Electric Vehicle Event Tips

This is a list of suggestions and tips for building a successful SO project. All of these pointers have stemmed from actual observations during previous competitions. If you keep these comments in mind while designing and building your device, you will be more likely to go home satisfied with your experience.

Rules

- **Read carefully and understand the rules absolutely:** If you are not completely clear on what each rule means you will have trouble complying.
- **Check the Science Olympiad main web site for corrections and clarifications:** You may inadvertently violate a rule if you don't take advantage of that information
- **Request rule clarifications of ambiguous rules or others that you don't understand:** Go to the Science Olympiad web site and follow links to the clarification request.
- **Contact the event supervisor for help interpreting the rules:** I cannot pre-judge your device, but I am happy to point out and help you interpret the relevant rules.
- **Pay attention to detail and be sure your vehicle matches exact requirements:** Sizes, configurations, required and prohibited components, start/stop mechanism, etc. Common avoidable oversights often cost points, and in some cases, have won or lost competitions.

Preparations

- **Make a checklist of everything you need and be sure to bring it all:** The best groups come with clever storage systems for organizing and transporting their materials. Double check your list and be sure you don't leave something essential at home or on the bus!
- **Bring a supply kit with extra parts for everything possible:** Transport damage is a frequent issue - bring spare parts, supplies, and tools.
- **Make a checklist of all the preparations necessary to set up your device:** Double and triple check it. It's heartbreaking to watch a device fail because of a simple preparation oversight like an unconnected battery, unprepared energy source, unset adjustments, etc.
- **Division/Organization of Labor:** Break your project into subsystems, divide labor, communicate effectively, understand each other's roles so that your expectations are clear, both in the construction and testing phase, and at the competition. However, be sure the other group member is familiar enough with your role in case they can not attend.
- **Practice Authentically:** When performing the final testing of your vehicle, do your best to replicate the competition environment and rehearse as if you were actually competing. You might be surprised how many details you overlook in practice that are important at the competition. If you practice exactly as you compete, you reduce your chance of confronting time shortages, encountering surprises, or forgetting something important.

Design Considerations

- **Quality over quantity:** A simple device with components that work reliably will usually place high in the standings. Work on designs that have robust components. First priority should be put on making your vehicle function properly so that you can at least score points for accomplishing something. Worry about timing, accuracy and other fine-tuning after you have a fully functional design.
- **Keep it simple:** Simpler approaches often result in more successful projects. Add complexity only where necessary. Finer touches and fancier approaches are nice, but you must weigh that against the reliability of simpler designs.
- **Haste makes waste:** Hurrying through the design, construction, or preparations often ends with disappointment. Try to focus on keeping calm, planning your work, and being organized. These will all contribute to an atmosphere where you can do good work and keep your composure. Often the intensity of the competition time causes teams to rush things. The best approach is to remain relaxed, keep to the plan, and use your head. Prepare as well as you can, make checklists, and double check them. Practice your setup routine under a timer, and try to think of contingency plans ahead of time. Know what you will do if certain problems come up. Reprioritize as needed and try to make the most out of any unfortunate situation.
- **Items that require setting or adjustment should be accessible:** Electrical connections, battery holders, other energy storage devices, parts to position, etc. Build easy access into the design. If your energy sources and adjustments are cumbersome to reach, you risk damaging your machine or triggering components prematurely. These issues can be very difficult to overcome at evaluation time. Also, make a checklist of these items so you don't overlook one of these preparations during set-up!
- **Tidy work is easy to follow and repair:** Spend the necessary time one quality connections, fastenings, craftsmanship and placement of parts. Use color codes. Break into subsystems. Make the device easy to troubleshoot by using an organized design.
- **Do not plan on doing any construction on event day:** This time is for final preparations only. If the vehicle is not finished and fully working when you get on the bus, it will probably not be finished for the competition. This lesson has been learned from consistently watching the painful disappointment of teams that came under-prepared.
- **Build it so it can withstand transportation to the event:** Next to unfinished designs, this is the single most common source of competition-day problems.
- **Duct tape seems like magic but that's an illusion:** Duct tape usually represents the potential for a better solution. Typically the quantity of duct tape is inversely proportional to score. ☺
- **Allow time for testing, redesign and rebuild:** Too many teams show up with what essentially amounts to a prototype. If you test and redesign your vehicle as necessary you will work out the bugs before the competition. Set a completion date well before competition day and use the remaining time for evaluation and reworking your device.
- **Above all, be creative:** Re-assess your thinking when you get stuck. Try to think outside the box. When you get frustrated take a break and come back to it when you're refreshed. This is meant to be a fun and creative learning experience. Try new things, learn from each other, and have fun!

Specific Issues for Electric Vehicle

- **Dimensional Specifications:** Make a checklist of all dimensional requirements in the rules and double check that your device meets them—both in the design phase AND in the competition preparations: We will measure ALL dimensional requirements and those that do not meet the specifications will be subject to penalties as dictated by the rules. No matter how close you are, or how inconsequential the rule or deviation might seem, either your device meets the requirements or it doesn't. These are not negotiable rules.
- **Activation Mechanism:** Accuracy is paramount in this event. Unfortunately many past designs for the mechanism that starts the car have been poorly designed. Most importantly, make sure it works reliable. If the action requires lateral force it may mis-align the car causing inaccurate tracking down the course. Try to employ a mechanism that is easy to operate and has minimal friction without risk of misfire. If possible, use a design that it requires *downward* force which will minimize the chances of vehicle misalignment. Light-weight and low-friction vehicles are most effected by this issue because they have little inertia to resist the force required for the starting action.
- **Battery Management:** Both alkaline and rechargeable batteries behave differently at different states of charge. Be sure you plan for varying battery state during design and competition. Manage your battery power well, and know how to adapt to varying conditions.
- **Decelerate slowly:** Relying on track surface friction is banking on an unpredictable variable. Vehicles that decelerate slowly place less reliance on surface friction. Practice on a variety of surfaces, we make no guarantees of what exact surface the competition will be held on.
- **Track/Environment Specs:** Make no assumptions about the track or environment that are not specifically dictated in the rules! Modifications to the track surface will not be allowed and requests to change it will not be honored. Here are a few examples brought on by past issues (but by no means an exhaustive list of potential pitfalls):
    - *One-inch tape will be used to define the track's center, the Starting Line, and Target Distance (finish line).* This means that the tape can be any color or any thickness. It can be made out of anything. In fact there's no provision that suggests it even has to be visible. Think about these things before you customize your design around any assumed parameters.
    - *The track will be on a smooth, level and hard surface.* This means the surface could be a floor made of a variety of materials. However, this loose definition also allows for the surface to be made of ice, Teflon-coated, elevated, magnetized, painted any color, etc. While we will do our best to provide a reasonable surface free of as many interferences as possible, you can not afford to make any assumptions about what it will be exactly.
    - *At the event supervisor's discretion, more than one track may be used. Teams will be given the option to choose which track they will use..* This does not mean that a team can request a different track if the they do not like the one provided. The event supervisor is not required to offer more than one track, and has sole discretion over its design as long it complies with the specifications. In any case it will be determined ahead of time and is not negotiable at any time.
    - There are no provisions about ambient light, sound, wind, vibration, etc.

Learning opportunities in this Event

- ❑ Teamwork
- ❑ Project management
- ❑ The “sacred loop” of design: Plan, Design, Build, Test, Repeat
- ❑ Hands-on skills
- ❑ Education on concepts used
- ❑ Sense of accomplishment
- ❑ Competitive spirit
- ❑ Fun!

All of these resources and many others are available at the event supervisor's web site

http://www.ee.nmt.edu/~tubesing/electricvehicle

- Event day policies
- Success tips for participants
- Score Sheets
- Links to other resources
- Contact info for national SO resources and clarifications, and the state event supervisor

Event Supervisor:
Please feel free to contact me any time for help with your preparations. Most of the questions I get are related to rule interpretations. While I can not pre-judge your ideas or devices, I gladly provide guidance to help you interpret the rules or point out where to look for your answers.

Andrew 'Otis' Tubesing, Laboratory Manager
New Mexico Tech - Electrical Engineering
801 Leroy Place Socorro, NM 87801
tubesing@ee.nmt.edu
http://www.ee.nmt.edu/~tubesing
(575) 835-5205 Tel
(575) 835-5332 Fax