

FIRST ROBOTICS COMPETITION (FRC) TEAM HANDBOOK



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Welcome

Thank you for your interest in starting or maintaining a FRC team. Your efforts will inspire students to explore careers in engineering, science, technology and result in some of the hardest fun you'll ever have.

FIRST Overview

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. *FIRST* is a 501 (c) (3) not-for-profit, public charity based in Manchester, N.H. *FIRST* is volunteer-driven and built on partnerships with individuals, businesses, educational institutions, and government. Some of the world's most respected companies provide funding, mentorship time, talent, and equipment to make *FIRST*'s mission a reality. As a Volunteer with a *FIRST* team, you are in good company.

Gracious Professionalism®

A large part of the success of many teams and *FIRST* itself is the somewhat unique emphasis and approach to teamwork. Dr. Woodie Flowers, *FIRST* National Advisor, coined the term "Gracious Professionalism®."

Gracious Professionalism is part of the ethos of *FIRST*. It's a way of doing things that encourages high-quality work, emphasizes the value of others, and respects individuals and the community.

With Gracious Professionalism, fierce competition and mutual gain are not separate notions. Gracious professionals learn and compete like crazy, but treat one another with respect and kindness in the process. They avoid treating anyone like losers. No chest thumping tough talk, but no sticky-sweet platitudes either. Knowledge, competition, and empathy are comfortably blended.

In the long run, Gracious Professionalism is part of pursuing a meaningful life. One can add to society and enjoy the satisfaction of knowing one has acted with integrity and sensitivity.

FRC

FIRST introduced the *FIRST* Robotics Competition (FRC) in 1992. Each year FRC unveils a new challenge at Kickoff in January. High school aged students work with professional Mentors to solve the engineering design problem in just six weeks, then work with other teams in alliances to play the game at competition events where they are judged on design, innovation, culture changing behavior and performance. The program is a life-changing, career-molding experience and it's a lot of fun.

Pre-Season

The time between Kickoff and competition is so action packed that few (if any) Mentors have time to spare. In order to succeed in your first year in FRC, start preparations well before the season begins.

Off Season or community event

Many mature teams hold demonstrations and participate in team sponsored events during the off season. Off Season events give teams time to practice their skills and try out new ideas. As a new mentor, attending an Off Season event will give you both an idea of what you're getting yourself into

and examples of how teams function. *FIRST* Regional Directors and Senior Mentors will know of Off Season events happening in your area. They can also connect you with other teams that may be willing to share their experience with you.

Recruit engineers and additional adults

Recruit as many adults as you can. The more variety they have in their backgrounds and skills the better. You will need technical Mentors for robot design and build. You will also want Mentors who are willing to take on programming, fundraising, travel arrangements, communication and a host of other aspects of the FRC program. Diversity in your Mentors (having a mix of genders, ages, ethnicities, experience and education) will strengthen your team and encourage participation by a variety of students.

Mentors will have to facilitate the workings of the team, deal open-mindedly with personality clashes within the group, and have the final say for the good of the whole. Communication and interpersonal management skills are important. Mentors should also be comfortable with letting the students 'do it themselves'. *FIRST* encourages the 'hands on' method of learning. We believe that the more each student is allowed to try, the more confidence and knowledge she/he gains from the FRC program. Make sure your Mentors enjoy working alongside high school age students and are comfortable with letting students take the lead at times.

Look beyond your immediate family and friends. Does the school you plan to partner with have science, technology, industrial arts or other staff who would be interested? Is there a college or university nearby that offers engineering courses? Ask both faculty and students if they'd like to participate. Some colleges and universities offer their students credit for participating in *FIRST* programs.

What are the major employers in your area? Many businesses recognize that engineers and technical staff that participate in *FIRST* programs return invigorated by the experience and excited by the contacts they made during the season. Recruiting Mentors from multiple locations will give you multiple contacts when the time comes.

As you recruit help, consider the roles you will need to fill. FRC requires each team to have a Main Contact, an Alternate Contact, and a Shipping Contact for the purposes of communication with *FIRST*. These three key volunteers must understand the importance of providing a conduit between FRC and the team. The contacts do not necessarily have to be the hands on Mentors, but must be post high school adults.

Draft a financial plan

Develop a team mission statement and business plan, and decide what your team goals are. These will help you develop a budget and determine fundraising targets. Things to include are; the registration fee, travel costs, robot and field construction items, publicity and sponsorship materials, plus Off Season event participation. Once you have experience as a team, it becomes easier to plan ahead.

Find financial sponsors

We recommend that you begin your fundraising efforts well before the extremely busy build season which starts in January and schedule fundraising activities throughout the year.

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, and/or community involvement. Also look to industrial or medical suppliers, pharmaceuticals, patent/copyright offices, technical development, information technology, manufacturing, financial intuitions or youth-focused corporations.
 - Ask the parents of team members if they have any connections. Perhaps one or more can help make contact with companies in your area through the Corporate Giving Department for a donation.
2. Talk to the principal of your students' schools and find out if the education department already has partnerships with local businesses. One of them might be interested in helping you start/maintain a team.
3. Find out who the largest employers in your area are by calling your state representative's office for information. Web search 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 in helping because they have a stake in your community.
4. Contact the Chamber of Commerce and request the names of companies that might be interested in partnering with schools on a project that will help these businesses 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. Visit the web to find out whether setting up a non-profit organization for your team fits its needs. If so, there are numerous sites offering suggestions to implement.
8. Call your local college/university and ask for a meeting. Very often these schools welcome inclusion because they can use the program as part of their curriculum.

The Approach

Potential Sponsors will be interested in the positive publicity team sponsorship will provide and the long-term appreciation of the future student workforce on the team. 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. Be sure to tell them, their banner will travel with your team to your event(s) and you will proudly display it in your pit station.

The Preparation

Before you speak with a potential partner, donor, or Sponsor, make sure you do some research. Ask around to find the best contact person at that particular business or corporation. Does anyone on the team know someone who works there? It is best to try for a contact in senior management, such as the head of Engineering or Human Resources. Have dates and times in mind before you call and be prepared to ask for and set up a face-to-face meeting.

Prepare a list of what you will need in advance. Ask for the full registration amount when you petition for funding, but graciously accept any offer of help. If a company can't or won't donate money, ask for services such as machining, mentoring, or the loan of meeting/facility space. Other in-kind donations could include tools, supplies, food, printing, copying, or team T-shirts.

The Presentation

Be prepared when you call or visit, and smile while you are there. Explain what *FIRST* is about, and be sure you can articulate it to others. Describe your team's makeup including the number of kids and their ages, team goals, and any accomplishments to date.

Provide budget information and the amount of money you have already raised. Consider bringing your own PowerPoint presentation outlining your team's plans for using the potential Sponsor's donation. Whenever possible, bring the students to do some of the presentation.

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

- Promotes community visibility
- 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 engineering

An excellent way to attract recruits is to invite them to an event. If the official competition season is over, find a listing of Off Season Events in the FRC Season Calendar on www.usfirst.org. These Off Season Events run through the summer and fall. Once potential Sponsors see the creativity, action, fun, and excitement, it will help them understand the value of the program.

The Close

Finish with a clear outline of what you are asking for. Ask high; they may be willing and able to fully support your team. If they are unable to provide full funding, ask for a specific amount for a specific line item. If they cannot support you with monetary means, you could also ask for specific items or support that they could provide (meeting space, access to machines, technical support).

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. Include any information on your team. Reiterate your budget needs and how their support will positively impact the future workforce of the area. Thank the prospect by name for the meeting.

If there was a promise of funding, machining, or mentoring support, send a letter of thanks and detail what you understand the agreement to be or what you hope the partner will provide as support with deadline dates. Mention what the direct impact of the donation will do for your team.

For engineering or promise of technical 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.

When the season is over, send a pictures of your team building and your robot at an event. Detail some of the experiences, accomplishments, and excitement of the team. If there were newspaper articles, send copies. Schedule a visit to partners, donors, Sponsors and potential Partners, for early next season. This works.

Visit the following web sites for additional information and fundraising ideas:

- www.chiefdelphi.com
- [Fundraising webinar](#)
- [Fundraising Plan](#)

Find a meeting place

Ask your sponsoring companies and school(s) for suitable space for your team to meet and build a robot. Survey the area for businesses with unused space they may be willing to loan or rent. Ideally, you will want a machine shop and all its tools for your robots' build space. If a machine shop isn't available, consider team size, equipment, work schedule, safety, security and the potential for practice space when reviewing possible locations. Some teams build their robot in a garage. If you are offered a location, be sure to develop a contract with the facility before your first team meeting to ensure understanding of its use, scheduling, etc.

Obtain tools

Your team will need a computer with Internet and e-mail access to download documents and communicate with *FIRST*. You will also need a toolbox with the following suggested tools:

Hand tools

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

Hand power tools

Drills	Lathe
Jig Saw	Mill
Dremel	Bandsaw
Machine Tools	Drill press

Find a secure place to store your tools and plan methods of inventory, storage and maintenance. A sign-out sheet may help you manage frequently used tools. Remind the team that searching for missing tools or finding an important tool has been broken means lost time and money. A sign out process will also 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, plan to train and assign people to that task.

Bookmark important *FIRST* website pages

Use the *FIRST* web site (www.usfirst.org) to stay current with the program, its benefits, and its deadlines. If you and the team become familiar with the website before the season starts, it will be easier for you to check during the season for updates and important deadlines.

Use the links online to find and contact your Senior Mentor and Regional Director. They are available to support you as you mentor your team. You can also benefit from years of team experience, by exploring the resources from the FRC team community.

Rookie teams may want to take a look at last year's game materials on the *FIRST* website to get a good idea what the upcoming season will bring.

After Kickoff, you will be able to find all of the new *FIRST* Robotics Competition Game Manual sections and the updates as well as information on events, such as dates, event agendas, and shipping and drayage particulars listed on www.usfirst.org/frc.

Identify important deadlines

Important deadlines are listed on www.usfirst.org on the [FRC Season Calendar](#)

Regional Directors and Senior Mentors

Regional Directors and Senior Mentors from *FIRST* want to help you help your team. Regional Directors and Senior Mentors cover specific territories. You can find them on www.usfirst.org or Team Support can put you in touch.

Team Support

Live team support is available 8:30AM-5:00 PM EST from FRCteams@usfirst.org or 1-800-871-8326 x0. Please choose only one method of contact as leaving multiple messages about the same question slows down the response time for everyone.

FRC Blog

Frank Merrick, the Director of the *FIRST* Robotics Competition, hosts the [FRC Blog](#) that is available on our website. Be sure to read this blog whenever a new post is available.

September

Pre-Register and Register in TIMS

The Team Information Management System (TIMS) is a vital link between teams and *FIRST* headquarters. Your team Main or Alternate contact must log into this system to:

- Enter your team, contact, and Partner/Sponsor information
- Receive your team number
- Register for Local Kickoffs and Regional and District Events
- Receive team email blasts
- Provide information for judges
- Supply team demographics
- Get started with your Youth Protective Service screening (YPP)

Important dates and deadlines are listed in the [FRC Season Calendar](#) on www.usfirst.org. Pre-registration in TIMS begins in May. When you begin the process for a rookie team, you will receive a temporary team number. Once you secure payment for your initial event, you will receive your official, permanent FRC team number. FRC event registration begins in late September and ends in late November.

To complete the TIMS online process, you will need the following information on your Main, Alternate, and Shipping Contacts. (Note: The contacts must be post high school adults).

- Primary address
- Primary email address
- Phone number
- Secondary address, email address, and phone number, if desired (highly recommended)
- Permission from at least 1 team contact to share their information on the web if your team would like to request or provide mentoring assistance

For the School(s), Youth Organization(s), and Sponsor(s), you will need:

- Full name of the organization
- Contact name
- Phone number

Notes about TIMS:

- The Main and Alternate Contacts will each receive a unique password and be able to access TIMS to add or update information about the team or contacts.
- The Main and Alternate Contacts will receive emails and updates from *FIRST* during the season. They should be dedicated to making sure they distribute these emails to team members, as appropriate.
- It is very important that the Main and Alternative Contacts ensure their email system does not block email from usfirst.org and allows attachments of up to 2 MB.
- All team Contacts will need to agree to and go through Youth Protection Program screening.

Register for events

FRC Event registration in TIMS begins in late September and ends in late November. Some popular events fill up fast, so now is the time to decide where your team will compete. Registration fees and event locations are listed on www.usfirst.org.

Keep the following in mind as you weigh your choices:

- Research Grants: If you apply for a NASA grant, read the details carefully. You may be required to register for the event associated with that grant in order to be eligible.
- Travel costs: Check on hiring a bus if the event is within driving distance; and compare train and plane fares if not. Ask the airlines if they give group rates and carefully check the stipulations.
- Arrival and Checkout Times: Check the sample agenda in the “At the Events” section of last year’s Game Manual to find general starting/ending times.
- Hotel Reservations: Teams research hotels and make their own reservations for FRC events. *FIRST* has a reservation system in place for the participating Regional and District Events and the *FIRST* Championship. If you attend the *FIRST* Championship, you will be able to register your team for a block of rooms via Experient.
- Transportation from your hotel to the event: *FIRST* does not provide shuttle service from hotels to events.
- Consecutive Weekend Events: If you choose to participate in events that are on back-to-back weekends, you will also need to be prepared to transport the robot yourself.
- Back-to-back robot shipping to events is not possible for teams going to international events, including Canada, because of transit time, potential problems with Customs and border crossings, and weather delays.
- Shipping and Customs: If you plan to compete internationally, check the shipping and Customs requirements well ahead of time, and be sure to comply with necessary paperwork. *FIRST* does not supply customs paperwork or pay any duties or taxes on international robot shipments.

Complete a W-9

Every team must have a W-9 form on file declaring the tax id number for the individual or institution willing to accept grant money on behalf of the team. Teams must complete this document before they may receive specific grant monies above and beyond the cost of registration. The W-9 form is available online.

Are you a rookie team?

FIRST recognizes the commitment teams and Mentors must make to get a first year team off the ground and for this reason grants qualifying teams rookie status. Rookie status offers teams specific incentives

and recognition including access to Rookie grants and the opportunity to earn the Rookie All Star Award. Details are available on *FIRST* Robotics Competition [Grant Information](#) page.

Note for homeschool teams

FRC does not differentiate between homeschool teams and teams from schools or other youth organizations. Enter a name for your homeschool into TIMS when prompted for your school or youth organization. Every other aspect of participation in FRC remains the same.

Recruit students

FRC team sizes vary between 6 and 100 students, with the majority of teams averaging 25 to 30 students. For your first year, target a team size you're comfortable with, keeping in mind there's a lot of work to be done. You can always increase or decrease the team size in future years.

Post flyers where students will see them. You can use [How to Start a Team Flyer](#) or [Editable Flyer](#). Involve teachers at local high schools in the area. Teachers will be familiar with students' abilities and interests and can encourage talented teens to participate.

Hold an open house for all potential team members, parents, and Mentors to describe the program. Prior to the meeting, download the [Information Sheets](#) from the web and distribute them as handouts or post them for all to see. If you can, invite a veteran team to speak and demonstrate their robot. Discuss the time commitment, meeting times, and dates up front with the team and parents. Let them know that at times, some of you may be meeting every day of the week.

Recruit responsible students with a variety of interests to help manage the business of running the team. Let students know there is more to being on the team than building a robot. There will be fundraising, awards submissions and marketing tasks to accomplish. Tell students they are all expected to help with the various aspects of the project.

Consider if your team want to set down membership criteria such as a minimum grade point, age, or grade level? Some teams stipulate that each member has to contribute a certain amount of money toward travel expenses or team "uniform," which could shrink your talent field.

Each team has a different way of attracting and choosing students. Decide if your team should have an actual team application. This is a good way to capture contact information at the outset and find out if the applicant has an idea of which sub teams she/he would enjoy.

Send a "Welcome" letter to those who make the team, and include some team goals, rules, and meeting information. Have a pre-determined, sensitive process in mind to notify those who do not make the team.

Involve parents

Parents often make great Sponsors and Mentors. Ask the students if any of their family members are engineers or have useful skills such as machining. You may also find parents with fundraising, programming, or marketing experience. A parent may be willing and able to handle the robot transportation. All parents can be involved as chaperones or be put to work organizing snacks and food. Ask parents for help regularly during the season. If you can be specific about your needs, parents can often assist you in finding solutions.

Apply for grants

Grants are a good way for teams, especially rookies, to get a leg up on funding. Grant availability varies from year to year, but they are usually offered right around registration time, so be sure to check the *FIRST* Robotics Competition [Grant Information](#) page often. Read all the details of a grant before applying as some include the requirement of participating at a specific event, or the involvement of Mentors from a specific company.

Hold strategy meetings

It is a good idea to meet with your team Mentors prior to the first team meeting with the students. Do all the Mentors understand their role? Can everyone agree to a common philosophy of working with high school age students? Do all Mentors have to come to all team meetings? Do you have a method in place for communicating during the season?

Hold strategy meetings with the students as well. What aspects of the FRC program does the group feel are most important? How will group decisions be made? How will tasks be assigned? What can be done if the team falls behind schedule?

Plan team structure

Successful companies have a management or core group that oversees multiple project specific subgroups working toward the common goal. Most successful *FIRST* Robotics teams work under a similar framework. Each FRC 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 subgroups, but team management, travel, financial, creative writing, marketing, and artistic groups can support your team throughout the season. Before the actual season begins, spread the workload by forming self-motivated subgroups, utilizing your members' unique talents, and giving everyone an opportunity to contribute.

Keep the groups small and project oriented. Remember that the build team subgroups will have to interface often to make sure all mechanisms will mesh. Consider rotating roles to strengthen team members' knowledge and experience as well. Train younger team members so they can replace graduates next season. It's a good idea to have all students on more than one subgroup. Find out what each does well, and put each on a subgroup dealing with that skill so that group has strong assets with lots to teach. Put these same students with groups from whom they can learn new skills.

Mentoring advice

Consult the [Mentor Resource Library](#) for tips on "paying the knowledge forward" and using communication as the key component for building necessary trust and respect.

The design and build season is short, 6 weeks. As team leader, don't ever accept procrastination. The "we have plenty of time" statement is just not true with *FIRST*. Keep your collective eyes on the calendar, students included, and watch those deadlines.

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

Make sure the students work on the robot, and make it a team effort by encouraging group decisions. Supervise the students, but let them fail once in a while if they have to; it's how we all learn. Winning the trophy isn't everything. Sometimes the prize is working together successfully.

Encourage "out 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.

Encourage mutual respect. It's important that everyone feels safe enough to throw out an idea no matter how far out, so try to work toward 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 avoid revisiting topics unless all team members agree to do so.

Every team member should understand and embrace the feeling of pride, happiness, honor, joy, pleasure, satisfaction, admiration, and self-confidence. Every person on your team should experience these confident feelings when they work on and complete a job.

Set up record keeping methods

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 3-ring binders for others. Make copies of important documents in case they get damaged or lost, and set up an organized way of maintaining at least the following:

- Expenditures
- Team contact and emergency information and medical emergency forms
- Team Roster
- Sponsor recruiting efforts and related correspondence
- Design ideas and test data
- E-mail blasts and Team Updates

Accurate records will assist you in future planning, make grant and award application writing easier, and help track your progress. Take lots of pictures and make videos of your team and robot during build season, competition and any outreach or fundraising event you attend.

As students graduate, make a note of where they go to school next and keep in touch. Sponsors like tangible evidence that the FRC program is inspiring students, and *FIRST* appreciates the information to present to our Sponsors as well.

Alumni & Scholarships

All *FIRST* Students become *FIRST* Alumni, and there are many opportunities available to these current and former participants. Questions/needs can be sent to scholarships@usfirst.org or alumni@usfirst.org

Scholarships – Millions of dollars in potential scholarships are made available to *FIRST* Participants by hundreds of colleges and universities and corporations/associations. It is important that students know about these opportunities and take advantage of them – it's free money that can help defer the cost of college! Designate someone at school or on the team as the Scholarship/Alumni Contact in TIMS, they will receive information on how to use the [FIRST Scholarship Program](#) and share that information with

the Team and their Parents. Make sure all Team Members are familiar with www.usfirst.org/scholarships

Internships – *FIRST* supporter companies are looking to hire in young talent for internship roles, and many post that information for easy access to *FIRST* Participants and alumni in the [FIRST Internship Portal](http://www.usfirst.org/internships) at www.usfirst.org/internships

Alumni Networking – *FIRST* alumni are an elite group of the leaders of tomorrow who have all had similar experiences as students on a *FIRST* Team– The [FIRST Alumni Networking Group](https://www.linkedin.com/groups?gid=11111111) on LinkedIn is an easy way for rising alumni and alumni to find and connect with one another in professional setting. Make sure juniors and seniors on your Team are joining now! www.usfirst.org/alumni.

November/December

Plan for build season

Once you have a team of Mentors in place and you have recruited and selected student members, it's time to bring everyone together. Meeting before the build season will allow members to get to know one another, plan and build relationships.

Create a team calendar showing special events and important deadlines. Include school testing dates and local events that might affect your members' availability. Involve the entire team in drafting a timeline and scheduling meetings/work sessions to meet those deadlines. Planning for the build season with the entire team will ensure everyone understands the schedule and their role in the team's progress. Some teams utilize project management software for this purpose, but many teams get by with calendar pages and check lists.

Establish reasonable goals. Start small so there's a feeling of accomplishment. Foster innovative thinking and focus on learning, improving, and inventing, rather than winning. Make sure team members are aware of the [FIRST Scholarship Program](http://www.usfirst.org/scholarships), and set down safety rules for working, traveling, and event participation.

Develop a notification process so that you can keep everyone updated. How will you alert members to a sudden schedule change due to bad weather? Do you have the ability to hold extra work sessions if the team falls behind schedule? Build in opportunities for regular updates from subgroups and project teams so everyone understands the team's progress.

Plan for set up and clean up time when developing a standard meeting schedule. Include breaks for tension relief and understand teenagers work best when they can refuel regularly. It's a good idea to get a group of parent Volunteers to arrange regular snacks. Teams that hold day long meetings on weekends often schedule one or more meals into the day.

Manage your team day to day

Define tasks

Describe each task to the subgroup assigned and be sure to ask if there is anyone who does not understand. You will save time, wasted materials, and money if you make sure everyone understands

the task at hand. Give each task a title, a start and finish date. If the assignment is complex, facilitate with instruction.

Monitor Progress and Ask Questions

Have a time for discussion at the beginning of each meeting. Ask if anyone needs help. This fosters kindness, thoughtfulness, and cooperation - real team builders.

Check with the various team members or subgroups to make sure everyone is focused on the purpose, knows the deadline and is progressing. Again, ask if anyone has questions or concerns. If someone seems stumped, ask questions to guide the subgroup toward an easier, quicker, or more efficient way to do the job. 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.

Manage Punch Lists

Each subgroup should learn to maintain a “to-do” list of items requiring immediate or scheduled attention. Include deadline dates and the persons assigned to each task and a column for notes so the team can pencil in progress or problems and initial their notations. Highlight completed jobs to indicate progress and provide incentive. Label each list with the subgroup’s name and post them together in a convenient spot so everyone can get a feel for critical items that may impact their particular task or area of expertise.

Follow the Task Timeline

Utilize a timeline of the design and build season and beyond. This graph should help your team map out its own season and form subgroups with the correct overlap.

Value Each Mentor, Team Member, and Volunteer

It is extremely important that each person feels valued and respected. 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 rule of “No disparaging remarks allowed.”

Adult and Student Decorum

Early on conduct a Mentor/student propriety discussion with the adults. Students should be comfortable in this atmosphere, so be sure that language, behavior, dress, and jokes are proper at all times. Students look up to those they trust and respect, and they closely watch the adults’ actions and will see them, bad or good, as appropriate. Make sure team members know they can come to you with complaints or concerns.

Hold trainings

The meetings prior to kickoff are an excellent time to prepare students and mentors for the challenges ahead. Arrange for guest speakers in topics related to robot design and build: programming, CAD design, machining, wiring, the list is endless. Ask your Mentors and Sponsors to train the students in their particular areas of expertise. You can also find training outlines developed by other teams on websites listed at www.usfirst.org.

Does your team need a website?

Many FRC teams have a team website that promotes the team, the Sponsors and *FIRST*. A team website provides a vehicle for connecting with others and a place for team members to communicate with one another. Online research will turn up a lot of FRC team websites. If you have a Mentor or team member who is enthusiastic about website design, utilize them. The benefits for connecting to your local community and the *FIRST* community are vast.

CAD & animation

Traditionally Autodesk, PTC and Solidworks provides FRC teams with a copy of their software to enable teams to design a robot before ever lifting a tool. If you can find someone familiar with the program to train your team, you will save a lot of time and consumable supplies.

Team identity

Official Name:

This team name is generated automatically when you enter any school/Sponsor/Partner into TIMS and is the name we print in *FIRST* documentation. Please be sure to list your Sponsors and the school(s) in TIMS by the first of December so that your complete official name can be included in the Program Books.

Nickname:

The team comes up with this name. 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 uniquely important to the team. The deadline for the team nickname in TIMS is the first of December.

Logo

Once you choose your team's nickname, you may want to come up with a team logo to incorporate with your image. This is optional. Keep your logo simple because each color you use costs more to print. For information about using the *FIRST* logo, refer to www.usfirst.org Marketing Tools for *FIRST* Branding Standards.

Style

A big part of the team fun is individualizing your appearance. This is optional. Some teams have T-shirts, while others wear matching outfits. Many teams decorate their pit space to match the theme and some even decorate their robot and robot cart.

Mascots

You will see colorful soup cans, caped wizards with pointy hats, Oompa Loompas, cheerleaders, and just about every furry animal mascot at competition events. This is optional. Please keep safety in mind when if you choose to design a team mascot and consider things like clear vision and temperature when designing.

January

Kickoff

Kickoff unveils the game and marks the beginning of the design and build season. Kickoff is broadcast from Manchester, NH and made available to teams worldwide. We strongly recommend you check www.usfirst.org for a Local Kickoff hosted by a team or committee near you. It's a great opportunity to get together with other teams, compare notes, get ideas, make connections and get geared up for the exciting year ahead. Some Local Kickoffs also include workshops or robot quick build sessions which can be beneficial.

Teams attending official Local Kickoffs are able to pick up their Kickoff Kit at the event. An adult team member must be present to sign for the Kickoff Kit upon receipt.

Teams that cannot, or do not wish to pick up their Kickoff Kit at a Local Kickoff must log into TIMS and select "Ship My Kit" in the Kit Pickup/Delivery location section. Teams are responsible for the shipping charges and will be invoiced through TIMS. Your Kickoff Kit will ship after Kickoff in January.

The Kickoff Kit will consist of a minimum of one tote and additional other items dependent upon the new game. These items are generally heavy and will fill most car trunks. The Kickoff Kit is too expensive to ship and cannot be brought on a commercial airline, so you should make every effort to attend a Local Kickoff.

Be sure to register for a Local Kickoff in TIMS by the deadline. Teams may split up and attend more than one Local Kickoff location if they wish, but must choose only one location to pick up their Kickoff Kit.

Upon receipt of your Kickoff Kit, you must inventory the contents and report any shortage by the deadline. See the Kit of Parts section of this manual.

At the conclusion of Kickoff, your team should meet as soon as possible to discuss the game objectives and scoring. Many teams schedule a design meeting for the afternoon of Kickoff.

Consent and Release forms

Everyone attending FRC Competition events must complete the *FIRST* Consent and Release Form. Attendees under 18 years old need a parent or guardian's signature. The form is available on www.usfirst.org in both TIMS and STIMS. Make sure that everyone on your team completes it prior to leaving for an event. If you are attending a District Event, please fill out the District Consent and Release Form on www.usfirst.org as well.

Kit of Parts

Every registered FRC team receives the Kit of Parts, which includes the Kickoff Kit, *FIRST* Choice, and the Virtual Kit. The Kickoff Kit contains the parts for use in building a robot for competition. The Kickoff Kit generally contains items ranging from batteries and motors, to control boards and pneumatic devices. The Kickoff Kit is designed to help any rookie team get a functional drive base running within a few days. Conversely, the Kickoff Kit also includes advanced sensor technology which may be appreciated by more experienced and expert teams. The contents of the Kit of Parts varies from year to year, and much of it

is donated by generous organizations. Some of the items in the Kit of Parts are required on all competition robots and teams may use some additional items, as outlined in the Competition Manual.

The Kickoff Kits are distributed to teams at Local Kickoffs or shipped to teams at their cost. See the Kickoff section of this manual. You will receive a list of the items contained in the Kickoff Kit and you should compare your kit items to the pictures and the list. Teams have four days to inventory their parts and report any shortage, via TIMS, before the deadline which is Wednesday at midnight following the Kickoff.

FIRST Choice is online shopping opportunity where teams can select what items they want to purchase, rather than getting required items. Access to *FIRST* Choice is available throughout the Fall, and more information can be found on the Kit of Parts page(s) on the website.

The Virtual Kit includes all the software donations as well as the Product Donation Vouchers. Some of these Donation Vouchers are found at the Kickoff Kit, and some of the access codes are found in TIMS. All the information about these opportunities can be found on the Kit of Parts page(s) of the website.

Spare Parts

Have spare parts on hand so they are available during the build season. An experienced team can help you decide what parts are valuable to have on hand. Become familiar with the replacement parts policy of Kit of Parts items. During the season, check the “At the Events” section of the Game Manual for the short list of replacement kit parts that may be available at competition events.

Game Manual

FRC publishes a new Competition Manual every year. This document contains everything your team needs to know to build a legal robot, ship your robot to competition events, compete in the game and apply for awards. Teams must read every section of this manual to succeed. Teams may download an encrypted copy of the Game Manual prior to Kickoff. The key to the encryption is released during the Kickoff broadcast.

Questions about information found in the Game Manual may be posted by teams on the Q&A. Updates to the Game Manual are released during build season and posted to www.usfirst.org.

Build Season

Once the game is revealed at Kickoff, have everyone read the game description in the Competition Manual and hold 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 Kickoff.

Once your team has strategies for robot design and function, get your subgroups working on programming the autonomous mode; designing the devices necessary to manipulate game pieces; and building the frame and drivetrain. It is a good idea to have subgroups work simultaneously. There isn't enough time in six weeks for everyone to participate in every step in the process.

Your team Main Contact will receive emails from *FIRST* throughout the build season. This person **MUST** be prepared to read each and every email and forward them to team members. Team email blasts

contain vital information on game updates, competition details, and other topics specific to FRC. Email blasts are archived on www.usfirst.org where any team member may access them.

Assign someone to frequently monitor the FRC Forum and Team Updates on www.usfirst.org for game updates or clarifications. This person MUST be prepared to check the sites often and share their findings with the rest of the team.

FRC Game Question & Answer

FRC maintains a Question and Answer (Q&A) forum where teams may post questions about information found in the Game Manual for clarification by the Game Design Committee.

Each team is assigned a unique username and password in TIMS that they may use to access the FRC Q&A forum. Ask your Team main or alternate contact for this information and assign ONE (1) member to act as spokesperson for your team. Anyone may view the Q&A forum, but only the person with the username and password may post.

If your team posts a question, please be sure to refer to the Game Manual section needing clarification in your post. 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 ensure all questions relating to the same concept will be answered the same way, rather than re-phrased multiple times. Remember that the *FIRST* Web site is the only place to find official answers.

Email Blasts

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. Only the team Main and Alternate contact will receive email blasts. Email blasts are archived on www.usfirst.org where any team member may access them.

Team Updates

During the season, team updates will be posted on www.usfirst.org. Teams should assign someone to check this site regularly (team updates are generally posted twice a week). It is vital to review the team updates as they contain corrections and additions to the information contained in the Competition Manual. Many teams print out the team updates and file them with their copy of the Competition Manual so that they can refer to them easily and quickly.

Run parallel activities to prepare for competition

While your build team and programming team are constructing a working robot, other team members can be preparing for the season.

Form a robot drive team and make sure they are ready to compete. Most teams use two joysticks to run their robot, so the student operators must be able to communicate with each other using a minimum of words. The drive coach can be a student or adult but cannot score for the team. This person relays referee information, assists the team in predetermined strategies, or calls strategy changes when necessary.

Recruit a scouting team and have them develop/create a table/worksheet that will help track other participating teams' strengths and weaknesses. This is especially useful for knowing opponent

capabilities and choosing complementary alliance partners when your team makes it into the final rounds.

Have members design your pit space. What tools will you need for robot repairs during competition? How will you transport that equipment? How can you lay out your pit space for maximum efficiency? Do you want to incorporate your team colors or logo?

Build your robot cart. And if you are attending or qualify for the *FIRST* Championship, build a robot crate. Information on building a crate can be found in the [Shipping Crate Construction](#) document.

Safety

Safety is paramount to the FRC program. Train your team about safety in the workplace and at the events. Establish and discuss procedures for reporting an accident or safety violation to the Mentors. Provide hands-on training for power tool operation and include instruction on any associated safeguards and their functions. Consider investing in having one or more Mentors certified in First Aid.

The FRC Safety Manual from UL is available on www.usfirst.org. Familiarize the mentors and team members with the Safety Awareness and Recognition program and get them excited about earning safety tokens at the competitions.

At each team's initial competition event of the season and at the *FIRST* Championship, there will be a Safety Captain badge in the registration packet. The Safety Captain would be in charge of identifying safety hazards and implementing corrections with the coaches' help. Consider having more than one captain and having them alternate being "on watch."

February

Stop Build Day

On Stop Build Day, teams must stop work on their robot. Teams must seal their robot into an isolation bag and tag it. The bag and tag were provided in the Kit of Parts.

The Competition Season

Teams sign up for Competition Events when they register in TIMS in the Fall. Teams travel to District or Regional Events to compete in the game and be judged for awards in design, creativity, innovation and culture changing behavior. Sample agendas for FRC competition events are included in the Game Manual along with specific competition rules.

When you arrive at an event, go directly to Pit Administration, hand over your team's roster and check in. You will be given a schedule and a pit map. The pit map shows team pit locations, the practice field, the robot inspection station, the queue line to the playing fields and the travel path for return to the Pit.

Pit Administration

Pit Administration is the registration area and hub for information. If you need help or have a question, that's where to go. All events have someone here with medical training available in the event of illness or injury.

The Pit

The pit is where teams store and work on their robots. If you were approved for a robot transport exemption and shipped your robot via FedEx, your robot crate will be waiting in your pit space when you arrive. If you transported your robot to the event, you must find the official in charge of checking the isolation bag before you unpack. Set up your tools and supplies, uncrate or unbag your robot and program your radio with the WPA key assigned to your team for this event.

The Practice field

Competition Events generally have practice fields with representative game pieces and game elements. You may receive a practice field schedule, or teams may be able to sign up on a first come, first served basis. The practice field is the perfect place to make sure your robot is running as planned before you compete.

Robot Inspection

Every robot must be inspected before it can compete. Allow yourself plenty of time to make it through robot inspection before your first match. Robots that do not pass inspection are allowed to return to their pit space to make repairs or changes until the robot does pass inspection.

The Playing Field

Games, field setups, rules, and goals are different from year to year; however, the actual matches are usually about 2 ½ minutes long. Teams queue for matches and talk strategy with their alliance partners while they wait. If a team does not arrive at the playing field in time for their scheduled match, the match is run without them.

The human players must wear ANSI Z87-approved safety glasses and their team specific drive team badges provided at registration. Drive team members carry their robot onto the field and switch on the power to their robot when directed to do so by the queuers. Drive team members also set up their robot controls in the protected driver station at the same time. LEDs show the competitors' team numbers above each station.

Teams play on competing alliances. Alliances change from match to match.

The Drive Team

Generally, four people from each team are permitted in the queue line and on the playing field. The person acting as the drive ("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. They score for the team and must be of pre-college age/status.

Judges

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

Team Spokespersons

Have 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, the

robot and its processes, problems the team encountered and the team's solution to those problems. They must also be able to speak above the loud pit noises.

Scouting

Teams that qualify for the finals choose their alliance partners during alliance pairing. Many teams prepare for this moment by scouting during qualification matches.

Awards

FIRST recognizes FRC teams for excellence in design, creativity, innovation, culture changing behavior and competition performance. Judges at each competition event interview teams and watch team behavior, both on and off the competition field, as they evaluate everyone for awards.

There are a few awards that teams submit entries for prior competition. These include the Chairman's Award, Woodie Flowers Award, Entrepreneurship Award, Dean's List Award and a pre-season Safety Animation Award where the winning entry is shown at Kickoff.

April

FIRST Championship

The *FIRST* Championship is the culmination of the FRC competition season and includes Jr. FLL, FLL, and FTC competitions and demonstrations.

In order to register for and participate in the *FIRST* Championship, teams must meet the current eligibility criteria and compete in at least one competition event during the competition season.

Celebrate

Even if your team doesn't earn a spot at the *FIRST* Championship, you should celebrate your team's success. Look back on how much everyone has accomplished and make sure to acknowledge everyone's individual contribution to the team. Remind members and mentors of the great ideas they had, the problems they solved, the way they supported teammates, the skills they mastered during the season, and the growth you have seen. This positive reinforcement is a great way to encourage students and Mentors to return for another competition.

Ask your school to hold a special assembly or ask your sponsoring organization to hold a team social. Display the team's safety program documentation, demonstrate the robot, and showcase team mementos, journals, photos, and awards submissions.

This might be a good time to present the participation pins you received at your initial event. Some teams provide certificates to each team member, with special recognition of the contribution each person made during the season. Be creative when awarding them, and use the *FIRST* logo to make them special. Be sure each student on your team receives one.

Applaud Your Sponsors, Mentors, and Volunteers

Invite your sponsors to your celebration. 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. This personal recognition will encourage their involvement next season. Giving them a gift with the *FIRST* logo is a great way to honor volunteers, mentors, or sponsors.

Events run by teams

Some teams run Invitational events during the off season. Check www.usfirst.org for a list of upcoming events. If you decide to run an off season of your own, details on borrowing competition fields are available on www.usfirst.org. It is a good idea to attend a number of off season events before committing to host one of your own.

Team demonstrations

Many teams hold demonstrations for the public during the off season. This is a great opportunity for your students to spread the word about FRC and to recruit new members or Sponsors. Check with local schools, malls, and special events to see if your team can give a presentation.

Other items of interest

Dean Kamen



Founder, *FIRST*

“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 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.”

Prior to retirement, Dr. Woodie Flowers was the Pappalardo Professor of Mechanical Engineering at the Massachusetts Institute of Technology. He is a Distinguished Partner at Olin

College and co-founder of *FIRST*’s cornerstone program, the *FIRST* Robotics Competition. Dr. Flowers has served as a National Advisor to the *FIRST* Robotics Competition since its inception.