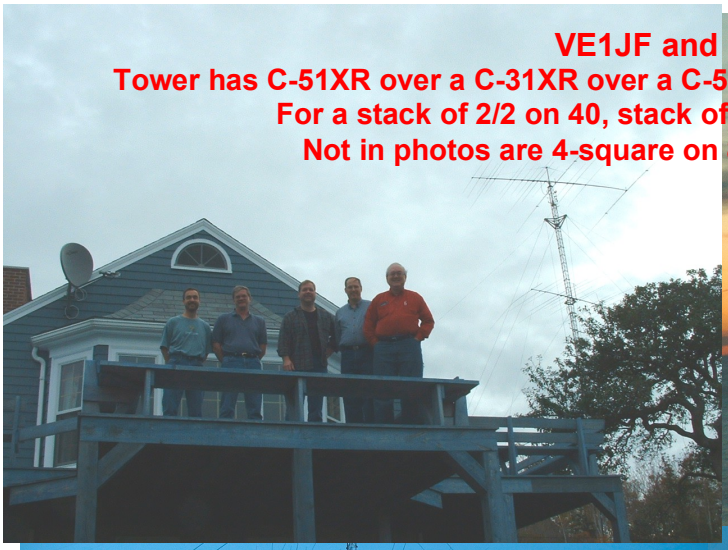
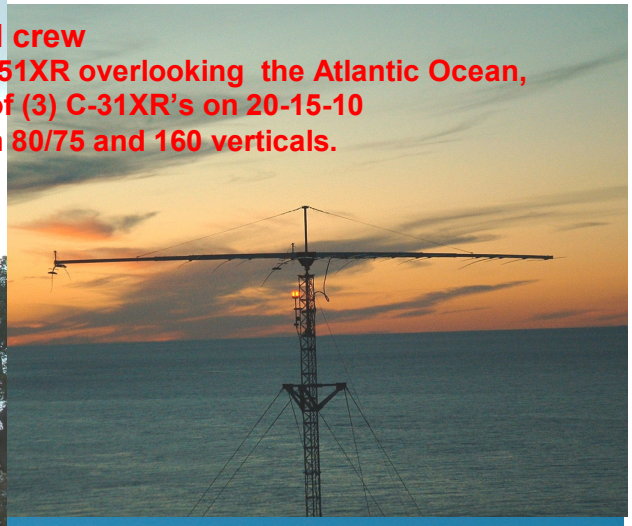
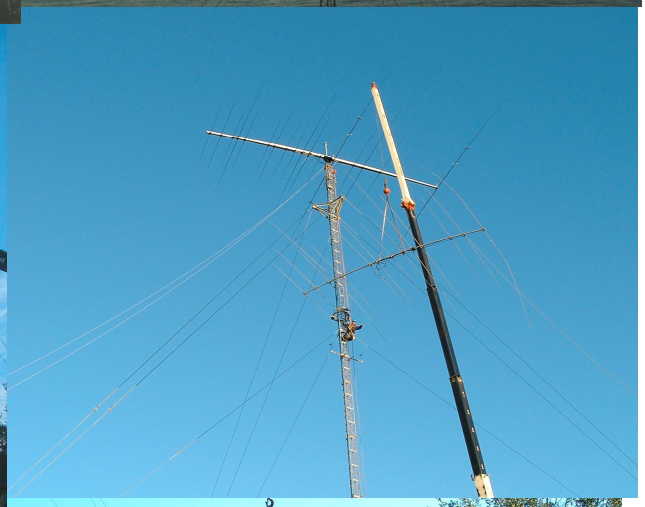
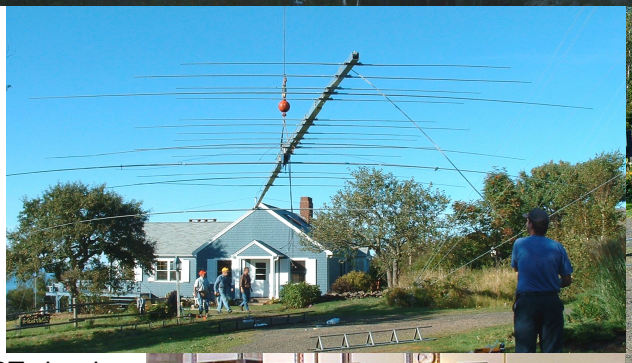
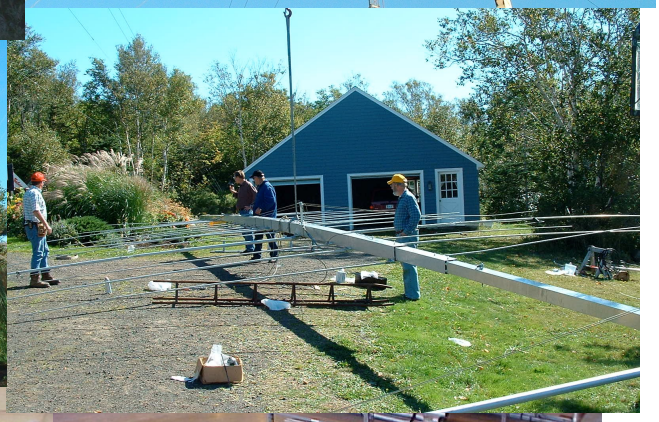
VE1JF and crew
Tower has C-51XR over a C-31XR over a C-51XR overlooking the Atlantic Ocean,
For a stack of 2/2 on 40, stack of (3) C-31XR's on 20-15-10
Not in photos are 4-square on 80/75 and 160 verticals.

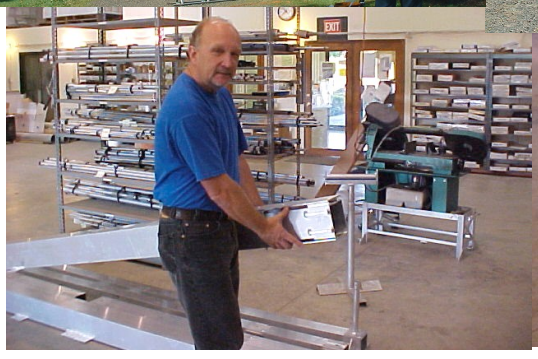


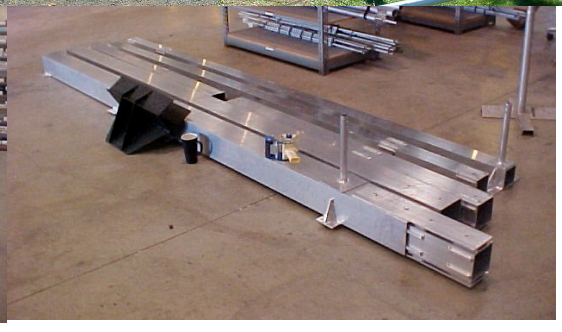












N6BT showing 6" center of super duty C-51XR boom. Entire boom and cradle are on the right. Antenna is a C-31XR with 2-el 40, Magnum 240N

How much bigger to get 3dB?

20 meters

- 18' boom (.26 wavelength) with 3 elements
  The theoretical maximum is about 9.3dBi (7.1dBd).
  A practical Yagi will be about 2dB below this figure (~5dBd).
- 47' boom (.67 wavelength) with 6 elements
  The theoretical maximum is about 11.2dBi (9.1dBd).
  Practical Yagi will approach within 1dB of this figure (~8dBd).

These figures show that extending the boom from 18' to 47' and doubling the number of elements from 3 to 6 will increase the gain by about 3dB.

Lobe Compression in Yagi Antennas

The test range was set up with a variable tower height for the antenna under test and a receive antenna on a calibrated vertical track. Between the antenna under test and the receive antenna was solid copper sheet, extending behind the antenna under test and going past the receive antenna. The receive antenna fed a spectrum analyzer with 2dB per division and the vertical track could go down to an elevation of 1degree.

The discovery was that with antennas less than 1 wavelength high, the main lobe was lowered as the gain of the array was increased. This means that when going from a dipole to a 3 element Yagi, gain improvements exceeding the actual gain were observed when measuring at low angles. It was repeatable to measure the increase of a 3-element Yagi over a dipole at 8dB. When the measurement was made in the main lobes, the gain improvement was the expected 5dBd. When measurements were made at angles below the main lobe, especially at 5 degrees or less, gain increases of >8dB were observed. This sheds light on at least two issues.

One is that people making measurements on typical antenna ranges might well be documenting erroneous gain figures. Antenna ranges that are a pair of 70' towers spaced a number of wavelengths away measure at zero degrees. If this 70' height is near a wavelength or less, which it will be on 20 meters, one can most likely count on inaccurate comparative data.

Computer modeling software actually gives a fairly good picture of this phenomenon, as shown on the following pages: