the Ampeer

June | The EFO Officers | 2018

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The Next Flying Meeting:
Saturday, June 16, 10:00 a.m., Midwest 7 Mi. Rd. Field

What's In This Issue:

Wing Cube Loading (WCL) Update for 2018

By Ken Myers

Preface:

This is revised, updated and added information from the CWL section "Wing Cube Loading (WCL)" in the article "One Way of Selecting a Brushless Outrunner Electric Motor for a Radio Controlled (RC or R/C) Sport Plane or Sport Scale Plane Using ANR26650M1 (A123 Systems Nanophospate™ lithium ion) 2300mAh Cells", by Ken Myers, December 2007.

"**Wing loading is a lousy way to compare models with each other** and with full-scale airplanes, because **wing loading varies with the size of the plane**. The problem is that we are dividing weight, a cubic-like function (weight is proportional to volume which we measure in cubic feet) by area, a squared function measured in square feet. We should be, and many modelers are, comparing planes by their wing cube loading, which is independent of size because both the numerator and the denominator are cubic." Francis Reynolds, Model Builder, September 1989
http://www.theampeer.org/CWL/reynolds.htm
(**Bold font** created by KM for emphasis.)

Wing Cube Loading (WCL) provides a comparative value which can be used as an **indicator**, or a rule of thumb, for grouping radio controlled, miniature, aircraft by similar flight characteristics and "flyability". As Mr. Reynolds notes in his article, some people feel that it is a better "flyability" indicator than wing area loading (WAL) expressed in oz./sq.ft. of wing area. The WCL comparative value, or even WAL, has little to do with the aerodynamics needed to get the model to fly at various sizes/scales in real, un-scaleable air.

As Mr. Reynolds points out, the term weight, as we commonly use it, is really a cubic function based on the volume of a mass.

"Mass is commonly confused with weight. The two are closely related, but they measure different things. Whereas mass measures the amount of matter in an object, weight measures the force of gravity acting on an object. The force of gravity on an object depends on its mass but also on the strength of gravity. If the strength of gravity is held constant (as it is all over Earth), then an object with a greater mass also has a greater weight."

Matter-Mass-and-Volume

https://www.ck12.org/chemistry/Matter-Mass-and-Volume/lesson/Matter-Mass-and-Volume-MS-PS/

"Volume is a measure of the amount of space that a substance or an object takes up. The basic SI unit (*International System of Units - KM*) for volume is the cubic meter (m^3), but smaller volumes may be measured in cm^3, and liquids may be measured in liters (L) or milliliters (mL). How the volume of matter is measured depends on its state."

Matter-Mass-and-Volume

https://www.ck12.org/chemistry/Matter-Mass-and-Volume/lesson/Matter-Mass-and-Volume-MS-PS/

The "tricky" part about understanding the concept of wing cube loading (WCL) is that it not a directly measurable value, like the wing area loading (WAL).

To create the WCL value, the wing area is mathematically manipulated to create a volume. The weight, which in final analysis is a cubic volume, is then divided by the mathematically manipulated cubic volume of the wing area yielding a comparative value.

For me, the WCL comparative value seems to be more useful than the more commonly used wing area loading (WAL).

As previously stated, the common wing area 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.). This is a real world value based on physically measurable objects. A scale of some type can "weigh" the plane. The actual wing area can be computed with physical measurements.

Using the wing cube loading (WCL) comparative value, because it is not "size" dependent, makes it easier to comprehend the possible "flyability" of a plane and the skill required to fly the plane as an RC model. If a person states that their aircraft has a WCL of 8, no other mental calculations need to be performed, That plane will fly in a similar manner to other aircraft with a WCL of about 8 without regard to its actual size. The actual wing area does not have to be taken into account when the wing cube loading (WCL) value is stated. It provides a single step, comparative number.

Using wing area loading (WAL) is a two step process to understand how a given plane might fly. If someone says that their model has a 20 oz./sq.ft. wing loading, then the actual wing area of the model must also be taken into consideration. A plane with a 400 sq.in. wing with a 20 oz./sq.ft. wing area loading will fly very differently from a similar plane with a 1200 sq.in. wing with the same 20 oz./sq.ft. wing area loading. Both the wing area loading and the actual wing area must be known by the experienced modeler to determine the possible flight characteristics when using the wing area loading method. That is two steps.

The importance of the WCL comparative value is that it also indicates the relative ease of flying, or skill level, required to fly various RC model aircraft and allows for the pilot's ability level to be linked to the "flyability" groupings of these aircraft.

As previously noted, it appears that when two aircraft, with the same wing loading, are sized or scaled differently, they fly differently. A "giant scale" model of 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.

The wing cube loading (WCL) comparative value attempts to handle this apparent difference in "flyability" using a mathematical manipulated wing area. The resultant mathematical volume is not related to the real, measurable, volume of the three-dimensional wing. The WCL comparative value 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 VALUE for grouping and comparing aircraft by possible flight characteristics and skill levels.**

Creating mathematical models is not unusual. 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, K_v, amps and volts are put into a mathematical formula yield an answer that approximates what the output power might be.

One way that the WCL can be used - An Example:

The example model has a ready to fly (RTF) weight of 60 ounces and a wing area of 500 sq.in.

That aircraft has a wing area loading of 60 oz. / (500 sq.in. / 144 sq.in.) = 17.28 oz./sq.ft.
The 500 sq.in. wing area is divided by 144 sq.in. 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.
60 oz. / 3.4722222 sq.ft. = 17.28 oz./sq.ft.

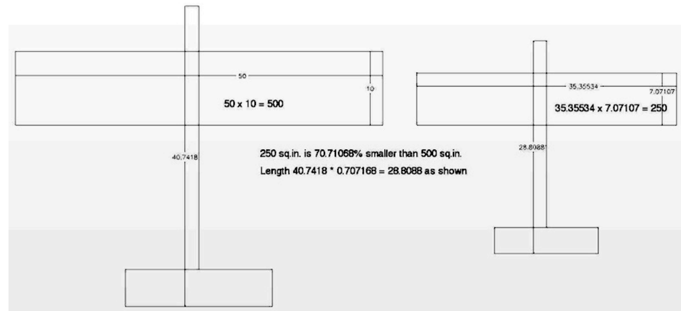
The wing cube loading (WCL) = 60 oz. / ((500 sq.in. / 144 sq.in.)^1.5)
The 500 sq.in. wing area is divided by 144 sq.in. because there are 144 sq.in. in a square foot. The result yields the wing area in square feet.
500 sq.in. / 144 sq.in. = 3.4722222 sq.ft.
Raising that result by a factor of 1.5 yields a cubic result.
3.47222^1.5 is 6.47
When a number is raised to the 3rd power it is called cubing the number, which is the number times the number times the number.
That previous result, by raising to the 1.5, is exactly the same as finding the square root of 3.47222 sq.ft. and then cubing it.
The square root of 3.47222 is 1.86339. (A simple calculator yields this result.)
1.86339 cubed, or raised to the 3rd power, is 6.47.
That is the same value as 3.47222 raised to the 1.5.

Again, it is important to keep in mind that the mathematical manipulated cubic result has nothing to do with the actual volume of the wing.

How is using the wing cube loading (WCL), instead of the wing area loading (WAL) in ounces per square foot, useful to us?

A similarly designed plane, to the example plane, with a 250 sq.in. wing is not half of the size of the 500 sq.in. wing used for the example. Actually it is only about 30% smaller.

To scale wing area, it needs to be changed to a linear value. That is done by finding the square root of the area value.
The square root of 500 sq.in. is 22.36068 in.
The square root of 250 sq.in. is 15.81138 in.
15.81138 in. divided by 22.36068 in. = 0.7071068
Thus the 250 sq.in. model is about 71% of the size of the 500 sq.in. model.

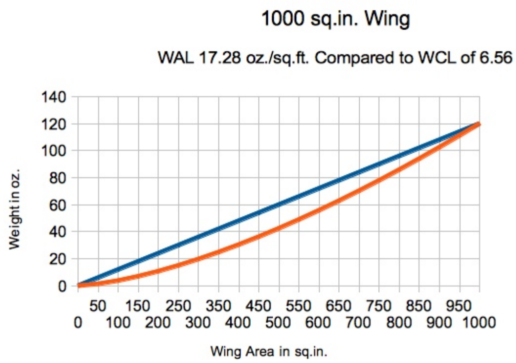


For the smaller model, with a 250 sq.in. wing, to have similar flight characteristics, providing it is designed properly to fly at the reduced scale, it would have to have the same WCL of 9.27 as the larger model. It should weigh, (250/144)^1.5 * 9.27 = 21.2 oz. ready to fly (RTF). The wing area loading of the 250 sq.in. would be, 21.2 oz. / (250 sq.in. / 144 sq.in.) = 11.65 oz./sq.ft. That is quite different from the 500 sq.in. model's wing area loading of 17.28 oz./sq.ft.

Even though the wing area loadings are over 30% 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 because they both have a WCL of 9.27.

A 1000 sq.in. wing, based on the example plane, for the same type/task aircraft is about 30% larger than the 500 sq.in. plane. Using the same cubic wing loading (CWL), yields a RTF weight of (1000 / 144) ^1.5 * 9.27 = 169.64 oz. Its wing loading would be 169.64 / (1000/144) or 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.

Don't Believe It?



In the April 2014 issue of the Ampeer, I presented the data for two similar designs in different scales. See "Scaling the ElectroFlying Fusion”
http://www.theampeer.org/ampapr14/ampapr14.htm

Steve Pauly's Electro Flying Fusion design from a kit:
RTF Weight: 74.615 oz.
Wing area: 558.45 sq.in.
WAL: 19.24 oz./sq.ft.
WCL: 9.77

Ken Myers' Fusion 380 scratch build:
RTF Weight: 40.6 oz.
Wing Area: 375.5 sq.in.
WAL: 15.57 oz./sq.ft.
WCL: 9.64

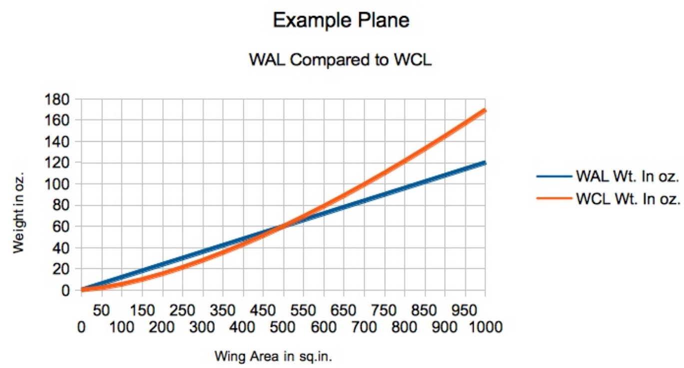
The "flyability" "feels" almost identical for the two planes as well as the skill level required to fly them both. There is about a 20% difference between the wing area loadings (WAL) of the two planes but only about a 1% difference in wing cube loadings (WCL).

Yes, the statement about "flyability" and "feels" is subjective, but it is true for me. With decades of RC flight experience, it has also proven true for a whole range of different RC aircraft types and sizes.

* * * * *

Continuing With the Example Plane:

Another way to look at it.



If the 250 sq.in. plane had a wing area loading of 24.42 oz./sq.ft., like the 1000 sq.in. plane, it would weigh 42.4 oz. Flying a 250 sq.in. model at this weight is challenging.

The WCL indicates why.
WCL = 42.4 / (250 / 144)^1.5 = 18.54. A WCL of 18.54 is for experts only. Why that is true is illustrated later in this article.

Wing area loading (WAL) forms a straight line on the graph. The wing cube loading (WCL) creates a curved line.

The wing area loading for the graph is 17.28 oz./sq.ft. The WCL is 9.27. Both values are based on the Example plane of 500 sq.in.

The graph shows, that for a small range of wing areas, the WAL or the WCL can be used to compare planes with equally useful results, but as the wing area differences approach the extremes, there is a much greater difference between the WAL and WCL predictive useful results.

The graph at the top of the following page demonstrates what happens when the WCL is set to reach the predictive value of a 1000 sq.in. wing at a RTF weight of 120 oz. based on a WAL of 17.28 oz./sq.in.

Using 17.28 oz./sq.ft. changes the WCL to 6.56 because the weight of the 1000 sq.in. plane is now only 120 oz. 120 oz. / (1000 sq.in. / 144 sq.in.)^1.5 = 6.56

The WCL line on the graph indicates that for the plane scaled to 500 sq.in., to fly in a similar manner, it should weigh about 42.43 oz. ready to fly. That would be a WAL of 12.22 oz./sq.ft.

The WCL line on graph also indicates that for the plane scaled to 250 sq.in., to fly in a similar manner, it should weigh about 15 oz. ready to fly. That would be a WAL of 8.64 oz./sq.ft.

With all of this taken into account, I believe that the WCL factor **IS** the valid **indicator** of flight characteristics, even more so than the traditional wing area loading.

The three different size examples of the same plane, using wing area 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, but their wing area loadings are very different, especially if the smallest, 250 sq.in wing area version, with an 11.65 oz./sq.ft. WAL, is compared to the biggest, 1000 sq.in. wing area version, with a 24.42 oz./sq.ft WAL.

Over the decades, one anecdotal comment by RC pilots, has always been, "Bigger flies better." Using WCL, partially explains this subjective observed phenomenon. The WCL line on the first graph also indicates this. Of course there are other factors involved as well.

Grouping by Flyability Types Using Wing Area Loading (WAL)

In Getting Started In Backyard Flying by Bob Aberle, Bob chose to group model types using weight, wing area and wing area loading. When the comparative value of WCL is used instead of wing area loading in oz./sq.ft., some interesting things come to light.

Bob created several groups (p.64, p.65);

Ultra Micro: Up to 2 oz., wing area 50-100 sq.in., wing loading up to 5 oz./sq.ft.

Sub Micro: 2-3 oz., wing area 75-125 sq.in., wing loading up to 5 oz./sq.ft.

Micro: 3-8 oz., wing area 125-300 sq.in., wing loading up to 5 oz./sq.ft.

Parking Lot & Backyard: 8-14 oz., 300-600 sq.in., wing loading up to 8 oz./sq.ft.

Speed 400: 14 oz. and up, 300 sq.in. and up, wing loading 8-10 oz./sq.ft.

Here's another way to look at them with one specific example from each group.

Ultra Micro: Lite Flyer, 1.6 oz., 68 sq.in., 3.4 oz./sq.ft, WCL 4.93

Sub Micro: DJ Aerotech Roadkill Series, 2.8 oz, 80 sq.in., 5 oz./sq.ft., WCL 6.76

Micro: GWS Pico Stick, 7.7 oz., 238 sq.in., 4.7 oz./sq.ft., WCL 3.62

Parking Lot & Backyard: Merlin, 17 oz, 511 sq.in., 4.9 oz./sq.ft., WCL 2.54

Speed 400: Miss-2, 29 oz., 390 sq.in., 10.8 oz./sq.ft., WCL 6.5

None of these planes would be considered "hard to fly" by an experienced R/C pilot.

Examples Arranged by Wing Area Loading

Ultra Micro: Lite Flyer, 3.4 oz./sq.ft,

Micro: GWS Pico Stick, 4.7 oz./sq.ft.

Parking Lot & Backyard: Merlin, 4.9 oz./sq.ft.

Sub Micro: DJ Aerotech Roadkill Series, 5 oz./sq.ft.

Speed 400: Miss-2, 10.8 oz./sq.ft.

Examples Arranged by Wing Cube Loading

Parking Lot & Backyard: Merlin, WCL 2.54

Micro: GWS Pico Stick, WCL 3.62

Ultra Micro: Lite Flyer, WCL 4.93

Speed 400: Miss-2, WCL 6.5

Sub Micro: DJ Aerotech Roadkill Series, WCL 6.76

The table shows the planes and types arranged by wing area loading (WAL) on the left and WCL on the right.

It is interesting to note what happens to Bob's order, which uses WAL, when it is compared to the WCL method of organizing planes by their 'flyability' level.

It is also interesting to note that the "flyability" order doesn't go as expected or predicted by Bob.

If you have experienced flying some of these or similar models, you should be able to see that using the WCL comparative value, shown in the right column, gives a more realistic idea about the relative ease of flight of the various models.

The Seven WCL 'Flyability' Levels

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 in an Excel workbook with several spreadsheets. The Excel workbook is available and may be downloaded to your computer.

http://www.theampeer/new-power-theory/metricnewtheory.xls

Based on the collected data, I have created seven WCL levels. The levels reflect the "ease" of flying and ability required to fly them.

oz./sq.ft. and wing cube loading (WCL) of 6.64. Therefore, this plane fits in my group called Level 3 (typically Park Flyers), but you'd not fly it in a park! However, the relative ease of flight is very much like a park flyer!

The levels are purely arbitrary. A plane with a WCL on the high end of one level will most likely fly in a similar manner to one on the low level of the next higher WCL level. The Fusion sport planes

Level	WCL Range	Typical Type(s)	Notes
1	0.00-2.99	Indoor	Includes mostly indoor type models and those that can be flown outside in very light winds. When flown indoors, the venue size will vary depending on the size and speed of the model. This is the only level with no internal combustion powered planes.
2	3.00-4.99	Backyard	Includes what some people call backyard models and some electrically powered gliders. Some "backyard flyers" can be flown indoors in larger venues and outside in low wind conditions. The electrically powered sailplanes are best flown outdoors. It includes very few internal combustion powered planes.
3	5.00-6.99	Park Flyers	Includes park flyers, electrically powered sailplanes, some trainers, some biplanes, and many 3D planes.
4	7.00-9.99	Sport planes & Trainers	Includes sport types, many trainers, biplanes, some light scale, some 3D planes, and some pattern planes. The greatest number of RC planes are found in this category.
5	10.00-13.99	Advanced sport	Includes advanced sport types, sport scale and sport scale warbirds, and some twins and other multi-motor aircraft.
6	14.00-16.99	Expert types	includes expert sport types, scale, scale warbirds, some twins and EDF "Jets"
7	17+	Advanced Expert Types	Includes planes for the advanced expert fliers only, heavier twins and other multi-motor aircraft, true scale, and true scale warbirds and EDF "Jets".

This table supersedes all previous WCL tables by Ken Myers
The WCL range of 13 - 13.99 was moved from Level 6 to Level 5

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.

Not all aircraft will fit the title or level grouping I have given.

An example that doesn't fit the physical environment is the SR Batteries Eindecker E1 powered by a Zenoah G-26 gasoline engine. In a review published in Model Aviation it had a given wing area of 1700 sq.in. and RTF weight of 16 lb. 13.5 ounces (269.5 oz) for a wing loading of 22.83

are at the high end of level 4.

For comparison, several WCL comparative values were noted in "Aircraft Performance Parameters Revisited" by Roger Jaffe, Model Builder, June 1994.

http://www.theampeer.org/CWL/jaffe.htm

Types of Aircraft to Their Wing Cube Loading
Value
Gliders 4
Trainers 6
Sport Aerobatic 9

Pattern 11
Racers 12
Scale 10-15

My table also 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 reflected 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.

Obtaining Wing Area Data is Harder Than It Should Be

I recently went through 13 *Model Aviation* magazines, February 2017 through February 2018 The December issue had no construction articles or reviews of planes, so the total was 12 issues. There were 42 reviews and 7 construction articles. Of the 42 reviews, 7 made no reference to the plane's wing area. That is about 17% of the total number of reviews. Of the 7 construction articles, three made no reference to the plane's wing area. That is 43% of the total number of construction articles! Over 20% of the total construction articles and reviews made no reference to the plane's wing area. That is 1 out of 5!

missing-WCL-data.xls

There were no Level 1 planes in the magazines.

There were four Level 2 planes.

The smallest wing area was 400 sq.in. for the Pietenpol Air Camper, and the largest was 1033 sq.in. for the Horizon Hobby E-Flite Opterra 2M Wing.

The wing area loadings (WAL) ranged from 5.29 oz./sq.ft. for the Pietenpol Air Camper to 9.62 oz./sq.ft. for the Horizon Hobby E-Flite Opterra 2M Wing.

The wing cube loadings (WCL) ranged from 3.18 for the Pietenpol Air Camper to 4.58 for the ICARE Magellan-E 2M.

There were four Level 3 planes.

The smallest wing area was 558 sq.in. for the Multiplex RR Extra 350SC Gernot Bruckmann Limited Edition, and the largest was 691.3 sq.in. for the Flex Innovataions Premier Aircraft Mamba 10 PNP.

The wing area loadings (WAL) ranged from 11.25 oz./sq.ft. for the Flex Innovataions Premier Aircraft Mamba 10 PNP to 14.15 oz./sq.ft. for the Tower Hobbies Uproar V2 .46 GP/EP ARF.

Note: The wing area range is very small with this group. The small range illustrates why using either the WAL or WCL as "flyability" predictions would appear to work, but in the long run doesn't.

There were eleven Level 4 planes.

The smallest wing area was 364 sq.in. for the Flyzone Rapide Performance Glider RX-R, and the largest was 2139 sq.in. for the Aeroplus RC Extra 330LT 100-120CC ARF.

The wing area loadings (WAL) ranged from 13.4 oz./sq.ft. for the Horizon Hobby E-Flite Valiant 1.3M to 31.44 oz./sq.ft. for the Aeroplus RC Extra 330LT 100-120CC ARF.

The wing cube loading (WCL) ranged from 7.08 for the Horizon Hobby Carbon-Z Cessna 150 2.1M to 9.95 for the Flyzone Rapide Permormance Glider RX-R.

Note: The wing area loading range is very LARGE with this group, 13.4 to 31.44. That illustrates why using the WCL as a "flyability" prediction appears to work better than using the WAL.

There were seven Level 5 planes.

The smallest wing area was 400 sq.in. for the Horizon Hobby E-Flite Razorback 1.2M, and the largest was 1464 sq.in. for the Phoenix Model 1:4-3/4 Westland Lysander Gas/EP ARF.

The wing area loadings (WAL) ranged from 21.55 oz./sq.ft. for the Performance Aircraft Unlimited Extra 300SP to 41.9 oz./sq.ft. for the Phoenix Model 1:4-3/4 Westland Lysander Gas/EP ARF.

The wing cube loading (WCL) ranged from 10.1 for the Performance Aircraft Unlimited Extra 300SP to 13.52 for the Flightline RC B-24 Liberator 2000MM.

Note: Again, the wing area loading range is very LARGE with this group, 21.55 to 41.9.

There were six Level 6 planes.

The smallest wing area was 215 sq.in. for the Durafly EFXTRA Racer and the largest was 670 sq.in. for the FlightlineRC F7F-3 Tigercat.

The wing area loadings (WAL) ranged from 15.59 oz./sq.ft. for the Horizon Hobby Blade Theory Type W FPV to 33.67 oz./sq.ft. for the Freewing YAK-130 Super Scale Ultra Performance 8S 90MM EDF Jet.

The wing cube loading (WCL) ranged from 14.34 for the Horizon Hobby Blade Theory Type W FPV to 16.77 for the Durafly EFXTRA Racer.

There were two Level 7 planes.

The smallest wing area was 333 sq.in. for the Freewing F-16 V2 6S Pro 70MM EDF Jet and the largest was 372 sq.in. for the Freewing A-4E Skyhawk 80MM EDF Jet.

The wing area loadings (WAL) ranged from 30.04 oz./sq.ft. for the Freewing A-4E Skyhawk 80MM EDF Jet to 31.57 oz./sq.ft. for the Freewing A-4E Skyhawk 80MM EDF Jet.

The wing cube loading (WCL) ranged from 18.69 for the Freewing A-4E Skyhawk 80MM EDF Jet to 20.76 for the Freewing F-16 V2 6S Pro 70MM EDF Jet.

The ten reviews and construction articles with no wing area given were the; Zlin Z-37T Agro Turbo, AJ Aircraft Acuity, Sky Dancer, Freewing Avanti S 80MM Ultimate Sport Jet, Aerobeez 20CC MXS-R, BMJR Models Super Sniffer, VQ Warbirds C-47 Skytrain D-Day Edition 70.8-inch EP/GP ARF, Peak Model ACRO 31% Laser X 55-60CC EP/GP ARF, Skyshark RC 1/9th Scale Hawker Tempest Kit, and Grumman F8F Bearcat.

Only three of the reviews contained the wing cube loading (WCL). Andrew Griffith provided the WCL in his reviews of the Maxford USA E-2C Hawkeye EP ARF and the Horizon Hobby Hanger 9 Ultra Stick 30CC ARF. Josh Bernstein provided it in his review of the Flex Innovations Premier Aircraft Mamba 10 PNP.

Editorial

It is my opinion that omitting wing area from the specifications should never be allowed to occur. The physical plane is always available to the designer and reviewer. Calculating or measuring and reporting the wing area is not difficult, nor is it a time consuming task.

Because I believe in using WCL to help me select possible planes to model or fly, I wish that designers would report the wing area to manufacturers or publishers, manufacturers would report the wing area to their suppliers and suppliers would report the wing area to the end users. If the wing area is still missing when a plane reaches a reviewer, it would be useful if the reviewer calculated it and reported it to the readers of the review.

Final Thoughts

The WCL comparative value is only a rule of thumb, albeit a valuable one.

It is important to keep in mind that the way different RC planes fly in "real" air and varying amounts of wind has a lot to do with their basic design, which includes their physical size, weight and power. Other considerations of the design such as, airfoil selection, angle of attack (AOA), center of gravity (CG) placement, tail moment, decalage, speed (top end, cruise & stall) and even how a full scale was designed, if it is a scale model, all have influences that are not taken into account using this simple rule of thumb.

Upcoming Keith Shaw Birthday Party Electric Fly-in 2018

From CD Dave Grife via Email

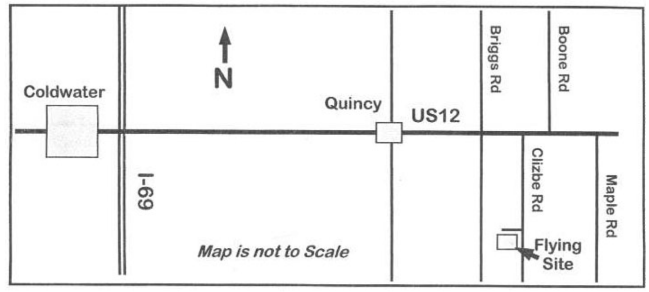
The Balsa Butchers are hosting the “Keith Shaw Birthday Party Electric Fly-In”, for the 17th year, at their field near Coldwater, MI. The event takes place on Saturday, June 2, 2018. It is a one day event again this year.

The event consists of Open Electric Flying with a "Special Guest of Honor Theme”, Happy Birthday Keith Shaw.

Enjoy a day with the "Pioneering Master of Electric R/C Flight". 8 am - 5 pm, Saturday. New this year, NO LANDING FEE! Donations for field maintenance and lunch appreciated.

For additional information contact;
Dave Watson 517-250-6190 or
flybuddy619@yahoo.com
Contest Director: Dave Grife - E-mail:
grifesd@yahoo.com or Phone: 517-279-8445
Please e-mail or call with any questions.

The field will be open for guests to fly on Sunday as well.



Directions: Quincy is approximately 4.5 miles east of I-69. Clizbe Road is approximately 1.6 miles east of Quincy. The Flying site is approximately 1.5 miles south of US-12 on the west side of Clizbe Road.

Skymasters’ Electric Night Fly and Fly-in

From Pete Foss Via Email

The Skymasters’ Annual Electric Night fly will be held on Saturday, June 9 and the electric fly-in is on Sunday, June 10.

More details at http://www.skymasters.org/index.php?page=events&id=10787.

34th Annual Mid-America Electric Flies 2018

AMA Sanctioned Event

Saturday, July 14 & Sunday, July 15

Hosted by the:

Ann Arbor Falcons and **Electric Flyers Only**

The 7 Mile Rd. Flying Site, Salem Twp., MI, is

Provided by the:

Midwest R/C Society

Contest Directors are:
Ken Myers phone (248) 669-8124 or
kmyersefo@theampeer.org
http://www.theampeer.org for updates & info
Keith Shaw (734) 973-6309

Flying both days at the Midwest R/C Society Flying Field - 7 Mile Rd., Salem Twp., MI

Registration: 9 A.M. both days
Flying from 10 A.M. to 4 P.M. Sat. & 10 A.M. to 3 P.M. Sunday

Pilot Entry Fee: 18 and over, $15 Sat. - $10, Sunday, (ask about the family rate),
Under 18, FREE
Parking Donation Requested from Spectators

Saturday’s Awards

Best Scale

Most Beautiful
Best Ducted Fan
Best Sport Plane
Special Foam Flurry for NCM Aircraft
CD's Choice

Sunday's Awards
Best Scale
Most Beautiful
Best Mini-Electric
Best Multi-motor
Special Most Unique NCM Aircraft
CD's Choice

Planes Must Fly To Be Considered for Any Award
Saturday's & Sunday's Awards:
Plaques for 1st in each category

Open Flying Possible on Friday
Night Flying Possible, Weather Permitting, Friday & Saturday Nights
Refreshments 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!

Merchandise drawing for ALL entrants

Special Events for this year for NCM (Not Conventional Materials) aircraft.
Traditionally, model aircraft airframes have been mostly constructed from balsa wood, plywood, spruce, and fiberglass. For the purposes of this meet, NCM airframes are mostly constructed from not conventional materials i.e.; sheet foam, foam board, cardboard, block foam, foam insulation material, etc.

Foam Flurry for NCM aircraft: This is a true event. It is based upon the all up/last down event of early electric meets. Any NCM aircraft may be used (no ARF types). Power systems are limited to a maximum of 3S (no paralleling) LiPo batteries or 4S maximum, no paralleling, for A123 packs. All planes qualifying for this event will launch at the same time, and the last one to land will be declared the winner.

Most Unique NCM Aircraft Award: An award will be given on Sunday to an aircraft in the NCM category that is judged as 'most unique' by the Mid-Am panel of judges.

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To locate the Midwest R/C Society 7 Mile Rd. flying field, site of the Mid-America Electric Flies, look near top left corner of the map, 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, Salem Twp, MI 48167 - numbers are on the fence.

Because of their convenient location and the easy drive to the flying field, the Comfort Suites and Holiday Inn Express in Wixom, MI have been added to the hotels' listing. They are only 10 miles northwest of the field and located near I-96 and Wixom Road. See the map-hotel .pdf for more details.

http://www.theampeer.org/map-hotels.pdf

Upcoming E-vents

June 2, Saturday, Keith Shaw Birthday Electric Fly-in, Quincy/Coldwater, MI, details in this issue

June 9, Saturday, Skymasters Night Fly-in for electrics and
June 10, Sunday, Skymasters Electric Fly-in, details to follow More Details at http://www.skymasters.org/index.php?page=events&id=10787

June 16, 2018, Saturday, EFO flying meeting, 10:00 a.m. Everyone with an interest is welcome. AMA membership required to fly - watch for possible date changes on the EFO Web site.

July 14 & 15, 34th Annual Mid-America Electric Flies - (full details in this issue - also considered the EFO July Flying Meeting)

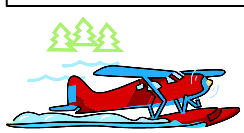
August 24 & 25, Friday and Saturday, CARDS (Capital Area Radio Drone Squadron) of East Lansing, MI, 8th Annual Electric Fly In, 8328 Otto Rd. in Grand Ledge, Michigan
More details:
http://www.cardsrc.com/index.php/events/electric-fly-in

More Mid-Am Info
Also Featuring:

Midwest Priceless Sale at the flying field. No prices on any items. Make a reasonable offer and its yours. Money goes directly to the Midwest RC Society.

Open Air Tailgate Swap Shop

No charge for space. The $5 requested donation for non-participant entry parking would be appreciated.



The Ampeer/Ken Myers
1911 Bradshaw Ct.
Commerce Twp., MI 48390
http://www.theampeer.org

The Next Monthly Meeting:
Date: Saturday, June 16 **Time:** 10:00 a.m.
Place: Midwest RC Society 7 Mi. Rd Flying Field