Mid Hudson Radio Control Society

Pilot Briefing

Volume 7 Issue 2 February 2015

March meeting

This is intended as a synopsis, the full meeting minutes are available on the club website http://www.mhrcs.com/pages/minutes.htm

Have you renewed your membership?

Considerable time was devoted to discussing the By Law changes sent to all members by President Warren Batson's email on February 27, 2015. This is very important because it will affect the "flavor" of the club. You owe it to yourself and the club to become familiar with this issue and make your views known to your fellow members by actively attending club meetings.

Rick Rizza stepped down as Wallkill Field director.
The excellent conditions at Wallkill are due to Rick's dilligence and efforts.

Thank you Rick.

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WRAMS 2015 Show

For those who didn't make it to the show, you can see the winning models at the WRAM show by visiting

http://www.modelairplanenews.com/blog/2015/02/23/and-the-winners-are-2015-wram-show-airplane-competition/

To read the entire build thread on the Best of Show model, a FW-190 (Jeff chronicles the entire build and rebuild, he had a mishap landing his first model), go to

http://www.rcscalebuilder.com/forum/forum_posts.asp?TID=20274&PN=1&TPN=1

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Brushless Motors

We've discussed basic DC electric theory, batteries and Electric Speed Controllers thus far, now we move to the motor. The following links will explain how a brushless motor works:

Part 1 - https://www.youtube.com/watch?v=ZAY5JInyHXY

Part 2 - https://www.youtube.com/watch?v=WyQInXjpGwU

Lloyd Quick has graciously granted permission to include his articles that will aid you specifying the motor you will need for your aircraft.

How to calculate requirements for an electric power system,

Using the information from Lloyd S Quick 6-4-2013

for further information call 845-229-7357 or e-mail lquick@optonline.net

Date 6-4-2013

1. Determine the type of performance you require:
Indoor, backyard, Park flier, flying field
Scale flying, Acrobatic flying, Three D flying.

Using line 21 from the information from Lloyd S. Quick 6-4-2013, pick the appropriate Watts/lb or Watts /oz.

2. Weigh your plane. Multiply the Watts /lb OR Watts /oz, times the weight of your plane in lb or oz and call it" W". [Use lb or oz in BOTH cases.] This is the Power in watts you require.

3. Decide how many cells and what type of battery you are going to use, this will determine the voltage you will use. Call it "V".

4. Divide the watts in 2. by the voltage in 3. and call it" A". This is the current in amperes, called Amps

5. Pick a switching bec speed control with twice the current rating of "A" and a higher voltage rating than "V".

6. Pick a motor rated for twice the watts you found in 2. and twice the "A" found in 4.

7. The motor must turn the propeller fast enough to fly the plane. Stall speed is the slowest speed a plane can fly. Using line 14 from the information from Lloyd S. Quick 6-4-2013, determine the pitch speed. Using line 15 from the information from Lloyd S. Quick 6-4-2013, multiply the pitch speed by 1.25 to get flying speed in miles per hour. Call it MPH.

8. RPM equals MPH divided by pitch, then divided by .000947. Example: Pick a propeller pitch. Let's start with 10 inch pitch and 50MPH flying speed. Then RPM=5279

9. Free speed of the motor {no Propeller} should be 1.25 times the flying RPM or 5279*1.25=6600Rpm.

10. KV of the motor should be RPM divided by voltage found in 3. Example: 3 cells lipo at 11 volts, KV equals 600. Therefore the motor should have a KV of 600, watts of "W"from 2. and amps of "A" from 4.

11. Pick a propeller diameter to clear the ground and run the motor measuring current. If the current is too high for the motor or speed control, use a smaller prop. Use a battery with at least twice the current capacity as the current you measured.

12. A good source for information.
http://www.wattflyer.com/forums/showthread.php?t=24238

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Information from Lloyd S Quick 4-10-09

lquick@optonline.net

229-7357

Here are a few things to consider when you modify your model plane.

1. Be careful when using color coded wires on RC equipment. There are no standard color conventions for wires. A car battery provides DC current, House current t is AC. With DC the color Red is usually plus and black is minus. With AC white is neutral and is connected to green

which is ground and black is hot. Servos have black or brown as negative, red is positive, and white or yellow is the signal. Three phase motors leads can be Red, White, and Black or Blue, Blue, and Blue or any other color.

2. E=IR (Electromotive force equals current times resistance or impedance) E is measured in Volts (V), Current in amperes (A) and resistance or impedance in Ohms(Ω). (E=I*R, V=I*R , and V= A*R) all mean the same thing.

3. Power is (P) equal to Volts (V) times Amps (A) and is measured in watts (W). P=V*A

4. Torque= ounces of force times Inches from the pivot point. Torque is measured in, inch. Ozs or ft lbs. A micro servo puts out 12 in. oz. of torque and weights 9 grams. Torque (T)= ounces*inches or lbs*Feet.

5. Weight is measured in pounds, ounces or grams. (28.35 grams per ounce).

6. The torque of a motor is proportional to the current through the motor. The lost power in a motor due to heat is equal to the square of the current times the motor resistance. Power lost is P=A*A*R

7. What is the KV of a motor? It is the speed constant (RPM per Volt) where K =RPM and V is volts. If you put the shaft of a motor in a drill press turning at 1000 RPM and it generates one volt at the motor terminals, then the KV is 1000/1 or 1000. If you connect the same motor's terminals to a 7 volt battery with no propeller it will turn at 7000 RPM.

8. If you double the battery voltage, you double the speed of the motor, which doubles the available Power (Watts). Your propeller will need 8 times the power, so you have to use a much smaller prop or a gear reduction to keep from over loading the motor.

9. The pitch of a propeller is the distance it travels forward in one revolution, measured in inches. A pitch of less than half the diameter is very inefficient, and is only good for stirring paint. (According to Astro) Pitch speed is measured in Miles per hour and is equal to (.000947 X RPM X pitch in inches.)Optimum would be (KVx85%)X80%=RPM see #15 & #16

10. Power increases by the third power of the RPM of the propeller. If you double the speed of a propeller you need 8 times the power (Watts) to turn it . Power (P)=K*K*K

11. Power increases by the fifth power of the diameter of the propeller. Power (P)=D*D*D*D*D

12. Thrust increases by the second power of the diameter of the propeller. Thrust (T)=D*D

13. Power is equal to the density of air (Da) times RPM to the third power times the diameter of the propeller to the fifth power, divided by the cp of the propeller. Power (P)=Da*K*K*K*D*D*D*D*D/cp

14. Pitch speed should be 2.5 to 3 times the stall speed of the airplane for good performance.

15. Maximum efficiency of a propeller is at an air speed equal to 80% of the pitch speed.

16. Maximum efficiency of a motor is at 80% to 90% of the KV speed.

17. Maximum Power of a motor is at 50% of the KV speed, but it gets real hot because it is inefficient

18. Stall speed increases as the square root of the load (4 times the weight needs 2 times the speed).

19. If you want more performance, use a watt meter, and increase propeller diameter and pitch until the current reaches the maximum allowed for the motor, speed control, or batteries, whichever is less. Check the temperature of the motor, speed control, and batteries, if anything is too hot put on a smaller propeller.

20. Wing loading

Indoor 1-2 oz/sq ft

Backyard 3-6 oz/sq ft

Park Flier 5-7 oz/sq ft

Flying Field 7-16 oz/sq ft

21. Power required

Indoor 3-15 Watts (1-2 Watts/oz),(16 -32 Watts/lb)

Backyard 10-20 Watts (2-5Watts/oz),(32-80 Watts/lb)

Park Flier 15-30 Watts (2-5 Watt/oz),(32-80 Watts/lb)

Flying Field 30-1000 Watts (3.5 Watts/oz),(80-300 Watts/lb)

22. Scale flying (25-50 Watts/Lb)

23. Acrobatic flying (100 -300 Watts/lb)

24. Three D flying (over 100 Watts/lb)

Motor design

25. For the same KV if you double the length of the stator and rotor, you have to cut the number of turns in half.

26. For the same KV if you double the flux density of the stator, you have to cut the number of turns in half.

27. If you cut the number of turns of wire on the stator in half, you double the speed (RPM).

28. An out runner motor with 6 poles (12 magnets) runs at 1/6 the input frequency, so does not need a gear reduction. A 2 pole in runner needs a gear reduction to swing a large prop.

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Big gas guys need to checkout this rudder system:

https://www.youtube.com/watch?v=UWv9CKGpN3A

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WWII warbird buffs should look at the following for a neat way to install pop-up hatches that use magnets to keep them closed. Its the bees knees.

http://www.rcscalebuilder.com/forum/forum_posts.asp?TID=16463&PN=1&TPN=496

and look for the author ram3500-rcu dated February/22/2015, that starts the discussion and continue to the end.

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A Wankel rotary engine model

https://www.youtube.com/watch?v=WfK5Eh4Erek

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The USA F3P team will be competing at the World Championships in Poland this March. For more info see:

http://www.teamusaf3p.com/

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March is Hump Month!

As of March 1 there are only 31 days until Wallkill opens.