NVARC
Nashoba Valley
Amateur Radio Club

SIGNAL

SPECIAL SERVICE CLUB

March 1997 Volume 6 Number 3

March 1997 Presidents Letter

April is almost on us. What does that mean? Warmer weather and the opportunity to get out and about. As you should remember, the annual Groton Road Race will be held on April 27. Put it on your calendar. I'll be calling all NVARC members, and previous helpers to get our team together. I already have over a dozen volunteers from the BARS club. Let make sure that the majority of workers come from NVARC!! This year will require more radio communications because the event has been expended to 3 events, a 2K, 5K and the major event, the 10K. If you would like to help, please call me before I contact you. (448-5536)

Not to sound too repetitive, the elections are coming. Here is an opportunity to get a view of amateur radio from another perspective. What is it like to be in a club leadership position? The experience will serve you well, not only in your radio career, but in your work experience as well.

Come to the meeting on Thursday, especially if you have not been in a while. We would love to see you.

73, Erik

This Months Meeting

At the time of printing I was unable to find out the speaker for the monthly meeting.

Club float for Pepperell 4th of July parade. Think about it.

Field Day only three months off.

At The Last Meeting

The speaker at last months meeting was William K1WD. He spoke on operating HF from a mobile or apartment setting. William has both of these everyday since he lives in an apartment. These situations present considerable challenges to good performance.

FCC Phone

ARLB011 FCC new toll-free number

The FCC has designated a new, toll-free (WATS) number for Amateur Radio license inquiries--including inquiries about vanity and new call signs. The new number, 888-225-5322, will connect callers to the FCC National Call Center, handled by the FCC's Consumer Information Bureau.

Callers to the old consumer information number will get a message referring them to the new number.

SKYWARN Training

On Saturday, May 17 from noon to 3 pm there will be a SKYWARN training session at the Fitchburg Public Library.

The instructor will be Glen Field, Senior Warning Coordinator Meteorologist for the National Weather Service in Taunton, Ma. The training session will consist of lecture, videos, slides, and other materials. Handouts of various types will be provided.

This program should be of special interest to those who are interested in the weather. Trained Amateur Radio operators are of particular value during time of severe weather conditions.

You will learn how to:

- Observe and report destructive and severe, unusual, or abnormal weather conditions.
- Estimate wind speed by interpreting tree motion.
- Recognize the dangerous portion of thunderstorms, tornadoes, and what safety measures should be taken.
- Mr. Field will also discuss and show interesting photographs of the Great Barrington and Worcester tornadoes, and the Brockton-Whitman area downburst of last summer.

SKYWARN is a program sponsored by the National Weather Service. Ground reports from trained SKYWARN observers used in conjunction with radar observations may lead the NWS to issue Severe Weather Warnings. Ground reports also help to validate forecasts. SKYWARN is generally activated any time when thunderstorms or other severs weather conditions are predicted in the forecast.

For more information, contact Jeanine N1QIT at 508-582-7351.

Additional training opportunities;

Wed 04-09-97 NWS Taunton, Ma
Contact Glen Field 508-823-1983

Wed 04-16-97 Holy Cross, Hablin Hall Worc
Contact Ted Agos N1SBM 508-865-5613

What Size Wire Should I Use For My New Dipole?

The other morning, at the local ham radio Saturday morning breakfast, the question of what size wire should be used for a Dipole came up. It was recognized by all that the larger the wire diameter the greater the SWR bandwidth. By this is meant the amount of frequency coverage between a chosen SWR limit, i.e. 2:1. Everyone agreed with the fact that making the wire diameter larger would improve the SWR bandwidth, but there was much discussion and many opinions as to the magnitude of the advantages or not of using wire with large diameter to improve the SWR bandwidth. One person mentioned that someone had used #4 AWG for a 160 meter dipole to improve the SWR bandwidth. Well I decided that some numbers were probably better than all the talk. I decided to use several computer programs I have to examine the effects of the wire diameter on the SWR bandwidth. This method was chosen over a more analytical approach. I could just model a dipole and then have the computer program calculate the SWR at selected frequencies across the band. Then I could change the wire diameter in the model and do the SWR calculations again. Well as a starting point I chose a dipole in free space for 160 meters. I chose 160 because it is the longest wavelength amateur band. It has the second widest percentage bandwidth of the nine HF bands. The percent bandwidth of these bands is listed in table I as a point of interest. We will get back to it later. By using the longest wavelength, the ratio of wavelength to wire diameter is largest. At the shorter wavelength bands the ratio will be smaller providing wider match bandwidths.

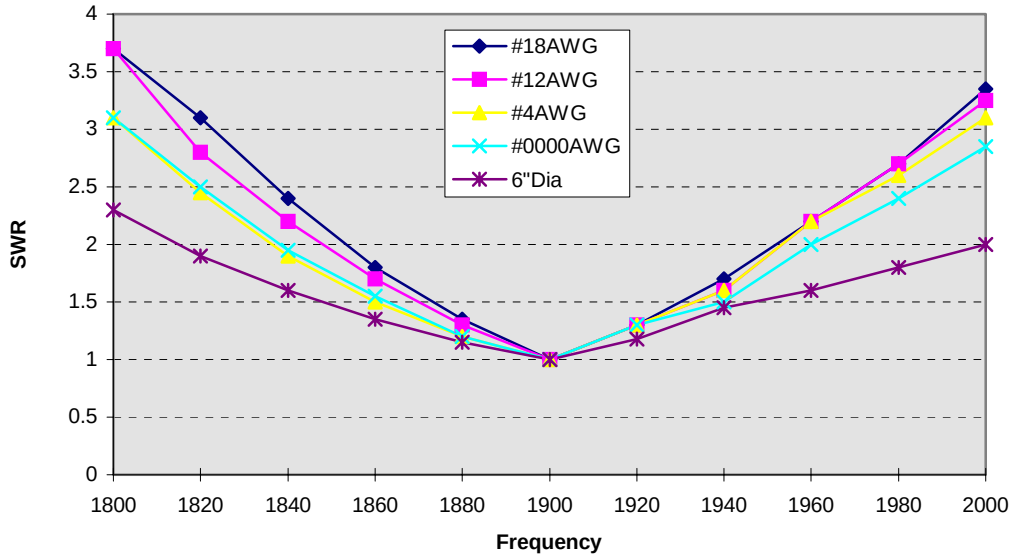
Table I

Wavelength	Percent Bandwidth
160	10.5
80	13.4
40	4.2
30	0.5
20	2.5
17	0.6
15	2.1
12	0.4
10	5.9

By choosing Free Space for the environment of the dipole we are considering the best case we can expect to achieve. An antenna completely free of external influences. I chose to model five different antennas using wire diameters from #18 awg (0.040” dia) to a wire with a diameter of six inches. I am not suggesting an antenna made out of solid wire of this large diameter, but it is possible to build an antenna with six

or eight small wires held into a skeleton of a large diameter cylinder with light weight spreaders spaced along its length. #18 on the other hand is about as small a wire diameter that might be considered for a dipole on 160 due to the great length and the required supports. As intermediate wire diameters I chose to use #12 awg, (0.081" dia) #4 awg, (0.204" dia) and #0000 (0.460" dia). To cut to the chase, the results of this modeling are shown in figure 1.

Figure 1 Dipole In Free Space



I chose a 2 to 1 SWR limit. The 2 to 1 bandwidth limits are pulled off the graph for the five different cases. These are tabulated in table II. Note that the bandwidth difference is less than two to one (100KHz to 185KHz). You might say that the six inch diameter antenna is 85 percent wider than the #18 awg antenna. The change of bandwidth from #18 to the #0000 is only 21%. I also calculated the losses in the antenna wires. These loss figures are included in table II. Note that the losses are not significant in any of the conductors. Certainly not in the #12 or larger. As a third entry in table II I included the weight of the wire in the antenna. A fourth entry is cost, but I did not have price information available. If we assume the cost is directly related to the amount of copper in the wire then taking the cost of #12 awg as one the cost ratios are shown. The last entry in table II is the percent bandwidth based on our 2 to 1 SWR limit. This probably shows best the small effect that wire diameter has on the bandwidth.

Table II

AWG	BW(kHz)	LOSS(dB)	WEIGHT	COST	%BW
18	100	0.5	1.2	0.24	5.3
12	104	0.2	5	1.0	5.5
4	116	0.1	32	6.4	6.1
0000	121		160	32	6.4
6"DIA	185		7.2	1.4	9.7

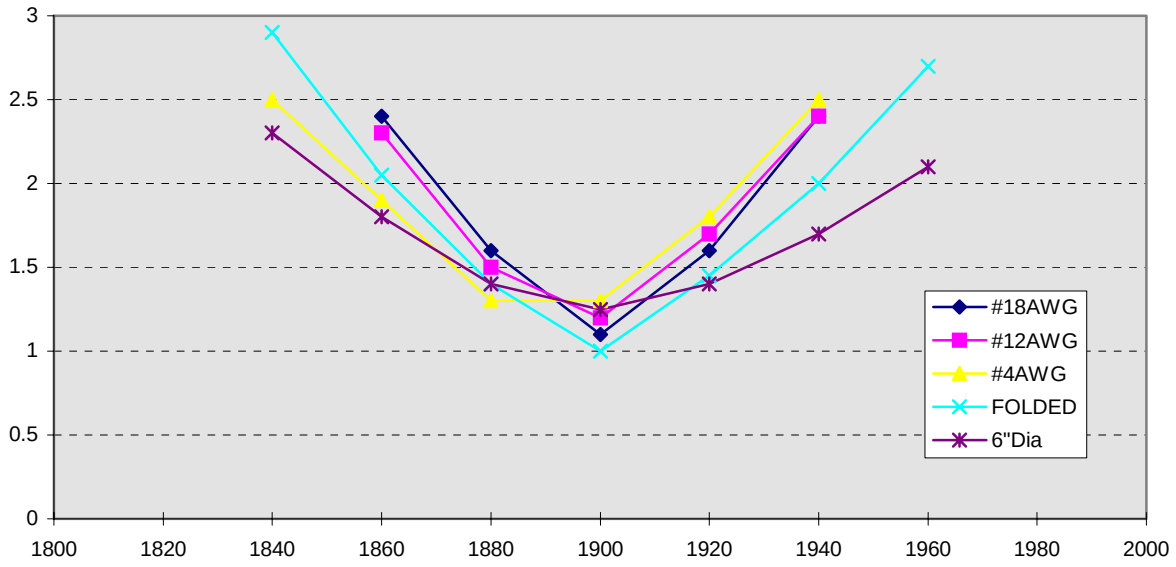


Figure 2 Dipole Over Ground

But recall that this data is for a dipole in free space. What is the effect of locating the dipole over real ground? To evaluate the effects of this I used the above antenna model in another program that actually calculates the interaction of the antenna and the complex ground under the antenna. For this analysis I positioned the dipole 50 feet above a nominal ground with a dielectric constant of 13 and a conductivity of 5mS/m. This is probably a bit more favorable than the rocky soil here in New England. The results of the analysis are shown in Figure 2. The first thing that is obvious is the much narrower 2 to 1 SWR bandwidth. This is due to the interaction between the antenna and the ground that is only about 0.1 wavelength below the antenna. The antenna at this height is a close match to 50 ohm coax at the resonant frequency, so it was decided to use 50 ohms as the reference impedance. This represents how the antenna would behave when feed with cable with a 50 characteristic impedance, such as RG8 or RG58. Since the antenna is not a perfect match to the transmission line, the SWR bandwidth indicated is somewhat narrower than could be achieved, but it represents results that one might achieve in a real situation. Remember that not only the ground will interact with the antenna, but other things will also have an effect on the antenna if they are close to the antenna. It was necessary to adjust the antenna length to try to maintain the resonance at 1900KHz. In the case of the #4awg wire dipole, the length was off a bit moving the resonant frequency down about 10 KHz. In this case I dropped the #0000 dipole and replaced it with a folded dipole made with #12awg and six inch spacing between the two conductors. The results are tabulated in table III. The shrinking of the SWR bandwidth is due to the closeness of the dipole to the ground. If the antenna could be higher the bandwidth would improve. The performance of the antenna would also improve in other ways, but that is a topic for another time.

Table III

AWG	BW(kHz)	%BW
18	58	3
12	58	3
4	64	3.4
6"DIA	103	5.4
FOLDED DIPOLE	80	4.2

The folded dipole has a wider band width due to two facts. The folded dipole has a larger effective diameter than the wire. The two conductors have an effective diameter

that is related to the separation of the two wires. I used six inches in this example. It could have been larger. It is the same effect as the six inch diameter dipole made out of the parallel wires. In this case there are only two wires. The second effect is that the two quarter wave transmission line segments on each side of the center act as parallel resonant circuits. See "Basics for Beginners- The Whys of Transmission(s) Lines Part 1 By George Grammer", Reprinted in an earlier edition of this News Letter. As the operating frequency changes from the resonant frequency of the dipole, the reactance of the antenna (series resonance) is canceled by the reactance of the two quarterwave stubs (parallel resonance). Where the antenna is capacitive (lower freq.) the stubs are inductive and vice versa. This partial cancellation of reactance helps to provide a wider range of low SWR as it is the reactance of the antenna off the resonant frequency that is the cause of the increase in antenna SWR.

So from figure 2 and table III, it appears that the most bang for your buck might well be a folded dipole. It only requires some spacers and an extra length of wire. The down side is that the feed impedance is not any thing like 50 ohms so some method of matching the folded dipole to 50 ohms is required.

It seems obvious to this writer, that the choice of wire for the dipole antenna should be based on availability, physical strength, cost, and ease of installation, and not on what the expected bandwidth might be. Comparing Table III and Table I it is obvious that the 3% bandwidth will easily cover the bands above 40 meters with the exception of 10 meters, at 5.9%. The 3% almost covers 40 meters. Putting the 40 meter antenna at the same height will reduce the ground effects. 50 feet is almost a half wavelength at 40 meters. So even the small wire antenna will cover the bandwidth. I analyzed a third antenna at 10 meters. This antenna easily covered the full band with less than 2:1 SWR for both #18 and #12 awg wire at 50 ft height. A matching transformer was employed to match the line to the antenna. A dipole this high has a resistance closer to the 73 ohms of the free space dipole. So regardless or the wire size we can cover most of the nine HF bands with our dipole antenna. 160 and 80 meters are special cases due to the long wavelength, i.e. it is hard to get the antenna much of a wavelength away from ground or other objects, and the large percentage bandwidth of these two bands. If full coverage is required for the wide percentage bands (160 and 80/75 meters) then feeding with openwire line and a suitable coupler (impedance matching network) or some of the broadband antennas described in the ARRL Antenna Book will be required. The pros and cons of either approach is a possible topic for another article. For now, Spring can't be far away, so get out the tape measure, the soldering iron, and the SWR bridge and start planning that new dipole antenna. Just remember, be safe and stay away from those power wires. 73 Bob W1XP

QRZ For Sale

The December 1996 QRZ CDROM is now in production. Any member interested in purchasing a copy at the club discounted price should contact Ralph KD1SM.

Johnny Appleseed Special Event

Want to meet some area hams from the Montachusett ARA. They have been planning a Special Event Station to celebrate Montachusett's local hero Johnny Appleseed. The Special Event Station is to be run at the new visitors center on Route 2 (westbound, between Route 70 and Route 190) on its opening. That is scheduled for Memorial Day Weekend.

They plan to run from the visitors center on Saturday May 24. They intend to continue operating from coordinated home stations for Sunday and Monday. Bill Wornham NZ1D is coordinating operators for this event.

Upcoming Public Service Events

Apr 13 Boston Multiple Sclerosis Walk. Contact Bob WA1IDA

Apr 19 Manchester, NH. Cub Scout Chuck Wagon Derby. Contact David WB1FLD

Apr 21 Boston Marathon. Contact Bob WA1IDA

Apr 27 The Groton Road Race. Erik KA1RV is the contact for this event.

May 21 Boston Assistive Technology Conf. Contact Bob WA1IDA

Other public service events are listed in the KD1SM/KD1LE Public Service List as they are submitted.

Club Call N1NC

If you didn't see it in last month's newsletter, we received our first choice of N1NC as a club call. Thanks to Bruce K1BG for working through the process of getting a club call and then the processing the vanity call papers.
Stan

E-mail Addresses

From time to time it would have been nice to be able to get in touch with as many members as possible at the last minute. For example, to let everyone know who/what the topic for the club meeting was, when we didn't know at the time of publishing the newsletter. For this reason I am adding E-mail addresses to the roster. If you have a regular E-mail address please give it to Ralph or me and we will add it.

Board Meeting Minutes

The Board met at Eriks for the 13th of February. Craig N1ABY and Stan KD1LE volunteered to be a nominating committee to seek candidates for the upcoming April elections. So if your interested in trying out a leadership position to direct some of the clubs activities this is the time to speak up and they are the people to see. There was some discussion about the Groton Road Race and the need to start gathering help for it.

Stu reported that he had submitted the required information for the club to maintain its Special Service Club standing.

Stan and Ralph reported on the fox hunt that was cosponsored with MARA on February 1st.
Stan

Points to Ponder

"If I had thought about it, I wouldn't have done the experiment. The literature was full of examples that said you couldn't do this." Spencer Silver on the work that led to the unique adhesives for 3M "Post-It" Notepads.

"Professor Goddard does not know the relation between action and reaction and the need to have something better than a vacuum against which to react. He seems to lack the basic knowledge ladled out daily in high schools." 1921 New York Times editorial about Robert Goddard's revolutionary rocket work.

Why do "tug" boats push their barges?

Does a fish get cramps after eating?

$The Treasurer's Report $

March Treasurer's Report

Income for the month of February was $49.00 Expenses were $32.20 for newsletter printing and postage. Current balances are:
General Fund $444.24
Education Fund $448.34

We had two ARRL renewals through the club. Many thanks for supporting the club in this way.

Are you thinking of joining the League but haven't yet found that RoundTuit? Well, there couldn't be a better time!

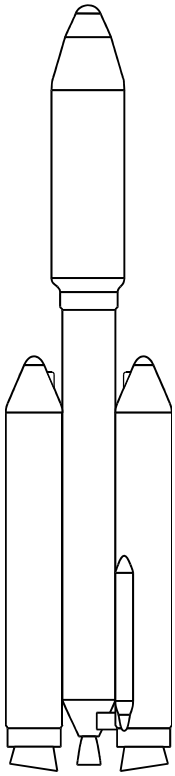
73, Ralph KD1SM

NVARC QSL BUREAU

Bring your cards and a QST label to the meeting or to breakfast and the club will

take care of the shipping and bureau fee. Stan

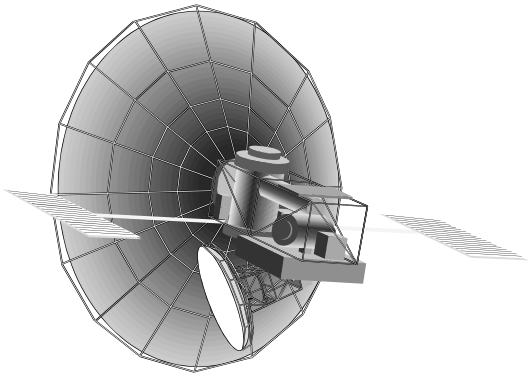
RS-16 Launched



ARLS006 RS-16 Satellite In Orbit

According to sources at AMSAT, a new Russian Amateur Radio satellite, designated RS-16, has been launched from the Svobodny Cosmodrome as part of a Zeya satellite package. RS-16 reportedly has an average orbital altitude of 276 miles, producing a footprint some 2000 miles in diameter on Earth.

On March 4, 1997, 1614 UTC, Jim White, WD0E, reported hearing strong signals from the RS-16 CW beacon on 29.408 MHz. Others in the US and Europe have reported strong signals on 10 meters. The transponders are not yet active. The twice-delayed launch had been expected as early as December. RS-16 is expected to be a Mode A (2 meters up/10 meters down) satellite, like RS-10 and RS-15. It's the first Russian satellite to have a 70-cm beacon, but the beacon there is not yet operational. Beacon frequencies are 29.408,



29.451, 435.504 and 435.548 MHz.

When the transponders are operational, the RS-16 frequencies are e45.948 MHz, downlink, 29.415 to 29.448 MHz. Orbital elements and additional information will be announced as they become available.

Spread Spectrum

ARLB012 FCC proposes changes in spread spectrum regs

Responding to a petition for rulemaking from the ARRL, the FCC has proposed in WT Docket 97-12 to adopt changes in its Amateur Service rules governing spread spectrum. In spread spectrum the energy of the transmitted signal is distributed among several synchronized frequencies within a band and reassembled at the receiving end. This reduces power density and duration of a transmission on a particular frequency and lets spread spectrum almost invisibly share the same spectrum with users of other, narrowband modes. Spread spectrum also provides for improved communication under poor signal-to-noise conditions and in selective fading and multipath environments, and the ability to accommodate more communication channels operating simultaneously in the same spectrum.

The League's December 1995 petition asked the FCC to relax its rules to give Amateur Radio more opportunities to contribute to the development of spread spectrum techniques. Specifically, the League sought to have the FCC relax restrictions on spreading sequences and asked for greater flexibility in spreading modulation. In response, the FCC now has proposed to drop rules restricting amateur stations to transmitting only frequency-hopping and direct-sequencing spreading techniques. As requested by the League, the FCC also has proposed to require automatic power control for spread spectrum transmitters, to ensure use of the minimum power level needed to carry out communication.

The FCC also went along with the League's request to permit brief test transmissions using spread spectrum and to allow international spread spectrum communications between amateurs in the US and those in countries that allow hams to use spread spectrum. The current rules allow only domestic communication.

The use of spread spectrum techniques was first approved for Amateur Radio in 1985 for bands above 225 MHz and at power levels up to 100 watts, and there has been some experimental amateur operation since then. The FCC also has authorized Special Temporary Authority (STA) in some instances to allow broader SS experimentation. Since spread spectrum was introduced in the Amateur Radio service, commercial spread spectrum applications have been developed, including personal communication services, remote meter reading and position locating. But, the League had argued that rules limitations held back further spread spectrum experimentation. No changes are proposed in the frequency bands where spread spectrum is permitted.

The FCC said the rule amendments would "increase spectrum efficiency and allow amateur operators to contribute to technological advances." Comments on the NPRM in WT Docket 97-12 are due May 5, with reply comments due June 5.

CW Practice Nets

The NVARC Slow Speed Net meets Tuesday and Thursday at 7:30 P.M. on 28.123 MHz. Except the third Thursday of the month. that being the club meeting night.

There is now a CW practice session running on the Nashua Repeater (147.045) Wednesdays at 8:00 PM. It will be ARRL Style and the text will be taken from the Nashua Area Radio Club Newsletter. You don't need the newsletter to be able to take advantage of the broadcast.

These are not two way communications like the NVARC net is. They are designed to listen and copy the code. If your license class or equipment limitations prevent you from being on HF then these might help. The best way is to get on the air is with a net, like the NVARC Slow Speed Net, and actually send and receive code. Stan

NVARC

Nashoba Valley Amateur Radio Club

PO Box # 900
Pepperell Mass 01463-0900

Pres.: Erik Piip KA1RV
V Pres.: Bruce Blain K1BG
Secretary: Stewart Jackson K1YET
Treasurer: Ralph Swick, KD1SM
Editor: Stan Pozerski KD1LE
PIO: Earl Russell WR1Y
Meetings are held on the 3rd Thursday of the month - 7:30 p.m. - Pepperell Community Ctr.
Talk-in 146.490 simplex
This newsletter is published monthly. Submissions, corrections and inquiries should be directed to the newsletter editor. Articles and graphics in most IBM-PC formats are OK.
Packet address: PEPMBX (145.09 MHz)