



In this issue	
President's Message .....	1
Circling Back .....	3
Indoor photos .....	8
Flyers .....	9, 11
News .....	12
Calendar .....	13



**Happy February!**

Sure was a quiet January. I only made it to the field once for winter flying with a couple of other crazies. Then the cold snap we have been having hit! Sure is nice to fly off the lake this time of year since it's a 1 minute walk to the flightline from the house!

With Omicron raging (including my wife getting it), the EOC decided not to host the February meeting in person. We will get together on Feb 17<sup>th</sup> at 7PM on Zoom. Zoom link will be emailed on the 17<sup>th</sup>.

Swap meet season seems to be going ahead this year. I saw on Facebook that the RCCD swap yesterday was quite

*(Continued on page 2)*



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successful. We'll keep the online calendar up to date as they are announced. So far, I am aware of the Toledo R/C Swap (April 1-2) and Flint Flying Aces (April 3).

On a final note, today was John and Tracie Hoover's last day at Flightline Hobby Shop. Sure will miss the shop but I hope we see them at the field a lot more! Sad to see yet another brick and mortar shop fade away. But I also look forward to some great new kits from Aspect Aviation. Good Flights John and Tracie!

**Pete**

**Pete Foss, President**

**Skymasters RC**

[president@skymasters.org](mailto:president@skymasters.org)



**Front Cover**

Jack Iafrat enjoying some indoor 3D action at UWM.

*Paul Goelz photo*



### Electric power: A short primer

Last month I mentioned the watt per pound rule commonly used when discussing electric power systems without giving it much thought. It later occurred to me that some of you may not be familiar with the terminology and that a review of the basic principles might be helpful.

#### Understanding power requirements:

When dealing with either glow or gas engines we normally understand power in terms of displacement. It is also easy to see why; most advertising lists the engine size needed to fly the model and this particularly true for larger models (i.e. those intended for gas engines). As electrics become more popular manufacturers have started to offer models which can take either power system. Along with the recommended engine displacement they also suggest an equivalent electric system.

Electric power can be a little harder to understand because there isn't a single parameter which adequately describes it; it needs to be thought of as a system made up of the motor, battery, and prop. Changing one can significantly affect performance.

The unit of measure is the watt and to put in terms that most are familiar with:

$$1 \text{ hp} = 746 \text{ Watts}$$

The guideline commonly used is known as the "Watts per lb" rule; originally developed by Keith Shaw back when brushed motors were the norm. It is a somewhat out of date, but I have enclosed it as a historical reference:

Power level	Expected Performance
< 50 W/lb	Hand launched glider, unable to rise off the ground
50-60 W/lb	Can rise off the ground, "trainer like aerobatics"
60-75 W/lb	Will loop from level flight, sedate sport aerobatics
75-100 W/lb	"Fighter like" performance, good sport aerobatics
100-150 W/lb	Long verticals, will probably hover, impressive aerobatics
> 150 W/lb	Will fly even if you forget to bolt on the wings...

Our current systems can deliver values of 100 W/lb or greater easily. Given this context I would recommend these ranges:

Sport flying: 100-150 W/lb

Heavy aerobatics: 150-200 W/lb

As you can see the rule is easy to apply; a sport model weighing 6 lbs would need at least 600 watts to fly well (i.e. loops, rolls and reasonable stall turns). Any additional power will improve performance particularly in the vertical plane.

#### How do we measure power?

Now that we have a rough idea of how much power we need let us consider how it can be calculated:

Power = volts x amps or ohms x amps<sup>2</sup>

$$P = V \times I \text{ or } R \times I^2$$

From the equations it is apparent that if we know the voltage and current, we can determine power. The simplest way to make the measurement is to use wattmeter. If you are serious about electrics it is a must have. To use the device, you simply connect it between the battery pack and ESC:



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In this instance the meter reads a voltage of 13.9V, a current of 58.7amps for 811W of power. As such we are measuring the power being drawn from the battery; there is no consideration given to the losses associated with the ESC and motor. For us, this is generally accurate enough.

Next we will take a look how the motor along with the battery come together to deliver the power we seek.

#### Understanding motor specifications:

Electric motors are quite flexible; they can deliver a wide range of power depending on the operating voltage and current. To mathematically describe a motor three parameters are needed:

RPM per volt or Kv: This is a measure of how fast the unloaded motor (i.e. no prop) will turn for each volt applied. A motor with a Kv of 1000 would turn at 10,000 RPM at 10 volts.

Idle current or  $I_0$ : The current drawn by the motor as it spins freely in response to an applied voltage. The measurement is commonly made at 10 volts.

Internal resistance or  $I_r$ : This is the resistance of the windings. It is also a measure of efficiency and of how much heat the motor will generate.

To make the calculations these values are generally entered into a performance estimator. This is the simplest way of assessing the suitability of your choices. There are several versions available online; I currently use:

<https://www.ecalc.ch/motorcalc.php>

One nice feature of the software is that it includes an extensive library covering many popular motors, ESCs and props. In most cases you will find the data you need without having to look for it elsewhere. Access to the software is not free but at \$10 per year it is not terribly expensive either.

If you are not keen in making a detailed evaluation you can always use the manufacturer's recommendations as a starting point while keeping in mind that some experimentation will be needed to find the right prop.

For example, let us consider using an E-Flite Power 25 (870 Kv) to power a 4lb aerobatic model. The Horizon Hobby webpage list the following information:

#### Key Features

- Equivalent to a 25-size glow engine for sport and scale airplanes weighing 3–5.5 lb (1.4–2.5 kg)
- Ideal for 15-size 3D airplanes up to 3.5 pounds (1.6 kilograms)
- Ideal for models requiring up to 600 watts of power
- High-torque, direct-drive alternative to inrunner brushless motors
- Includes mount, prop adapter and mounting hardware
- External radial rotor design—6mm shaft can easily be reversed for alternative motor installations
- Slotted 14-pole outrunner design
- High-quality construction with ball bearings and hardened steel shaft
- Quite, lightweight operation

#### Needed To Complete

40–45A brushless ESC  
3S–4S Li-Po or 10- to 14-cell Ni-MH/Ni-Cd  
11x8 to 14x7 prop

The motor appears suitable for our application, we just need to decide on what battery and prop to use. The current limit is not explicitly stated but a 40–45 amp ESC is suggested. Given this we will assume a current limit of 40 amps (lower is safer).

In terms making power efficiently it is desirable to opt for the higher voltage battery, in this case 4S.

This is where things get a little tricky, the suggested prop range will lead you to believe that on 4S the motor could spin a 14x7 prop. That is not true, you will over amp the motor if you do.

Tip: If the motor data lists a range of usable battery voltages always assume that the largest diameter prop operates at the lowest input voltage while the smallest prop is generally suitable for the highest input voltage.

In our case, using a 4S battery, we would start out with a 11x8 prop and see where we stand. If you embark in such experimentation it is wise to use a wattmeter to measure the current and power levels; you want to make sure that you do not exceed the motor's current limit.

Since I do not own a Power 25 I cheated and used E-calc to determine if the combination might work:

Motor: E-Flite Power 25, 870 Kv

ESC: 60 amp generic

Battery: 4S 3000 mah, 30C

The initial estimate is that this prop will over amp the motor:

Prop: APCe 11x8

Current: 50 amps

RPM: 9936

Pitch speed: 75 mph

(Continued on page 5)

(Continued from page 4)

Power: 684 watts

Based on this we would like to try prop with a little less pitch:

Prop: APCe 11x5.5

Current: 39 amps

RPM: 10495

Pitch speed: 55 mph

Power: 543 watts

So now we have a combination which could work. A few things to keep in mind:

The motor unloads in flight; the in-flight currents will be somewhat lower than those recorded on a ground test run.

The manufacturer's suggestions should be taken with a grain of salt; it is always a good idea to check the power and current draw.

The pitch speed is a theoretical indication of how fast the model would fly if it had no drag. E-Calculator will provide an estimated flight speed if you enter data to describe the model. In this case, a 4lb model with a 55" WS using the 11x8 prop would reach a speed of 65 mph; 10 mph slower than the theoretical pitch speed.

#### Understanding batteries and C-ratings:

Most of the batteries we use have their capacities listed in milliamp hours (mah) and their discharge capability as a multiplier of their capacity (C-rating).

Capacity is defined by the current which the battery can sustain for 1 hour before becoming fully discharged (and hence the term milliamp hours).

The C-rating is a multiplier applied to the capacity of the battery (in amps) which defines the maximum "safe" discharge rate. Many batteries list a continuous rate as well as max burst capability. For example, a 4000 mah pack with a 20C/40C rating could deliver:

80 amps continuously

160 amps in short bursts

Having that much power available might be great but if you push the packs at those levels for the whole flight it will also be a very short flight. To put things in perspective:

5C discharge: 12 minutes of flying

10C discharge: 6 minutes of flying

20C discharge: 3 minutes of flying

Lithium packs do not take well to being fully discharged so we generally leave 20%-25% of their capacity unused. The actual flight times would be less than those indicated above.

Finding a balance between capacity, C-rating, desired flight time and performance takes some thought. Many seem to emphasize the importance of the C-rating when capacity is what is truly important. Let me provide an example.

As most of you know I like to fly pattern which means that I fly a predetermined sequence of maneuvers. As a result, my power consumption varies little from flight to flight. I would consider pattern flying as a form of spirited sport flying when it comes to its power requirements.

The Vanquish uses 4000 mah packs and a typical 7.5 minute flight yields the following numbers:

Consumption: 2600 mah

Average current: 20.8 amps or 5.2C

Peak current: 62 amps or 15.5C

As you can see the average and peak discharge levels do not require cells with high C-ratings. I used to use 20C packs and they normally lasted for 2 seasons and occasionally 3. These are no longer available so now I use 30C packs with good results.

The point is that the flight time will dictate the pack's capacity and for normal flying high C-ratings are not necessary. Keep in mind that cell weight increases with C-rating even if capacity remains unchanged; you could potentially be adding unnecessary weight.

If you enjoy 3D flying or ducted fans you will have a legitimate reason for wanting to use batteries with higher C-ratings.

#### Case study 1: 1/6 scale SBD Dauntless

I got asked to provide my input regarding this model so I decided to weave the answer into the column.

This particular model is sold through Motion R/C and it is made by Nexa. The plane features many scale details such as a working dive flaps, retractable undercarriage, bomb drop, and detailed panel lines.

(Continued on page 6)

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The model is large with a wingspan of 81", a wing area of 1300 sq in and a finished weight of about 15.4 lb. At that weight the wing loading approaches 28 oz per sq foot; it is on the heavy side. Most of our aerobatic or sport models have wings loadings in the 23 oz range. It will need to be flown with care.

The recommended motor is the GP26 6330-245Kv. No details are provided other than the motor can use an 8S-10S battery, has a 70 amp limit and can swing a propeller in the 17x9 to 20x10 range. For the Dauntless they suggest using an 8S pack and an 18x12 prop.

I made an educated guess that the motor is a clone of the E-Flite Power 160 and ran the numbers under that assumption. Using E-calc once again this is what I found:

Motor:	E-flite Power 160
Battery:	8S, 4000 mah
Prop:	APCe 18x12
Current:	54.6 amps
RPM:	6337
Pitch speed:	69 mph
Power:	1490 watts

The numbers are roughly in the ballpark, the current, RPM and pitch speed are reasonable, but the power is below the 100 w/lb target at 96 w/lb. Close enough that I would say let us go fly and see.

The owner already has several 6S packs and is tempted to see if he could use them. Using a single 6S pack will not provide the power needed with this motor, combining

two packs into a 12S pack certainly would. The higher input voltage requires using a smaller prop; after some trial and error it appears that a 16x8 would work and that a 16x10 might also be an option:

Battery:	8S, 4000 mah
Prop:	APCe 16x8
Current:	54.6 amps
RPM:	9327
Pitch speed:	71 mph
Power:	2255 watts

The gas engine suggested for the model turns a 16" prop so having the electric motor turn a similar diameter prop makes the answer reasonable.

A few things to keep in mind, a 12S pack will be 1.5 times heavier than an 8S pack if the capacity remains the same. I suspect that the model's weight would increase by 1lb which could also lead to C.G. issues. I normally weigh my models as they are coming together to get a sense of what the final weight will be and if things need to be moved around to achieve the proper C.G.

#### Case study 2: Caleus F3A

The Caleus has been around for some time and known to be a good flyer in pattern circles. The model is all composite and comes already painted so it goes together quickly once you have what you need.

In this instance the owner has already purchased an E-Flite Power 160 and would like to know what battery and prop would work best. The Caleus is slightly smaller than the Dauntless but much lighter at 11-12 lbs.



In this case the recommendation would remain the same, an 8S pack swinging a 18x12 prop should fly the model well.

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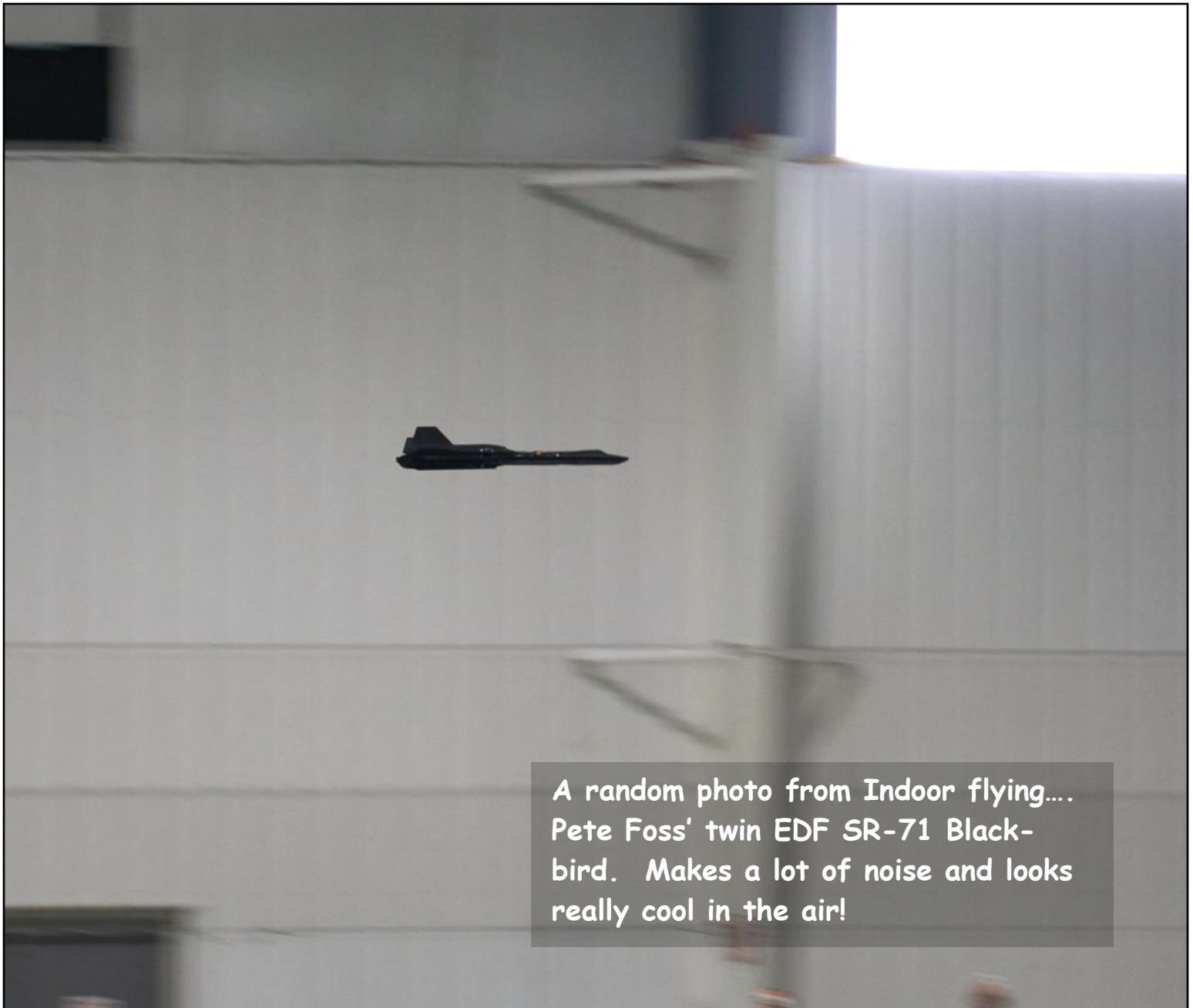
Using a 12S pack with a 16x8 prop is also a possibility, but again, the effect of the increased weight needs to be considered.

In both instances the owners had 6S packs readily available and it would make sense to use them to power these larger models. Looking at E-Flite's offerings, the Power 180 would be a perfect match. From the specs it appears to be a rewind Power 160 of lower Kv; no weight increase but the ability to run on 12S easily.

#### **On the bench**

I have kept working on the Shark 402 and it is almost ready for covering. I have taken photos along the way and will provide an update next month. As it sits on the table it weighs 11.3 oz. I am hoping that once finished and ready to go it will come in at 32-36oz. Time will tell.

**Teo Terry**



A random photo from Indoor flying....  
Pete Foss' twin EDF SR-71 Black-  
bird. Makes a lot of noise and looks  
really cool in the air!



# Indoor flying at UWM (formerly Ultimate Soccer)

*Click anywhere in the collage to view the entire photo album on the Skymasters web site*





# ***Skymasters***

## ***Indoor Flying/Driving*** \*



**Join us Wednesday's \*\***

**from 10:AM-1:PM**

**On Field #4 at the**

**UWM Sports Complex**



***Located on 867 South Blvd., Pontiac, MI 48341***

***Oct. 20<sup>th</sup> thru Apr. 13<sup>th</sup>\*\****

**Single Session \$10 pay at the door  
Session Season Pass - \$150**

**All Pilots/Drivers must have proof of current AMA Membership  
A Special 3 Month Trial AMA Membership Application is Available**

**All Pilots/Drivers and Spectators must sign a Responsibility and Release Agreement  
Waiver\*, AMA Youth must be have a parent or legal guardian sign the form.**

**\* Schedule, Rules, and Waiver available on line at  
[www.Skymasters.org](http://www.Skymasters.org)**

**\*\* Dates or Times Subject to Change with out notice.  
UWMSC closed Wed. Dec. 29<sup>th</sup>.**

**All Pilots can Register Online now at:  
[www.Skymasters.org](http://www.Skymasters.org)**

# ***“SKYMASTERS”* INDOOR FLYING**

## **At UWM Sports Complex Field #4**

*For the 2020-2021 Winter Season\**

### **OCTOBER:**

Wed. 20<sup>th</sup>

Wed. 27<sup>th</sup>

Flying sessions start at 10 am and end at 1: PM \*

**Please Bring Proper Change For Payment.**

### **NOVEMBER:**

Wed. 3<sup>rd</sup>

Wed. 10<sup>th</sup>

Wed. 17<sup>st</sup>

Wed. 24<sup>th</sup>

### **FEBRUARY:**

Wed. 2<sup>nd</sup>

Wed. 9<sup>th</sup>

Wed. 16<sup>th</sup>

Wed. 23<sup>th</sup>

### **DECEMBER:**

Wed. 1<sup>st</sup>

Wed. 8<sup>th</sup>

Wed. 15<sup>th</sup>

Wed. 22<sup>nd</sup>

Wed. 29<sup>th</sup> CLOSED

### **MARCH:**

Wed. 2<sup>nd</sup>

Wed. 9<sup>th</sup>

Wed. 16<sup>th</sup>

Wed. 23<sup>th</sup>

Wed. 30<sup>th</sup>

### **JANUARY:**

Wed. 5<sup>th</sup>

Wed. 12<sup>th</sup>

Wed. 19<sup>th</sup>

Wed. 26<sup>th</sup>

### **APRIL**

Wed. 6<sup>th</sup>

Wed. 13<sup>th</sup>

**\* *Dates & Times Subject to Change or Cancellation Without Notice***

***All pilots/drivers and spectators must sign a Responsibility and Release Agreement Waiver,***

***AMA Youth must be have a parent or legal guardian sign the form.***

**Schedule, Rules, and Waiver available on line at [www.Skymasters.org](http://www.Skymasters.org)**

**You can contact the Event Director at: [Indoorfly@Skymasters.org](mailto:Indoorfly@Skymasters.org)**





**30th  
ANNUAL**

# FLINT'S R/C SWAP MEET

SPONSORED BY  
The Flying Aces R/C  
Club  
Swartz Creek, MI

**OVER  
120 Tables  
Available**

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WELCOME**

**SUNDAY**

**April 3, 2022**

**Public Admitted At  
9 AM until 12 PM**

**LAKE FENTON HIGH SCHOOL**

4070 Lahring Rd, Linden, MI 48451

42° 51' 32"N 83° 45' 5"W

**SEE MAP BELOW AND CHECK OUT OUR WEB SITE**

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**CONCESSION UNAVAILABLE BECAUSE of COVID**

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50/50 Drawings

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Gliders ◀

► Boats

Supplies

Cars ◀

**COFFEE WILL BE AVAILABLE**

**ADVANCE TABLE REGISTRATION \$20.00, INCLUDES ONE ADMISSION. (IF RECEIVED  
BY MAR. 30, 2022). EACH ADDITIONAL TABLE IS \$12.00.**

**TABLES AT THE DOOR \$22.00**

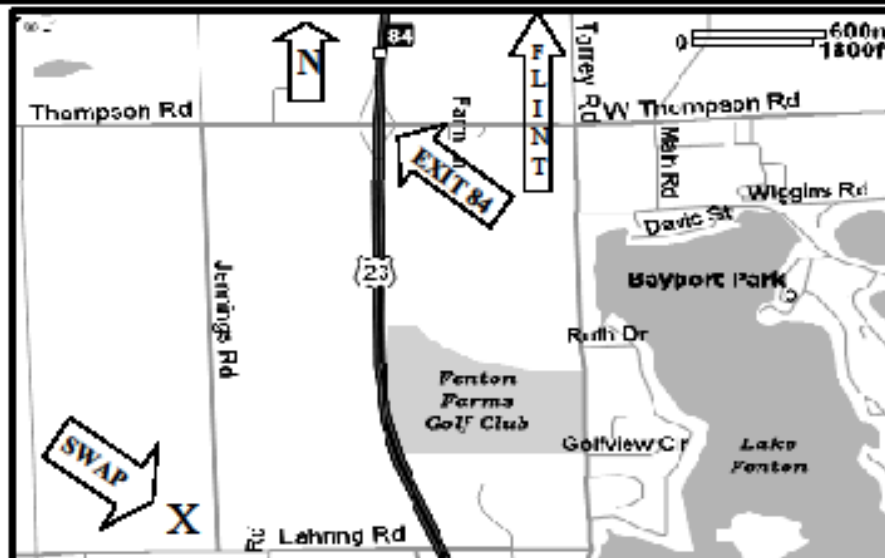
**ADMISSION FOR EACH ADULT \$5.00; 17 AND UNDER \$1.00.**

**ACTIVE MILITARY ID and LADIES ADMITTED FREE.**



**Advanced Table Registration  
Make Checks Payable To:  
The Flying Aces R/C Club Inc.  
Mail to:**

**Flying Aces R/C Club Inc.  
6184 King Arthur Dr.  
Swartz Creek, MI 48473  
For Info. & Table reservations:  
Call Bill Gerald Cell 810-845-3007  
Set-up 8:00 AM Reserved tables will be  
held until 9:00 AM. Then released to  
be issued as unreserved  
General Information ONLY:  
Steve Polen 810-730-3533**



# ON THE WING

## The Retirees and Wannabes Breakfast At Ram's Horn (new location)

9AM, 1st and 3rd Mondays

1990 Rochester Road,  
Rochester Hills

## Skymasters Breakfast At Iris Café

Cancelled for a couple months  
due to remodeling

3667 Baldwin Rd  
Orion Charter Township

## Indoor Flying at UWM Sports Complex (formerly Ultimate Soccer)

(AMA required - See flyer in this issue for more info)

Every Wednesday (note new day)

10AM — 1PM

UWM Sports Complex field #4, in the rear of the complex  
Park and enter in the back

867 South Blvd E, Pontiac, MI 48341

(North off of Auburn, west of Opdyke. Click this link for a map)



## Other local area indoor flying

### Premiere Sports Center

14901 23 mile, Shelby Twp, MI

(northwest corner of 23 mile and Hayes)

Every Thursday, 9AM to 3PM

Electric planes and helis (separate heli space)

\$10/session, AMA required

Info: Steve Durecki 586-246-4203 (text or voice)

<http://www.stevesindoorflying.com/>

### Legacy Center

9299 Goble Dr.

Brighton, MI 48139

(Off of Winans Lake Road, between Rickett  
Rd. and M23)

Wednesdays 12:30PM—2:33PM November  
through March

\$10/session

Sponsored by the Hamburg Flyers RC club



# February 2022

Sun	Mon	Tue	Wed	Thu	Fri	Sat
		1	2 Indoor Flying 10AM UWM Sports Complex (formerly Ultimate Soccer)	3 Indoor Flying 9AM—3PM Premiere Sports Shelby Twp	4	5 Breakfast CLOSED for remodeling Iris Café
6	7 Skymasters Breakfast 9AM Ram's Horn	8	9 Indoor Flying 10AM UWM Sports Complex (formerly Ultimate Soccer)	10 Indoor Flying 9AM—3PM Premiere Sports Shelby Twp	11	12 Breakfast CLOSED for remodeling Iris Café
13	14	15	16 Indoor Flying 10AM UWM Sports Complex (formerly Ultimate Soccer)	17 Indoor Flying 9AM—3PM Premiere Sports Shelby Twp  Skymasters Meeting 7PM (Via Zoom)	18	19 Breakfast CLOSED for remodeling Iris Café
20	21 Skymasters Breakfast 9AM Ram's Horn	22	23 Indoor Flying 10AM UWM Sports Complex (formerly Ultimate Soccer)	24 Indoor Flying 9AM—3PM Premiere Sports Shelby Twp	25	26 Breakfast CLOSED for remodeling Iris Café
27	28					

# Skymasters Information...

[The Skymasters field is located in Lake Orion, within the Bald Mountain Recreational Area](#) on Scripps Road, between M24 and Joslyn (see map). A recreation passport or sticker is required and can be obtained from the Park Headquarters located on Greenshield Road or you can check the box on your tab renewal for a "Recreational Passport".

## Flying hours:

**QUIET ELECTRICS ONLY** from 8AM to 10AM and 8PM to 10PM.

**The noise limit is 80dBa at ten feet.** Regular flying is permitted between 10 AM to 8 PM. **The noise limit is 94 dBa at 10 feet.** These noise limits are enforced.

**Student Night & Pot Luck** Every Wednesday, May through September. Flying any time but we eat at 6:00 p.m. - rain or shine, literally!

For those participating we ask that

you bring something for the grill - enough to feed (at least) you and your guests -OR- bring a dish to pass -OR- bring your own (non-alcoholic) beverage. **Something for the grill:** The obvious choices are burgers, sausages/brats and hotdogs - but other alternatives are welcome. If you bring it we will cook it! We've cooked pork tenderloin and chops, salmon, venison burgers, steaks and more. Don't forget the buns.

We start cooking about 5:30 p.m. - having grill items by then helps us get everything ready on time.

**Potluck dish to pass:** Don't know what to bring, working late? Each week we'll let you know what is needed for the next week from plates to condiments, charcoal, etc. **Pick one of the needed items to bring instead!** Not one to cook? A quick stop at local supermarket deli

for a side salad, or bakery for dessert always works!

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

The Skywriter newsletter is available online at the Skymasters web site and is free to all. It may also be printed from the web site if desired. All contributions are welcome. Please send photos and articles to [newsletter@skymasters.org](mailto:newsletter@skymasters.org). If you know of anyone who may be interested in R/C Aviation, please give them a link to this newsletter or give them a copy of an AMA magazine. It may spark their interest!



## 2020 Club Officers & Appointees...

President:	Pete Foss	Oxford	<a href="mailto:president@skymasters.org">president@skymasters.org</a>
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## Newsletter Submissions

Please send all articles, photos and announcements to the Skywriter editor at:

[newsletter@skymasters.org](mailto:newsletter@skymasters.org)  
Deadline is the 20th of each month.

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[www.skymasters.org](http://www.skymasters.org)