



Harbor Soaring Society

Charter #128 Costa Mesa, California
 AMA's Oldest Radio Controlled Soaring Club
 Silver Leader Club Since 2009



HSS PLANE RAP NEWSLETTER

HSS is the oldest AMA chartered R/C Soaring Club in the USA. Founded 1964
 Silver Leader Club since 2009, Gold Leader Club 2011-2013, 2015.

January 2016

HSS IS NOW OVER 52 YEARS OLD!

Volume 53

**What to do about R/C aircraft registration with the FCC?
 The AMA says "Hold off" on registration until they work out the details.
 See the problems and requirements on pages 3 through 5.**

Plane Rap Index

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Coming Events and Soaring Competitions

January - February 2016

- Tuesday January 5, 2016. HSS monthly meeting, Round Table Pizza, 11095 Warner Ave. General meeting, 7 PM. See P.11 for details.
- Friday – Sunday January 8-10, 2016. AMA Convention at Ontario Convention Center. See page 8 for details.
- Tuesday February 2, 2016. HSS monthly meeting, Round Table Pizza, 11095 Warner Ave. General meeting, 7 PM. See P.11 for details.
- Tuesday March 1, 2016. HSS monthly meeting, Round Table Pizza, 11095 Warner Ave. General meeting, 7 PM. See P.11 for details.



December 1, 2015 HSS Christmas Party Minutes

Greetings from your newly installed 2016 HSS Secretary and Field Safety Officer (Wade Rathbun).

6:50 PM. Opportunity Collection of \$1 per ticket was a great success. Our members went away happy and surprised by such quality donations. Money collected was handed over to our Treasurer, Jim Hanson. We sold 65 Tickets out of 25 people who attended. In further, we all laughed and had fun during the ticket drawing. Congratulations to all.

7:00 PM. Henry Smith III opened our Christmas Party with a positive message. "The status of HSS In in good forward working order"

7:03 PM. Henry Smith III formally announced our new officer Installation, this includes:

2016 HSS President: David Miller

2016 General Director: Joni Whitsitt

2016 HSS Safety/Treasurer: Jim Hanson

2016 HSS Secretary/Assist Field Safety: Wade Rathbun

7:05 Jim Hanson announced we have made great progress in the implementation of Wade Rathbun as Assistant Safety Officer.

7:06 Wade Rathbun commented it's all about having safe fun, and treating people with respect, making our field open to all.

9:30 Dinner adjourned. Merry Christmas and Seasons Greetings, 2016 is going to be a fun year as we move forward together.

Opportunity Collection Winners Circle:

HENRY SMITH III

ROB ASKEGAARD

JONI WHITSITT

RICHARD MORLEY

JESSE CALLEROS

RANDY WILBUR

ETHAN MILLER

GREG STONE

RICHARD MORLEY

GREG STONE

JONI WHITSITT

ETHAN WILBUR

HENRY SMITH IV

JONI WHITSITT

GEORGE BRIMMER

HENRY SMITH IV

DAVID MILLER

JONI WHITSITT

JESSE CALLEROS

RICHARD MORLEY

GARY BALDWIN

RANDY WILBUR

SHARI GREENE

ALBATROS PLANE

ECO-FLY PLANE

SCORPION QUAD-COPTER

P-51 MUSTANG ARF

P-51 MUSTANG

BIRD OF TIME SAILPLANE

BLADE QUAD-COPTER

CA GLUE

BRUSHLESS MOTOR

COVERING IRON

ROLL OF MONO-KOTE

BATTERY CHECKER

SERVO CHECKER

DIE-CAST MUSTANG PAPERWEIGHT

PARAGON GLIDER KIT

INCIDENCE METER

HOBBISTAR TRAINER PLANE

CA GLUE

HEXACOPTER DIY FRAME

PROPELLER

BALANCING STAND

SPINNER

DIY QUAD-COPTER FRAME

Respectfully submitted, Wade Rathbun, Secretary



It's Not a Drone Problem

The government's attempt to take over model aviation is thought by many as applicable to drones only. This is not correct. The regulations being developed by the Federal Aviation Administration (FAA) were initially aimed at drones, but are now intended for all radio controlled model aircraft. It's everyone's problem.

Two massive documents have been prepared. One specifying the regulations on model aircraft and the other dealing with government registration of the pilots of all R/C aircraft. These are "Operation and Certification of Small Unmanned Aircraft Systems" (195 pages), and "Registration and Marking Requirements for Small Unmanned Aircraft" (211 pages). These are available from the Department of Transportation/FAA.

The first,

Operation and Certification of Small Unmanned Aircraft Systems

Download title: 2120-AJ60_NPRM_2-15-2015_joint_signature.pdf

Available at www.faa.gov/uas/model_aircraft ;

and the second,

Registration and Marking Requirements for Small Unmanned Aircraft

Download title: 20151213_IFR.pdf

Available at www.faa.gov/uas/registration .

There is an enormous turmoil developing with the Academy of Model Aeronautics (AMA) and modelers throughout the nation. While some harbor resentment towards the AMA, it is generally felt that the AMA did as much as they could considering the arrogant attitudes held by federal employees. It is apparent that the FAA essentially ignored the 2012 law protecting the hobby of model aviation (section 336 of the FAA Modernization and Reform Act of 2012, Public Law 112-95). Following is the official statement from the AMA.

AMA and the FAA Registration Process

Today (15 Dec 2015) the FAA announced plans for a model aircraft registration process to begin next week. AMA was a member of the task force that helped develop recommendations for this registration rule and argued throughout the process that registration makes sense at some level but only for those operating outside the guidance of a community-based organization or flying for commercial purposes.

Unfortunately, the new FAA registration rule does not include our advice. The rule is counter to Congress's intent in the Special Rule for Model Aircraft and makes the registration process an unnecessary burden for all of our members who have been operating safely for decades.

While we are disappointed with the new registration rule and still maintain that AMA members should be exempt from registration, the rule is being implemented over AMA objections. Therefore, we want to provide federal requirements:

- All aircraft that are flown using a ground control system, such as a transmitter, are required to participate. This includes fixed-wing aircraft, not just multirotors or drones.
- Any pilot flying models weighing between 0.55 pounds (or 250 grams) and 55 lbs is required to register.
- You will not be required to register every aircraft individually. You only need to register yourself and can affix one registration number to all your aircraft.
- You must mark all aircraft with your registration number. The number can be inside the aircraft, such as a battery hatch - but should not require tools to access.
- The FAA plans to launch the online registration website on Monday, December 21.
- There is a \$5 fee to register, which is waived if you register within the first 30 days.
- You only need to register once every 3 years.



It's Not a Drone Problem (Continued)

We are still working out the logistics for this process. Some details are still being discussed, including:

- We are seriously discussing with the FAA a system where your AMA number could be used as your federal registration number as well. At this point, this is only a proposal and details are not yet finalized.
- At this time, AMA members will not automatically be registered when the registration website launches next week. However, we are in conversations with the FAA about the best way to streamline the registration process for AMA members going forward.

This is an ongoing process and we will continue to provide updates on the registration rule. Stay tuned to modelaircraft.org/gov, social media and your email for the latest news on the registration process.

Thank you,

AMA Government Relations and Advocacy Team

On 17 Dec 2015, the AMA sent out the following notice which recommends that AMA members HOLD OFF on registering until the AMA can develop a method to streamline the registration process for our members.

Dear AMA Members:

Yesterday, the AMA Executive Council unanimously approved an action plan to relieve and further protect our members from unnecessary and burdensome regulations. This plan addresses the recently announced interim rule requiring federal registration of all model aircraft and unmanned aircraft systems (UAS) weighing between 0.55 and 55 pounds.

AMA has long used a similar registration system with our members, which we pointed out during the task force deliberations and in private conversations with the FAA. As you are aware, AMA's safety program instructs all members to place his or her AMA number or name and address on or within their model aircraft, effectively accomplishing the safety and accountability objectives of the interim rule. AMA has also argued that the new registration rule runs counter to Congress' intent in Section 336 of the FAA Modernization and Reform Act of 2012, otherwise known as the "Special Rule for Model Aircraft."

The Council is considering all legal and political remedies to address this issue. We believe that resolution to the unnecessary federal registration rule for our members rests with AMA's petition before the U.S. Court of Appeals for the District of Columbia. This petition, filed in August 2014, asks the court to review the FAA's interpretation of the "Special Rule for Model Aircraft." The central issue is whether the FAA has the authority to expand the definition of aircraft to include model aircraft; thus, allowing the agency to establish new standards and operating criteria to which model aircraft operators have never been subject to in the past.

In promulgating its interim rule for registration earlier this week, the FAA repeatedly stated that model aircraft are aircraft, despite the fact that litigation is pending on this very question. The Council believes the FAA's reliance on its interpretation of Section 336 for legal authority to compel our members to register warrants the Court's immediate attention to AMA's petition.

While we continue to believe that registration makes sense at some threshold and for flyers operating outside of a community-based organization or flying for commercial purposes, we also strongly believe our members are not the problem and should not have to bear the burden of additional regulations. Safety has been the cornerstone of our organization for 80 years and AMA's members strive to be a part of the solution.



It's Not a Drone Problem (Continued)

As we proceed with this process, we suggest AMA members hold off on registering their model aircraft with the FAA until advised by the AMA or until February 19, the FAA's legal deadline for registering existing model aircraft.

Holding off on registration will allow AMA time to fully consider all possible options. On a parallel track, it also allows AMA to complete ongoing conversations with the FAA about how best to streamline the registration process for our members.

In the near future, we will also be asking our members to make their voices heard by submitting comments to the FAA's interim rule on registration. We will follow-up soon with more detailed information on how to do this.

Thank you for your continued support of AMA. We will provide you with more updates as they become available.

Kind regards,

The AMA Executive Council

This FAA rule making is attracting a lot of attention throughout the media. John Goglia, who is a contributor to the Forbes online website, had the following to say concerning privacy.

The FAA finally confirmed this afternoon that model aircraft registrants' names and home addresses will be public. In an E-mail message, the FAA stated: "Until the drone registry system is modified, the FAA will not release names and address. When the drone registry system is modified to permit public searches of registration numbers, names and addresses will be revealed through these searches."

Steve Neu of Silent Flyers of San Diego (SEFSD) made the following comment in their newsletter, "Peak Charge". His suggestion of educating the general public is a good one, and his photos provide a touch of tongue in cheek humor.

"As a public service SEFSD members are encouraged to help let the FAA inspectors and public know the difference between "drones" and model planes. With the media and general public's perception of "drones" being negative, we modelers need to make sure that our activities are clearly differentiated from the "drones". In keeping with the new FAA mandate to register all aircraft over 10 oz in weight and to include the government supplied ID number to the models, all club members should also apply the appropriate descriptive label for each aircraft they own. It is clear that the FAA does not clearly understand the difference between model planes and "Drones"-we hope that the labels will assist them in identification. It's nice to know that the traditional model fliers are being dumped into the same tar pit as the small percentage of irresponsible "drone" fliers that have been making the news lately. Our FAA has managed to generate a 210 page document on how and why we need to register our models. We need to make sure that we give proper thanks to the irresponsible drone fliers that have brought this to pass....."



HSS Christmas Dinner, 1 December 2015

The December meeting and Christmas party was Tuesday December 1 at Woody's Diner, in Huntington Beach. Our 2016 officers were installed, followed by dinner and a spectacular raffle. Below are a nice collection of photos taken by Rob Askegaard. Thanks, Rob.



HSS Christmas Dinner, 1 December 2015 (Continued)



2016 AMA Convention at Ontario

Here are the details for the 2016 AMA convention.

All Advance Tickets purchased will be available at Will Call the days of the show

[Click HERE for further details](#)

Ontario Convention Center – Ontario, California

Friday, January 8, 2016	11am – 5pm
Saturday, January 9, 2016	10am – 5pm
Sunday, January 10, 2016	10am – 4pm

ADMISSION AT THE DOOR

One Day Pass	\$13 AMA & EAA Members/\$15 Nonmember
Two Day Pass	\$24 AMA & EAA Members/\$28 Nonmember
Three Day Pass	\$33 AMA & EAA Members/\$36 Nonmember
Youth Pass(13-18 years)	\$5 per person – includes FREE AMA/EAA Membership

Kids 12 and Under are Free

Active military with ID, Civil Air Patrol Cadets, Boy Scouts, Girl Scouts, Sea Cadets etc...enter for free

If you have any questions about AMA Expo please contact us at (765) 287-1256 ext. 272
or email amaexpo@modelaircraft.org.

ADVANCE TICKET SALES END 4:00PM EDT JANUARY 6, 2016 NO EXCEPTIONS. "All Advance Ticket Purchases are Will-Call Pick Up Only"

AMA Member (one day pass): \$10.00

Non Member (one day pass): \$12.00

SC2 Competition Schedule for 2016

Soaring Clubs of Southern California (SC2) has not yet posted the 2016 competition schedule. Check their web site at <http://sc2soaring.com>.

AMA District X Website

AMA District X Vice President Lawrence Tougas wants to invite AMA members from all districts to enjoy District X's new website. "We have a lot of great articles in our blog, plenty of pictures in our photo albums, and a spot where you can learn more about our associate vice presidents and myself," says Lawrence, District X VP. [All of the information is at www.ama10.org](http://www.ama10.org). Why not consider helping your district with its website.

HSS Membership

Our 2016 HSS membership enrollment season is in full swing. Note that the new membership rate of \$25 per year is now in effect. A membership application is included in the last pages of this newsletter. These can be mailed to our post office box shown on the last page, or given to a club officer. Alternately, HSS and AMA membership applications can be obtained from any club officer, or available on our club web site at www.harborsoaringsociety.org. Applicants must be members of the AMA prior to joining HSS. AMA Membership applications can also be obtained at the AMA web site www.modelaircraft.org, download document No. 902 from the publications page. Or you can apply on line. If you renew your AMA membership online, be sure to print the receipt that they provide as proof that you joined. And, don't forget your City of Costa Mesa Flying Permit. Details are shown on page 12 of this newsletter.



Seen Around The Field

At right is Asmir Shaham and his "Addition XL" from Precision Aerobatics.

Below left and right is Murry NcDole and his "Daddy-O 525 built from a Stevens Aero kit.

Bottom left and right is Jeff Denham and his Me-163 Comet from Hobby King. It has a 37" wing span, uses a 2200Kv motor, and has a droppable dolly for take-off.

Many thanks to Rob Askegaard for the great photos. - Ed.



Seen Around the Field (Continued)

At right and below is Bruce McCaskie (from Vacaville) with his nicely built "Ugly Stick 25". Bruce uses a 7 channel Futaba radio, and a Rimfire 25 motor from Great planes.

All photos courtesy of Rob Askegaard in spite of his very busy social schedule. Thanks, Rob



Invitation To Member Contributions To The Plane Rap Newsletter

Your editor would love to hear from club members. If there is anything you would like to share with the rest of us I want you to send it to me. I will add it to the next newsletter. My favorite things to publish are items sent in by members!! These can be anything like reviews of your plane or equipment, links to good videos, links to articles and things you have built or created. Bad spelling and/or grammar gladly accepted. Anything from a picture with a caption to a full blown build/review article is good. Letters-to-the-Editor are always welcome as well. Tell us what you think. Please help make the newsletter and website more interesting with your submissions. Embarrassing pics/vids are the best. I look forward to hearing from you.

Fred Hesse - Plane Rap Editor - fhesse@socal.rr.com .

HSS on Facebook

Our new Social Media Manager, David Miller, sent out the following announcement.

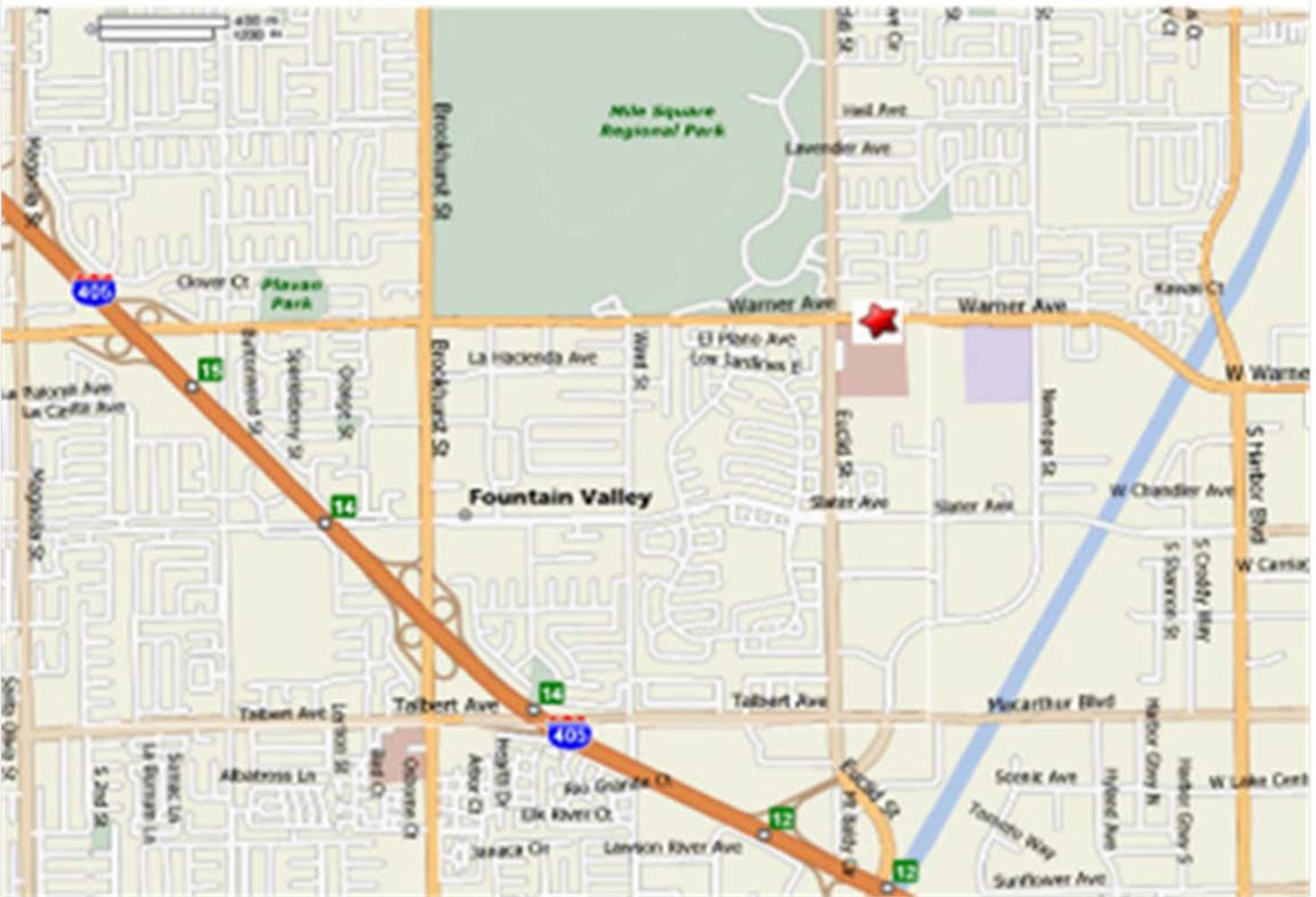
I wanted to announce our Facebook page has been launched. The address is www.facebook.com/harborsoaringsociety . If you're on Facebook, please join and share our site/page.

A project we should work on is a Press Release. I would like to develop a press release to announce our new website and new Facebook page. I would like to send this to the AMA marketing department for assistance announcing our great move forward.



Next Meeting Announcement

Our monthly general meeting is held on the first Tuesday of each month. We meet at Round Table Pizza, 11095 Warner Ave. & Euclid (North-east corner) in Fountain Valley. Phone number is (714) 839-0276. The Family Night rate is all-you can-eat pizza, plus one salad bar, for \$6.99. Fountain drinks are an additional \$1.99, self-service, or \$2.99 per liter. Beer and wine are available. Time will be allowed for show-and-tell of your favorite plane. Bring your wife, family, and friends. There will be a raffle, with items listed below. The location is also shown below.



Raffle Prizes for January 5 Meeting

The following are raffle prizes scheduled for our January 5 2016 meeting. From left to right below, a stock Easy Star from Larry White, a 3-meter Olympic sailplane that needs covering, and a UDI Quad Copter from Ted Broberg. Not shown is a DVD titled Warplanes of World War II from Dwight Carrithers, a battery meter from Art Tinsley, and a very nice wattmeter from Henry Smith III.



January 2016



2015 City Flying Permits Available Now

A permit to fly radio-controlled model aircraft is required to operate model aircraft at Fairview Park. This permit can be obtained by going to www.costmesaca.gov and downloading the file Model Airplane Fly Permit 2014.pdf . You must also show proof of adequate liability insurance in the form of a current Academy of Model Aeronautics (AMA) membership card or a current homeowners/personal liability policy specifically covering model aircraft operation with a minimum limit of \$500,000. Rules and regulations for flying the model aircraft can be found in the City of Costa Mesa Municipal Code, Title 12, Chapter II, Articles 2 & 3.

Permit Fee: \$25 per year. Learner's Permit for youths 6-14 years old - \$15 per year.

WALK-IN Costa Mesa City Hall (77 Fair Drive, Costa Mesa 92626), 3rd Floor Recreation Counter Tuesday through Thursday from 8:00 AM – 4:30 PM (excluding City-observed holidays),

MAIL-IN Mail your renewal packet (see list below), to include full payment, to:

Recreation Division – Fly Permit

City of Costa Mesa, P. O. Box 1200, Costa Mesa, CA 92628

Renewal Packet must include **ALL** of the following:

- Permit Application (filled out and signed).
- Copy of your drivers license.
- Copy of the AMA Membership Card (showing the required year) or homeowner's/personal liability insurance policy (specifically covering model airplane/aircraft flying with a minimum limit of \$500,000).
- Renewal Fee (\$25); payment by Check (payable to City of Costa Mesa) or charge to Credit Card (filled out and signed).

Note: Current permit holders with email addresses on file with the City will receive renewal packet via email.

If you have questions or need additional information, please call the Recreation Division at (714) 754-5300.

Note that to fly at Fairview Park you need the above permit, liability insurance (preferably AMA), and you need to follow City of Costa Mesa Ordinance No. 07-01, City Regulations for Issuance, Suspension and Revocation of Permits to Fly at Fairview Park, Academy of Model Aeronautics Safety Code, and the Fairview Park Flying rules posted at the flying site.

Photos of Your Planes

We are very fortunate to have Rob Askegaard as our club photographer. Rob has a high degree of talent, and supplements that with an excellent camera. His well composed and very realistic photos taken at ground level and his remarkable stop action in-flight pictures are superb. Rob's contributions are what make our newsletter really spectacular. We try to feature everyone and their planes, so if you haven't seen yourself in our newsletter, look for Rob just about any morning and pose for him.

Soon, we will be updating the photos on our web site with those by Rob and also those provided by Ted Broberg who recently acquired an excellent camera. Anyone that wishes a high quality print, or the digital file of their favorite plane should contact Rob, Ted, or your editor. Phone and E-mail are shown on the last page of this newsletter. Web site photos have been compressed to shorten download time, and newsletter photos are cropped, so when you obtain any image, it will be the original full resolution quality and size.

The Different Forms of Spread Spectrum

Here is a recent discourse on the various forms of spread spectrum radios available for our hobby.

Carlos Reyes maintains a good web site called www.RCadvisor.com that has a lot of technical articles.

JR's new DMSS 2.4 GHz RC radio system made me (Carlos Reyes) take a closer look at the different spread spectrum signal encoding schemes.



The Different Forms of Spread Spectrum (Continued)

Spread Spectrum Radio Signals

Our old FM 72 MHz RC transmitters operate with a channel spacing of 20 kHz. These channels were defined about 40 years ago. That is a very long time ago in terms of technology. High quality radio hardware technology has dropped dramatically in price since then. It would not surprise me at all if a modern RC radio system could be created today for a reasonable cost with channel spacing of only 1 kHz.

Why then are the new spread spectrum radio systems required by law to operate with a minimum channel spacing of 1 MHz? That is about a thousand times wider than really needed. That has to do with the nature of how they work. It is also where the name of the technology comes from. You see, the signal is spread out over a larger portion of the radio frequency spectrum than strictly necessary.

This is done to make the signal more resistant to radio noise and interference. The signal takes up more space than it really needs, allowing for redundancy in the data transmission. If the interference is only affecting a narrow range of frequencies, then spread spectrum is very robust.

Frequency Hopping

But what if the interference is wide enough in frequency to blanket an entire channel? Could a radio system switch to another channel if it detects interference in the first one? What if it is only the receiver that is being affected by the interference? In that case, the transmitter would have no idea there is interference. It would not know of the need to switch frequencies.

It is a tricky problem, because the time when switching frequencies is most needed is exactly when the transmitter and receiver cannot communicate reliably with one another. How would the receiver know the transmitter has switched to another channel? What if the new channel also has interference?

The frequency or channel hopping schemes circumvent all of these issues by switching to a new channel on a regular schedule. That way, even if the receiver loses the signal from the transmitter, it will know when and to what channel the transmitter will be switching to next. Clever, isn't it?

For this scheme to work, the channel switching has to be done many times per second. Otherwise interference on one channel would disrupt communications for too long. That is why they typically hop every millisecond or so.

The transmitter tells the receiver what are the channels it will be hopping to and in what order. This is done during the initial signal locking phase. If the receiver loses power momentarily, all it has to do is listen on one of those channels and wait for the transmitter to hop onto it. Then the receiver knows it is synchronized and will begin hopping in unison with the transmitter once again.

Radio Equipment Regulations

There is an interesting wrinkle to this whole story that you may not know about. Although each country gets to define how its radio frequency spectrum is used, the laws for spread spectrum operation are very similar across countries. The standards document ETSI EN 300 328 covers the use of the 2.4 GHz band in European countries ([link below](#)). These regulations generally state that radio transmitters operating in the 2.4 GHz band that do not employ frequency hopping schemes are limited to a maximum output power of 10 mW. That is not much power. Our old FM transmitters generally produced about 100 mW of transmitting power. But if the system employs frequency hopping, then the maximum allowed power output jumps to 100 mW.

Spread Spectrum Radio Systems in Practice

Up until now, RC spread spectrum radio system manufacturers have relied on one of the two schemes described above to make their systems resistant to interference.

Radio systems from JR/Spektrum (DSM), Assan, Corona, iMax, and XPS rely on wide signals to get their interference protection.

On the other hand, the systems from Futaba (FASST), Airtronics, Hitec, FrSky, FlySky V2 and most others use frequency hopping as their silver bullet.

Whoa! Given what I just said about non-hopping systems, does that mean that Spektrum DSM radio systems are limited to only 10 mW?



The Different Forms of Spread Spectrum (Continued)

Direct Sequence Signal Encoding

The answer is no, because a radio system qualifies as hopping even if it does not switch frequencies while it is operating. As long as it selects from a group of frequencies before it starts transmitting, that is good enough. That is exactly how the non-hopping RC radio systems work. They are called direct sequence spread spectrum (DSSS) systems. They select from the available channels when they are first turned on. Most select two channels. Then they transmit over those channels, using a complex encoding of their signal that mixes in pseudo-random noise to make it very robust. Frequency hopping systems normally do not employ this very sophisticated type of encoding.

Pros and Cons

So which type of system is better, frequency hopping or direct sequence? Well, they both have their advantages and disadvantages. The direct sequence systems get to pick and choose which channels they are going to use when they are first turned on. If they have any intelligence to them, they are going to pick two channels that are well apart from each other and free of interference. Under most circumstances, it is extremely rare for both channels to be blocked at the same time. Because these systems do not hop all over the place, it is a lot easier for the receiver to reacquire the signal from the transmitter after a power loss.

Hopping systems, on the other hand, are very robust. They make use of a large portion of the available radio spectrum, giving them excellent resistance to interference. However, a receiver recovering from a power brownout will take a little longer to resync with the transmitter. Also, because of the more complex hopping logic involved, hopping systems are likely to cost a little more to manufacture.

New JR DMSS System

So where does JR's new DMSS technology fit into all of this? What are some of the characteristics of other systems on the market, like DSMX? Stay tuned!

[ETSI EN 300 328 European Wideband Usage Regulations \(pdf\)](#)

How do the various RC radio systems sold by JR, Spektrum, and Horizon Hobby implement the spread spectrum technology?

Horizon Hobby, Spektrum, and JR

I have always thought of Spektrum and JR as the same company. Up until a short time ago all of their products were completely compatible with each other. Now I know that the situation is a little bit more complicated than that. JR (Japan Radio) is a leading manufacturer of radio control systems. As their name implies, they are based in Japan. Horizon Hobby is a large distributor and manufacturer of radio controlled products. They are based in Illinois here in the United States. Spektrum, on the other hand, looks to me like just a division of Horizon Hobby (HH). It is not a separate company.

JR is a long time partner of HH. But when it came time to develop spread spectrum radio systems, HH took a leadership role. That is what led to the creation of Spektrum.

And yes, do not get the two names confused. Spektrum is the brand name, spread spectrum is the technology.

Big Caveat

All of the products that I am about to describe are commercial proprietary products that belong to private companies. Being in a competitive industry, many of the technical details are closely guarded secrets.

It took a lot of digging to find the few technical details mentioned below. I was very careful to consider the trustworthiness of my sources. Nevertheless, I would be pleasantly surprised if I managed to get every single technical detail right.

2.4 GHz ISM Band

All of the spread spectrum radio systems operate in the 2.4 GHz ISM band. It is called this because it was set aside for industrial, scientific, and medical users. It is about 80 MHz wide, and with the required minimum spacing of 1MHz between channels that I mentioned in my last article, it can handle about 80 usable channels.

You might think that the limit on the number of simultaneous operating radio systems would be 80, too. In practice it is more like 100. One reason is the very fast multiplexing and switching of frequencies that goes on. The other reason is the unique identifying numbers associated with each transmitter. It keeps receivers from getting confused as to which signal they are listening to.



The Different Forms of Spread Spectrum (Continued)

DSM

DSM (Digital Spectrum Modulation) is their original spread spectrum system that was sold under the Spektrum brand name. This is a DSSS (Direct Sequence Spread Spectrum) system.

It is very similar to the far more popular DSM2 system that superseded it. But why was this system limited to park flyers only? The most plausible explanation I was able to find is that the receivers only listened to one of the two channels in use by the transmitter. Presumably, they picked the one with the strongest signal and stuck with it for the entire flight.

DSM2

Easily the most popular spread spectrum technology sold by these companies. It is full-range and uses the DSSS protocol. It uses two channels at a time, giving it a limit of about 40 simultaneous transmitters operating at the same time. The AR6100 DSM2 park flyer receiver has only one physical receiver that rapidly switches from listening between the two frequencies.

DSMJ

This is where things start to get interesting. I do not believe that this technology was ever introduced into the United States. I also have reason to believe that it is the brainchild of JR and not HH.

This is the first frequency hopping spread spectrum (FHSS) system sold by these companies. It does not support telemetry, but does support plugin modules for older transmitters.

DSMX

DSMX is very popular right now. It is fully backward compatible with the DSM2 hardware. In other words, all DSMX transmitters and receivers also support DSM2. This is a frequency hopping system and has been shown to support 100 simultaneous operating transmitters. This was also the first technology to support the downlinking of telemetry data. It is actually an interesting hybrid between DSSS and FHSS. Based on its unique id, each transmitter will only ever use 23 of the available 80 channels. Like a DSSS system, it transmits over this subset of channels. Like a FHSS system, it does so in turn.

I do not have any solid evidence to support this, but my hunch is that the DSMX development was spearheaded by HH and DSMJ was created by JR (hence the J in the name?).

DMSS

The interesting new kid on the block. It stands for Dual Modulation Spectrum System. To my knowledge, this is the first RC radio system that truly incorporates the best features of DSSS and FHSS. It is used in the new JR XG series of radio systems.

It is only available from JR. HH/Spektrum is sticking with DSMX, at least for now.

It uses a 3 MHz wide signal on each channel. Every other system uses 1 MHz or less. Note that the minimum required spacing is 1 MHz, but the signal itself could be wider. For extra robustness, it also uses the pseudo-random encryption of DSSS.

But this is also a full-blown FHSS system. Apparently, it is based on the DSMJ technology developed earlier by JR. Based on the specs alone, I would expect DMSS to be far more robust against radio interference than anything else out on the market today.

An excellent telemetry system is fully integrated into the transmitters. You can have vibrating alarms go off depending on various conditions in the aircraft, for example. On the receiver end, a separate telemetry module is required. JR already sells sensors for pressure altitude, temperature, RPM, and monitoring electrical power. Many have reported that this is the first Spektrum/JR radio system that does not support satellite receivers because it does not need them. That is not true. The telemetry transmitter module has a satellite receiver built-in.

DMSS Downsides

All of the fancy manipulations of the signal come at a cost. Where an 8-bit processor used to be powerful enough to encode the signal, now a 16-bit processor is needed. The radio frequency hardware is also different from the systems that came before it. I believe these are the primary reasons that led to the big downside of the technology.

You see, DMSS systems are not backward compatible. The transmitters do not inter-operate with DSM2 and DSMX receivers, for example.



The Different Forms of Spread Spectrum (Continued)

A lot has been said about the cost of the new receivers, but I do not see it. A 6 channel DSMX receiver from Spektrum sells for about \$60. A 6 channel DMSS receiver starts at \$100. However, it comes with the telemetry module that costs \$43 all by itself. Remember, this also has a built-in satellite receiver. The electrical system monitoring telemetry sensor, arguably the most useful one, costs an extra \$100.

In other words, the cost of the receiver itself is about the same as what a brand-name JR/Spektrum receiver has cost all along. DMSS compatible receivers manufactured by other companies have already started to hit the market. Telemetry is an immensely useful feature. Whether it is worth an extra \$143 per aircraft is entirely up to you.

Conclusion

Despite all the complaints from others about the cost, I think the new XG systems are fairly priced. My X9303 radio system cost less than an XG8 sells for now, but not by much.

You could argue that HH/JR are just following an old tradition in the RC business. After all, we went through AM, FM, narrow band FM, PCM, and S-PCM before spread spectrum was introduced. All of these technologies are incompatible with one another and more expensive than what came before.

A good argument can be made that DSMX is good enough. Many say that the interference problems today, even in worst case scenarios such as large meets, do not demand bulletproof technologies such as DMSS.

But guess what? It is nice having the choice.

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