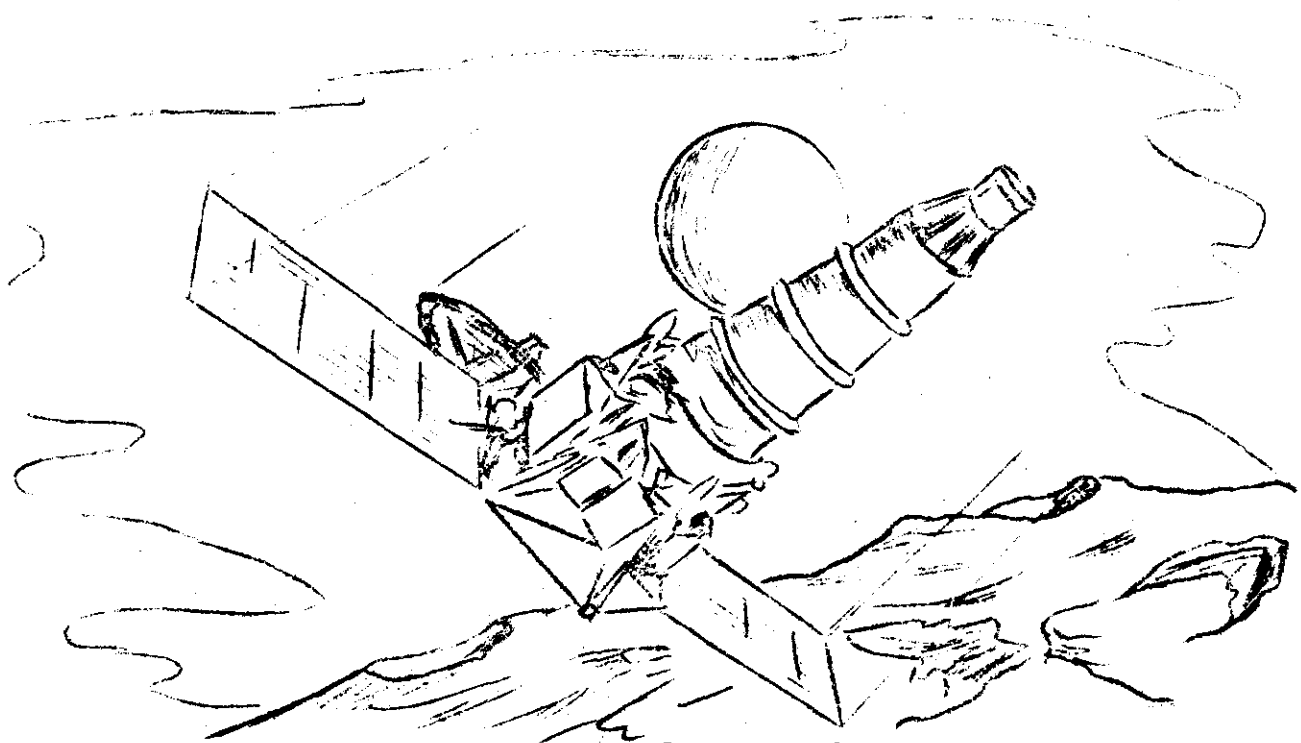
GLOUCESTER COUNTY AMATEUR·RADIO·CLUB NEW JERSEY

CROSSTALK

NOVEMBER 1965 VOL. 7 NO. 11

THE STORY OF RANGER IX see page 4



AREC PARTICIPATES IN SET--

The Gloucester County AREC participated in the Nationwide Simulated Emergency Test sponsored by the ARRL over the weekend of October 8-9-10. Several 50 mc. fixed stations as well as mobile stations passed simulated emergency traffic from points in Gloucester County to the NET Control Station where it was routed and passed to points across the country. Jim Peck, W2LVW EC/SEC, deemed the test a complete success.

WHITE ELEPHANT SALE NETS $52.

Everybody went away happy! Maybe poorer $ wise but richer ham gear wise. Allkinds of good goodies, and not so good goodies, went on sale..at the October GCARC meeting. There were some real bargains, too... new 4X150's @ $1.00 each...$12 relays for 50¢...and 811A's @ $1.50 each. If you weren't there, you missed some good buys!

FOR SALE--HE-45B & HE-61A

WANTED--Plastic QSL card holders

Anyone interested in buying 813's? Call Bob WB2RVE

HERE AND THERE...

The Reading Radio Club, formerly W3CCH, is now W3BN. W3BN was last held by the late Jim Marx, a past president of the club.

GCARC TO HAVE CODE CLASS

Just before press time it was learned that arrangements have been made to start the code and theory classes for the year. Jack Bowen, who is in charge of the instruction this year, announced that the classes will be held in PITMAN HIGH SCHOOL, rooms 108 and 109 on Thursday evenings from 7:00 to 9:00 beginning October 28. All interested in attending are invited to do so. No previous registration is necessary just show up on Thursday evenings. GCARC membership is not a prerequeset for attending. Anyone interested may attend. From time to time some of the club members will be needed to help with the classes.

WB2PHV RESIGNS

Hank Hankinson, WB2PHV, the newly elected SCM for Southern New Jersey has resigned due to a transfer in his employment. Hank took office on August 26 of this year. W2ZI, Ed Raser, who is well known in South Jersey, has been appointed by the ARRL to serve until elections can be held sometime in January of 1966.

ATLANTIC DIVISION ELECTION TO BE HELD FOR ARRL DIRECTOR

All ARRL members in the Atlantic Division will shortly receive a ballot to vote for a new director and vice director. All members are urged to vote....let it not be heard six months from now that you disapprove of the way ARRL affairs are being run if you do not take this opportunity to select the man to represent you on the ARRL board. Complete instructions are contained with the ballot.

RENEW ARRL MEMBERSHIP THRU GCARC

CROSSTALK...

is the official publication of the Gloucester County Amateur Radio Club, Inc. The deadline for the submission of material for publication is the 20th of the month. Any material contained herein may be reproduced provided proper credit is given.

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MEETING NOTICE

THE REGULAR MONTHLY MEETING OF THE GLOUCESTER COUNTY AMATEUR RADIO CLUB WILL BE HELD ON WEDNESDAY EVENING, NOVEMBER 3, AT THE PITMAN BUSINESS OFFICE OF THE ATLANTIC CITY ELECTRIC COMPANY (2nd FLOOR), 7 SOUTH BROADWAY, PITMAN.
PLEASE NOTE THE CHANGE IN MEETING PLACE...STARTING TIME-8 P.M.

FACTS ABOUT YOU

Tetanus, which is almost 100 per cent preventable, is fatal in from 30 to 50 per cent of all cases.

Application of a baking soda-and-water paste will generally relieve the pain of a burn.

de K2JKA

VOTE--VOTE--VOTE--say the signs plastered on buses, store windows, and in magazines these days. A little bit of this stratagy could be applied to GCARC. As you well know, December 1 is GCARC Election Day. The polls open at the end of the business meeting and stay open until we have elected 5 officers and 2 directors for 1966.

But, before we can vote, we need candidates. The nominating committee will have met by the time you read this. They will have picked a slate. The November and December meetings will present an opportunity for additional nominations. Will you take an active part in GCARC '66?

Ye-hon-ed received a letter during the past month asking who the word "we" referred to in some of the editorials in Crosstalk! All three of us--me, myself, and I...WHO ELSE!

AN INSIGHT INTO THE ELECTRONIC EQUIPMENT CARRIED BY

RANGER IX

From time to time the programs at regular GCARC meetings have touched on SPACE EXPLORATION, the most recent being photographs taken by RANGER MOONPROBES. All seemed to enjoy this so the ED has come up with some additional information on some of the complex electronic equipment that was aboard the history making RANGER IX.

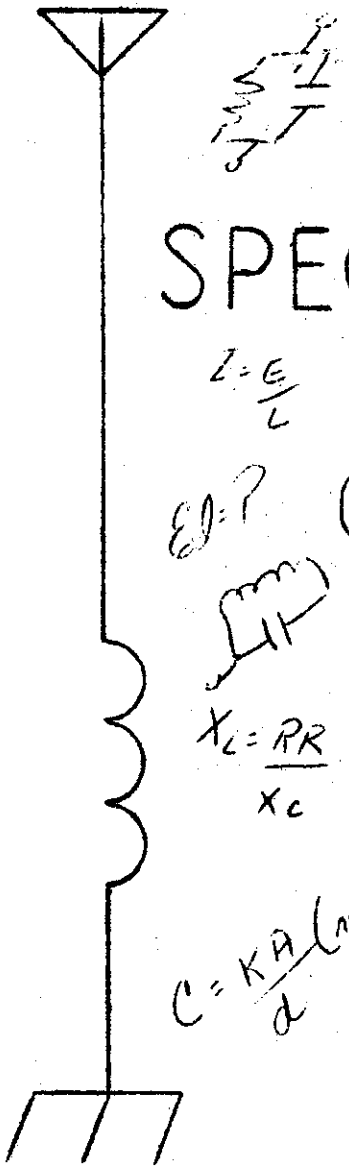
In 1958, the Jet Propulsion Labratory, which had been operated by Caltech for the Army was transfered to the National Aeronautics and Space Administration. Deep space explorations immediatly followed, Mariner II to Venus, Mariner IV to Mars and the tremendously successful Ranger moonprobe shots.

In all the Ranger shots returned 17,259 pictures of the moon's surface to the earth. What was accheived was truly remarkable. Lunar resolution of detail was increased by a factor of 1000. This means that the moon, which to the unaided eye is seen at a distance of 240,000 miles and through the best telescopes at an equivlent distance of 500 miles, has been resolved to a distance of half a mile!

THE RANGER TELEVISION SYSTEM was the dominant factor in the design of the space vehicle. In all six cameras were used. The camera signals were directed to one of two video combiners; the output of this was converted to an FM signal which was fed into a 7 watt driver which in turn drove one of the two 60 watt TV transmitters. Pictures were earthbound on 959.52 and 960.58 mc. Transmissions beamed toward the earth by the high gain antenna were received by the 85 ft. parabolic Goldstone antenna which is equipped with a Maser pre-amplifier. The 60 watt transmitters provided a substantial power margin above the receiver threshold. Modulation method, power level and system compatibility--all conceived in terms of maximum reliability--combined to determine the type of television transmission system that was designed. Studies show that FM modulation of the television signal would, within the current state of the art, would form the best combination of power requirements and equipment availability. Frequency tolerance of the TV transmitters was .0035%! Frequency deviation for 100% modulation of the vidio transmitter was 350 kc. (plus and minus) The final amplifier tube for the TV transmitters was a ML-7895.

THE RANGER TELEMETERING SYSTEM operated on a center frequency of 960.05 mc. (in between the two video chanels) and was FM modulated plus and minus 80 kc. (total bandwidth 160 kc.) The tube used for this function was an ML-546. The VSWR on the telemetering cavity was approx. 1:08 to 1. The power input to the telemetering transmisster was approx. 5 watts; the power output approx. .25 watt. For a period of 23 minutes following launch the voltage on the annode of the telemetry transmitter was reduced from 250 volts to 150 volts to reduce the possibility of arc overs while the Ranger passed through the ionized upper layer of the earth's atmosphere. Specifications called for a cavity power variance of no more than (plus and minus) .1 db over a temperature range of -10 degrees C to + 65 degrees C.

The source of the material for this article came from several places however the bulk of this came from the Rayethon Co.



THE HOW AND WHY SECTION
DEVOTED EXCLUSIVELY TO
TECHNICIAL MATERIAL

SPECIAL CROSSTALK BONUS PAGES

DIODES

THEIR RATINGS AND WHAT THEY MEAN

The P.I.V. rating on a diode refers to the peak inverse voltage that the rectifier is capable of with standing. Just what does this mean? In simple terms it can be stated as the maximum reverse voltage that a diode is capable of having applied across it's terminals before it breaks down.

HOW DO WE CHOOSE THE PROPER DIODE FOR THE JOB? Usually there will be two ratings on a silicon diode that will be of interest to us.

THE FULL WAVE POWER SUPPLY shown in figure #1 (with filter eliminated) will help with the explanation. Transformer T's secondary delivers 500 volts each side o of it's center tap; therefore the voltage between points A and C is 1000 volts. At any given point on the AC cycle, only one of the two diodes will be conducting, this means that each diode must be capable of handling the entire current drawn by load R. Looking at the diagram, we see that D1 and D2 are connected back to back across the secondary of transformer T, or across the entire 1000 volts. With one diode conducting, this puts the entire reverse voltage of 1000 volts across the other diode. Even though the output voltage of the supply will be approx. 500 volts, D1 and D2 should have a P.I.V. rating of at least 1000 volts.

THE FULL WAVE BRIDGE POWER SUPPLY shown in figure #2 presents a little different situation. At any given moment on the AC cycle here we have two of the four diodes conducting; either D1 and D4 or D2 and D3. Careful analisis of the circuit will show that both of the conducting diodes are in series with load R; therefore each must be capable of handling the entire current drawn by R. Here again we have two diodes back to back across the secondary of T, and the same rule applies here as it did in the full wave supply in so far as the P.I.V. rating is concerned. In the bridge supply the DC output will be near 1000 volts but must remember not to exceed the primary rating of the transformer in use. Normally this will mean that only ½ the current should be drawn from the secondary; however in the case of a transformer with several windings (filament, bias, etc.) where these windings are not being used, the primary is usually rugged enough to withstand the extra current being passed through it.

FIGURE #1

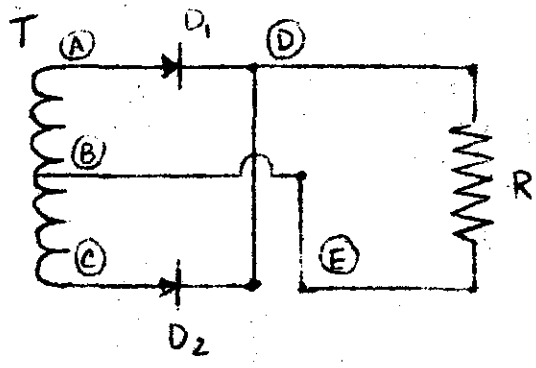
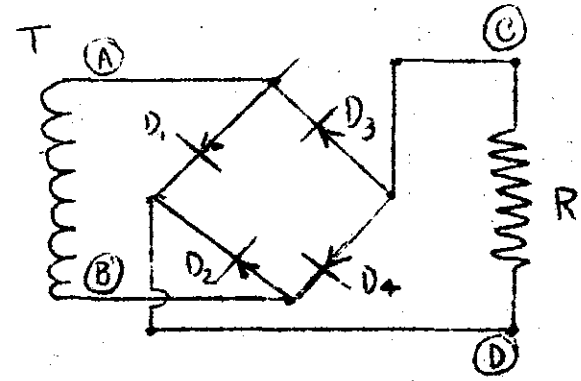


FIGURE #2



PART ONE OF A MULTI-PART SERIES

ABOUT ANTENNAE

written for CROSSTALK by Jim Peck W2LVW *

It should be obvious to every amateur that the antenna system is about the most important part of his radio system. Without it the radio system won't work, and without a proper antenna system, the radio system will not work at peak performance.

It should be equally obvious to every amateur that the antenna system is common to both his transmitter and his receiver; any change made to the antenna will affect both his transmission and his reception. Which brings me to one of my pet topics: the economics of the radio system. We can help our talk range (the normal distance of operation) by raising or doubling our transmitter power. This is expensive and affects only our transmission; it does not affect our reception. On the other hand, we can change the antenna so that it will effectively double our transmitting power while at the same time almost double the amount of signal that will be received. (Later on, it will be seen how this is accomplished) Therefore by changing the antenna system, we help both the transmission and the reception of signals. Generally speaking, it costs a lot less to install a good antenna than to raise the power of a transmitter.

What is an antenna? Well, that sounds like a really stupid question--but we will still devote a bit of space to it here. The antenna is the portion of the antenna system found at the top of your tower which is supposed to radiate energy out into space and also collect energy from space. It may be a simple dipole, or it may be a complex multi-element array. It takes radio energy from the transmission line and radiates it into space, and also collects radio energy from space and feeds it down the transmission line to your receiver. This is all than any antenna is supposed to do, is designed to do, and can do!

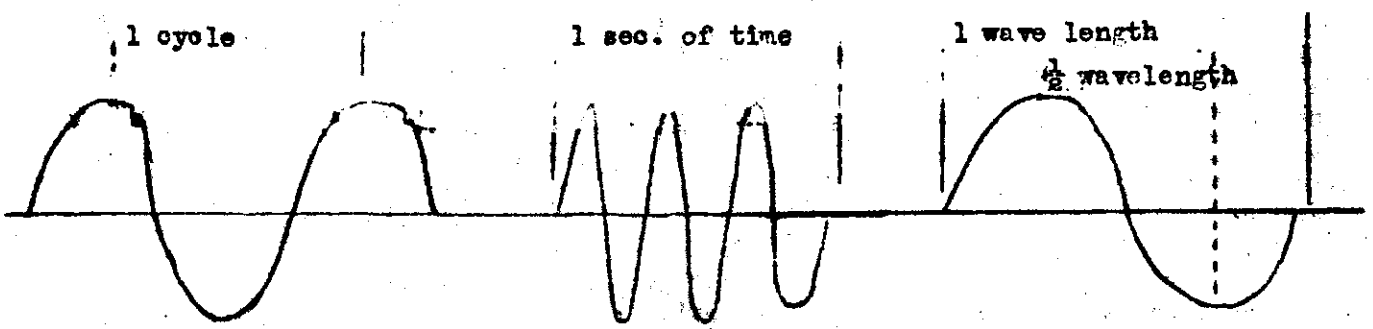
We can see that the antenna changes radio energy contained in the transmission line into radiated energy and vice versa. What is remarkable about this is how efficiently it does this. Whereas a light bulb commonly used around the house is only about 20 per cent efficient in changing electrical energy into light energy, the antenna system is almost 100 per cent efficient. The only losses are the so-called copper losses. (There are others, but too technical for the purposes of this article) Other losses come from such things as skin effect, insulator diaelectric, eddy currents, etc. But, the antenna is a pretty efficient device compared to most things which we find in amateur radio. Take it for granted that the antenna radiates better than 95 per cent of the watts which reach it from the transmission line. (This should show some of you the importance of "matching" the line to the antenna.)

Well, already it has become quite obvious that unless the antenna is properly matched, then it cannot accomplish the job it should. In our automobile we know that the gears must match if we are to transmit the maximum power to the wheels. The same thing is true of matching the transmitter, the transmission line, and the antenna. We match the output of the transmitter to the coaxial line or whatever line we are using by adjusting or tuning the output circuits. Since the standard in amateur radio seems to be around 50 ohms, we will use this figure

here. Let's connect a 50 ohm coax to our transmitter and put a 50 ohm dummy load at the other end of the line. (Everyone should have a 50 ohm dummy load) By use of a wattmeter we can read the power at the output of the transmitter and also at the end of the transmission line. The power difference is the loss in the cable; and we can do nothing about this; so, don't even worry about it. If the dummy load perfectly matches the line, all the power that reaches the dummy load will be dissipated. No power will be returned (reflected) back to the transmitter because it is all consumed..either in the line or the dummy load. This is what a good antenna will do for you. Now, let us assume that the load has changed to say 25 ohms. It becomes like a gear in our car which has half its teeth missing and can't accept all the power from our transmission line. The part that it cannot accept is rejected by the antenna and is sent back and forth down the line to the transmitter. This sets up a fexed wave pattern along the line which we can measure, and which is called the standing wave ratio (SWR) or the voltage standing wave ratio (VSWR). This ratio expresses the degree of match between the line and the load, whether that load is a dummy or an antenna. When the VSWR is 1 to 1 (1:1), we have a perfect match. When the VSWR is 1.5 to 1, the per cent reflected power is only 4 per cent; or, in other words, 96 per cent of the power reaching the antenna is being radiated.

Before we can explain a few more things further on, we will just review some basic terms which we normally use almost daily...Wavelength, frequency, and velocity. We know that a radio wave travels at the same speed as light, around 186,000 miles per second--or nearly a billion feet per second. This is its speed or velocity. We also know that this radio wave oscillates or alternates from a plus to a minus back to a plus, etc. This variation from plus to minus to plus we call a cycle, since like a wheel it keeps repeating itself. Now the number of cycles it goes through in one second we call frequency. If we know the frequency (which we can measure), we can then find out how far the wave travels in one cycle by dividing the speed by the frequency. We call this distance the wavelength; and we generally express it in feet or inches. Half of this distance or the distance between a plus and a minus change in the wave is called the wavelength. The following rundown will give most of you a mental image of the relative sizes of antennas involved at the different frequencies (bands):

On the 75 meter band, the approximate size of a halfwave dipole will be 130 feet
On the 40 meter band, the approximate size of a halfwave dipole will be 65 feet,
On the 10 meter band, the approximate size of a half wave dipole will be 16 feet,
On the 6 meter band, the approximate size of a half wave dipole will be 9.8 feet,
On the 2 meter band, the approximate size of a half wave dipole will be 3.35 feet.



A cycle completes itself in going from a plus through a minus back to a plus.

The number of cycles in one second gives us the frequency.

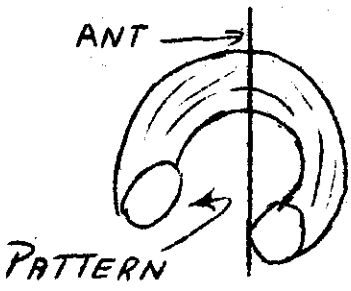
If we divide the speed by the frequency, we find the distance the wave travels in one cycle. This we call the wavelength.

THE HALF WAVE DIPOLE: This is the antenna which is used as the standard for all antenna reference tests. All gain references given by all manufacturers are in relationship to the half wave dipole. This is the most basic antenna used by amateurs. The half wave dipole is simply a straight conductor of wire, rod, or tubing that is electrically one-half wavelength long and is generally "fed" in the middle. It radiates at maximum intensity in the middle of the dipole at right angles to its length, and at minimum intensity at its ends. The dipole antenna is generally cut or adjusted in length to the desired frequency because it radiates best when it is resonant at the frequency you wish to operate at most efficiently. Furthermore, the electrical half wavelength is generally a few per cent shorter than the physical half wavelength in order to allow for what is called "end effect" of the conductor. A rule of thumb for the length of a half wave dipole antenna is: Length(in feet)= $\frac{492}{\text{freq. in mc's}}$. This formula says...a half wave dipole at 3.5 mc's is around 130 feet long, while at 145 mc's, it is about a foot long. It is a good idea to keep these lengths in your mind when you start talking about stacking antennas on towers, etc. More will be mentioned about this later.

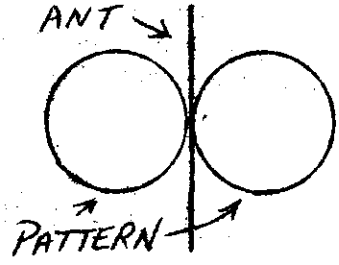
ANTENNA POLARITY: Antenna polarity simply refers to how the antenna is positioned or oriented. If the horizontal element are vertical, then the antenna has a vertical polarization; if horizontal, it has horizontal polarization. The thing to keep in mind here is that there is a great loss when one fellow uses one method and the fellow he is trying to work is using the other method of polarization. You both should be using the same polarization for maximum results.

ANTENNA RADIATION PATTERNS: All antennas have a given three-dimensional radiation pattern. If the radiation were equal in all directions, the pattern would be that of a ball or sphere. If we cut the ball or sphere vertically, we would have the vertical pattern and it would be a circle. If we cut the sphere horizontally, we would have the horizontal pattern; and it would also be a circle. At this point, we could make the statement that the vertical pattern was omnidirectional, and that the horizontal pattern was omnidirectional, and that the two were equal.

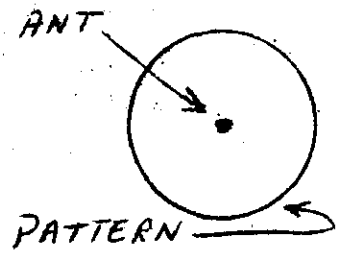
This new word used above could bear a little explaining. Omni comes from the Latin word "omnis" which means all. It is the combining form meaning all. So, in our case, we mean that the antenna has a pattern in ALL directions. Now with a theoretical explanation, this is always possible; but in actual practice, there is no such animal as an omnidirectional antenna. Our dipole mounted vertically has a three-dimentional pattern as shown in the drawing and has all the earmarks of a large fat donut. Looking at it horizontally, it appears like a figure 8 on its side.



3-dimentional view looks like a big fat donut



Vertical pattern looks like a figure 8 on its side.



Horizontal view looks like (and is) a perfect circle from the antenna.

Every amateur who ever worked DX has heard about vertical patterned antennas and the inherent low angle of radiation. This works out really fine on the lower bands where you are interested in the greater distances involved. On the upper bands, this is no longer a factor and other things become more important.

ANTENNA GAIN AND PATTERN: Antenna gain and pattern shape are tied together and you can't change one without changing the other to some extent. Since gain is a relative thing, we must have something to compare it to. As stated a bit earlier, this is the good old half wave dipole again. The half wave dipole has become the standard reference antenna. The gain of a half wave dipole antenna is stated as a gain of one or unity, or zero db (0 db.)

Here we go again with Daisy Belle. A lot of fellows would quit right here and say that this is too technical for me and no use of reading any more. Well, just stick around a bit more. This is not supposed to be a technical article. The decibel (db) is used to compare one power level with another. For example, say we have an antenna that has twice the power gain of a half wave dipole. Here is a small chart in which all of the math work has already been done for us and all we have to do is use it. Looking at this chart we see that if an antenna had a power gain of two, it is 3 db better than the reference antenna. So, the next time you run across a figure of 3 db, it means that this antenna has a power gain over a half wave dipole of 2. The rest of the chart now seems to be a little bit simpler.

POWER RATIO	=	DB	DB	=	POWER RATIO
0.10		-10	-10		0.10
0.20		-7	-7		0.20
0.40		-4	-4		0.40
0.50		-3	-3		0.50
1.00		0	0		1.00
2.00		3	3		2.00
2.50		4	4		2.50
4.00		6	6		4.00
5.00		7	7		5.00
8.00		9	9		8.00
10.00		10	10		10.00

The references used here below 0 db are just in order to try and show how this ratio can be used for low power or high power. For instance, the next step in the plus direction would be 100 for a power lever which would become 20 db. So this can be used by someone who never even heard of logs and antilogs.

LOOK FOR

PART II - ABOUT ANTENNAE

A discussion of antenna gain
An explanation of phase relationship
Shorted and open lines
Reactance and resistance

IN THE BLUE PAGES OF

DECEMBER CROSSTALK

SPACE SHOT FREQUENCIES

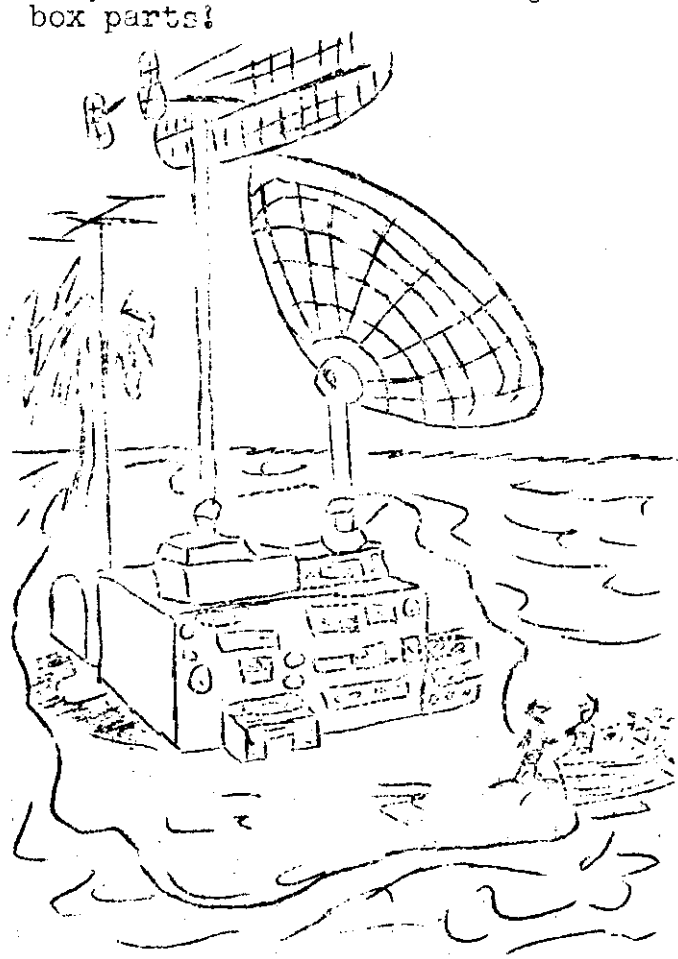
Those of you that have general coverage receivers might mark down these frequencies if you are interested in reading the mail on our space shots from Cape Kennedy:

5.258 7.579 10.613 15.016 and 15.969 mc.

These frequencies are used by the news services, recovery ships and helicopters, Cape Kennedy and the Houston Space Center for communications.

From the SPECTRUM W8GGE ED via AUTO CALL, Wash. D.C.

Yep, it was all made from junk box parts!



FCC INTERPRETATION
(excerpt from ARRL Vice Directors Notes....October AUTO CALL)

It is appearant from conversations and arguments overheard, that the FCC's intrepretation of sec. 97.81 regarding the use of licensed equipment by amateurs other than the one to whom licensed needs clarification. The true intrepretation as made by the FCC is that:

a) when the licensee is present in the station and a visitor is permitted to use the equipment the visitor may use the licensee's call, OR, with the permission of the licensee, may use his own call with the portable designator

b) when the licensee has granted permission to another licensed amateur to use the licensee's equipment and the licensee is not present while the visitor is operating, the visitor must use his own call with the portable designator

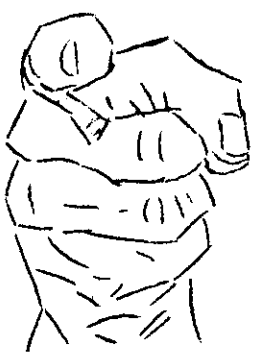
c) in the case of a club station the Trustee of the station may grant the authority to use the station equipment to any licensed amateur and he may also grant authority to such individual to use his (the non-trustee) own call with the portable designator, although the club call should normally be used.

d) in any case the station operation must conform to the limitations imposed by the FCC Rules on the class of license held by the individual who is using the equipment, regardless of the fact that the licensee may hold a higher class of license.

DON'T FORGET

THE NOVEMBER MEETING WILL BE HELD AT A NEW PLACE

SEE PAGE THREE



YOU

ARE

NEEDED

BY GCARC

TO

supply material for CROSSTALK

serve on committees

run for office in '66

FIRST ALIEN AMATEUR AUTHORIZATION UNDER PUBLIC LAW 88-313

On May 4 the commission issued the first permit for the operation of an alien's amateur radio station in the United States under public law 88-313. It went to Mrs. Grace Ruiz Castro Glorioso, licensee of TI2AMG who is now in the United States.

(from the FLORIDA SKIP W4IYT ed)

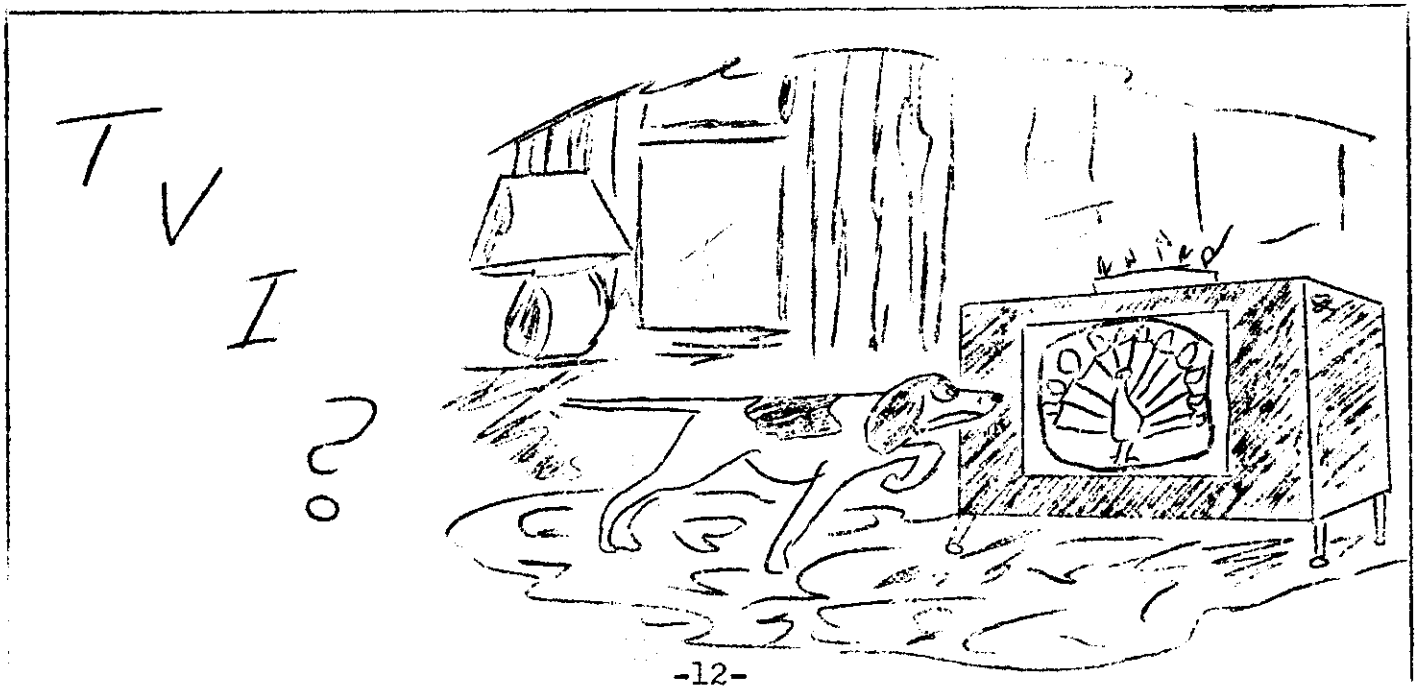
WE NEED SOME MATERIAL FOR THE CHRISTMAS ISSUE OF CROSSTALK WILL YOU HELP?

YE-HON-ED TALKS SOME MORE (as if he hasn't talked enough!)

Since joining the Amateur Radio News Service (ARNS) we have been receiving quite a few of the members publications. In case you didn't know the ARNS is an organization made up of editors of ham club magazines. We have tried to go through them and will try to devote a page or two of CROSSTALK a month to some of the more interesting material.

Did you like the blue pages of CROSSTALK this month? If so and would like to see them continued why not try to get some technicial material to me for use on these pages? If not, have a ream of blue paper left.....will sell to the highest bidder!

DONT FORGET...GCARC HAS A NEW MEETING PLACE THIS MONTH...SEE PAGE #3



HAMS HOROSCOPE Charles Vorderberg WØCCT October AUTO CALL

ARIES (March 21 to April 19) A fine day to look for QSO's outside of the crowded bands. If you're challenged, tell them you're from MARS.

TAURUS (April 20 to May 20) Those born at this time of year should feel jovial and gay. Get on the rig and wish everyone a "Happy May-day." You're bound to make dozens of contacts this way. (The FCC enjoys this "Mayday" business as it indicates the hams are cheerful and in good sprits.)

GEMINI (May 21 to June 21) Gemini! Haven't we heard of that some where recently? Keep busy, devote most of your day to work. Work on the ham bands, of course. Get new things for the home. (Phone patch, automatic keyer, maybe a new mobile rig.)

MOON CHILDREN June 22 to July 22) Impress friends with a goodly supply of brown 807's. An even half dozen will make transmitter payments seem remote. Give Dick at Arcade Electronics a couple and he will see things pretty much your way on the new transmitter payments.

LEO July 22 to August 21) Leo, of course, is Uncle Georges middle name. His stock for the season has some dandy buys. It is unwise to overlook new transmitters at this time.

VIRGO (August 22 to September 22) Get your problems out of the way first and then turn to fun. Problems like, trying to decide which band to work. The fun? DX of course.

LIBRA (September 22 to October 22) A trip to the mountains at this time is a good idea. One can make more contacts at higher altitudes. See that your affairs are in good order. i.e., listen on the frequency before transmitting.

SCORPIO (October 23 to November 21) Indulge in your favorite philanthropies. It is suggested that you talk to only YL operators. Eyeball QSO's produce very pretty eyeballs, as you know.

SAGITTARIUS (November 22 to December 21) Christmas shopping is tops during this period. Buy the XYL practicial gifts such as call books, mikes, some QSL cards, or maybe a new receiver.

CAPRICORN (December 22 to January 20) A good time to pay your club dues. This should be done before the xmas bills are paid. Important things first you know!

AQUARIUS (January 21 to February 20) It is impossible to perform during this period without a new linear amplifier. So the XYL wants a new stove. You can't make contacts with a stove.

PISCES (February 20 to March 20) Convince the XYL that the old home needs a few things fixed up, cleaned up and painted up. Start with the ham shack.