The 3-Element 10-Meter Cheapie

Basic Amateur Radio: A CB beam is introduced to Amateur Radio after a few adjustments are made. For an inexpensive 10-meter Yagi that performs well, this one fits the bill!

By Jim Bartlett,* K1TX and Stan Gibilisco,** W1GV

Right now, the 10-meter amateur band is of interest to most active hams. With the sunspot cycle nearing its high point, the DX opportunities on 10 and 15 meters are excellent. A directional antenna, such as a Yagi, is desirable for even the smallest DXing station. If you've been contemplating the construction or purchase of a small 10-meter Yagi, consider modifying a similar CB beam as we did.

Pros and Cons

If you're an experienced antenna builder who has established sources for inexpensive aluminum tubing and element-mounting hardware, you may be better off going the "homebrew" route. On the other hand, if you're like many amateurs who lack the necessary mechanical knowledge or tools to build from scratch, or who live 100 miles from the nearest anything, you might be wiser to consider *purchasing* an antenna.

Of course, you could buy a number of compact commercial Yagis specifically designed for 10 meters. However, they range in price from about $50 to more than $100. If you're willing to do a small amount of "tinkering" on a used (or new) CB beam, chances are you can save more than a few dollars. Let's face it — with CB antennas being made in such large quantities, the manufacturers certainly must be able to sell them for less than a comparable 10-meter beam. Checking through a few catalogs, we found that most CB beams are at least 20 percent less expensive than comparable ham antennas. In addition to this, used CB Yagis are presently flooding the market as more and more CBers become disenchanted with the goings-on at 11 meters. Flea markets, "coffee breaks," swap meets, and even classified ads usually contain bargains for the sharp antenna hunter.

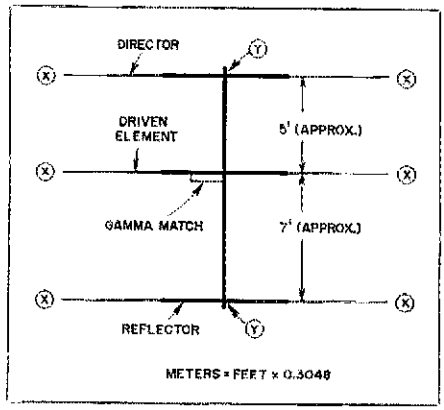

Fig. 1 — The 3-element 11-meter beam with modification points shown. At the points marked X, remove about 4 inches for 10-meter cw, or 7 inches for phone. At the points marked Y, the boom should extend about 2 inches past the elements for cw or about 4 inches for phone. Gamma-match adjustment and positioning are discussed in the text. This modification can be applied to any commercially manufactured 11-meter Yagi.

Antenna Selection and Preparation

Only one criterion was used to select the antenna we modified: price. The least expensive antenna we could find happened to be an Archer "Crossbow" — a 3-element job. (This is Radio Shack stock number 21-933.) First, the antenna was disassembled, cleaned and checked over for wear and tear. The antenna had been originally mounted for horizontal polarization, so the mounting bracket was already in the proper position for our use. Note that some antennas you find may be set up for vertical polarization. Not only must the bracket be changed for horizontal mounting, but you may find that one side of the driven element is longer than the other. If this is the case (and you don't have the original instructions for the antenna), cut the longer side (the one that would have been at the bottom — parallel to the mounting mast) so it is the same length as the other side. Finally, spread out the antenna parts in an orderly fashion. This will make the antenna ready for 10-meter modification.

Modification Details

Chances are that the SWR would remain acceptable (2:1 or better) even if the CB beam weren't modified at all! However, a parasitic array has other parameters that must be considered. A "low SWR" cannot be taken as assurance that a beam or quad is correctly adjusted. The front-to-back ratio is affected even by rather small frequency changes. Forward gain is also affected to some extent. In practice, these two factors are much more important than the change in SWR.

It was assumed that the Archer beam was designed for optimum performance at the center of the 11-meter band, or approximately 27.1 MHz. The center frequency chosen for 10-meter cw operation at W1GV was 28.1 MHz. It follows that if the antenna could be "shrunk" to 27/28 of its original size, the antenna would be optimized close to 28.1 MHz. This is a size reduction of 1/28 or 3.6 percent.

The modification was simple to perform; see Fig. 1. Since each element measures about 9 feet on a side, or 18 feet overall, a 3.6-percent reduction in size would entail removing about 4 inches from the ends of each element.[1] We used a tubing cutter to remove 4 inches from

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[1]Notes appear on page 37.

each of the six end pieces for the elements. This was done in the living room prior to assembly. Care was exercised to ensure that we cut each piece on the outer end (the one without predrilled holes), and that each piece was cut once and only once!

During assembly, the instructions were followed as written for horizontal installation, except that the director and reflector were mounted a couple of inches from the ends of the boom, and the gamma match short was moved 3/4 inch closer to the boom. Both of these changes were part of the scale-down operation, but were not considered as critical as element length, so we "guesstimated." It was also decided that the gamma assembly ought to be below the driven element rather than above it, to keep water from running down into the driven element.

The 27/28 scale ratio will be adequate for Novice operation. For phone, the center frequency might be chosen as 28.8 MHz, which would result in a ratio of closer to 27/29. In this case, about 7 inches should be removed from the ends of each element, and the reflector and director should be mounted about 4 inches in from the ends of the boom.

The gamma assembly adjustment will affect the impedance match, and consequently the SWR. However, it will have no effect on the center frequency of the antenna, its gain, or its front-to-back ratio. If the SWR at the center frequency, as measured at the transmitter, is better than 1.5:1, there's no point in tampering with the gamma adjustment unless you're feeding the antenna with 200 feet of RG-58/U (in which case you probably don't care much anyhow).[2] If the SWR is more than 2:1, adjust the gamma assembly for minimum SWR at the center frequency you chose, or at least until the SWR is below 2:1 over your favorite part of the band.

Performance

At W1GV, the modified Archer "Crossbow" is chimney mounted atop a 10-foot mast on a three-story apartment house. It is about 45 feet above the ground and there are no serious obstructions in any direction. The transmitter output is 3 watts. Would there be good results? The authors were confident. The SWR checked out all right (1.2:1).

In about 20 hours of operation as of this writing, 23 countries have been worked, including a ZE8 on the fourth attempt in a heavy pileup during the CQ WW cw contest. The front-to-back ratio is excellent. When the band is open with the beam pointed eastward in the evening, little or nothing is heard; but when the antenna is aimed west, there are numerous good signals.

Europeans are generally worked on the first call, and compliments are often received when they're told they are listening to 3 watts. A couple of hams have expressed skepticism concerning the accuracy of the power measurement!

Conclusion

Although the antenna we used was an Archer Yagi, the same modifications could easily be applied to any other commercially made CB Yagi. If you can't find any used bargains and decide to purchase a new in-the-box antenna, you might want to consider shopping for other brands similar in design to the Archer Crossbow. An example is Lafayette catalog number 42-P-02206W, which is comparable to the Archer antenna in both design and price.

The antenna installed at W1GV was attached to a mast section slipped through a small TV-type rotor. It provides ample torque to turn the antenna under most conditions. When installing your antenna, remember to stay clear of power lines, poles and transformers. Make sure that you are far enough away from any power leads that a stray antenna element cannot possibly contact them.

You don't have to tell your ham friends that the new antenna on your mast was made for CB, just tell them how well it works and how much money you saved! Remember — performance and cost are usually the most important things to hams! ham

Notes

[1]Meters = feet × 0.3048; mm = inches × 25.4.
[2]Gibilisco, "What Does Your SWR Cost You?" *QST*, January 1979.

Strays

TENTH-GRADE HAM TEACHES A LESSON

☐ We continue to be amazed at the vast sweep of Amateur Radio — at its potential for joy and hope as well as heartbreak and misery.

We made a routine contact the other evening with a KAØ in Colorado Springs, CO, who told us his name was "Hai."

After our signal report and all the usual mumbo-jumbo, we asked, "Is Hai a nickname? What does it stand for?"

He came back: "Hai is my name. It's Vietnamese."

While we were getting our breath back, Hai went on to explain, "We left Vietnam just one day before the Communist takeover. We stayed at Camp Pendleton in California for three months, then came here."

"What's your line of work, Hai?" we asked. And this was when he finally rocked us back on our heels.

"I'm in the tenth grade in high school," Hai said, "and I have my Advanced ticket."

So here's a Vietnamese kid, three years into a strange land, a sophomore in high school, and already an Advanced Class Amateur Radio operator.

Fumbling some, we suppose, we asked the obvious question: "Do you like it here, Hai?"

His answer: "Everyone has been very kind."

And we closed out as friends, promising to listen again for one another on the 40-meter band.

But although we said goodnight to Hai, we couldn't shake him from our awareness all that fast.

And in trying to put the whole QSO into perspective, we kept returning to his final words — "Everyone has been very kind." And, oddly, we found ourselves a little proud — proud of the people Hai had found kind and considerate.

America makes a lot of mistakes, as a nation and as individuals. But sometimes we win through to a magnificent sunrise — when sorely beset people, not much wanted, unschooled in our ways, frightened and abashed in a completely foreign environment, can say, "Everyone has been very kind."

For all our bumbling and fumbling, America is still the land of hope.

It took a Vietnamese tenth-grader to remind us! — *Lew Fay, AA5Q. Reprinted with permission from the* KC Club Bulletin

PAN-AM NET NEEDS VOLUNTEERS

☐ KP4EBQ has been designated the official Amateur Radio station for the Eighth Pan American Games, to be held in San Juan, PR, during July. Op Hans Tischer is looking for radio amateur volunteers to participate in a schedule system to handle the high volume of traffic expected (there will be 6000 athletes and officials from all parts of the Americas). Contact KP4EBQ at Box 524, Old San Juan, PR 00902, indicating operating hours, equipment, bands and frequencies. — *KP4RK*