

The RCRC Prop-wash..... February 2010

River City Radio Controllers

E. P. "Tom" Sawyer State Park
Louisville, KY



A.M.A. Gold Leader Club #1263

www.rcrcky.com

IMAA Chapter #751

Club Meeting:

E.P. "Tom" Sawyer State Park
Administrative Building
7:30 PM - 1st Wednesday of each month

Training Night

E.P. "Tom" Sawyer State Park
The RCRC KY Airfield
6:00PM to dark - March through October on
Mondays during daylight savings time

Officers:

President	Bill Fluke
Vice Pres.	Tim Evans
Treasurer	Jim Schroder
Secretary	Tim Hardin
Safety	Doug Bailey

Upcoming Events:

March 3 -	General Meeting – 7:30PM Sawyer Park Admin Building
March 23 -	Board Meeting – 7:00PM Sawyer Park Admin Building
March 5-6 -	Perry, GA swap meet
March 27 -	RC Trainer building workshop
April 9-11 -	Toledo, OH – Weak Signals RC Show

Board Members:

Doug Bailey
Doug Blakeman
Travis Collard
Tom Hohman
Jim Trombetti

The Take-Off...

March is here and it won't be long before the gates at the airfield will be open on a daily basis and airplanes will once again be filling the sky over E.P. Tom Sawyer Park. Jenny and I stopped in at the field a couple weeks ago to find the driveway and parking lot still covered in deep, slushy snow; but the runway was almost clear. I actually enjoy the snow and look forward to pushing it around with the tractor; however, I've had enough snow this past month and can hardly wait for spring to get here. Once spring finally arrives, I'm sure I'll be eating my words when I have to start mowing the lawn on a weekly basis again....



FYI - the trainer program will be starting on Monday evenings in the next couple of weeks. Mark your calendars such that when daylight-savings time begins, Monday evenings will be closed to general flying beginning at 6:00PM to instruct and train new pilots. On another note, you may have already heard that the club intends to “tighten” compliance and enforce the safety rules that govern flying at our field. Please be aware of this and familiarize yourself with both the RCRC club rules *and* the AMA Safety Rules. They were included in the January 2010 Prop-wash and members will be expected to comply with these rules. They are in place to protect you as well as the other people using the park, and those who live near and adjacent to the field. Be safe and have fun!

February 2010 General Meeting Highlights...

It’s been noted that our club has become somewhat lax in enforcing the AMA safety rules and some of our own club’s rules governing safe flight at our field. Steps are being taken to see that these rules are being followed by pilots flying at the RCRC field. This year, the club will be strictly enforcing the rule that each pilot flying at the RCRC airfield will be required to place his/her 2010 AMA card (with current RCRC club decal/bar code) in the pin box and have the appropriate frequency pin attached to the radio or his/her person (visibly displayed) when flying any aircraft. **THIS INCLUDES 2.4 GHz RADIOS.** This rule is to be followed even if you are the first person in the gate and are the only pilot flying at the field. Doug Bailey, club safety officer, will be issuing citations of \$2.00 per offense and loss of flying privileges for the day. Most likely, the first offense will be a warning; however, all offenses will be tracked and recorded. If a pilot is caught operating an aircraft without placing their card in the pin box and/or having an appropriate frequency pin in possession for a third time, the pilot will lose flying privileges for one week. Successive offenses after the third offense will be dealt with by the board.

ATTENTION ALL PILOTS

Consequences of Card & Pin Violation

1st violation: \$2.00 fine and No Flying rest of the day

2nd violation: \$2.00 fine and No Flying rest of the day

3rd violation: \$2.00 fine and No Flying for 1 week

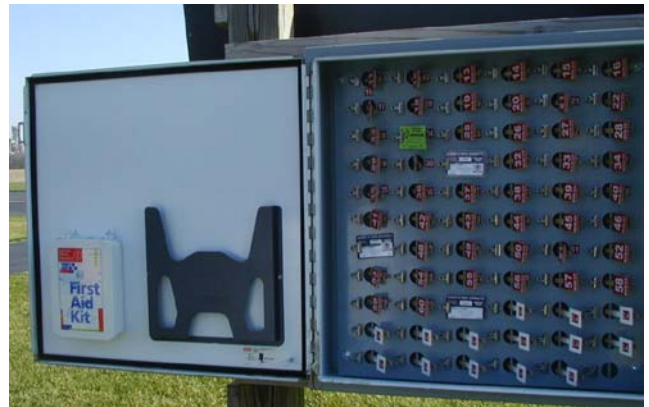
Last year, club members lost a couple of aircraft, some of which flew out of the park’s property. The park ranger was contacted by one home owner who found an airplane in his yard which had no identification or contact information of the aircraft’s owner – either in or on the plane. An AMA rule stipulates that the pilot’s name and contact information is to be affixed to the aircraft. Beginning this year, all club members will be required to place their contact information into each aircraft that is flown at the RCRC airfield. The AMA sells a decal (like that on the right) as a 10-pack for a cost of \$1.25. I am looking into creating a template that could be downloaded from the RCRC website in which club members could fill in electronically; or simply print out and write their information on, to put inside the aircraft.

Jim Schroder and Loren Kloft prepared paperwork to submit to the AMA for field-improvement grants. The paperwork has to be submitted by early March. Up to 10% of the cost of a project can be applied for grant/reimbursement (up to \$1,000 total per year). We submitted paperwork for both the cement slab in



the pit area as well as the new safety fence. If both projects are selected to receive funds from the AMA, RCRC could be looking at receiving close to \$1000 to apply toward other field improvements, etc.

Loren Kloft provided some pricing information on potential pin box replacements. We are looking to obtain a larger pin box to hold additional 2.4-GHz pins, as well as the first aid kit and hopefully a fire extinguisher. Whenever anyone is flying – the pin box should be unlocked (opened) to hold the pilots' AMA cards and to allow quick access to the first aid kit or fire extinguisher if ever needed. Since the February general meeting, Bill Beach ([Ohio River View RC Flyers](#)) has pledged to donate a new pin box to the RCRC club/airfield. The Ohio River View RC Flyers will be hosting the National Scale Masters later this year and we (RCRC members) will be helping out where we can in this event.



The “Trainer Assembly Workshop” has been set for March 27th and will be held in the basement of the Sawyer Park Admin Building (the same building where the general meetings are held). The workshop will run from 10:00AM to 5:00PM and will be directed by Tom Hohman.

The sanctioning paperwork for the RCRC “Wings for Kids” air show has been submitted to the AMA. Meetings to prepare for the RCRC club’s annual Kosair Charities fund raising event – the “Wings for Kids” air show will start taking place in early March and will be held every Tuesday evening as needed. More information will be coming in email and the next news letter. Please consider helping out this year if you can spare a couple of hours to do so. Last year, the RCRC club raised \$12,500 for this charity and the money is used for a good cause.

The lease for the field is coming due again. It is hoped the cost will remain the same as last year - \$5 per member (included in your yearly dues).

We will be pursuing the foamy jet build a little later this spring. Detailed information can be found in the “Features” section below.

It was decided that the RCRC club will no longer be the sponsoring club for Lewis Patton’s Jet Show which is held down near Springfield, KY.

Finally, Hobby World re-opened its doors under new ownership in February. Scott Kimble and Rob Schryver donated a Tower Hobbies trainer to the RCRC club to help train new pilots in the Pilot Trainer program held Monday evenings - March through October. Bill Fluke, RCRC Club President accepted the donation of the new trainer. The store hours are Mon-Sat 10AM – 7PM and Sunday 12PM-6PM. The store has a small building area for modelers to work on planes and helicopters, and are planning a “Pilot’s lounge”. The store is located at 104 Vieux Carre Drive, Louisville, KY 40223. It is just off Shelbyville Road, just east of Hurstbourne Lane. The telephone number is (502) 749-7879.



RC Shows

Several RCRC members went to a swap meet in Dayton, OH in February. I came home with a Great Planes .40-sized "Patriot". It required quite a bit of cleaning – especially to free the barrel of the carb as it hadn't been flown in a couple of years. I swapped out the RX and battery, repositioned the On/Off switch and added a charging jack to the side of the fuselage. The plane is pretty much ready to fly now. I doubt it will be the first plane I fly this season, but I am looking forward to taking it over to the field to see how she runs and flies. Hopefully the wife won't read this and see that I had the plane on the island in the kitchen one day!



Tech Tips...

Jim Trombetti provided some additional "electric-flight information" as a follow-up to information he provided in the August '09 Prop-Wash. It could come in handy should you decide to participate in the club's foamy F-22 build this spring!!!

Understanding the Electronic Speed Control

By Ed Anderson

Amended - 11/2008

When we look at model airplanes that have electric motors as opposed to liquid fuels, the things we notice first are the quiet electric motor and the battery. However there is a component that sits between them called the electronic speed control that is really the master control point for all power in the plane. We are going to look at its make-up and how it does its job.

On the surface we can see that the electronic speed control, the ESC, takes over the function of the throttle servo that would operate the carburetor in a glow or gas powered plane. Just as the throttle servo controls the speed of these wet fuel motors, the ESC controls the speed of the electric motor. But there is more to it than that.

The first thing that we want to recognize is that there are two different kinds of ESCs that are specific to the type of motor they control. There are brushed motors, such as the speed series or the Mabuchi motors, and then there are the brushless motors. Each type of motor needs a different electronic speed control.

Understanding the Wires

When you look at an electronic speed control, you notice that you have three sets of wires. Typically two sets of thick wires and one set that looks like a servo wire.

Two of the thick wires, typically black and red, connect to the battery. The ESC will usually be marked to tell you which are the battery wires. They would connect to the battery as red to red and black to black.

A second set of wires, typically thinner than the battery connection wires, has a plug on the end that looks like a servo plug. This will be connected to the receiver and will serve two purposes as it sends power to the receiver and gets signals from the receiver.

If we look at the wires on this plug they usually run from a dark or black wire on one side to a light or white wire on the other side. I am going to use black, red and white for this discussion. Yours may be dark brown, orange, yellow or something similar.

The black and red wires feed power to the receiver which in turn distributes power out to the servos and other accessories that are plugged into the receiver. Note that the red wire is in the center. This is the power wire. Since it is in the center you can insert the plug into the receiver either way and nothing bad will happen. You won't get any response from the servos if you put it in wrong, but you won't damage anything. Note that, on some older systems, particularly Airtronics radio systems, the red wire was on the end. If you plugged it in the wrong way it could damage the receiver and possibly the servos. However the center red design has been fairly universal for many years.

The third wire, the white wire is the signal wire that sends commands from the receiver to the ESC to tell it how to control the motor. As you move the throttle control on your transmitter, the receiver gets the command and passes it up the white wire to the ESC so it knows how much speed you want from the motor.

There is a third set of wires that go to the motor. The ESC is usually marked to show which wires are the motor wires. If this is a brushed motor ESC then there will be two wires, typically red and black.

On a brushed motor ESC, if we connect red to red on the motor, and black to black, the motor will turn in the expected direction. If we reverse them the motor will spin in the opposite direction.

On a brushless ESC, you match color to color as well. However if the colors don't match then you need to observe the direction of the motor. If it is spinning in the wrong direction, reversing any two wires will correct this.

Note that on some older brushless motors there were additional wires that attached to a sensor in the motor. However, unless you have an old motor and ESC combination you won't see that on any of the current designs.

Some ESCs have an integrated switch. In most cases this will allow or prevent the motor from running and pass or block power to the receiver. However it typically does not stop the flow of current from the battery to the ESC. In fact, even if there is no switch there is always current flowing to the ESC which will drain the battery.

It is for this reason that you should never leave your battery connected when you store your plane. This small current drain will take your battery to zero charge over time. If you are using NiCd or NiMh, the damage may be minor. If you are using Lithium batteries, your lithium battery pack will likely be ruined. So, don't leave your battery connected unless you are preparing to fly.

Connectors

The connector/plug that goes to the receiver is standardized. It is the same wire scheme and plug type as is used for the servos. Today all makers, except Futaba, use the universal plug.

On the Futaba J plug you have the same wiring scheme but there is an extra tab on the plug that insures the connector is inserted properly into the receiver. If you have a receiver that accepts this slotted plug it will also accept universal plugs. However if you have a receiver that expects the universal plug, then you will need to trim off this tab with a hobby knife or you can sand it off. Once trimmed, the plug will work fine.

Battery and motor connectors are not as simple.

There is an emerging standard for motor/ESC connection on brushless motors. The connectors are round and are called bullet connectors. Most brushless motor/ESC makers seem to be using these now, so on brushless motors this connector standard seems to be established. However, for brushed motor connections there is no standard.

On the motor side we have the option of not using a connector as we can solder the motor and ESC wires together. This works fine if you don't plan to remove the motor or the ESC and it gives the best connection. However if you do have to remove one of them for service, you will need the soldering iron in order to take the connection apart.

On the battery side we always use a connector so that we can remove the battery for charging and storage. When flying electric planes it is common to have several battery packs so the connector allows us to remove one pack and insert a fresh one while the first is charging.

Whatever battery or motor connector you use, make sure that it has a current, amp, rating that is larger than what the motor is likely to pull. The reason the wires for these links are thicker is that the battery has to deliver high current to the motor as opposed to the relatively small current that goes to the receiver. If the connector can't handle the flow, it will heat up and potentially be damaged. Likewise, if the connector can't handle the current the motor will never develop full power. Too light a connector can also cause a serious voltage drop.

This lack of standards leads to situations where you buy a motor that has one connector, your battery has a different connector and your ESC has a third type. Or, as seems to be becoming more common, none of them have connectors and you have to add your own.

My suggestion is to standardize connectors. Once standardized, any motor or battery connection that doesn't have your standard connector gets a connector replacement. It takes time and soldering but with one standard, all of your batteries will work in any plane for which they are appropriate and you can move motors and ESC around as you desire.

This will also simplify your battery to charger connections. One or two adapters for your charger will handle all of your batteries. Just make sure the connector you use can handle the current.

I have three standards. For brushless motors, I use the bullet connectors. For brushed motors and batteries in very small light planes where the current will typically be under 5 amps, I use the red BEC connectors. These are sometimes called GWS connectors as they are common on GWS motors, batteries and ESC. They are small and light and are well suited for small light planes.

For my high current applications I use the Deans Ultra connectors. They can handle up very high currents, are easy to solder and can be easily removed and reused. However there are many other high current connectors that are equally as good. As long as it can handle the current flow, it will be fine.

Sizing an ESC

Electronic Speed Controls are sized according to how many amps they can control and the voltage that they can handle. So you may see an ESC marked as 20 amps and 7-10 NiXXcells or 2-3 cell Lipo. That says it can handle a 20 amp flow using a battery pack that ranges between 7.4V and 12 volts. If you use it with a motor/battery system that is outside this range it will likely fail. When it fails it may simply not run the motor or it may also cut power to the receiver, which will lead to a crash.

You size your ESC according to the motor and the battery you are using. I won't go into how we determine what the motor and battery will need. That is covered in another article. It is enough to say that, if your motor is going to draw 20 amps you will need an ESC that is rated for at least 20 amps. There is no problem having an ESC that is rated for more amps than you need, but an ESC that is rated below the expected current load will likely lead to a failed ESC.

The same goes for the voltage. Use your ESC outside the voltage it is designed for and you can expect it to fail.

Your ESC will likely have an integrated battery elimination circuit, a BEC. This is the part that delivers the power to the receiver. Always check the specs for the BEC. While the ESC might be able to handle 14.4 volts, the instructions may say that for uses above 11.1V you may have to disable the BEC. There is a complete article on the BEC, so I won't go into it here. Let's just say you need to check this.

I recommend that you always have at least a 20% margin between the amp requirements of your motor and the rating of your ESC. This way you will know you will not be overloading the ESC. A bigger margin is also fine.

How the ESC controls the Motor

Motors are rated by Kv, which means the number of revolutions the motor will turn when you apply 1 volt of electricity. So a 1200 Kv motor will spin at 12,000 rpm if you apply 10 volts.

From this you might imply that the ESC changes the voltage to the motor in order to change the speed of the motor, but that is not the case. If you look at the specifications for your ESC you will probably see a frequency number. This might range from 2 KHz to 12 KHz or higher. This is related to how fast the ESC can pulse power to the motor. You see your ESC is not a variable resistor that adjusts the voltage to the motor, it is a fast switch that pulses power to the motor.

You can think of this as a duty cycle control. How long will the ESC leave the power on till it turns it off? Then, how long will it be off before it turns it back on? There is no need for you to know this cycle time, only that on every on cycle your motor is getting the full voltage of your battery.

I take the time to explain this because people mistakenly believe that if they run their motor at partial throttle they are sending reduced voltage to the motor. If the motor is not supposed to get more than 7.4 volts and you put in an 11.1V battery, running the motor at 1/2 throttle does not reduce the voltage to the motor. It is getting 11.1V hits every time the ESC switches on. On a brushed motor that is receiving too much voltage, this will typically produce arcing which will bum up the brushes on the motor. In addition to this arcing on brushed motors, this higher electric pressure may push too much current that will overheat the motor.

If you have had a motor “bum up” even though you usually ran it at a partial throttle setting, this may be the reason. Understanding how the ESC controls your motor will help you diagnose problems.

Note also that, since the ESC is switching power on and off it is also producing electromagnetic pulses, or radio waves. The electronics in the ESC will typically be designed to reduce or shield some of this radio wave noise, but it can't block it all. This is why we recommend keeping the ESC and the receiver as far apart as possible as this ESC noise can interfere with the receiver. If you are getting “glitching” or odd pulses to your servos, these may be coming from ESC noise bothering the receiver. Try moving things around.

Other Components in the ESC

I am going to address these in later articles, but there are typically two other components that are integrated into your ESC. We already mentioned the BEC. The other is the LVC, the low voltage cutoff. These are not directly involved in controlling the speed of your motor, but as you will see in the articles that are focused on these that they are very valuable parts of your ESC that you will want to understand.

Summary

The electronics speed control is the power system controller for your airplane. Its various components distribute power to the receiver and control the speed of the motor. Understanding how it works will give you the ability to properly size and install the ESC and to diagnose problems in the system.

AMENDMENT:

MY MOTOR WON'T RUN - WHAT'S WRONG?

A tip for new electric pilots - Setting the throttle to zero

Before most most Electronic Speed Controls, ESC, will allow the motor to run they require that you move the stick to zero throttle. But, is it really at zero?

There is a trim on the throttle channel, just like the other channels. On glow planes they use this to set the idle, so the motor won't shut off when they go to zero throttle position. In other words the throttle isn't really at zero.

But we don't have to worry about idle on electric models. So we want the throttle to be able to go to zero.

If your throttle trim is set to the center, then your throttle channel may not really be going to zero. This can result in your ESC not arming and not allowing your motor to run. If this happens to you, move that trim on the throttle channel till it is all the way down, to zero. Now see if the ESC will arm and the motor will run.

This came up because a friend with a new Radian had this problem. When he called for support, they thought it was a defective ESC and sent him a new one. But that one did not work either. So he called me. Well, I have been down this path before, so after trying a few other things, we moved the trim all the way down.

Bingo! His motor now works and all is right with the world.

Just a tip from someone who has seen this a few times before. 😊

Features...

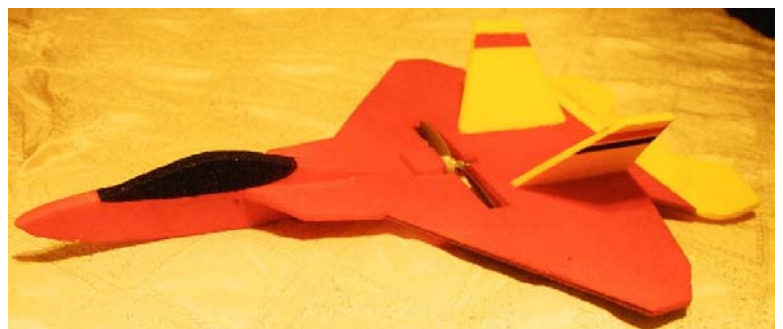
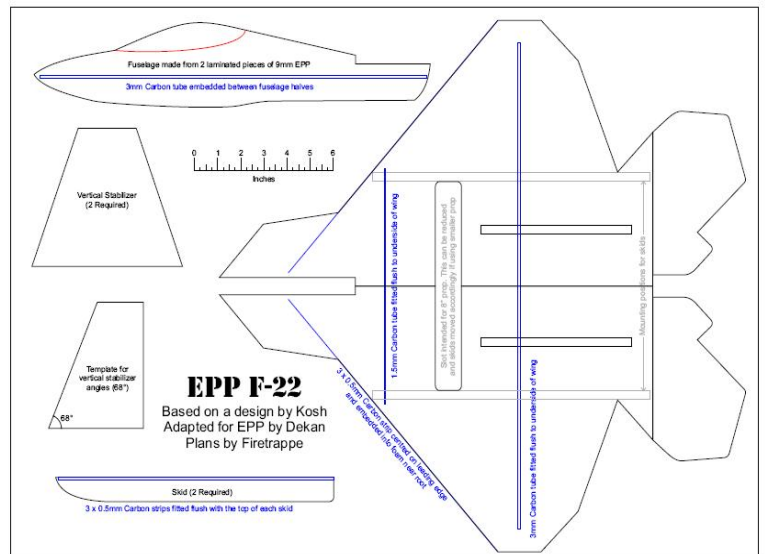
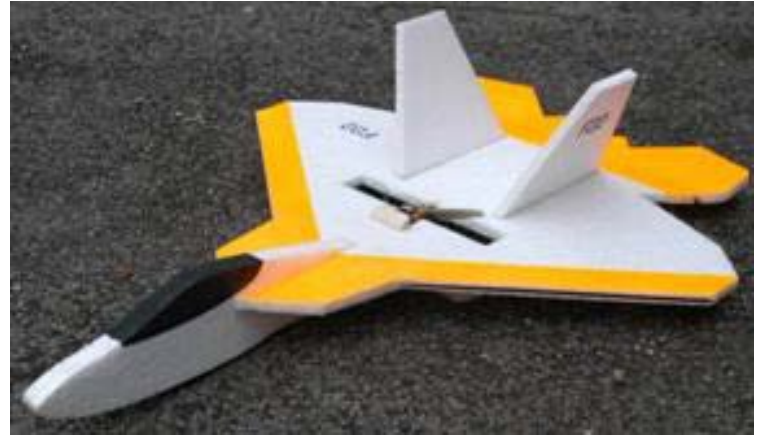
If you have a plane, helicopter, or other piece of equipment you think might be interesting to other members and are willing to share, please write up a commentary on it, snap a couple of pictures and send them to newsletter@rcrcky.com. It definitely makes for a “better read” of our news letter.

Several RCRC club members expressed interest in participating in the club’s foamy F-22 jet build. I am re-running the article so if you have interest, you can look into this and provide me a list of what you may need to build one of these planes. I am hoping to have the orders together by late March/early April.

I have printed out a full-scale plan of the F-22 foamy we will be building. Travis Collard may be able to cut them out for us on his C&C table, or I can transfer the plan to some Luann and cut out a template that can be used to trace a pattern on the EPP foam that can then be cut out with a razor blade or utility knife.

The idea for this combat-foamy build came from one of my friends (Jim) who flies RC airplanes out in Lawrence, KS; and is a member of the [Jayhawk Model Masters](#) RC club. I made a trip out to KS back in September 2009 and accompanied Jim to one of his club’s “build-night” meetings. I got to meet Hank, another member in Jim’s club, who was ripping the components out of the first F-22 foamy he built. He moved onto cutting out the foam to build his new model – this one equipped with ailerons. He had already attached the control surfaces to the plane by the time we left the meeting. Hank led a club build of the F-22 foamy there and was kind enough to provide me a list of the components he used to build his F-22 foamy, which I will provide below. Jim painted his F-22 in a red and yellow scheme, and is pictured below and to the right.

Hank ordered his foam and carbon fiber supplies from a place called RC Foam, located in Atlanta, Georgia. He ordered his electronic components from HobbyCity, better known as HobbyKing. Several of our members have purchased batteries from this site for their electric airplanes and helicopters. This site is located in China, and therefore, it would make the most sense to combine our orders to save on shipping.



The foam, carbon fiber material, and miscellaneous stuff (Dubro RC Micro2 E/Z links, DuBro Micro2 control horns, .047 piano wire, heat shrink tubing, foam-safe CA, stranded packing tape, and epoxy) will run about \$20 per plane. Below is a table detailing the “electronic costs” to build this airplane. You may want to consider purchasing two or more batteries and a charger; if you don’t already have a charger with a “balance” feature built in to it.

<u>Component</u>	<u>Cost</u>	<u>Qty Needed</u>	<u>Total Cost</u>
Brushless outrunner motor :	\$14.95	1	\$14.95
18-amp Electronic Speed Control (ESC) :	\$ 9.99	1	\$ 9.99
Turnigy three cell battery :	\$ 7.63	1 (min)	\$ 7.63
HXT 9-gram servos :	\$ 2.99	2	\$ 6.98
Micro receiver (if needed): {dual synthesized}	\$19.99		
Zippy three cell battery :	\$ 9.32	1 (min)	
Charger with Zippy style balance plug:	\$22.95		

Based on the numbers above, you are looking at ~\$20 (foam/carbon fiber/miscellaneous) + \$15 (motor) + \$10 (ESC) + \$8 (servos) for a total of \$53. Add the number of batteries you want, a charger and/or receiver if you need it, and you can figure out roughly what your plane will cost. If you purchase one battery, the receiver, and the charger with your plane, you are looking at around \$110. Add two more batteries for three fun-filled flights before having to recharge, and you are looking at \$130.

There may be a little extra expense for shipping and pricing fluctuations, but that gives you a pretty good idea of what you will have invested.

If you are interested in doing this, and if we as a club want to start this any time soon, we need to start preparing our orders. I would like to get a tally of who all wants to be included in this club project. Send me an email containing your email address, and what you want for electronic components. I will figure one set of a foam/carbon fiber pack per respondent. The “ball park” prices have been laid out for you – so just let me know if you are interested. You can send email to newsletter@rcrcky.com

Here is the link to the [F-22 Epp/Depron parkjet](#) build thread on RCGroups.com

Back to the Hangar...

Spring is just around the corner and hopefully we’ll all soon be seeing one another over at the field, as well as some new aircraft. If you are getting a little excited about showing off a new airplane or helicopter you have been working on over the past winter months or recently acquired, please take a few minutes to send me some photos and a quick write-up. I would like to include them in the “Features” section off the news letter. You can send them to newsletter@rcrcky.com.