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# **BARA** Facts

**Newsletter of the Binghamton Amateur Radio Association**

**July 2003**

Website: <http://www.wtsn.binghamton.edu/bara>

## **CHANGES IN THE AIR**

In the last few weeks several changes have changed the face of Telecommunications in general and some of these touch upon the Hobby that we all love.

The World Radiocommunication Conference (WRC) in Geneva is underway and it appears a certainty at the time of this writing that the Mores Code requirement for access to the HF Bands will be dropped. According to the *ARRL Letter* of 27 June no participating Administration has spoken in favor of maintaining the requirement internationally, however this does not mean that National Administrations (such as the FCC) will automatically drop the requirement and, in fact, the proposed amended regulation simply states that *THE "[NATIONAL]ADMINISTRATIONS SHALL DETERMINE WHETHER OR NOT A PERSON SEEKING A LICENSE TO OPERATE AN AMATEUR STATION SHALL PROVE THE ABILITY TO SEND AND RECEIVE TEXTS IN MORSE CODE SIGNALS."*

Regarding the proposals to harmonize the 40-Meter band there is less agreement. Several proposals are being discussed and no decision is certain at this time.

In our own country we understand that the Navy has dropped the venerable "Sparks" rating and replaced it with communications ratings that match the specialties required by current technologies as used in the Navy.

But the news is not all negative. The FCC — despite opposition from the National Telecommunications Information Administration (NTIA) — has released five *Channels* in the Sixty-Meter band effective Midnight, Local Time on 3 July. These allocations — which are secondary for Amateur Users — come with several unique restrictions including the requirement that we use Upper Sideband (USB) mode exclusively and that our radiated signal

(not tuned center frequency) remain within the channel. There are also restrictions on Effective Radiated Power (including a requirement of documenting Antenna Gain if you use other than a Dipole).

There has been lively (and sometimes negative) comment on this allocation in Amateur Circles, however we should bear in mind that there was opposition to any allocation and that the restriction to USB recognizes the fact that government HF transceivers often support only USB as a voice mode. Before attempting to use these new allocation you would be well advised to carefully read the relevant regulations. A good place to start is the ARRL FAQ at <<[arrrl.org/FandES/field/regulations/faq.html](http://arrrl.org/FandES/field/regulations/faq.html)>>.

With NTIA recognizing the need for access to HF spectrum and Shortwave Broadcasters hesitant to surrender allocations on the 40-Meter Band we have a sobering reminder that our HF allocations are still valuable. Likewise the incursions of Licensed and Unlicensed users in the VHF bands and above remind us that our spectrum means money to certain users. For us as Amateurs it is more important than ever to prove our value to the public at large through Emergency and Public Service work and for us to remember that our communications can be monitored by anyone with an appropriate receiver. What we do with our privileges is really the face of Amateur Radio.

## **"Junkyard Wars" at BARA**

We are pleased to announce that the program for our September General Meeting will be a "Junkyard Wars" challenge. We invite members (and non-members alike) to participate in this event by creating a piece of radio equipment (transmitter, receiver, station accessory, etc.) using as many "creative" parts as possible.

Entries in this prestigious competition can be as simple or as complex as the crafter desires, but a premium should be placed on craftiness — home-made resistors, capacitors, sockets, hardware, etc. — with the goals being creativity, imagination, and fun. It's also a chance to experience the thrill that Amateurs felt in the early days of our hobby when components were difficult to obtain through commercial channels and were often home-brewed.

The rules for this event are simple, flexible, and open to interpretation:

1. Anything goes. Crystal Sets, Home-Brew Slat-Board MOPAs and Tri-Tets are allowed. So are converted Arc Welders and things tinkered together from Odds & Ends.
2. You must be able to physically bring your creation to the September General Meeting without requiring major structural modifications to the Unitarian Universalist Church or creating a danger of catastrophic structural failure.
3. Your project should be “functional”, however if operation would endanger life, limb, or property, we may dispense with an actual demonstration in lieu of the standard Hamfest Disclaimer *“It worked the last time I used it....”*
4. You don't need to be a BARA member to participate and team projects are welcome.
5. Judging will be by vote of the members and visitors present at the September General Meeting.

There are a number of print resources available on the subject of “homemade electronics” as well as many InterNet Resources. Here are a few websites with Transmitter, Receiver, and Crystal Radio ideas to get you started:

☞ <<[vintagehamradio.com/junkbox-xmtr2/](http://vintagehamradio.com/junkbox-xmtr2/)>>

☞ <<[home.attbi.com/~radiowarren/1distget.html](http://home.attbi.com/~radiowarren/1distget.html)>>

☞ <<[midnightscience.com/](http://midnightscience.com/)>>

Consider brewing some magic and bring it to the September General Meeting!

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## Tripping the Arc Fantastic

The early days of Wireless are studded with technologies that were innovative improvements in their time, but which quickly faded to obscurity. One example of these “dead ends” is the Oscillating Arc.

In the early days of radio Spark — of course — was king, but King Spark was wasteful and inefficient and the immense power of the early transmitters was promiscuously scattered over wide swaths of spectrum. The key to efficient communication lay in taming the varying frequency of Spark and confining it to a single frequency as a Continuous Wave. Music and Acoustics both offered tantalizing examples of pure and continuous waves, but their production with Electromagnetic Art seemed an impossible quest.

And then, in 1900, Duddell noticed that an Electric Arc could, under certain circumstances produce a musical note. This observation led the Danish scientist Valdemar Poulsen to further investigations that culminated in the development of the Arc Transmitter.

In its most basic form an Arc Transmitter is little more than a Carbon Arc lamp connected to an antenna circuit. The Arc burns in a special chamber filled with hydrogen and an electromagnet near the arc continually “extinguishes” the flame so that it is continually re-ignited. Although the Arc is fed by Direct Current an Alternating Current is produced across the electrodes and with the addition of an inductance in series with an Antenna/Ground Capacitance the system produces Continuous Waves.

The difference between Spark and Arc is significant: A Spark System is fed Alternating Current which is increased in voltage by a transformer until the Electrical “Pressure” breaks down the resistance across a Spark Gap. The resulting alternating spark can — in a very rough way — be tuned to resonate at Radio Frequencies. In the Arc System a relatively low voltage is used to produce an Arc. The Arc itself produces an Alternating Current which, through proper choice of circuit constants, can be brought into the domain of Radio Frequencies.

In the United States Cyril Elwell and Leonard Fuller of the Federal Telegraph Company worked to bring the Arc Transmitter to a high state of perfection and for a brief period massive Arc Transmitters generating many Kilowatts of power were used to transmit messages from land stations while smaller portable units (some small enough to fit in your palm) were used on ships and by the military. It was a robust technology that required engineers with electrical, mechanical, and plumbing skills, but it was short-lived and soon made obsolete by the genie in the bottle — the Vacuum Tube.

But the story does not quite end there. Although obsolete the installed base of Arc Transmitters hung on for some years. Some were retired into service in atomic laboratories where their massive electromagnets found some application and the U.S. Navy kept a few in operation for communications at very low frequencies with the submarine fleet. Today they are gone, half-forgotten relics of the early days of Wireless.

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## A Conundrum from Kirchoff

Returning to the subject of Antennas and Transmission Lines we look at the conundrum of Unbalanced Feedlines and Feedline Radiation. We ask what exactly is happening when Feedline radiates and what circumstances make a Feedline radiate?

Feedlines are nothing more than a path for RF Currents. They are to Radio Circuits what Lampcord and 12-3 are to house wiring circuits, but at Radio Frequencies wires behave somewhat differently than they do for DC or 60-cycle AC. As the frequency goes up the distribution of current in the conductors becomes less and less uniform as something called the Skin Effect becomes more pronounced.

Skin Effect is the name given to the tendency of High Frequency currents to stay near the top surface of a conductor and to not penetrate deeply within the conductor. It is an interesting phenomena and it is the reason why a “clad” Antenna Wire like Copperweld is electrically equivalent to a solid copper wire of the same diameter. It is also the reason why the currents are confined to the interior of a “well-behaved” Coax Feedline. Unlike Parallel Conductors which are balanced, but permit the currents to Couple with nearby conductors a Coax Feedline keeps the currents *inside* the “system” because the RF Currents flow on the outer surface of the inner conductor and the inner surface of the braid. No currents flow from the Transmitter over the outer surface of the braid. With the currents safely inside the braid shield, there can be no coupling with conductors near the Coax.

This where the fun starts. Kirchoff’s Second Law tells us that the sum of the Currents flowing into a Node must exactly equal the sum of the currents flowing out of the Node. In the system under consideration, this means that each microamp of RF Current that flows out of the Transmitter must be returned to the Transmitter. In a perfect system the Current on the surface of the center conductor would be equal in magnitude and opposite in direction (sign) to the Current on the inner surface of the braid, however if

you consider the situation at the Antenna end of the Feedline, you will see that Coupling between the Antenna and the Feedline may well induce a Current on the *outer surface* of the braid. This divided Current Flow is possible because of the Skin Effect — the two surfaces of the braid must be considered two separate conductors — and while the sum of the Currents on the inner and outer surfaces of the braid will be equal in magnitude to the Current on the inner conductor, the currents *within* the Coax will not equal and, more significantly, the Current on the outer surface of the braid is free to couple with nearby objects and raise all manner of mischief!

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## Review: Radio Rescue

Robert J. Marx, W2AZX, ex 2AZX, was first licensed in New York City in the 1920s when radio was a new and exciting technology that captured the hearts and minds of young and old with its promise of immediate communication. *Radio Rescue* by Lynne Barasch is the story of his youthful love affair with radio as recounted by his daughter.

This is first and foremost a book written for children, but unlike many other books for children it is not written for “babies”. Mrs. Barasch is not afraid to set the scene with details of life in the 1920s nor does she avoid technical terms. Morse Code plays a big part in the story as does young Robert’s struggle to learn the language. Those with memories of “Radio Row” will appreciate Robert’s visit to Cortlandt Street with his friend and Elmer, Bill. The high point of the story is a Rescue resulting from the long-distance assistance Robert gives during a hurricane that struck Florida in 1926.

One of the charms of this book is in the illustrations (by the author) and if purists find some minor errors in the text, they can take comfort in the fact that the bus wire is drawn square and that the late-night “Antenna Party” is true to life. The endpapers of the book are also charming with statues of the “great men” of communications commenting on their contribution to the Radio Art.

*Radio Rescue* (ISBN 0-374-36166-5) is published at \$16.00 by Frances Foster Books, a division of Farrar, Straus, and Giroux. It’s a fun story for kids and also for adults.

Club Officers and Committees			
President	Bob McCabe	KC2DSS	748-9808
Vice President	Jack Connors	WB2GHH	724-8822
Secretary	Ron Regan	N2RWK	722-6790
Treasurer	Paul Slocum	N2NCB	687-2057
Directors	Bob Handel	K2FU	693-4310
	Steve Orzelek	N2MSB	775-0281
	Ed Plesnar	KB2SCF	754-3810
	Mel Snitchler	WE2K	723-9612
W2OW Trustee	Frank Scoblick	N2HR	729-4249
Newsletter	Ed Plesnar	KB2SCF	754-3810

**BARA, The Binghamton Amateur Radio Association is**



**an ARRL Affiliated Club**

### ***Next General Meeting***

7:30 PM, Wednesday, July 16th Unitarian Universalist Church Riverside Drive, Binghamton, Next to Lourdes Hospital

### ***Board Meeting***

7:00 PM, Wednesday August 6th

Broome Community College Campus, Office of Emergency Services (West Side of Campus)

### ***Exam Session***

NOTE: No July Testing Session!

Vestal Public Library, Route 434 Vestal

1:30 PM, Saturday August 9th

Endicott Fire Station, Across from UE High School

### ***BARA Dues***

\$18/year Single Member; \$27/year Family