, children in 31 countries are active in FLL. We are thrilled to have teams in Austria, Belgium, Brazil, Canada, China, Denmark, Egypt, France, Germany, Hungary, Iceland, India, Israel, Italy, Japan, Jordan, Lithuania, Luxembourg, Mexico, The Netherlands, Nigeria, Norway, Singapore, South Africa, South Korea, Sweden, Switzerland, Taiwan, Turkey, the United Kingdom, and the United States.

WHO ARE DEAN AND WOODIE?



"We want to change the culture by celebrating the mind. We need to show kids that it's more fun to design and create a video game than it is to play one."
Dean Kamen
Founder, FIRST

Dean Kamen is President of DEKA Research & Development Corporation, a dynamic company focused on the development of revolutionary new technologies that span a diverse set of applications. As an inventor, physicist, and entrepreneur, Dean has dedicated his life to developing technologies that help people lead better lives. Dean's proudest accomplishment is founding *FIRST*.

Woodie Flowers
Co-Founder and National Advisor, FIRST

"…It's like life. You never have enough information. You never have enough time. The kit of materials may be what you have in the warehouse. There are always people doing competing things and you must have a strategy. We created a microcosm of the real engineering experience."

Dr. Woodie Flowers is the Pappalardo Professor of Mechanical Engineering at the Massachusetts Institute of Technology, a Distinguished Partner at Olin College, and co-founder of *FIRST*'s cornerstone program, the *FIRST* Robotics Competition. Dr. Flowers participates in the design of the *FIRST* Robotics Competition game each year. He has served as a National Advisor to the *FIRST* Robotics Competition since its inception.

EXAMINE THE UNDERPINNING

With this handbook, we hope to make it easier for rookie teams to get a good, stable start, and we will try to provide existing teams with new ideas to bolster and refresh their efforts.

Help us, please.

It is crucial that we receive your feedback about this initial attempt at providing helpful information to our FRC teams prior to the Kickoff and start of the season. Please submit any comments as well as subjects you find missing or in need of augmentation or clarification.

We will make every effort to improve the handbook. Please jot down notes as you read and e-mail them to us at frcteams@usfirst.org or fax them to 603 666 3907. In both cases, please use a subject heading of "FRC Handbook Feedback."

FIRST Robotics Competition (FRC) relies on volunteers and mentors for its life and breath. Our teams and their mentors are unparalleled. Brains and work ethic to the max! Each team has its corps of adults guiding and instructing the kids through timelines, team building, safety cautions, brainstorming, fundraising efforts, CAD instruction, award submissions, and T-shirt design, while teaching and nurturing gracious professionalism throughout. Oh yes, then there's the small matter of robot design, robot building, robot testing, troubleshooting, and re-design. And did we mention improving work ethics to a "nose to the grindstone" frenzy and oh so many long days and late nights?

Why would someone want to volunteer to be a part of all of this you ask? Many say that it is good for young people and their communities. Yes, those are true reasons, but whom are they kidding? It's an exciting competition and it's so much fun! The kids love it, and we have a sneaking suspicion that the adult team members are at least as captivated by this program that is so over the top!

But, is *FRC* sport for the mind or is it a more serious challenge for a lot of the team kids and mentors? Is it an obsession for the sci-curio mentality, a mind-altering "drug" for potential inventors, or a brain food for future technological advancement champions? Yes to all of it. Get used to it! Once bitten = totally smitten and always addicted.

……But wait a minute; kids and mentors with other talents will also love the ride! Line up some graphics/Picasso-type artists, aspiring writers, accounting neophytes, marketing or salespeople, and others still searching for a niche. They will surely find or create one once they catch the team fever!

The FRC program wants to provide students with a positive team experience and give them an opportunity to develop leadership. Your team must be able to work with each other to complete the many individual tasks necessary to create a competitive robot and submit an entry for an award or two. It is critical to assemble a group that can work well together.

The "ASME Guide to Starting a *FIRST* Team" is available for download on the www.usfirst.org web site. It advises, "Perhaps the best operating perspective is to ***view your FIRST team as your own personal company.*** You certainly want to have a successful business, so you want to involve the best people on your team. You will need to "hire" effective managers for your company: people that can follow a chain of command, receive delegated responsibilities, and deliver the required products. These managers must direct the work of motivated and energetic employees (that may be students, faculty, parents, or industry participants). Like the real world, you will need to work hard to recruit talented people to join your company."

Read ASME's helpful and insightful guide with views about financial models and cost sharing, impact documentation and the press, and a general schedule for the robot design and build phase.

SUPPORT AND COMMUNICATION

Support for your team is readily available and easy to find. If you can't find the information you need from the web site or the "*FIRST* Robotics Competition Game Manual," contact Team Support for help.

Team Support

You can reach *FIRST* Team Support, located at *FIRST* Headquarters in Manchester, NH during regular business hours, 8:30 a.m. to 5:00 p.m. Eastern Time. There are extended hours during the competition event season.

frcteams@usfirst.org

800 871 8326

Field Support

Regional Directors, Regional Committees, and Senior Mentors cover specific territories and can help if you have questions for your locale or competition. Team Support can put you in touch.

Use the *FIRST* Web site - www.usfirst.org

One way to familiarize the team with how *FIRST* works is to tour the web site. If you and the team are somewhat acquainted before the season starts, it will be easier for you to check for available scholarships, deadlines, grants, and the various award submission and shipping deadlines.

Read available guides: Find, download, and read the "ASME Guide to Starting a Team" the "Mentoring Guide," and the "Team Safety Manual." These web site documents will help you get started in the right direction. Ask the other mentors to read them also.

Get a jump on the season: For practice, rookie teams may want to consider how they would design a robot based upon the information in last year's FRC Manual and game format. During the fall, take a look at last year's materials, and you will get a good idea what the upcoming season will bring. It's a good time to practice brainstorming and design.

After the Kickoff, you will be able to find all of the new "*FIRST* Robotics Competition Game Manual" (FRC Manual) sections and the Updates as well as components of the individual events, such as dates, event agendas, and shipping and drayage particulars.

Get Acquainted With the TIMS

This is the system that provides *FIRST* with necessary, up-to-date team information. The on-line Team Information Management System (TIMS) allows the Main and Alternate Team Contacts to register and manage the information about their *FIRST* Robotics Team.

Once the Pre-Registration time approaches in mid September, go to the FRC registration area to start the process. When registering a rookie team, you will receive a temporary, seven-digit number, a password, and logon. When you register for your initial event, you will receive your official, four-digit team number.

With computer-assigned but changeable passwords and their logons, Main and Alternate Contacts provide and update required team, contact, and partner/sponsor information; register for Kickoffs and events; provide helpful information for judges, and supply team demographics. There are web-listed, associated deadlines with each of the TIMS subject areas.

Communications from *FIRST*

This section talks about some of the critical ways FRC communicates with its teams, such as Team Updates, e-mails, and the Q & A Forum. There are also other web sites linked to ours that provide information on off-season events and other useful materials.

Team Updates

Once the season begins, teams will be able to download "Team Updates" from the web site for distribution to relevant team members. Have two people, one serving as backup, in charge of the web site monitoring and information sharing. *FIRST* tries hard to follow a designated posting schedule for this new information twice a week, more often if necessary. The updates contain such items as General Notices; the Question and Answer System; e-mail blasts sent since the last update, and the team manual sections including rules clarifications.

E-mail Notifications

Team contacts will receive many e-mail communications during the year. It is important that the main and alternate contacts check for them often during the registration and competition season and *every day* during the build season.

Q and A Web site Forum

This team discussion area includes all sections of the Competition Manual, such as "The Game," "Robot Transportation," "The Robot," etc. Anyone can view questions and replies on this system, but only those team contacts with the team username and password can post questions to it.

CONSTRUCT THE FOUNDATION WITH ETHICS

A large part of the success of many teams and *FIRST* itself is the somewhat unique emphasis and approach to teamwork. The respect for peoples' ideas and methods is the foundation for overflowing brainstorming and invention, both huge elements for scientific success. Enough said. Read the pro's insights in the following paragraphs.

Make Gracious Professionalism the Cornerstone

Dr. Woodie Flowers, *FIRST* National Advisor, asks and provides his view regarding the question, **"Why do *FIRST* folks talk so much about that phrase?"**

Quoting Dr. Flowers, "Obviously it would not make sense to endorse 'asinine professionalism' or 'gracious incompetence.' It is, however, completely consistent with the *FIRST* spirit to encourage doing high quality, well informed work in a manner that leaves everyone feeling valued. Gracious professionalism seems to be a good descriptor for part of the ethos of *FIRST*. It is part of what 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 are losers. 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!"

Write a Team Credo

During the fall, establish your own team philosophy that stresses the attitudes and respect that Woodie, Dean, and *FIRST* value. Brainstorm together and write it all down. Listening to what the kids think is as important as hearing what the adults contribute.

Get your whole team to buy into the credo by signing what the team sets down as important. Include wording to encourage honesty, integrity, dedication, good judgment, and general all around positive behavior for all team members. Stress such things as keeping up with regular schoolwork. This may be a good place to define what the team can expect from both students and mentors.

Let the team members and mentors know that following the credo will be a criterion for being on the team throughout the season. You will find that when the team is under pressure, the kids and mentors will remember what it is you are trying to create, a working robot and a productive atmosphere in which that effort can happen. Give each person a copy as they sign it.

Open the House

Early in the fall, hold an open house for all potential team members and mentors to describe the program. Download the FRC information sheets from the web and distribute them as handouts or post them to a board for all to see. Invite a veteran team(s) as guest speakers, and ask them to bring their robot to demonstrate. They like to show their stuff! You will be amazed at the speaking competence, demonstration ability, and the excitement these young people bring to the presentation. Veteran

teams will often lend new teams a robot and encourage becoming a “Pre-Rookie” player at an off-season event.

This pre-season meeting is a great time to capture parents’ attention/involvement by mentioning one of the huge rewards of FRC student participation – over 8 million dollars in scholarship offerings to team members.

PLOT A TEAM BLUEPRINT

Most likely, you want to start a new team or improve your existing one because you want to help young people get excited about science and technology, and you probably hope to have a good time in the process. Get ready for lots of fun!

Consider the word “team” in the old sense of horses or oxen accomplishing work with a plow or moving product. If the animals didn’t work well together, the job was tedious and slow. To prevent this type of stall, plan your team structure before the season begins.

Balance the Structure

Decide what kind of team model suits your style and aims. Refer to the Appendix for samples of these types team structures.

If you know another team, ask that team’s mentors if their team could assist yours. For those who need to find a team, use the “We would like to be mentored by another FRC team” option in the Team Information Management System’s (TIMS). The help can be as simple as having help available via e-mail or phone, or providing specific technical assistance. Identify potential local resources. Look at your community with new eyes and think about who can mentor and manage, provide a machine shop or materials, funding, and financial/budget management for your team.

Balance management and crew numbers, and get to know your team so you can empower it by coupling the right strengths and weaknesses. Use this system to grow talents and facilitate learning. Those taught by mentors become “teachers” to a new, green group of rookies. Let the kids work on the robot, and make it a team effort by encouraging group decisions. Supervise them, but let them fail once in a while if they have to; it’s how we all learn. Winning the prize isn’t everything. Sometimes the trophy is the trying and working together successfully.

Tier Your Team

Each team has its own personality, organization, and strengths; and each decides its work distribution and methods. The obvious, necessary working groups of the team are the robot design and build sub teams; there also are management, travel, financial, creative writing, and artistic groups that support your team throughout the season.

There is a spot on every team for those who haven’t yet cultivated the scientific part of their brains. These persons may not ever want to become technically savvy, but each can make real contributions by helping manage schedules and disseminating information and materials, or by designing T-shirts and your robot’s unique look. Try to involve students who take photos, videos, or create 3d animation. They can really help archive progress and get your team to shine in the public’s eye!

Organize for Success

Well-run companies have a management or core group, and most successful *FIRST* Robotics Teams work under a similar framework.

The Team Core

Cement your support system and make sure all are committed. Design a *Memorandum of Understanding* (MOU) with your mentors, and include a schedule and expectations for both the mentors and student team members. If yours is a school-based team, ensure the dedicated involvement of the school administration and teachers.

Other team types should confirm the dedication of major supporters and staff. All teams need to involve the parents and inform them about the time commitment so they can plan to carpool or stay and help whenever possible.

The Sub Team and Their Makeup

Before the season begins, most successful teams spread the workload by forming self-motivated sub teams, utilizing unique talents, and giving everyone an opportunity to contribute. It is smart to set up your core group ahead of time and document what each person’s leadership responsibilities will be.

One very successful, fairly large team uses the following breakdown for its team structure. Of course smaller teams can combine them.

- Strategy and Integration Team
- Drive Team
- Electrical/Software Team
- Mechanisms Team
- Model Shop Team
- Promotions and Awards Team
- Support Team for travel, food, facilities, finance, and materials

Keep the groups rather small and project-oriented. Remember that the build team sub groups must interface often to make sure all mechanisms will mesh. Consider rotating roles to strengthen team members' knowledge and experience as well as avoiding cliques.

It's a good idea to have all students on a couple of sub teams. If you can find out what each does well in, put the student on a sub team dealing with that skill, so the group has strong assets with lots to teach. Also, put this same student with a group from whom he or she can learn new skills but not slow the group.

Name your sub teams and consider combining them if your team is small. Make sure each has a competent leader and a backup if possible. Besides robot construction, remember there are awards to shoot for, a web site to plan and maintain, a business plan to design, resources and projects to manage, and there's the business of getting the team some media notice.

The Talent

Who's good at what? Who wants to learn what? Who should be the student operators and human players during the competitions? *Designate backups for important roles*, especially those with a deadline. Train younger team members who can replace graduates for next season.

Who has experience useful for building a crate and packing and shipping the robot, perhaps a parent with carpentry skills or someone in the wood shop? Parents are a great place to start when looking for mentors. The following types of experiences are particularly valuable:

Machining	Programming	Photography	Teaching
Electronics/Circuitry	Manufacturing	Construction	Financial Management
Robotics	Engineering:	Design:	Leadership
	Mechanical	Web	
	Electrical	Visual	
	Computer	CAD	

Recruit a drive team large enough to practice and cultivate several stand-by operators in the wings. You may choose to have one group study the new game and recommend play strategies. Another group might work on a shooting arm as a result of the strategy group's recommendation. Those who are computer clever may enjoy programming the robot. Establish an Awards team: Autodesk, Chairman's, Web site, and Team Imagery for T-shirt and badge design.

The Documents and Data

Think ahead. Where's a good place to keep the team documents and data? You may decide to use portable file boxes for some items and ring binders for others. Some items will need to be accessible to many, such as the "FIRST Robotics Competition Manual" sections, "ASME Guide," and "The *FIRST* Mentoring Guide."

Team members will be referring to Team Updates and e-mail blasts often, so make sure everyone has easy access to them. Make copies of important documents in case they get damaged or lost, and set up an organized way of maintaining at least the following:

- Design ideas and test data
- Sponsor recruiting efforts and related correspondence
- Budget items
- Team contact and emergency information and medical emergency forms.
- E-mails and Updates
- Team archive materials
- Consent and Release forms. Consider how to best collect and store these mandatory, completed forms you must bring for all attending mentors and team members. (Necessary at your initial Regional event of the season registration.

Recruit Other Mentors

Try to choose team mentors with varied talents. Besides the robot design and build team, you need to recruit someone who can get the word out to potential sponsors or local media about your team. Also, who would be good at booking travel and hotel arrangements?

Mentoring Opportunities

Is there a need for teacher or student translators? Finance and fundraising might be a good sub-team partnership. Consider which folks could handle team safety education best, encourage students to apply for the many scholarships, or handle the logistical details of your various meetings and competitions.

If there is a college or university nearby offering engineering courses, try to enlist them in partnering or mentoring. Many colleges and universities use the FRC program as their capstone project for seniors, so they welcome the opportunity to work with teams.

This program is also a great way for engineers to get the wind back in their sails. The project is certainly not humdrum, and they have design ideas, they motivate, they create, they modify, and they become excited with their craft all over again. They love collaborating with other bright minds and cultivating new ones!

Team Contacts and Mentors

Who is willing to receive e-mails, monitor the web site, and circulate these communications from *FIRST*? Make sure you have committed adults willing to be your team contacts. You will need *at least* the following people to consistently monitor the calendar and various duties involved with running the team, but not necessarily work on the robot:

- Main Contact
- Alternate Contact
- Shipping Contact

The Main and Alternate contacts are in charge of keeping the Team Information Management System (TIMS) up to date. Sometimes they are the mentors as well.

The mentors acting as leads represent the team and should be involved in all major decisions. Above all, there should be a reciprocal respect of young people and he/she must be capable of mediating disagreements about robot design, team fundraising and funds distribution, choosing events, and discipline problems, etc. These mentors must be able to facilitate the workings of the team, deal open-mindedly with personality clashes within the group, and have the authority of final say for the good of the whole. Interpersonal management skills are important to communicating well with sub-team leaders and *FIRST* staff.

Many teams decide to incorporate a student team leader into their structure, with duties including representing and encouraging peers, collaborating with adult leaders, assuming defined responsibilities, and keeping an eye on the calendar deadlines.

Diversity

Ask around to see if anyone can suggest potential mentors for the team. The school may have some great Tech Ed or Industrial Arts teachers willing to help. Consider recruiting women for technical and non-technical positions. Mentor diversity encourages team member diversity, so try to include teachers and other volunteers with similar backgrounds and ethnicity as the students.

Promote all areas of the team because it's not just about building a robot. A great way to get non-technical students feeling comfortable is to have them initially work with non-technical mentors and projects. A lot of them will jump on the techie wagon once it gets rolling. Just watch!

Sponsors/Partners

If you are lucky enough to have potential sponsors, ask for a meeting to discuss the project with some technical people at their facility. Call a local college or university and ask for a meeting. Very often these schools welcome inclusion because they can use the program as part of their curriculum. Be sure to bring the attendees some information sheets from the FRC Resource Center located on the www.usfirst.org web site. You may also want to create your own.

The very best way to reel in recruits is to throw out the competition bait. Bring the potentials to an event. If the official competition season is over, you can find a listing of "Events Run By Teams" on the FRC portion of the usfirst.org web site. These off-season events run through the summer and fall. Once they see the creativity, action, fun, and excitement, there's no holding them back!

Parents

Don't forget them! All parents can offer valuable assistance. Ask the students if any parent is an engineer or has any useful expertise for the team, such as a machinist, or someone who handles shipping and knows how to get the robot crate shipped by the deadline. You may find parents with fundraising, programming, marketing experience, or a parent group willing to provide snacks...fuel for the team. Many teams have parents who are so dedicated that they donate team dinners.

Skills, Preferences, and Approaches

When meeting with potential mentors, you will naturally talk with them to find out what skills they have and are willing to share. It's equally important to make sure the team's philosophy about who builds the robot is clear and agreed upon by the decision makers. If an engineer won't let anyone touch his "baby," he or she might not be a positive team addition. Perhaps the team Memorandum of Understanding (MOU) would help prevent this.

We all learn by failure, and kids are no exception. Team management varies, but *FIRST* encourages the "hands on" method of learning. We believe that the more each student has this experience, the more confidence and knowledge each gains from the FRC program. Be sure you all discuss this and agree on this subject early.

Be sure your mentors enjoy working alongside kids and have a good approach to learning and discipline. The web site document, "*FIRST* Mentoring Guide," provides a good footing for developing the methods of mentoring and facilitating and provides information on productive brainstorming. Give each of your mentors a copy.

Recruit Students

Consider recruiting responsible students from various clubs to help manage the business of running the team, disseminating communications, or writing articles and marketing the team's activities. Remember that the Main, Alternate, and Shipping contacts must be post high-school age.

Application?

Each team has a different way of attracting and choosing students. With your other mentors, decide if your team should have an actual team application and/or interview process. If you do, agree on what items you want to consider putting on the page. This is a good way to capture contact information at the outset and find out if the applicant has an idea of which sub team he or she would enjoy. Have an area where each can list talents, experience, and interests.

If you decide on an application process, set dates and advertise for it. FRC team size varies between 6 and 100, with the average of 25 to 40 including students and mentors. The trick is to make sure your team will be efficient and effective. All members should have a job, with sub teams big enough to share the load.

Students without tasks can distract and disrupt. Target a team size and have a pre-determined, sensitive process in mind to notify those who do not make the team. If the "no" hurts, they may not try again next year. You may want to consider a "Welcome" letter to those who make the team. Include some team goals, rules, and meeting information perhaps. As years go by, you will be able to include a little team history.

Interview?

Does your team want to interview each applicant? This would be the perfect time to ask questions to determine if the kids are mature enough to work alone. Mention that the project is a long one and that dedication is critical to the team's success. Do you want some of the students to be part of the qualifying/culling process? There are obviously pros and cons to this decision, so give it some thought.

Qualifying Criteria

Be sure to let the kids know there is more to being on the team than building a robot: fundraising activities, awards submissions, marketing the team, and cleanup activities are all roles within the team. Tell them that they are all expected to help with the various aspects of the project, and that they have to earn active and productive roles. Make sure they have transportation to the work sessions.

Does your team want to set down membership criteria such as a minimum grade point, age, or grade level? Realize that sometimes the best team members are those who haven't yet found their niche. Take time with this process since many times this program provides an opportunity for an unexpected, life-changing experience and growth for those kids. Some teams stipulate that each member has to contribute a certain amount of money toward the team travel expenses or team "uniform." This stipulation could shrink your talent field.

Archive Your Team

From the outset, be sure to keep an historical record of what your team spends in time and money, the ideas it has during brainstorming and robot design meetings, the problems it experiences as well as the team and personal growth resulting from overcoming hardships. Take lots of pictures and make videos of your team and robot during fundraising and competition events.

Partners

Keep track of the potential partners/sponsors you approach, the results of those meetings, and archive the communications. This way, you can show how the team improves from year to year, which may make it easier to gain or increase their support in the future.

Alumni

Monitor your alumni when they graduate. Sponsors like tangible evidence that the FRC program is inspiring students, and *FIRST* appreciates any such information for grant proposals. This historic material will also help you when you solicit for donations/support or submit an entry for a NASA Grant or the Chairman's Award.

Press Releases

Write at least one Press Release so you have it on hand. Share your progress with your community. Besides what you want the public to know about your upcoming fundraiser or competition event, include a little about *FIRST* and its mission and impact. You can obtain much of this information from the web Resource Center. Be sure to include your team number and official team name that includes your sponsors/partners. To make the writing process easier, start an electronic file to archive your letters and releases so you can borrow pieces from them to create new ones easily.

The Moments

Take lots of pictures of team events and meetings. Use a team member checklist to ensure that you have a couple of pictures of everyone, including parents and mentors. Photos are a good way to make everyone feel like part of the team, and as such they may be a great way to open discussions and encourage quieter team members to contribute their ideas.

Set Objectives

Meet with the team early on and decide what the team's hopes and goals will be for the season. Make them simple so there is a feeling of accomplishment, such as creating a robot that works, learning how to program and use the design software, and/or submitting entries for award consideration. Foster innovative thinking and focus on learning, improving, and inventing, rather than winning. Get the kids interested in earning scholarships through the program. Set down safety rules for working, traveling, and event participation.

Remember that you want to establish *reasonable* goals and meet the deadlines. A wise contributor advises teams to take advantage of the fall season before Kickoff for organization, planning, and training: "***3 hours early ---- to save 3 days later when time is short and pressure is high."***

Value Each Team Member

It is extremely important that each team member feels valued and respected. Encourage everyone to check egos and consider other's feelings at all times. A good place for this concept to begin is at the first few meetings during the brainstorming process, when any idea should be considered valuable. Establish the "No disparaging remarks allowed!" rule.

Once the pressure builds, it's too late to learn to control the "nasties" and misguided comments. Make it a rule that no bad language or degrading remarks are allowed from anyone, including the adults. Nurture patience, good will, and positive attitudes and you will see a happy team grow.

Team Building

Try to attend an off-season event to see how veteran teams function "on stage." Try out your team's scouting techniques. You can find a listing of these events on the *FIRST* Web site. In the fall, well before the grueling design and build season, use some team building games to help everyone get to know each other and work well together. Try things like Charades or Pictionary to get the laughter roaring. Include a scavenger hunt with information about teammates. Stress that bad moods and attitudes are a big waste of time and energy, and bring laughter to the group whenever possible. Silly works - big time!

Have a time for discussion at the beginning of each meeting to find out how each person can contribute to a pleasant work time atmosphere. Ask if anyone needs help. This teaches kindness, thoughtfulness, and cooperation - real team builders. Stress fun, but put down some boundaries!

Adult and Student Decorum

Be sure to have a discussion with all of the mentors regarding propriety when working alongside students. The kids should be comfortable in this atmosphere, so be sure that language, behavior, dress, and jokes are proper at all times. Young people look up to those they trust and respect, and they closely watch the adults' actions and will see them, bad or good, as appropriate.

Watch out for inappropriate emotional or physical behaviors/actions. This would include someone on the team made to feel uncomfortable, by an adult or student, by inappropriate innuendo. Establish a reporting procedure for this type of harassment and discuss it with the group.

If anything skids down a slippery slope, be sure to handle it right away. Don't embarrass anyone in public, but speak to the right parties about the situation. In separate conversations, discipline the offender and reassure the offended. Make sure the team members know they can come to you with complaints or concerns.

Share Your Visions

Start each meeting with a few remarks about your team and its goals. Be positive. Cultivate personal *and* technological growth; be a cheerleader. Throughout the process, you should all become partners, comrades, and teachers. Respect each other, encourage each other, and compliment each other for each job well done, no matter how small it is. Learn from the failures and build on them. Don't dwell on them.

Set Your Team Apart

Establish Your Team's Various "Names"

During the registration portion of the season, you will be inputting information about your team's names in the Team Information Management System (TIMS). At *FIRST*, we recognize the team number and the official name. Read below for name descriptions and functions.

Official Name

This one is generated automatically when you enter any sponsor/partner into the TIMS. The official name is what we print in *FIRST* documentation, so be sure to list your sponsors and the school(s) by the first of December, the deadline for the Program Books. It is important to honor your partners in this way, and *FIRST* also includes them in the Annual Report.

Nickname: The team comes up with this one. Once the season gets going, have a team naming activity that includes everyone. Have some fun with it and when you are name brainstorming, think about potential costumes and logos! Many teams use their school's mascot as part of their name such as, TigerBots, Robo Lions, or Metal Knights, and others come up with something way out of left field, such as Miss Thelma. The deadline for TIMS Nickname input is usually mid February, but you are better off getting this done before the Kickoff - before the holidays is even better.

Scoreboard "Short Name": This name can be no longer than 21 characters and should include partners and school. As you can imagine, sponsors love seeing their names up on those scoreboards!

Stylin'

A big part of the team fun is individualizing your appearance. Of course it's optional. Some teams just have some nifty T-shirts and trading pins, while some wear complete, matching outfits, stylized or dyed hair…. pink, blue, or red….with sparkles yet! Grown men and women get into this too, and have so much fun in the process!

This team has a "striking" weather look to carry out its lightning theme. What a collection of trading buttons!

Mascots

You will see colorful soup cans, caped wizards with pointy hats, Oompa Loompas, cheerleaders, and just about every or common furry or morphed animal. This mascot is right with the program!

Keep safety in mind when planning your team and/or mascot's costume. Consider things like clear vision and temperature when designing. Where is this nutty character's assistant? Think he bolted?

Logo

Once you choose your team's nickname, you may want to come up with a team logo to incorporate with your image. Keep your logo simple because each color you use costs more to print. Have some fun with it like this team did!

If you need information about the "*FIRST* logo, refer to the Robotics Competition Manual" or the web site for *FIRST* logo restrictions.

Know the Game

As soon as the game is revealed at the Kickoff, you will want to get your team going on becoming familiar with what the game is all about. Have everyone read the game description several times and have a meeting as soon as possible to discuss the objectives and scoring. Some teams begin discussing the game as soon as they arrive home from the Kickoff.

Brainstorm to see what your team thinks would be good strategies for your robot. Get all the ideas out there on paper, no matter how "out there" or farfetched they sound. Once your team has some reasonable strategy ideas in mind, get your sub teams going on the autonomous and visioning modes of the game as well as designing the devices necessary to scoop, shoot, or scatter; place, pile, pillage, horde or hang the game pieces where they earn you the best score.

Read the queries and answers on the web site Q & A forum to clarify any rules questions you might have. It is possible that your question, while unique to you, will have an answer that refers you to the answer for a previously asked question. If you don't see the answer and you have read the appropriate Manual sections, post the question, referring to the Manual section needing clarification. Watch for the official answer in a day or two. This method helps maintain that all questions relating to the same concept will be answered the same way, rather than multiply re-phrased.

Another critical team exercise is to constantly monitor the "Team Updates" and all *FIRST* e-mail blasts for game updates or clarifications. Make sure they are distributed, and file them in a consistent manner so you will be able to refer to them easily and quickly.

Pursue Awards

Most of the awards presented at the events are judged at the competitions by judges who interview the team members and watch and listen to what they, adults and kids alike, say and do. But there are a few awards that teams work on and submit entries for prior to posted deadlines. Autodesk donates software to teams and judges their submissions using posted criteria. There is also a judging for team web sites. Be familiar with the entry criteria listed in the "Awards" section of the Manual for these contests.

There is also a pre-season Safety Animation contest, with the winning entry highlighted during the Kickoff in early January. Honor one of your hard-working mentors by submitting an entry about her/him for the Woodie Flowers Award, and you can also try for the Chairman's Award, the most prestigious honor your team can earn. Before the rush begins, have the team read about all of the possibilities in the FRC Manual "Awards" section.

PREPARE MATERIALS AND MECHANICS

Your team will need to have access to basic the basic equipment mentioned below. If you are a new team, it will help to become familiar with the information from the prior year, as mentioned below

Set the Jobsite

Ideally, you will want a machine shop and all its tool trappings for your team's robot birthplace. If that's not possible, begin to frame a Plan B, considering the following while assessing your needs:

- Size of your team
- Equipment you will need
- Hours you will be working
- Safety and security of the area for team and tools
- Whether a practice field/area will fit

Ask your sponsoring companies and school(s) if there is suitable space available. If not, consider surveying the town for businesses with unused space; they may be willing to donate or rent it at a cheap rate. Once you find a workspace, develop an MOU with the facility to ensure a clear understanding of its use, scheduling, etc. If all else fails, some teams build their robot in a mentor's garage!

Obtain Primary Equipment

Technical Requirements: It is necessary to have the following for participation in the FRC program:

- A computer
- Internet and e-mail access
- A printer

Recommended Tools: To get started, your team will need a toolbox and at least the following tools or easy access to them:

Hand tools:

- ☐ Screwdrivers
- ☐ Allen keys
- ☐ Wrenches
- ☐ Socket set
- ☐ Hacksaw
- ☐ Pliers
- ☐ Calipers
- ☐ Tape measure
- ☐ Clamps
- ☐ Files
- ☐ Wire Strippers
- ☐ Multimeter
- ☐ Soldering iron

Lathe

Hand power tools:

- ☐ Drills
- ☐ Jig Saw
- ☐ Dremel
- ☐ Machine Tools
- ☐ Drill press
- ☐ Bandsaw
- ☐ Mill

Inventory and Care for Equipment/Tools

Early on, find a secure place to store team tools, and establish a method for storing them. Make a list, note where each should be stored, and install a method of inventory/storage so mentors and team members learn to put clean tools back where they belong, once they are finished using each one. A sign-out sheet may work to keep track of frequently used tools.

Remind the team about lost time and the aggravation of searching for missing tools. This process will help instill team courtesy and teach important manufacturing discipline as well. If there are tools or equipment that need special care, such as sharpening or oiling, train and assign people to that task.

Research Parts/Training Information

Allowable Parts: The kits are usually quite similar from year to year, so before the season begins, take a look at last year's Kit of Parts (KOP) list on the web site for an idea of what it contains. This is a very large document that contains many good parts pictures, so it takes some time to load and print. Also look at the "Additional Material List" to see what other items were allowed for building *FIRST* robots.

Mentoring/Philosophy: The parts lists may also show what areas you may need to research the types of mentoring your team may want to pursue. The information will also help you become familiar with the general philosophy regarding the kit and allowed materials.

Spare Parts: It is important to have spare parts on hand so they are available to your team during the build season. An experienced, mentoring team can help you decide what parts are valuable to have on hand. Become familiar with the replacement parts policy of KOP items. During the season, check the "At the Events" section of the current Manual for the very short list of replacement kit parts that may be available at the competitions.

Training Resources: Check the web site for training resources that are available web workshops. They cover subjects such as programming, data acquisition, Autodesk tutorials, chassis construction, safety, non-profit information, videos and photography, brainstorming, diversifying, designing, and fundraising.

COACH FOR SUCCESS

Coaches give "Attaboys," mentors are about "Here's how to do it," and facilitators are big on "I showed you, now you teach someone else." Your team mentors will probably use all of these methods interchangeably within the FRC program. Each of those expressions is a simplification of the processes that work well for teams. Remember to read the "*FIRST* Mentoring Guide" for tips on paying the knowledge forward with facilitation, using communication as the key component for building necessary trust and respect.

Beware: The design and build season is short – just 6 weeks. As coach, do not *ever* accept procrastination, because the "we have plenty of time" statement is just not true with *FIRST*. The mentors will suffer most from stress when things come down to the wire. Keep your collective noses to the calendar, kids included, and watch those deadlines! Discuss the time commitment, meeting times, and dates up front with the team and parents. Let everyone know that at times, some of you may be meeting every day of the week.

Remember that the students have joined the team to have fun, not work with those with whom they have a history of conflicts. Choose your sub team membership wisely, and be careful not to stereotype team roles.

Personal Growth: Successful coaching will encourage independent thought, open communication, and help develop working roles within your team. Mentors and students will become united, with the kids learning mentoring skills through example and osmosis. They become empowered by the ability to contribute and teach, and they in turn lighten the mentors' loads.

"Group Ear" and Agreement: A good way to get your team to have the right attitude is to strive for team consensus about important issues. One of the best ways to achieve this is to promote the concept of listening both as individuals and as a group. If the group doesn't listen, how can everyone understand the problem under discussion? Provide every speaker the courtesy of the group ear; in other words, listen courteously without interruption. If the discussion drones on too long, as coach, you may need to facilitate agreement by stepping into some topics when team paralysis occurs.

Help is out there**:** It's important to develop a realistic action plan for the season through good planning, team input, well-rounded expertise, and continual bobbing-and-weaving problem solving along the way. If you know team members from another team, pick their brains for anything that might eliminate stumbling blocks and round out the learning curve for your team.

Be sure to specify, via TIMS, that you would like another team(s) to mentor yours. *FIRST* teams are famous for giving advice, materials, and labor, and one day your team may be able to return the favor. This is the bedrock concept and why the program works so well.

Useful Web Links: Check out the "Useful Web sites" links for additional help with building your robot, troubleshooting, fundraising, training, or information about planning to attend an event

Brainstorming

Encourage "outside of the box" thinking throughout the year. Brainstorming is a wonderful tool to get adult and students' brains creating and working overtime. Be sure that you set down rules before you begin and document each idea in the process. To brainstorm effectively, capture all ideas on paper or whiteboard first and allow in-depth discussion later.

Make sure everyone respects each idea. Allow people to disagree, but not judge the individual or let things get personal. It's important that everyone feels safe enough to throw out an idea no matter how *far* out, so try to work toward that comfort and confidence. Balance the session to include and encourage quiet team members to contribute while keeping others from monopolizing the time. Invite everyone to build on already suggested items, but don't re-open finished discussions unless all team members agree to do so.

Stress Levels

When your team is working long hours and deadlines are approaching like dark, static storms, keep the team's keel as even as possible. One way to do this is to make sure you provide deserved pats on the backs, even when things aren't going as planned. Keep your team's eye on the bright side. There always is one! Take a little time to celebrate the accomplishments thus far in the season. List things the team has learned and acknowledge improved work habits….anything to inject a positive, accomplished attitude.

Keep the kids focused on the task at hand and help them stay focused on the purpose and impending deadline. If you can make them laugh, good for you! Be a clown if you must, or get someone else to be silly when you are wound up tighter than an eight-day clock. It's a proven fact that laughter lessens stress, and we all know we think better when our brains aren't in vises. Do some stretches, run some laps….all the while smiling. Remind the team that it's not all about winning. Roll out the levity. So what if your robot's arm looks like a toilet seat! You all are doing great things here! If all else fails - snacks!

Attitudes and Tasks

Every team member, young or old, should understand and embrace the concept of pride. Some synonyms for the word are: happiness, honor, joy, pleasure, satisfaction, admiration, and self-confidence, all warm and fuzzy descriptors. The other concept we link with pride is commitment. Handshake, promise, warranty, and trust are words that describe the sentiments that come to mind when we think of well-oiled, committed *FIRST* teams.

Every person on your team should experience these confident feelings when they work on and complete a job. Go easy on the criticism and lavish honest praise for jobs well done. It's like sunshine to a garden or a bright campfire in a dark, damp cave. It works. We all need it.

Provide Job Descriptions

Be sure to describe each task to the appropriate parties and *be sure to ask if there is anyone who does not understand*. Once team members feel comfortable about admitting that they don't "get it," they will not be shy about making sure they know the ins and outs of every task. You will surely save time, wasted materials, and money if you make sure each is comfortable with the details and required level of expertise.

Give every job a description, a start and finish date, and a list of the designated people for that task. If the assignment is complex, provide written instructions, at least the main points, to help them accomplish the job.

Monitor Progress and Ask Questions

Check with the various team members or sub teams, as appropriate, to make sure everyone is focused on the purpose and deadline and that progress is adequate. Do it gently. Ask if anyone has questions or concerns. If someone seems stumped, a good tool is to ask questions that may provide a hint about an easier, quicker, better, or more correct way to do the job. For instance, if you saw someone raking leaves up a hill, you would ask what would make the job easier.

If someone produces a part incorrectly, ask simple questions such as "Did you measure twice?" or "Did you look at the drawing?" to lead him to a solution for the error. This method teaches more than just doing it for him or telling him what he did wrong.

Give suggestions if you see that they are veering off course too far. Remember, this project may be the first time some of these youngsters have used tools or been tasked with a duty. Try not to take over the project so they feel incompetent.

Manage Punch Lists

Each sub team should learn to maintain a "punch list," a "to-do" list of items requiring immediate attention. On this sheet, include deadline dates and the persons assigned to each task. Add a column for notes so the team can pencil in progress or problems and initial their notations. Use a highlighter to show when jobs are complete. It's a good way to indicate progress and provide incentive. Label

each list with the sub team's name and post them all together in a convenient spot so everyone can get a feel for critical items that may impact their particular task or their area of expertise.

Follow the Task Timeline

Refer to the Appendix for a generic timeline of the design and build season and beyond. This graph should help your team map out its own season and form sub teams with the correct overlap.

DRAFT A FINANCIAL PLAN

If you are a new team, develop a team mission statement and business plan, and decide what your team goals are for the first year. Once you have experience as a team, it becomes easier to plan ahead for a second and third year. Your goals will help determine the fundraising targets and recruitment of sponsoring partners.

Develop a budget for the team. It should include the registration cost, travel, robot and field construction items, publicity and sponsorship materials, and off-season event participation. The minimum budget for a team attending one local, Regional competition should be $10k or $11k. Refer to the sample budget in the Appendix for examples of some of the line-item costs.

Raise the Funds

Besides the registration and Kit of Parts (KOP) fee, this program requires money for additional parts and travel expenses. We recommend that you begin your fundraising efforts *well before* the extremely busy design and build season that starts in January. Start as early as you can, before the school year begins if possible. Use the following summer to get a step up on your subsequent season.

THINK BIG!! Ask for the full registration amount when you petition for funding, but be prepared to graciously accept any offer of help. Most teams survive on many small donations. If a company can't or won't donate money, be prepared to ask for services such as machining, mentoring, or meeting/facility space. Other in-kind donations could include tools, food, printing, copying, or T-shirts.

Visit the following web sites for information and fundraising ideas:

- www.fundraising-ideas.org
- www.fundraiserhelp.com
- www.stepbystepfundraising.com
- www.chiefdelphi.com, a popular, team-run web site, not officially *FIRST* sanctioned.

The Prospects

1. Look for companies that:
   - Produce innovative products and have a reputation for creativity.
   - Have a high profile in your area related to engineering; architecture; computers, hardware or software; advertising; community involvement; industrial or medical suppliers; pharmaceuticals; patent/copyright offices; technical development; information technology; manufacturing, or youth-focused corporations. If none of the above, perhaps they would just like to support the FRC program.
   - Employ the parents of team members. Perhaps one or more of the parents can help make contact with the company through the Corporate Giving Department.
2. Talk to your principal, and find out if the school already has partnerships with local businesses. One of them might be interested in helping you start a team.
3. Find out who the largest employers in your area are by calling your state representative's office for information. Web engines having custom sorting capabilities, such as *Hoovers.com* and *Yahoo.com*, may provide leads about technical companies in your area. Many of these local companies may be interested because they have a stake in your community.
4. Contact the city or county Chamber of Commerce and ask for the names of companies that might be interested in partnering with schools on a project that will help them develop a pool of future employees qualified in science and technical fields.
5. Research association web sites, especially those involved with engineering.
6. Submit an article to a local newspaper about your team and indicate the need for funding.

7. Check out the www.usfirst.org web site for information about the setting your team up as a non-profit organization. One of our *FIRST* Teams has posted helpful information and links dealing with the requirements, qualifications, costs, and benefits.

The Approach

Approach potential sponsors by showing "what's in it for them." They will be interested in the positive publicity team sponsorship will provide and the long-term appreciation of the future student workforce on the team. Don't limit your search to just big companies.

Many smaller companies and individuals make great *FIRST* sponsors/partners. For instance, ask a sign company to donate a banner that lists your team's sponsors…and include their name on it. Mention that their banner will travel with your team to your event(s) and that you will proudly display it in your Pit station.

If you don't feel comfortable in this role, find someone else on your team who may have other contacts or more authority to make a presentation and subsequent agreement. The school principal or the science, math, or physics department head might be a good representative. If you already have corporate support, a well-informed representative from Manufacturing, Operations, IT, or other technical discipline would be excellent. Be sure to stress that the team members will comprise a future, team-oriented workforce for the potential sponsor.

The Preparation

Before you talk to a potential partner, aka donor, sponsor, prospect, make sure you know who the best contact person is at that particular business or corporation. Very often it is best to try for senior management, such as the head of Engineering or Human Resources. You might want to talk with a non-technical person who is familiar with what the company would like to accomplish in the community relations area. This person may be able to get the initial legwork done.

With dates and times in mind, be prepared to ask for and set up a face-to-face meeting. Know what you are talking about when you call or visit, and smile when you talk. Understand what *FIRST* is about, and be sure you can articulate it to another person. Be brief, but describe your team's makeup as to the number of kids and age bracket, team goals, and awards won or those for which the team plans to submit. Show enthusiasm!

Provide information on your total budget and the amount you have already raised through fundraising and/or other sponsors. You might also bring your own PowerPoint presentation about your team's plans for using the potential sponsor's donation. Whenever possible, bring the students to do some of the talking and convincing. Bright, enthusiastic young people are hard to resist!

In your presentation or letter, include some of the donation benefits to the potential partner:

- Grows their company's visibility in the community
- Presents networking and marketing opportunities with other sponsors
- Provides a pool for internships and future employees
- Re-energizes and renews the team-involved engineers' love for back-to-basics engineering

The Close

Don't forget to come right out and ask for the money. Ask high; they may be willing. *If there is silence after your request, don't talk at all.* Wait until the prospect responds, even if the silence is uncomfortable. Or, ask for a specific amount for a specific line item. If none of these works, try a compromise. Ask direct questions to identify objections and listen to what they are *NOT* saying.

If the meeting goes well:

- Thank the donor.
- Tell him/her when you will need the money or promised support.
- Ask if there are technical or non-technical employees who might be willing to mentor the team.

- Ask if she/he knows any others who may be interested in helping in some way.
- Mention that you will follow up with a request for a digital image of their logo for use on the team's uniform and robot.

The Follow Up

Whether or not the prospective partner agreed to help the team, be sure to follow up with a thank you letter within a week. If you asked for financial support, include a couple of the information sheets such as *Vision and Theory*, *Impact*, or the *Tri-fold Brochure* from the usfirst.org web site; a team brochure if you have one; reiterate your budget needs, and a sentence or two on how their support will positively impact the future workforce of the area. Thank the prospect for the meeting.

A Yes: If there was a promise of funding, machining, or mentoring support, send a letter of thanks and put down the details of what you understand is the agreement or what you hope the partner will provide as support. Perhaps the most important thing to mention is what the direct impact of the donation will do for your team. Remember to send an e-mail requesting an electronic copy of the company's logo.

For engineering or technical promise of support, include a list of your needs, the above-mentioned printouts, and a sample teamwork schedule. Provide a synopsis of how you will use their support as well as your team's approach to the design and build phase. Is yours a student-build team with curricula in place to support this method? Do you expect the mentors to do most of the work and have the students observe and learn that way? Will the students have a role in managing aspects of the project?

No Commitment: If you send the letter and there still is no commitment, but you saw a glimmering of interest, have someone with persuasive writing skills keep the "prospects" abreast by sending a note about the team's progress during the build phase. Include a picture or two. Generate curiosity. Invite them to an event to see your team compete – It's free!

When the season is over, send a team and robot picture from an event and nail down some of the experiences, accomplishments, and excitement of the team. If there were newspaper articles, send copies. Try them again early during the next season. Be sure to let them know where and when they can see the team demonstrate or compete. *This works. Read this paragraph again!*

Research Grant Opportunities

A September/October activity: Check the web site area pertaining to grants. Grants are a good way for teams, especially rookies, to get a leg up on funding. They are usually offered right around registration time.

The NASA grant information will be linked from the usfirst.org web site. The NASA Regional grants have the requirement of participation in a NASA-sponsored event, so you will want to find out which events they are. To get a head start on the application process, read about the prior year's criteria/requested information. Although it is only a reference, it will provide a starting point.

Read about the various grants and their criteria, get started right away when the application is available, and comply with the stipulated deadline date.

ESTABLISH SAFETY STANDARDS

One of the first things a team should do is get *everyone* to think about safety in the "workplace," during team travel, and at the events. Bring up the topic at your first meeting and mention that each person will be responsible for team safety as well as his/her own. Stress safety at each meeting!

Safety Captain(s)

The Safety Captain will be a valuable member of your team. Refer to the bulleted items in the sections below for specific team safety education items and concerns. With a mentor presiding, have the students meet to establish safety rules and plans to enforce them. Talk with them about how to prevent bumping into sharp edges and objects, what causes accidents between man and machines, and the importance of keeping the workplace clean and free from things to trip over. If the kids embrace the guidelines as their own ideas, they will be much more likely to follow them.

The Safety Captain would be in charge of identifying safety hazards and implementing corrections with the coaches' help. This may be a good role for a responsible, interested student. He or she could work with a committee to make and post signs about team safety. Consider having the team vote for the Safety Captain position rather than having it an appointed position. You might also consider a person new to the technical area.

At each team's initial competition event of the season and the Championship, there will be a Safety Captain badge in the registration packet. Consider having more than one captain and having them alternate being "on watch."

Safety Concerns

Most of the following points are from a PowerPoint presentation one of our teams produced. It is on our web site also. Use these as a starting point for your safety discussions.

- Mandatory, non-shaded safety glasses that meet ANSI Z87 standards
- Open-toed shoes are not allowed at events
- Stored energy hazards - electrical, mechanical, and pneumatic: Springs, chains, and gears; batteries; pneumatic cylinders and lines, extended "arms," bound joints, and lifted weights. Release stored energy before you power down; return it to its "home" position, and power off the equipment.
- Hazards of the autonomous mode
- Harmful dust/fumes and protective masks or respirators
- Chemicals and exposure
- Electrical hazards
- Welding and brazing - appropriate eye and hand protection
- Pinching and crushing
- Trips and falls prevention
- Protective equipment
- Loose clothing, long hair or jewelry, and moving parts
- Proper lifting technique

Some teams come up with a system for monitoring team safety and use a checklist to document both good work habits of team members as well as their safety blunders. Bring this information to the competitions. Judges are extremely interested in safe habits and safety education.

Team Safety Education

One of the really important aspects of the program and the events is safety. It's so important for your team to be conscious of work habits in your own environment and at the events. Take the time to explain what the events will be like so everyone knows what to expect.

You will find that they are booming with team spirit and noise. There is music, many announcements, robot inspectors, referees, judges, loads of dedicated volunteers, and a spirited MC--usually a wild and crazy guy who adds a lot to the fun and crowd enthusiasm. You will also find that there is a real push to ensure that teams and guests are safe.

- Appoint a Safety Captain who will be responsible for:
  - Starting an actual safety program
    - Keeping a log of safety training attendees
    - Keeping a log of improvements, such as numbers of team members using non-shaded, ANSI-approved Z87 safety glasses, gloves, as well as safe lifting, drilling, and machining practices at each work session.
  - Showing the UL safety training DVD (In the KOP) and discussing it with the team. FIRST recommends that teams do this soon after Kickoff. It wouldn't hurt to show it twice, especially before the events.
  - Training the team about safety at the workplace and at the events
- Create and include a "Best Practices" safety document within your safety program.
- Invest in having one or more Mentor certified in First Aid since proper First Aid is critical for machine shop accidents. Local training is usually readily available.
- Provide hands-on training for power tool operation, being sure to include instruction on any associated safeguards and their functions. Do not override safeguards.
- Establish and discuss procedures for reporting an accident or safety violation to the mentors. Discuss items such as chemicals and impact or penetration injuries and ways to treat them.
- As part of your safety documentation, set down workplace safety expectations for your team, and admonish poor examples and praise the good. Adults set the example. Remind team members that over-familiarity with the robot or various tools can lead to a lax approach to safety.
- Set team travel and safety rules in writing and distribute them. Use the buddy system and provide contact phone and room numbers while at events.
- Download and read the "Team Safety Manual" and go over it with everyone before the season begins and then again before you leave for an event. Team mentors set the pattern for the team, so be sure to personally practice and instill safety awareness during all aspects of team activities.
- Familiarize the team members with the Safety Awareness and Recognition program and get them excited about earning safety tokens at the competitions. Review the restrictions in "Site Info" for your event. NOTE: You must supply and bring safety glasses for each attending person. The glasses must have the Z87 imprint to show that they meet the American National Standards Institute's requirements.
- Refer to the FRC Manual for information and rules regarding the Pit, queue line, practice field, and competition field. Before you make plans for your pit station, learn about its size, use, and height restrictions.

Buddy System

Begin the buddy system as soon as you begin meeting, and ensure that the students have at least one partner at your work location, while traveling, and at the events. If an accident or problem occurs, there is help right at hand; and it's less scary to be lost with someone else. When traveling to events, make sure the students also have the mentors' contact information and room numbers.

Safety Equipment and Best Practices

Ear Plugs: To prevent hearing loss, keep earplugs or noise inhibiting ear protection on hand when you use or are near loud equipment or machinery.

Fire Extinguisher: Be sure to have a fire extinguisher at your workplace, and make sure everyone knows how to use it and where it is stored.

First Aid Kit: Maintain a first aid kit that meets the ANSI standard for the number of people in the team's workshop. Tell all team members where it is and make sure someone, such as the Safety Captain, is in charge of replacing items as necessary. Bring it to your events.

Safety Glasses: Right from the get-go, buy ANSI Z87-approved safety glasses for all team members. *FIRST* Robotics has strict requirements for safety glasses/goggles use in the Pit and on or within 5 feet of the playing field. **Approved glasses have "ANSI Z87" imprinted somewhere on the frame.** It's best to get the team to work responsibly right away -- at all times. Each must consider safety glasses as required equipment because ***they are a must at FIRST competitions.***

Make sure each person:

- Labels the frame with name and team number, and has a specific place to store them. Do not mark the lens.
- Wears them at all times when working on the robot or when in the vicinity of someone working on the robot.
- Is especially careful when near grinding or machining.
- Wears ANSI Z87 approved safety eyewear, which requires side shields on the glasses. Using regular glasses with attached side shields does not meet the standard because they offer almost no impact resistance. Robot parts can be like flying missiles
- Wears safety goggles over corrective eyeglasses if they are not marked ANSI Z87.

Gloves: Most team injuries at and prior to events are cuts and pinches. Gloves can be cumbersome at times, but can obviously preserve fingers. Have some on hand at your workplace and at events as part of your safety program. Teach the team why and when they should use them.

Robot Cart: Build a device to transport your robot easily and safely from the Pit to the competition field and back. It must be small enough to fit through a 30" doorway and tall enough to make robot removal and placement on the field safe, easy, and comfortable.

Your cart can be really simple, or you can build it to take on your team's theme. Do not incorporate music on board since additional music is not permitted at *FIRST* events.

Safe Lifting: Teach your team proper lifting techniques. The robot operators should be able to safely lift the robot off and onto the rolling cart quickly on the playing field, and should practice the routine.

RESEARCH AVAILABLE SCHOLARSHIPS

Eight million dollars worth of scholarship offerings are available to participating students in the FRC program! It is important that students know about these opportunities and take advantage of them. Designate someone at school or on the team to research them on the web site and reveal them to the team members and their parents.

Start Early

Consider reviewing the scholarship listings for the previous year during the fall, before the Kickoff, to offer students the ability to get a head start on the application process and required information submission. Once robot construction begins, it is difficult to get students to "start" the scholarship application. Mentors may also be too busy to write the often-required recommendation letter. If most of the requirements and questions are already thought out and in the draft stage, it is far more likely that students will get the current year application completed on time.

Timing is critical.

Most of the scholarships are awarded during the senior year, but some are given during the students' junior year. The application deadlines vary, but most are in February or March. The awards differ, and most of the schools require that students apply and receive acceptance to their school before they can submit a scholarship application. Many of the schools will absorb the application fee. Most scholarships go to students pursuing a scientific or technical degree, but there are some for more general studies also.

Don't let this opportunity slip by!

FRAME OUT THE SEASON

The easier you make it for your volunteers and sub teams, the smoother things will go. Emphasize clear and consistent communication. As with most team activities, adhering to a published schedule may be a problem, so make sure everyone understands that things change and emphasize the need for flexibility and cooperation.

Season at a Glance

Fall – Set the Foundation.

Recruit mentors, students, sponsor partners
Register for events
Apply for grants
Fundraise
Train your team
Stress safety
Form sub teams
Attend an off-season event - students/mentors/partners
Research scholarships

Winter – Hit the ground running!

Attend a Kickoff
Brainstorm
Build a robot
Ship your robot
Make travel arrangements
Submit for awards
Apply for scholarships
Collect "Consent and Release" forms
Compete in events

Spring – Celebrate Successes

Recognize your sponsor/partners
Recognize your mentors, parents, teachers, students
Alert local media of your successful season
Participate in the Team Forum. Provide feedback.

Summer – Maintain Momentum

Attend/participate in off-season events
Fundraise
Have workshops and training
Create community visibility opportunities:

- Exhibits
- Demonstrations
- Presentations to sponsor/partners

Consent and Release Forms

Have mentors and team members fill out the mandatory "Consent and Release Forms." Bring them to your initial competition event's registration. Use only the web-posted version for the current year.

If these forms are required for the Kickoff your team attends, you must also provide them for the Kickoff as well as original copies for your initial competition event.

Scheduling

Timeline: Before the design and build rush and crush season begins in January, you will want to establish a timeline for your team and various sub teams. You may want to use project-managing software for this purpose, calendar pages, or something as simple as a check-off list showing responsible individuals and dates. Be sure to note dates where your school may have testing or conflicts with other events.

Meetings: Establish and publish a team work/meeting schedule including an update and notification process. Make sure to include everyone on your notification list, or provide information to sub teams and instruct them to disseminate appropriately. The sub teams in turn should include you on their notification lists so you are abreast of the activities and progress.

Remember to consider the parents when holding and scheduling your meetings. Start and end them on time. Parents can be your best volunteers, so keeping them waiting lessens their enthusiasm for the program. Their time is valuable too; don't step on their collective toes by extending team meetings or workshops. Be sure to plan for setup and cleanup when scheduling. Think about ways to include parents in the meetings and team activities. It's also important to include breaks as part of your work sessions to lessen tensions by sharing a few laughs, ideas, and accomplishments.

Team Fuel: Long meetings and workdays will go a lot better if someone provides meals or snacks for the team. Plan way ahead and ask a parent to lead this "fuel" team. It's an excellent way to involve parents and reassure them that the kids will be fed. Of course these volunteers will need to know where the team will be meeting and when, so have one of your mentors create a schedule and provide that information as needed. The sub team leader will need volunteer names, suggested food types, e-mail addresses, and phone numbers.

FIRST Web Calendar: Keep and eye on the web site calendar for FRC. Once the season begins, *FIRST* continually updates and adds items and dates to the "Calendar of Important Deadlines" once they are established. Take a look at last year's calendar if the current season hasn't been posted yet. It will give you an idea of about what and when things are due.

The Kickoff

This is a really great event that unveils the game for the year and marks the beginning of the design and build season. Whether it's the big NASA-televised event in New Hampshire or one of the numerous "local" Kickoffs, you should attend! It's just plain fun to get together with other teams, both rookie and veteran, to compare notes, get ideas, make friends, and generally get geared up for the exciting year ahead. Some events also include workshops for team representatives. Don't miss the opportunity to be there!

TIMS Signup and Varying Site Options: Be sure to register for a Kickoff(s) in the TIMS by the deadline. You will be able to link to the web site to find nearby locations, event activities, workshops, and attendance restrictions. Teams can attend more than one Kickoff, so if possible, register for and send some team members to a site having workshops.

Receiving the Kit of Parts Options: NOTE: The KOP is expensive to ship and cannot be brought on a commercial airline, so you should make every effort to attend a nearby Kickoff.

1. *Free FedEx shipment* - If *FIRST* and its FRC teams continue to enjoy the exceptional, generous support and donation from FedEx Express Freight Service, you will be able to pick up your KOP at a Kickoff without a shipping charge. FedEx ships pallets of KOPs to the local Kickoffs for team pickup. By the deadline, each team must designate its Kickoff pickup location via the TIMS. Each team must designate one of its adult team members to pick up and sign for its kit at the team-designated Kickoff. The KOP shipment is heavy and comprises 2 large totes and several boxes, but it fits in most car trunks.
2. *Team pays for shipment* - If you don't inform *FIRST* of your Kickoff choice, or if you do not want to or cannot attend a Kickoff, the team must pay for the KOP shipment. The team must provide an account number for FedEx, UPS, or Purolator shipping company in the TIMS by the designated deadline in December. The KOP will ship the early part of the week following the Kickoff. The KOP shipment is heavy and comprises 2 large totes and several boxes, so the shipment will be costly.

Kickoff Registration and KOP Receipt: Each team must sign in at the Kickoff event. If the team indicated in the TIMS that it will take advantage of the free Kit of Parts (KOP) shipment to the Kickoff, the registration volunteers will have the team's pre-printed KOP Receipt. The team's adult team representative will pick up this sheet listing the KOP items. He or she will then go to the kit pickup area, collect the KOP items, check each box on the form upon receipt of the designated items, and sign it.

This sheet then represents the teams "Kit of Parts Receipt. All KOP receipts will be collected at the Kickoffs for the auditing process. *FIRST* must have a signed receipt for each team attending a Kickoff.

KOP Inventory Deadline: You will receive a list of the items in the KOP and you will be able to compare your kit items to the pictures and the list. Teams have four days to inventory their parts and report any missing items, via the TIMS, before the deadline, *midnight Wednesday following the Kickoff*. For auditing purposes, *FIRST* catalogs teams' KOP receipts and maintains the teams' replacement parts lists from year to year.

The Game

As soon as the game is revealed at the Kickoff, you will want to get your team going on becoming familiar what the game is all about. Have everyone read the game description several times and have a meeting as soon as possible to discuss the objectives and scoring. Some teams begin discussing the game as soon as they arrive home from the Kickoff.

Brainstorm to see what your team thinks would be some good strategies for your robot. Get all the ideas out there on paper, no matter how "out there" or farfetched they sound. Once your team has some reasonable strategy ideas in mind, get your sub teams going on the autonomous and visioning modes of the game as well as designing the devices necessary to scoop, shoot, or scatter; place, pile, pillage, horde, or hang the game pieces where they work to earn you the best score.

Read the queries and answers on the web site Q & A forum to clarify any rules questions you might have. If you don't see the answer and you have read the appropriate Manual sections, post the question. You must refer to the Manual section needing clarification. Watch for the official answer in a day or two. It is possible that your question, while unique to you, will have an answer that refers you to the answer for a previously asked question. This method helps maintain that all questions relating to the same concept will be answered the same way, rather than multiply re-phrased.

A critical team exercise is to constantly monitor the "Team Updates" and all *FIRST* e-mail blasts for game updates or clarifications. File them in a consistent manner so you will be able to refer to them easily and quickly.

Drive Team

Form a robot drive team with backups and make sure they are ready to compete. Practice time should include both groups in case of illness or "stage" fright. Most teams use 2 joysticks to run their robot, so the operators must be able to communicate with each other using a minimum of words. The field coach can be a student or adult and cannot score for the team. He/she must be calm, not a shouter, and shouldn't talk with his/her hands. The drivers can't see hands. This person relays referee information and assists the team in predetermined strategies or makes changes if necessary.

Scouting and Alliance Pairing

Thorough scouting and choosing alliances are a part of the process at the events. Teams usually have team members monitor other teams at the competition events. These "scouts" look for talents and mechanisms that work well with or augment their own team's robot abilities - or not. If your team doesn't have a mechanism that scores well, or your robot doesn't do well in the autonomous mode, know which ones do. This is especially useful for knowing opponent capabilities and choosing complementary alliance partners should your team make it into the final rounds.

There is only a short time before the pairing process for a review of your scouting list. Prior to the event, create a table/worksheet that will help track other participating teams' strengths and weaknesses. Include likeness of the field so scouts can remember/describe what the robots do. The person you choose to be your team's alliance captain for the alliance-pairing process should have this record or a similar sheet with him during the pairing. It should have the team numbers clearly visible so he or she can check off those teams already chosen and no longer available as partners.

The Competition Tournaments

The following sections attempt to give a short description of the FRC competitions where robotics teams compete with machines they have built and programmed in both autonomous and driver-operated modes.

The Excitement

These tournaments may well be the most exciting and rewarding competitions you will ever be a part of or witness. The teams are extraordinary and their accomplishments staggering. Just being there is like no other reality show. The kids are exceptionally talented. Their robots are uniquely marvelous, technologically varied, wonderful, super automatons; and the matches are bang-up, colorful, noisy,

spine-tingly, hair-raising climaxes to the teams' season of personal stretches and strivings! And they are oh so much fun. *You need to be there with the future!*

The Overview

The official competitions are either Regional Tournaments or the Championship. Sample agendas in the "At the Events" section of the Manual provide a scheduling overview for both event types. Event times may vary.

All competitions have a Pit where teams work on and repair their machines in their pre-numbered team pit stations. A *Pit Map* will show teams the pit stations and a specific competition queue line to the playing fields. A group of queue volunteers guides teams to the correct field and competition station. There is also a specified travel path for return to the Pit.

The on-site event Registration provides a team packet, which includes a *Practice Schedule* for actual pre-match field experience. Teams may take part in practice matches prior to their robot passing inspection, but it's a "pass-to-compete" for the actual competition.

Games, field setups, rules, and goals are different from year to year; however, the actual matches are usually about 2 ½ minutes long. The field size may also vary year to year, but usually measures about 55 feet by 25 feet. It is boundaried by a short, gated guardrail on the long sides with an alliance station wall at either end of the field. Drawings and specs are available each year.

The players bring their controls to compete within their protected competition station, diamond plate for the lower portion and a transparent, acrylic view area for waist-high and above. LEDs show the competitors' team numbers above each station.

The Players

Generally, there are four people from each team permitted in the queue line and on the playing field. The person acting as the "on-the-field" coach can be a student or an adult, but he or she is not allowed to score. Typically, the game specifies that each team must also have two robot operators and a human player who score for the team. They must be of pre-college age/status. To gain access to the field, these four must bring and wear their mandated ANSI Z87-approved safety glasses. They must also wear the required, team-specific operator badges provided at registration.

Usually, two or three teams play together against two or three other teams, forming competing alliances. The next match may have a team competing against one of their former alliance teams.

Event Support

The Pit Administration Station is the hub for registration and information. If you need help, that's where to go. All events also have a nurse or EMT available for illness or injury, and if you have shipping questions, there will be a representative to help.

Judges

These volunteers watch the competitions and talk with teams to evaluate performances and sportsmanship, attention to safety, and knowledge about their robot's construction and operation. Judges confer and decide which teams have earned which awards and present trophies to the winners during the Awards Ceremonies.

Spokespersons

Consider having a few students groomed and ready to lead the group when talking with judges or Pit guests. These team representatives should be familiar with and be able to speak about the team and its members, its robot and its processes, as well as team-encountered problems/solutions of the season. The must also be able to speak above the loud Pit noises.

The Regionals

These competitions are usually held in geographic areas with large numbers of registered teams, and the program is growing so rapidly that we are expanding to include some international events. Many of our veteran and some rookie teams compete in two or three Regionals. We organize the events with consistency in mind; so all events must meet standard requirements.

In order to adhere to the published schedules, the number of matches is adjusted to accommodate the number of teams. If the event is a small one, there will probably be more competition matches. Some events include an optional team social and some do not.

The Championship

The Championship is a huge version of the FRC Regional events and includes FLL, JFLL, and FVC competitions/demonstrations. Picture your team under the lights in a huge athletic dome. Cheering onlookers with the now familiar, strangely colored and styled hair and far-out getups. It's like having four huge Regionals going on at the same time. So many teams compete that they are divided into four divisions. Final rounds culminate with winning alliances from each of the divisions competing sprocket-to-sensor for the Championship title.

In order to register and participate in the Championship, teams must meet the current, web site-published eligibility criteria and compete in at least one Regional during that competition season. *FIRST* tries very hard to make the Championship available to all teams.

Teams can qualify for the opportunity to register for this event by meeting eligibility criteria during the prior or current year. The tier system, which is dependent on the amount of time since a team's previous Championship attendance, is another way to become eligible for Championship registration. Rookie teams have to earn their way to the Championship by winning the Rookie All-Star or one of the other specified awards. Many do just that!

Besides FRC, the Championship welcomes and spotlights the *FIRST* LEGO League (FLL) exceptional International and U.S. teams at the a wonderfully diverse World Festival competition on Thursday and Friday. Children ages nine to fourteen proudly show their presentation and programming skills.

REGISTER YOUR TEAM

The “Pre-registration” stage of registration encourages teams to become familiar with the TIMS by inputting basic information prior to the actual event registration. This phase must be complete before a team can actually register for an event. There are “Help” screens associated with this progressive process. We suggest you download some of the more involved ones.

The Process

This on-line process, via the usfirst.org web site, usually begins mid September with official event registration beginning near the end of September and ending early December. Before starting the TIMS on-line process, gather the contact information for those persons you wish to have as Main, Alternate, and Shipping Contacts. Use the worksheets for this data collection. Find them on the TIMS registration front page by clicking where it says, “Click here for a description of the registration process.”

Be sure to allow plenty of time for this process….at least an hour. Input the required work and home addresses, e-mail addresses, and phone numbers as well as additional contact information about the team and its partners by the deadline. (*These persons must be post high-school-aged adults).* The school(s) and sponsors are considered partners.

Notes about the TIMS:

1. The Main and Alternate Contacts will each receive a unique password. Using e-mail address and that password, each will be able to enter the TIMS to add or update information about the team or contacts. These persons do not necessarily have to be the hands-on mentors, but should be dedicated to making sure they distribute, as appropriate, whatever important e-mails *FIRST* sends to the team.
2. It is very important that the e-mail addresses for those team contacts are not restricted by a firewall that filters messages from usfirst.org and allows attachments of up to 2 MB.
3. During the process, use the keys that will save your work, such as “OK” and “Finished.” Use the “Back to Team Summary Page” or the “Log Out” areas at the top of the page when they apply. Your information will ***not*** save if you use the system back arrow key □.

Rookie Team or Not?

- Rookie - If your school has never been involved as a *FIRST* team or has not been involved during the past three years, you will be considered a rookie team.
- Not - *Past Involvement:* If your school has been involved within the past three years of the present registration, your team cannot be considered a rookie team and must register under the existing team number for your team. Contact *FIRST* via frcteams@usfirst.org if you have forgotten the number, password, or logon.
- Not - *Team Split / Expansion:* If your school was a part of a team and is splitting to form a new one, your team cannot be considered a rookie team. Contact *FIRST* via frcteams@usfirst.org, explain the situation, and you will receive registration instructions. Your second team will receive an unused team number associated with the timeframe/year your school became involved as a team.

Team Number: Upon completion of the whole process, which includes online event registration, you will receive a four-digit, permanent team number that will remain constant and linked to your team through the years.

Event Registration: Registering for events is a staggered process. There are deadlines for choosing a first event, second event, the Championship, and an unrestricted time to choose additional Regionals. These choices are open from the end of September to the beginning of December. For specific dates, refer to the “Calendar of Important Deadlines” on the web.

Event Choices

Have someone do some fact finding before approaching your team with Regional event location choices. Keep the following in mind:

- **Research Grants:** If you want to apply for a NASA grant, determine which are this year's NASA-sponsored events by clicking the web link in the grant area.
- **Find the cheapest travel:** Take the time to check on hiring a bus if the event is fairly local, and compare train and plane fares if not. Ask the airlines if they give group rates and carefully check the stipulations. Consider having the team stay Saturday night in case event runs long. Compare the hotel cost versus the airfare you save by staying over the Saturday. It may be a wash.
- **Establish Arrival and Checkout Times:** Check the sample agenda in the "At the Events" section of last year's Manual to find general starting/ending times. You will probably want to have at least a 3-person team, (at least 2 adults) arrive at the hotel Wednesday evening so they can arrive at the Pit early Thursday morning to uncrate the robot, register, set up the team pit station, and begin robot inspection. Conceivably, the rest of the team could arrive between 8:30 and 10:00 am when the Pit will be open to all others and practice rounds begin.
- **Hotel Reservations:** Once you have registered for your event(s), watch our web site for information regarding hotels in the event areas. *FIRST* contracts with a vendor to secure room blocks with reasonable rates for safe team lodging. Using this system, you will be able to register your team for a block of rooms via the web. Pay attention to the deadlines and remember that the accommodations will be on a first come, first served basis.

  NOTE: There is no shuttle service from hotels to the events, so the hotel should be close and safe enough to walk to the event, or you will need to arrange for transportation to and from the event.
- **Consecutive Weekend Events:** If you choose to participate in events that are on back-to-back weekends, be aware that there are "arrival at the drayage site" deadlines. We do not recommend that teams register for consecutive weekend events when they are located more than 1,000 miles apart.

  The complimentary shipping option will not work for these back-to-back shipments, and there are shipping regulations requiring robots to ship with the designated carrier to these events. *You cannot use your own shipper when shipping between events.* Shipping the robot to arrive on time to the second event will most likely be expensive because of the expedited method of the shipment.

  Back-to-back event shipping is not possible for teams going to international events, including Canada, because of potential problems with Customs and border crossings.
- **Shipping and Customs:** If you plan to compete internationally, check the shipping and Customs requirements well ahead of time, and be sure to comply.

CELEBRATE THE PROJECT

Your robot is well on its way. It's sturdy; it's strong; it's working, and it's safe. So is your team! If the FRC season's climax were a ship, you would smash a champagne bottle and watch and hear the effervescence pop and sparkle. You would cut a shiny red ribbon with huge, silvery scissors to celebrate a new bridge, tunnel, or building. Don't let this end-of-the-season time implode into an anticlimax. CELEBRATE your team -- It pops and sparkles, and it shines!

Flatter
Idolize
Rejoice
Sing praises
Toast!

Congratulations! Little did you know what your team would accomplish in so short a time or how much your team would be willing to give -- lots of sweat, late nights, and at times, elephant-sized tears.

What can you do to celebrate your team's high-spirited energy and accomplishments that are at least as long-term and meaningful than the tangible building or ship? You, the team mentors, parents, and volunteers have taught and guided these fresh, young minds through so many stages and mazes of learning, growth, and safety awareness. You all have experienced success, disappointments, and failures while they were learning to mentor the less experienced, maturing in the process.

You have not only become a working team, but a promise to the future. They will not forget the foundations you and the other volunteers have grounded in their tomorrows.

Prepare To Acknowledge Each Person

As the season progresses, make notes about accomplishments and growths of the individual team members. You may want to have a sub team working to create templates for awards presentations during the season. This would be a great job to assign to your team's graphics stars.

At the season's close, take some one-on-one time for each team member and tell each one how she or he contributed to the team. Remind them of the great ideas they had, the problems they solved, the way they supported teammates, the things they mastered during the season, and the growth you have seen. This is your most important job as a mentor, so take time and be thoughtful about what you say to each participant. If your team is a large one, ask the sub team leaders to gather information about their crews. This positive reinforcement is a great way to encourage the students and mentors to return for another competition.

Recognize Your Team Members

With your team, plan a celebration and invite family and friends to see what you all have accomplished. Ask your school to hold a special assembly or your sponsoring organization to hold a team social. Display the team's safety program documentation, demonstrate its robot, and showcase team mementos, journals, photos, and awards submissions.

Medallions

This might be a good time to present the bronze participation medallions you received at your initial event. If so, you may want to postpone the celebration if you need more than the allotted 25. You can order more beginning mid May.

Certificates

Some teams provide certificates to each team member, with special recognition of the contribution each person made during the season. You can mix and match using future professions, mastered skills, or special awards as below. Be creative when awarding them, and use the *FIRST* logo from the *FIRST* Robotics Competition Resource Center on the web to make them even more special. Put names on each, and be sure each student on your team receives one.

Make the certificate presentation part of a larger ceremony with your team. Take a picture of the group with their certificates. If your team is large, break the team into groups or sub teams and create special sheets for them, adding a short tagline for each person. Hold the ceremony as part of a celebration dinner or pizza party. Whatever you do, make it special!

Special Learned Skills: This kind of recognition helps kids understand how their newfound skills and talents translate to the professional world. Recognize a special skill of particular team members, such welding, programming, newspaper article production, or robot painting. If you add humor, make sure it doesn't hurt.

Future Professions: To help with the certificate project, ask the team to write down what each member contributed as an end-of-the-season teamwork exercise. Show the contributions other team members cited. You could also ask team members to vote on the future profession they think each team member may pursue, such as Most Likely to:

- Invent Something to Change the World
- Create a New Computer Program
- Run a High-Tech Company
- Be President of a Research Facility

Special Presentations: Ask the kids to review the positive values they have experienced as a result of participating in FRC. Choose one that each member best exemplifies. This is a great way for the kids to understand that their contributions to the team are greater than the tasks each one took on. One person might receive a Gracious Professionalism award, and another the Spirit of Safety.

Applaud Your Sponsors, Mentors, and Volunteers

Invite them all to your party. Be sure your team recognizes the contributions of mentors and volunteers at the end of the season. The team can present its sponsor representatives, coaches, and mentors with a framed team or robot photograph, a certificate, or a letter recognizing the special talents she or he shared.

The same goes for the partners/sponsors. This personal recognition will encourage their involvement next season. Recognize the portion of the season they enabled, such as buying tools or supplying machining, parts, or ANSI Z87-approved safety glasses. Let them know how you spent their donations. Giving a gift with the *FIRST* logo is a great way to remember volunteers, mentors, or sponsors. Visit the *FIRST* on-line store for clothing, awards, and other customized items.

Salute the Group

Begin or end the celebration by telling the group how their accomplishments as a team were special, innovative, or unique. Tell them what they did that changed you, or changed the way that you think about them. You may ask several mentors to help you. Sometimes it's difficult to say the words, but it's important that the whole team understands what coaching them has meant for you.

Recognizing the entire team, as well as praising each student individually in front of his teammates, will create a lasting memory of working with you and the FRC team. It will encourage them to return for the next season. If they are graduating, it may result in them returning as mentors.

Now pat yourself on the back. You have had a positive influence on the lives of these students and have helped expand their horizons. **Congratulations on a job well done.**

APPENDICES

Appendix A: Budget Samples

Sample Budget: One Local Regional Event

Cost	Items
$6000	Registration for a regional competition, includes kit of parts and *FIRST* team support
1500	Additional parts and shop materials
500	Practice field components:
200	Shipping crate (consider asking school construction class for materials)
100	Robot cart (could be flat dolly constructed from leftover wood)
1000	Travel costs: bus transport to Regional for 3 days
100	Publicity and sponsorship materials:
500	T-shirts & marketing materials
0	Robot shipment – Used FedEx donated shipments. (Refer to "Robot Transportation" section of the Manual)
500	Post-season events. Set aside money for participation. Besides being fun, they provide more experience for your team and possible press coverage.
Total: $10,400	

Budget Note:

This budget does not include any designation for food at meetings or events, nor is there an allocation for hotel stays.

Sample Budget for Two Regional Events

(Teams should budget at least $10,000 for a local event)

Two Competitions	Cost	Notes:
Local Regional ($8,300)		
First event registration	**6,000**	
Lodging for 3 nights	2,100	7 rooms: 14 students - $100/room/night
Team buttons/trinkets	200	
Robot ship – dropped off at drayage facility	0	
Second Regional ($8,920)		
Second event registration	**4,000**	
Travel	2,200	8 students at $275 each
Lodging	1,200	4 rooms, 3 nights - $100/room/night
Rental vehicle	1,320	
Team buttons/trinkets	200	
Robot – free FedEx	0	FedEx free between events and home
Materials ($1,190)		
Electronics	595	
Speed controllers	345	
Sensors	200	
Controls	50	Operator interface controls and connections
Construction ($1,615)		
Metal, etc.	250	
Sprockets, chains, bearings, etc.	500	
Wheels	140	
Polycarbonate	50	
Hardware	250	
Signs	50	
Playing field	300	
Shipping crate	75	
Miscellaneous ($1,239)		
FIRST LEGO League	264	Sponsorship of a middle school team.
Tools	300	
Web site	175	
Off-season event	500	
TOTAL EXPENSES	**$21,264**	

Important Team Finance/Budget Notes:

1. This budget has not allocated for food during meetings, practices, or at the events.
2. The team was able to drop off their robot at the first event's drayage facility, thus saving a shipment cost. The team used the FedEx free shipment for the second event and the return shipment home. Check the FRC Manual for specifics and stipulations.
3. The team received a school-funded grant and field trip payments for the two events, which together totaled about $6,500 in school support. The student body and booster club contributed over $1,800, and the balance came from fundraising and individual and sponsors' contributions.

Appendix B: Sample Schedule and Checklist

Sample Robot Competition Work and a Brief Event Schedule

APPROXIMATE WORK HOURS
Various sub teams: Monday through Friday 5pm to 9pm – Weekends 9am to 3pm

Kickoff Weekend:
Kickoff Meeting – Game and rules announced - Saturday
Team game and rules review - Saturday or Sunday
Team meeting to plan game strategy / form sub teams - Sunday

Week One: Formulate Design Ideas
Sub teams develop design ideas
Complete design ideas - Determine the ***"what to do"*** before the ***"how to do"*** aspects of the robot
Team meeting for sub teams to present design ideas

Week Two: Design / Integrate Systems and Components
Order Parts
Sub teams - Design systems and components
Complete system designs, component drawings, and parts list

Week Three: Fabricate / Procure Components
Fabricate components
Complete component fabrication and procurement

Week Four: Assemble Robot and Shipping Crate
Sub teams assemble robot
Complete robot
Build / check robot crate for sturdiness

Week Five: Develop and Test Robot
Test, refine, and develop robot
Complete testing and development
Start the Drive Team practice process

Week Six: Game Practice and Revisions
Drive team practices and team makes final robot/play revisions
Prepare robot for shipment

Week Seven:
Ship Robot by Deadline
Team meeting for review of:
- Robot design
- Competition sub teams' rules knowledge
- Competition needs
- Collect completed Consent & Release Forms for registration at initial competition
- Safety – Ensure enough ANSI Z87-approved safety glasses for team at competition
  - Travel safety, venue safety, buddy system, etc.
  - Provide contact information

Regional Competition:

Thursday	Registration, pit station setup, practice rounds, robot inspection, shipping documents
Friday	Opening Ceremony, Qualifying rounds, Awards Ceremony, Team Social if applicable.
Saturday	Opening Ceremony, Qualifying and final rounds. Ship robot from event home or to next event, Awards Ceremony, pick up participation medallions.

Championship:

Wed. Eve.	Three-person team to register and uncrate robot. (Optional, at least 2 adults)
Thursday	Registration cont., uncrate, pit station setup, inspection, and practice rounds
Friday	Qualifying rounds
Saturday	Qualifying and final rounds, ship robot from event, Awards Ceremony, *FIRST* Finale.

Team Checklist: Pre-Season Through Event Preparation

Starting a new team takes a lot of organization. The following is a suggested pre-season through design and build phase "to do" list for new and returning teams.

Before the Season Starts

- ☐ Consider linking up with a veteran team for pre-season activities
- ☐ Recruit your team: mentors, parents, and students.
- ☐ Find a meeting place and meet with site host.
- ☐ Determine how the team will cover its costs.
- ☐ Find sponsorship.
- ☐ Determine which computer the team will use for Autodesk.
- ☐ Set up a competition area.

Your Team and Organization

- ☐ Make your initial meeting a friendly meet and greet.
- ☐ Review FRC values and gracious professionalism.
- ☐ Learn as much as you can about FRC by familiarizing the team with usfirst.org web site.
- ☐ Decide how to organize your team.
- ☐ Create a meeting schedule.
- ☐ Create a team credo/contract.
- ☐ Host and Open House.

Success Tips for Learning and Mentoring

- ☐ Read the" ASME Guide to Starting a *FIRST* Team."
- ☐ Read the "*FIRST* Mentoring Guide."
- ☐ Check out the workshop resources on the *FIRST* Web site (usfirst.org).
- ☐ Use team meeting time for training sessions.
- ☐ Run team-building exercises.
- ☐ Learn and teach the basics of pneumatics, electrical, programming, mechanics, etc.
- ☐ Create a safety plan and monitor the program.

Team Logistics and Preparation

- ☐ Practice brainstorming
- ☐ Purchase supplies, tools, and 3-ring binders. Have someone maintain binders for *FIRST* documents, research, design ideas, and test data. This may prove valuable in future years.
- ☐ Print out last year's Manual sections to familiarize the team with the season.
- ☐ Go to an off-season event with your school principal, potential sponsors, and team members.
- ☐ Send a note to parents requesting team members' emergency and medical information.
- ☐ Schedule technical mentors or specialists if possible.
- ☐ Schedule weekly preparation times.
- ☐ Research travel options and hotel rates.
- ☐ Choose and register for your event(s) by the deadline(s).
- ☐ Build a practice robot.
- ☐ Install software on computer(s), adhering to the site license requirements.
- ☐ Design a team logo and work on your team T-shirt and/or trading button.

Pre-Kickoff Preparations

- Research the Kickoff location options through TIMS.
  - Are there workshops?
  - What else is offered?
- Choose a Kickoff(s) to attend and designate your choice by the deadline. Note that allowed attendance numbers vary.
- Choose and designate the method of receiving your KOP by the deadline.
- Make travel arrangements to Kickoff.
- Build the robot crate.

Kickoff – Game is Revealed

- Download the Manual sections.
- Inventory your KOP and report any inconsistencies through TIMS by the deadline.
- Learn the game and immediately begin game brainstorming.

Competition/Event Preparation

- Develop a competition strategy.
- Distribute and collect the *Consent and Release Forms* for each traveling team member.
- Begin work within your sub teams and prototype the robot.
- Test the robot.
- Re-design the robot as necessary.
- Designate pre-college team members as the drive team.
- Pre-inspect your robot, using the sample inspection sheet on the web site.

Robot Shipment

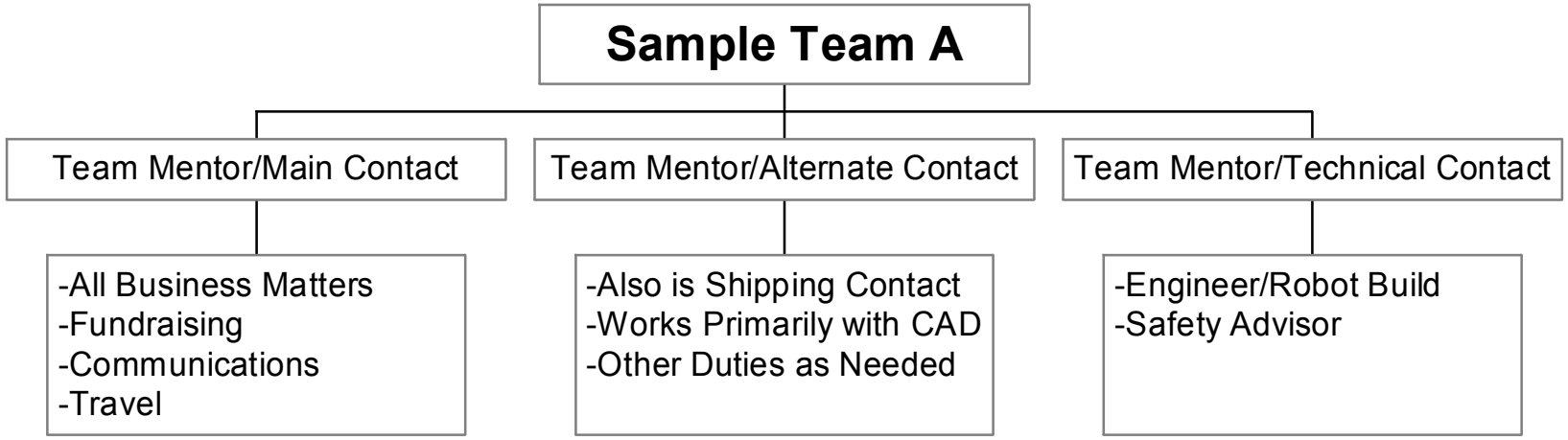
- In January, the Shipping Contact and a back-up person must familiarize themselves with the *Robot Transportation* section of the Manual. Pay particular attention to the donated FedEx shipment area.
- Choose your method for shipping the crate to the initial event drayage facility. There is a choice for the initial shipment, but any subsequent shipments are made through FedEx or the *FIRST* designated carrier.
- Ship your robot by the deadline.

Event Travel

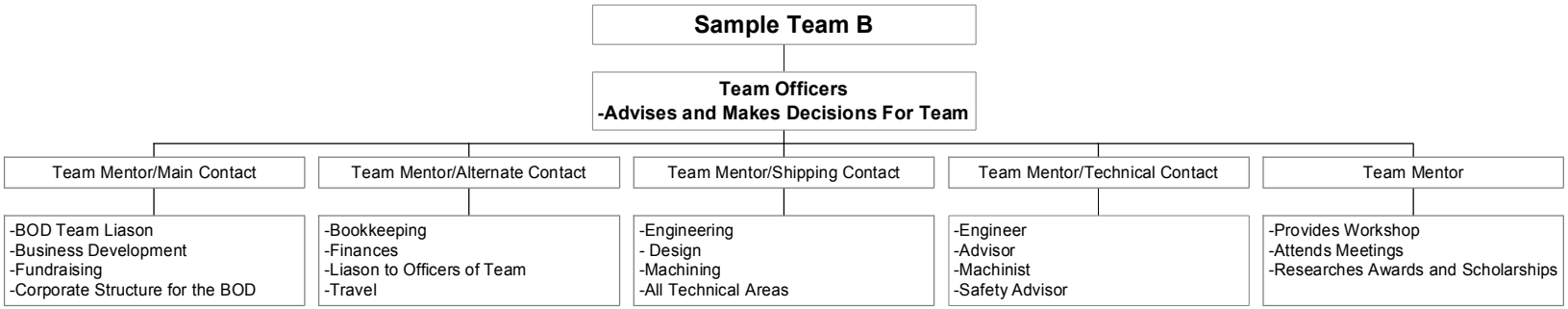
- Review your Team's Credo and the Gracious Professionalism tenets.
- Bring the Consent and Release Forms required for Registration.
- Review travel/ event safety procedures. Use the buddy system.
- Provide the team and parents with contact and hotel information.
- Bring ANSI Z87-approved safety glasses for each team member and team guests. Bring extras.

Appendix C: Sample Team Organization Charts

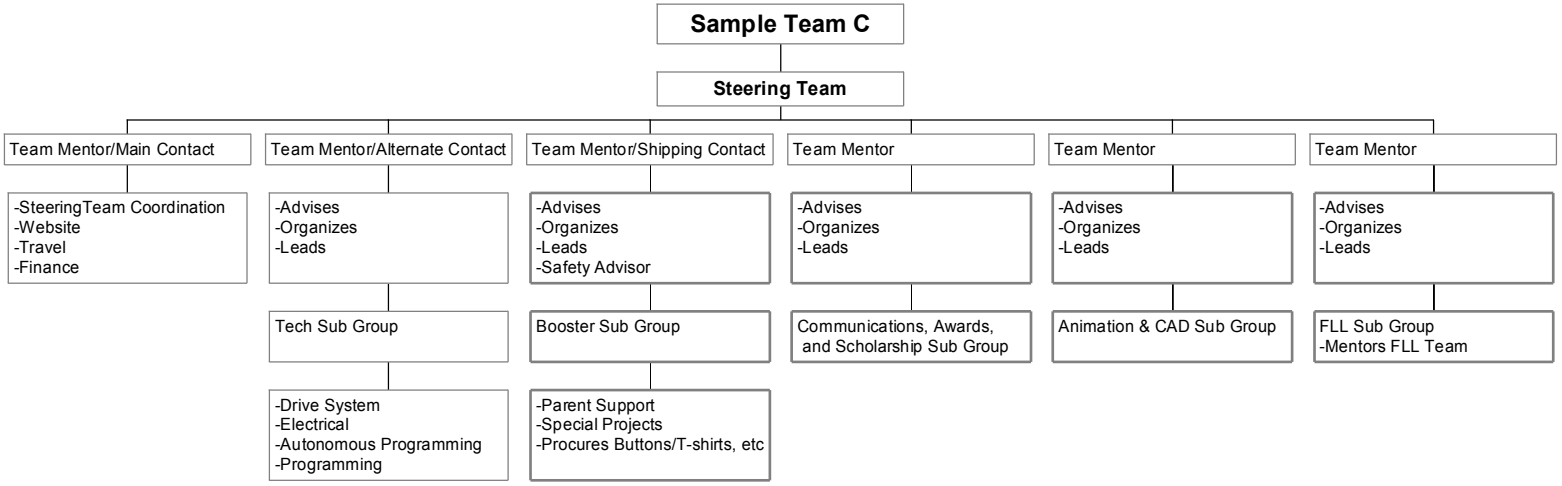
Team A



Team B


Sample Team B
Team Officers
-Advises and Makes Decisions For Team
Team Mentor/Main Contact
Team Mentor/Alternate Contact
Team Mentor/Shipping Contact
Team Mentor/Technical Contact
Team Mentor
-BOD Team Liason
-Business Development
-Fundraising
-Corporate Structure for the BOD
-Bookkeeping
-Finances
-Liason to Officers of Team
-Travel
-Engineering
- Design
-Machining
-All Technical Areas
-Engineer
-Advisor
-Machinist
-Safety Advisor
-Provides Workshop
-Attends Meetings
-Researches Awards and Scholarships

Team C


Sample Team C
Steering Team
Team Mentor/Main Contact
Team Mentor/Alternate Contact
Team Mentor/Shipping Contact
Team Mentor
Team Mentor
Team Mentor
-SteeringTeam Coordination
-Website
-Travel
-Finance
-Advises
-Organizes
-Leads
-Advises
-Organizes
-Leads
-Safety Advisor
-Advises
-Organizes
-Leads
-Advises
-Organizes
-Leads
-Advises
-Organizes
-Leads
Tech Sub Group
Booster Sub Group
Communications, Awards, and Scholarship Sub Group
Animation & CAD Sub Group
FLL Sub Group
-Mentors FLL Team
-Drive System
-Electrical
-Autonomous Programming
-Programming
-Parent Support
-Special Projects
-Procures Buttons/T-shirts, etc