February

Skywriter

2013

SKYMASTERS RADIO CONTROL CLUB
OF MICHIGAN
AMA Chartered Club #970
15 Year Gold Leader Club
www.skymasters.org

In this issue:

From the President...

At just two weeks into this job, I'm truly learning to appreciate the work of my predecessors and of the many members who contribute so much of their time to get things done. As much as I have on my own plate, there are dozens of others who constantly work in the background to keep the club running.

We're working to finalize this year's event schedule. We're also reviewing the events to see if there's anything we can do to make them more enjoyable for members and visiting pilots and also more accessible to the public. This is part of our strategy to make a good name for ourselves in the community and to attract new members.

We have a team working on a plan to make our field more attractive and more visible from Scripps Road. Our entrance is easy to miss or to mistake for just another farm field access point. We want it to pull people in, and once they're in, we want them to take an interest in what we do.

Another aspect of public relations is how we interact with people at the field. I would like to ask all members to engage with visitors whenever they get the chance. When someone shows up in the bleachers, go talk to them. If someone else is flying, explain to the visitor what's happening and how a pilot handles each aspect of flight (take off, landing, flying the pattern, aerobatics). Some people will be very interested. Others may just

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want to watch. You don't need to push if the person doesn't want to talk but most are happy to get some attention.

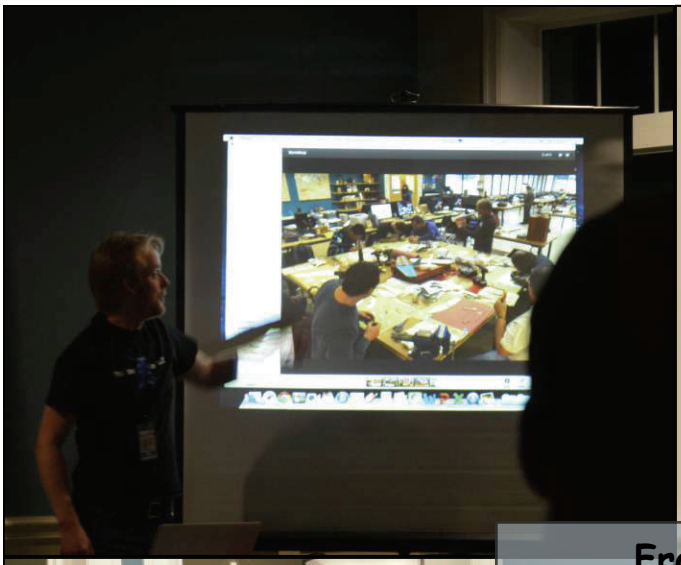
There is also a team working to improve how we handle student pilots. This includes how we run student night and the specifics of the training we give. There will likely be some instructor training so that we are consistent in how we teach. There will be more news on this as we go along. The plans are not yet finalized.

Before I sign off, I want to mention the Swap Shop. This year we are at the Community Education Resource Center which is a former Lake Orion school building. We believe that we will be welcome at this facility in coming years and hope to make it the permanent home of this event. Pre-registration is available on the website. Members who help to set up will receive free admission or $5 off of their table fee if they are buying a table.

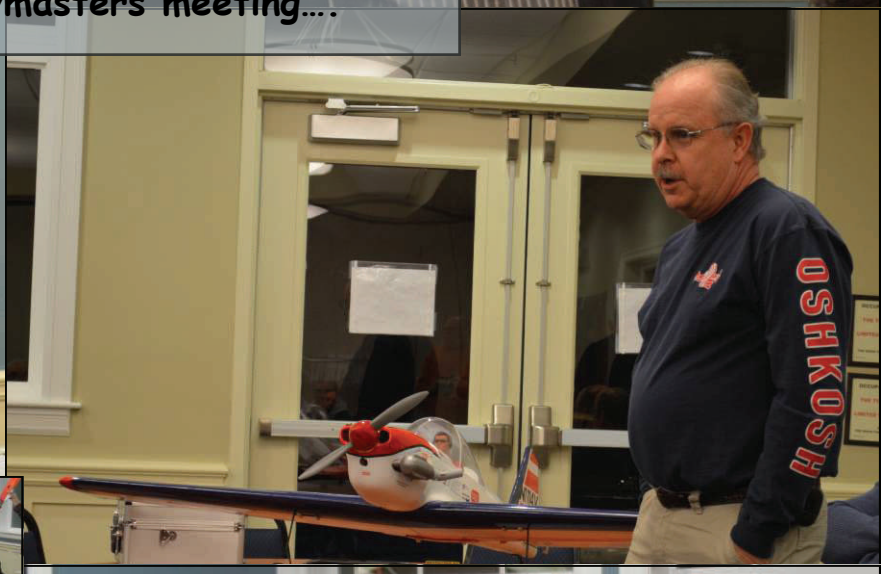
Ken Gutelius

President, Skymasters

kennanc@msn.com



From the January Skymasters meeting….



Front Cover:

A view of the Ultimate Soccer flying site from the "3D" end, with light streaming in through the windows.

Paul Goelz photo

Propwash

By

Joe Finkelstine

February, 2013

Hi All

Well, after a long absence and some arm twisting by your new BOD, I have agreed to write my column again. I can't say I'll have something every month, but I will try to come up with ideas that I have not covered before (or at least in a long time), but it is getting increasingly difficult to cover new ground. I will say however, that we have so many new members coming in over the last few years that it also makes sense to me to cover some topics again. I have had several discussions with new members this summer and this leads me to believe that knowledge transfer from experience to newbie is still much needed.

To that extent, I want to visit a topic I got asked about almost every time I brought out my pattern ship this last summer - "High Voltage" electric power setups.

The reason I put High Voltage in quotes, is to first point out that high voltage is a relative term in several ways. In my house, high voltage to me is the few 220 VAC lines I have running my furnace, air conditioner, oven, etc. To a shop floor electrician, 480 VAC may be the beginning of high voltage in his thinking. In our usage, high voltage is also a relative term. I will define it for this discussion to simply be any battery above a 4s configuration. This is certainly quite arbitrary, but I find that when someone shows up at the field with an electric plane or heli that requires a 5s or greater, the questions start popping out - At least to me they did anyways.

Let's start first with some definitions for anyone who may still be a bit uncertain about all these terms I use assuming you already know. When someone describes a 4s battery, what exactly does this mean? - Well, what it means is how the internal cells are connected. A 4S Lipo has 4 individual cells connected in series - The series connection is what is the "S" part of the 4S, and the 4 denotes 4 cells connected. When cells are connected in series the output of the configuration is the sum of the voltages of each cell. For a common Lipo in use at the field, a 3S 2100Mah pack, 3 cells of 3.7 volts are in series giving a nominal 11.1 Voltage output - the key here to remember is that each cell in series adds 3.7 volts to the output of the pack. The 4S of my example gives a pack with a 14.8 nominal voltage output. The capacity of the pack (2100 in this example) helps us understand how much total current the pack can deliver. Unlike voltages, when cells are connected in series, the capacity of each cell does not add up in the pack- For example, each cell in a 3S 2100 pack has a capacity of 2100 Mah.

Let's also remember a quick definition of voltage and current. Voltage is the "push" in a circuit that causes electrons to flow - The actual flow of electrons is the current. One way to think about this is by remembering an analogy to the water hose in your backyard. The "voltage" in this case is the water pressure, the "current" in this case is the water flowing out of the hose.

Another term I will throw around today is Power. Power is measure of how much current we are using at a particular voltage. In or case, how much current our electric motor is asking for to turn the prop. The unit of power is the "Watt". More on all these terms in a paragraph or two.

Now that electronics 101 is out of the way, let me return to why I have adopted using "High Voltage" in a few of my electric RC planes and even 1 heli now

It is common in our hobby now to see the electric power system listed for a plane to be listed in terms of "suitable for 300-400 Watt power systems", or similar. The designer is not mandating a particular battery configuration (3s, 4s, etc), or capacity, but rather relating the anticipated flying characteristics to the power required to fly. Over the last 10 years or so, a common metrics for planes has emerged for electric flight. This metric relates the motor power to the total weight of the plane. It is said that 100 watts per pound can give "scale" flight, 150 watts per pound can give "sport aerobatics", and 200+ watts per pound can supply strong aerobatics (not sure if I remember these numbers correctly, but you get the idea). Well, the designer looks at the anticipated weight of the plane, the style of flying it is suited for, and derives the Watts/pound needed, and then can let all us anxious flyers know how to go about choosing the power system based on the Power requirements.

Well, in our above example, we know our plane needs 350 Watts, now how do we relate that to a battery (and

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speed control)? - Let's ignore the weight of the battery pack and size for a moment (something we really cannot do!) and focus on the voltage and current capacity of the pack. Let's start to unravel this mystery with the first equation of this column (sorry folks, I can't help myself)

Power = Voltage * Current,

or in short hand

P = V*I (P=power, V=voltage, and I=current)

Let's examine this a bit closer with a few common Lipo pack configurations (remember, in our example, we want 350 Watts)

1) Let's try a 3S pack -

350 (Watts) = 11.1Volts * Current, solving this equation for the current, would give us the fact that at 11.1 Volts, we need approximately 31.5 Amps from the pack (11.1 (Volts) * 35.5(Amps) = 350 (Watts))

2) Let's try a 4S pack

350 = 14.8 * Current, with the necessary current now being ~ 23.5 Amps - that is 12 Amps less than the 3S pack

3) Now let's see about a 5S pack

350 = 18.5 (volts) * Current , with the necessary current now being ~ 18.9 Amps

As you can see, as we add Lipo cells in series (increasing pack output voltage), we get a decline in current needed to produce the same power.

Why is this important? - Time to introduce another important formula for heat involving current (again) and resistance. For this discussion, resistance is the property of all things that conduct/consume current to resist and hamper the current. All electric motors have a "resistance". Think back to our water example, the "hose" the water flows through offers resistance to the water because the walls are rough, there may be a pinch in the hose, etc.

Heat = I^2 * R (I=current, R=Resistance)

where I^2 is the square of the current, and R is the total resistance.

Now I want to focus on the fact that this formula relates the heat that a given current creates going through a resistance (for those of you care, it is called Joule heating) - Notice that that the amount of heat is proportional to the ***square*** of the current. this means if I double the current (for same resistance) the generated heat goes up by 4X. If I triple the current, the heat increases by a factor of 9X ! - heat causes all kinds of problems for our planes, particularly the motor, speed control, and battery! The less of it we have, the better we will generally be with our RC equipment.

Now, let's look at that same equation going the other way. As I decrease the current by a factor of 2 (I.E. cut it in half), the heat generated will decrease to 1/4 of the original (1/2 * 1/2) , if I decrease the current by 3X, the heat generated decreases to 1/9 (1/3*1/3)

Since the heat decreases so fast for current reduction, it sure makes sense to produce a required power with the least current as practical. So, just how do we reduce the current? - look back the power equation. To decrease current (for a given power), we increase voltage of the pack!

So in general , as we increase the number of cells in series in a potential battery pack, the current necessary in the motor system decreases (for the same power output), and most importantly, the heat really decreases - this is a prime reason (not the only one though) to go to higher cell counts when powering an electric RC plane or heli. Keep in mind we still have mechanical constraints here. For example, it is doubtful you could find a 5 or 6S pack that would be small enough to fit into the battery compartment of the 350 Watt example I gave earlier - we still have other limiting factors, related to pack availabilty, correct capacity, etc. Speed controllers also have limitations both on current and voltage.

Let's look at two examples I flew this summer that I got most of my questions on

1) My 2 meter pattern ship - the "Black Magic". given that the plane weighs ~ 10 pounds, the 200 Watts per pound formula then says we need at least 2000 Watts to make her fly as designed. How about a 3S pack? - well, at 2000 Watts, it would require the 3S pack to deliver around 180 Amps! - I think it would work as a great welder! - Because of mechanical constraints along with weight and balance, several people before me realized the best compromise for the battery configuration of these style planes is 10S - 37.1 Volts Nominal - (I use 2 5S packs in series to create a 10S) at around 5000 Mah capacity - with this setup, I am able to get 2500-2900 Watts with about 80 Amps of current, well within the pack capacity and speed control - My packs come down barley warm and the speed control is easily cooled to ambient. The 5000 Mah capacity gives me about 6-7 minutes of flight at those 80 Amps

- This setup absolutely requires a high voltage setup as any plane you may be contemplating that is greater in

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size than a traditional "90" size glow ship. You would find anything other than a "high voltage" setup not even feasible. This represents an example of high cell count being mandatory.

How about my next example, where high voltage is ***not*** mandatory?- That would be my 450 Trex electric helicopter.

This increasingly popular helicopter size is manufactured generally assuming the user will utilize a very common size 3S 2100 Mah battery pack. As you will soon see, it is not the only way to power this vessel.

These 450 size helis actually request a very healthy amount of power to spin those main blades and if you want spirited flying out of your 450, a very high "C" rating 3S pack will be necessary, as the current demands for this flying style are near the very limit of all but the highest "C" rating packs. For this type of flying, you would be pushing the battery pack, motor, and speed control to near capacity every single flight. However, If all you do is hover, you generally won't require power to this limit.

When I built my new 450, I made some changes to the configuration. I planned on having lots of fun with this setup and I wanted a sufficient power to deliver this. I did not want to deal with batteries, motor and speed control operating at or near their design limits - High voltage to the rescue!

I chose to power my 450 with a 6s configuration - The physical limits of the 450 precluded just doubling up the standard 3S 2100 pack, so I chose to use the smaller 3S 1300 packs in series. I also increased my power available by about 25-30 % because I wanted a higher head speed than the normal 3S configuration can provide.

The 6S configuration required me to make a new battery tray, as the standard tray was long and skinny to fit the 3S 2100 pack - So I had this easy mod and I also bought a motor with the correct Kv rating for 6S and put everything else together as stock.

Since I am using 6S, the current draw is nearly 50% less than the 3S and I am able to have the same flight times as a 3S setup, but enjoy much faster head speeds, and the motor, controller and battery pack are barley warm and are working well within their design limits. It is possible to put a finger on my motor right after landing - try that with a regular 3S setup and you will almost certainly burn your finger!

So, I enjoy head speeds around 3500 (as opposed to 2800 for most 3S setups), and run all of my components very cool. In addition, since I have low current draws from my packs, I can buy low cost versions of these packs, so that my battery cost is actually equal to, or more often less than the 3S flyers. Each of the 3s 1300 packs I have cost $8, so the total battery cost per combo of 2 packs is $16 - This is right in line with medium quality 3S 2100 packs

What's not to like about this setup? - This setup worked for me because I bought a kit and sold off the original motor and speed control and changed out to components that I wanted. The same Kit I bought now comes without any electronics, which is even better.

Finally, let me conclude here with some reasons why it ***might not*** be a workable idea for you to go high voltage.

1) If you buy an electric plane/heli that already includes a motor and speed control, it will likely need to be changed out to move to a higher cell count pack - This may be a cost not worth it, or even practical.

2) As you add cells to a Lipo, you also add cost - check out the prices for any pack of a given capacity (and rating)for 3s, 4s, 5s, and 6S - the more cells, the more cost - Your flying style might not justify the cost differential for batteries as well.

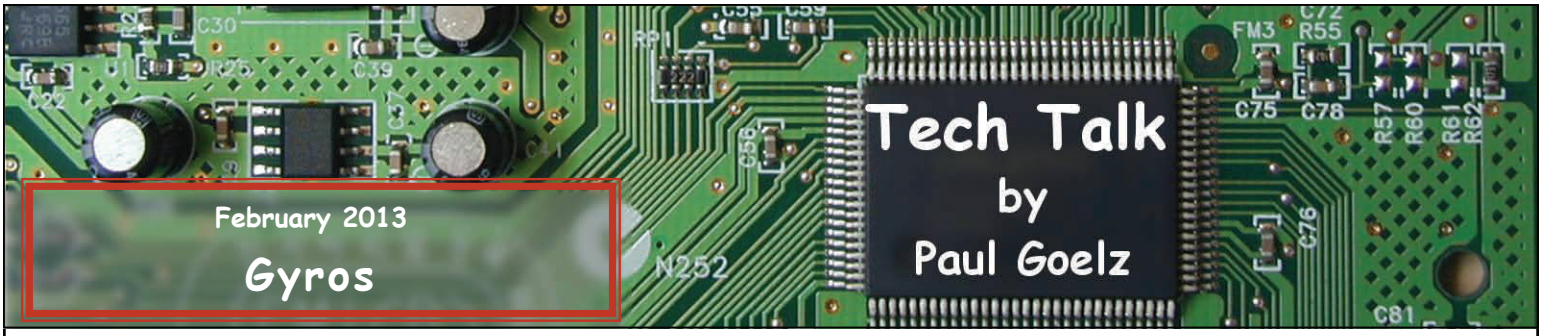
3) There may be strong physical constraints in the plane/heli that will not allow much more than the standard battery/motor configuration as envisioned by the designer/manufacturer. There just might not be any room to cram that 5S pack in the fuse!

4) Before you embark on going high cell count, you need to be comfortable playing around with a bit of math and researching other opinions on what works - it is OK to stay with the standard setup!

Regardless of the above caveats, I absolutely love my high voltage electric planes and helis and will strive to go High voltage whenever possible. The benefits can be quite substantial and I would encourage you to consider it as you gain experience and the opportunity presents itself

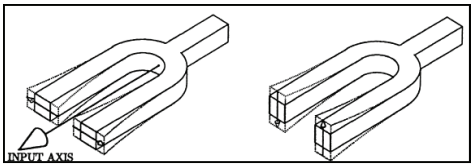
See you at the field in the not too distant future

Joe

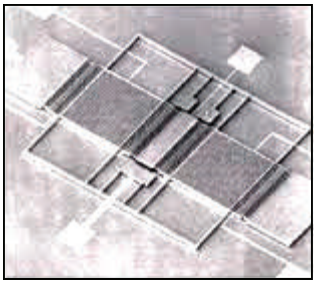


No, I don't mean the Greek delicacy. I mean the things that we use to stabilize our helicopters and lately our airplanes.

First, some background. The term "gyro" is a shortened form of the word "gyroscope", which until the 70s or 80s meant a spinning mass like a child's spinning top. When a mass is spun, it resists efforts to move it in directions other than the spin axis. Using sensors on the mechanism, this property was used to sense motion and apply a correcting action. Mechanical gyros are relatively heavy and fragile. They also require significant power to keep the mass spinning.



In the 80s, a new "gyro" was introduced that used a mass that vibrated instead of rotating. The instantaneous direction of the vibration was sensed, processed and used to determine if the assembly had moved. The vibrating mass was often a piezoelectric assembly, where electronics were used to keep the mass vibrating as well as to derive the output. The first peizo gyros required much less power than their mechanical counterparts, but they were still relatively fragile because they were made from several small parts that needed elastic suspension and used VERY fine wires to connect to the electronics.



Nowadays, most gyros in model aircraft are "MEMS" gyros. MEMS stands for "Microelectromechanical Systems". A MEMS gyro is still a piezo gyro, but it is manufactured using lithography and as such is smaller, much more rugged and much less temperature sensitive.

OK, now that we have that under our belts, how do gyros apply to our models?

Basically, a gyo is used to sense unwanted movement and produce an output that is applied to one or more control surface servos to correct that movement. The most common use is on the tail (rudder) of a helicopter, but they are finding wide application lately as stabilizers in small electric airlanes. The AS3X system from Eflite is one common example. Gyros come in two distinct "flavors".

A rate gyro senses movement and produces an output as long as the movement continues. If the movement ceases, the correction output falls to zero. A rate gyro does not sense absolute position, just the fact that movement is occurring. Think of it as damping out unwanted movement, but not holding any given position. On the rudder channel of a heli (for example), a rate gyro will prevent the tail from swinging wildly but it will NOT hold the tail stationary.

Like a rate gyro, ***a heading hold gyro*** senses motion. However, it also senses and controls absolute position. If a heading hold gyro is moved away from the last commanded position, it produces an output that does not fall to zero until the gyro is moved back to the last commanded position or until the pilot commands a new position. On the rudder channel of a heli (for example), a heading hold gyro will hold the tail stationary until the rudder stick is moved to command a new position.

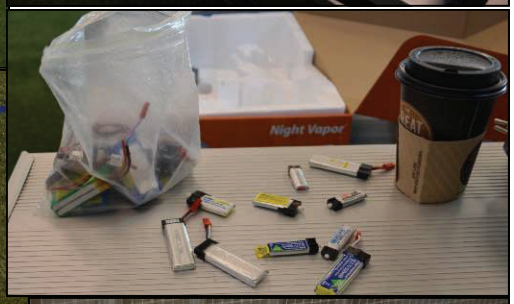
A gyro needs to "initialize" when it is powered up. While it is initializing, it corrects for internal errors such as sensor errors and temperature effects. If it is not stationary during initialization (or if it does not include effective temperature compensation), it may produce an output even when not in motion, causing the controlled channel to drift in one direction or another.

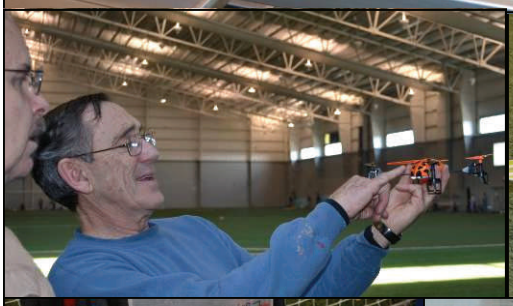
A vibrating gyro is temperature sensitive. Modern gyros include temperature compensation, but some inexpensive gyros are signigicantly affected by temperature changes in spite of internal compensation. If you have an unexplained drift, try powering off and back on the re-initialize the circuitry.

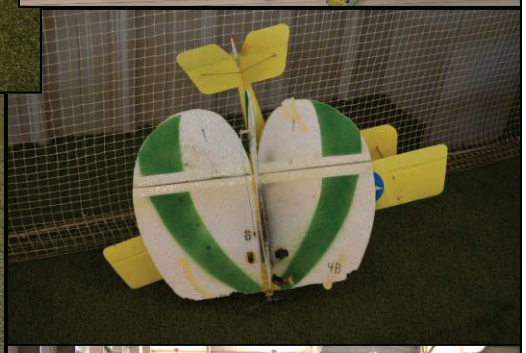
Until next month…..

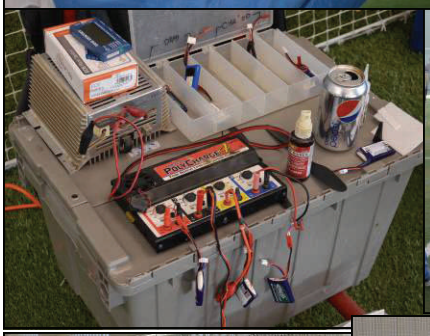
Paul Goelz paul@pgoelz.com

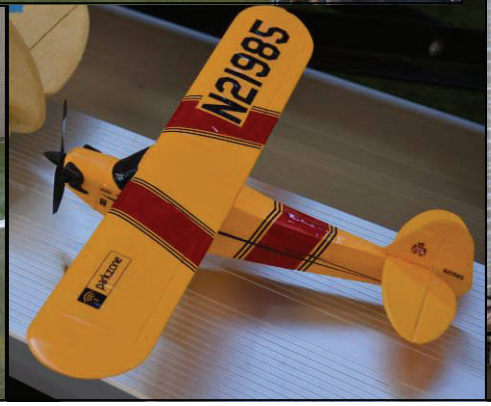
January indoors at Ultimate











ON THE WING

Skymasters Breakfast!

First and Third Monday
of each month
9AM
Everyone welcome

Red Olive restaurant
In the strip mall on
Walton, across from
Crittenton Hospital

Indoor Flying

every Tuesday
11AM to 1PM
At Ultimate Soccer,
Opdyke and South Blvd
Pontiac, MI

Put it on your calendar….

The 2013 Skymasters Swap!

Saturday, February 2nd

9AM to 1PM

Lake Orion Community Schools

Community Education Resource Center

455 East Scripps Road

Lake Orion, Michigan 48360

Skymasters Meeting

XXXXXXXXXXXXXXX

6:45 to 8:45pm

At the Orion Center

1335 Joslyn Road

(just south of Clarkston Road)

Lake Orion, MI

Other local indoor flying sessions

Thursdays, 9AM to 3PM (6 hours)
51379 Quadrate, Macomb MI
(north off 23 mile, east of Hayes)
Small electric planes and helis
(safe separate heli space)
AMA not required
$10/session
Information: Steve Durecki 586-246-4203

February 2013

SUN	MON	TUE	WED	THU	FRI	SAT
					1	2 Skymasters Swap (see flyer)
3	4 Skymasters Breakfast at Red Olive 9AM	5 Indoor flying at Ultimate 11AM –1PM	6	7 Joe Malinchak demos (see flyer) noon—3PM Indoor rubber at Ultimate 1PM—3PM Joe Malinchak at Ultimate 7PM	8	9
10	11	12 Indoor flying at Ultimate 11AM –1PM	13	14 Indoor rubber power at Ultimate 1PM—3PM	15	16
17	18 Skymasters Breakfast at Red Olive 9AM	19 Indoor flying at Ultimate 11AM –1PM	20	21 Indoor rubber power at Ultimate 1PM—3PM	22	23
24 DAM Swap (see flyer)	25 Hobbico Visit at Ultimate 7PM	26 Indoor flying at Ultimate plus Hobbico visit 11AM –1PM	27	28 Indoor rubber @ Ultimate 1PM—3PM Skymasters meeting at Orion Center 6:45PM		

Newsletter Submissions
Please send all articles, photos and announcements to the Skywriter editor at:
newsletter@skymasters.org
Deadline is the 20th of each month.
The Skywriter newsletter is published monthly by the Skymasters Radio Control Club of Michigan
www.skymasters.org

2013 Club Officers & Appointees...

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The 2012 "Krazy Snow Fly"

R/C Super Swap

Of Lake Orion

Saturday February 2, 9-12 p.m.

Lake Orion Community Schools –CERC
Community Education Resource Center
455 East Scripps Rd.—Lake Orion, MI 48360

Take I-75 to exit 81 (Lapeer Rd) go North 4.2 miles, turn right on E Scripps Rd and follow for ¼ mile– Destination will be on left

WWW.SKYMASTERS.ORG

- $20/table Pre-registered [$25/door]—set up 8-9 see website*
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***Visit website for online PayPal Registration, or printable mail in registration form**

Skymasters R/C Club

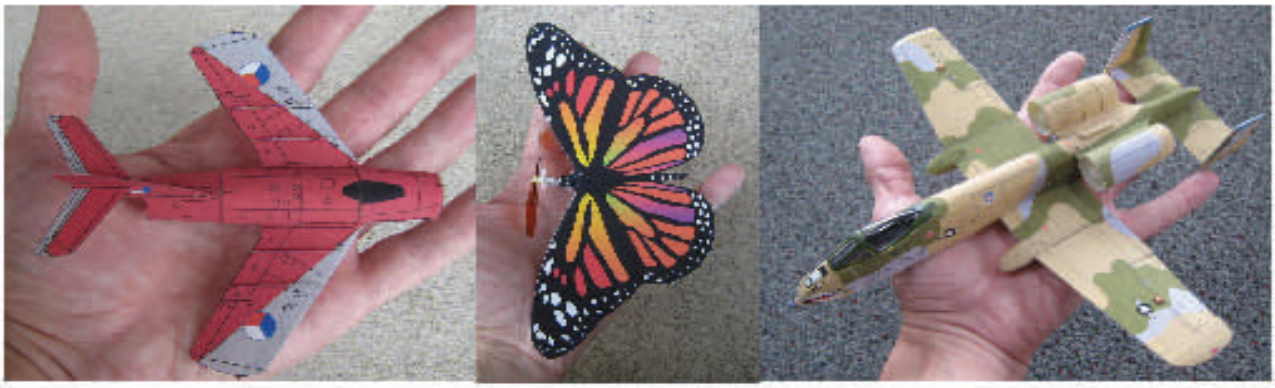
We'll Teach You To Fly!

Join the Skymasters Radio Control Club for an R/C Symposium

Joe Malinchak

Thursday February 7th – 7PM

World Class Micro Flyer
Model Aviation Columnist

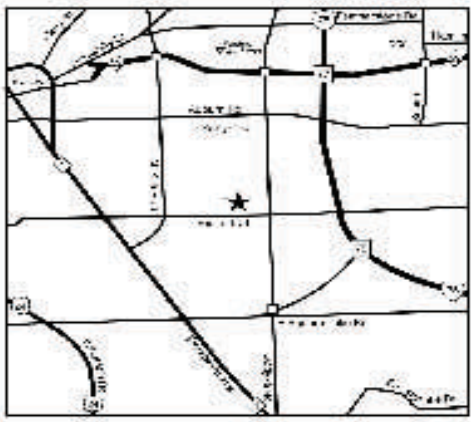


Come see a 4.2" EDF Mig and a 9.4" A-10 twin EDF.

Free Admission!
All Welcome!!!

Ultimate Soccer Arena
867 South Blvd, Pontiac, MI

Restaurant open before and after meeting for dinner/drinks!



For more information call Pete Foss 248-236-0676
Visit our website at www.skymasters.org

Special notice….

Since flying will not be possible Thursday evening at Ultimate, Joe Malinchak and Pete Foss will be at the regular indoor flying session at **Premier Training Center, 51379 Quadrate Dr, Macomb, MI 48042** from about noon to 3PM. The session runs 9AM to 3PM and costs $10 to fly. AMA not required.

Skymasters R/C Club

Indoor Electric Flying

Ultimate Soccer Arenas
867 South Blvd., Pontiac, MI

2 miles south of the Pontiac Silverdome

In conjunction with the Radio Control Club of Detroit

PRESIDENTS' DAY

Monday, Feb. 18th from 11 AM to 1 PM

2 Hours of Indoor Flying - $10.00

Spectators Free

Large Enough For Simultaneous
Sport, 3 D, Micro, and Heli.
See rules for size and weight limits.

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All Pilots must have proof of current AMA Membership

For more information call Roger Schmelling 248-321-7599
Visit our web site at www.skymasters.org

* Single Session Rate for Parents - Family Members Under 12yrs Free at Discretion of Event Director

GIBRALTAR TRADE CENTER SOUTH

RC SWAP SHOP

FEBRUARY 24TH

GENERAL ADMISSION: FREE !

THE DOWNRIVER AEROMODELERS, FORMERLY THE DOWNRIVER HELICOPTER ASSOCIATION IS HOLDING ITS FIRST ANNUAL RC HOBBY SWAP SHOP AT THE GIBRALTAR TRADE CENTER SOUTH.

THE TRADE CENTER IS LOCATED AT THE INTERSECTION OF I-75 AND EUREKA ROAD. (EXIT 36) THE EVENT WILL TAKE PLACE ON SUNDAY FEBUARY 24TH. DOORS WILL OPEN TO TABLE HOLDERS AT 8:30 ON THE EAST SIDE OF THE BUILDING ADJASCENT TO THE YELLOW ENTRANCE. THE GENERAL ADMISSION DOORS WILL OPEN AT 10:00AM AND THE EVENT WILL CLOSE AT 3:00PM. PARKING/ENTRANCE $2.00.

TABLES: $15.00 ADVANCED
$20.00 AT THE DOOR

GENERAL ADMISSION: FREE !

ADVANCED RESERVATIONS CALL DAVE GEORGE
1-734-307-6727 OR EMAIL INDIANCITY5129@YAHOO.COM

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A 2 DAY EVENT with ASSISTANT MARKETING MANAGER

STEVE KALUF

Monday, Feb. 25th from 7-9pm

Special Product Program

Regular Indoor Flying at Ultimate Soccer Arenas

Tuesday, Feb 26th from 11am -1pm

HOBBICO Product Demos, Product Support, Q & A.

Futaba **EVERYONE WELCOME** GREAT PLANES

ULTIMATE SOCCER, 867 SOUTH BLVD., PONTIAC, MI

FOOD AVAILABLE ON SITE:
DINE AT SALVATORE SCALLOPINI
BEVERAGES AT KICKERZ CAFÉ AND UPPER 90 PUB

SUPPORT THE ORGANIZATIONS WHO SUPPORT AEROMODELERS!

Regular Indoor Flying Rates for Tuesday, Feb 26th

SKYMASTERS RC MICHIGAN

For more info contact: Joe Hass
(248) 321-7934 or joehass@gmail.com
Visit our website at: www.skymasters.org

Hobbico has consistently been one of the most generous supporters of aeromodelers in southeastern Michigan. Late last year they sent along some goodies that were used at the Ultimate Charity Fundraiser and at the Christmas Party. They asked for a few pictures of the indoor activity and users of Hobbico products. They also supplied even more items that were given away at the Hobbico Picture Day.

Joe Hass

248-321-7934

Skymasters Information…

The Skymasters field is located in Lake Orion, within Bald Mountain State Park on Scripps Road (see map). A state park Permit is required and can be obtained from the Park Headquarters located on Greenshield Road or at club events. Flying is permitted from 10 AM to 8 PM. The noise limit is 94 dBa at 10 feet. This noise rule is strictly enforced.

Wednesday evening (through August) is Family Night with flying and a pot luck buffet. Bring something for the grill & a dish to pass.

Thursday 3PM to 8PM is Student Night (through August) but there are usually instructors around all day. Meet the instructors and arrange for more instruction time together on other days. Our Chief Flight Instructor is Roger Schmelling, 248-321-7599.

From June through August, **Club meetings** are held at the field, on the second Wednesday of the month at 8 PM . A great chance to fly and socialize. **Winter meetings** (September through May) are usually held at the Orion Center, 1335 Joslyn, in Lake Orion. Check the calendar here or on the web site for specifics. Bring a model for Show and Tell, enjoy coffee with donuts and listen to the speaker of the evening.

The Skywriter newsletter is sent to members, local hobby shops, and other R/C clubs in the area and around the country. All contributions are welcome. Please send photos and articles to **newsletter@skymasters.org** If you know of anyone who may be interested in R/C Aviation, please give them a copy of this newsletter or a copy of an AMA magazine. It may spark their interest!