THE FLYER

Middlesex County R-C Fliers, Inc.

February 2012

Elect Powered LT-40? Not ours, but read this newsletter for details on plans to built and test an electric powered LT-40 of our own. The Sig LT-40es is now back in production and available at RC Buyers in Nashua. This photo is from the Internet.

Inside this issue:

President's Message, *by Jerry Crowley*

Greetings to all our Club members. It's January and we have just finished off a great year 2011.

January was a busy month with our annual Elections, the Club's annual Holiday Party and our Club Auction held on Sunday the 29th.

First, the Elections were held at our January Club Meeting and by means of Secret Ballot the following slate of Officers and Directors were elected for the year 2012:

* President: Jerry Crowley
* Vice-President: Bob Forgione
* Treasurer: Jeff Ward
* Secretary: Ray Capobianco
* Board of Directors:
    - Dan Fisher
    - Dan Costa
    - Paul Sullivan

Dave Varrell decided not to run for a position on the Board of Directors this year. We thank Dave for his help over the last several years while on the board of directors.

Cont. Pg 4

Choosing Electric Power System Components

Editorial Note: *This issue will continue the discussion of how to choose electric components for your next model, but this month we are starting a new series dealing with specifics on how to convert an LT-40 to electric power.*

Last month I included an article that explained how Joe Marrone at RC Buyers uses a spreadsheet to help customers select an electric motor. This month we are going to continue that thread, but look specifically at the selection of electric components for a Sig LT-40 Kadet trainer.

The Sig LT-40 has been out of stock for over a year, and we've had to transition all of our training recommendations to consider other alternatives like the Avistar 40, Arrow 40, and the Alpha. In January, Sig re introduced the LT-40es and announced that it was designed to support either glow or electric power.

The MCRCF Training program has always recommended glow powered trainers because they support 12 to 15 minute flights and have a quick turnaround after adding additional fuel. But new students continue to ask about "clean" electric power options to the traditional glow fuel.

In the first article, starting on page 3, we will look at how to evaluate the weight and flight power requirements of an LT-40. The theory has already been presented in the last issue, but this article will deal with some of the specific details regarding weight and power.

By the way, Bob Prescott will be continuing his discussion of electric motor selections as well. Last month we looked at the E-Flite and RimFire motors that are available from RC Buyers. There are literally hundreds of motors that are available today across the Internet. If you noticed this month's AMA magazine, OS Engines has just announced a new line of electric motors. Unless we learn how to evaluate and compare these motors, the task of selecting a motor will become almost impossible.

So Bob's article this month deals with the Cobra line of motors that are available from Innov8tiveDesigns.com over the Internet. You will notice that I have included several Cobra motors in the choice of options for our LT-40 project.

Future articles on the LT-40 will deal with the actual motor selection process. Based on the calculations, we will probably examine at least two alternatives and try to report on the differences. The objective will be to assess how accurate the calculations are in terms of predicting actual flight performance.

Ray Capobianca is pressing forward with the construction of a new LT-40es ARF just purchased from RC Buyers. So we plan to include an article on construction details and any modifications that may be recommended when assembling this model as an electric powered conversion.

The final article in this LT-40 series will have some pre-flight power measurements and will conclude with an in-flight assessment of how the electric trainer compares to the traditional glow model.

Jim

Electric Powered LT-40

by Jim Orsborn

Selecting an electric motor for a model airplane begins by looking at the model's weight and the type of flying experience that the pilot expects.

Let' s begin by reviewing the data in the table at the bottom of this page. The first column is a description of the baseline, glow powered LT-40. Component weights are based on using an OS-46AX engine.

Years of experience with this model says that an OS-46AX will provide plenty of power for a student trainer. The OS-40LA is a bit under powered, and an OS-55AX has extra power that is not really needed in a student trainer. As a trainer, we typically fly the plane at 1/2 to 2/3 throttle and would like it to remain airborne for about 12 to 15 minutes per flight.

By breaking out the weight of the engine, servo and Rx battery pack, we are able to come up with a baseline weight for the LT-40 fuselage and wing that will be common across all of the power options.

With a baseline set for the fuselage, each column provides weights for a different motor, battery, ESC and motor mount combination that is being considered.

I've then included both a total All Up Weight for each combination as well as a check on the probable nose moment calculation. Tail moments will be the same, so this will help determine what problems we might face with the CG. Note that several of the combinations appear to suggest a nose heavy situation that will require moving the battery into the main cabin rather than locating it in the area of the glow fuel tank which has a removable hatch.

The bottom of this table offers some recommended motor wattage requirements that are based on the AUW of the LT-40. Building on last month's article I've added an estimated takeoff power wattage that is 10% greater that the higher sport model flying wattage. This adjustment should help clarify that additional power is required for takeoff, and that the AUW power is based on the model already in flight.

The next article in this series will look at the power that we can expect each motor to produce and how it compares to our estimated requirements. In the meantime, take a look at Bob's article on comparing Cobra motor options.

	Glow Engine OS-46 AX	[illegible]	[illegible]	Maxx Prod [illegible]	Maxx Prod [illegible]	Cobra [illegible]	Cobra [illegible]	Cobra [illegible]
Component Weights (oz.)								
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]							
Engine / Motor	17.2	12.2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Battery		21.6	20.7	[illegible]	[illegible]	[illegible]	[illegible]	20.7
ESC		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]				[illegible]				
[illegible]	7	8.3	[illegible]	[illegible]	[illegible]	8.8	[illegible]	[illegible]
Nose Moment Calculation	[illegible]	395	369	[illegible]	[illegible]	467	371	355
[illegible]		Move battery aft.	Move battery aft.			Move battery aft.	Move battery aft.	Move battery aft.
[illegible]				[illegible]	[illegible]			
Wattage Required (e.g. 80 to 100 watts/Lb)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Recommended Prop	[illegible]	[illegible]						

President's Message, Cont.

Dan Costa and Paul Sullivan are congratulated on their new positions on the Board of Directors.

Leaving his seat on the Board of Directors is Charlie Bacon. We would like to thank Charlie for all his assistance and guidance he has provided the Club over the past number of years.

Our Holiday Party was a great success once again. I think we had approximately 30 people attending the festivities. Thanks go out to everyone who helped organize and gather items for the door prizes. The big prize this year was a .45 size Space Walker was won by Paul Sullivan. Several cash awards were picked in a separate drawing for the lady visitors. Thanks go out to Dan Fisher, Ray Capobianco, Bob Forgione and Don Fitzreiter for their help in putting this event together.

The 2012 MCRCF Auction held at the Middle School in Billerica on Sunday the 29th. Over 140 items were auctioned off while a small items table offered sales of items usually $25.00 or less to be sold without going through the auction process. The 50/50 Raffle and the Raffle for a DX7s Transmitter were well received and helped boost the profits. Door prizes were drawn at intermission and at the end of the auction day.

A big **Thank You** goes out to everyone who participated (the actual list is too long) in making this another huge success. Official results are not in yet but it appears that it should yield over $1,000.00 again this year. This is a big money maker for the Club that goes very far in maintaining our field facilities.

Our own Dave Varrell won the Spektrum DX7s transmitter with Telemetry capability. The 50/50 Raffle yielded $104.00 for the Club.

I hope to see everyone at our monthly club meeting on February 8th. Our Raffle drawing will be a Spektrum AR8000X (8-Channel Receiver) and maybe some additional small items.

Thanks everyone for a wonderful 2011.

In closing I would like to offer our heartfelt condolences to the family and friends of Ralph Neff, a long term member, who passed away recently.

Good safe flying.

Thanks,

Jerry Crowley,
President MCRCF

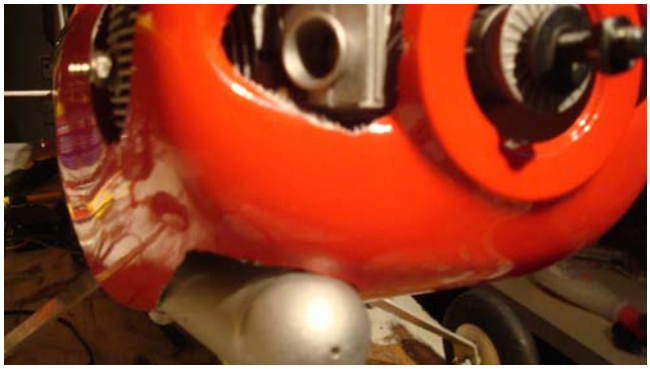
Using a Standard Muffler for Cowl Mounting *by Bob Forgione*

I have a Great Planes Super Skybolt which I wanted to adapt a muffler from a K&B 65 engine. The engine is new but it is an older model and finding an internal Pitts muffler was next to impossible with the existing bolt centers for the muffler mounting. The muffler I want to use is the standard muffler provided with the engine.

If you look at some of the newer ARFs such as the Phoenix Models Decathlon, you will see that they provide a cutout in the fuselage to adapt to the standard muffler. This also prevents the additional expense of using a non-standard muffler for a cowl mounting.

The first step in adapting the muffler was to make a cutout in the fuselage. The size and orientation of the motor were not suitable for a complete internal muffler installation, alterations on the cowl were necessary as will be seen later.

The next photo is the installed muffler and engine before the cowl is mounted. This last photo shows the cowl installed over the engine with the muffler cutout.



The exhaust comes out of the bottom of the fuselage which makes for a neat installation in this case.

If you are a purist, the internal Pitts type muffler for an OS engine that was in the 60-70 range would cost around $70 dollars. As I indicated earlier I could not find one for this engine so I did the next best thing.

Hope this helps someone to realize that the standard mufflers can be adapted to cowl mounting.

Bob Forgione

Choosing An Electric Motor

by Bob Prescott

A critical component of choice when configuring your power system is the motor. A big problem with electric motors is that they do not follow a unified convention for naming and testing. So if E-Flite recommends a Power 32, it's up to the user to find out what other motor may be compatible if they do not want to use that one. If no motor is recommended (or you are converting a glow to electric), then you must figure out what size and speed motor is the right fit for your project.

There are some online utilities that help analyze motor data, but the ones I have found are rather difficult to use and don't do a great job providing actual recommendations. The one source I have used the most are the online forums (such as RC Groups and RC Universe), in which other flyers share the motor they used and often give performance and prop information gathered from their airplane.

Another big concern is that propeller data is not always available. A lot of kit manufacturers will list a single recommended propeller based on a recommended motor. Whereas a motor manufacturer will give a range. For example, E-Flite lists propeller sizes from 11x7 to 14x10 for their Power 32 motor. That is a very large range and is listed that way because the motor can be used from 12v to 16.8v. So it falls onto you to figure things out and select a propeller that works. A 3S battery is 11.1 volts nominal, so does that mean that the Power 32 will not work on 3S? A 5S battery runs at a nominal 18.5 volts, so will this motor only work on 4S? How much power is pulled by the different prop sizes at different voltages?

These questions are only fully answered by doing bench tests and require that the modeler have (or purchase) numerous props and have a watt meter available so they can perform these tests themselves.

One option to running these tests yourself is to choose an expensive motor that has been fully tested and provides those specs in an easy to access library you can search when picking out a model. Otherwise you will have to buy something that you believe is close and find out afterward.

When choosing electric components it is tempting to go with the cheep, Chinese brands that are available from places like Hobby King. The problem with these parts is that there is very little data available from the manufacturers. So unless you have another motor with specs that you're trying to match, it becomes a guessing game. Even after choosing a Turnigy motor that matches the specs, actual testing must be performed to be sure that it will fit your specific plane and will not be burned up in it's first flight.

When I scratch built my first plane, I made a guess when I selected that first motor, battery, and prop. When it was finished I threw the plane into the air (no landing gear) without a clue as to what was going to happen. I want to help others avoid this situation, so I have put together a spreadsheet of actual tested motor specs that I got from the Innov8tive Designs

website. The motors listed are the Cobra series of motors, which are very well built and have these features:

1) Mid-range cost

2) Come with a two year warranty

3) Include a full hardware mounting package (including prop mounts)

4) Have been fully tested for performance with a range of propellers and different battery cell counts

5) Are available here in the US

The spreadsheet shown below shows the Cobra model number at the top of each column. Data for each motor includes physical size, weight, Kv rating and several amperage and power wattage parameters. My complete spreadsheet covering the entire Cobra line of motors can be downloaded from the Members section of the MCRCF Website.

Notice that my spreadsheet only lists the largest prop size for each battery cell count. More data is available at inno-v8tivedesigns.com under each specific motor. This spreadsheet can serve as a simple cross-reference to help choose a motor from another brand, such as Rim-Fire, or you can choose a Cobra motor and be done with it.

Maximum continuous current and max continuous power (at a specific cell count) are two important parameters that specify limits on the actual usage of each motor. Props listed at the bottom, are the largest one listed for each motor, so smaller props will likely consume less power from the battery.

The Cobra ESC's are also a nice choice because of their lower cost and built-in switching BECs (units larger than 22A) that typically provide more amperage to the servos than the cheaper oversees ones and are less expensive than E-Flite and much more reliable.

	A	AN	AO	AP	AQ	AR	AS	AT
1	Cobra Motor Specifications	C-3515/14	C-3515/18	C-3520/10	C-3520/12	C-3520/14	C-3520/18	C-3525/10
2								
3	Stator Diameter	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)
4	Stator Thickness	15.0 mm (0.591 in)	15.0 mm (0.591 in)	20.0 mm (0.787 in)	20.0 mm (0.787 in)	20.0 mm (0.787 in)	20.0 mm (0.787 in)	25.0 mm (0.984 in)
5	No. of Stator Arms	12	12	12	12	12	12	12
6	No. of Magnet Poles	14	14	14	14	14	14	14
7	Motor Wind	14 Turn Delta	18 Turn Delta	10 Turn Delta	12 Turn Delta	14 Turn Delta	18 Turn Delta	10 Turn Delta
8	Motor Kv	950 RPM / Volt	740 RPM / Volt	980 RPM / Volt	820 RPM / Volt	700 RPM / Volt	550 RPM / Volt	780 RPM / Volt
9	No-Load Current (Io)	1.39 Amps @ 14 Volts	1.01 Amps @ 14 Volts	1.84 Amps @ 14 Volts	1.45 Amps @ 14 Volts	1.33 Amps @ 20 Volts	0.93 Amps @ 20 Volts	1.65 Amps @ 14 Volts
10	Motor Resistance (Rm) Per Phase	0.044 Ohms	0.065 Ohms	0.037 Ohms	0.039 Ohms	0.048 Ohms	0.075 Ohms	0.035 Ohms
11	Motor Resistance (Rm) Phase to Ph	0.029 Ohms	0.043 Ohms	0.025 Ohms	0.026 Ohms	0.032 Ohms	0.050 Ohms	0.023 Ohms
12	Max Continuous Current6 Amps	44 Amps	36 Amps	60 Amps	56 Amps	46 Amps	36 Amps	62 Amps
13	Max Continuous Power on 2S Li-Po							
14	Max Continuous Power on 3S Li-Po	490 Watts	400 Watts	670 Watts	620 Watts	510 Watts		690 Watts
15	Max Continuous Power on 4S Li-Po	650 Watts	530 Watts	890 Watts	830 Watts	680 Watts	530 Watts	920 Watts
16	Max Continuous Power on 5S Li-Po	810 Watts	660 Watts	1110 Watts	1040 Watts	850 Watts	670 Watts	1150 Watts
17	Max Continuous Power on 6S Li-Po	970 Watts	790 Watts			1020 Watts	800 Watts	1380 Watts
18	Max Continuous Power on 8S Li-Po							
19	Max Continuous Power on 10S Li-P							
20	Weight	178 Grams (6.28 oz)	178 Grams (6.28 oz)	210 Grams (7.41 oz)	216 Grams (7.62 oz)	216 Grams (7.62 oz)	216 Grams (7.62 oz)	253 Grams (8.92 oz)
21	Outside Diameter	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)
22	Shaft Diameter	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)
23	Body Length	41.0 mm (1.614 in)	41.0 mm (1.614 in)	46.0 mm (1.811 in)	46.0 mm (1.811 in)	46.0 mm (1.811 in)	46.0 mm (1.811 in)	51.0 mm (2.008 in)
24	Overall Shaft Length	63.0 mm (2.480 in)	63.0 mm (2.480 in)	68.0 mm (2.677 in)	68.0 mm (2.677 in)	68.0 mm (2.677 in)	68.0 mm (2.677 in)	73.0 mm (2.874 in)
25	2S APC Prop max							
26	3S APC Prop max	13x4-E, 24.40A 270.8	15x6-E, 27.94A 310.1	13x6.5-E, 47.47A 526.9	15x8-E, 43.17A 479.2W	15x8-E, 30.34A 336.7W		15x8-E, 41.49A 460.6
27	4S APC Prop max	10x7-E, 34.68A 513.3	12x6-E, 26.03A 385.2	11x5.5-E, 45.51A 673.5	13x4-E, 33.25A 492.1W	15x4-E, 34.61A 512.3	15x8-E, 25.76A 381.2	15x4-E, 49.32A 730.0
28	5S APC Prop max	9x6-E, 33.35A 616.9W	10x7-E, 26.32A 487.0	10x5-E, 47.73A 882.9W	11x5.5-E, 43.71A 808.7	13x4-E, 32.65A 604.1	15x4-E, 26.87A 497.1	13x4-E, 46.39A 858.2
29	6S APC Prop max	8x4-E, 28.23A 626.6W	9x6-E, 23.49A 521.4W			10x7-E, 36.71A 815.0	13x4-E, 23.12A 513.4	10x6-E, 44.38A 985.2
30	8S APC Prop max							
31	10S APC Prop max							
32								
33								
34								
35								
36								
37								

LiPo Battery Usage Window

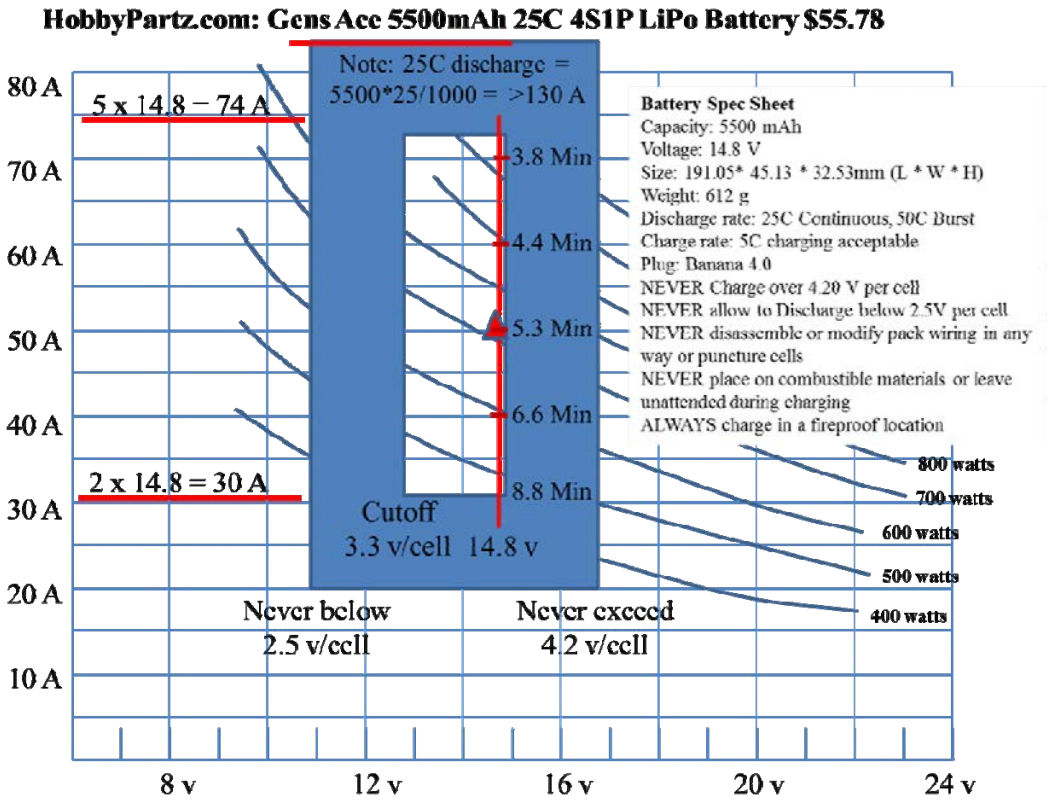
by Jim Orsborn

This article will help show how we can look at battery specifications and learn how to select an appropriate battery for our airplane. The diagram at the bottom of the page is for a 4S battery that is available from HobbyPartz.com. Data from the battery spec sheet is on the right. I've developed a visual "Usage Window" for this battery that is shown in the center.

Depicted as a framed window, the right side of the frame matches the "Not to Exceed" charge voltage, and the left edge is the "never go below" voltage. For LiPo batteries, these values will typically be 4.2 and 2.5 volts per cell respectively. The "window" inside the frame then uses the Nominal and cutoff voltages (3.7 & 3.3) v/cell as the right and left edge of the open area.

The top and bottom amperage values for this window are handled differently. There is no real lower current limit, but I've shown 2 times the nominal voltage as a reasonable value. On the high end, 5 times the voltage is offered as a high current drain limit. The real upper limit is defined by the C value of the battery. In this case, 25C suggests that the battery is capable of delivering 130 A which far exceeds our recommended usage limit of 75 A.

On the right side of the frame, battery capacity if shown as the length of time that the battery will support a continuous load. These are based on delivering 80% of the battery capacity (e.g. 5500 mAh equates to 4.4 minutes at a 60 A continuous load). A full 25C load will obviously deplete the battery in more like 2 minutes.



In conclusion, try to stay within the "Usage Window" and you'll see longer battery life. If you operate at either voltage or current values on the frame (not inside the window), then expect to see problems.

The next article will show how to understand motor specs and which battery will work with your motor.

Jim

Notes from the Field

by Jim Orsborn

General Meeting:

Elections — MCRCF Elections were held at the January meeting. There were no debates but the nomination process went forward without a hitch. Everyone in attendance was more than satisfied with the fiscal soundness and policy directions of the existing board. So the previous Officers were re-elected to the Board without opposition. Board Members for the coming year will include Dan Fisher, Dan Costa and Paul Sullivan. The Board is considering a Youth Liaison position, so look for a mission statement and board member appointment in the coming months.

Annual Party:

Yes, we held the Annual Holiday Party, as scheduled, at the Great Wall in Bedford, MA. There was plenty of food for all who attended — buffets usually work out that way. Everyone enjoyed an opportunity to get together and socialize for a few hours. There were plenty of door prizes for both members and the spouses as well. Seems like Paul Sullivan was the big winner, when his number came up first in the drawing pool and he was able to go away with the grand prize — Space Walker ARF.

When the meal and raffle drawings were over, we all went home in time to check out the AFL Division playoff game and help root the Pats on to their big win over the Broncos.

Annual Auction:

The Annual Auction was help at the Marshall Middle School on Sunday, Jan 29th. We had a good day weather wise, lots of members showed up to help and it looks like we had another sterling day. Jeff is on travel, but his initial assessment is that we had over 100 items hit the auction block.

We were in the cafeteria this year, so the room was filled pretty much to capacity with planes and people when the auction first started.

Some of the items that we sold looked really good. The sales prices seemed to be down a bit from previous years, but Jeff seems to think the total sales were fairly close to previous years.

The radio raffle this year was a Spektrum DX-7s Transmitter. Dave Varrell (one of our own) was the winner. He says the radio came with a special AC adapter, because the charger is actually built into the radio. So it pays to stay around for that final drawing.

I don't remember who bought what, but I do seem to remember that Paul Sullivan is probably going to be bringing a larger (call it a 1.20 size) plane to the Warbird Tuesday meetings next summer.

Notice: POOR Field Conditions

Due to the warm weather conditions, the field is CLOSED to ALL vehicle traffic. Folks are still welcome to fly, but please park your vehicle in the area across the street from the field. Do not drive around the fence to park on the field.

Official Publication of the Middlesex County R-C Fliers, Inc.

The FLYER is the official publication of the Middlesex County R-C Fliers, Inc., a non-profit organization chartered for the promotion of radio controlled model aircraft building and flying. The club operates a flying field located on Treble Cove Road, Billerica, MA. The club offers free flight instruction to any member provided they have a current membership with the Academy of Model Aeronautics. Contact any club member for details. Meetings are held on the second Wednesday of every month between September and June in the Billerica Recreation Dept building at 248 Boston Road in Billerica, starting at 7:30 PM.

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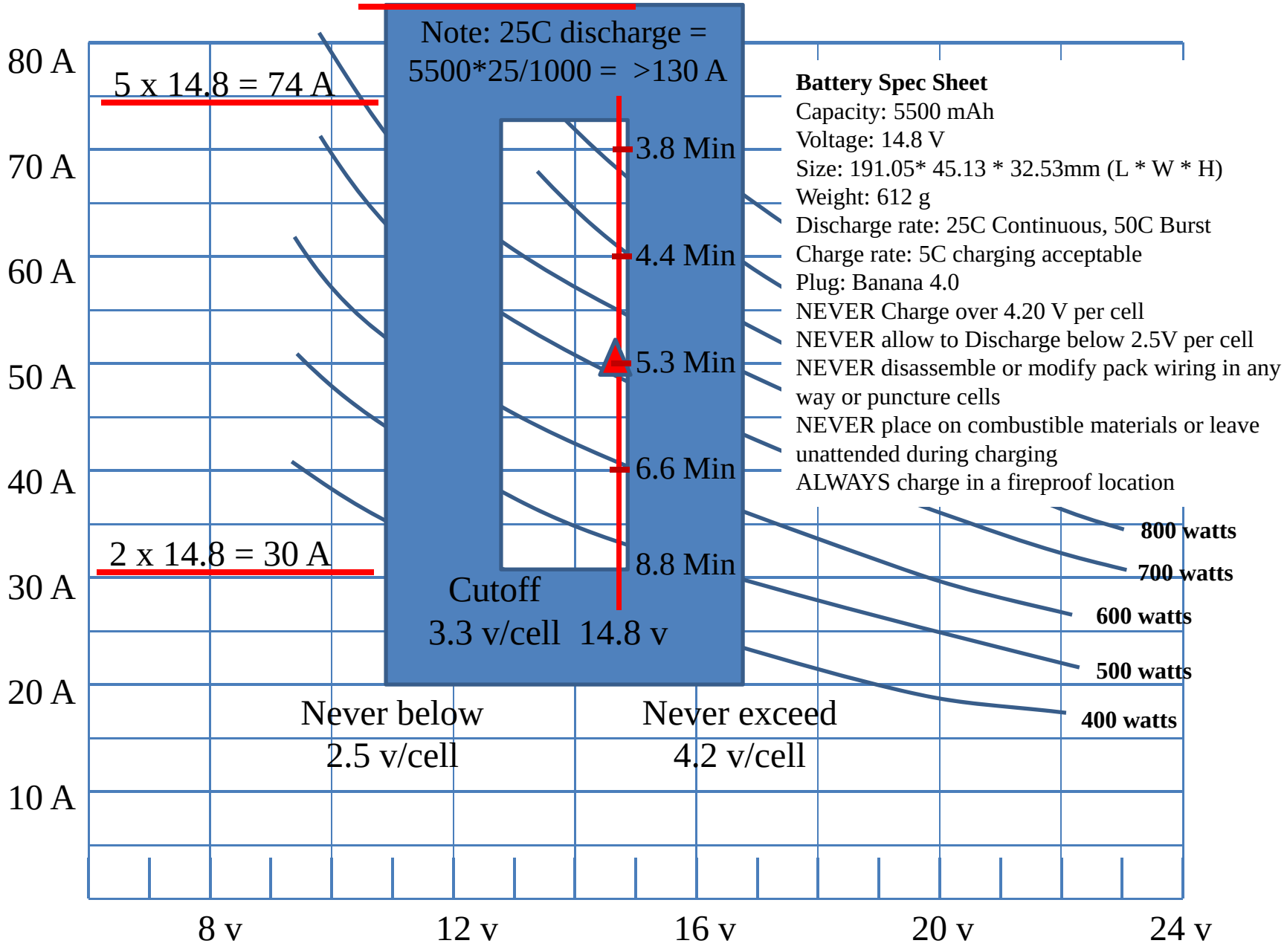
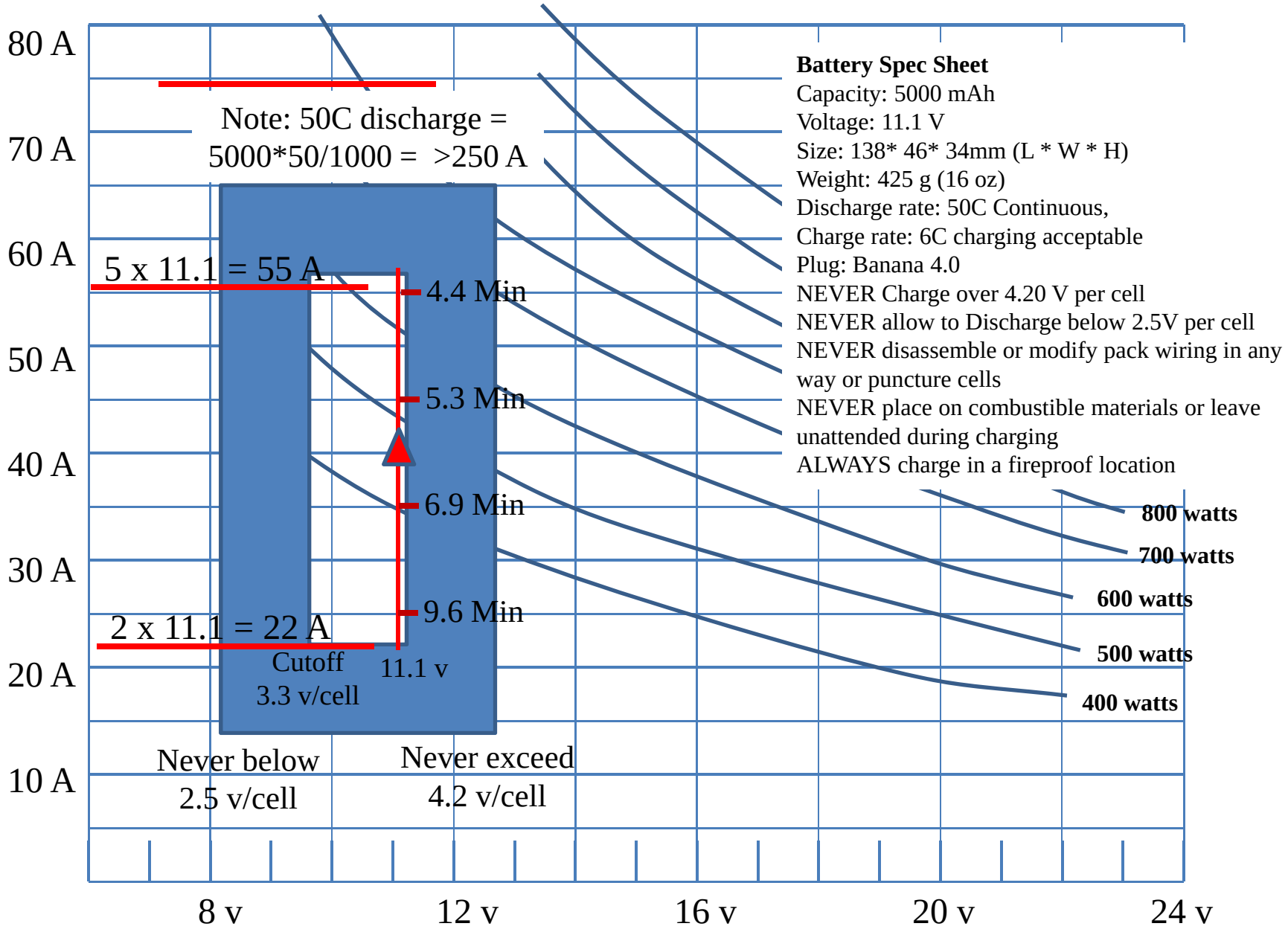
Feb. 8th, 2012
7:30 PM
Lewis Building
248 Boston Road (Rt 3A)
Billerica, MA

HobbyPartz.com: Gens Ace 5500mAh 25C 4S1P LiPo Battery $55.78



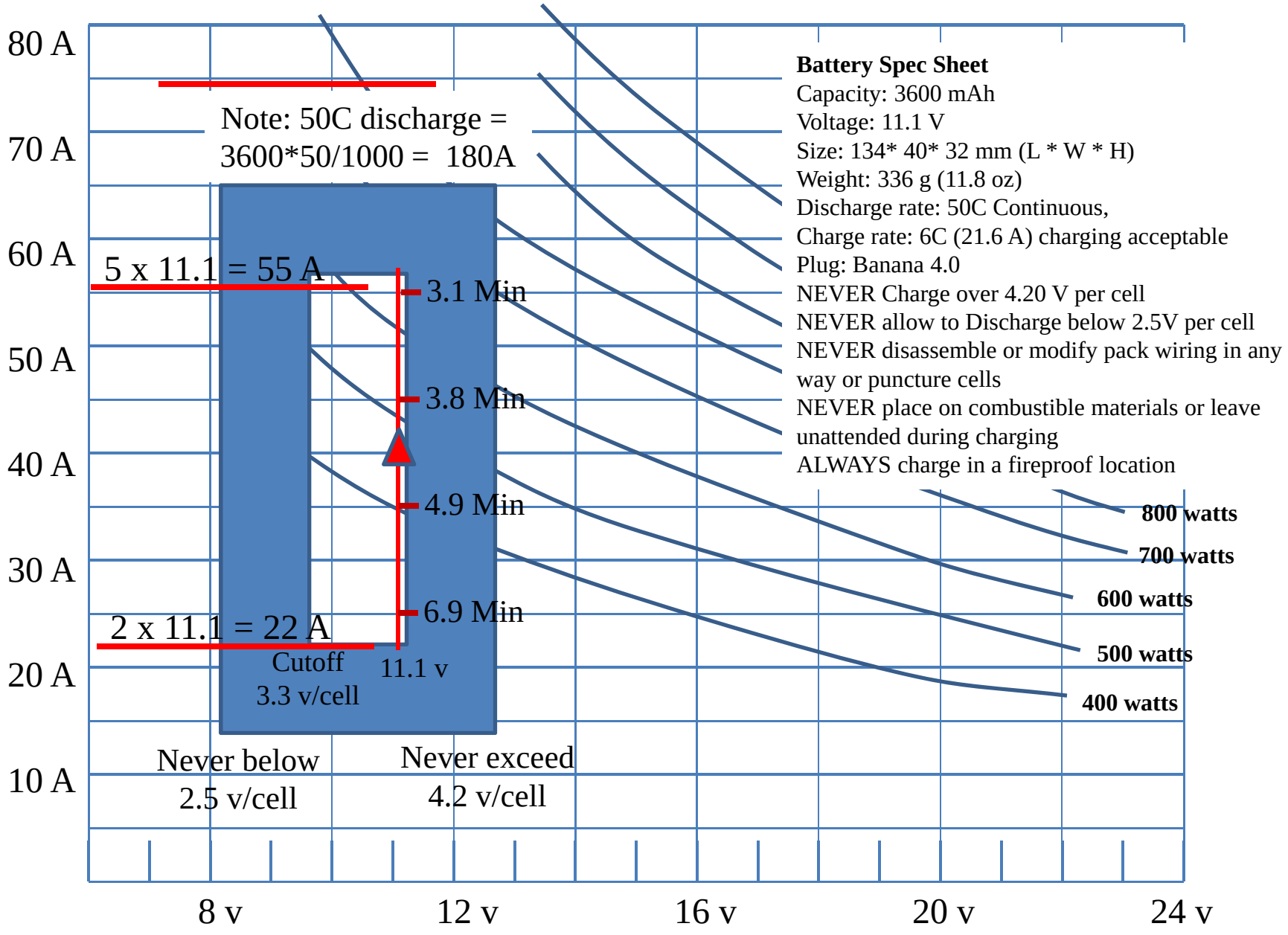
Battery Spec Sheet
Capacity: 5500 mAh
Voltage: 14.8 V
Size: 191.05* 45.13 * 32.53mm (L * W * H)
Weight: 612 g
Discharge rate: 25C Continuous, 50C Burst
Charge rate: 5C charging acceptable
Plug: Banana 4.0
NEVER Charge over 4.20 V per cell
NEVER allow to Discharge below 2.5V per cell
NEVER disassemble or modify pack wiring in any way or puncture cells
NEVER place on combustible materials or leave unattended during charging
ALWAYS charge in a fireproof location

Towerhobbies.com: FlightPower Pro50 5000mAh 50C 3S1P LiPo Battery $139.99



Battery Spec Sheet
Capacity: 5000 mAh
Voltage: 11.1 V
Size: 138* 46* 34mm (L * W * H)
Weight: 425 g (16 oz)
Discharge rate: 50C Continuous,
Charge rate: 6C charging acceptable
Plug: Banana 4.0
NEVER Charge over 4.20 V per cell
NEVER allow to Discharge below 2.5V per cell
NEVER disassemble or modify pack wiring in any way or puncture cells
NEVER place on combustible materials or leave unattended during charging
ALWAYS charge in a fireproof location

Towerhobbies.com: FlightPower Pro50 3600mAh 50C 3S1P LiPo Battery $99.99



Battery Spec Sheet
Capacity: 3600 mAh
Voltage: 11.1 V
Size: 134* 40* 32 mm (L * W * H)
Weight: 336 g (11.8 oz)
Discharge rate: 50C Continuous,
Charge rate: 6C (21.6 A) charging acceptable
Plug: Banana 4.0
NEVER Charge over 4.20 V per cell
NEVER allow to Discharge below 2.5V per cell
NEVER disassemble or modify pack wiring in any way or puncture cells
NEVER place on combustible materials or leave unattended during charging
ALWAYS charge in a fireproof location

Cobra Motor Specifications	C-3515/14	C-3515/18	C-3520/10	C-3520/12
Stator Diameter	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)	35.0 mm (1.378 in)
Stator Thickness	15.0 mm (0.591 in)	15.0 mm (0.591 in)	20.0 mm (0.787 in)	20.0 mm (0.787 in)
No. of Stator Arms	12	12	12	12
No. of Magnet Poles	14	14	14	14
Motor Wind	14 Turn Delta	18 Turn Delta	10 Turn Delta	12 Turn Delta
Motor Kv	950 RPM / Volt	740 RPM / Volt	980 RPM / Volt	820 RPM / Volt
No-Load Current (Io)	1.39 Amps @ 14 Volts	1.01 Amps @ 14 Volts	1.84 Amps @ 14 Volts	1.45 Amps @ 14 Volts
Motor Resistance (Rm) Per Phase	0.044 Ohms	0.065 Ohms	0.037 Ohms	0.039 Ohms
Motor Resistance (Rm) Phase to Ph	0.029 Ohms	0.043 Ohms	0.025 Ohms	0.026 Ohms
Max Continuous Current6 Amps	44 Amps	36 Amps	60 Amps	56 Amps
Max Continuous Power on 2S Li-Po				
Max Continuous Power on 3S Li-Po	490 Watts	400 Watts	670 Watts	620 Watts
Max Continuous Power on 4S Li-Po	650 Watts	530 Watts	890 Watts	830 Watts
Max Continuous Power on 5S Li-Po	810 Watts	660 Watts	1110 Watts	1040 Watts
Max Continuous Power on 6S Li-Po	970 Watts	790 Watts		
Max Continuous Power on 8S Li-Po				
Max Continuous Power on 10S Li-P				
Weight	178 Grams (6.28 oz)	178 Grams (6.28 oz)	210 Grams (7.41 oz)	216 Grams (7.62 oz)
Outside Diameter	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)	43.0 mm (1.693 in)
Shaft Diameter	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)	5.00 mm (0.197 in)
Body Length	41.0 mm (1.614 in)	41.0 mm (1.614 in)	46.0 mm (1.811 in)	46.0 mm (1.811 in)
Overall Shaft Length	63.0 mm (2.480 in)	63.0 mm (2.480 in)	68.0 mm (2.677 in)	68.0 mm (2.677 in)
2S APC Prop max				
3S APC Prop max	13x4-E, 24.40A 270.8	15x6-E, 27.94A 310.1	13x6.5-E, 47.47A 526.9	15x8-E, 43.17A 479.2W
4S APC Prop max	10x7-E, 34.68A 513.3	12x6-E, 26.03A 385.2	11x5.5-E, 45.51A 673.5	13x4-E, 33.25A 492.1W
5S APC Prop max	9x6-E, 33.35A 616.9W	10x7-E, 26.32A 487.0	10x5-E, 47.73A 882.9W	11x5.5-E, 43.71A 808.7
6S APC Prop max	8x4-E, 28.23A 626.6W	9x6-E, 23.49A 521.4W		
8S APC Prop max				
10S APC Prop max				

Note: Please visit the Members Only section of the MCRCF Website to download a copy of the excel file covering the entire line of Cobra motors.

	Glow Engine OS-46 AX	E-Flite Power 52 w/ 80 A ESC (2) 3S Bat	E-Flite Power 46 w/ 60A ESC 5S Bat	Maxx Prod HC3528-1000 Sig's .40 Solution	Maxx Prod HC3528-800 Sig's .46 Solution	Cobra C-4130-16 w/ 80 ESC 6S Bat
Component Weights (oz.)						
LT-40 Airframe, w/ 3 Servos	90	90	90	90	90	90
Glow engine servo (1.3) + Rx Battery (3.3 oz.	4.6					
Engine / Motor	17.2	12.2	10	6.9	6.9	13.9
Battery		21.8	23.7	10.9	21.5	28.5
ESC		3.75	2.3	2.13	2.13	3.75
Elect Motor Mount (Tower Hobbies)		5.1	4.9	0.7	0.7	5.1
Est Nose Weight				2		
All Up Weight (Lbs) [Sig est. is 5.5 to 6 Lb]	7	8.3	8.2	7	7.6	8.8
Nose Moment Calculation	215	395	369	211	270	467
(e.g. Motor = 12.5; FW = 10; Battery = 7.5)		Move battery aft.	Move battery aft.			Move battery aft.
Note: Trainer = 70-90 & Sport = 90-110 w/Lb.				11x7E	10x6E	
Wattage Required (e.g. 80 to 100 watts/Lb)	560 to 700 watts.	664 to 830 watts.	656 to 820 watts.	560 to 700 watts.	608 to 760 watts.	704 to 880 watts.
Takeoff Power (Est.) -- 110% AUW wattage	770 watts.	913 watts.	902 watts.	770 watts.	836 watts.	968 watts.
Recommended Prop	11x7 or 11x6	11x7 or 12x6E				

Sheet 1:
OS-46AX compared to E-Flite and Maxx Prod motors.

	Glow Engine OS-46 AX	Cobra C-4120-14 w/ 80 ESC (2) 3S Bat	Cobra C3525-12 w/ 60 ESC 5S Bat	Cobra C-3515-14 w/ 60 A ESC 4S Bat	Cobra C-3520-12 w/ 60 A ESC 4S Bat	Cobra C-3515-12 w/ 60 ESC 4S Bat
Component Weights (oz.)						
LT-40 Airframe, w/ 3 Servos	90	90	90	90	90	90
Glow engine servo (1.3) + Rx Battery (3.3 oz.	4.6					
Engine / Motor	17.2	10.3	8.9	6.3	7.6	6.3
Battery		21.8	23.7	21.5	21.5	21.5
ESC		3.75	2.3	2.13	2.13	2.13
Elect Motor Mount (Tower Hobbies)		5.1	4.9	4.9	4.9	4.9
Est Nose Weight						
All Up Weight (Lbs) [Sig est. is 5.5 to 6 Lb]	7	8.2	8.1	7.8	7.9	7.8
Nose Moment Calculation	215	371	355	305	321	305
(e.g. Motor = 12.5; FW = 10; Battery = 7.5)		Move battery aft.	Move battery aft.	Move battery aft.	Move battery aft.	Move battery aft.
Note: Trainer = 70-90 & Sport = 90-110 w/Lb.				11x7 = 30A	11x7 = 35A	
Wattage Required (e.g. 80 to 100 watts/Lb)	560 to 700 watts.	656 to 820 watts.	648 to 810 watts.	624 to 780 watts.	632 to 790 watts.	624 to 780 watts.
Takeoff Power (Est.) -- 110% AUW wattage	770 watts.	902 watts.	891 watts.	858 watts.	869 watts.	858 watts.
Recommended Prop	11x7 or 11x6					

Sheet 2:
OS-46AX compared to several Cobra motors.