

# How to start designing and building a 12lb Fighting Robot.

By Peter Smith

The 12lb “Hobby Weight” fighting robots are one of the most popular and fastest growing classes in this exciting sport. They are big enough to look and even sound like the bigger bots that appeared on the TV shows whilst being much cheaper to build and enter into events.

The first stage in designing any Bot is to look closely at the competition. Go to events, if possible, to see what works and what doesn't. Study the rules for the class, most events use the Robot Fighting League (RFL) rule set (available at [www.botleague.com](http://www.botleague.com)) and probably most important of all is to visit the RFLs forum, starting at [www.botleague.com/forum.asp](http://www.botleague.com/forum.asp) to get first hand advice from real builders.

There are many other websites that offer specialist robot parts, [www.banebots.com](http://www.banebots.com) , [www.robotcombat.com](http://www.robotcombat.com) and [www.battlepack.com](http://www.battlepack.com) for example and others like [www.cncbotparts.com](http://www.cncbotparts.com) and [www.teamwhyachi.com](http://www.teamwhyachi.com) that can provide those and also specialist machining and other engineering services. Finally there are even websites like [www.inertialabs.com](http://www.inertialabs.com) and [www.rollingthunder.com](http://www.rollingthunder.com) which offer battle proven designs in kit form.

The next step is to decide what type of Bot to build. It is tempting to jump straight in and try to build a Bot with a big spinning blade or a pneumatic flipper but I would advise any first time builder to start with either a “Wedge” or a “Brick”. There are several reasons for this. Firstly, they are fundamentally simpler than any Bot with an active weapon, therefore easier to design, build, and maintain. Secondly, they are safer and much less likely to cause injury to a young or inexperienced builder or driver. Lastly, they tend to be tougher and are more likely to keep working during fights and survive to fight another day.

To compensate for the lack of a weapon you will need to combine good speed, power, maneuverability, and armor. This requires careful choices of drive motors and gearboxes, electronic speed controllers (ESCs), batteries, Radio Control equipment, and finally what materials to use for the chassis and armor.

1. Drive Motors and Gearboxes. These combine a small electric motor with a gearbox. Good choices would be converted cordless drill motors (good Cordless Drills are available for as little as \$16 from [www.harborfreight.com](http://www.harborfreight.com) or ready converted from [www.teamrollingthunder.com](http://www.teamrollingthunder.com) ), or the 25:1 36mm 545 motors from BaneBots or the TWR18 from Team Whyachi. All of these will give good speed and power when combined with 3” to 4” wheels and the right battery pack.
2. Electronic Speed Controllers. The BB-12-45 from BaneBots or the Scorpion XL from [www.robotpower.com](http://www.robotpower.com) are popular choices. The latter is an all-in-one unit that combines two ESCs and a mixer on one board. You would need to

add a mixer (or mix using a computer transmitter) when using a pair of the BB-12-45s but their small size lets them fit in tight spaces.

3. Batteries. Packs of 14.4V – 18V (depending on your choice of motor voltage) GP2000 NiMH cells are ideal for this weight class giving plenty of current when required and enough capacity to last the longest fights. These are available from [www.battlepack.com](http://www.battlepack.com) . It is possible to use cheaper hobby packs, connected in series, such as those sold for RC cars but they tend to be heavier for the same performance. You will also need a suitable charger for your pack.
4. Radio Control. Whilst many events will allow you to use cheap 27MHz AM and FM transmitters on non-weapon Hobby Weights, it is probably better to get a 75MHz FM set (you will not be allowed to use 72MHz RC aircraft equipment). Added features are built in computers that allow mixing and also PCM, which is a requirement for most bots with weapons.
5. Materials. 0.25” polycarbonate (one brand name is “Lexan”), 0.25” UHMW and 3/16” aluminum are popular choices for chassis materials and all are easily cut, drilled, and tapped using hand tools. 0.08” – 0.1” thick titanium is the ideal choice for armor. It too can be hand cut and drilled but takes this takes more skill and better equipment.

It is vital that you keep an accurate track of the weight of the parts you choose and design. Many excellent designs have had to make serious compromises when they discovered that they were over the weight limits just before their first competition. A computer spreadsheet program like “Excel” is ideal for doing this. The actual part designs can be done on paper or using one of the many computer aided design (CAD) programs that are available. I usually use a professional grade package called “SolidWorks” which I can recommend but there are many other that are much cheaper and that will do the job almost as well.

Do your research first, don’t be afraid to ask questions and listen to the advice offered then there is a good chance that your first Bot will be successful. One last piece of advice, try and complete your build well before your first competition and get lots of driving practice. Good driving has won more fights than great design!

Another useful site is <http://tcr.architeuthis-dux.com/> in the “tools” section there is an excellent calculator for working out which motors, gearing and batteries to use. There is also a link to a Kinetic Energy calculator. This will let you try out different designs of spinner weapons to see how they compare with each other and the total weight etc.