

# Getting Started

**W**ith many projects, getting started is the hardest part. Not so with combat robots. You're probably already brimming with ideas about weapons and strategies. Before you get too far down the path of deciding what material to use for the armor, and which drive motor to buy, consider the points in this chapter and make sure that you're going in the right direction. We will answer some of the questions you may have about the process, including how much this will cost, and how long it will take, and give you a basic idea of what you're getting yourself into. As I mentioned in the introduction, it's a bit different than it appears on TV.

## Getting Your Ideas on Paper

Before building anything, you've got to start with a picture or description of your idea. Most builders already have an idea in their heads for a specific weapon. Maybe you have more than one. Write them all down. Perhaps it's a new twist on something you've seen out there, or a combination of ideas. In the case of my robot Deadblow, inspiration came from a hammer robot called Thor that I'd seen at the Second Annual Robot Wars (San Francisco, 1995). The robot had genuine personality. It seemed excited as it fired its hammer, bucking wildly around the arena, while also commanding fear and respect with its deadly amount of power. Whatever your inspiration, it's important to put your plan down in writing. You don't have to create a dimensioned drawing or a fully rendered CAD (computer-aided design) model. Cocktail napkins and the backs of envelopes will do.

### Tip



One of the more challenging aspects of the sport is coming up with a catchy name that hasn't been used before. You can use [www.nameprotect.com](http://www.nameprotect.com) to see if your choice has already been taken.

## Pick Your Battles

The next step in the process is to select a competition to enter. The main reason you need to choose your competition so early in the process is that you've got to see what the weight limits are and what weapons are allowed. Before spending weeks and months pondering a weapon, it's a good idea to make sure that it's legal. The rules are different for every competition. What

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might be allowed at one event may be strictly prohibited at another (flame throwers, for example). Also, the rules change slightly from season to season. You should start by locating competitions that are available to enter. Then weigh the cost of hotels, entry fees, and other expenses. Finally, revise your ideas based on the rulebook and weight limits.

### Finding the Events

Robot combat has gained widespread popularity in recent years through television coverage. At one time, there were three major televised combat robot events: BattleBots, Robot Wars, and Robotica. BattleBots was easily the largest of the three events in the United States, with hundreds of competitors each season vying for the coveted spots in the televised rounds. Since then, however, things have changed a bit, and BattleBots and Robotica have gone off the air, while Robot Wars continues both domestically and in England. More information on Robot Wars can be found at their Web site at [www.robotwars.com](http://www.robotwars.com). BattleBots is currently negotiating with other networks and exploring the possibility of hosting another live event. Updates and information can be found at their Web site: [www.battlebots.com](http://www.battlebots.com). Unfortunately, Robotica is pretty much a part of robot history now.

Where will you fight? Most of the builders in the sizeable U.S. fighting robot community have turned to untelevised regional combat events. The *Robot Fighting League* (or RFL) comprises over 20 large and small regional events, banded together under one central organizational structure. Events are hosted in states all across the country, including California, Arizona, Nevada, Minnesota, North Carolina, and Florida. There is a unified rule set that can be scaled to the size of each event's arena. More information is available at their Web site, [www.botleague.com](http://www.botleague.com), as well as a schedule of local competitions.

### Competition Costs

In deciding what competition you want to enter, logistics is usually the determining factor, since all competitors are responsible for their own travel and accommodations, as well as any entry fees and shipping costs. I'm sure you'd love to compete in a regional event in Los Angeles, but if you live in Miami, then you've got to consider airfare to the West Coast, shipping for the robot, and food and lodging during the competition, all of which could add up to more than the cost of your robot. I would target local events first. You don't have to travel far, and it will give you a taste of the combat experience.

### Check the Rules

Don't just read the rules. Know them. Having a good grasp of the rules will save you from wasting precious time and effort on something that's illegal. Don't develop your design without knowing what's allowed and what's not.

Follow the rules. They're there to ensure fairness, and more importantly, to protect you, other competitors, and the audience from weapon systems that exceed the arena's capabilities, which could cause an injury. This isn't a sandlot sparring match behind the school at 3:00. Break the rules and you won't be allowed to compete.

## Questionable Weapons

You'll find that what's allowed or prohibited is pretty clearly spelled out in some rulebooks, while others are a little vague. If you have an idea that's not specifically disallowed, but seems borderline, it's best to contact the competition's organizers and get a ruling from the source. Most, if not all, organizers are open to exploring fresh, new ideas that may not fit into established guidelines, as long as they can be done safely and don't cause any harm to the builders, the arena, or the audience. Remember that the organizers will ultimately determine if you can compete or not, because they're liable if something goes wrong.

This is not to say that you should bother them with *every* idea that you have, only *borderline* cases. If the rulebook says, "no explosives," don't e-mail them and ask if you can use explosives. Likewise, if a weapon clearly falls within established parameters, you won't need approval.

## How Long Will It Take?

One thing that first-time builders often underestimate is how long it takes to build a robot. It will take a while before you will be able to compete. You can't go to "Joe's Used Robot Lot" and purchase last year's model with low-low financing (although a few robots have been bought and sold on eBay). These things are built from scratch, and as a rule of thumb, you will always have less time than you need, due to those pesky day jobs that cut into valuable robot-building time.

You should consider robot building a journey. Like any journey, it doesn't happen overnight. It will take *weeks* and *months* to finish. And then, as any veteran robot builder will tell you, it's only finished until *after* competition. Then, the process of repair begins, and inevitably, the robot evolves into something else, as you have the opportunity to go back and fix those few small things that were bugging you during the competition, and try new and better parts and designs.

The most important goal for time management is to try to finish before the competition. You must allow time for testing and fixing the robot (from your testing) before the event. Let me say from personal experience that finishing your robot in the pits *sucks* and is to be avoided. (A description of my rookie year experience can be found in Chapter 20, "Going to a Competition.")

In truth, fabrication time depends on your access to tools and your experience. The more you build, the more familiar you become with the tools, and the faster you get. You shouldn't be in a rush when building the robot, however, because rushing and cutting corners lead to accidents and injury.

You also need time to practice driving. Driving is what wins and loses matches, because it allows you to bring your weapon into contact with your opponent, while escaping theirs. Without any practice, how can you expect to drive well under pressure?

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### How Much Will It Cost?

Building a competitive robot isn't going to be cheap. If you do it cheaply, you may be putting yourself at a disadvantage compared to others who have more resources than you. As with any competitive sport (like auto racing, for example), higher-performance parts cost more. Another rule of thumb is that bigger robots are generally more expensive. A bigger robot means bigger motors and speed controls, more batteries, and more materials overall, all of which inflate the cost. If you have no experience and little money, then it's best to start small, and avoid the superheavyweight category until you've built up your skills and have more disposable income.

I would set aside a minimum of \$3,000 for parts and materials to build a competitive lightweight (60-pound) robot. Add to that another \$1,500 for each weight class you step up. Also, this does not include the cost of purchasing power tools and other equipment you'll need to construct the robot. Of course, these estimates could vary wildly, depending on what type of armor you use, if you already have a competition-legal radio system, and whether you have a weapon system that uses pneumatics, hydraulics, or a very large and expensive electric motor. Bear in mind that there is no limit on the amount of money you can spend on your robot, and some teams have spent \$40,000 or more on a single robot (many accomplish this by enlisting sponsors).



**Tip**

The Law of Good, Fast, Cheap: pick any two. Prefabricated custom parts for robot combat can save you a lot of time engineering a motor bracket, or a bearing mount. Unfortunately, as the law predicts, they tend to be expensive.

You may be intimidated facing a big team with a lot of resources. It's true that not everyone has a large chunk of money to dedicate to this sport. That's okay. Here's the catch: Simply having expensive parts doesn't guarantee a victory. An expensive robot can face defeat just as easily as an average one if it's not thoroughly tested, or if the driver hasn't had enough practice time.

### Other Tips to Keep the Process Moving

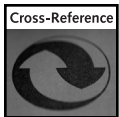
Here, you can find some general organizational techniques for keeping the design and building process moving smoothly, as well as some tips to keep you out of trouble that are often overlooked (even by veteran builders), like keeping track of your weight and ordering parts early.

#### Keep Track of Your Weight

The number one thing that makes builders scramble at the end of the build process is having an overweight robot. (You'll hear me mention this numerous times throughout the book.) In order to prevent (or at least minimize) the scramble, you've got to start your design with the weight limit in mind, and be aware of it at all times. Be as stingy as possible with your weight, and you won't end up horribly over the limit at the end. Keep a running list of your parts and their weight. You should be able to tally the weights of all your parts and armor at any time, which will help you make decisions about lightening other parts.

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Remember that your weight is a fixed limit, and you've got to stick to it. Each item that you add to the robot's design eats into that budget. Novice designers and casual observers often wonder why you don't just put a saw on every side or a hammer on the front and back. These things require weight. Extra weapons mean less armor, or battery capacity, or motor power, and the best robot designs balance these categories to avoid weaknesses.



Chapter 4, "Selecting Materials," tells you all about how to calculate the weight of any given part, and the effect that choice of material has on the weight of a part. Since weight is such an important part of design, most (if not all) of the parts mentioned in this book also include their weight as part of the discussion.

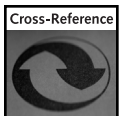
### Leave a Paper Trail

All construction diagrams and notes should be dated, so you can track your changes. It may seem simple enough to keep track of now, but things can become impossibly confusing as you get further along with construction. Designs often change from the original concept, and most of the time, more than once. If you move a bracket, for instance, referring to an old diagram could cause you to drill a bunch of holes in the wrong place, possibly making the part unusable. I usually have a dimensioned sketch or CAD drawing for each part that I make notes on. All that confusion can easily be avoided by taking a few seconds to put a date on a piece of paper.

### Order Materials Early

Order your materials early in the process. They will take at least a few days to arrive. It's murder when you can't continue working on a part because you forgot to order something that you need. Waiting around for parts, especially when you're on a tight deadline, is a drag.

Before placing an order, read the manufacturer's catalog thoroughly, and make a list of parts. Make sure you've got all the correct (and complete) part numbers. Also have a backup choice if (gasp!) your part is out of stock, which happens occasionally, even with huge suppliers like McMaster-Carr. Keep the catalog nearby for reference when you call your order in. Being prepared will help you feel much less like an idiot if there are complications. Keep all of your parts lists in one place. All you need is an envelope or folder in which to collect them separately from your other notes. You'll surely need to refer to them again during the build process to get more of something that you've run out of (screws, for instance) or to source parts for another robot in the future.



Appendix D describes the Web sites of various online vendors for robot parts, while Appendix E lists the contact information for mail-order companies that have catalogs that are useful in robot building.

### Make a Master To-Do List

Sit down and compose a list of things to do for every system in the robot. Sometimes it's hard to track your progress, and the task may seem daunting. As I mentioned earlier, it's a pretty

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long process. It will take more than a few weekends to complete. Having a running checklist of steps to perform gives you a little morale boost each time you complete a task and cross it off, helping to keep you motivated. Updating your lists can also help identify and prioritize the items that need more attention than others.

### Document Your Progress with Pictures

You should take pictures of your robot as you built it. This will be important later on, if you decide to build a Web site. Right now, you may not feel that you'll want to have a Web site for the robot, but you should give yourself that option. Not only will you be able to share your experiences with other builders, but you can also direct potential sponsors to the site, so *they* can see all of the work that you've done.

It's always more interesting when you can see what went into the finished product. Try to capture at least the beginning and completion of each step. You don't have to get bogged down with documenting every little detail (although I'm sure some builders would appreciate it). Just keep a camera nearby so you can snap some shots of your work in progress here and there, when the opportunity presents itself.

### Wrapping Up

This chapter has given you the basic rundown of the process of designing and building a combat robot. Things may still seem a bit vague at this point, but hopefully, you now have a better idea of what will probably be required of you, in terms of both time and money. If you're willing to accept the challenge, you will be rewarded with the feeling of accomplishment from having built something yourself.