Here's an interesting approach to an age-old problem. The basic design can be scaled for 1¼, 2, 6 and 10 meters.

The Ultra-Yagi

A Different Approach to U.H.F. Yagi Design

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Ever since a couple of those wonderful folks who brought you the Z-car invented the Yagi-Uda antenna, amateurs have toiled countless hours to find the one combination of spacing, length, thickness, stacking distance, etc., that would produce the "perfect" beam. Some succeeded in developing fantastic gains, but nobody succeeded in making that gain (and attendant low s.w.r. and high F/B ratio) usable over more than a couple of MHz. This is just what we *don't* want at u.h.f., where antennas must perform well over wide ranges.

Here is a design that flies in the face of some "established" criteria, yet works over a spread of 10 MHz or more, while staying within usable gain, F/B and s.w.r. parameters. And perhaps the best "discovery" of all is that huge stacking distances are not required.

The antenna shown here is for use at 420-435, but it may be scaled to 1¼ or 2 meters or even 6 and 10. On 2, for example, it would also cover the upper end of the aircraft band and the satellite band, working well from 135 all the way to 148 MHz.

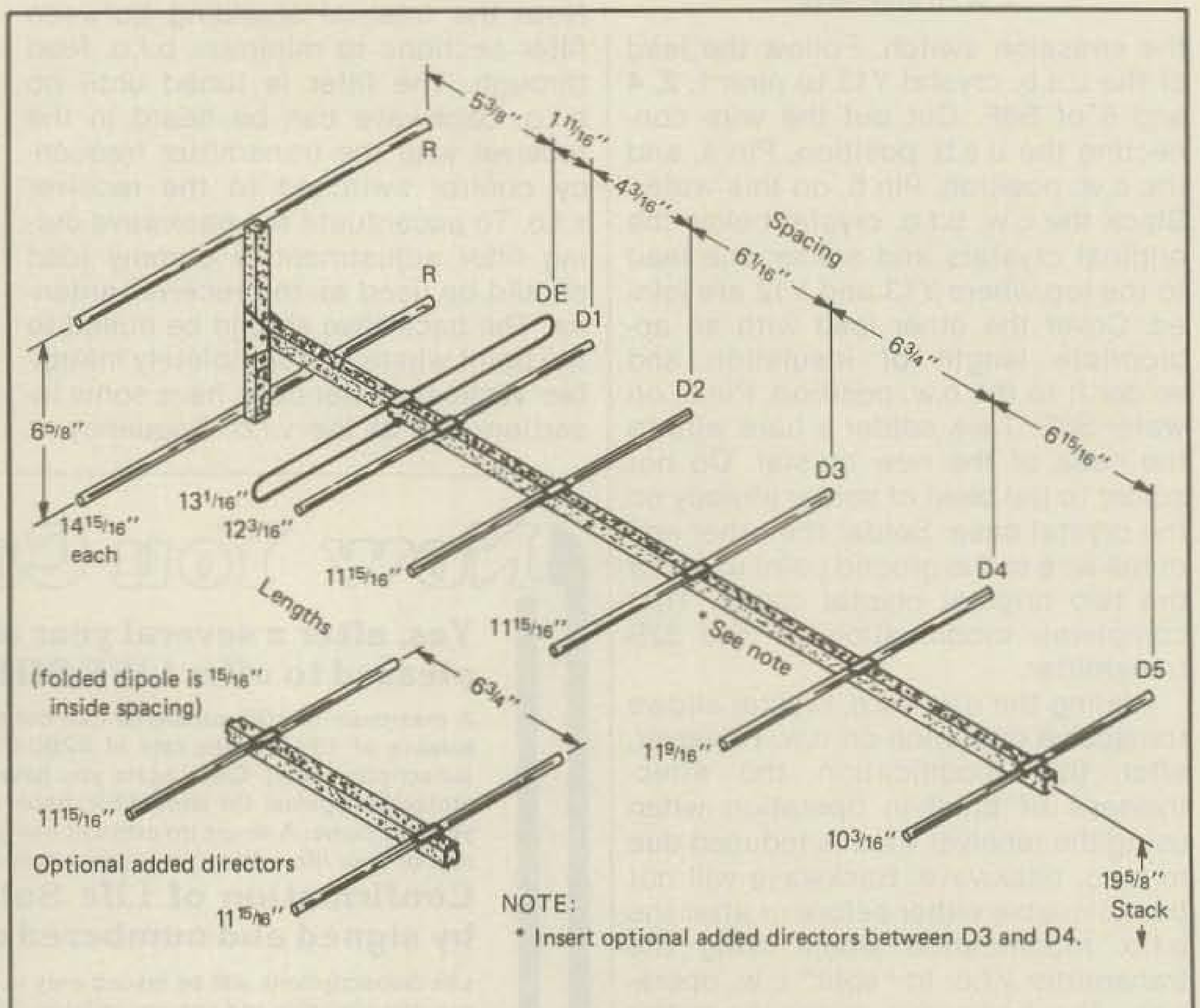

Fig. 1—Dimensions and spacing for the ultra-yagi.

Our "Ultra Yagi" uses the *digonal* reflector system (no, not di a gonal) to preserve usable F/B ratio over a wide band. The reflector elements are longer than previous formulae would have them. All elements are of ⅛" rod. The boom is ¾" square tubing as is the reflector spacer.

The DE is not a ratio assembly but a straight folded dipole. It may be fed directly with 300 ohm line or with a 4:1 balun and coax, but coax losses at these frequencies are severe if runs exceed 25 ft. Impedance has been measured at from 240-260 ohms at the DE terminals (a lot higher than the 80 ohms one might think).

D1 is very close to the DE. D2 and D3 are equal length. Not until D4 and 5 are reached do we start shortening D's. And if we wish to add more D's, we do *not* do so at the far end. Rather we in effect break open the boom and insert D's of the same length as D2-3. The two forward-most D's remain at their staggered lengths (the last D is much shorter than you might think proper).

The antenna shown has 2 R's, 1 DE, and 5 D's, or an 8 element beam. Increase of slightly over 1.5 dB at max. gain point can be obtained by inserting 2 additional D's as explained above. The former D4 and D5 thus become D6 and D7, without change in previous length or difference in length.

Further gain beyond this can far better be obtained by stacking 4 bays vertically (assuming horizontal polarization) rather than continuing to add directors. The advantage of this array to the constructor is that bays need only be spaced about 19", at which point side lobes are near minimum. A very compact antenna results, one that is easily rotatable. So the "old" practice of very wide stacking distances for long Yagis does not apply here, nor do some of the rules for maximum aperture or capture area previously used.

The beam pattern is "squeezed" in the H plane and a lower wave angle results. This is the prime requirement for terrestrial DX.

If 2-bay stacking is used, a fairly simple parallel harness of open-wire line provides a roughly 125 ohm mid-

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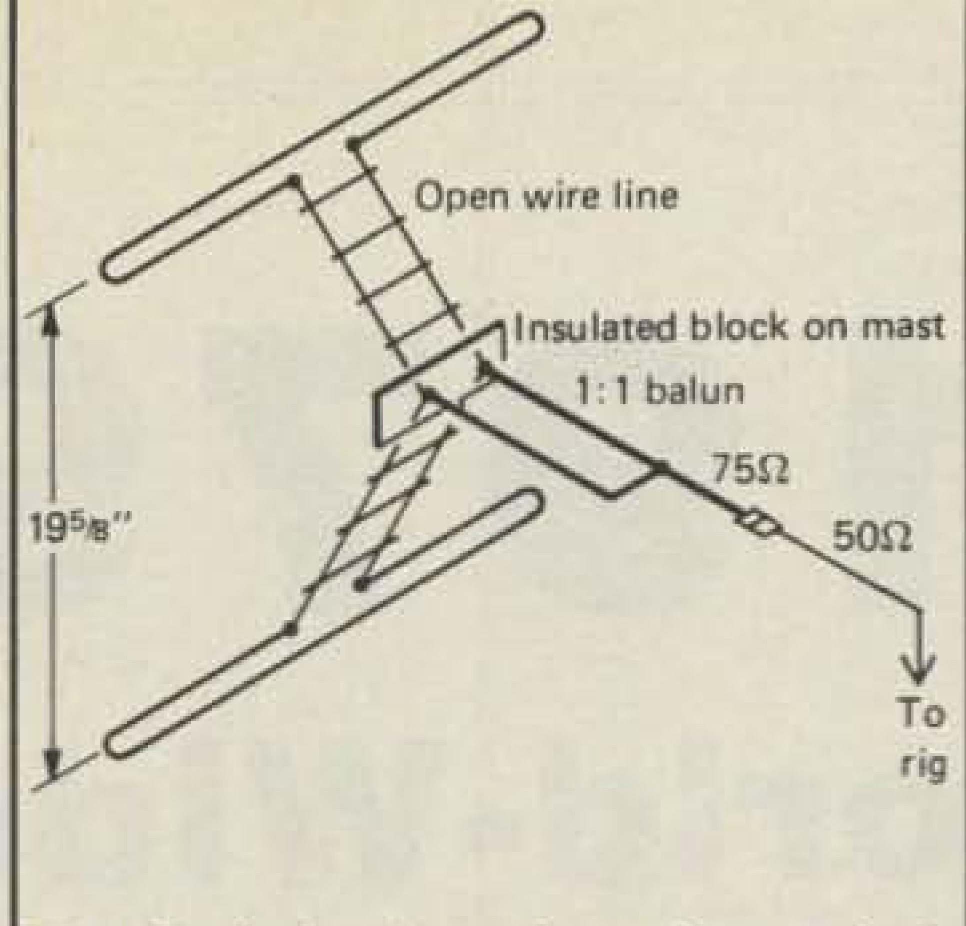
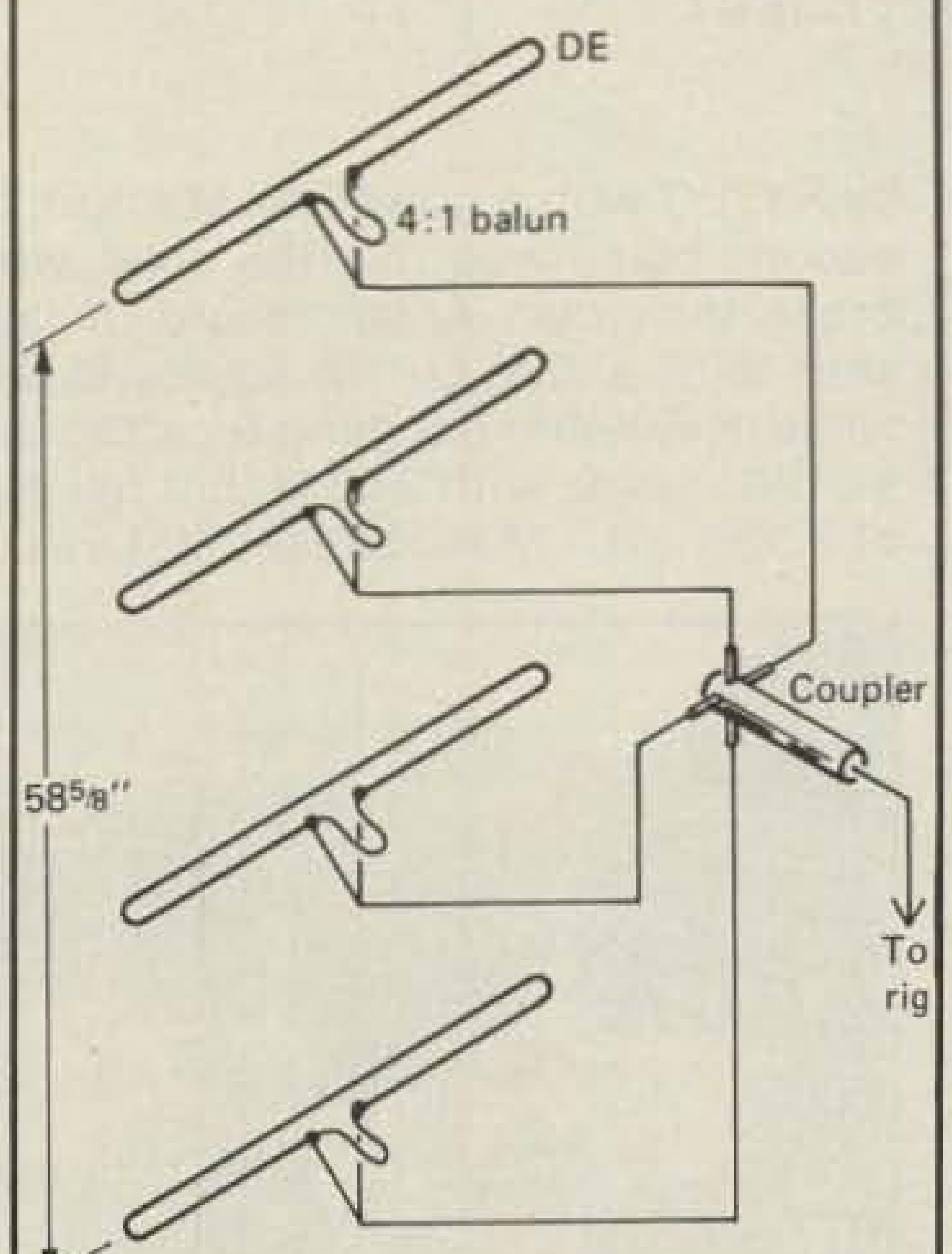


Fig. 2–A feed system for a two-stacked array.



NOTE:
All branches are of equal length (any odd multiple of $\lambda/4$)

Fig. 3–Feeding a four-stacked array.

feedpoint. To match 50 ohm downlead, a 75 ohm section with a 1:1 balun is used as a transformer. Type N fittings are mandatory. Don't use "UHF" types. And if a long coax run is unavoidable, use the newer type having a #18 or even #14 center conductor.

Four-bay arrays should use 4 equal lengths of coax with 4:1 $\lambda/2$ loop baluns. These ideally should terminate into a 4-port transformer-coupler (commercially available from KLM Electronics), with a 50 ohm run to the shack.

The overall dimensions of even a 4-bay array are quite reasonable, and many hours of good DXing will reward the u.h.f. amateur who constructs this "Ultra Yagi."