Linear Loaded Wire Antennas: by Joe, W8DCQ

I have done a lot of research on wire antennas on the internet as well as other places and developed an interest in linear loading. It is superior to loading with an inductive coil as the loading is distributed along the entire length of the element rather than being lumped. The end result is much better radiation efficiency and greater band width than the coil loaded equivalent. A simple dipole can be linear loaded to shorten its length and make it possible to operate on the lower bands despite having the disadvantage of living on a small city lot. An excellent resource for antenna designs can be found at www.AC6V.com/antprojects .

At this site I found a novel design by KE4UYP for a top fed, linear loaded vertical antenna for 160 meters. I immediately thought this design had merit because: 1) it takes up half the space of a dipole 2) being top fed, the high current portion of the antenna is up high thus improving the radiation efficiency, and 3) it theoretically has vertical and horizontal radiating components making it good for close in work as well as DX chasing. The one small disadvantage of this design is it uses more wire than a dipole and has slightly less bandwidth.

The KE4UYP design utilized a wooden mast with a horizontal boom at the top to support the vertical wire elements.

The horizontal radiator is a ¼ wave length of wire, while the vertical radiator is approximately 170 feet of wire spaced 24 inches apart in a zigzag arrangement. The number of vertical elements is determined by the height of the support; KE4UYP noted that a minimum height of 50 feet is recommended for 160 meters. After looking at this design for a while, I thought; why not make the support structure one of the vertical radiating elements? So I did! I had previously purchased two 40 foot mast kits composed of ten 4 foot sections, one of aluminum and the other of fiberglass. I used one section of fiberglass as the base insulator and 8 sections of aluminum (32 feet) as the last of five vertical elements, the other four being wire.

I used simple ceramic egg insulators to space the vertical elements 24 inches apart at the top and used another section of fiberglass mast to separate the bottom of the vertical elements 6 and create a simple method of tying off the bottom of the wire "curtain". The antenna is feed with a 1:1 current balun with 50 ohm RG8X running to the shack. The vertical mast is guyed at the top and approximately half way down every 120 degrees with 3/32 inch Dacron rope; one set of guys should be directly opposite the horizontal wire to provide tension and keep the vertical straight.
Once I completed the antenna construction,

I hooked the coax up to the rig to see how well I did. Surprisingly, the antenna was actually resonant inside the 160 meter band on the first try! As it turned out, the antenna was overall a little short, so I added some wire to the end of the horizontal wire as well as attaching a piece of wire with a sheet metal screw to the bottom of the aluminum mast. I made the antenna resonant at the Firebird net frequency of 1.877, the bandwidth below 2:1 SWR measured at approximately 65 kc. By removing the piece of wire at the bottom of the aluminum mast, the resonant frequency dropped about 40 kc, so I can operate the bottom of the CW portion of the band without adjusting the length of the horizontal wire.

After several months of operation on 160 meters, the antenna appears to radiate as well as the half wave dipole it replaced. During the ARRL 160 meter CW contest in December, I made 317 contacts in 67 sections for 43,000 points. I haven't attempted to work any DX on 160 with the new antenna yet, but that is next on my agenda. I plan on adding a remotely controlled relay so I can switch the tuning stub in and out from inside the shack eliminating the need to walk outside with a screwdriver.
The KE4UYP plans on the AC6V website also have the dimensions for the higher bands in case you want to try the concept on a smaller scale. My next antenna project: a constant current distribution (CCD) antenna for 80 meters.
Stay tuned, this is W8DCQ.