Fred Meyer
834 Shennecossett Road
Groton, CT 06340
News Letter Editor 860-445-7694
e-mail: fmeyerrc@gmail.com

AN AMA
GOLD LEADER CLUB

Meeting date: Tuesday February 17th **@ 7:30PM**.
The Meeting location is the new Salem Library
Located on Rt 85 about one mile north of the Salem Four Corners.

Visit RC Propbusters online at:
http://www.rcpropbusters.com

February 2015 NEWSLETTER

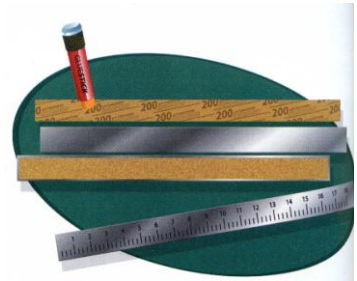
SAME REQUEST PEOPLE. ***I AM STILL LOOKING FOR INPUTS FOR THE NEWSLETTER.***

This Month we have an article by Bernie Liskov addressing the question "How do Multi-Copters Fly"?

TIP OF THE MONTH

A Straight Edge that Stays in Place

Cutting long narrow strips from a balsa sheet using a metal straight edge can be frustrating and time consuming. You have to clamp the straight edge to prevent it from moving while applying pressure with a hobby knife, which can be cumbersome and if not done properly, can dent the wood. To solve this problem you can glue 100-grit sandpaper on the underside of the straight edge using spray adhesive such as 3M 77, that can be found at your local hardware store. The sandpaper will prevent the straight edge from sliding on the wood.



RC Propbusters
Meeting 02/17/2015 Agenda

1. **Call To Order.**
2. **Reading of Minutes of last Meeting.**
3. **Financial Report.**
4. **Committees Reports.**
   a. **Upcoming Events**
      i. **Improved Web Site**
         1. **Pay Pal Progress**
         2. **On line application**
         3. **Checking AMA numbers**
5. **Old Business**
   a. **Search for a field to purchase**
   b. **COMO**
   c. **Distribution of Clubs new flier**
6. **New Business**
   a. **Any new business from the floor?**
7. **We need to schedule a Neighborhood Fun Fly this year**
   a. **Suggest Aug 15th with 16th as a rain date.**
   b. **Volunteer(s) to direct this event.**
8. **Good and Welfare**
   a. **Ideas for school or group presentation to local organizations.**
   b. **Ideas for demonstrating how to do various radio installations, covering, & construction techniques.**
9. **New Members**
10. **Model of the Month**
11. **Motion to Adjourn**

CHECK OUT OUR NEW WEB SITE. WWW.RCPROPBUSTERS.COM

INSTRUCTORS

TOM VERNON – CHIEF PILOT	860—859-1548	BOB BOUDREAU – FIXED WING	860-443-8421
JOE COMEROSKI –HELI	860-848-3184	RON CZIKOWSKY – FIXED WING	860-388-2953
DENNIS DUPLICE–Fixed Wing	860-376-6230	BRIAN JOLLICOEUR–FIXED WING	860-464-9315
RICH IPPOLITO –BOTH	860-443-0085	FRED MEYER – FIXED WING	860-445-7694
ROBERT LARSON – BOTH	860-526-2267	MARK O'CONNELL – BOTH	860-367-9067
BERNIE LISKOV – FIXED WING	860-460-7095	LEN BUFFINGTON – *GLIDERS	860-395-8406
KYLE SWAIDNER - ** Gliders	860-405-5304	RICHARD CROOKS – FIXED WING	860-446-0050

*Len Buffington is a Glider and Aero-Tow expert that can also help with your fixed wing flying.

**Kyle Swaidner flies everything, but he is offering to introduce everyone interested in side arm & discus launched GLIDERS. Give him a call if interested.

IF YOU ARE A STUDENT HOOK UP WITH ONE OF THESE MEN AND GET TRAINED.

ANY CLUB PILOT CAN TRAIN YOU, BUT AN INSTRUCTOR MUST SIGN YOU OFF.

MODELS OF THE MONTH

Ed Deming brought in 2 helicopters and discussed some of the issues with setting these models up flying time and other issues including battery life and care.

The Goblin 630 is a full-on competition helicopter using two 4100mAh 6 cell LiPo packs in series. These 45C packs are capable of providing 200+ Amperes at over 50VDC or 10KW+ of power; this is over 13HP and that is also the approximate HP of the electric motors used. Ed pointed out that modern permanent magnet electric motors basically have a flat torque curve so power is instant and when operating in the 3D constant rpm mode the change in rpm on the main rotor (about 2500rpm) is nearly constant regardless of the load being placed on the blades. The tail rotor runs about 4.5 times the main rotor rpm or approximately 11,000rpm and the top speed of this model is near 120mph. At full power 3D usage the flight time is 3 minutes. Sport flying times are over 4 minutes.

The second model Ed brought in is an HD Cell 500. This 500 class helicopter uses a unique approach for the main frame which all the other components of the aircraft are attached. Rather than using aircraft grade aluminum and carbon fiber pieces screwed together to make up the main frame of the helicopter, the HD Cell 500 uses an aircraft grade aluminum "cell" frame hogged out of a single billet that results in a very strong and ridged main frame. This helicopter used a single 4100mAh 6 CELL 45C liPo battery pack. It has not been flown yet (must be a Christmas present) but the expectations are very high that this helicopter will be a great flying machine and perhaps best in its class.

Thanks Ed for a great presentation.

Items of Interest.

While roaming around Home Depot, I found some Super Magnets in the regular hardware isle. The part numbers for the ones I bought are, 07090 and 07045. One of the ones I bought has a hole in the center that allows for a small screw or a whole lot more epoxy to hold the in place. Also for the bigger models they have larger sizes. Hope this can help someone with their next build.

Dave Hoffman

Trimming Your Model

After flying some of the models at our field I found many of them were not trimmed properly or the transmitter was not set up correctly or both.

It is very important to trim you models regardless of the type of model it is or your skill level.

1. Acrobatic models with symmetrical airfoils require more trimming techniques to allow the best precision flying and neutral responses in any orientation.

2. War-Birds need to be properly balanced and set up so the tendencies to snap roll with excessive elevator control or tip stall during landing because the speed is too slow is essential to having a model that is easy and fun to fly.

3. Sport models of all types will also benefit from proper trimming resulting is more fun for the pilot, but more importantly a longer life for the model.

The next page is a copy of what was included with a model that basically pioneered 3D ARF's developed by a world class modeler, Dave Patrick.

All of the line items will apply to acrobatic model aircraft but some of the steps are not appropriate for other model types.

Always start with the control throws & CG set per the manufacturers or designers recommendations. After your first flights to get your trims dialed in make the needed mechanical adjustments to return your transmitter trims to center.

Remember the best flying aircraft will be balanced laterally as well as longitudinally. This is easily done by inserting an screw eye at the CG & hanging the model with a string attached to a "sky hook". For low wing models, hang them inverted. *Put the trimming chart in your flight box for easy reference.*

DAVE PATRICK MODELS

www.davepatrickmodels.com

TRIMMING CHART

These tests assume that the plane has been perfectly aligned, wings square to fuse, stab in line with wings, vertical fin is exactly 90 degrees to horizontal stab. Thrust, incidence and balance (CG) are set according to designer's recommendations. The wings are not warped as checked with an incidence meter, and the elevator halves are moving together as checked by a "Throw Meter". These flying tests should be done in near calm conditions. Double check each of the following tests before making any changes.

The most critical component of aircraft setup is finding the proper Center-of-Gravity (CG). It must be correct for each airplane, regardless of differences due to building variables and weight. Because of this requirement, ***it is important that this trim chart be followed in the order in which it is written.***

Test For	Procedure	Results	Adjustments
Control Neutrals	Test response to each control	Adjust trims for straight & level flight	Adjust clevises to center transmitter trims
Control Throws	Apply full deflection of each control	Check for response; aileron high rate 3 rolls in 3 secs. Elevator, square loop, corners, rudder, 35 to 40 degrees	Change control horns, ATV, and dual rates as required
Center of gravity Method 1 Method 2	1 Roll into a vertically banked turn 2 Roll into inverted flight	**1 A** Nose drops **1 B** Tail Drops **2 A** Lot of down required to hold level flight **2 B** Up elevator needed to hold level flight	**A** Add tail weight **B** Add nose weight See **Note A** at bottom
Up/Down Thrust Test 1	Fly model straight & level, then cut throttle Note: Either change B or C requires retest of decalage and verticals	**A** Model continues level flight with gradual drop **B** Model abruptly dives **C** Model abruptly Climbs	**A** No change **B** Increase down thrust **C** Reduce down thrust
Up/Down Thrust Test 2	Fly model straight & level, then pull up Note: Either change B or C requires retest of decalage and verticals	**A** Model continues straight up **B** Model pulls to canopy **C** Model pulls to belly	**A** No change **B** Increase down thrust **C** Reduce down thrust
Decalage, Angle of Incidence	Power off vertical dive from high altitude (neutralize elevator) (See **Note B** at bottom)	**A** Model continues straight down **B** Model pulls to canopy **C** Model pulls to belly	**A** No change needed **B** Increase wing or stab incidence **C** Reduce wing or stab incidence
Knife Edge Pitch	Fly model on normal pass, roll to knife edge, left and right, use rudder to hold model level	**A** Model does not change pitch **B** Model pitches to canopy **C** Model pitches to belly	**A** No adjustment needed **B** Either move CG aft; or increase wing incidence; or mix down elevator with rudder **C** Reverse of B
Tip Weight Test 1	Fly straight; level, roll inverted, release aileron stick	**A** Model does not drop a wing **B** Left wing drops **C** Right wing drops	**A** No adjustment **B** Add weight to right tip **C** Add weight to left tip
Tip Weight Test 2	Fly model towards you/away from you, pull tight inside loop, repeat with outside loop	**A** Model comes out with wings level **B** Model comes out with right wing low **C** Model comes out with left wing low	**A** No adjustment **B** Add weight to left tip **C** Add weight to right tip
Side Thrust	Fly model away from you and pull up to vertical	**A** Model continues straight up **B** Model veers left **C** Model veers right	A No adjustment B Increase right thrust C Reduce right thrust
Aileron Differential	Fly model toward you, pull into a vertical climb before it reaches you. Neutralize controls then half roll	**A** No heading changes **B** Heading change opposite to roll command **C** Heading change in direction of roll command	**A** Differential settings OK **B** Increase differential **C** Decrease differential
Dihedral	Fly model on normal pass, roll to knife edge, left and right, use rudder to hold model level	**A** Model does not roll **B** Model rolls in direction of rudder **C** Model rolls opposite to rudder	**A** Dihedral OK **B** Reduce dihedral **C** Increase dihedral

Note A: *These two methods for determining the CG of a model will give approximate results only. Start out with the CG where the designer suggested, or somewhere between 25% to 35% of the Mean Aerodynamic Chord. The optimum CG for your model will require further testing while performing maneuvers. The results will only be an approximation at best.*

Note B: *This portion of the trimming chart may be unclear for the following reason: In order to maintain level upright flight, the wing of a plane with a symmetrical airfoil wing needs to have a positive Angle of Attack (AOA, usually less than 1 degree). This positive angle provides the lift required to cause the plane to fly level. If the plane is balanced slightly to the nose heavy side (required for pitch stability), it will require a slight up elevator trim to hold level flight. A plane with a zero/zero wing to elevator angle will also need a slight amount of up elevator trim to hold level flight. Therefore, a plane trimmed in this manner will have a tendency to pull to the canopy on a straight, thumbs off, down line because the elevator is controlling the AOA of the wing.*

This positive AOA may also be achieved by a positive incidence change, which requires an offsetting down elevator for level flight. Thus, a power-off down line should fall straight down, with neutral controls. There are significant interactions between wing incidence changes and CG, therefore it is most important that the CG of the airplane be established first.

In the final analysis, flight trimming an airplane is a personal preference issue after you have taken care of the basic essentials.

TEAM PATRICK

Dave Patrick Models
1811 E. 400 North Rd., Milford, IL 60953
815-457-3128 Voice 815-457-2938 Fax
DavePatrickModel@aol.com

Special Thanks to:
NSRCA
National Society of Radio Controlled Aerobatics

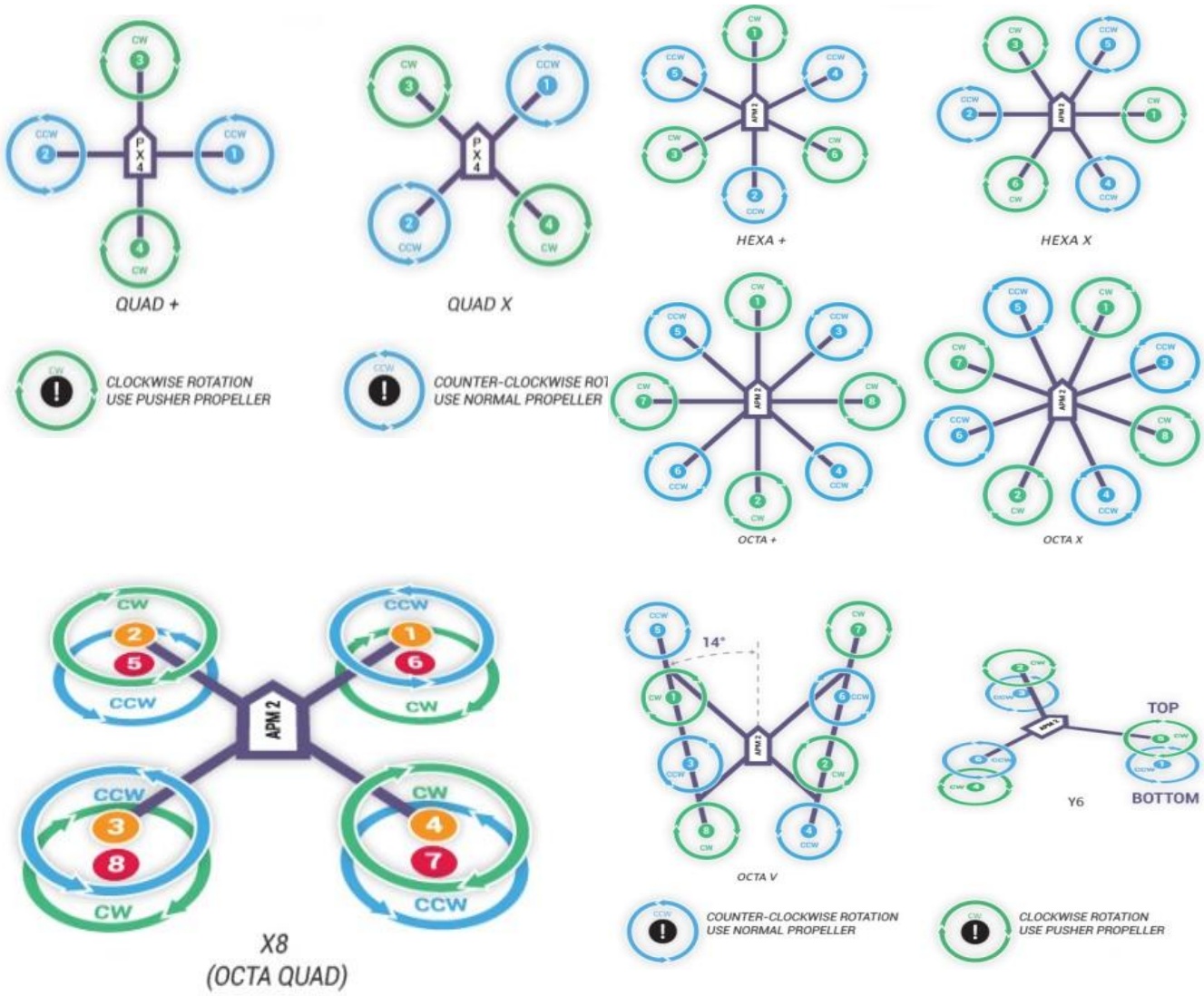
www.nsrca.org

How Do Multicopters Fly?

This is a short overview on how a multi-copter flies. On the surface, the way a multi-copter (MC) flies is very simple, but the science, math and control algorithms the allow us to fly them is quite complicated. I can explain the first fairly easily but the second will be a more daunting task.

Most of us know what P factor is. It is the tendency for a plane to try to turn left on takeoff and while climbing. Skewing the engine to the right is one way to combat this tendency. The ascending side of the propeller takes a bigger bite of air while in a climb thus giving a greater pull on that side. There is a second force or reaction taking place at the same time. That is when the propeller rotates it is pulling/pushing air past the blades. The torque that it takes to do this work has the effect that the same twisting force it takes to rotate the propeller is trying to rotate the airframe in the opposite direction. On an airplane the ailerons easily accomplish this task because the lever arm is so long. But, if we look at a helicopter, in order to counteract the torque we either must have a tail rotor whose thrust is in opposition to the torque of the main blades or have a coaxial twin rotor where the counter rotating blades cancel the torque each produces.

Multi-copters (MC) deal with the problem in the following way. They have an equal number of clockwise rotating and counterclockwise rotating propellers. There are several configurations but the concept is the same for all.



The quality of the lettering in the diagrams is not clear but green represents CW rotation and blue represents CCW. The principal is quite simple. Let's start with a quad MC. If I rotate all 4 propellers at the same speed there is no yaw because each blade set cancels out their respective torques. If I increase the speed of the four blades up to a point where the thrust produced is equal to the weight of the MC, the MC will be able to now fly. An increase will result in liftoff straight up. If there were no wind and the quad was perfectly balanced and the blades were identical in thrust production etc. the MC would go up perfectly vertical. For the time being consider that there are no external forces like wind complicating our simple example. We are in a state of equilibrium if we have provided enough thrust to maintain a chosen altitude.

Now, let's talk about yaw, pitch, and roll. To yaw (rotate) CW we speed up the CCW pair of props and slow down the CW set by the same amount. The result is we maintain altitude because the overall thrust is the same but rotate because more of the thrust is being produced by the CCW pair of blades. To rotate in the opposite direction we do the exact opposite by speeding up the CCW set and slowing the CW set.

To pitch forward, we speed up the propellers that are aft of the centerline and slow down the set that are forward of the centerline. What is most interesting is that there are always an equal number of sets of CW and CCW blades on opposite sides of the centerline (center point) no matter which direction you want to tilt to and also no matter whether you have 4, 6, or 8 props. So the result is forward flight because the MC is now tilted forward and so the thrust is directed towards the rear. Rearward flight is done in exactly the opposite way, by speeding up the props that are forward of the center point and slowing down those to the rear. Rolling left or right is done in much the same manner.

There are + configurations and X configurations which relate to the rotation of the MC with respect to the front but the same rules of operation apply.

The second part is a bit above my pay grade but here goes. As I said earlier, with no wind or other outside influences the MC will fly as I have described earlier, but in actual operation more things are at play. Almost all basic MC's have a few things in common. They have a chip which contains a 3 axis gyroscope, a chip which has a 3 axis accelerometer. a very sensitive barometer, and they have a computer processing chip (CPU). They are essentially like a machine that has I/O, inputs and outputs; add the inputs from the receiver which input the commands of the operator with respect to altitude and direction of flight. The outputs are the pulse width modulation signals which determine the speed of each of the electronic speed controls. The CPU is set up for the configuration you are using. If you buy an RTF MC then everything is set up by the manufacturer. If you are doing a DIY setup, you communicate with the CPU in one of several different ways depending on which brand it is. But, essentially you would tell the CPU what the configuration is: + or X and how many motors are on the MC. The heart of what is going on is a computer program that knows whether the MC is level or not, what altitude it is at relative to a reading it gets from the barometer at power on, and the pilot's inputs. Sometimes the program may have fixed and adjustable limits as to maximum tilt or roll in degrees and maximum acceleration rates. Therefore this program takes your inputs along with the other onboard inputs to control the speed of each motor. If you add a GPS module &and put the program in the position hold mode, the mc will tilt or roll itself to counteract the winds. If you have a higher end machine, it will have some type of interface which can input a series of moves, speeds, and actions in a set sequence you can program into it (mission planner). There is more to it if we are talking first person view and cameras and gimbals, but I will stop here before your eyes glaze over too heavily.

Bernie Liskov

Minutes of the January 20th, 2015 RC Propbusters Meeting

The meeting was called to order at 7:30 PM with absolute record of 30 members present.

Board Members/Officers introduced to the membership

Model of the month

- Ed brought in two helicopters. Goblin 630 & HD Cell 500

New Members

- None.

Minutes of the December meeting read and accepted.

Treasury report for December/January 2014/2015 was read by Peter Sylvester:

- Beginning balance was $20559.92
- Expenses were : $2654.15
- Income was : $2015.00
- Ending balance as of 01/20/15 was $19920.77

Committee reports:

- Website:
    - Added PayPal payment possibility.
    - Membership form is not reachable. Peter will add new PDF and online membership form.
    - Add Junior membership requirements to the application.
- Motion accepted to have the PayPal membership $5 more compared to the regular membership

Old Business:

- Public relation: we do have printed brochures. Please take them to schools, hobby shops etc.
- We have a small version of the brochure which will be available on the website.
- We had 78 member renewals.
- Fred gave an update about the investment opportunities for the club's money resources.
- Fred's update about CoMo and proposed to pay $750 in advance for 10 days. We will collect $10/person and excess funds collected will go to the club's treasury. Proposal accepted.

Events

- January 1st – New Year's First Flight. – There were a number of flyers on the field. Cold and windy.
- Dennis, Nepro: May 2nd, 3rd and 19-20th of Sept.
- Aero-tow, Lenny: May 14-17th
- Memorial event: Jun 13-14th. Come fly whatever you want. Fred asked for sponsorship and raffle donations.
- July 18th – Heli Fly-in Event – Sanction is already in. They will fly both fields.
- Neighborhood Fun-fly Aug 15th.(rain date Aug. 16th) Dennis: Looking for somebody to head up this event.
- Labor day pot-luck fun fly Sept 7th.

New Business:

- Peter will do the Re-Chartering with AMA and registering with Ct Dep. Of Commerce.

Good and Welfare :

- We would like to have ideas/demonstrations to be presented at club meetings – new radios, quads, new technologies (Buss-S). These should also make it into articles of the newsletter.

Club Officer attendance:

___ President ___x__ Vice President _____ Treasurer __x___ Secretary

Adjourned at 8:37
Respectively submitted by Peter Sylvester.