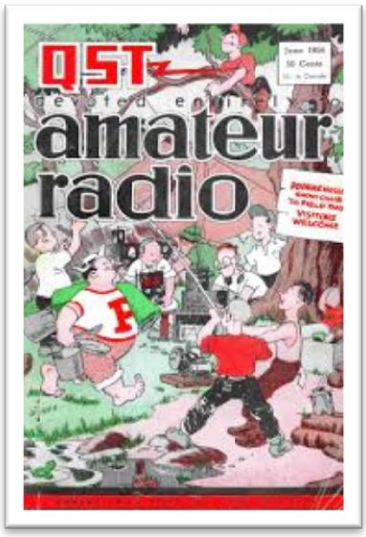

The Days before Social Distancing

The Aero Aerial

The Newsletter of the Aero Amateur Radio Club
Middle River, MD
Volume 16, Issue 6
June 2020

Editor Georgeann Vleck KB3PGN

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Vice-President	Rob Ballou KC3ROB
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Club Nets	Joe Miko WB3FMT
Contests	Bob Venanzi ND3D

Website: http://w3pga.org
Facebook: https://www.facebook.com/pages/Aero-Amateur-Radio-Club/719248141439348

About the Aero Amateur Radio Club

Meetings

The Aero Amateur Radio Club meets at 7:30 pm on the first and third Wednesdays of the month at Essex SkyPark, 1401 Diffendall Road, Essex. Meetings begin at 7:30 p.m. local time. Meetings are canceled if Baltimore County Public Schools are closed or dismiss early.

Repeaters

W3PGA **2 M :** INPUT : 147.84 MHz, OUTPUT : 147.24 MHz, PL 123.0
W3PGA **70 Cm:** INPUT : 444.575 MHz, OUTPUT : 449.575 MHz, PL123.0
W3JEH **1.25 M:** INPUT : 222.24 MHz, OUTPUT : 223.84 MHz

Club Nets

Second Wednesday Net – 70 Centimeters (449.575 MHz Repeater) @ 8 p.m. Local Time
Fourth Wednesday Net – 2 Meters (147.24 MHz Repeater) @ 8 p.m. Local Time
Fifth Wednesday Net – 10 Meters (28.445 MHz) @ 8 p.m. Local Time

Radio License Exams

The Aero Amateur Radio Club sponsors Amateur Radio License Exams with the ARRL VEC. Examination sessions are throughout the year. Walk-ins are welcome; arrive no later than 30 minutes after start time. $15 charge.

2020 Examination Schedule DUE TO COVID19 May and June DATES May be Canceled!

Time:	1:15 pm	1:15 pm	
Dates:			Saturday, June 27
Where:			FBO, Essex SkyPark

White Marsh Library, 8133 Sandpiper Circle, White Marsh, MD
Contact: Patricia Stone AC3F, email: ac3f@juno.com, landline: 410-687-7209

LOCAL AREA NETS

Day	Time	Freq. (MHz)	Net Name
Daily	9 – 10 am	145.330	Oriole Net
Daily	6 pm	3.820	Maryland Emergency Phone Net
Daily	6:30 – 7 pm	145.330 no PL	Balto. Traffic Net (b/u 146.670 PL 107.2)
Daily	7 pm & 10 pm	3.643	MD/DC/DE Traffic Net
2nd Tue	7:30 pm	146.670	Baltimore County RACES Net
2nd Wed	8 pm	449.575	Aero ARC Net
4th Wed	8 pm	147.240	Aero ARC Net
5th Wed	8 pm	28.445	Aero ARC Net
Fridays	7:30 pm	145.330	Back in the Day Net
When activated by NOAA		147.030	SkyWarn (primary)

CLUB NEWS

Aero ARC Meeting, May 20, 2020, via Zoom Video Conference Call
Start Time: 07:30pm End time: 08:14pm Date: 5/20/2020

Members Present: Joe WB3FMT, Rob AE3B, Steve KD3TP, Harry AC3EK, Tom WA3QYL, Pat AC3F, Lou KC3NMT, Don K3DON, Gus AA3GG, Rich KB3VAE, Larry KB3QWC, George KB3TBH, Bob WA3SWA, Montel KA3RFI, Ken KB3JVP, Lou AB3QK, Dave KA3SNY. 17 members.

Treasury Report: Bank $3,050.02 On Hand: $56.00 /FD Food

Repeater Report: 2 m: No Problems 70 cm: No Problems

Correspondence: None

Public Service: Notice was sent out all members about checking in with and helping neighbors and your fellow hams if possible.

EmCOM: Nothing scheduled before the end of hurricane season. Tropical Storm Arthur, first named storm of the 2020 hurricane season, is a depression, no longer listed as an active storm.

SKYWARN CLASSES - Basic on Wednesday, 5/27, Online Webinar 6 – 8 pm. You must register.
Flood on Thursday, 6/18, 6:00 pm – 8:30 pm, Online Webinar. You must register for the session.

VE Testing : The next on is scheduled for FD Saturday the 27th this is planned for the Essex Skypark as of this time. We would have testing limited to 10 participants. If more then 10, than break the test sessions into 2 one-hour sessions.
Meet the 6-foot social spacing and require a face mask.
Testing would be done outside using canopies the skypark long tables. Mask must be worn if required by the County. In case of inclement weather, testing might be done in participants cars. VEC would not be required to stay for other FD activities, unless they want too.

Old Business:

Aviation Scouting event at the Essex Skypark rescheduled for November 6, 7, 8, first weekend in November. There is no information about the September Wings and Wheels event.

Field Day 2020 Planning:

We decided to have our FD. It will be a reduced FD activity. I have decided to go with a modified FD20.

1. As shown in the photos it appears that there are 2 partial aircraft in the community hanger. We need to have a work around.
2. Because of hanger space, we came up as a 3A configuration, 1 CW/Digital, and 2 HF stations. Maybe No beam, just a G5RVs or OCFD.
3. Try to set up an operator schedule.
4. No supplied dinner made by Susan. Maybe Pizza John carry out, or ROFO chicken.
5. Porta-Potty - Pat will call the Porta Potty Co, and request that they deliver the PP around noon. I plan to be at the airpark by 11:00 am.

New Business:

Addition Info: Talked to Warren and he suggested in getting a set of duplexers for the 147.24 repeter and going to a single antenna site. Get rid of the tower and antenna at the gym. He is going to talk to Phil about looking for a duplexer.

It is now up to the individual state to change COVID19 health requirements as they feel fit. The MD Governor has released these requirements and has made it the responsibility of each county to open as they see fit. The state is currently in Phase One.

Almost forgot, the election for club officers will take place next at the next face to face meeting rather than on May 20, 2020. I checked with Warren and Ron the Election Chairman.

Please Note: Due to CONVID19, if any one does not feel comfortable, do not feel you must attend. If you are a care giver, reside with older people, or for any reason you are uncomfortable with? Take the safe route for you and yours.

Joe Miko, WB3FMT

Net Reports

5/13/20: 440 net, 20:00 to 20:52 local.

W3PGA NCS Joe Essex, KB3VAE Rich Middle River, AC3F Pat Middle River, N3FQC Don, KC3HXL Joel Essex, WA3QLY Tom Middle River, W3JEH Ron Perry Hall, N3VBJ Jerry Rosedale, KB3TBH George White Marsh

9 participants on the net.

Thanks to Rich KB3VAE for starting the net. I was on the computer and lost track of time, also the clocked stopped at 19:20. Got a call from Joel and was on the net by 20:10. Also replaced the battery in the clock.

Another note, as discussed with Ron W3JEH, the chairperson for elections for 2020, elections will be postponed until we can have a face-to-face meeting at the Skypark.

5/27/20: 147.24r, 20:00 to 20:32 local.

W3PGA Joe Essex, K3DON Don Joppatowne, W3VRD Phil Essex, K3TEL Arnold Towson, AC3F Pat Middle River, KC3CMS Dan Baltimore, WA3QYL Tom Middle River, KB3VAE Richard Bowley Quarters, W3JEH Ron Perry Hall

There were 9 stations on the net.

VE CORNER

by Pat Stone, AC3F

No new information received.

The Attraction of CW

by Howard R. Bernstein, WB2UZE

(This article was originally published on the popular website eHamenet.com)

CW: What's the attraction in today's high tech world and how does one learn it?
Before I can answer the question why CW would be of interest to any ham in today's high tech world, let's spend some time first on how it all got started back in the day of the telegraph.

The telegraph was developed in the 1830s-1840s by Samuel Morse (1791-1872) and other inventors. It was a revolutionary long distance communication done by transmitting electrical signals over wires between stations. Morse invented a code (Morse Code) that assigned a set of dots and dashes to each letter of the English alphabet, which gave an understandable format to the electrical signals.

The first telegraph transmission in 1844 was between Washington DC and Baltimore and by 1866 an oceanic line had linked the USA and Europe. By the end of the 19th century telegraph communication became the backbone of our country. Yet with the invention of the telephone, telegraph lines became of less importance in the early part of the 20th century. However Morse Code (CW or continuous wave) continued to be used with newly developed radio transmitters of that era. Even with the advent of AM transmission and later SSB, CW was the preferred mode for ship to shore, commercial and military applications through the 1950s due to its effectiveness to get through in poor atmospheric conditions and with compromised equipment. With the coming of microwave, fax and satellites, CW use waned but maintained its major use amongst the amateur radio community.

So is there value in CW today or is it a lost art of the past? Let's take look back to what it was like when I first got my license in 1965 when CW was still required by the FCC. The FCC required all entry level Novices to be able to copy 5 words per minute. Back then there were no computers, internet or software for learning CW so an aspiring Novice had to seek out a local ham to help with learning CW and theory. That local ham would also give the Novice exam and code test. There were no repeaters so most all hams were HF active and imparted these skills to their eager students. So there was a direct connection between aspiring Novices and established HF operators. Seeing the experienced operators handling CW at high speeds was fascinating and motivating. There was also something very engaging about hearing CW over what we now call Boat Anchor radios. When one tuned one of those vintage radio and saw the glow of tubes, it felt like real solid equipment which we developed admiration and respect for. For some older hams today, the need to own those very rigs is due to this same connection made years ago.

Once we became Novices, we were not allowed to have VFO privileges and we worked off crystals. This meant we were stuck with a handful of individual frequencies. Our first receivers were not the best and we had to learn to receive CW with drifting receivers, poor sensitivity and no selectivity, the very things we take for granted in modern radios. These challenges made us excellent listeners and with that our speeds and CW skills increased as we progressed in the hobby. Back then to get a General license 13 words per minute was required and 20 for the Extra. As we became more proficient to reach these required speeds we developed head copy and CW became a language and not a series of dots and dashes. This is why many of the older hams are still preferring CW to voice and digital as they have developed a strong connection to the CW mode. To me there is nothing more satisfying in the ham radio hobby than having a CW QSO at a rapid speed with the challenge of copying in poor conditions, making few sending mistakes.

So getting back to the original purpose of this article: why should we be interested in CW today? I can list a host of reasons as follows:

• CW can get out better when the ham has a compromised antenna or low power. CW is ideal for QRP and portable operations. With weak signals it's harder to comprehend SSB than it is CW so CW has a clear advantage.

• CW can be copied easier in today's poor atmospheric conditions.

• Sometimes it's nice to operate your radio and not have to physically talk.

• CW bands are less crowded than the SSB portions so there is less competition to make a contact.

• The challenge to send CW well is always there. We call that 'having a good fist'.

• CW is like a language and it's no doubt good exercise for one's cognitive health and hearing.

• Knowing CW requires a good knowledge of operating techniques and protocols which will challenge the individual ham.

So one might ask, why CW if we have FT8 or other digital modes which can also get out in poor conditions. The digital modes leave most of the skill to a computer where CW is 100% the skill of the operator. To me it is truly more rewarding to make a CW QSO than sit idly by a computer and have it done for you, yet this is for any ham a personal choice.
Since CW was eliminated from the FCC license requirements in 1991, exams have been issued by Voluntary Examiners. In many cases after the exam, there is no longer any connection between the examiner and the new licensee. Most new hams think that our hobby all revolves around an HT and repeaters. Some have no idea of the thrill of operating on the HF bands or the attraction of CW. Unfortunately a lot of these new hams become inactive as they are not engaged. And with this deficit of active hams, when it comes to contests like Field Day and other special events, the demand for CW operators far exceeds what is available today.

So what is there to do about this? I myself along with my friend Rich K2UPS decided to make a difference. In 2018 we established the Long Island CW Club (longislandcwclub.org). We teach CW via an internet video conference platform at beginner, intermediate and advanced levels. Students get actual QSO training also by video conference for honing technique and increasing skill. We have found the interest very high from the students and everyone is having a lot of fun. The retro-ness of CW is very appealing in today's fast moving world and it's nice to make a connection to the bands with art and skill. It does take some dedication to learn CW and this commitment, like learning any language is not for everyone. So how does one learn CW?

• Using a combination of what is called the Koch and Farnsworth method, we send the CW at 20 words per minute character speed but the spacing between letters is 5 words per minute. This will acclimate the student to higher speeds from the beginning and prevent the counting of the dots and dashes which will only slow the learning curve

• We teach 11 classes of 1 hour per week at various levels. For the beginners, the student is needing to practice 15-20 minutes daily using G4FON cw software and 4 letters and or numbers are taught per week.

• Sending skills are honed along the way

• QSO skills are taught live as soon as a student can send their call sign and 599. We feel it's important to get students on the air quickly to help mitigate any fears and to see the value of their studies.

Like the learning of any language, I must admit there is a dropout rate as some students find out they don't have the time or commitment. However for those who stick it out, they are rewarded by carrying on a skill and tradition that is most enjoyable and unique.

I hope after reading this article, hams that were considering to learn CW or had it on the 'back burner', will now spring into action. See you on the lower part of the HF bands!

Did You Know? submitted by Tom Griswold, WN7E
Thomas Edison proposed to his second wife via Morse Code (he'd previously taught her how to communicate using it so that they could talk secretly in the presence of her family).

HAM NEWS

Amateur Radio Gains Significant Boost in UK by Connecting People During Lockdown

A recent BBC news feature has outlined how ham radio has gotten a significant boost by connecting people during the COVID-19 lockdown in the UK. The article, by Vanessa Pearce, quotes the Radio Society of Great Britain (RSGB) -- the UK's IARU member-society -- as saying that many former hams are now returning to the hobby. Mark Rider, G3VHJ -- a retired engineer who lives alone in North Warwickshire -- said that after the lockdown restricted his occasional trips to the pub, rehearsing with musician friends, and visiting his wife in a nursing home, he decided to dust off his ham radio equipment

Mark Rider, G3VHJ

"to seek out some other social interaction." Rider said that ragchewing has become one of the highlights of his day. "Just speaking to somebody else in the same situation is very rewarding," he said. The 67-year-old told BBC News that keeping in touch with others has been more important since his wife suffered a stroke.

RSGB General Manager Steve Thomas, M1ACB, said the society has experienced a three-fold increase in license examination applications since social distancing rules were put into place. The UK has about 75,000 amateur licensees.

Eleven-year-old Anne-Marie Rowland, 2E0RUX, of Cornwall, worked with the Cornish Amateur Radio Club to conduct informal twice-weekly nets to help keep people in touch. "We have some regulars, but also
some new people join in," she told the BBC. Her father, Bill, M0NXF, runs a net that has attracted older radio amateurs who are self-isolating, to help them feel connected.

Ann-Marie Rowland, 2E0RUX.

The RSGB recently instituted its "Get on the Air to Care" (#GOTA2C) campaign in conjunction with the National Health Service and its GB1NHS amateur station to promote amateur radio use during the pandemic lockdown. Some stations have been adding /NHS to their call signs to support the effort, which aim to support the emotional health and wellbeing of the amateur radio community.

The RSGB introduced remote administration of entry-level Foundation-class amateur radio exams in mid-April. Pete Sipple, M0PSX, told BBC News that he's seen a "massive" surge in demand for training courses and exam session and has had to up the number of course offerings.

Source: ARRL Letter for May 14, 2020

Federal Judge Okays Retrieval of *Titanic* Marconi Wireless Equipment

A US federal judge in Virginia has given permission to retrieve the ill-fated RMS *Titanic*'s Marconi wireless gear, which transmitted distress calls from the sinking ocean liner during its maiden voyage. Judge Rebecca Beach Smith of the US District Court in Norfolk ruled that the radio gear is historically and culturally important and could soon be lost within the rapidly decaying wreck. The *Titanic* sank in 1912 some 370 miles off the coast of Newfoundland after striking an iceberg.

"The Marconi device has significant historical, educational, scientific, and cultural value as the device used to make distress calls while the *Titanic* was sinking," Judge Smith wrote in her ruling. She said the company would be permitted "minimally to cut into the wreck" to access the radio room.

David Concannon, a lawyer for R.M.S Titanic Inc., which the court has recognized as the steward of the vessel's artifacts, said the company would try to avoid cutting into the ship, noting that the radio room may be reachable via a skylight that was already open. More legal wrangling may lie ahead. The National Oceanic and Atmospheric Administration (NOAA) contends that the retrieval expedition is still prohibited under US law and under an international agreement between the US and the UK.

R.M.S Titanic has said the radio transmitter could unlock some of the secrets about a missed warning message and distress calls sent from the ship.

"It tells an important story," Concannon said. "It tells of the heroism of the operators that saved the lives of 705 people. They worked until water was lapping at their feet."
In an April court filing, NOAA argued against the salvage effort, saying that any benefit to be realized from cutting into the vessel to recover the Marconi equipment would not be "worth the cost to the resource and not in the public interest."

A recreation of the *Titanic* Radio Room

RMS *Titanic* sought permission to carry out what it called a "surgical removal and retrieval" of the Marconi radio equipment. As might be expected, the deteriorating Marconi equipment is in poor shape after more than a century under water. The undersea retrieval would mark the first time an artifact was collected from within the *Titanic*, which many believe should remain undisturbed as the final resting place of some 1,500 victims of the maritime disaster. The wreck sits on the ocean floor some 2 1/2 miles beneath the surface, and remained undiscovered until 1985. R.M.S. Titanic said it plans to use a manned submarine to reach the wreck and then deploy a remotely controlled sub to retrieve the radio equipment.

Source: The ARRL Letter for May 21, 2020

Hamfests

CANCELLED Sunday, June 21, 2020: Father's Day Hamfest at Arcadia
Location: Arcadia Fairgrounds, 16920 Carnival Avenue, Upperco, MD 21155
Website: http://W3FT.com & Facebook
Talk-In: 146.67 (PL 107.2)
Public Contact: David Shadwell , AB3TE, P.O. Box 120 Reisterstown , MD 21136, Phone: 410-252-2878, Email: W3ft67@yahoo.com

NO NOTICE OF CANCELLATION AS OF 6/4/20 Sunday, Oct. 4, 2020: CARAFest 2020
Location: Howard County Fairgrounds, 221 Fairgrounds Rd., West Friendship, MD 21794
Website: http://www.carafest.org
Sponsor: Columbia Amateur Radio Association
Talk-In: 147.390/R+ (PL 156.7)

Public Contact: David Parkison , KB3VDY, P.O. Box 911 Columbia, MD 21044, Phone: 443-492-9501
Email: vendorsales@carafest.org

FEATURE ARTICLE

eHamnet
ham radio on the net

Manager

Where Does 468 Come From?

Created by Ward Silver - N0AX on 2010-05-04

"Where Does 468 Come From?"

We've all seen this number over and over again - the "magic number" that gives us the length of a half-wavelength dipole in feet from the dipole's resonant frequency: L = 468/f. In free space the wavelength in feet is 492/f, but a practical half-wavelength antenna is shorter so the constant is smaller. The number 468 is on the license exams and in the literature. It's been there ever since I started reading about ham radio in the mid-1960s. It's a pillar of amateur antenna theory. Every ham is expected to memorize it. And it's wrong.

It would be more accurate to say that it's rarely correct. There are certain instances where it's close, but using it often leads to wasted wire. The usual instructions to a new ham are, "Calculate how much wire you need using 468/f and then add a couple of feet." What that really means is the value 468 is too small and we compensate for the error by "adding a couple of feet". If 468 isn't right, why do we use it? Answering that question requires a trip along the paths of history.

Recently, I had the opportunity to spend a few days at ARRL Headquarters to plan upcoming writing and editing projects. The ARRL has a great Technical Library with every edition of ARRL publications and technical publications going back decades. (If you ever get close to Connecticut, it's well worth dropping in on the ARRL for a tour!) I had some time one afternoon and decided to find out when and how the number 468 first appeared in the ham literature.

My first stop was the *ARRL Antenna Book's* initial edition in 1939. Sure enough, on page 13 in the chapter on "Antenna Properties", the familiar formula 468/f appears. The *Antenna Book* states that the "end effect" due to the attachment of insulators at the ends of the antenna results in the approximately 5% reduction in length from the free-space 492/f to 468/f. The text goes on to state that the percentage "varies slightly with different installations", but doesn't say how, nor is a citation provided to identify how the value of 468 was obtained.

Since it is unlikely that the value of 468 appeared in the *Antenna Book* without any "prior art", I next turned to the *ARRL Handbook's* first edition in 1926. That turned out to be a dry hole - no formula for

antenna length and nothing in 1927 or 1928 either. Then, in the 1929 edition's "Antennas" chapter on page 128, I hit pay dirt! The text defines natural wavelength as the highest wavelength (the lowest frequency) at which the Hertz antenna (a half-wavelength dipole) will resonate. It is stated that "The natural wavelength of the wire...will be its length in meters multiplied by 2.1" Hmmm...2.1 is 5% longer than would be the free-space value of 2. (Remember, the text is discussing wavelength, not frequency.) Farther down the page I saw, "Speaking in terms of feet, the natural wavelength of the antenna will be its length in feet divided by 1.56." That equation translates to L = (300 x 1.56)/f and 300 x 1.56 is 468! Here were the headwaters of the mighty River 468!

Still, no background for the correction was given. Where does the use of a correction factor originate? Back to the stacks! Did I really want to go through all of the *QST* magazines until I found my answer? Well, not really, but inspiration struck in the form of the online *QST* archives. I logged into the ARRL Web site, brought up the *QST* archive search page, and...hit another roadblock. I couldn't very well search for "468" because it was unlikely to be a keyword. "Dipole" would return hundreds of hits. Then I realized that in the early days, a half-wavelength dipole would have been referred to as a "Hertz antenna" or "Hertzian antenna". I entered the former and scrolled down to the very earliest entries.

The oldest article on Hertz antennas was in the July 1925 issue by 9BXQ and titled "The Hertz Antenna at 20 and 40 Meters" but it didn't discuss a formula for length. The next oldest article, October 1926's "The Length of the Hertz Antenna" by G. William Lang, turned out to be what I was looking for. In the article, Lang (who was apparently not a ham, but worked in the Dept of Radio Operations for Radio Station WBZ in Boston) set up some Hertz antennas at amateur station 1KA and also measured antennas at station 1CK and 1KF. He used an oscillator and a wavemeter to determine the frequency at which the antenna resonated then measured the entire antenna - tip-to-tip, including the counterpoise. A table of correction values was derived, with the free-space wavelength in meters multiplied by an average value of 1.46 to get the antenna's resonant wavelength in feet. This corresponds to an equation of L = 438/f. This is the first suggestion that the actual resonant length of a practical amateur antenna can be predicted by using a correction factor to a free-space wavelength.

The early experiments of 1925 and 1926 took place on or near 40 meters. In those days, CW operation on what we now call the "low bands" of 80 and 40 meters was the norm. At these wavelengths, a half-wavelength dipole was of a reasonable length. It could be made of ordinary copper wire, probably #8 to #14 AWG, and installed in the back yard at heights of 20 to 40 feet. For these antennas, 1/8th to 1/4th wavelengths above ground, a value of 468 is about right, resulting in the equation printed in the *ARRL Handbook* in 1929.

In truth, many variables affect the resonant frequency of a half-wavelength dipole, the two primary factors being the length-to-diameter ratio of the antenna conductor and most strongly, the antenna's height above ground. These can combine to change the actual correction factor quite a

bit! (Insulation can also affect an antenna's electrical length.) In my November 2009 *QST* column, "Hands-On Radio: Antenna Height", I modeled a typical 20 meter dipole made of #12 AWG un-insulated wire at heights from 1/8th to 2 wavelengths over realistic ground and calculated the correction factor at each height. It varied from 466 to 481 over that range! Clearly, using 468/f would lead to an antenna being too short most of the time.

If 468 is too small and rarely correct, what should you do? Realistically, you should expect to trim your dipole to get the resonant frequency you want. Instead of being frustrated that the calculations aren't exact, learn to adjust the antenna's length efficiently by using an instrument such as an antenna analyzer. Start with an estimated value based on a more realistic formula such as 490/f that results in a small amount of extra wire for attaching insulators. During tuning, twist the wire connections together or use clamps, then raise the antenna into position and measure. When it's right, only then solder and weatherproof the connections. Recognize that every antenna's circumstances are slightly different - height, ground conductivity, thickness of wire, nearby conductors, and so forth.

Another lesson to learn from this exploration is to realize that "magic numbers" in formulas have often been determined through experimentation under specific circumstances. As such, they likely depend on a variety of factors that you may not be able to replicate. They will only approximate what you actually encounter. If the assumptions behind the value are given - you can use that information by comparing it to your situation. If the assumptions are not known - you should allow for variations or try to find a more accurate model representative of your own circumstances.

I hope you've enjoyed reading about this journey as much as I enjoyed taking it, opening the covers of books nearly 80 years old and mapping the stream of knowledge back to its sources - finding there the footprints of wireless pioneers that set ham radio on the course we travel today.

Additional Comment----

468 is *not* wrong! It's a good, practical number as a *starting point*.

C'mon Ward! Just as AA4PB keeps pointing out, the wire length is shorter simply because the velocity factor of *average* bare wire is around 0.95.

RF travels more slowly through various conductors than it does through air.

That's all.

There's no mystery here
...<imitating Bill Nye> "It's SCIENCE!"

Have you ever noticed that when you build an antenna from insulated wire, that it has to be even shorter?
Objects on and around the conductor slow down the RF even more (an arguably simplistic explanation).

The 'electrical length' of a conductor, in feet, for one full wavelength, would be:

1/2 wavelength = (984/f)*Vf

Where f is in MHz and Vf is the velocity factor.
Some typical velocity factors are:
1 air/free space
0.95 bare copper wire
0.93 insulated copper wire
0.91 window line
0.88 coax with foam dielectric
0.66 coax with solid dielectric.

To roll it all into one convenient number for a half wave in *average* bare copper wire, you can combine part of the equation:

(984/2)*0.95 = 468 (well.. 467.4 actually)

.. leaving us with one handy dandy equation:
half wavelength in *average* bare copper = 468/f

Of course, your explanation is a whole lot more entertaining!

The number I like to remember is 11811 (roughly 984 x 12), which returns a length in inches. It's a palindrome: the same forwards as it is backwards, and is sometimes handier when making calculations for higher frequency antennas.

"Science Rules" .. even if it isn't so glamorous sometimes.

Respectfully,

--...MARK_N1LO...--

From the Skies over Mt. Essex

SKY Events for June 2020

June 3rd - – The Hale 200-inch telescope was dedicated in 1948, NASA's Ed White's 1st US spacewalk 1965

June 4th - – Double shadow transit on Jupiter 11:21UT, 07:21EDT; Mercury greatest elongation East 24° 13UT, 09EDT

June 5th - Full Moon, "Strawberry Moon" for Traditional "Raspberry Moon" and the for the Shawnee American Indian.

June 11th – Pluto was demoted to a Plutoid in 2008

June 13th - Last Quarter Moon

June 19th – Venus is 0.7° S of the Moon 09UT, 05EDT

June 20th – Solstice (Summer begins) 21:44UT, 17:44EDT

June 21st - New Moon,

June 28th - First Quarter Moon

June 30th – Tunguska meteor impact (airburst) in 1908

Planet Lookout at mid-Month EDT
Sunrise 05:42 EDT and Sunset 20:24 EDT

Mercury Evening Rise 07:11 Set 21:30 Mag 1.6; Size 10 arc seconds

Venus - Morning Rise 04:39, Sets 18:38 Mag -4.3 and 56 arc seconds.

Mars Morning Rises 01:13, Sets 12:45, Mag -0.2 and 10 arc seconds wide.

Jupiter Late Evening, 22:14, Sets 08:02; Mag-2.7 size 46 arc seconds.

Saturn Morning, rises 22:32, Sets 08:28; Mag 0.3 size 18.2 arc seconds.

Uranus Morning 03:03, Sets 16:35; Mag 5.8 size 3.5 arc seconds.

Neptune Morning Rises 01:02 Sets 12:34; Mag +7.9 size 2.4 arc seconds.

Lux Luther, Not Quite! -How bright is sunlight, its over 100,000 Lux a Full Moon is 0.05 Lux.

LUX Light Meter Readings

The **lux** (symbol: lx) is the SI derived unit of illuminance and luminous emittance, measuring luminous flux per unit area. It is equal to one lumen per square meter. In photometry, this is used as a measure of the intensity, as perceived by the human eye, of light that hits or passes through a surface. It is analogous to the radiometric unit watt per square meter, but with the power at each wavelength weighted according to the luminosity function, a standardized model of human visual brightness perception. In English, "lux" is used as both the singular and plural form. @ Wikipedia

Here are some examples of the illuminance provided under various conditions:

Illuminance (lux)	**Surfaces illuminated by**
0.0001	Moonless, overcast night sky (starlight)
0.002	Moonless clear night sky with airglow
0.05 – 0.36	Full moon on a clear night
3.4	Dark limit of civil twilight under a clear sky[1]
20 – 50	Public areas with dark surroundings
50	Family living room lights (Australia, 1998)
80	Office building hallway/toilet lighting
100	Very dark overcast day
320 – 500	Office lighting
400	Sunrise or sunset on a clear day.
1000	Overcast day; typical TV studio lighting
10,000 – 25,000	Full daylight (not direct sun)
32,000 – 100,000	Direct Sunlight