Ham 143 – HF EmCom radio, power, antennae

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1. Local HF for EmCom requires specific, unique equipment. For hobby apps, see article Ham 113 HF Equipment. Mission: Establish reliable, lowest technical common denominator, communications locally.

2. Radio: *ICOM 7300*
   a. The transceiver has great performance, is easy to use, and is price competitive.
   b. Why not something else? (1) More Evergreen Hams use this than any other. (2) TARC emergency response uses them. (3) It is most used emergency radio.
   c. A tremendous advantage of using a common radio is support and trading skills.
   d. Not small, the radio is still small and light enough to use portable or mobile.
   e. It transmits 160m – 6m on all modes, which is very important for local HF.
   f. The touch-screen, software-defined radio (SDR) is incredibly flexible.
   g. At 100 W, the power draw is 21 A on 13.2 Volts.

3. Power Supply: *Linear 35 Amp, not adjustable.*
   a. For HF, low noise is critical. 1 to 2 S-units difference will mean no contact.
   b. Inherent noise made me quit using my switched-mode supply. It is not technically possible to eliminate.
   c. A linear supply has smooth wave-forms, huge transformer, is heavy, is pricier, but it is inherently quieter on RF. Ambient noise is quieter.
   d. Adjustable voltage is not recommended, since mis-setting can destroy a radio.
   e. The radio needs 21 A, so the supply needs 25A continuous.
   f. My VHF/UHF radio draws 13A. Using a single power supply requires 35A continuous.
   g. My supply is Astron RS-35M.

Lower end of voice		
MHz	λ-m	λ/4-ft
50 - 54	6	4.9
28.0 - 29.7	10	8.7
14.0 - 14.35	20	17.3
7.0 - 7.3	40	34.2
3.5 - 4.0	75	64.8

4. Local HF: *Bands* are 6m and 10m for close-in direct comms, while 40m and 80/75m depend on ionosphere reflection.
   a. The antennas must be viable for any ham, regardless of where they live.
   b. Environment is a major consideration, requiring use during inclement weather. Indoor requires a diminutive size.
   c. Mount the feed-point at 15' above earth to as low as 6'. This type radiation uses the earth as a major component.
   d. Low gain with a circular pattern seems to work best, based on Marconi, Hertz, military practices, and modelling.
   e. Many operators have demonstrated multi-band, EFHW does <u>not</u> work. Go ahead and try. Take-off angle is wrong.

5. Resonant antennas: Three options for each system have proven effective. External tuners may be disruptive.
   a. The build can use conventional long wires or a compromise, tunable-loaded-inductor design.
   b. The tunable system is much smaller, indoor, environmentally superior, and may be the only viable choice.

6. Antenna 1: *6m and 10m* preferably use vertical polarity.
   a. A vertical dipole is simplest and is effective with a decent ground.
   b. A vertical monopole with counterpoise takes more space.
   c. A vertical triad, which is a combination of the two, is very effective. The identical antenna was tested at 11-miles to vertical mobile, 14-miles to horizontal tower, and 1200-miles (~2000 km) to a Los Angeles horizontal beam. A separate article discusses construction.

7. Antenna 2: *40m and 80/75m* preferably uses a near vertical incident sky wave (NVIS).
   a. A horizontal dipole properly spaced above the earth is generally least preferred option.
   b. An inverted-Vee is the most common used by military and hams, but requires height and a lot of space.
   c. A horizontal triad, which is a combination of the two, though a compromise, is much smaller & indoor.

8. Coax: *RG-213/U vs RG-8X*
   a. RG-213/U is a lower-loss, high-quality, relatively-stiff coax. RG-8X is small diameter, but high loss.
   b. For 10 and 6 meter keep 8X about 25'. At lower frequencies, use to over 50'.
   c. I run separate coax from each antenna to the radio, typically 25 - 50' each.
   d. A short 3' RG-8X jumper with barrel connector aids connection from the stiff coax to the radio.
   e. Coax switches are high-loss devices, as much as a couple dB. I do not switch antennas often, so I do not use.

9. Noise & Lightning Protection: *Important: Connect to an earth ground system.*
   a. Ground the top coax connection to antenna for near DC. The return is unaffected since it carries RF.
   b. If over 20', run a second path (>AWG 6) to a different ground rod.
   c. Put 3 to 7 ferrite beads on the coax below the feed. Use at least 3 on a dipole. These aid tuning.
   d. Use lightning arrestor below beads and before entering building. Use a second near the top if over 60'
   e. Place at least three 8-ft ground rods 17' apart. Bond them together. Bond to utility ground.
   f. For ground resistance > 5Ω, use concrete to backfill rods and around conductors. Bury more conductors.
   g. I use the same protection system for my attic antennas, since it helps lower the noise floor.

10. Life is good. Enjoy!