the Ampeer

May | The EFO Officers | 2008

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The Next Meeting:
Date: Saturday, May 10 **Time:** 10:00 a.m.
Place: Midwest RC Society 7 Mi. Rd. Flying Field

What's In This Issue:

CWL & A Performance Factor

By Ken Myers

CWL Revisited

Cubic wing loading (CWL) is an **indicator**, just as wing loading expressed as ounces per square foot (oz./sq.ft.) is an **indicator**, for grouping radio controlled miniature aircraft by their possible flight characteristics. CWL, or even the typical wing loading, has little to do with the aerodynamics needed to get the model to fly at various sizes/scales in real, un-scaleable air.

For me, the CWL **indicator** seems to be easier to understand and more useful than the more commonly used wing loading based on wing area.

The common wing loading uses the ready to fly (RTF) weight in ounces (oz.) related to the wing area in square feet (sq.ft.). In Imperial units the wing loading is given as ounces per square foot (oz./sq.ft.).

CWL is easier to use because it is a one step mental process, while using the standard wing loading requires two steps. If someone says that his or her model has a 20 oz./sq.ft. wing loading, the next step is to identify the size of the model by its wing area. Once the wing area is known, the experienced modeler can determine the possible flight characteristics.

Cubic wing loading is related to a cube rather than a square and the resulting number, in Imperial units, appears as ounces per cubic foot (oz./cu.ft.). If the metric system is used, the cubic wing loading, in kilograms per cubic meter (Kg/M^3), contains the same digits, even though the units have changed. A CWL of 10 oz./cu.ft. is the same as a CWL of 10 Kg/M^3. I find this somewhat "interesting".

When a modeler says my plane has a CWL of 10, little else needs to be known about the model to have a good idea of what the flight characteristics might be.

The CWL **indicates** the relative ease of flying and skill level, required to fly various RC model aircraft and allows for ability and "flyability" groupings of these aircraft.

To many, it appears that when two aircraft, with the same wing loading, are sized or scaled differently, they fly differently. A "giant scale" model of about 1200 sq.in. with a 32 oz./sq.ft. wing loading seems to fly, subjectively, much differently, and seems to the pilot, more easily, than a 400 sq.in. model with the same 32 oz./sq.ft. wing loading.

Cubic wing loading (CWL) attempts handle this difference in "flyability" using a mathematical model. The model takes the two-dimensional wing area and changes it to a three-dimensional volume. The mathematical volume is not related to the "real" volume of the three-dimensional wing. CWL does not take into consideration the actual airfoil or aerodynamics required to get the plane to fly at a given size or scale in "real" air. It simply applies an ease of flight number for grouping and comparing aircraft by <u>possible</u> flight characteristics.

We create useful mathematical models to help us understand many things. Electrically powered model builders and fliers are aware of and use these types of mathematical models a lot. An example would be when trying to determine the power loss through an electrically powered motor system. Factors such as Io, Rm, Kv, amps and volts are put into a mathematical formula/model to give an answer that approximates what the output power might be.

Here is an example of using CWL:

If a model's ready to fly (RTF) weight is 60 ounces, and it has 500 sq.in. of wing area, the CWL in oz./cu.ft. = 60 oz. / ((500 sq.in. / 144 sq.in.)^1.5)

The 500 sq.in. is divided by 144 because there are 144 sq.in. in a square foot. The result yields the wing area in square feet.

500 sq.in. / 144 sq.in. = 3.4722222 sq.ft. Raising that result by a factor of 1.5 yields cubic feet. In this instance 3.47222^1.5 is 6.47 cubic feet. This is the mathematical model number and has nothing to do with the actual volume of the wing. (When a number is squared and then raised to the 1.5, it is the same result as cubing (raising to the 3) the original number.)

The example aircraft then has a wing loading of 60 / (500 / 144) = 17.28 oz./sq.ft. and a cubic wing loading of 60 / (500 / 144)^1.5 = 9.27 oz./cu.ft.

How is using the cubic wing loading (CWL), instead of the wing loading in ounces per square foot, useful to us?

For a smaller plane, say 250 sq.in. to have about the same flight characteristics, providing it is designed properly to fly at the reduced scale, it would have to have the same 9.27 oz./cu.ft. CWL. It would weigh (250/144)^1.5 * 9.27 oz. or 21.2 oz. and have a wing loading of 11.65 oz./sq.ft. Notice that the wing loading of this 250 sq.in. model is a much lighter wing loading than the 500 sq.in. example, which has a wing loading of 17.28 oz./sq.ft. Even though the wing loadings are different for the two models, with the appropriate power system and aerodynamics, the 250 sq.in. plane would have much the same "feel" and flight characteristics as the 500 sq.in. model.

A 1000 sq.in. example for the same type/task aircraft, using the same cubic wing loading, yields a RTF weight of (1000 / 144) ^1.5 * 9.27 = 169.64 oz. Its wing loading would be 169.64 / (1000/144) = 24.42 oz./sq.ft. Again, the 1000 sq.in. model would have the same "feel" and flight characteristics as the other two sizes, given the proper power and aerodynamics.

I believe that the CWL is a valid **indicator** of flight characteristics, even more so than the traditional wing loading. The three example planes, with wing loadings of 11.65 oz./sq.ft., 17.28 oz./sq.ft. and 24.42 oz./sq.ft., all would have pretty much the same "feel" to the pilot and exhibit close to the same flight characteristics.

For many years I have collected data for propeller driven model aircraft using glow, gas and electric power systems. I have archived and analyzed that data on an Excel spreadsheet. The Excel spreadsheet is available and may be downloaded to your computer using this URL:
homepage.mac.com/kmyersefo/metricnewtheory.xls

Based on the collected data, I have created the following CWL levels. Some planes won't work in a given physical environment, where I've used a physical description, but they fly like others in the level. (See left column p. 3 for CWL Levels table)

The table illustrates the trend over the past couple of decades to larger glow and gas powered models. Since the data was mostly collected from modeling magazines, and the magazines reflect the "current trends", there are few reviews of the more "typical" .20-size to .60-size glow planes.

There is also a hint, in my collected data, of a Level 0 emerging. I only have data for one plane, but have read about others that might become part of this new level. The Level 0 planes might be called "Living Room" Flyers.

A Performance Factor:

The cubic wing loading (CWL) is an **indicator** of the "flyability" of a given model. It does not indicate the type of performance that can be expected.

My CWL Ease of Flight Levels

Level	Level Loading Range oz./cu.ft.	Average Wing Area	Average Weight ounces	Average CWL	# of examples
1	?-2.99	347	8.44	2.12	19
Level 1 is typically Indoor for electrics. I have no records for glow & gas powered planes that have this CWL range.					
2	3-4.99	468	27	4.09	37 electric
2	3-4.99	1350	141.5	4.8	4 glow & gas
Level 2 is typically Backyard for electrics.					
3	5-6.99	486	42.3	6.06	74 electric
3	5-6.99	1255	168	6.32	12 glow & gas
Level 3 is typically Park Flyer for electrics.					
4	7-9.99 oz./cu.ft.	459	56.5	8.5	124 electric
4	7-9.99 oz./cu.ft.	1219	218	8.43	45 glow & gas
Level 4 is typically Sport for all power systems.					
5	10-12.99	482	76.5	11.35	59 electric
5	10-12.99	844	166	11.4	40 glow & gas
Level 5 is typically Advanced Sport for all power systems.					
6	13-16.99	459	89.5	14.6	22 electric
6	13-16.99	706	161	14.65	22 glow & gas
Level 6 is typically Expert Sport for all power systems.					
7	17.00-?	360	78.7	19.8	3 electric
7	17.00-?	730	281	21.1	5 glow & gas
Level 7 is typically Expert for all power systems.					

Watts in is a typical **indicator** of performance. It is pretty reliable in most cases, when talking about electrically powered planes. I **DO** recommend it as one **indicator** of performance, but it is difficult to relate glow and gas powered propeller driven models to electrically powered models using that method. It is also difficult to relate the performance of a model "flying on the wing" to one "flying on the prop."

Today, we have onboard data gathering systems that can record actual performance such as airspeed in level flight, climb rate and more, yet much of our performance feelings about a given aircraft are based on our perceptions of how it is flying based on previous experience with various propeller driven models. There is a tendency to say that one model flies "better" than another based on these perceptions. "Better" is a relative term, also based on perception.

The following theory attempts to create a performance factor (PF) that can be applied to all types of propeller driven radio controlled models. The method can be used to compare completed and flying aircraft and rank them by "performance." It can be used to "get a feel for" the performance of a newly completed model before the maiden flight.

A performance factor theory:

One component of my performance factor theory is the pitch speed to stall speed ratio. It can be equally applied to both glow and gas and electrically powered propeller driven models. The pitch speed (PS) to stall speed (SS) ratio relates the theoretical pitch speed to the theoretical stall speed.

Ratio of Pitch speed to Stall speed:

In Keith Shaw's ground breaking "Electric Sport Scale" article from the July 1987 *Model Builder* magazine, he states;

"The stall speed of our models depends on the wing loading, airfoil choice and surface contour finish, but fortunately is not a very strong function of any of these. At wing loadings of 14 to 25 oz./sq. ft. and the nominal airfoils used in sport scale, an amazingly reliable stall speed estimate is:
Stall speed (mph) = 3.7 x the sq. root of the wing loading (oz./sq.ft.)

In order to just do a nice inside loop, the plane must enter at twice the stall speed. To do clean inside loops, rolls, and other sport-type aerobatics, three times stall speed is needed. Anything over 4 times the stall speed gives 'fighter-type' performance and extended vertical aerobatics."

Some specific examples of pitch speed to stall speed ratios:

I have owned and flown the SR Batteries Bantam monoplane backyard flyer. My version used all of the recommended components. It has 210 sq.in. of wing area and weighs 8.3 oz. ready to fly, which yields a CWL of 4.71 oz./cu.ft. (Level 2). It has a pitch speed of 16.7 mph and stall speed of 8.83 mph and pitch speed to stall speed ratio of ~1.89. According to Keith's statement, this plane would most likely NOT do a nice inside loop from level flight, and it wouldn't. The plane required a dive to do a nice inside loop.

My ElectroFlying Fusion sport plane has a wing area of 569 sq.in. and weighs 73.9 oz. ready to fly. The CWL is 9.41, which is towards the high end of Level 4, typical sport. It has a pitch speed of ~74 mph and stall speed of ~16 mph with a pitch speed to stall speed ratio of 4.62. Keith's statement indicates that this plane should have "fighter-type" performance, and it does!

If "flying on the wing" were the only type of flying task to be considered, then this performance indicator would be sufficient to make valid comparisons between performances of various propeller driven models.

However, there are other tasks asked of propeller driven model aircraft. These tasks rely more on the aircraft "flying on the prop" rather than "on the wing." Flying types that rely more on "flying on the prop" are the limited motor run time (LMR) events for electrically powered sailplanes and old-timers. These types of planes are literally "pulled" to altitude by the prop. Another type of "thrust flying" has become known as 3-D. 3-D can be flown with both glow and gas powered planes and electrically powered planes. An appropriately powered 3-D plane can literally hang on the prop in a hover and then pull vertically from that position, like a helicopter.

In general, both the LMR type and 3-D type aircraft use props with a larger diameter and lower pitch yielding a lower pitch speed to stall speed ratio than planes that "fly on the wing" with about the same wing area. Larger diameter props create more thrust than smaller diameter props, so the perception is that the LMR and 3-D planes have more performance, even with the lower pitch speed to stall speed ratio when they are compared to a similar sized "fly on the wing" plane, which tends to have a higher pitch speed to stall speed ratio.

Many modelers have converted existing glow or gas powered planes to electrically powered planes. Often they will say something like, "It flew as well or even 'better' as an electric." They also note that they used a .40 2-stroke with a 10x6 prop on their glow version and used an appropriately sized brushless motor on their electric conversion using a 14x10 prop.

A "typical" .40 glow 2-stroke sport engine might turn a 10x6 prop at about 11,500 RPM. An appropriately sized electric motor might turn the 14x10 at 7000 RPM. The 10x6 at 11,500 RPM has a theoretical pitch speed of about 65 mph, while the 14x10 at 7000 RPM would have a theoretical pitch speed of about 66 mph. The theoretical pitch speeds are about the same. The electric might be perceived to fly "better" for one reason; more thrust. According to my very rough calculations, the 10x6 at 11,500 RPM might be producing about 67 oz. of static thrust while the 14x10 at 7000 RPM could be producing about 85 oz. With the same pitch speed in level flight, the planes may seem quite similar until pulled into a climb. The electrically powered version, with more thrust available, would climb higher or at a greater angle when compared to the glow powered version and thus be perceived as a "better" flying plane.

It can then be seen that a total performance factor also needs to take "thrust" into consideration to allow for the "better" performance of larger diameter props.

A thrust to RTF weight ratio is extremely difficult to determine. The prop's physical characteristics, the sea level elevation and the ambient temperature all affect the actual thrust. The static thrust, while somewhat of an indicator of available thrust, is really quite unreliable and varies greatly with the pitch to diameter ratio.

Here is what Tom Hunt had to say about "thrust" and the thrust to weight ratio. It appeared in his column "Electro-Active: Power system selection: Part 7 - The Propeller", *FlyRC*, May 2006.

" ... Static thrust is the value (usually in pounds in 'English' unit countries) measured 'on the bench'. The oncoming air-speed is '0'. The number derived from measuring static thrust is a very useful number if you are designing helicopters or '3D' aircraft, but has little bearing on choosing the proper propeller for just about any other model.

Many 'rules of thumb' have been published over the years for the modeler that predict the performance of the model based on the ratio of static thrust from the prop to the vehicle weight. Some say that you need a minimum of one pound of thrust for every three pounds of vehicle weight just to get a model to fly; one and a half pounds for every three pounds of weight for 'acceptable' performance, and anything above that for aggressive flying. Some state that you need better than 1:1 for '3D' models.

Static testing of propellers with a pitch/diameter (P/D) ratio of greater than .75 (such as a 12x8) can and often does produce erroneous results. Part of the prop, at even these modest P/D ratios, may be stalled (like a wing that stalls and looses lift) which will show poor static thrust. As the propeller moves forward just a few mph, the prop will become 'unstalled' and produce significantly more thrust. As the P/D ratio approaches 1:1, most of the prop is effectively stalled in the static condition and is characteristically 'loud'.

Even with the ability to accurately measure the thrust of a prospective power plant, an acceptable value by these rules of thumb alone will not guarantee a good flying model."

Tom's statements indicate that the thrust to weight ratio is not an accurate reflection of the possible performance, but does have some effect on the total flight performance.

By integrating the pitch to stall speed ratio and the thrust to weight ratio, I have created a Performance Factor (PF) that appears to apply reasonably well to propeller driven models.

I created a spreadsheet using many of the planes I've built and flown, so that my firsthand knowledge could be used as to their perceived flight performance in relationship to one another. The spreadsheet is available for download at homepage.mac.com/kmyersefo/performancefactor.xls

My first attempts to create a useful model for a Performance Factor (PF) did not work out very well. My Multiplex EasyStar kept coming out in the middle of the performance range, when it actually has almost the least perceived performance of all of my planes.

The problem arose with the EasyStar because it has a relatively high theoretical pitch speed to stall speed ratio. The model, because of its design, cannot actually reach its theoretical pitch speed. When I tried using just the prop diameter, because it has the largest influence on thrust, as a part of the total Performance Factor, the EasyStar's relative performance continued to be higher in my list of planes than it should have been.

In the February 1994 issue of Model Airplane News, Mitch Poling, in his article "New Thoughts on Gearing" provided the following,

"**My equation for thrust:** (*Mitch's not Ken's*)

Thrust (ounces) = $PxD^3xRPM^2x1.0xl0^{-10}$

Note: P = pitch in inches; D = diameter in inches.

The 1.0 is a 'form factor' and can vary from .8 to 1.4, depending on the prop blade shape; 1.0 is an average value."

At that time, I felt that it didn't do a very good job of predicting the static thrust, because there was a variable in the formula that depended on the type/brand of prop, and of course did not take into account any of the other variables that affect a prop's static thrust. It languished in my memory for the next almost 15 years.

Since I didn't want "real" static thrust numbers, I decided to give Mitch's formula, without the "form factor", a try as part of my total Performance Factor. After trying various iterations of several formulas, my planes were finally placed, mathematically, almost in my perceived performance order.

A different "form factor" added to Mitch's formula

I found that I did need a "form factor" to allow my planes to be aligned more closely to my perceived performance. My form factor is the diameter in inches divided by the pitch in inches.

It is important to note that the following is NOT a very good static thrust predictor. It sometimes comes pretty close, and sometimes not close at all! The only reason I'm using it is that it provides a "form factor" to the formula to make the Performance Factor (PF) work.

Ken Myers' thrust formula, used as part of the total Performance Factor.

Thrust (ounces) = Pitch (inches) x Diameter^3 (inches) x RPM^2 x (Diameter (inches) / Pitch (inches) x 10^{-10} x 0.5

i.e. a 12x9 prop at 7000 RPM

Thrust = 9 x 12^3 x 7000^2 x (12/9) x 10^{-10} x 0.5

Thrust = ~50.8 oz. of static thrust

Drive Calculator predicts 1402g or ~49.5 oz.

The Thrust to Weight Ratio:

The thrust to weight ratio is the RTF Weight in ounces divided by the Thrust in ounces from the above formula.

The Total Performance Factor:

Performance Factor = pitch speed to stall speed ratio times thrust to weight ratio.

An example of the Performance Factor:

Hangar 9 FuntanaX 100 from my archived data

Photo from Horizon Hobby Web site

Power Type	RTF oz.	CWL	Prop	RPM	PS / SS	Static Thrust / RTF wt.	Pitch Speed mph	PF
Electric	163	7.64	17x10	7250	4.03	1.35	68.7	5.43
4-stroke	148	6.93	16x4	10,200	2.38	2.30	38.6	5.48
2-stroke	132	6.18	13x6	11600	4.30	1.46	65.9	6.26
PS / SS = Pitch Speed to Stall Speed Ratio					PF = Performance Factor			

What can be learned from the above data?

1. The glow versions might be perceived by the same pilot as slightly "easier" to fly based on the CWL.
2. Based on the pitch speed, the 2-stroke and electric might appear to be flying at about same speed in straight and level flight, while the 4-stroke version would appear to be about 1/2 that speed. It is not "normal" to fly this type of plane in straight and level flight too much, so difference might not be perceived.
3. The Performance Factor (PF) indicates that the same pilot might perceive all three versions of the plane as being similar in performance, with a slight edge going to the 2-stroke powered version.

The following shows some of my planes sorted by their performance factors. The sorting is very close to what I believe their perceived performance to be in relationship to each other.

Plane	PF
EasyStar RTF, stock brushed	0.84
SR Batteries Bantam, stock brushed	1.05
Bill Grigg's Rocket S400 Pylon Racer	1.10
Senior Skyvolt, AF25 Geared 14 NiCads	1.67
Goldberg Eaglet 50, brushed 035 geared	1.99
E-250, my low-wing sport design, AF035 direct	2.01
SR Batteries X-250, brushed Turbo 450	2.15
SR Batteries Cutie Mag. Mayhem brushed/geared	2.22
TigerShark my low-wing sport design AF 035	2.29
ElectroFlying Fusion, brushless/16 3000 NiMH	2.69
Sportsman Sport Stik 40 brushless/4S Li-Po	2.87
Ryan STA conversion, brushless/4S Li-Po	2.97
Sportsman Sport Stik 40 brushless/5S Li-Po	3.32
Sport Aviation Sonic 500, brushless/4S Li-Po	3.44
RC Dymond Flite 40 TP3520 6S A123	3.57
RC Dymond Flite 40 EMP 42-60 6S A123	3.66
Son of Swallow brushless, 3S A123 2.3Ah	3.69
ElectroFlying Fusion, brushless 6S A123	3.94
Sport Aviation Sonic 500 brushless 5S Li-Po	4.16

The following reflects the data I've collected to date for the PF levels in the various CWL levels.

CWL Level	Power Type	Range	PF Avg.	PF Median	Number Examples
1	elec.	1.11 - 15.42	5.02	3.75	13
2	int.	5.92 - 8.91	7.10	7.18	3
2	elec.	0.41 - 9.41	4.34	4.22	30
3	int.	2.81 - 10.09	6.05	5.93	12
3	elec.	0.39 - 13.73	3.92	3.07	55
4	int.	1.81 - 9.50	5.14	5.10	43
4	elec.	0.81 - 8.43	3.69	3.59	79
5	int.	1.20 - 19.56	4.59	4.37	39
5	elec.	0.38 - 6.64	2.88	2.68	38
6	int.	1.06 - 8.64	3.28	2.88	11
6	elec.	1.71 - 8.73	4.21	3.90	14
7	int.	1.28 - 4.40	1.79	1.99	5
7	elec.	NA	3.09	3.09	1
int. = internal combustion elec. = electric					

All of the data can be down loaded as an Excel spreadsheet at homepage.mac.com/kmyersefo/metricnewtheory.xls

The April EFO Meeting

The April meeting was excellent. Ken demonstrated “Zip Charging” his 3S1P A123 Systems pack, and a lot of new planes were shared.

Roger Wilfong & 25-size Stik

James Maughan & flying wing

Richard Utkan had his autogyro & Fun 38

Jim Young showed his new Goon racer & how he installed the retracts in his Comet

Hank Wildman shared two EDFs

Rick Sawicki showed his Hyperion Chipmunk

Mid-America Electric Flies 2008

At the 7 Mile Road MRCS Field

Note the new field location!

AMA Sanctioned

Saturday, July 12 & Sunday, July 13, 2008

Hosted by the:

Ann Arbor Falcons and **Electric Flyers Only**

Site Provided by the:

Midwest R/C Society

Your Contest Directors are:
Ken Myers phone (248) 669-8124 or KMyersEFO@aol.com – http://members.aol.com/kmyersefo/
Keith Shaw (734) 973-6309
Flying both days is at the Midwest R/C Society Flying Field - 7 Mile Rd., Northville Twp., MI
(see map on map-hotels flyer)

Registration: 9 A.M. both days
Flying from 10 A.M. to 5 P.M. Sat. & 10 A.M. to 3 P.M. Sunday

Channels 00 through 60, the six 27Mhz frequencies, & eight 53MHz frequencies, will be in use. Flying on five 49 MHz frequencies may be accommodated on request - Narrowband receivers are recommended for flying on Channels 00 - 60 - Very Wideband 27, 49, & 53 MHz, receivers may be accommodated on request – 2.4Ghz controlled at impound

Pilot Entry Fee $15 a day or $25 both days - - - -
Parking Donation Requested from Spectators

Saturday's Events
All Up - Last Down
(No Li ion, Li-Po, etc.– NiCads or NiMH only in AULD – any size motor)
Best Scale
Most Beautiful
Best Ducted Fan
Best Sport Plane
CD's Choice

Sunday's Events
Best Scale
Most Beautiful
Best Mini-Electric
Best Multi-motor
CD's Choice

Planes Must Fly To Be Considered for Any Award

Open Flying Possible on Friday
Night Flying Possible, Weather Permitting, Friday & Saturday Nights
Refreshments will be available at the field both days.

Potluck picnic at the field on Saturday evening.

Come and join us for two days of fun and relaxed electric flying.

Come, Look, Listen, Learn - Fly Electric - Fly the Future!
Saturday's & Sunday's Awards:
Plaques for 1st in each category
Merchandise drawing for ALL entrants

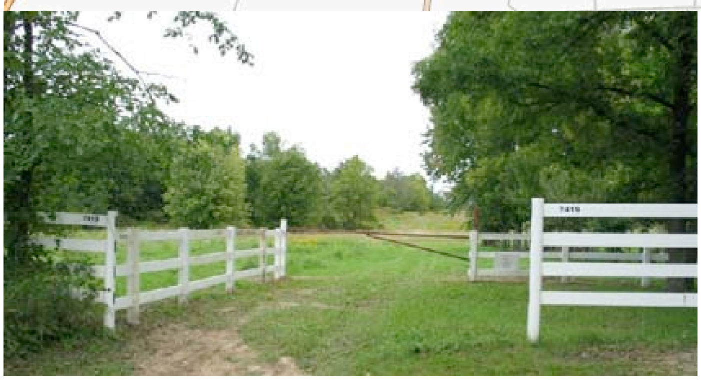

Photo of Entrance to New Site off 7 Mile Rd.

To locate the Midwest R/C Society 7 Mile Rd. flying field, site of the 2008 Mid -America Electric Flies, look near top left corner, where the star marks the spot, near Seven Mile Road and Currie Rd. The field entrance is on the north side of Seven Mile Road about 1.6 Miles west of Currie Rd.

Address: 7419 Seven Mile Road, Northville Twp, MI 48167-9126 - numbers on the fence

Mid-America Flies Hotel List – 2008 Please call the hotels for current rates

Novi Hilton
21111 Haggerty Rd.
236 rooms
800-445-8667
248-349-4000

Sheraton Oaks
27000 Sheraton Dr.
206 rooms
248-348-5000

Travelodge Detroit
21100 Haggerty Rd.
124 rooms
800-578-7878

Detroit Marriott Livonia
17100 Laurel Park Dr. N.
227 rooms
800-228-9290

Hampton Inn Northville
20600 Haggerty Rd.
125 rooms
800-426-7866
313-462-1119

Wyndham Garden Hotel
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800-222-4200
248-344-8800

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When subscribing to or renewing the paper version of the *Ampeer*, please make the check payable to Ken Myers. We do not have a DBA for the *Ampeer* or EFO. Thanks, Ken

Upcoming E-vents:

May 1 - 4, 2008 Southeast Electric Flight Festival, Hodges Hobbies (hodgeshobbies.com) 428 Neil Hodges Rd, Andersonville, GA 31711

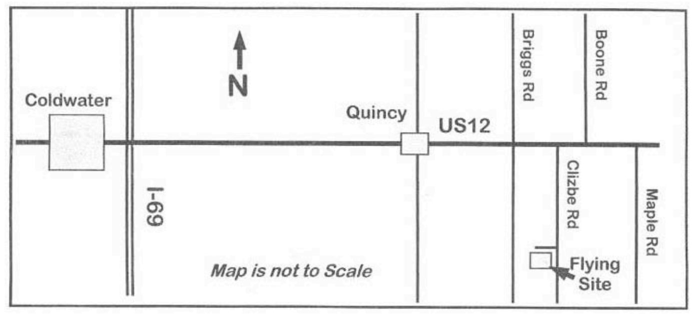
May 3 RCCD Electric Fly-in at the club field. Visit RCCD Web site for details.

May 10 Auburn Indoor Electric Fly-In, Century Aviation hangar Aubrun/DeKalb Airport, 2710 County Rd. 60, indoor electric flying and full scale display, 6 p.m. - 10 p.m., contact Tim Fox 260-437-7702

May 18 Kishwaukee RC Flyers of DeKalb, IL, 5th Annual Electric Fly-in at the club field. Open flying event for all electric aircraft. The $10 entry fee includes free lunch. Info at: www.kishwaukeercflyers.org

May 31 Ravenna Thunderbirds Night Fly, Club Field at Jetway Airpark, 7600 Peck Road Ravenna, OH, Bob Ferrante CD PH: 330-297-8955, www.ravennathunderbirds.com, $5 registration, Night fly, open flying starts at 7 pm till midnight. Bring your night equipped airplane or heli. Glow and Electrics welcome.

June 7 & 8 Keith Shaw's Birthday Electric Fly-in, Quincy (Coldwater area) MI, CD Dave Grife, for info email Dave at grifesd@yahoo.com, or phone 517-279-8445



Balsa Bashers Flying Site – map not to scale
Lots of Fun for Everyone. ☺

The Ampeer/Ken Myers
1911 Bradshaw Ct.
Walled Lake, MI 48390
http://members.aol.com/kmyersefo

The Next Flying Meeting:
Date: Saturday, May 10 **Time:** 10:00 a.m.
Place: Midwest RC Society 7 Mile Rd. Flying Field
Please NOTE the PLACE!