



THE RAMS HORN

The Official Newsletter of the Rainbow Aero Modelers Society
Metro Milwaukee Area Franklin, WI Founded Nov. 6, 1980

AMA—Academy of Model Aeronautics Club #1264, Operating for Public Benefit, Milwaukee County RC Flying Field, S.70 & W. Oakwood Rd.

Next Meeting: Wednesday, February 4, 2009

WaterStone Savings Bank, 6560 S. 27th Street, 7PM
(formerly Wauwatosa Savings Bank)

PRESIDENT'S REPORT by **Tom Ryan**

Nominations. Done, you guys are stuck with me again for another year! I tried to sell my seat in hopes I'd be impeached, but I couldn't, and you wouldn't. So you got me, plus Craig Manka and a new face, Mike Lutzenberger, rounding out the three Amigos! The by-laws and rule up-dates will be voted on at our next meeting, and we'll have some snacks there to bribe some of you into coming and meet your new Vice President Mike, nick named "Zipper" by Marv Anderson. Ask Mike how he got the nick name! Of course Marv also has a nick name..."The Perv." Don't ask about that!

The Economy! The economy is once again a big issue with many, but model aviation isn't feeling it, at least not now and not from the flyers' stand point. In fact, as the economy slows, R.C. Flying increases. Seems many who'd be traveling and spending their money on more expensive recreation, now cut back and stay closer to home. Many dust off their R.C. models and head back out to the local flying field for fun and some summer sun! So for our hobby (*at least for now*) we're still holding our own and may even grow this summer? Our July 11, 2009 Fun Fly-In should prove to be a big hit with the local pilots and our plans are already underway to make it the best fun fly-in ever! That's why we are calling it a "FUN FLY-IN" and not just a "fly-in."

Instructors named! We have our new instructor core and their names will be officially announced at our

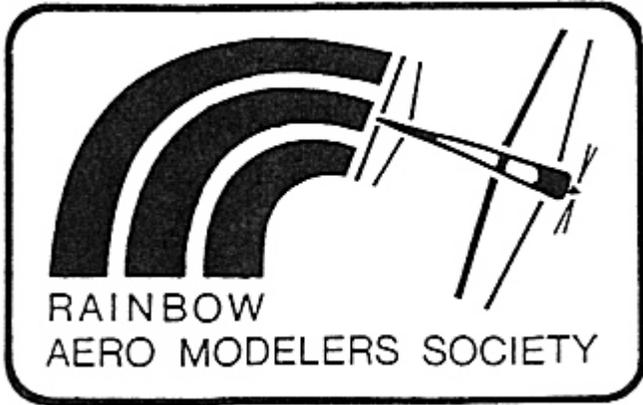
Volume 30 – Number 2, February, 2009

February meeting. Added to the instructor list s a new "Check Pilot, Don Finney." He will be working with those who fly large scale aircraft and those wanting to fly large models. Details on these new instructor and their duties will be discussed at the February meeting.

Other Clubs! I had a chance to attend the Racine and Astro Wings (Grafton) club meetings the 18th and 19th of January. These two clubs are very progressive and have a host of activities going on. It was really nice to visit with them and they showed me a very warm welcome and expressed, like us, a very optimistic view of our hobby and its up and coming flying season. They're all a really great bunch of guys.

Personal Comment! The January meeting death with a host of changes including By-Laws Field Rules and positions. The idea was to streamline and un-complicate complicated matters. I believe it did just that. As we start our new season, it's always best to get the stuffy (*an frankly boring*) business out of the way early so we can concentrate on having fun, but be safe while we're having fun! As a club we have to get all that done... hopefully we've done all that and can move on to fun stuff... like making fun of each other and picking on our New Vice President, who thinks his job is going to be easy... it isn't! His first official task is to buy us food (*snacks*) and drinks (*coffee or soda*) and have it at our next meeting! (*That'll teach him to accept a nomination!*) Hope to see you there!

Pilot Profile this issue: Greg Mitchell
(Read 46past profiles at www.rcslot.com/rams)



**RAINBOW
AERO MODELERS SOCIETY**

Founded Nov 6, 1980 Club #1264 Academy of Model Aeronautics

PRESIDENT

Tom Ryan, cell 414-881-0070
PO Box 1111 tomcat@execpc.com
Milwaukee, WI 53201-1111

MEETINGS-7PM

First Wednesdays
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(*formerly Wauwatosa Sav.Bk.)

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James Hatzenbeller, 414-483-1246 \$50.Mar.1-Feb.28
4388 S. Pennsylvania Avenue \$20 under 18 Jul. 1
St. Francis, WI 53235 jimhatzy@aol.com half after Sept. 1

updating the lists of flight instructors, following the November, 2008 Flight Instructors Training sessions organized by RAMS President Tom Ryan, and the upcoming review of an instructor's manual being assembled by Marty Gscheidmeier.

Corrections



Above: This photo at the December, 2008 meeting only identified the "Zipper" nickname Marv Anderson gave to the \$125 ARF from Nitro Planes that he setup for Mike Lutzenberger. The 56" span .52 cu.in. Evolution engined model is a scale version of the Russian "Yak 54" two-seater aerobatics plane.



Above: Two of the three trays of sub-sandwiches at the December Awards Night meeting. The SWARM helicopter club donated them. They were identified as from Cousins, but they actually came from Mama Angie's Italian Deli at 6508 S. 27th St., in the same block as our WaterStone Bank meeting room.

- Visitors at Meetings or the Field Always Welcome -
All Flight Instruction is Without a Fee.
WATCH THIS SPACE in the March, 2009 issue for

Happenings at the Meeting

RAMS Club, January 7, 2009

by Russell Knetzger, Librarian & Editor

In spite of snowy weather again as a major factor hampering members from attending the club meeting, the RAMS had a respectable 31 members present in January. The club closed 2008 with 85 members, reported Secty.-Treas. Craig Manka. That compares with 56 members last January. The closing club treasury was \$376.90. Field Licenses reached 125, according to license issuer Jim Hatzenbeller. His year-end treasury was \$309.91.

Field Manager Bob Kabella outlined projects for the 2009 flying season. He recommends a 60 ft. westward extension of the north cyclone fence. ABC Fence of Franklin, installers of the existing cyclone fencing in 2002-2003, have bid \$1500. Fixed monthly costs for toilet service, fuel, insurance and similar recurring expenses are \$2900 a year. With the fence project added, the resulting \$4400 budget would require sales of 88 licenses at the new \$50/year rate voted by the club.

The SWARM Club requested permission for exclusive use of the field for Saturday, July 25, 2009; Sunday the 26th as a Rain-Date. President Tom Ryan noted he will soon register the 2nd Saturday of July (the 11th) with AMA for the 2009 version of the Fly-In that got rained out in 2008. He also noted returning member Marvin Wolff underwent major hip to ankle "open leg surgery," and is recovering.

2009 Officer Nominations took place and unopposed are Tom Ryan for President; Mike Lutzenberger for Vice President; Craig Manka for Secretary-Treasurer, Bob Kabella for R/C Association delegate; and Jim Hatzenbeller for field license issuer. Uncertain was whether Ken Huber wanted to continue as alternate Assoc. delegate. (He does not, Bill Flannery is willing to take that position.) The two director positions are being left open on the basis the club may dissolve those posts as being suggested by the By-Laws Committee (see following article.)

Raffle winners were Dale Champagne of a ready for covering kit of a Waco biplane donated by Bill Flannery; Craig Manka of a 2-transmitter 4-receivers Hitec radio system (no servos) donated by Bill Stillely; Chuck Bucci of a super-fine metal file set; Mike Lutzenberger of an exacto knife kit, and Bob Ehlers of an epoxy glue combo.

BY-LAWS COMMITTEE REPORT

by Russell Knetzger

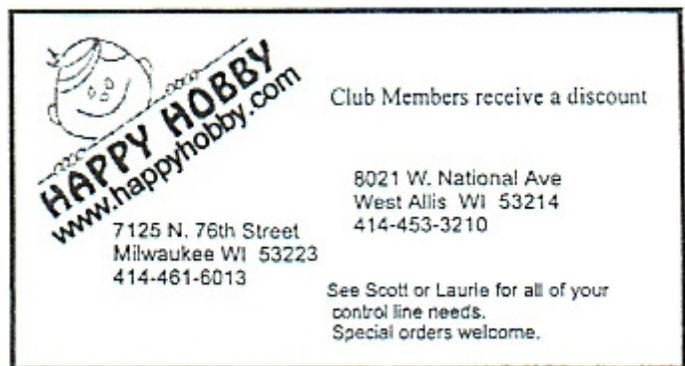
Most of the January, 2009 meeting was devoted to the report of the special By-Laws Committee described in the

last newsletter. From the initial dozen persons who met December 13th in Greenfield News & Hobby's club room, (who nominated 20 topics for review), a smaller working group chaired by Alan Borowski accepted the re-drafting task. Joining him were safety officers Marv Anderson (RAMS), Chuck Bucci (SWARM), and members Don Finney and Bob Ehlers.

The committee met several times, and distributed at the meeting proposed revised By-Laws and Field Rules. Alan read each, word for word, with no interruptions so all could get the whole picture before discussing any one portion. That draft is being mailed to all 85 RAMS members with this February newsletter, so voting can occur at the Feb. 4, 2009 meeting.



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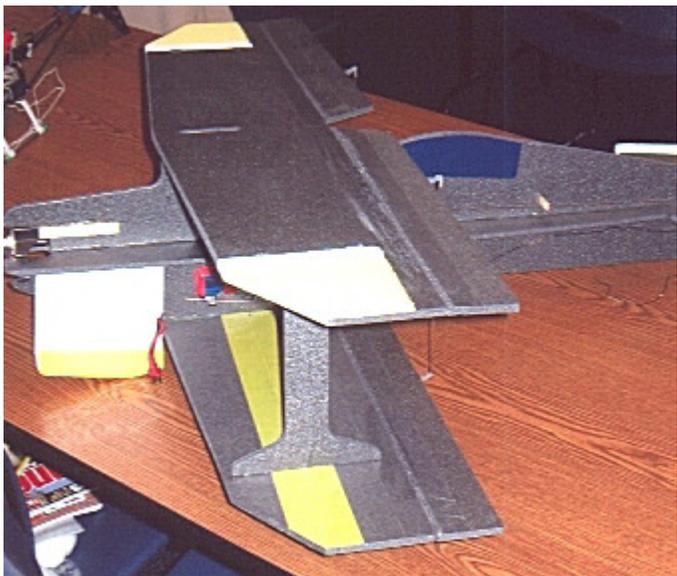
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Models at the Meeting

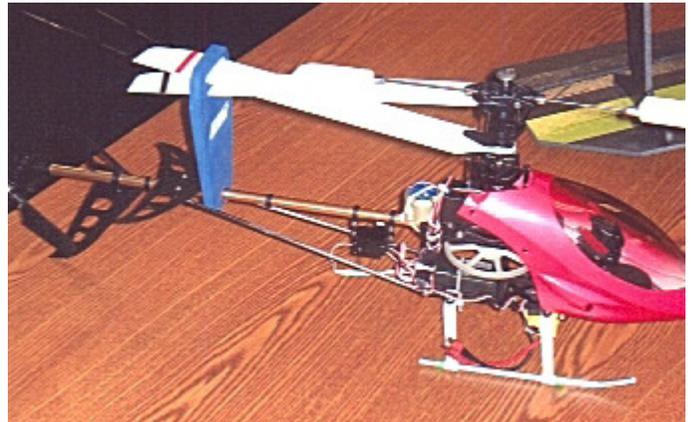
January 7, 2009



Above: WACO S.R.E. biplane kit ready for covering, donated by Bill Flannery to the meeting raffle, and won by Dale Champagne. Sterling kit. Bill won the plane at a previous club raffle, and gives a high rating to the workmanship, but does not feel he can find the time to complete the model. The original builder was in Pennsylvania. Engine: .60 cu. in.



Below Left: Steve Ward's electric "plastic foam" 15 oz. 3D biplane made of "Depron" a Canadian railroad protective packing product. Kit (\$20) by Desert Aircraft of Ft. Mojave. 80 watts motor propped for 13 mph slow indoor flight "Sussex Place", Main St. just east of STH 164 south of QuadGraphics plant, every other Sat. night (7PM, \$5 fee), call Glenn Dickau 414-354-0996 for schedule.



Above: Steve Ward's new indoor flight electric helicopter from E-Sky Corp. called the Honey Bee King II cost \$125 including a transmitter & servos, now has a 400 brushless motor in it after brushed gave out.

Plans Library (see pages 6-7)

As promised last issue, when the books and video tapes in the club library were listed, this issue lists the kit construction plans found in the library. They are catalogued on pages 6 and 7 by type of aircraft, and give engine size and basic aircraft dimensions. The plans contain a lot of favorites of club pilots, who loaned their plans long enough to be reduced to 11x17 inch paper. If you order a plan, you will receive it at that size, and at a FedEx Kinko's type shop, you can bring it back to full size.

Almost Ready to Fly (ARF) planes make kit building during flying season a waste of precious weather. But winter building keeps us busy all year long, and perhaps your building fingers are beginning to itch again. Do it!

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Pilot Profile: Greg Mitchell

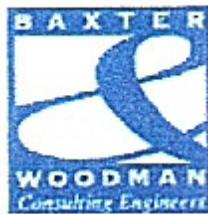
by Russell Knetzger

Everything that now fills his life, - his job, his wife, their home on Milwaukee's south side, and by the time this is published, their newborn twin children, plus this article's subject, his hobby of radio remote controlled model aviation, - Greg Mitchell owes to Marquette University in downtown Milwaukee.



From his boyhood home and schooling in Gurnee, Illinois, just south of the Wisconsin border near Kenosha, Greg came to Marquette University in 1994 to major in civil engineering. There he met his future wife, Jennifer Perdue, who came over from Michigan to major in physical therapy.

Upon graduation Greg was able to obtain jobs with two engineering consulting firms in the Gurnee region, first with Peter Olesen & Associates in Mt. Prospect, Illinois, and then with his present firm, Baxter & Woodman, Inc. in Crystal Lake, Illinois. During his 6-1/2 years at Olesen he earned his PE-Professional Engineer license with the State of Illinois. Four years of practical experience must occur before taking the day-long exam. About the time Greg and Jen were marrying, Baxter assigned Greg to their Burlington, WI office.



At Baxter Greg functions as a municipal engineering advisor to Illinois communities such as Grayslake and Winthrop Harbor, and Wisconsin towns near Lake Geneva. Civil engineering covers roads, bridges, subdivisions, water and sewers, including treatment plants.

At Jen's urging they moved to Milwaukee to facilitate her obtaining physical therapy work, first with Aurora, now with Community Memorial Hospital in Menomonee Falls. There she met **Art Schmidt**, our oldest club member, and when she learned of Art's aero modeling activity, she recommended Greg



Above: Greg Mitchell, PE with his Goldberg Eagle 2 trainer on which he soloed. It has a 63 inch span and 715 sq. in. of wing area, powered by an OS .40 engine. He is now looking for his next project, if home remodeling and new twin babies leaves time.

contact Art, which Greg did. Jen felt Greg needed a hobby, and since Greg did control line flying in Boy Scouts, radio control seemed a logical next step. Greg took Art's suggestion to build a Goldberg Eagle 2 trainer. Art gave Greg his flight lessons. Greg soloed in about 2006.

Greg, now age 32, also points to EAA's "Young Eagles" Flight program as an anchor for his continuing aviation focus. He got a chance to ride in a Cessna aircraft during his Scouting days.

Marquette University affected Greg & Jen in more than just providing them with professional occupations. Community service is one of Marquette's hallmarks, and Greg & Jen volunteer as crisis interveners for the **American Red Cross**. If a family loses their lodgings to fire, even in the middle of the night, Greg & Jen arrive at the scene to escort them to emergency housing.

That will likely end when the twins are born. Finishing their kitchen remodeling of a 1920's brick bungalow on South Howell Avenue near Humboldt Park may also crimp Greg's model building time.

RAMS HORN, February, 2009, Russell Knetzger, Editor
Rainbow Aero Modelers Society, Franklin, Wisconsin

Model Airplane Construction Plans (RAMS Club Library, Current to 6-08-04)

Engine Size	Wing Type	Wing Shape	Drafter and/or Model Name and Designer	lbs.	Est. Span	Wing Sq. In.	Wing Length	Fuselage
<u>Trainer (3)</u>								
.40	F.B.	S.W.	Balsa USA Stik 40			60"	580	43"
.40	F.B.	S.W.	Sig Kadet trainer by Claude McCullough	----		56"	650	44"
.40	F.B.	S.W.	Sig Kadet LT-40 large trainer	----		70"	860	56"
<u>Sport (14)</u>								
.40	Sym	S.W.	RCM Trainer, Jr. by Joseph Bridi	----		52"	546	46"
.40	SSm.	S.W.	Midwest Sweet Stik by Frank Garcher	----		53'	600	45"
.35	Sym.	S.W.	Das Little Stik by Midwest	----		46"	415	38"
.45	Sym.	S.W.	VK Cherokee by Vernon E. Kreheiel	6.5		65"	754	50"
.40	Sym.	D.T.	Top Flite Nobler	----		50"	550	42"
.40	Sym.	D.T.	Dragonette, R.J. Parker & Phil Kraft	----		53"	450	42"
.60	SSm	D.T.	Beech Bonanza by Dan Reiss	7.5		59"	545	49"
.45	F.B.	D.T.	RCM PT-19 by Walt Mitchell (also electric)	----		58"	515	42"
.60	SSm.	S.W.	Baby Ace by Bob Upton & Don Butman	8-12		78"	1070	54"
.45	SSm	S.W.	Astro Hog by Fred Dunn	----		71"	770	52"
.35	Ssm.	TESF	Extra 3.25 by Rich Uravitch	3.2		48"	340	36"
.25	SSm	S.W.	RCM Terrier by Al Clark	3.5		58"	550	41"
.25	Sym.	LESF	Safari by George Milner Smith	----		46"	370	35"
.15	Sym	LESB	GNAT by John Van't Hoof			36"	260	31"
<u>Aerobatic (8)</u>								
.40	Sym.	D.T.	RCM Super Kaos by Joseph Bridi	5.0		52"	507	48"
.60	Sym.	D.T.	Kaos (pattern) by Joseph Bridi	----		64"	696	55"
.60	Sym.	D.T.	Super Kaos, (pattern) by Joseph Bridi	----		58"	644	54"
.60	Sym.	LESB	Dirty Birdi (pattern) by Joseph Bridi	----		64"	660	55"
.60	Sym.	D.T.	Compensator (pattern) by Rhett Miller	----		64"	730	54"
.60	Sym.	LESB	Curare (pattern) by Hans & Hanno Prettner	7.5		64"	690	56"
.60	Sym.	D.T.	Prairie Duster, Mark & Weldon Smith	----		52"	500	48"
.61p.	Sym.	D.T.	RCM Double Eagle (twin tail pattern) George Smith			60"	600	67"
<u>Biplane (5)</u>								
.60	SSm	LESB	Aeromaster (Bipe)Lou Andrews & Don Anderson			48"	860	44"
.60	U.C.	S.W.	Travel Air 2000 (biplane) by Bill Northrup	----		58"	1160	48"
.40	SSm	S.W.	PT-17 Stearman (Boeing biplane) by M.A.N.	----		48"	490	36"
.40	SSm	S.W.	1930 Fleet (bipe) Barnstormer Romy Bukolt	----		49"	720	41"
.40	SSm	S.W.	1930 Fleet (bipe) by Gary E. Brown	5.0		56"	860	55"
<u>Sailplane (2)</u>								
Glider	SSm.	TESF	Pioneer II sailplane by Mike Trew	----		103"	825	29"
Glider	SSm	TESF	Standard Cirrus by Mike Trew	----		118"	540	47"
<u>Seaplane (2)</u>								
.049	F.B.	S.W.	Aqua Star (Seaplane) by Thomas Hieir	2.0est.		40"	240	28"
.60	F.B.	S.W.	Falconar "Teal" Amphibian by Don Prentice	----		70"	700	50"

(cont.)

Model Airplane Construction Plans (RAMS Club Library, Current to 6-08-04)

(cont.)

Engine Size	Wing Type	Wing Shape	Drafter and/or Model Name and Designer	lbs.	Est. Span	Wing Sq. In.	Wing Length	Fuselage
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Electric (2)

E.05	F.B.	S.W.	Pilatus Turbo Porter, (Electric) Steve Gray	----	65"	480	46"	
E.05	F.B.	D.T.	RCM Electric PT-19 by Walt Mitchell	----	58"	515	42"	

Pylon (2)

.45	Sym,	TESF	Vindicator-Mk.2 Pylon by Dario Brisighella	4.5	54"	600	48"	
.049	Sym.	S.W.	Supercat (pylon, John Kilsdonk & Harry Roe)	28oz.	30"est.	200e.	30"	

Specialty (3)

.40	SSm.	D.T.	RCM Cessna Agwagon Cropduster, G. Horstman	6.5	60"	470	38"	
.35	F.B.		Sidewinder (delta wing) by Dale E. Nutter	3.0	42"	745	29"	
.60	F.B.	S.W.	Don Quixote (pusher), L. Mikulasko	----	87"	920	54"	

Twin Engine (1)

.45T	Sym	TESF	Double Impact (twin engines) by Dick Sarpolus		54"	700	47"	
------	-----	------	---	--	-----	-----	-----	--

Combat (1)

.15	Sym.	S.W.	Wild Thing (combat) by Tom Stryker	2.0	36"	360	31"	
-----	------	------	------------------------------------	-----	-----	-----	-----	--

1/2A - .049 (4)

.049	F.B.	S.W.	RCM Bumble Vee by Henry Arance		38"	285	29"	
.049	Sym.	S.W.	Supercat (pylon, John Kilsdonk & Harry Roe)	28oz.	30"est.	200e.	30"	
.049	F.B.	S.W.	Aqua Star (seaplane) by Thomas Hieir	2.0est.	40"	240	28"	
.049	SSm.	S.W.	3-Warbirds (ME-109, P-51, Hurricane) R. Bukolt	28oz	42"	225	30"	

Legend: (wings) Sym.= Symmetrical, **SSm.** = Semi-Symmetrical, F.B. = Flat Bottom, U.C. Under-Cambered, D.T. = Double Taper, S.W.=Straight Wing, TEF=Trailing Edge Swept Forward, LESB=Leading Edge Swept Back, LESF=Leading Edge Swept Forward; (engines) E. 05 = Electric 05; .61 p. = fuel pumper; fuselage length = spinner to rear-most rudder/elevator.

How to Obtain Plans.

RAMS members, or others, may order from the above list. Choose your plan(s) and order via the club librarian: currently Russell Knetzger, 414-962-0637, 2625 E. Shorewood Blvd., Shorewood, WI 53211-2457. You will receive and 11"x17" print, which you may enlarge 400% back to original size, as noted below.

Library of Construction Plans

Rainbow Aero Modelers Society, Franklin, Wisconsin

Russell Knetzger, Librarian 414-962-0637

(25% of Original Plan Size)

(Use FedEx Kinko's, Inc. type service to enlarge 400% to original plan size)

Electric Flight News - XIV

by Dennis Vollrath, Editor, "The Flightline" - Oct., 2008
Racine R/C Club, Inc., Racine, Wisconsin - Reprinted in the
RAMS HORN, Russell Knetzger, Editor, Franklin, WI

INDUCTANCE

I've had a question on electric power systems, concerning the length of the ESC (Electronic Speed Control), battery, and motor leads. Some electric power suppliers are indicating that these wires are not to be changed in length because of "inductance" of these wires. (Part of the reason---many motor manufacturers such as Astroflight and Hacker simply run the magnet wire out of the motor for connections to the ESC. Problem is, this magnet wire has a very tough varnish coating that must be removed before attempting to solder it. If not done properly on the multiple strands of the Hacker motors, it could leave one strand unsoldered, causing serious problems.)

So exactly what is inductance? Way back in the beginning of my "How it Works" radio series, I talked about the radio frequency circuits that use a capacitor and inductor for a "tuned circuit". As it turns out, any piece of wire has a certain amount of inductance, however a piece of wire 6 inches long has extremely low inductance values. So, just what the heck IS inductance?

This gets pretty messy, what with real resistance values, impedance values, and "imaginary" impedance values. Yeah, "imaginary" is actually used in these calculations. What this involves is the property of an inductor, when current is applied to it, then the current is shut off. Anyone that has ever started an old car engine by placing a screwdriver across the starter contacts has observed the inductance property of the starter windings. You get a BIG spark when you disconnect the screwdriver. (Don't try this on your new car - first, you might not even be able to FIND the starter!)

So, when current is shut off very rapidly on an inductor, you will get a voltage spike, something that is not good for electronics, such as your ESC on your electric model airplane.

But, and this is an important "but," the inductance level of a piece of wire that is only a few inches

long is extremely low, and voltage surges from this phe-

nomenon would be very low. As it turns out, one unexpected very high source of this so-called inductance is your Nicad/ NiHyd battery itself! I ran into this during designing my brush type motor ESC back some 10 years ago. The voltage surges across the terminals of a 22 cell, 28 volt battery pack were measured at peak values of some 55 volts as measured by my Tektronics Oscilloscope. That was the direct result of switching current on and off very rapidly from the Nicad battery.

I've measured this same stuff on the new brushless motor ESC controls, and found virtually no voltage surges anywhere in the newer equipment.

However, something else is involved here. Remember back in the radio series, I said you can make a "radio transmitter" by simply taking a piece of wire, and using it to short out a D size alkaline battery by brushing both ends of the wire to the battery?

Same thing here. We have the ESC control sending high power pulse currents at a very rapid rate to the brushless motor. And, the wires between the ESC and the motor are radiating radio waves. In theory, these radiated radio waves could get into your receiver, causing interference, and loss of radio range. The radio interference from these motor wires are of limited range, on the order of a few inches, so when building up your electric model, keep the receiver away from the ESC and motor.

Now, if you decide to put 30 inch long wires between the ESC and the motor, such as might happen in an electric twin, these 30 inch long wires could cause interference problems with the receiver.

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Here is a case where the new microwave 2.4 Ghz radios would save the day.

Next issue we cover charging Lipo and A123 cells.

About Our Radio Systems, XVI

by Dennis Vollrath, Editor, "The Flightline" – Jan., 2009
Racine R/C Club, Inc., Racine, Wisconsin – Reprinted in the
RAMS HORN, Russell Knetzger, Editor, Franklin, Wisconsin

More on microwave radio systems.

Both *JR/Spektrum* and *Futaba* have come up with 2.4 Ghz (Gigahertz) microwave radio systems. More and more of the large model airplane meets are finding out that the pilots are going to these radios for their expensive scale and/or competition models.

Note that other manufacturers are releasing their versions of these microwave radios. Information on the Internet has strongly suggested that these other manufacturers should be investigated on the Internet before purchase. One or two of these off brand 2.4 Ghz Microwave radios have caused repeated crashes with many different modelers, due to poor design and/or software problems.

A lot of speculation exists on just what JR/Spektrum and Futaba are doing with their radio signals. As it turns out, these radio manufacturers are bound and restricted by the international rules concerning radio waves on the 2.4 Ghz radio frequencies. If you really want to see a lot of unintelligible stuff, try Googling "Spread Spectrum" on the Internet.

As previously mentioned in this series, the *Futaba* radio system uses a "Frequency Hopping" technology. This technology goes back a long time, back to a guy named Nikola Tesla, 1856-1943, back in the early part of the 1900's. That was long before anyone could actually design transmitters that could transmit radio waves. This Frequency Hopping technology compares to a modeler with a standard 72 Mhz transmitter, with a whole box of 60 crystals. Frequency hopping resembles taking that box of crystals, and plugging them into the transmitter, one at a time in some specific order. (Say channels 11, 15, 18, 12, 19 and so on) Now, do this swapping 1 000 times a second! And, you have to do the same thing with the receiver, using the same specific frequency order (Channels 11, 15, 18, 12, 19).

It was not until the late 1940's or early 1950's before this Frequency Hopping process became feasible with the electronic equipment available at that time. During this period of time, the military version of this radio equipment used three six foot tall relay racks that probably weighed in at 500 pounds or so. Now we've got this system in a receiver that weighs a fraction of an

ounce! Such a receiver could be dropped inside a typical 1/4 scale model and disappear.

The advantages of Frequency Hopping Spread Spectrum radios is that designing this sort of system is comparatively easy to do. It's negatives are that it is some 10 times slower in communication than the JR/ Spektrum systems. We'll get back to that comment later.

Direct Sequence Spread Spectrum (DSSS) radios such as *JR/Spektrum* radios use a completely different technology. This technology was designed in the mid-1990's and was made possible with the use of the very high performance, low cost, microcontrollers that exist today. They are used in everything from your cell phone, to the digital displays in your microwave oven, to your digital alarm clocks, dish-washers, you name it. Why? Because they are cheaper and more reliable than the old mechanical devices they replace.

Various Internet sites have indicated that the DSSS system is now accounting for some 80% of new products such as cell phones, computer wireless communication, cordless 2.4 Ghz home telephones, GPS systems, etc.

These DSSS radios still transmit on some basic frequency, but the JR/Spektrum radios transmit on two different frequencies, alternating very rapidly between the two. Kind of like a primary/backup frequency system.

What happens next gets really messy, really quick. We've covered the original 72 Mhz radios and how we modulate their transmitters, either by AM or FM modulation. What was not mentioned in this process, is that taking a fixed frequency such as channel 31 at 72.410 Mhz, and mixing that 72.410 Mhz frequency with a modulation signal, causes that 72.410 Mhz frequency to "spread out" to a wider band. The more information you send per second, the wider the bandwidth of the transmitted signal.

Problem is, these radios were limited to a 5000 cycle per second bandwidth by the Federal Communications Commission (FCC) rules. That's what was involved with the narrow band radios we've been using for the past twenty years or so. So, these 72 Mhz radios had severely limited ability to send a lot of information over a short period of time. Bottom line, the functions of these newer 2.4 Ghz radios such as "model match" was not possible in the 72 Mhz radios.

The JR/Spektrum radios can use a radio frequency bandwidth of several million cycles per second or more,

and stay within the FCC rules. So, in theory at least, the JR/ Spektrum radios could have 1000 or more channels, as compared to the typical RC radio we use that has up to 10 or 12 channels or so. (Wow, imagine trying to operate a transmitter with 1000 joy sticks! Worse, imagine trying to pick the danged thing up!)

We mentioned that the Futaba radios had more limited capacity in this area. Well, not really. They can handle 100 channels, so that's not really an issue!

The JR/Spektrum radios are taking the same information from your transmitter joy sticks and are mixing this with an-other much higher frequency binary sequence of information. This higher frequency is typically 100 times that of the basic information being sent from your transmitter's joysticks. The effect of this higher frequency mixing is it spreads the trans-mitted Radio Frequency over a far wider portion of the radio waves.

But, in order for the receiver to receive this signal, it has to have the SAME HIGHER FRFQUENCY BINARY SEOUENCE OF INFORMATION.

That's kind of like an electronic digital combination lock being sent out from the transmitter to the receiver. The magic part of this is if you have two receivers, one bound to the transmitter, one not bound, the bound receiver will receive the transmitted signal and will run your servos. The UNBOUND receiver, (and any other receiver for that matter) will receive the transmitted signal as noise or static, and will not recognize anything from that transmitter.

In fact, if you tried to listen to the JR/Spectrum radio signals on some high performance ham radio receiver, all you would hear would be static.

Note that this Spread Spectrum stuff does NOT involve how the Radio Frequency itself is sent. That can be by AM, FM Single Side Band, Double Side band or whatever.

Many articles on the Internet have indicated that these Spread Spectrum signals simply do not interfere with each other by nature of design. That's been proven by tests conducted by JR/Spektrum, as reported in their advertisements in our RC magazines.

So again, which is better, JR/Spektrum or Futaba? The information on the Internet on their respective designs indicate that the performance and reliability of the Frequency Hopping versus the Direct Sequence Spread Spectrum radios is pretty much a draw. They both perform well. The DSSS system is a newer design, 40

some odd years newer than the Frequency Hopping radios. Newer doesn't mean its better.

If there is an issue to consider, it's the "*Model Match*" design feature of the *JR/Spektrum* radios.

This model match process consists of both your transmitter, and its unique internal digital serial number, and your receiver and its unique internal digital serial number. Add to that, the transmitter also transmits a code to the receiver relating which model is actively being used in your transmitter's list of models programmed into the unit. The process of binding your transmitter to your receiver involves matching up the spread spectrum "combination lock" information of both the transmitter and receiver, and, matching up the selected model currently being flown from the list of models available on your transmitter.

If the receiver finds a mismatch, from what was programmed during the "Binding" process, it simply doesn't respond.

From what I can tell, only JR/Spektrum has this model match feature, something to consider if you are planning on buying a microwave radio for next season.

Interestingly, Spektrum now has a transmitter/ receiver only, no servos, or batteries, for about \$100. It's limited to one model at a time, but price is coming down on these units.

As you can tell a lot of stuff is happening under the hood of these Microwave radios. Even still, what they are doing is pretty simple, compared to what is happening under the hood of your typical cell phone.

(I found a document on the Internet about a college student in Europe that built up a DSSS spread Spectrum system from scratch as a school learning project. It was built without using microcontroller computer chips. This system got pretty large in physical size and would not fit in an average 1/4 scale model.)

Upcoming Feb. Events

Wednesday, February 4, 2009 RAMS Club meeting-7PM. (Waterstone Savings Bank, formerly Wauwatosa Savings Bank, 6560 S. 27th Street.)

**Election of 2009 Officers
Voting on By-Laws Revisions**

Tuesday, February 3, 2009 MARKS INVITATIONAL
to RAMS – 7PM Monokoting Video – 82nd & W. Forest
Hill Av., Franklin Public Schools District Community Center