HAMATEUR CHATTER

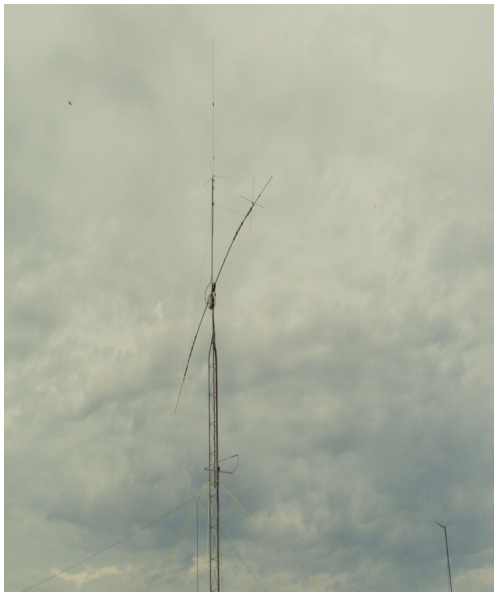
The Milwaukee Radio Amateurs Club

July 2012, Volume 20, Issue 7

One of the World's Oldest Continuously Active Radio Amateur Clubs—since 1917

Field Day Recap

The MRAC/MAARS Field day effort at Konkel park in Greenfield was strong again this year. There were a number of stations operated along with some learning centers, such as a soldering station and a satellite setup. Our setup crew headed by Dave, KA9WXN erected a rotatable beam antenna for the HF bands and a Yagi for VHF work. Over contacts were made during our Field Day. As attendance grows at our annual event more stations and learning centers will be added. Overall, the weather was good this year, with just haze reported.



MRAC Officers:

Terms Expiring in 2014

- President – Dave, KA9WXN
- V-President– Dan, N9ASA
- Secretary – Mike, KC9CMT
- Treasurer – Joe, N9UX
- Director – Mark, AB9CD

Terms Expiring in 2013

- Director – Al, KC9IJJ
- Director – Hal , KB9OZN

The Club Phone Number is: (414) 332-MRAC or

(414) 332- 6 7 2 2

Visit our website at:

www.w9rh.org

Mail correspondence to:

M. R. A. C.

P.O. Box 240545

Milwaukee, WI 53223

Board of Directors' Meeting Minutes

Board of directors meeting called to order at 7:18 pm by Dave DeFebo WB9BWP, outgoing club president.

Director's present: Mark, AB9CD, Dave WB9BWP, Michael KC9CMT, Dave KA9WXN, Hal, KA9OZN, Joe, N9UX.

Absent: Al, KC9IIJ, Dan N9ASA.

Preliminary discussions:

The MRAC field effort was last Saturday, at Konkel Park in Greenfield, across from Greenfield fire station number 1. Two stations were set up along with some rudimentary satellite workings. It is unknown at this time what the score or attendance at our field day site was. The ARRL purchased items were at the field day site in plenty of time prior to the start of activities.

The board of director's minutes from May were accepted as published in the June HamChatter by a unanimous voice vote. Joe, N9UX gave a treasurer's report for the month of May-June. The accounts came out to be $63.23 extra due to the change over of the MRAC certificates of deposit at the bank. $1552 was made by the club at this years auction. A very successful undertaking by the club this year. Many items were donated by club members for auction to benefit the club. We had 120 items to sell this year. The treasurer's report was accepted by a unanimous voice vote of the director's present.

Thursday will be this months meeting. It will consist of a field day recap. Dave, WB9BWP took many pictures that will be shown at the meeting. AES loaned the MRAC field day a IC-9000 to use. The club recored 439 contacts, which is the largest number since 2008. Total score may be 1848 this year, which is larger than last year. A digital receiver kit was build on site, which gives us extra points. Costs were $115.95 that will be split between both clubs present, MRAC/MAARS. A motion was made by Mark, AB9CD for the MARC to cover the entire cost. No action taken on this motion. The club would like to have the ARES van at our location next year. We would be able to pay for fuel and most expenses.
The pioneer village storage area has to be discussed and action finalized on this prior to September when the village closes for the year. If the club is not going to use this facility then we must vacate the space in use.

Dave, KA9WXN asked if he could visit the storage space some coming Saturday to inspect the inventory items that are specified on the Yahoo Group inventory sheet. This is more than likely not going to be used as a storage space in the future, so the club may decide to divest itself of the area. Space somewhere else needs to be found for the articles up there. The Pioneer Village site is not accessible at all times due to the need for security at the facility.

July & August no meetings. In September, West Mountain Radio will be doing a presentation on their power products. Still open dates for October and November. February is being discussed as a reoccurring date for a food gathering between the two clubs taking part in the Ham Fest.

Officer designations for the coming year is a very important topic. So far, there are no takers for these important positions. The club needs a vice-president and President. The Board of Director's is still in the process of convincing someone to take over at least the President position which the state of Wisconsin demands for a club to be legitimate due to regulation. Dave, KA9WXN has tentatively expressed an interest in being club President.

The idea of donating ARRL books to local libraries was discussed. It is noted that the SMARC group does this on the south side of Milwaukee County.

MRAC will be making a donation of $100 to the Pioneer Village for the use of their storage space.

The Yahoo group now allows 2 gigabytes of photos, yet still 100 megabits on their groups.

Special projects for the club is being discussed. Special project committee? One thing is to consider how much equipment the club should maintain in it inventory. A idea was put forth for the club to squire a tube based transceiver to solidify our position as a hobby in the case of an EMP sky burst event. An EMP sky burst it should be noted would render solid state equipment inoperable. Loaning equipment to new hams is problematic at best. Even so, the club should maintain at least some equipment to fall back on in a emergency.

The idea of mentoring new hams came up in discussion. The idea of club awards also came up for discussion. There used to be a "A.Travis Baird" award given out. Our archivist tells us that this award was only given out once.

Classes are still being discussed, but there has not been a lot of interest in this idea. The club will discuss this further at the next Board meeting. AES would be the most logical place to hold classes. The ITT site was discussed again as a host for Ham radio classes. It has been reported that ARRL Field Day is the slowest day of the year for AES sales.

Dave has been requested by the Board to be the Head of the special projects committee. A motion to accept Dave, WB9BWP as head of this committee was made by Mark, AB9CD and seconded by Dave, KA9WXN. Motion was carried by a unanimous vote of the present board members, 5-0.

The club should ramp-up our efforts for the 2013 field day effort. More glamour and equipment tents.
Field day should be kept a fun event, not really a score competitive event. The 95th anniversary paperwork has not been finalized yet. During the joint MRAC/MAARS picnic this year, the club will be having a special event station. Whether their will be a club set-up radio there or not is still being discussed. Perhaps a HF station will be put up. AES donated a G5RV to the club.

Board of Directors' Minutes Concluded

New Business:

Work out the Pioneer village situation by September 1st. The idea now is to move our equipment out of this location. Mark will talk to the caretakers there regarding the situation. The Board will be meeting in August of this year. Pioneer Village is still thought by the membership as being too far away for the clubs' operations. Dave has offered to ask Greenfield about using Konkel park again next year.

A motion was made to adjourn the meeting at 8:54 pm by Mark, AB9CD, seconded by Michael KC9CMT. Meeting adjourned at 9:00 pm.

Membership Meeting Minutes

The MRAC membership meeting was called to order at 7:08 pm by Dave, WB9BWP, club and board president. The Mic was passed around for introductions. A sign-in sheet was circulated for the recording of membership attendance.

Preliminary discussions:

The membership meeting minutes were accepted as published in the June HamChatter by a motion initiated by Dave, KA9WXN and accepted by the membership by a unanimous voice vote. Joe, N9UX gave the treasurers report for the month of May. The annual auction in May was very successful this time around. Proceeds were $1355 to the club plus donations. The next event on the horizon for the club is the annual MRAC/MAARS picnic on August 11th, Saturday, at Greenfield park area number 2, across from the water park/pool area. A small special event station on VHF will be up and running for people at the picnic.

A motion was made by Hal, KB9OZN to accept the treasurers report as read, seconded by Pancho, K9OFA. The treasurer's minutes were then accepted by a voice vote of the membership.

It was announced to the membership that Dave, KA9WXN will be the next president of the club, Dan, N9ASA will be the Vice-President. The next presentation will be during the September meeting which will be West Mountain Radio talking about their power devices. The SMARC SwapFest will be on Saturday, July 7th, at the American Legion Post on Shepard Avenue in South Milwaukee.

W1RU, Nick Baldwin of ARRL became a silent Key this past month. He had been a past attendee of the MRAC Christmas party. Ham Nation is still being podcast on the Internet, look up www. HamNation.com for more information. There is a breakfast planned for Jan. at the restaurant in Union Groove this Saturday. Jan was a member of the MRAC in 2011and is ill with a terminal disease. Bob, N9RFD can be contacted though the MRC91 repeater, 146.910 MHz, 123.7 tone, offset 600hz. Ron Crown has qualified to become a life member this year. The club will be presenting him with a certificate to note his long membership with the club.

Field Day Recap: Field day was at Konkel park the third weekend of June along with the MAARS group. There were stations setup and all had a good time. There was a write up in the Milwaukee Journal/Sentinel about the WAARC field day effort. AES offered us a radio to use during our effort, an FT-9100 HF rig. All of the equipment used was running on batteries charged by both solar and gas generators. The generators were hooked up to the RV. There was a 1.2 ghz digital station at the event. A digital interface kit was build during field day to interface with the FT-9100 radio. Dave, WB9BWP had many pictures to build a presentation. Our score this year is 1878 points for the field day contest part of the outing. Planning is already underway for the 2013 Field day effort again using the Konkel park area in Greenfield. Food was offered during this years effort. Sub Sandwiches and later a cook out of hotdogs and burgers.

Dave gave a presentation on the history of the club. This year is our 95th anniversary year. Dave. WB9BWP has been the club archivist for many years and has produced a DVD of historical club documents that he has scanned. Over 1500 PDF files have been scanned into his computer. The first papers are from 1920 and go through to the present. This is a lot of material. The club became affiliated with the ARRL in 1919. We were the fifth club to become an affiliate. On Gordon Wests' HamNation.com show he has talked about the MRAC over four times. In 1969 the club was granted its present callsign of W9RH. The MRAC received a commendation award from the City of Milwaukee to commemorate our 95th anniversary.

Our main presentation tonight is a recap of the recent field day effort by the MRAC at Konkel park in Greenfield this last weekend. Our next meeting is on September 27th at 7 pm. There are no meetings of this club during July and August. It is expected that the Board of Director's will meet in August.

The club maintains equipment at the Pioneer Village site basement that needs to be gone though and decided upon what we will keep and what we must sell. Dave, KA9WXN was introduced by Dave, WB9BWP as the new president for the MRAC. He gave a short introductory speech discussing what he wants to accomplish during the next year or two dozen.

Dave accepted motions to adjourn the meeting at 8:48 pm. Motion made by Michael, KC9CMT, seconded by Pancho, N9OFA. Meeting adjourned at 8:49 pm. Room policed of trash and returned to an acceptable condition as found before the meeting commenced. A parts raffle will commence after a short break.

ARRL Newsline

Executive Order Poses No Threat to the Amateur Radio Service

On July 6, 2012, the White House released an *Executive Order* that addresses National Security and Emergency Preparedness (NS/EP) communications functions of the federal government. Contrary to some concerns raised in a few Amateur Radio circles, the *Order* does not appear to contain any threat to the Amateur Service or its ability to continue support communications during times of emergency or disaster. It also poses no threat to amateur spectrum.

"The purpose of the new entity, which would be created by this *Order* within the Executive Branch, appears to be to plan for future NS/EP communications and to ensure survivability, hardness and interoperability, as well as to develop a long-term strategic plan for NS/EP communications," said ARRL Regulatory Information Manager Dan Henderson, N1ND. "Based on the Amateur Service's ongoing, positive working relationship with officials at the Department of Homeland Security's Office of Emergency Communications, it is hard to envision that any new management plan would not include Amateur Radio. Nothing in this *Order* directly affects Amateur Radio's daily operations." A good summary of the content of the *Order* can be found here.

Sometimes We Get Noticed

I wanted to share this story of interest to others who volunteer and support their communities in times of need. After recent major forest fires in the mountains above Colorado Springs with the loss of several lives and 350 homes lost, and a resulting 32,000 evacuees, flash flooding became our next urgent concern. Our local RACES team was activated by the Sheriff's Office to act as spotters for rising streams and possible flash flooding.

On a recent night as I stood in rain on the center span of the steel pedestrian bridge about 20' above a dark raging torrent of Monument Creek's muddy water, a passerby stopped to observe with me and comment about how amazingly fast the water had come up. I quickly agreed and said "Yeah, my buddy and I have been here awhile watching it and you should have seen it -- it went from just ankle deep to chest high in a matter of seconds!" Seeing my yellow safety vest he asked if I was with the city works or other agency. I said, "No, we're just a bunch of ham radio operators who volunteer our time to the county; we're actually with the El Paso County Sheriff Office.

I then went on to explain there was similar flash flood spotter teams strategically placed throughout the county watching streams rise and then using our radios to report observations back to the EOC. He said, "It's great to know someone's out here watching our backs!" He then turned and extended his hand to shake mine and said "Nice to meet someone on the front lines." He thanked me for being there and then went on his way.

I must say I wore a proud smile as I walked back across the bridge in the drizzle realizing that yep, that's what we do alright; we're out here watching our community's back while they sleep, watch TV, and live their lives. It sure felt great and meant a lot to be paid a huge unsolicited thanks, especially from someone who probably is sleeping a little better tonight knowing that someone has his back! -- Steve Galchutt, WG0AT, Monument, Colorado

Next Regular Meeting

The next meeting will be on Thursday, September 27th at 7:00PM. We meet in the Fellowship Hall of Redemption Lutheran Church, 4057 N Mayfair Road. Use the south entrance. Access the MRAC Yahoo group for important details about the February Meeting.

Please do not call the church for information!

Club Nets

Please check in to our nets on Friday evenings.

Our ten meter SSB net is at **8:00 p.m.** at **28.490 MHz USB** Our two meter FM net follows at **9:00 p.m**. on our repeater at **145.390 MHz** with a minus offset and a **PL of 127.3 Hz.**

Visit our website at: **www.w9rh.org**

Or phone (414) 332-MRAC or 332 - 6722

Chatter Deadline

The **DEADLINE** for items to be published in the **Chatter** is the 15th of each month. If you have anything (announcements, stories, articles, photos, projects) for the 'Chatter, please get it to me before then.

You may contact me or Submit articles and materials by e-mail at: **Kc9cmt@earthlink.net**

or by Post to:

Michael B. Harris

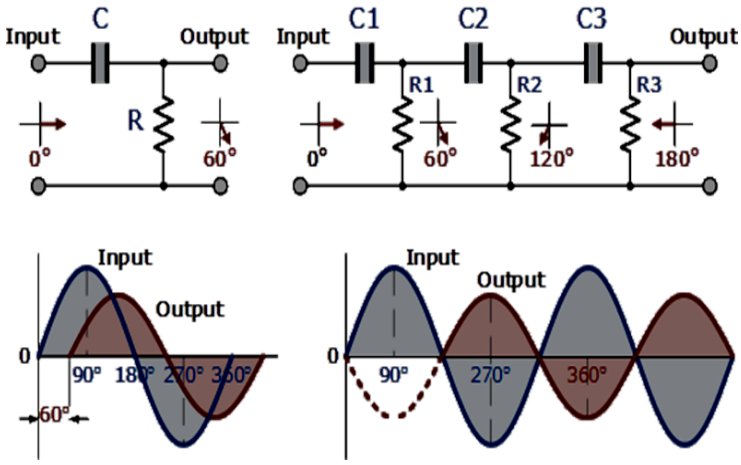
807 Nicholson RD

South Milwaukee, WI 53172-1447

The RC Oscillator

A single stage amplifier will produce 180° of phase shift between its output and input signals when connected in a class-A type configuration. For an oscillator to sustain oscillations indefinitely, sufficient feedback of the correct phase, ie "Positive Feedback" must be provided with the amplifier being used as one inverting stage to achieve this. In a **RC Oscillator** the input is shifted 180° through the amplifier stage and 180° again through a second inverting stage giving us "180° + 180° = 360°" of phase shift which is the same as 0° thereby giving us the required positive feedback. In other words, the phase shift of the feedback loop should be "0".

In a **Resistance-Capacitance Oscillator** or simply an **RC Oscillator**, we make use of the fact that a phase shift occurs between the input to a RC network and the output from the same network by using RC elements in the feedback branch, for example.



RC Phase-Shift Network

The circuit on the left shows a single resistor-capacitor net work and whose output voltage "leads" the input voltage by some angle less than 90°. An ideal RC circuit would produce a phase shift of exactly 90°. The amount of actual phase shift in the circuit depends upon the values of the resistor and the capacitor, and the chosen frequency of oscillations with the phase angle (Φ) being given as:

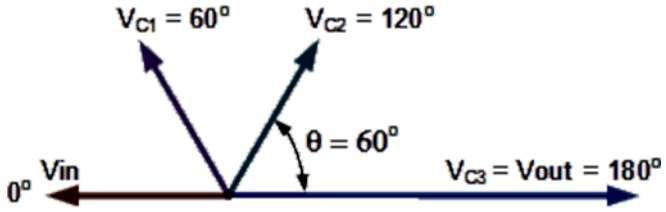
Phase Angle

$$X_C = \frac{1}{2\pi f C} \qquad R = R,$$

$$Z = \sqrt{R^2 + (X_C)^2}$$

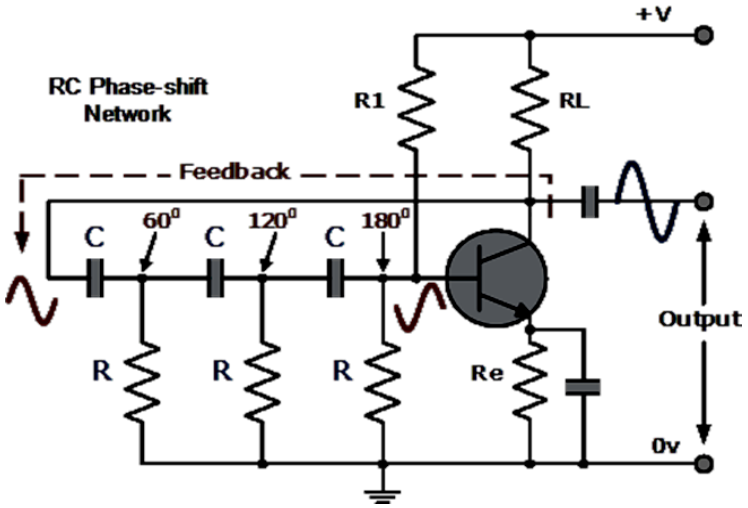
$$\therefore \quad \phi = \tan^{-1}\frac{X_C}{R}$$

In our simple example above, the values of R and C have been chosen so that at the required frequency the output voltage leads the input voltage by an angle of about 60°. Then the phase angle between each successive RC section increases by another 60° giving a phase difference between the input and output of 180° (3 x 60°) as shown by the following vector diagram.



Then by connecting together three such RC networks in series we can produce a total phase shift in the circuit of 180° at the chosen frequency and this forms the bases of a "phase shift oscillator" otherwise known as a **RC Oscillator** circuit.

We know that in an amplifier circuit either using a Bipolar Transistor or an Operational Amplifier, it will produce a phase-shift of 180° between its input and output. If a RC phase-shift network is connected between this input and output of the amplifier, the total phase shift necessary for regenerative feedback will become 360°, ie. the feedback is "in-phase". Then to achieve the required phase shift in an RC oscillator



circuit is to use multiple RC phase-shifting networks such as the circuit below.

Basic RC Oscillator Circuit

The **RC Oscillator** which is also called a **Phase Shift Oscillator**, produces a sine wave output signal using regenerative feedback from the resistor-capacitor combination. This regenerative feedback from the RC network is due to the ability of the capacitor to store an electric charge, (similar to the LC tank circuit). This resistor-capacitor feedback network can be connected as shown above to produce a leading phase shift (phase advance network) or interchanged to produce a lagging phase shift (phase retard network) the outcome is still the same as the sine wave oscillations only occur at the frequency at which the overall phase-shift is 360°. By varying one or more of the resistors or capacitors in the phase-shift network, the frequency can be varied and generally this is

If all the resistors, R and the capacitors, C in the phase shift network are equal in value, then the frequency of oscillations produced by the RC oscillator is given as:

$$f_r = \frac{1}{2\pi RC\sqrt{2N}}$$

- Where:
- f is the Output Frequency in Hertz
- R is the Resistance in Ohms
- C is the Capacitance in Farads

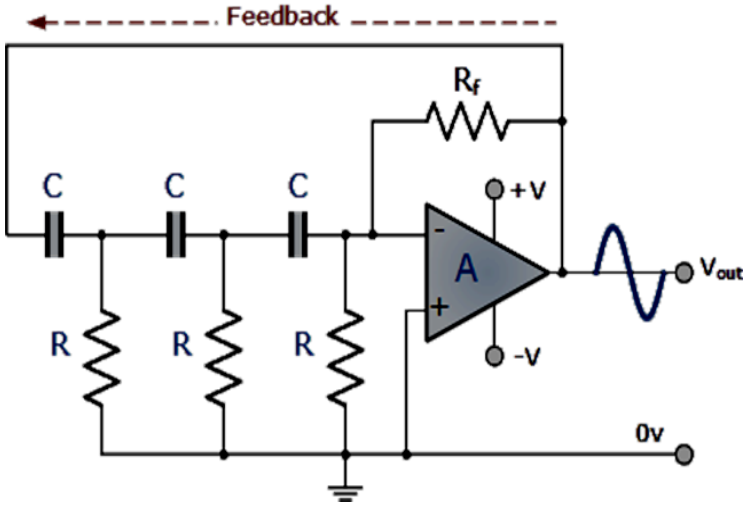
N is the number of RC stages. (in our example N = 3)

Since the resistor-capacitor combination in the **RC Oscillator** circuit also acts as an attenuator producing an attenuation of -1/29th (Vo/Vi = β) per stage, the gain of the amplifier must be sufficient to overcome the losses and in our three mesh network above the amplifier gain must be greater than 29. The loading effect of the amplifier on the feedback network has an effect on the frequency of oscillations and can cause the oscillator frequency to be up to 25% higher than calculated. Then the feedback network should be driven from a high impedance output source and fed into a low impedance load such as a common emitter transistor amplifier but better still is to use an *Operational Amplifier* as it satisfies these conditions perfectly.

The Op-amp RC Oscillator

When used as RC oscillators, **Operational Amplifier RC Oscillators** are more common than their bipolar transistors counterparts. The oscillator circuit consists of a negative-gain operational amplifier and a three section RC network that produces the 180° phase shift. The phase shift network is connected from the op-amps output back to its "non-inverting" input as shown below.

Op-amp RC Oscillator Circuit



As the feedback is connected to the non-inverting input, the operational amplifier is therefore connected in its "inverting amplifier" configuration which produces the required 180° phase shift while the RC network produces the other 180° phase shift at the required frequency (180° + 180°). Although it is possible to cascade together only two RC stages to provide the required 180° of phase shift (90° + 90°), the stability of the oscillator at low frequencies is poor.

One of the most important features of an **RC Oscillator** is its frequency stability which is its ability too provide a constant frequency output under varying load conditions. By cascading three or even four RC stages together (4 x 45°), the stability of the oscillator can be greatly improved. *RC Oscillators* with four stages are generally used because commonly available operational amplifiers come in quad IC packages so designing a 4-stage oscillator with 45° of phase shift relative to each other is relatively easy.

RC Oscillators are stable and provide a well-shaped sine wave output with the frequency being proportional to 1/RC and therefore, a wider frequency range is possible when using a variable capacitor. However, RC Oscillators are restricted to frequency applications because of their bandwidth limitations to produce the desired phase shift at high frequencies.

Example No1

Determine the frequency of oscillations of a **RC Oscillator** circuit having 3-stages each with a resistor and capacitor of equal values. R = 10kΩ and C = 500pF

The frequency of oscillations for a RC Oscillator is given as:

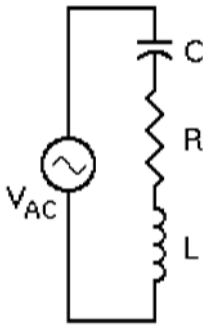
$$f_r = \frac{1}{2\pi RC\sqrt{2N}}$$

The circuit is a 3-stage oscillator which consists of three 10kΩ resistors and three 500pF capacitors therefore the frequency of oscillation is given as:

$$f = \frac{1}{2\pi\sqrt{(2\times3)}\times10000\times500\times10^{-12}} = 12{,}995\,\text{Hz or } 13\,\text{kHz}$$

The Experimenters Bench Continued

The Circuit



When we add a resistance to a series LC circuit, as shown in the schematic diagram to the right, the behavior of the circuit is similar to the behavior of the LC circuit with no resistance, but there are some variations. To see how the added resistance affects the operation of the circuit, we'll use the same parameters as with the Series LC Circuit, plus the resistor:

- f = 1 MHz
- e = 10 vrms
- L = 150 µh
- C = 220 pf

R = 100 Ω

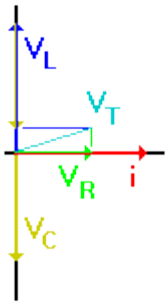
This time, our measured voltages come out as follows:

- v_L = 39.1v
- v_C = 30.0v

v_R = 4.15v

Does this make sense? We now know we must deal with the difference between v_L and v_C, which is just over 9 volts. But then we have a v_R of over 4 volts. Did we somehow convert that 10 vrms input voltage to a 13 volt drop? Or have we overlooked something else?

The Vectors



As before, we must take into account the different phase angles between voltage and current for each of the three components in the circuit. The vector diagram to the right, while not to scale, illustrates this concept. Since this is a series circuit, the current is the same through all components and is therefore our reference at a phase angle of 0°. This is shown in red in the diagram. The resistor's voltage, v_R, is in phase with the current and is shown in green. The blue vector shows v_L at +90°, while the gold vector represents v_C, at -90°. Since they oppose each other diametrically, the total reactive voltage is v_L - v_C. It is this difference vector that is combined with v_R to find v_T (shown in cyan in the diagram).

We already know that v_T = 10 vrms. Now we can see that v_T is also the vector sum of (v_L - v_C) and v_R. In addition, because of the presence of R, the phase angle between v_T and i will be arctan((v_L-v_C)/v_R), and can vary from -90° to +90°.

The Mathematics

As always, voltage and current calculations for this circuit are based on Ohm's Law. Our basic expressions are:

$$i_L = \frac{v_L}{X_L}$$

$$i_C = \frac{v_C}{X_C}$$

$$i_R = \frac{v_R}{R}$$

$$i = \frac{v}{Z}$$

Since this is a series circuit, the value of *i* in each expression is the same. That is, $i_L = i_C = i_R = i$, and we can use i as our reference value for our calculations. We will also need to know the value of $\omega (= 2\pi f)$ to determine X_L and X_C. For f = 1 MHz, $\omega = 2\pi f$ = 6.2831853 × 1,000,000 = 6283185.3

Now we can complete our calculations, starting with X_L, X_C, and Z:

$$X_L = \omega L$$

$$= 6283185.3 \times 0.000150$$

$$= 942.4778$$

$$X_C = \frac{1}{\omega C}$$

$$= \frac{1}{6283185.3 \times 220 \times 10^{-12}}$$

$$= \frac{1}{0.0013823008}$$

$$= 723.43156\ \Omega$$

Experimenters' Bench Continued:

$$Z = ((X_L - X_C)^2 + R^2)^{1/2}$$

$$= ((942.4778 - 723.43156)^2 + 100^2)^{1/2}$$

$$= ((219.04624)^2 + 100^2)^{1/2}$$

$$= ((47981.255) + 10000)^{1/2}$$

$$= (57981.255)^{1/2}$$

$$= 240.79297\ \Omega$$

$$i = \frac{v}{Z}$$

$$= \frac{10}{240.79297}$$

$$= 0.041529452$$

$$= 41.529452\ mA$$

$$v_L = i \times X_L$$

$$= 0.041529452 \times 942.4778$$

$$= 39.140586\ v$$

$$v_C = i \times X_C$$

$$= 0.041529452 \times 723.43156$$

$$= 30.043716\ v$$

$$v_R = i \times R$$

$$= 0.041529452 \times 100$$

$$= 4.1529452\ v$$

$$v = ((v_L - v_C)^2 + v_R^2)^{1/2}$$

$$= ((39.140586 - 30.043716)^2 + 4.1529452^2)^{1/2}$$

$$= ((9.09687)^2 + 4.1529452^2)^{1/2}$$

$$= (82.753044 + 17.246954)^{1/2}$$

$$= (99.999998)^{1/2}$$

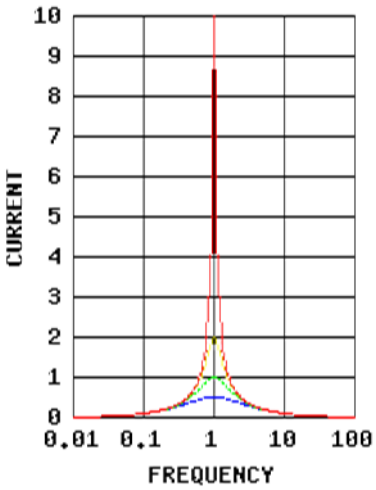
$$= 9.9999999\ v$$

$$= 10\ v$$

Experimenters Bench Concluded:

Allowing for calculator round-off errors through all these calculations, the total voltage *v* is exactly 10 volts, which is what we initially specified. Therefore our calculations check out, and our results are valid.
One effect of adding R to the circuit has been to reduce the current through the circuit, and increase the circuit impedance. How will this affect the circuit at resonance, when $X_L = X_C$?

Resonance and the Effect of R



At very low frequencies, capacitor C will be an open circuit, and virtually no current will flow through the circuit. At very high frequencies, inductor L will be an open circuit, and again no current will flow. However, at intermediate frequencies, both X_C and X_L will be moderate, and the difference between them will be small. At resonance, that difference will be zero, and only R will limit the current flowing in the circuit.

The graph to the right shows normalized values of current through a series RLC circuit at frequencies ranging from 0.01 times the resonant frequency, to 100 times that frequency. Beyond that range, as you can see from the graph, no significant current will flow at all. Within that range, current depends primarily on the value of R.

In order to get a graph with a resonant frequency at 1, we temporarily assign values of 1 henry to L and 1 farad to C, and use frequency in radians/second (ω, where $\omega = 2\pi f$). We will also assume a normalized signal voltage of 1 volt (rms). Now we can set the current at resonance by selecting the value of R.

(Note that these values are used specifically to obtain a normalized graph. Once we have the graph, we can change the component values and know that even when the resonant frequency and relative value of R change, the shape of the curve will always be the same, so long as the ratio L/C remains constant. We'll see shortly what happens as that ratio changes.)

In a fully normalized circuit, R = 1 Ω. This will permit a current of 1 ampere to flow at resonance, as indicated by the green curve on the graph. Similarly, if we set R to 2 Ω the current will be 0.5 ampere at resonance. The blue curve shows this.
The remaining curves show what happens if we reduce R. The yellow curve shows current when R = 0.5 Ω, while the red curve is for R = 0.1 Ω.

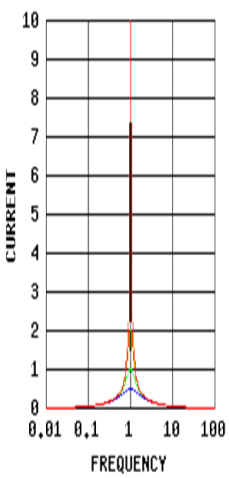
Note that for low values of R, the current at resonance peaks much higher, but falls off very quickly as frequency changes. For higher values of R, the curve is much broader, and maximum current remains much lower. This is the standard trade-off between bandwidth and maximum current, and the value of R is critical for controlling this factor.

Changing the Ratio of L/C

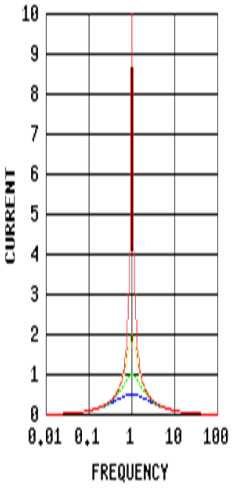
When we change the ratio of L/C, we change the reactances of both components at any given frequency without changing the resonant frequency. This is accomplished by making sure that the product of L and C remains constant even when we change their ratio. Thus, if L = 1H and C = 1f, LC = 1 and L/C = 1. However, if L = 2H and C = 0.5f, we still have LC = 1, but now L/C = 4. Or, if L = 0.5H and C = 2f, L/C = 0.25.

By changing L and C in this manner, we change the values of X_L and X_C at and near the resonant frequency without changing the resonant frequency itself. This controls the overall impedance of the circuit at frequencies near resonance, and gives the resistor, R, either more or less control over current at those frequencies. The result is a change in the frequency range over which this circuit will conduct significant amounts of current. The following three graphs illustrate this:

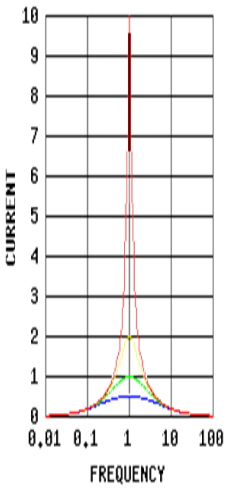
L/C = 4



L/C = 1



L/C = 0.25



When we plot the curves this way, it becomes clear that as we increase the L/C ratio, we limit the circuit to passing current over an increasingly narrow band of frequencies. However, as we reduce the L/C ratio, we widen the frequency band over which this circuit will pass significant amounts of current. This becomes very important when we deal with certain types of filters, and especially with tuned circuits.

Severe Weather Preparedness

Lightning Safety - Keeping safe Outdoors

Each year, about 400 children and adults in the U.S. are struck by lightning while working outside, at sports events, on the beach, mountain climbing, mowing the lawn or during other outdoor activities. About 67 people are killed and several hundred more are left to cope with permanent disabilities. Many of these tragedies can be avoided. Finishing the game, getting a tan, or completing a work shift aren't worth death or crippling injury.

Credit: National Oceanic and Atmospheric Administration/ Department of Commerce for photos

- **All thunderstorms produce lightning and are dangerous.** Lightning kills more people each year than tornadoes.
- **Lightning often strikes as far as 10 miles away from any rainfall.** Many deaths from lightning occur ahead of the storm because people try and wait to the last minute before seeking shelter.
- **You are in danger from lightning if you can hear thunder.** If you can hear thunder, lightning is close enough that it could strike your location at any moment.
- **Lightning injuries can lead to permanent disabilities or death.** On average, 10% of strike victims die; 70% of survivors suffer serious long term effects.
- **Look for dark cloud bases and increasing wind.** Every flash of lightning is dangerous, even the first. Head to safety before that first flash. If you hear thunder, head to safety!
- **Blue Skies and Lightning.** Lightning can travel sideways for up to 10 miles. Even when the sky looks blue and clear, be cautious. If you hear thunder, take cover. At least 10% of lightning occurs without visible clouds overhead in the sky.

The Single Most Dangerous Place

Outdoors is the most dangerous place to be during a lightning storm. When lightning is seen or thunder is heard, or when dark clouds are observed, quickly move indoors or into a hard-topped vehicle and remain there until well after the lightning storm ends. Listen to forecasts and warnings through NOAA Weather Radio or your local TV and radio stations. If lightning is forecast, plan an alternate activity or know where you can take cover quickly.

The U.S. lightning season is summer but lightning can strike year round! The Fourth of July is historically one of the most deadly times of the year for lightning. In summer, more people are outside, on the beach, golf course, mountains or ball fields. Outdoor jobs such as construction and agriculture, and outdoor chores such as lawn mowing or house painting are at their peak, putting those involved in danger.

Safety Rules

⇒ **Postpone activities promptly. Don't wait for rain.** Many people take shelter from the rain, but most people struck by lightning are not in the rain! Go quickly inside a completely enclosed building, not a carport, open garage or covered patio. If no enclosed building is convenient, get inside a hard-topped all-metal vehicle. A cave is a good option outside but move as far as possible from the cave entrance.

⇒ **Be the lowest point. Lightning hits the tallest object.** In the mountains if you are above treeline, you ARE the highest object around. Quickly get below treeline and get into a grove of small trees. Don't be the second tallest object during a lightning storm! Crouch down if you are in an exposed area.

⇒ **Keep an eye on the sky.** Look for darkening skies, flashes of lightning, or increasing wind, which may be signs of an approaching thunderstorm.

⇒ **Listen for the sound of thunder.** If you can hear thunder, go to a safe shelter immediately.

⇒ **If you see or hear a thunderstorm coming or your hair stands on end, immediately suspend your game or practice and instruct everyone to go inside a sturdy building or car.** Sturdy buildings are the safest place to be. Avoid sheds, picnic shelters, baseball dugouts, and bleachers. If no sturdy building is nearby, a hard-top vehicle with windows closed will offer some protection. The steel frame of the vehicle provides some protection if you are not touching metal.

⇒ **Listen to NOAA Weather Radio**. Coaches and other leaders should listen for a tone-alert feature during practice sessions and games.

⇒ **If you can't get to a shelter, stay away from trees.** If there is no shelter, crouch in the open, keeping twice as far away from a tree as it is tall.

⇒ **Avoid leaning against vehicles**. Get off bicycles and motorcycles.

⇒ **Get out of the water. It's a great conductor of electricity.** Stay off the beach and out of small boats or canoes. If caught in a boat, crouch down in the center of the boat away from metal hardware. Swimming, wading, snorkling and scuba diving are NOT safe.

Severe Weather Preparedness

⇒ Lightning can strike the water and travel some distance beneath and away from its point of contact. Don't stand in puddles of water, even if wearing rubber boots.

⇒ **Avoid metal!** Drop metal backpacks, stay away from clothes lines, fences, exposed sheds and electrically conductive elevated objects. Don't hold on to metal items such golf clubs, fishing rods, tennis rackets or tools. Large metal objects can conduct lightning. Small metal objects can cause burns.

⇒ **Move away from a group of people.** Stay several yards away from other people. Don't share a bleacher bench or huddle in a group.

⇒

What to do if someone is struck by lightning:

- **Call for help.** Call 9-1-1 or your local ambulance service. Get medical attention as quickly as possible.
- **Give first aid.** If the victim has stopped breathing, begin rescue breathing. If the heart has stopped beating, a trained person should give CPR. If the person has a pulse and is breathing, address any other injuries.

Check for burns in two places. The injured person has received an electric shock and may be burned. Being struck by lightning can also cause nervous system damage, broken bones, and loss of hearing or eyesight. People struck by lightning carry no electrical charge that can shock other people. You can examine them without risk.

Early Radio: Military Communications

Charlie of the South

Generally, early combat operations were similar in design. Marine helicopters landed grunts on the outskirts of villages and hamlets and the Marines established a perimeter. Vietnamese interpreters instructed the villagers to form in a group and move to a centralized location. Once the villagers (generally only women and children) had moved to comparative safety, Marine fire teams rushed into the village to search for the enemy. They were almost always met by VC snipers. The enemy was a pathetic looking lot . . . small, slim, barefoot and poorly armed, but he was determined, and he could and very often did, kill. Charlie of the South was elusive, cunning and tireless. He thought of himself as a patriot and often opened fire, single handedly, on advancing Marine companies or even battalions! He fought in small units, and often died . . . all alone, deserted by other members of his cadre.

"Another Landing"

History has a strange way of repeating itself. In May 1845, American Marines went ashore from the USS Constitution in an attempt to release a French Catholic missionary from prison.

"Old Ironsides" was anchored at Touron Bay, Cochin, China, during her cruise around the world. Touron Bay is known today as "Da Nang."

Much has happened since that first landing in Vietnam by American Navy men and Marines, over 125 years ago. Following the signing of the Geneva accords, Bedell Smith, representing the American delegation, stated that the United States would not threaten or use force to disturb the accords, and "would view any renewal of aggression in violation of the Agreements with grave concern as seriously threatening international peace and security."
Enemy troops continued infiltrating from the north. The monsoon rains came, bogging down the mechanized army of the south, but guerrillas don't need wheels.

As the rains fell heavily, the guerrilla units began strong offensives in every major sector of operations, including the southern deltas, central highlands and the mountainous north.

It was then that the USS Maddox was attacked in international waters by North Vietnamese PT boats, an attack referred to as the Gulf of Tonkin incident.

During a sneak night attack, the VC hit the air base at Pleiku in the central highlands. The American barracks was rocketed; aircraft and helicopters were shredded. Eight Americans were killed; 125 more wounded. The enemy then struck at Qui Nhon in Central Vietnam. The Americans counted their casualties.

The decision was made. "Land the Marines!"

March 8, 1965, began cloudy and windy. There was a pounding surf and a strong offshore wind. Breakers reached 20 feet. The landing was delayed.

Then the small landing craft reached the beach. Ramps ground open and the Marines stormed ashore. They were greeted by a mob of photographers, local officials and Vietnamese school girls.

Secretary of State Dean Rusk was asked if Marines would shoot back if fired on.

"Obviously," he replied. "That's the history of the Corps."
The 3d Bn., Ninth Marines waded ashore 10 miles west of Da Nang. They were part of the Ninth Marine Expeditionary Brigade, commanded by Brigadier General Frederick J. Karch.

Once ashore, the Ninth Marines linked up with the 1st Bn., Third Marines which landed by C-130 Hercules transport aircraft later in the day.

Early Radio: Military Communications

In support of the grunts, or infantry Marines, came Marine Medium Helicopter Squadron-162 from Okinawa, which would bolster its sister squadron, HMM-163. Marine Observation Squadron-2 landed the following day. The Marines surrounded the air base, weapons at the ready. Some moved atop Hill 327 which dominates numerous approaches to the air base. To many, it was "just another landing." Not a single shot was fired; not a casualty was suffered. The lack of pain and bloodshed would not be absent for long; sea breezes along the South China Sea would soon carry the smell of gunpowder, echoes of shells firing and blood would spill on both sides. But for now, at least, it was just another landing. It was "move out...spread out, hurry up and wait." It was hot. Throats were dry, backs wet with sweat and feet soaked from flooded rice paddies. Units moved to establish a perimeter defense around the Da Nang Air Base and helicopter landing zones. They were on Hill 327 and Monkey Mountain. The Marines had landed!

"A Plot To Defend"

They were like homesteaders. They came ashore, were assigned plots, and they dug in.

The 3rd Bn., Ninth Marine, Regiment, Third Marine Division ' landed in early March. By the end of July, the division was committed in its entirety in Vietnam.

Their mission: "To secure advanced air or naval bases . . . to deny the use of seized positions and areas to, the enemy . . . to close with and destroy the enemy . . ."

How best to fulfill this mission? The answer was simple . . . "enclaves!" According to the dictionary, an "enclave" is a "country, wholly surrounded by a foreign country."

As it pertained to the Marines, it was a plot of land surrounding vital airstrips. Without air power, South Vietnamese troops would be in a bind for a swift striking capability.

Without Marine security on the airstrips, aircraft and helicopters were vulnerable to enemy mortar and small arms fire. With the airstrip locked in a firm, friendly grasp, allied troops in the field were guaranteed resupply, reinforcements and quick medical evacuation.

Several battalions of Marines were, stretched out in a wide perimeter with their backs to the Da Nang River and the South China Sea. Patrols ranged deep into the mountains to keep the Viet Cong on the move, always away from the Da Nang Air Base.

The second enclave was established at Chu Lai, 60 miles south of Da Nang. Sea bees performed the near impossible, constructing a 4000-foot aluminum section runway in 23 days.

Doesn't seem too impressive? You haven't seen Chu Lai! Whereas Da Nang boasts firm, green flat lands and gently rolling hills (for the most part, at least Chu Lai is a settled sandstorm. Patrolling Marines were ankle deep in the golden sands, which tugged at boots and pulled at leg muscles until they cramped or were released for the next step. And there was cactus . . . The third enclave was Qui Nhon, 90 miles down the coast from Chu Lai, and III MAF's southernmost stronghold. A battalion landed there on July 1, 1965, from the carrier Iwo Jima after allied intelligence reported an imminent VC mortar attack against the airstrip. In addition to the security of the tiny, but very vital air base, Marines had a secondary mission of keeping the two major highways open; Route 1 runs I north and south, and Route 19 runs from the coast, inland to Central Vietnam.

The final and most northern enclave established was Hue/Phu Bai, 50 miles south of the 17th Parallel. Marine infantry and artillery dug in, protecting the 6000-foot runway, finding some relief in the flat, dusty rice paddy fields and mounds. A battery of 155mm howitzers provided artillery support for the 55-square-mile zone. Marines of III MAF lived in the hottest, coldest, wettest and driest sections of Vietnam. They wore out boots on the plains, in the mountains, steaming jungles and on the deserts. A Marine from Chu Lai visiting Da Nang would find himself in a seeming oasis of greenery, with ocean breezes fresh and constant.

From Hue-Phu Bai, another Marine might claw down a sharp jungle path and catch a flight to the flat, open, broiling expanse of Chu Lai.

Regardless of the surrounding terrain, the enclave Marines were, temporarily, like homesteaders.

Theirs was a necessary, vital assignment; theirs was a plot to defend.

" Things That Kill"

Your back is sticky with sweat and the jacket clings and chills. An odor flows upward, out of the open neck of your utility shirt, and you discover with a grimace that the smell is you.
The sun pounds down. Sweat burns the eyes, flows along the edge of the nose, gathers, then pushes on down to the corner of the mouth. A tongue flicks out. Salty. Yech!
Hot, tired, smelly and uncomfortable, you hear a voice. *"Cold soda, Marine?"* *You smile a "yes!"*
She flips off the soda top and pours the fluid into a paper cup full of chipped ice. You gulp down a large mouthful of the cold, sweet fluid. Small chips of ice slide down your throat along with the soda. Then you realize, too late, that slivers of glass are cutting your stomach . . . from the inside, out. The games people play in Vietnam are deadly.

A convoy of trucks moves slowly down the highway to Hue. A group of small boys offer loaves of French bread to Marines riding on the backs of the vehicles.

One of the trucks, loaded with supplies, suddenly heaves into the air; Marines thrown into lifeless shapes, landing in heaps on the side of the road.
One loaf of bread contained a hand grenade.
Cpl Burley Boykin was point man on a patrol with Co., 3d Recon Bn., when he tripped a homemade Viet Cong booby trap. The jazzed up I, beer can was filled with bits and pieces of discarded metal and Boykin caught 80 of them throughout his body.
Boykin was lucky. Though a painful encounter, he would live and walk the point again. But he walked ever so cautiously!

The Viet Cong's ability to make weapons from discarded objects is uncanny. Their tools are crude. Few enemy guerrillas have any technical knowledge explosives. They're lackadaisical in their approach to providing pain.

They don't care if they kill or maim, as long as they put a combatant out of action, while using as much pain as possible in the process.

Ever hear about the Marine and the bear trap? The enemy rigged the device so it took a special key to release the victim. A Marine stepped in and jaws clamped shut. No key was available for his release.

When others attempted to evacuate the casualty helicopter, it was learned that the device was chained to a concrete slab embedded in three feet of earth.

To evacuate the Marine meant digging up the anchor, carrying the concrete, chain, bear trap *and* the casualty to the landing zone. When the chopper set down at Da Nang, a doctor, corpsmen and Marines with hacksaws and cuffing torches were also standing by to release the jaws of the trap from the Marine's leg.

Punji stakes, sharp needles of bamboo, are concealed along paths and roads. Advancing Marines come under enemy fire and dive for concealment . . . to be pierced by deadly points which have been dipped in animal excreta to infect those not receiving fatal punctures.
Viet Cong booby traps don't look good. They aren't smooth, shiny or professional in make-up or composition. They're crude, clumsy, unbalanced, often resembling Rube Goldberg inventions.
Some are primitive, such as huge, heavy balls of mud which contain pointed spears. They're hung high and fall heavily on unsuspecting troops below.
Some are ridiculous. You'd laugh, until the thing exploded, knocking the grin off your face. Then you'd realize, they're *things that* kill!.
Enemy booby traps came in a variety of shapes and sizes. Some crude; others, highly sophisticated. Marine explosive experts, engineers, recon SCUBA teams and scout dogs continually searched for the gadgets of death. Some Marines chose to ignore the dangers of hidden explosives. It often proved a costly mistake. Some lived...many did not.

"Chasing' Charlie"

Charlie was elusive and cunning. Marine grunts and aviators teamed up in heli-assaults on suspected Viet Cong strongholds. At times, it appeared that the sky was full of droning choppers crammed with combat-ready Marines. At other times, Marine grunts rode to combat on armored vehicles, such as amphibious tractors, tanks and Ontos, which ferried units into battle.

But it wasn't the helicopter or the steel monster which found, faced and fought the enemy. It was the grunt. It was the young Marine, the recent enlistee who was trained, supplied, armed and transferred to Vietnam, who made the final contact with Charlie. It was the grunt who made Charlie run.

"The Sky Is Ours"

On the ground in Vietnam, the enemy may be anywhere, but in the air, it's a different kind of war.

The air belongs to allied jet jockeys, transport humpers and chopper poppas. Marine aircraft, regardless of size, shape or speed, drone unopposed through the skies of South Vietnam.

Marine close air support is like a poker hand with three jets as openers. Skyhawks, Phantoms and Intruders provide surprise, punch, speed and countless enemy casualties.

The Intruder, an all-weather attack bomber, can carry 28 500 -pound bombs, flying through any natural weather disturbance which grounds other aircraft.

Supersonic Phantoms with bombs, rockets and the 20mm mini gun (which "burps" 4000 rounds a minute, or 65-70 rounds per second) provide headache number 44 to enemy guerrillas moving towards friendly lines.

Skyhawks, stubby-winged jets, have recorded 120 sorties a day, dropping more than 10,000 tons of ordnance, up to 1000 pounders.

But it isn't all jets in the 'Nam. Jumbo, cargo planes, as the C-130 Hercules, burdened with men, mail, chow and whatever else there's room for, waddle out to the flight line, grunt and groan, then lumber into the air like gooney birds.

Observation craft, the O-1E Bird Dogs, unarmed and slow moving, carried six 2.75mm Willy Peter rockets for marking targets for the jets.

Helicopters come in a variety of shapes and sizes. First, there was the thinly clad, mosquito-like Sea Horse. It was small and could carry a limited load, but it was a workhorse, and dependable.

They ferried wounded from battle. They carried beans, bullets and broads. The latter, visiting USO troops. They flew plasma, VIPs, rockets or water.

The Sea Knight was huge in comparison, and could carry a lot more weight. It also mounted .50 caliber machine, guns instead of the .30's the Sea Horses toted.

Then came the Sea Stallion, an assault transport cargo helicopter, largest in the Free World's arsenal. Built especially for Marines, it carried 38 combat laden troops. Dubbed "Super Bird," it can trail a 20,000-pound external load. Top speed: 170 knots.

A Huey is a polliwog-like machine with a bump for a nose and a sawed off cigar for an exhaust, but no one laughs as it "whomp whomps" across the sky. It carries a rocket pod on each side, mounting eighteen 2.75-inch rockets. Two mounted machine guns are situated atop the rocket pods.

From the Huey evolved the Cobra, smaller, thinner, but with one hell of a sting! It boasts a rapid firing mini-gun pod that spits either 3000 7.62 rounds, or, with a flick of a switch, belches out a total of 279 40mm grenades.

Alongside the Cobra's center are rocket pods that carry 56 high explosive rockets.

Another innovation, introduced in Vietnam, is the OV-10A "Bronco," similar in design to the Lockheed Lightning or Black Widow of World War II.

The plane is armed with four internal 7.62 machine guns, two on each side. It can carry a total load of 3600 pounds of bombs, or marking rockets, Sidewinder missiles or the fast-firing mini-guns.

During the monsoon season, with torrential rains blanketing the airstrips, the enemy figured they'd have it knocked. No aircraft, they reasoned, could take off under such conditions. They attacked. So did the Marine pilots.
Results? Heavy enemy casualties.

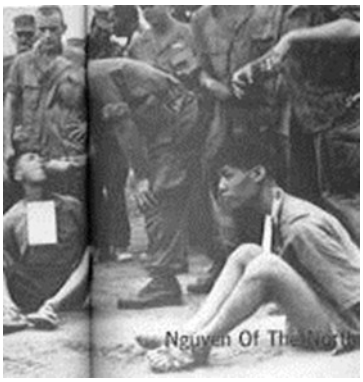
The enemy may roam the paddy or jungle, but sometimes he forgets, the sky is ours!

The role played by Marine aviators and the importance of Marine aircraft in Vietnam may never be properly told. In addition to aerial observation and reconnaissance, close air support, saturation bombing, strafing runs, medical evacuations and delivering the mail, aircraft provided a great morale boost to ground units while seriously demoralizing the enemy.

Many hard core Viet Cong and North Vietnamese soldiers surrendered to allied forces because of the continued pounding, strafing or hazing by Marine pilots and their aircraft. Without Marine pilots and their "birds," the story of Hill 881 or the results of the stand at Khe Sanh might have had a much different ending.

"Nguyen Of The North..."

Just before Thanksgiving Day, 1965, 3/7 met an enemy force near Quang Ngai. Three of the enemy were killed. Eight weapons were captured.



It marked a turning point in the war. The enemy proved to be members of the 95th Regiment, 325th Alpha Division, North Vietnamese Army. Nguyen of the North was migrating south.

At that time, it was estimated that seven NVA regiments had crossed into South Vietnam; an eighth was considered "probable" and a ninth, "possible."

By early 1968, four NVA divisions and elements of two other divisions were fighting in the south. '

How does Nguyen of the North differ from his fighting ally, Charlie of the South?

Early Radio: Military Communications

Nguyen is a "bo doi" or basic infantryman. He'll wear a simple, lightweight uniform which may be many colors, including gray, gray-green, khaki or even robin egg blue. He wears a light, camouflage covered pith helmet.

He carries plastic canteens on a thin webbed belt, and if he carries a knife, it'll be crude; homemade. He'll have an entrenching tool, and wear the canvas, rubber soled shoes, or "Ho Chi Minh" rubber sandals.

He's comfortably dressed and well armed, carrying a modern, effective ChiCom copy of a Russian weapon, either an SKS carbine, AK-47 assault rifle, light machine gun or rocket launcher. The SKS, AK and machine gun use the standard 7.62 cartridge.

Operating in the field, he's formed into squads, platoons, companies, battalions, regiments and divisions. He utilizes the "triangular" concept with three squads per platoon, three platoons per company and so forth. (A squad is 10 men divided into three cells.)

A rifle company has from 60 to 130 men and includes three rifle platoons and a weapons platoon which has 60mm mortars, 57mm recoilless rifles and light machine guns.

A regiment (1400 to 2000 men) may have special units attached, as signal, engineer, recon or medical, and may carry heavy machine guns, 120mm mortars and 70mm or 75mm pack howitzers.

Communications units carry field telephones, small hand radio sets or sophisticated switchboards and transmitters.

Engaged, they frequently use the "close embrace" tactic, meaning they get as near as possible to the enemy (as they did to Marines at Khe Sanh) to prevent the use of supporting fire.

The NVA is not a rinky-dink outfit. Nguyen has proved himself a well-trained, professional combatant.

During "Operation Hastings" in July 1966, Task Force Delta with 2/1, 2/4 and 3/4, the Special Landing Force (3/5), 1/1 and 1/3 clashed with NVA of the 324B Division. In all, 8000 Marines and 3000 South Vietnamese troops met Nguyen and his comrades. Then began "Operation Prairie" and "Deckhouse IV."

Nguyen of the North was fighting with his back against his homeland. He was well equipped; well trained; well supplied. But he was not invincible. Before the end of January 1967, nearly 1400 NVA had been killed during operations around the DMZ.

The NVA had moved concentrations of troops into the South through the DMZ because it was an easier route than along the Ho Chi Minh jungle trail. Also, moving through the Demilitarized Zone shortened Nguyen's supply lines.

He was stopped by American Marines . . . but it wasn't a permanent halt.

He'd be back . . . at Mutter's Ridge, Khe Sanh, Hill 881 and Meade River. Marines would hear more of Nguyen of the North.

The huge white star of North Vietnam waves next to the Ben Hai River Bridge, separating North and South Vietnam. The bridge is located in the Demilitarized Zone, and, in accordance with the Geneva Convention, it is neutral. However, Nguyen of the North Vietnamese Army infiltrated through the DMZ and into the Republic of Vietnam. His route varied. Inland, the Ho Chi Minh Trail was the most direct route, but the North Vietnamese soldiers also come by sea in fishing boats.

"Sunday Punch..."

"A Marine's concept of a perfect battle is to have other Marines on the right and left flanks, Marine aircraft overhead and Marine artillery and naval gunfire backing them up."- Ernie Pyle

Marine air support was explained in the chapter headed, "The Sky Is Ours." What remains is the story of guns; little guns, medium-sized guns and those bodaciously barreled boomers which project which project thousands of meters away with devastating results.

Even if the shrapnel doesn't kill, the concussion will, and if that doesn't, the enemy will probably die of fright from the noise!

Supporting Marine grunts is a collection of small weapons, such as the 60mm and 80mm mortar, the 4.2 howtar (mortar) and the 3.5 rocket launcher.

Within a squad, the M79 grenade launcher may be considered a supporting arm, but then, within a squad, under strained circumstances, a hand grenade or a rock may be considered "supporting arms," depending on the situation.

Terrain in Vietnam limited the use of armored columns, but the guns on armored vehicles lent a definite advantage to Marines. Amtracs carried machine guns. Some amtracs, (1st Armored Amphibian Company) had turret-mounted 105mm howitzers.

Tanks sported 90mm cannons, and the Ontos, (Greek for "The Thing,") carried six 106 recoilless rifles. The Ontos was intended to be a tank destroyer. The enemy in Vietnam doesn't use tanks to any great extent, so Marines utilized the vehicle against entrenched enemy troops with satisfactory results.

The mobility concept developed by the Third Marine Division near the DMZ provided a speedy method of providing artillery support to Marines. Once an area was cleared, a hasty landing zone was blasted out, and helicopters ferried 105 or 155mm howitzers to the hilltop. (Approximate effective range of a 155mm howitzer is 2300 meters.)

The Ist Marine 8-inch Howitzer Battery knocked out 19 NVA artillery pieces and damaged another 25 enemy guns during August 1968. The enemy was firing from the Demilitarized Zone against Marine fire bases.

The approximate range of the 8-inch gun is 4200 meters. Big Mama of Marine artillery is the 175mm gun which weighs 62,100 pounds. *It can hurl a projectile 11,500 meters!*

VE Testing:

Saturday, July 28th, 2012 - AES - 9:30 am to 11:30 am.

September 29th, 2012—AES– 9:30 am to 11:30 am.

October 27th, 2012—AES 9:30 am to 11:30 am.

November 24th, 2012—AES 9:30 am to 11:30 am.

ALL testing takes place at: Amateur Electronic Supply 5720 W. Good Hope Rd. Milwaukee, WI 53223

Area Swapfests

August 11th Fifth Annual RACINE MEGACYCLE FREEFEST 2012 Location: Sturtevant, WI
Type: ARRL Hamfest Sponsor: Racine Megacycle Club
Website: http://www.w9udu.org

August 11, 7 to 11 a.m. - Lakes Area Amateur Club Hamfest at the Lyons Town Hall, 6339 Hospital Rd., Lyons. Michel Bartolone, NX9A, 262-210-8652.

August 25th, Sixteenth Annual Circus City Swapfest
Location: Baraboo, WI
ARRL Hamfest, Sponsor: Yellow Thunder Amateur Radio Club Website: http://www.yellowthunder.org

MRAC Working Committees

95th Anniversary:

- Dave—KA9WXN

Net Committee:

- Open

Field Day

Dave—KA9WXN, Al—KC9IJJ

FM Simplex Contest

- Joe – N9UX
- Jeff – K9VS

Ticket drum and drawing

- Tom – N9UFJ
- Jackie – No Call

Newsletter Editor

- Michael-KC9CMT

Webmaster

- Mark Tellier—AB9CD

Refreshments

- Hal—KB9OZN

Membership Information

The Hamateur Chatter is the newsletter of MRAC (Milwaukee Radio Amateurs' Club), a not for profit organization for the advancement of amateur radio and the maintenance of fraternalism and a high standard of conduct. MRAC Membership dues are $17.00 per year and run on a calendar year starting January 1st. MRAC general membership meetings are normally held at 7:00PM the last Thursday of the month except for November when Thanksgiving falls on the last Thursday when the meeting moves forward 1 week to the 3rd Thursday and December, when the Christmas dinner takes the place of a regular meeting. Club Contact Information

Our website address **http://www.w9rh.org**

Telephone **(414) 332-MRAC (6722)**

Address correspondence to:

MRAC, Box 240545, Milwaukee, WI 53223

Email may be sent to: **w9rh@arrl.net .** Our YAHOO newsgroup:

http://groups.yahoo.com/group/MRAC-W9RH/

CLUB NETS:

- The Six Meter SSB net is Thursday at 8:00PM on 50.160 MHz USB
- Our Ten Meter SSB net is Friday at 8:00PM on 28.490 MHz ± 5 KHz USB.
- Our Two Meter FM net follows the Ten meter net at 9:00PM on our repeater at 145.390MHz - offset (PL 127.3)

An ARRL Affiliated Club

The HamChatter is a monthly publication of the Milwaukee Radio Amateurs' Club.
Serving Amateur Radio for Southeastern Wisconsin & Milwaukee County Club Call sign – W9RH
MRAC Website: http://www.W9RH.org
Editor: Michael B. Harris, Kc9cmt, kc9cmt@Earthlink.net

Milwaukee Area Nets

Mon.8:00 PM 3.994 Tech Net

Mon.8:00 PM 146.865- ARES Walworth ARRL News Line

Mon.8:00 PM 146.445 Emergency Net

Mon.8:00 PM 146.865- ARES Net Walworth

Mon.8:45 PM 147.165- ARRL Audio News

Mon. 9:15 PM 444.125+ Waukesha ARES Net

Mon.9:00 PM 147.165- Milwaukee County ARES Net

Tue.9:00 AM 50.160 6 . Mtr 2nd Shifter's Net

Tue. 7:00 PM 145.130 MAARS Trivia Net

Tue. 8:00 PM 7.035 A.F.A.R. (CW)

Wed. 8:00 PM 145.130 MAARS Amateur Radio Newsline

Wed. 9:00 PM 145.130 MAARS IRLP SwapNet d FM-38 Repeaters (IRLP 9624)

Thur. 8:00 PM 50.160, 6 Mtr SSB Net

Thur. 9:00 PM 146.910 Computer Net

Fri. 8:00 PM 28.490 MRAC W9RH 10 Mtr Net SSB

Fri. 9:00 PM 145.390 W9RH 2 Mtr. FM Net

Sat. 9:00 PM 146.910 Saturday Night Fun Net

Sun 8:30 AM 3.985 QCWA (Chapter. 55) SSB Net

Sun 9:00 AM 145.565 X-Country Simplex Group

Sun 8:00 PM 146.91 Information Net

Sun 8:00 PM 28.365 10/10 International Net (SSB)

Sun 9:00 PM 146.91 Swap Net