Here's some food for thought when you start to contemplate a new antenna.

LONG, LONG DIPOLES

BY JACK R. ROTHWELL,* VE7TK

This article is intended to stimulate thought on the use of long antennas, no matter what band you may operate.

The simplest and most widely used antenna today is the half wave dipole because it is easy to erect, low priced and resonant at 70 ohms thus eliminating the requirement of an antenna tuner.

It can be improved upon, retaining all the good features, except that more space will be required.

The two antennas to be described, the one and a half wavelength dipole and the one wavelength off center fed dipole, will give extremely good performance on any band.

The coaxial feed line should be adjusted to at least a ½ wavelength. In basic figures typical lengths would be:

1.815 MHz. = 180′
3.850 " = 84′4″
7.250 " = 44′9″
14.25 " = 23′9″
21.25 " = 15′3″
28.60 " = 11′4″

or multiples of the above.

Recommended reading on feed line lengths is K7GCO's article in the May 1974 edition of *CQ*.

Both antennas are fed at their 70 ohm point. The height above ground will affect the impedance just as it does with the half wave dipole. A chart showing radiation resistance versus height is shown in fig. 1. Similar charts will be found in the *ARRL Handbook and* Wm. Orr's *Radio Handbook*.

*P.O. Box 3359, Vancouver, B.C. Canada V6B 3Y3

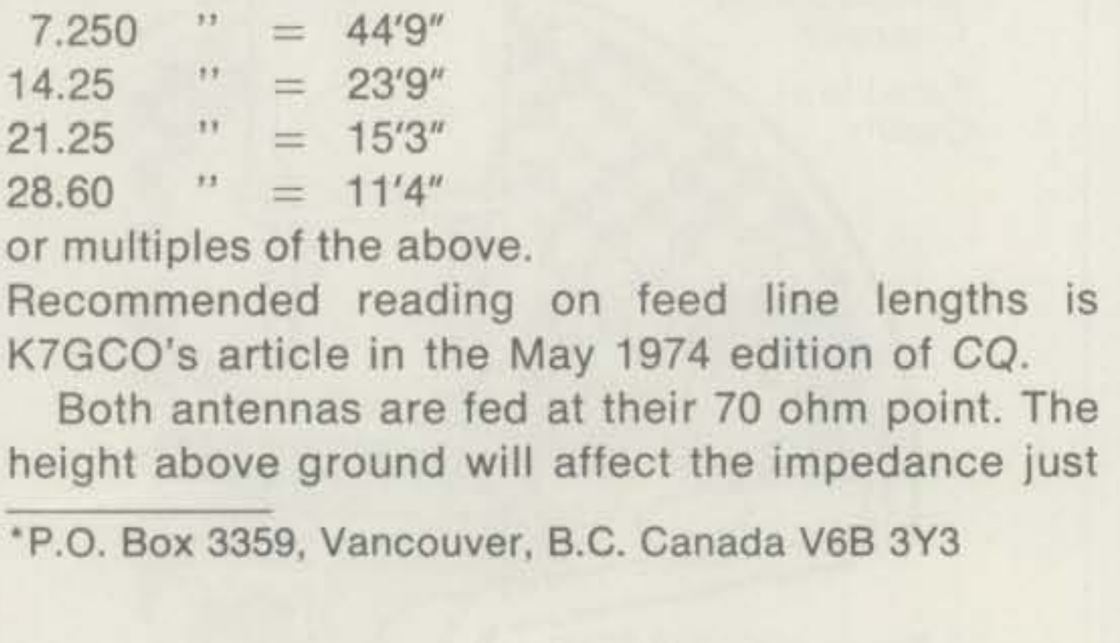

Fig. 1—Radiation resistance versus height.

These charts show a steep drop of impedance from ¼ wavelength to less in height. The reason for this is that the charts are for heights over perfectly conducting ground. In actual practice the drop is not so steep.

Many amateurs think that the ground surface is true ground but this is not correct. Obstacles on the surface such as cement and asphalt driveways, buildings and other similar objects affect the position of true ground. Underground water, large rocks, gravel and hard pan also have an affect, thus true ground can vary from a few feet to many feet under the surface. Most amateurs have problems at their city QTH's getting their antennas up high, so on 160 and 80 Meters under this circumstance you will probably find the impedance closer to 50 ohms.

The 1½ wave, besides being an excellent horizontal antenna, also gives a good account of itself as an inverted "V", and the ends may be brought closer to the ground than with the ½ wave version.

Typical overall lengths for the center fed 1½ wave dipole at random selected frequencies are as follows:

1.815 MHz. = 773′6″
3.850 " = 364′6″
7.200 " = 195′
14.25 " = 98′6″
21.25 " = 66′
28.60 " = 49′

The formula is; Length in Feet $= \frac{1404}{\text{Freq. in (MHz.)}}$

While the 1½ wavelength dipole is a fundamental frequency antenna, by coincidence the 21 MHz. dimensions work out to be a ½ wave dipole for 7 MHz. This fact has been exploited to the fullest, particularly by Novices.

Another long dipole that will perform very well is the 1 wavelength. In order to be resonant at 70 ohms it must be fed off centre with ¾ wavelength

on one side and ¼ wavelength on the other side.

At the present time "sloper" antennas are very popular, particularly on 40 meters. The 1 wave will provide outstanding results as a sloper. The slope angle should be kept between 45 and 60 degrees. As the slope angle is decreased from 45 degrees, the antenna tends to become a horizontal radiator and as the slope is increased over 60 degrees, it gradually becomes a vertical radiator.

The height above ground applies to the feed point in the sloper configuration and fig. 2 shows the proper erection method with the longest element closest to the ground surface. This basically is to give more height to the feed point. The coax cable should be kept at right angles for as far as possible to help keep the s.w.r. low.

Typical lengths for the 1 wavelength at random selected frequencies are as follows:

Freq. (MHz.)	Overall Length	Dim. "A"	Dim. "B"
1.815	515'6"	386'9"	128'9"
3.850	243'	182'3"	60'9"
7.200	130'	97'6"	32'6"
14.25	65'8"	49'3"	16'5"
21.25	44'	33'	11'
28.60	32'9"	24'6"	8'3"

Formulas are:

$$\text{Overall Length in Feet} = \frac{936}{\text{Freq. (MHz.)}}$$

$$\text{Dimension "A" in Feet} = \frac{702}{\text{Freq. (MHz.)}}$$

$$\text{Dimension "B" in Feet} = \frac{234}{\text{Freq. (MHz.)}}$$

The off center fed 1 wavelength dipole is a fundamental frequency antenna. The center conductor of the coax should feed the ¾ wave section of the antenna or dimension "A".

It should be noted that the foregoing formulas

(continued on page 86)

NOTES:
Dimension A = ¾ wave
Dimension B = ¼ wave
Angle for best performance = 45%to 60%

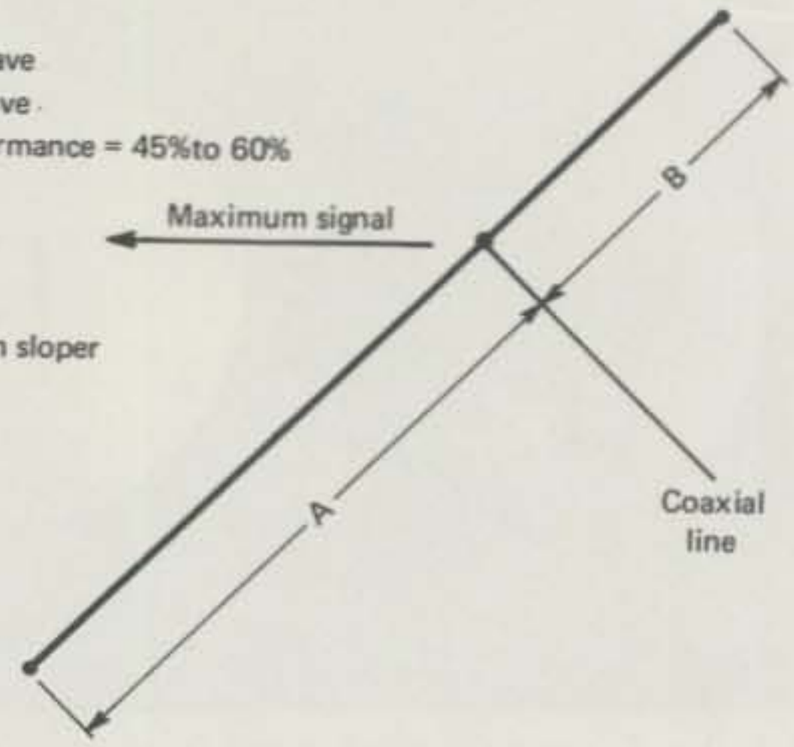

Fig. 2—Basic sloper configuration. The longest element goes closest to the ground.

Long Long Dipoles *(from page 37)*

for the long dipoles differ from the formula for the end fed long wire antenna which is:

$$\text{Length in Feet} = \frac{492\ (N\text{-}0\ .05)}{\text{Freq. (MHz.)}}$$

N = Number of ½ waves in the long wire antenna.

The reason for the difference is due to the end affect in the dipoles. The long wire dipoles in free space being fed at the 70 ohm point are similar to the ½ wave dipole in free space and so are made shorter by approximately 5%.

Maximum radiation from a half wave horizontal antenna is broadside to the wire. If the antenna is increased in length to one wavelength or more and fed off the end, some lobes will appear off the sides but the radiation concentrates off the ends. In long wire dipoles this holds true but the pattern is modified. The side lobes will be greater than those of the end fed long wire however there will still be radiation off the ends. There will also be an increase in gain over the ½ wave dipole when the antennas are compared to one another in their most favored direction. The higher you raise a one wavelength or longer antenna, the greater the increase in gain there will be over the half wave if they were to be compared to one another at the same height. Proper orientation of long wire antennas allow them to radiate a stronger signal in a desired direction than that possible with a half wave.

Patterns for ½, 1 and 1½ wavelength antennas may be found in most of the antenna and radio handbooks. The patterns shown in these books for one wavelength and over are more likely obtained patterns for the end fed long wires, but are reasonably applicable to the long wire dipoles. There will be some modification and for example the one wave dipole will have lobes at right angles to the wire whereas the one wave end fed will show lobes off the ends. There will still be radiation off the ends of the one wave dipole but it will have a pattern more closely related to the 1½ wave end fed. The 1½ wave dipole and end fed patterns are very similar.

There will be those who will wish to use the long dipoles for multiband operation. If you are so inclined this can best be done by inserting traps at the appropriate points.

It is possible to use multiple radiators but the author is against this method as it is extremely high in harmonic radiation. A tuner is almost a must.

The 160 and 80 Meter long, long dipoles will be easier to install as inverted V's. The author has, however, worked quite a number of stations on both of these bands with long wires on "the back 50."

Some amateurs on the high bands, have to be content with dipoles for one reason or another. They can improve their signals with the long dipoles and if they wish a degree of directivity they can erect them as slopers.

Don't expect these antennas to give the gain of Yagis, Quads and sophisticated directional arrays or you will be disappointed. You can certainly expect an improvement over the half wave dipole and you will be very pleased with the results.

The results you obtain from your antenna construction depend upon the effort you put into it. It is suggested that you use time and care in the adjustment of any antenna, no matter how simple it may be. The proper use of an s.w.r. and/or noise bridge will make the project well worth while. ■

YLRL Convention *(from page 35)*

next door to the hospitality room. Throughout the convention also, there was constant exchanging of the blue and silver covered "girl-on-the-globe" programs and the query, "Have you signed my book?"

Another query frequently heard was, "Did you get one of my swaps?" "Swaps" have become a real tradition of the conventions and this one brought forth all sorts of ingenious ones, such as a ceramic and yarn poodle, crocheted "yellow rose of Texas," Bicentennial coaster, pincushion, billfold, rain caps (fortunately the storms that brought over 13 inches of rain to Houston waited till the week after the convention!), petrified wood, photos, personalized matchbooks, sugar packets, pens, tiny Ojo de Dios, book marker, polished rock from the Rocky Mtns., and a ceramic round "TUIT" (ask K5MIZ for the cute explanation on this one). All could be carried around in our tote bags made by GAYLARKs — blue cotton with blue and white applique depicting the State of Texas.

Assisting chairman Annie, K5JKV, was WA5MPM, Frances, who acted as co-chairman and prize chairman and who also is president of GAYLARK. Secy-treas. of the club is K5MXO, Margaret, and treasurer for the convention was WA5VGJ, Jeanette. WA5WKE, Martha was tour chairman. Much credit goes to all of the other club members as well for their hard work in making the convention the success it was: WB5AQB, K5BJU, K5DJS, WA5DYC, W5ERH, WA5FVH, K5JGC, WA5KRI, K5MIZ, WN5NLM, K5PFF, WN5RFS, WN5SHS, WA5WZF, K5VZB, WA5ZDI. To assist guest YLs in spotting hostess YLs, each member of GAYLARK wore a white vest with the GAYLARK emblem and individual call embroidered in turquoise on the back.

Our sincere thanks to GAYLARKs from all who were fortunate enough to attend for a very fine convention and for the years of planning and work that went into making it a memorable occasion!

Of special interest was one GAYLARK family group: K5JKV, Annie (mother); WA5WKE, Martha, and WA5FVH, Sue (daughters), and WN5RFS, Lisa (granddaughter).

Of all the YLRL conventions that have been held, there are now only two YLs who have attended all