CREATE DRONES

To inspire and prepare the youth of today to become the engineers and scientists of tomorrow.

Coaches Manual 2019-2020

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CREATE Mission

To inspire and prepare the youth of today to become the engineers and scientists of tomorrow.

This will be done via competitive robotics/drone competitions that are:

Compelling – Competitions will include both sports-like (head-to-head) competitions as well as engaging social interaction through teamwork and alliances. A signature event will be held annually to reward and celebrate teams' accomplishments.

Accessible – By use of re-usable components, low annual and tournament registration fees, and low team registration fees, we will help ensure cost is not a barrier to participation. Tiered events and activities will be offered that make hosting events accessible to any size school or group.

Inspiring – Robust challenges and tournaments that keep students engaged throughout the year, are educationally rich and give appropriate focus to mechanical and electrical engineering. All participants will be surrounded by others aspiring to live up to the Values of CREATE.

Safe – Careful selection of equipment and focus on proper safety procedures will ensure all participants have a safe environment to compete in.

CREATE Values

"Honor by Design"

Honest - Do "what's right" when no one is looking.

Competitive - Always give your best. Be humble in victory and gracious in defeat. Be respectful of your teammates, coaches and mentors, competitors, judges and spectators.

Collaborative - Act in the best interest of the team's goals and be supportive of each other. Share knowledge, tools and parts with other teams.

Leader - Encourage, praise, involve, and constructively challenge your teammates.

Professional - Works hard, determined, overcomes obstacles and is well trained and acts in a professional manner.

Coaches Pledge

As the coach, everything you do communicates values.

1. To the best of my ability I will try to model "Honor by Design" at meetings, build sessions and competitions.
2. I will lead by example and expect my team to abide by the rules of any/all competitions we participate in.
3. The students come first. Our shared objective is to inspire and prepare through a program that is fun and exciting. Success is measured by how many students get excited about science and technology.
4. The students do the work and make the decisions. The students on my team will do all the research, design, problem-solving, building, programming and decision making. (Coaches are to facilitate and lead. As such coaches are encouraged to help the students find the answers and solutions.)
5. I understand that the competitions I attend are hosted by volunteers and will treat them with the respect and gratitude they deserve. I will make sure all team members understand that the competitions they attend are run by volunteers and will encourage them to be respectful and appreciative as well.
6. I will be responsible for reading all e-mails that are sent to me by CREATE and will forward all pertinent information to team members and parents of team members.
7. I will make "Honor by Design" an important part of my team.

Building a Team

Advice for Coaches

Enjoy the experience. Your goal is to help your students have fun with drones, the mechanical devices they build, and technology in general. Whether or not your team wins a trophy at a competition, team members achieve success by participating and learning.

The Foundation

You will need to direct the process the team uses to solve the game challenge without providing the solution yourself. In addition, you must be willing to acquire some basic knowledge of robot/drone building and mechanical systems. You may want to enlist the support of a technology teacher or technical mentor for additional assistance. You may want to invite other people with diverse backgrounds to share their knowledge and experience with your team.

The Students

Teams of three to five members work best. The CREATE Drones Challenge is aimed at middle and high school students. Teams can be formed in any environment and need not come solely from a school environment.

The Mentors

Mentors help provide valuable one-on-one interaction and serve as resources in their specialties. Here are some possible mentor contributions:

- **Engineer** – Mentors with experience with robots/drones and/or mechanical system experience that are capable of teaching the students these ideas as well as how to apply the engineering design process.
- **High school or college student**, preferably a Robotics Competition member – Helps the team work through a practice challenge, shares strategy, serves as a role model.

Registering a Team

Since this is the inaugural season for the CREATE Drones Program, the tournament schedule and registration process is still being finalized. **Please check back with CREATE periodically for an updated schedule of events and information regarding the registration process.**

The Coach

As a coach, you need to be involved, but you cannot allow yourself to take over the process, except when it comes to safety issues. Teach students to stop and think before they cut or bend metal, or do other similar tasks. As a coach, you may help everyone gain the most from this experience if you do not do the actual engineering/planning and building yourself. As much as you might like to build the team built mechanisms, the team must design and build all drone add-on equipment and the team-built game mechanism with only limited assistance from you or other adult mentors.

A successful coach controls the process, not the content. You are a facilitator, available to help your team complete the work and improve the way it works together. Students become problem solvers by finding solutions themselves, but coaches can assist young people best by facilitating problem-solving and helping students to reach their own solutions.

The Team

Discuss duties, time commitment, meeting times, and dates up front. If students cannot make a reasonable number of meetings, you need to know that. The level of commitment should be generally the same among all team members.

Roles and Activities for Team Members:

Building:

- Make decisions about building, and work to achieve consensus among team members on the mechanical design of any drone add-on equipment as well as the team-built game mechanism.
- Use guidelines for brainstorming to build a drone and team-built game mechanism that can accomplish the team's desired goals.

Pilots (2):

- Any two student team members will operate the drone during each race at a tournament. Each round can have different pilots if you wish. Refer to the Tournament Section of the Game Manual.

Engineering Notebook Documentation:

- Engineering Notebooks are necessary for the CREATE Drones Challenge – *your team will not pass inspection without an engineering notebook.* In the engineering notebook students record and document the entire team's thoughts, designs, decisions, actions, failures, and successes throughout the season.

Pit crew:

- After each race, check that all nuts/bolts are tight, all needed adjustments are made to keep the drone, add-on equipment, and the team-built game mechanism functioning properly. Make up a checklist and go through it after each race.

There are many other roles to fill.
Your team will find its own identity as the season progresses.

Team Goals

Keep your team focused on their goals during the season and review after the competition. CREATE Drone Challenge events provide excitement and recognition and celebrate each team's accomplishments.

The true goal has very little to do with winning medals or trophies.

If you can look back at the end of the season and say even one of the following, you have achieved the most important goals:

- We learned how useful and fun math and science can be.
- We did something we didn't think we could do.
- We respected and considered ideas from everyone on the team.
- We figured out how to manage time, deal with setbacks, or communicate ideas.
- ***We had fun!***

Safety

- **Always turn the drone off before turning off the remote.** It is important that the connection between remote and drone not be severed. If it is, the drone will sense the remote is no longer communicating and will start searching for another remote to connect to. This leaves the drone open to accidentally being linked to, and controlled, by a different remote. This creates a safety issue.

- **Decide where your students are allowed to fly the drones.** Drones may not be flown at ANY TIME outside of the netted arena while at a CREATE Drones Challenge tournament. Any infraction of this rule may result in disqualification from a race(s) or disqualification for the entire event at the sole discretion of the head referee. Make sure your students are aware of this rule for in the tournament setting but also the rules your establish for your team regarding where they are allowed to practice flying the drones.

- **Protective eye wear:** Safety glasses should be worn when working cutting or bending metal and at other times when appropriate during the build process. Safety glasses ARE REQUIRED to be worn by the pilots when in the arena or in the pilot's station during a race.

- **Equipment concerns:** Students should be doing actual work on the drone, add-on equipment, and team-built game mechanisms at all times EXCEPT when it comes to power tools and other dangerous or risky tasks. This is where adult's assistance is appropriate. Working with the students in this way is a great teaching moment. Don't just do it for them, explain and teach the students.

Meetings

- **Kickoff Meeting:** Have printed copies of manuals and graphics, rules of the new drone game, and playing field drawings. Brainstorm and come up with a game plan for the new season!

- **Early Season Meetings:** Teach members how to organize the tools and parts according to your system or have the team agree on a system of its own. Label the locations for storing different items. Provide key printed information. Put student names and distribution date on each copy. Discuss the Engineering Notebook. Students will be proud of the contents because they will be sharing them with judges. Have a suitable notebook ready at the beginning of the season.

- **Ongoing Meetings:** Meetings during the season involve building, testing, re-building, and re-testing. Guide the students but do not take over. Be sure to allow time for clean-up and documentation at the end. An entry in the engineering notebook should be made at each meeting.

Learning Environment

- **Problem Solving:** Keep it Simple, Silly = KISS. In the engineering world, simple solutions are much more desirable than complex ones. The complex solution has many more places to fail, is more difficult to repair, costs more, and the operation is less intuitive. Students are sometimes drawn to complex solutions.
- **Engineering Design:** It is important to remember that:
    1. Design is an iterative, ever-changing process.
    2. Effective design involves making compromises.
- **Team Built Mechanism Design:** In addition to moving around the playing field, a mechanical device has to manipulate various objects. What looks simple to humans can be extremely difficult for a mechanical device. In the early stages of the season, coaches often hear the team say, We will simply pick up the gizmo and zoom over there and dump it. Reality quickly sets in after the team begins to experiment with the challenge and begins to understand the difficulty involved.

CREATE Forum

Please visit https://forum.create-found.org/CREATE-drones to visit the online forum specifically designed for CREATE Drone Challenge teams and coaches to ask questions, share ideas, find out about other teams, and share knowledge. By using the forum, we hope that students and coaches can work together to inspire and prepare each other. We want to foster a sense of community between CREATE Drone Challenge teams from across the globe and give them a place to share ideas and knowledge regarding this unique, new competition.

There are official threads designed to allow you to ask questions, and get answers about, the current year's game and game rules. This function is restricted to coaches, but students can read through all this information and post on many other threads.

Students: You will need to register before you are able to post or comment. You will be unable to post or comment in the News or Rules categories but you can view these categories, as well as post and comment in the rest of the categories. If you have questions regarding News or Rules, please contact your coach.

Coaches: You will need to register before you are able to post or comment. Once you have registered, please send an email to tournamentinfo@CREATE-found.org with your forum username so we can add you to the appropriate Coaches usergroup. You will be unable to post in the News category. You will be able to post in the Rules category, as well as post and comment in the rest of the categories. If you have questions regarding any News posts, please contact CREATE at support@create-found.org."

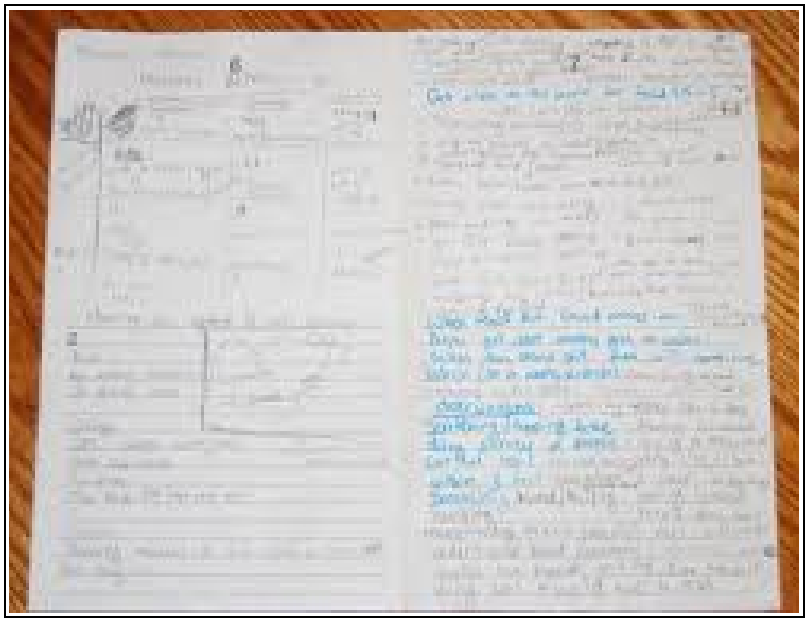
What is an Engineering Notebook?

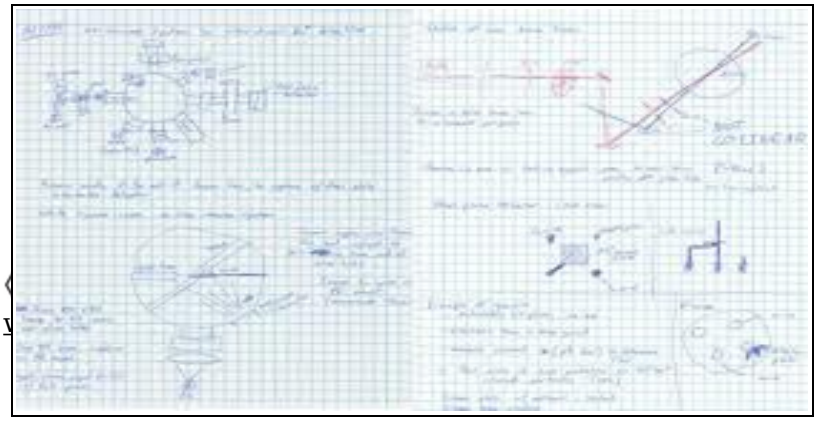
The Engineering Notebook is the story of the journey that a team makes during the phases of the problem definition, concept design, system-level design, detailed design, test and verification, and production. The notebook should be written by the team, not the coach. Throughout the building of your team, you will come across obstacles, lessons learned, and the need to draw things out on paper. This is where you and your team will use an engineering notebook, which will follow your team from kickoff throughout the competition. Judges will review your Engineering Notebook to better understand your journey, design, and team.

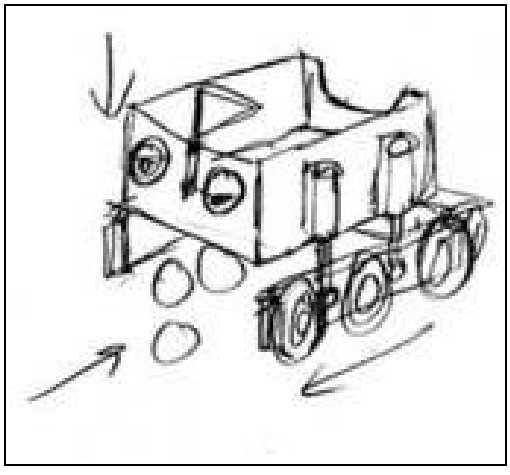
The Notebook Itself

Organize your Engineering Notebook so an outsider will understand your team and journey. Record all designs and changes to your drone add-on equipment and team-built mechanisms directly into your notebook. Include details and sketches if possible. Make notes and calculations in your notebook. Your team number should be clearly marked on the outside front cover. The notebook should be done in ink and nothing should be erased. Any discarded ideas or drawings should have a single line drawn through them. This way you will have a complete record of your journey. The notebook must be 7.5” x 9.75”. Each team will receive one engineering notebook at the beginning of the season as part of their team registration packet.

Notebook Examples







Tournaments

Registration Process

Before you participate in a tournament you must register for the tournament. This is usually done weeks or months in advance. Your team may register for more than one tournament in a season. Since this is the inaugural season for the CREATE Drones Program, the tournament schedule and registration process is still being finalized. **Please check back with CREATE periodically for an updated schedule of events.**

What to Bring

Sometimes, tournament organizers will send you an information packet prior to the tournament which will include some helpful hints on what to bring and what NOT to bring. In general, you should bring your two drones, two remotes, add-on equipment (if applicable), team-built game mechanism, spare parts, extra batteries, tools, a power strip or extension cord, the Engineering Notebook, and enthusiasm. You may also want to bring some snacks and water. (Check with the event organizers before you bring snacks and water. Some venues, particularly large events, do not allow outside food or drinks.) Most tournaments provide concessions.

Tournament Schedule

Arrive early for your race and be ready to go. **Pay attention to the races because the schedule will not be strictly adhered to.** It is your team's responsibility to be ready for your race, even if it happens ahead of the printed schedule. Make sure to leave yourself enough time for Solo Flights because those are offered on a first-come, first-served basis.

Competition Floor

There can be only two students per team, in the pilot's station for each race. Each pilot flies for approximately half the race. All other team members and coaches may watch the races with the audience. When it is your team's race, they will be instructed to go to the field and set the drone in the starting position. Once the race is over, the team should wait until the referee gives them the OK to remove the drone from the arena. They can then return to the team pit for any needed repairs, tweaks, or to rest.

Drone Extraction Breaks (DEB)

If your drone become entangled in the netting during the race, you will have to wait to retrieve it, and any add-on equipment, until a referee calls for a Drone Extraction Break (DEB). At least one member of your team should watching the arena since you do not know when the DEB will be called. When the DEB begins, two members of the team (either two students or one student and a coach) have exactly three minutes to try to extract the drone from the netting. Be sure to bring a screw driver because the only acceptable way to extract your drone is to remove the blades caught in the netting. Care must be take to ensure the netting is not damaged. If in three minutes teams are not able to extract their drones they must leave their drone and try again at the next DEB.

Awards and Judging

Awards are given to the tournament champions and sometimes the tournament finalists. There is an award for engineering excellence and one for overall team performance as well. Refer to the Awards Section of your respective Game Manual. Judges and other tournament officials observe teams all day. Both formal and informal judging is the basis for several awards at the end of the day. Always do your best, even when no one is watching.

Qualification for National Competition

Check with tournament organizers to see how many teams a tournament will qualify for the U.S. Open Robotics Championship Tournament.

Coaches Manual Highlights

Now that you have read the entire Coaches Manual, here are some guidelines and other things to remember:

Coach and Lead

Your job is to organize the team, get the kids started, and then let them take over.

This is a student-driven activity. Keep parents involved, as mentors, teachers and facilitators. Let the students make the decisions and do the work.

Encourage kids to try different ideas. If it doesn't work, re-build it into something else.

90% of progress comes in the last 10% of the time line. Deadlines of tournaments have a way of inspiring students, but try to get things done early so testing and small modifications can occur.

Practice. Practice. Practice. Drivers/pilots can never get enough practice driving/flying.

Organize / Paperwork

Get bins for parts. Fishing tackle boxes work well. So do small tool boxes. Set aside time at the end of meetings for clean up. Don't live in a vacuum. Talk with other teams/coaches.

Tournament Culture

Tournaments are competitive. But this program's culture is one of sharing. It is common for one team to help another to get their drones and team-built mechanisms working just before they compete against each other. We thank you in advance for helping this culture of cooperation and friendly competition continue to grow.

Talk with your alliance partners BEFORE you get to the field. Know what your "agreed upon" game strategy is for that race.

Failure is OK. Learn from it. Robots WILL break down. It's OK if something breaks. It usually breaks in an educational sort of way. Grasp this as a teaching moment.