O Radio, Radio, Wherefore Art Thou Radio

apologies to Bill S.

A Presentation on Transmitter Hunting
North Fulton Amateur Radio League
April 19, 2011
Mike Roden / W5JR

So, Just What is “Transmitter Hunting”

Facets of T-Hunting

- “Fox” Hunting
- “Fox’ Hiding
- Radio Orienteering - ADRF
- Orienteering (uses GPS, hey, that’s a radio!)
- Interference Hunting

Back in The Day…

- My First T-Hunts were on 75m
- Also hunted on 10m and 2m
- My 1968 ARRL Antenna Book has Receiving Loop Antenna designs
- Same 28 Mc (!) design in my 1991 and 2008 ARRL Antenna Books
- Ingenious “Foxes” were hard to find
  - Loading a railroad siding on 75m
  - Running a ¼ kW on 2m

Practice, Practice, Practice

- Several local clubs held T-Hunts, almost every weekend and a few during the week
- Honed skills on diverse bands and targets
  - Daytime Nightime
  - 75m 10m 6m 2m 70cm (440)
  - Continuous key & intermittent key
  - Stationary & mobile (extra tough w/intermittent key)
  - High power low power changing power
  - Unknown Freq – find that first, then the Fox

Thought I was Pretty Good

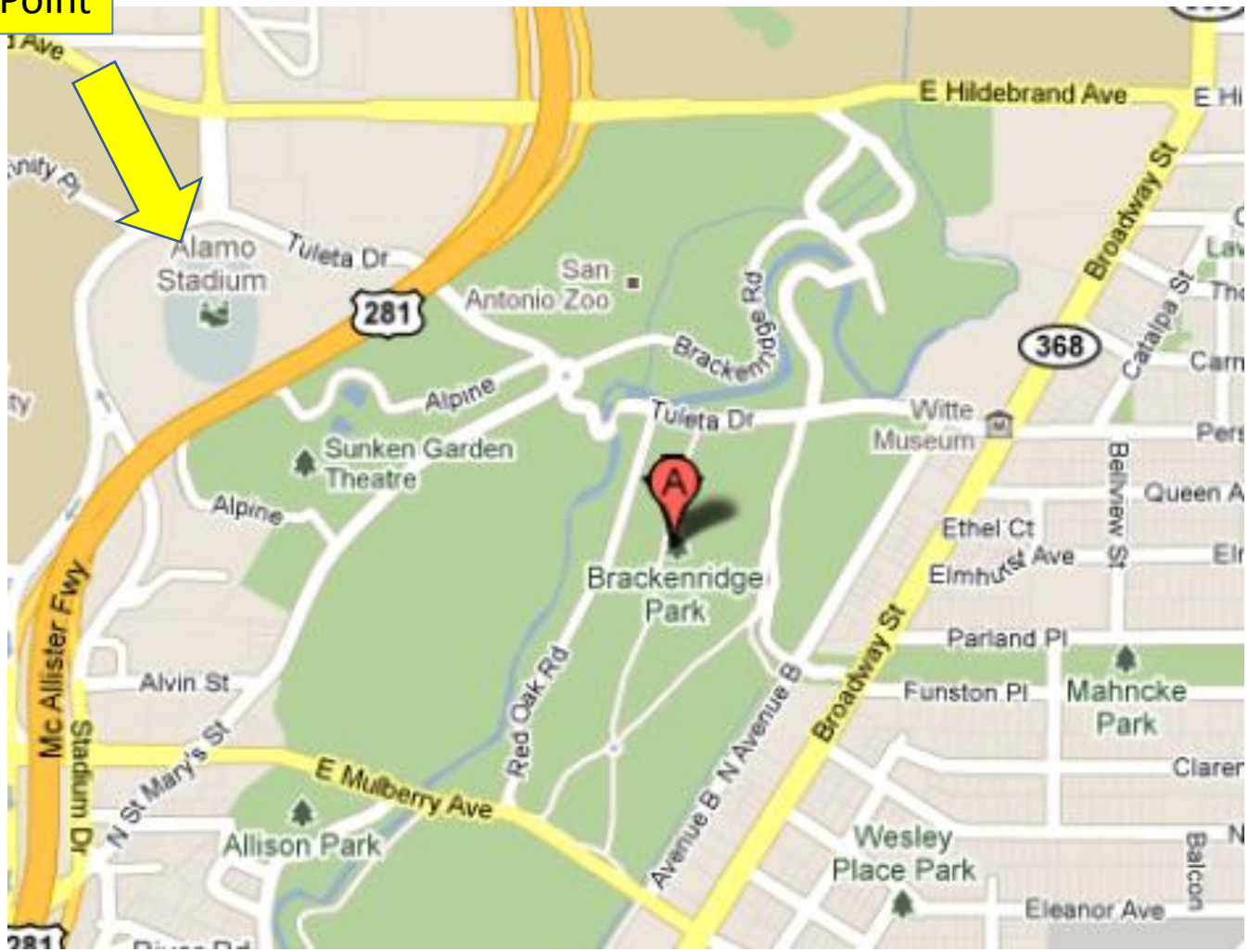
- Started getting reputation for finding & hiding
- Used skills to hunt down stuck radios on local repeaters
- Used skills to hunt down jammers on local repeaters
- Used skills to hunt down spurious interference on local repeaters
- Then the Statewide Challenge was thrown down…the best meets the best…

The Day Arrives

- TX-VHF FM Society Summer Meeting, Aug 1977 in San Antonio TX
- All “contestants” gather in Brackenridge Park, engines revving, maps of the city open & ready
- The rules sheet is passed out - What?
  - Transmitters (yes, plural!!) **ALL** located within the park
  - Unknown number of transmitters, all on same frequency
  - Random keying, all the same ID but different letter at end
  - Match “letter” to “symbol” on transmitter black box
  - Timed event, most # of correct letters/symbols in 2 hrs

The Park – How Hard Can it Be?
Roughly ½ mi x ¾ mi

Starting Point



Equipment

- Team Arlington - Manual Class

  K5FOG W5ETG WA5TKU WA5UOB (me!)
- 4 element 2m yagi to radio w/S-meter
- Switchable attenuators
- Maps w/clear overlays & grease pencils
- 4 walkie talkies for close in or foot traffic
- Yagi worthless – transmitters keying on top of each other

Reinvent Ourselves

- Toss all previous experience out the window
- Calls for a new approach
- Determine the likely # of transmitters
  - Seems like 5, A thru E but notice “C” missing
  - “C” transmitter ID has failed with dead air for ID
- Expect them to be “scattered” in park
- An hour goes by before finding 1st transmitter – tension rises on the team
- Next 3 in 35 min, including silent “C”
- Review map to guess general area of last one & rush over
- Arrive at final TX just as 1st “automated” entrant arrives
- 5 minutes to spare!!


W5ETG
K5FOG
FIRST PLACE
TEXAS CHAMPION TRANSMITTER
HUNT
MANUAL CLASS
SAN ANTONIO. TEXAS
AUGUST 5. 1977
WA5TKU
WA5UOB


ME!

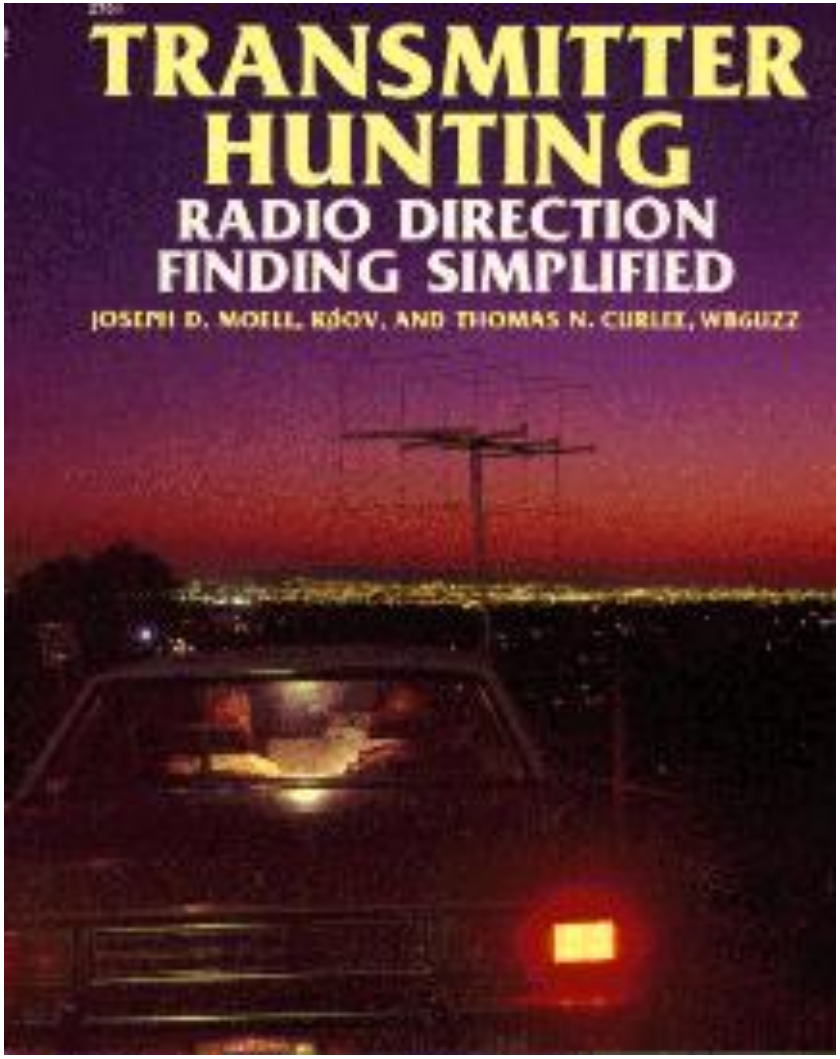
Hooked Yet? How Do You Get Started?

Hundreds of approaches and articles written

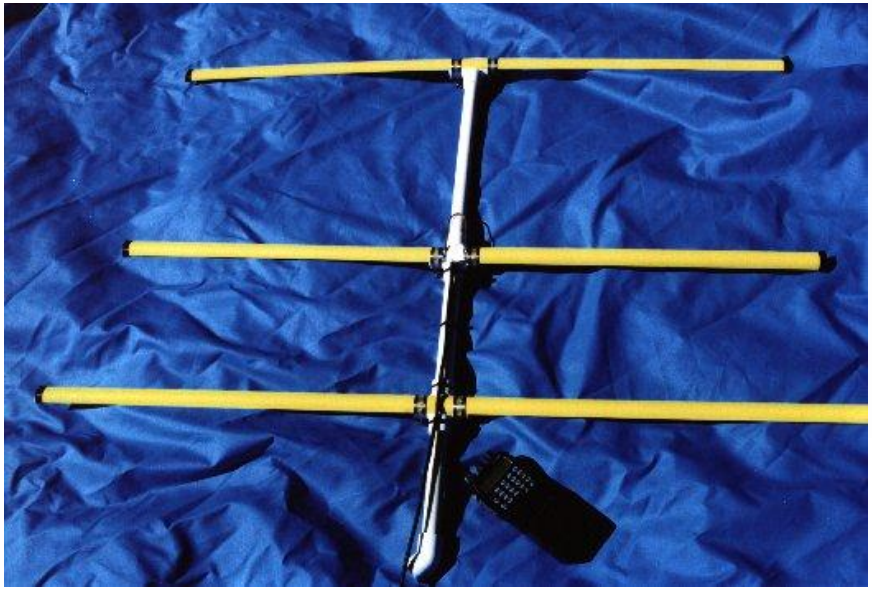
- ARRL http://www.arrl.org/direction-finding
- Homing In (KØOV) http://www.homingin.com/
- Hudson Valley Direction Finding Association http://www.n2ki.com/HVDFA/Index.htm

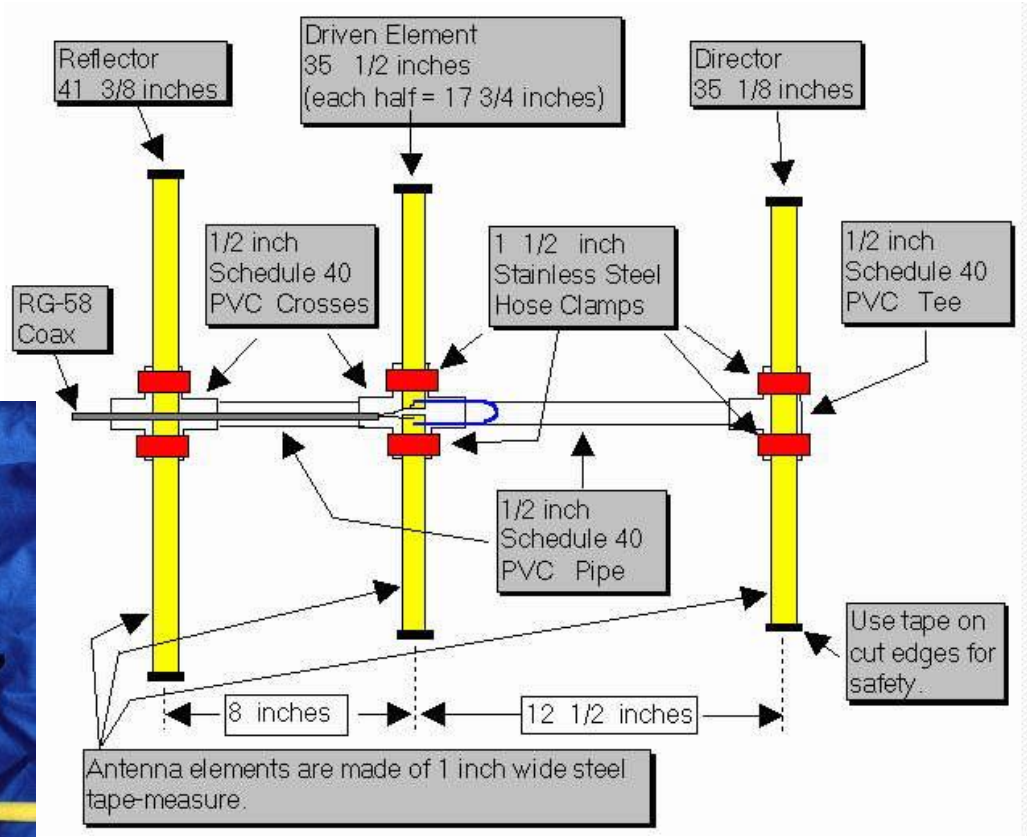
  Great Tips for Hunters – Body Shielding, tuning off frequency, listening to 3rd harmonic (UHF band for 2m Foxes), Gear for hunting from car or on foot
- Albuquerque Transmitter Hunters http://www.wb8wfk.com/
- WB2HOL RDF Pages http://theleggios.net/wb2hol/projects/rdf/rdf.htm
- N6QAB RDF Site http://www.qsl.net/n6qab/
- PicoDopp http://www.silcom.com/~pelican2/PicoDopp/PICODOPP.htm

Joe's (KØOV) Book

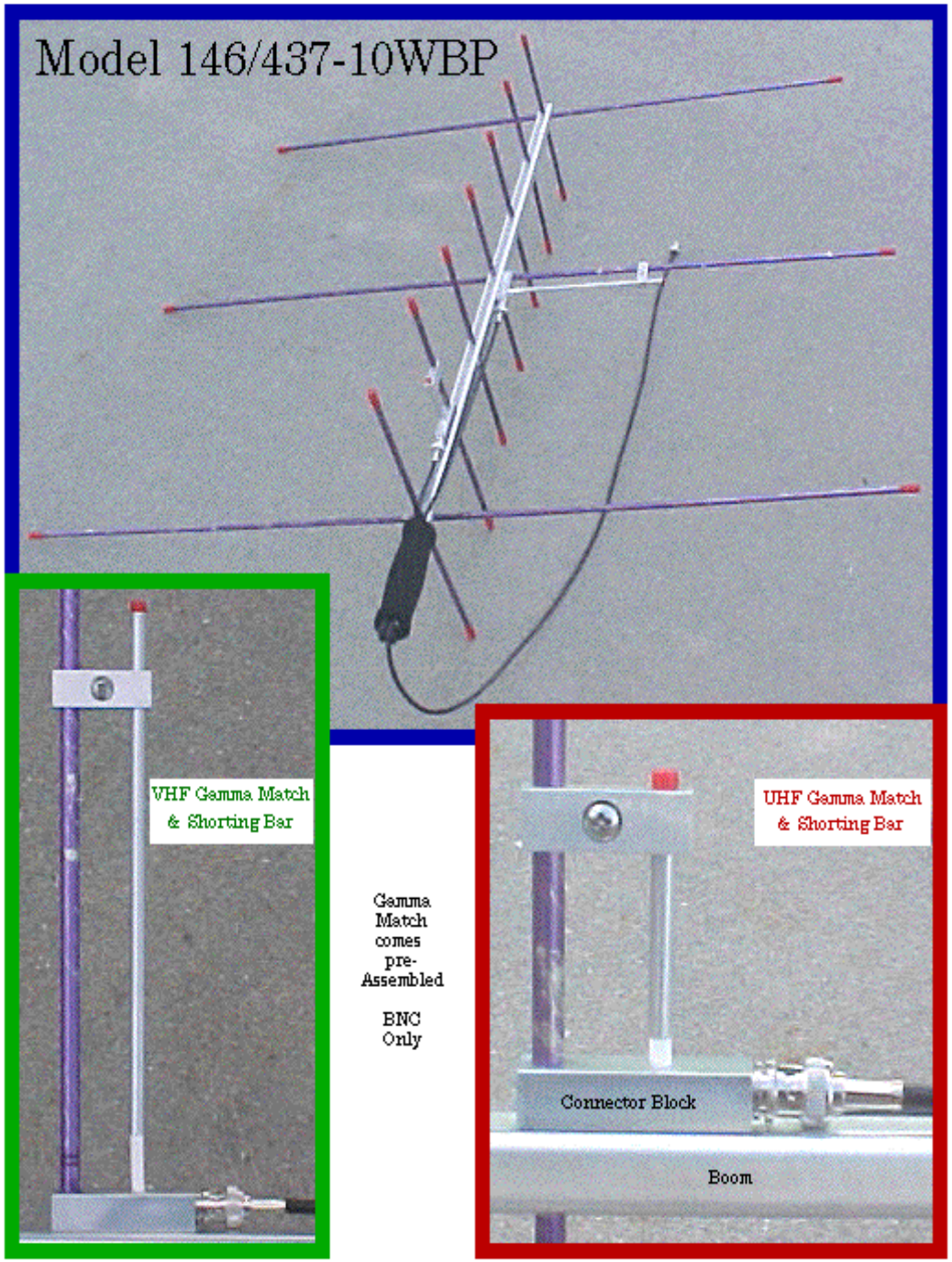


WB2HOL Tape Measure Yagi



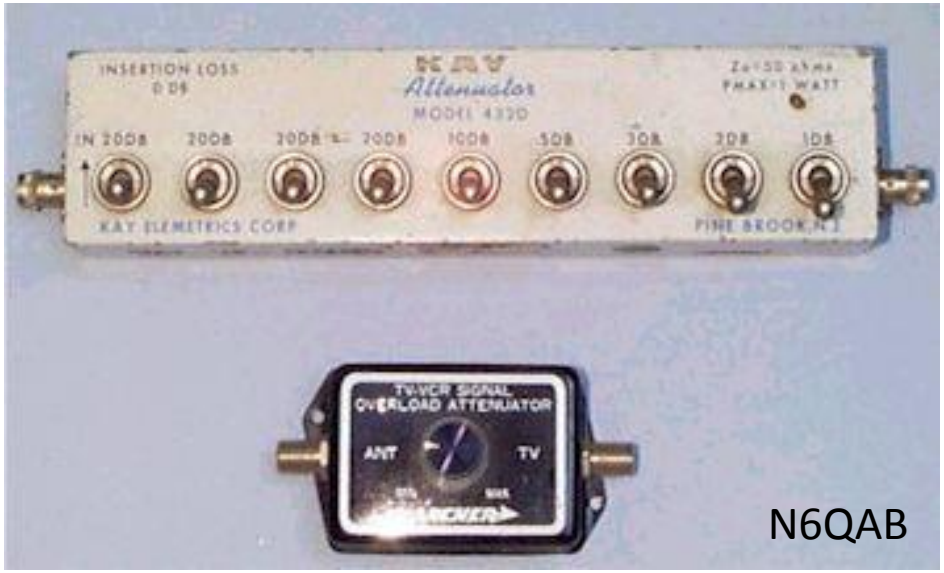


http://theleggios.net/wb2hol/projects/rdf/tape_bm.htm



Arrow Antenna

Yagi + Attenuator



- Need Radio with S-Meter
- Need Radio with built-in Attenuator
- Probably need external Attenuator for close in
- Option to use 3rd Harmonic (UHF) if on 2m
- Can Tune off frequency as signal gets stronger

My Hamfest T-Hunt Radio

- Folks are puzzled how I find 2m Hamfest Foxes with this radio
- Standard C-628A
- UHF & 1200 MHz ONLY
- Use 3rd and 9th Harmonics
- Beats ‘em every time
- I can get REALLY close

It Really is a UHF & 1200 ONLY Radio

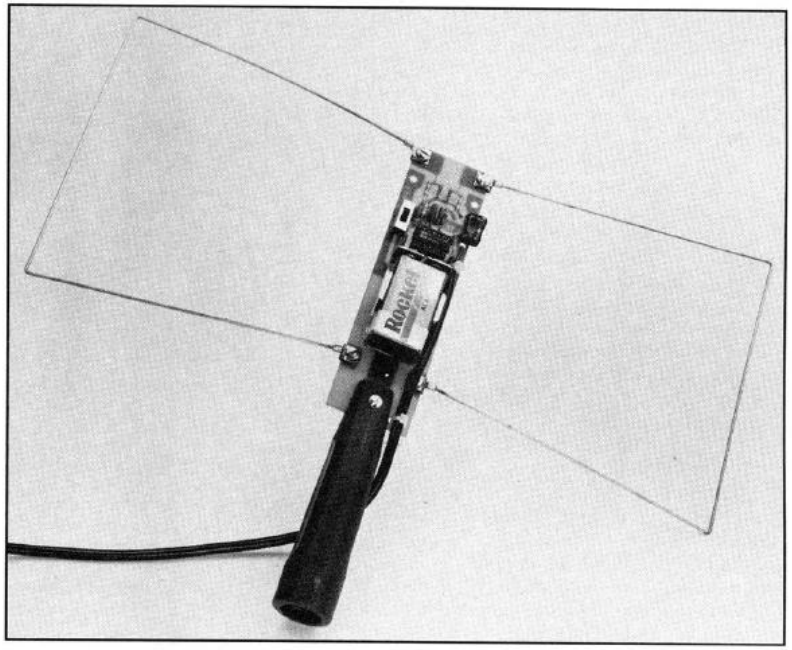
May 1993 QST

Ultra simple RDF Project

Build the HANDI-Finder!

This hand-held direction finder is great for "fox hunting"! Simply connect it to the antenna input of your H-T or FM scanner and you can locate AM or FM sources over the range of 45 to 470 MHz.

By Bob Leskovec, K8DTS
25884 Highland Rd
Cleveland, OH 44143-2722

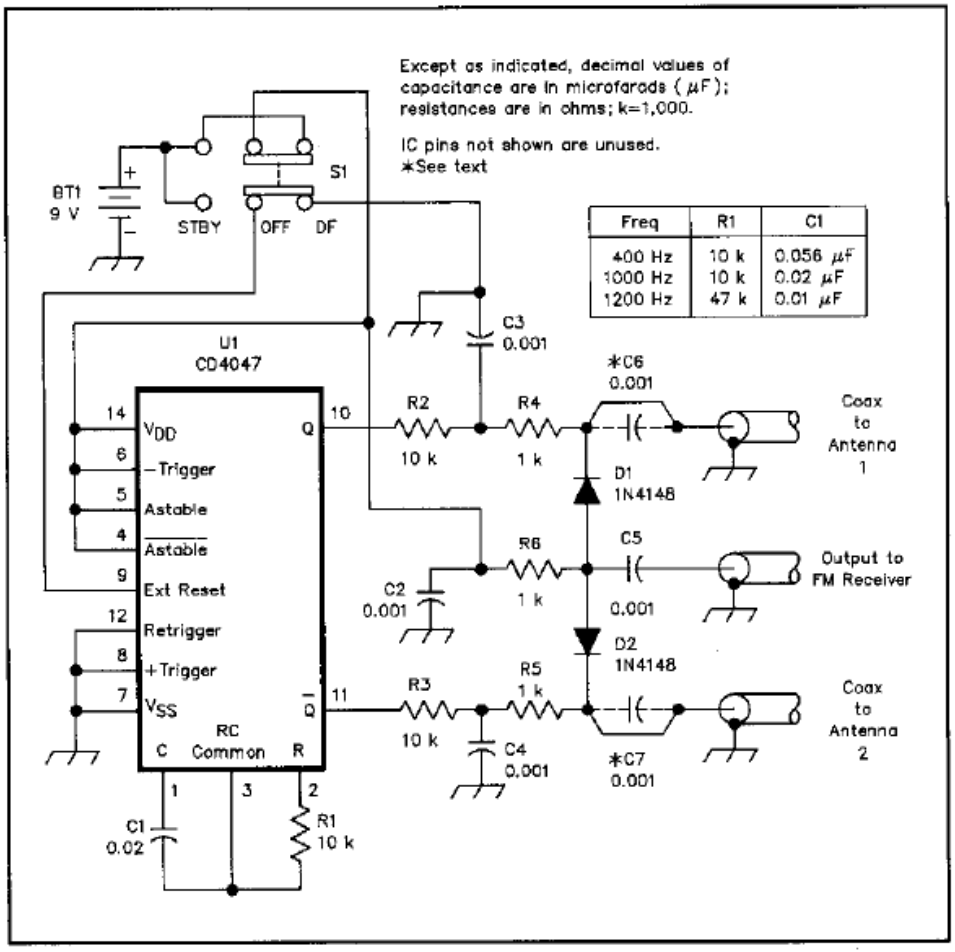


Inevitably, every Amateur Radio community experiences its share of repeater jammers. Tempers flare. A new generation of hams gets interested in direction finding. Car roofs start sprouting outlandish antenna arrays, looking more like tuna boats with every antenna addition. Fox hunts are scheduled for practice—and the jammers quickly become more evasive!

When that happened in our area a few years back, Rich James, N8FIL, of the Cuyahoga Amateur Radio Society (CARS), organized members from several area clubs into the "Bozo-Busters," and I resurrected four DOP-SCAN units[1] supplied by the Lake Erie Amateur Radio Association (LEARA). A few dedicated hams soon found themselves getting called out at all hours and driving all over town. When the gasoline bills started mounting up, we figured there had to be a better way!

Thought: Instead of a *few* hams outfitted with *special* equipment, why not have *many* hams equipped with *simple* direction find-

HANDI Finder Circuit

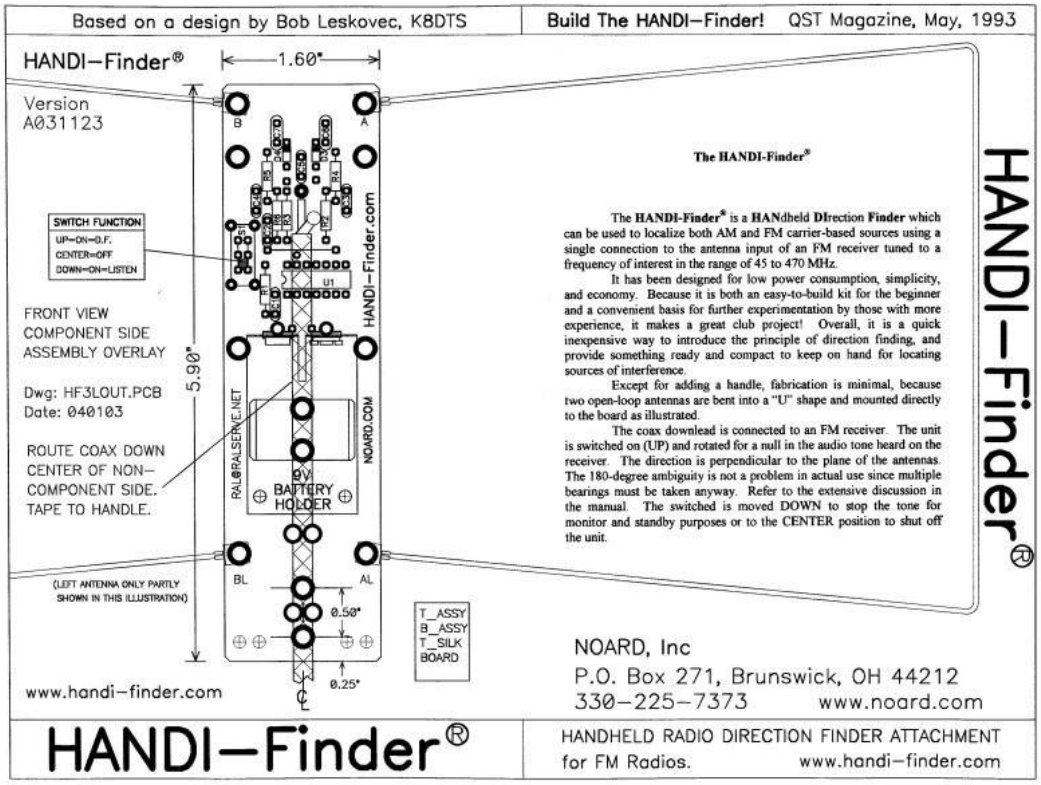


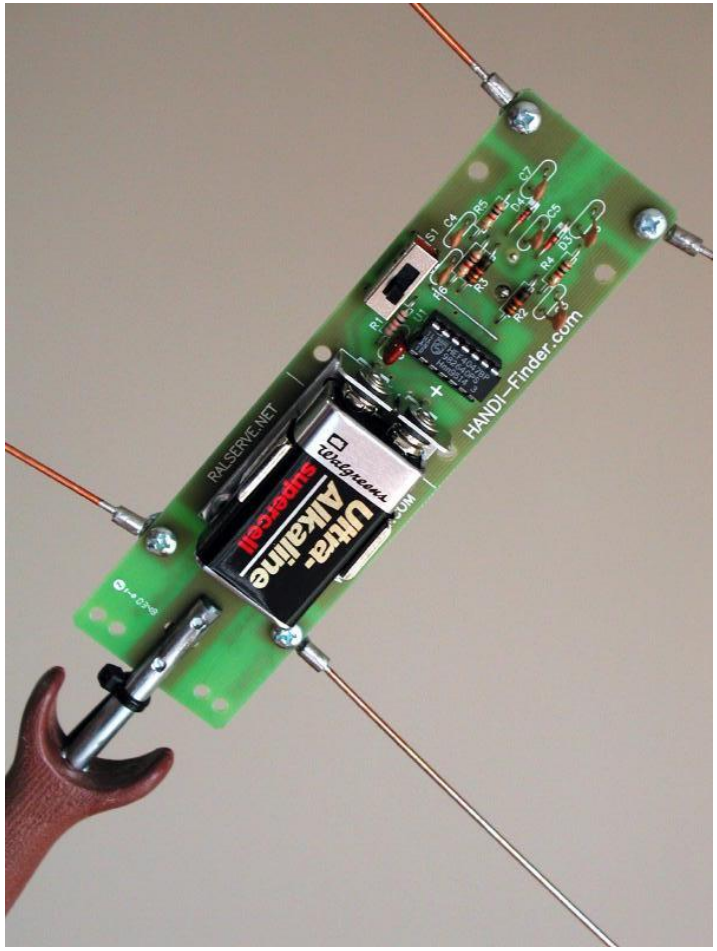
HANDI-Finder

- Uses Audio rate (~1000 Hz) antenna switching
- Null produced when both antennas receiving target signal “in phase”
- Uses TDOA (Time Differential of Arrival) principle
- Works without need for S-meter or attenuators
- Suitable for many different VHF/UHF bands
- Many modern commercial systems based on similar design

Current Version

http://www.handi-finder.com/

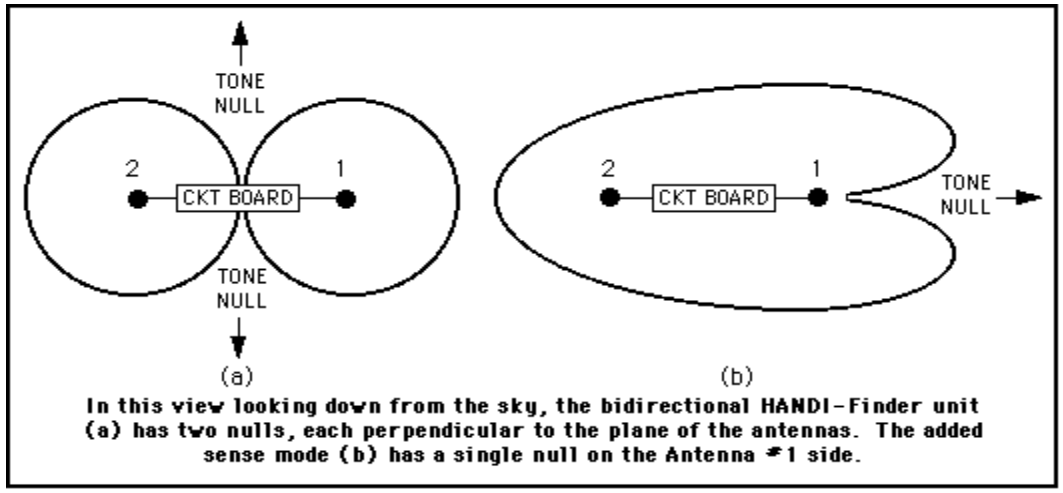




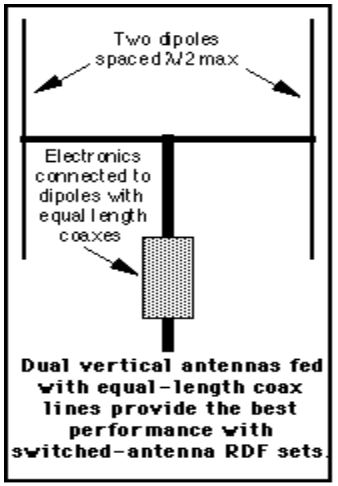
All “Good” Projects get Modified!!

http://www.homingin.com/hfinderfix.html

- Adds a “sense” mode to solve the 180° bi-directional signal
- Antenna redesign using two vertical dipoles



In this view looking down from the sky, the bidirectional HANDI-Finder unit (a) has two nulls, each perpendicular to the plane of the antennas. The added sense mode (b) has a single null on the Antenna #1 side.



Dual vertical antennas fed with equal-length coax lines provide the best performance with switched-antenna RDF sets.

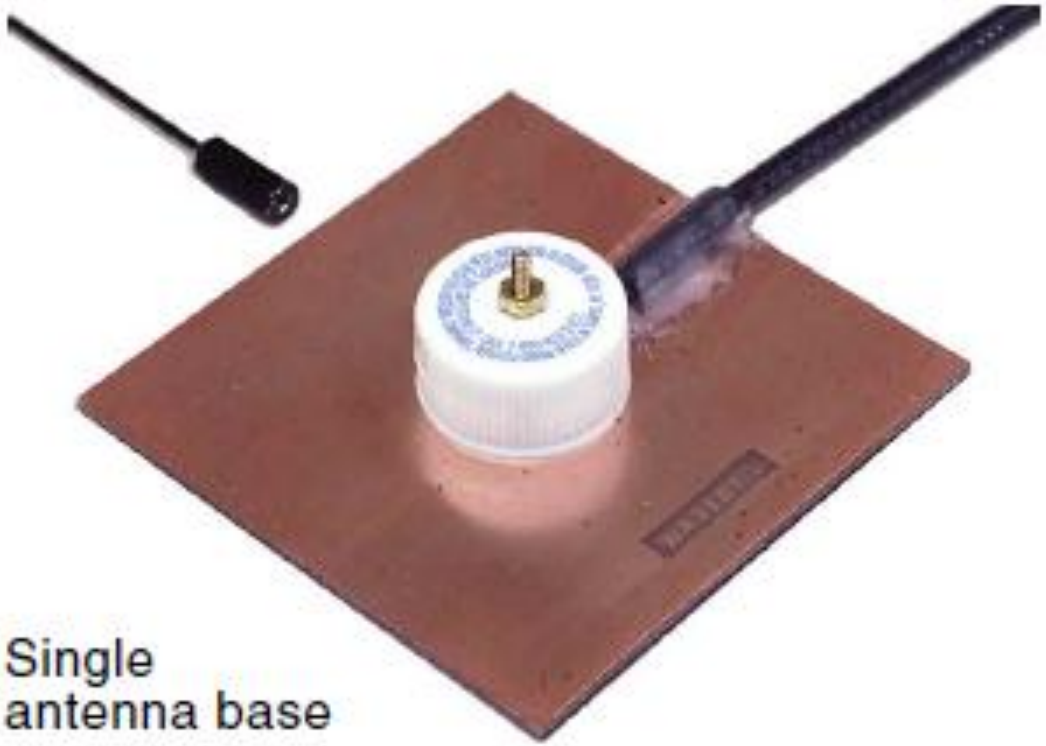
May 1999 QST, p 35

By Mike Kossor, WA2EBY

A Doppler Radio-Direction Finder

Part 1: A radio-direction finder (RDF) is useful in locating repeater interference (intentional or unintentional) and transmitter "fox hunting." Join in the fun with this VHF/UHF Doppler RDF project!

Great & Simple Antenna Design



Single antenna base

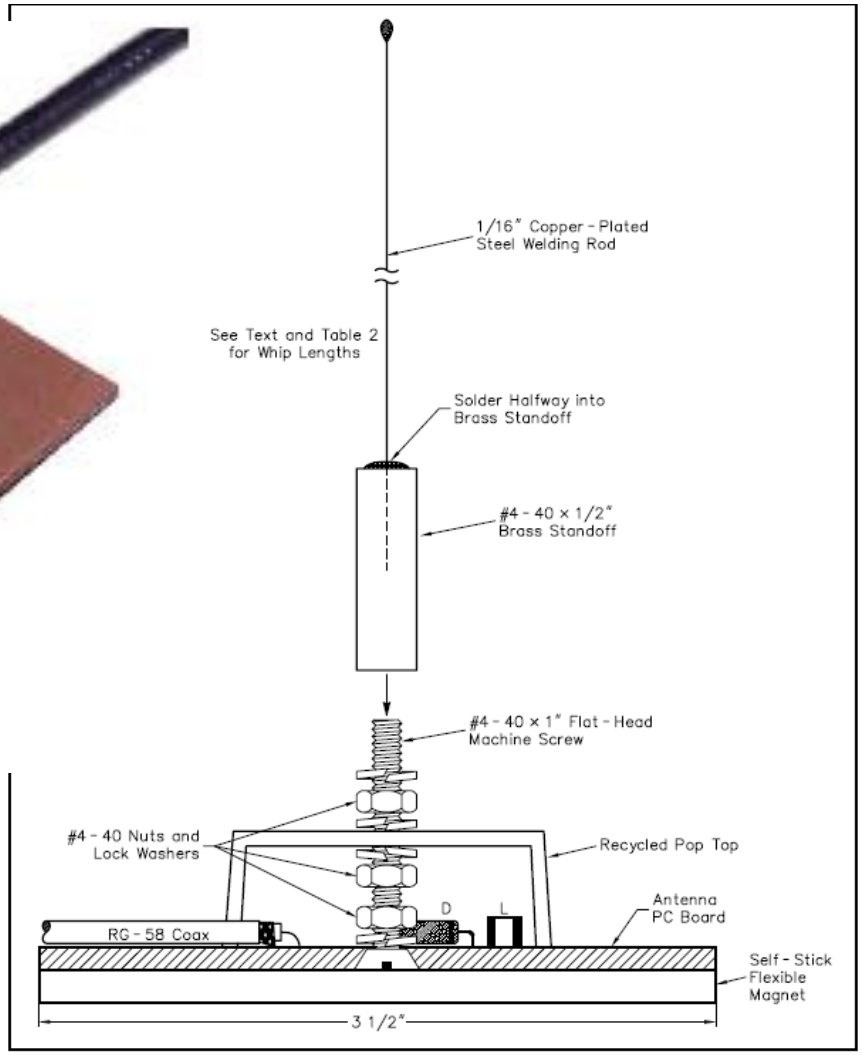
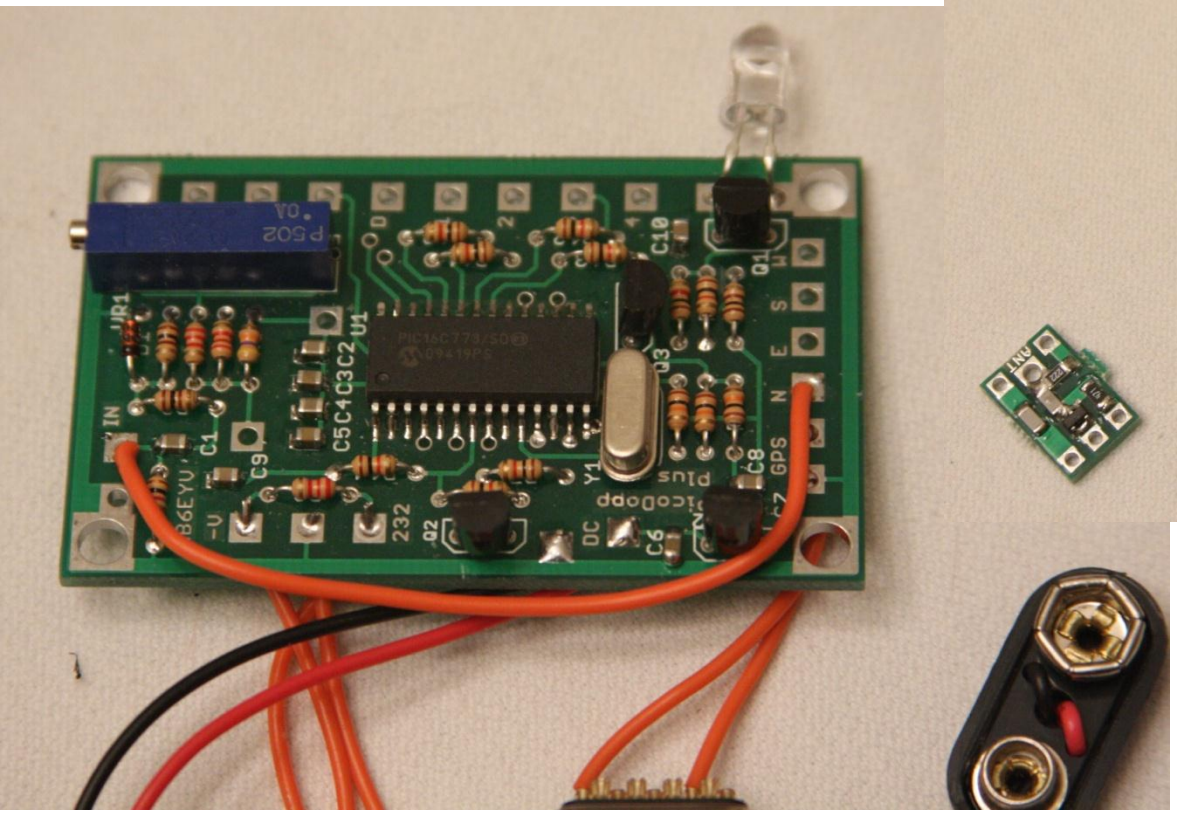
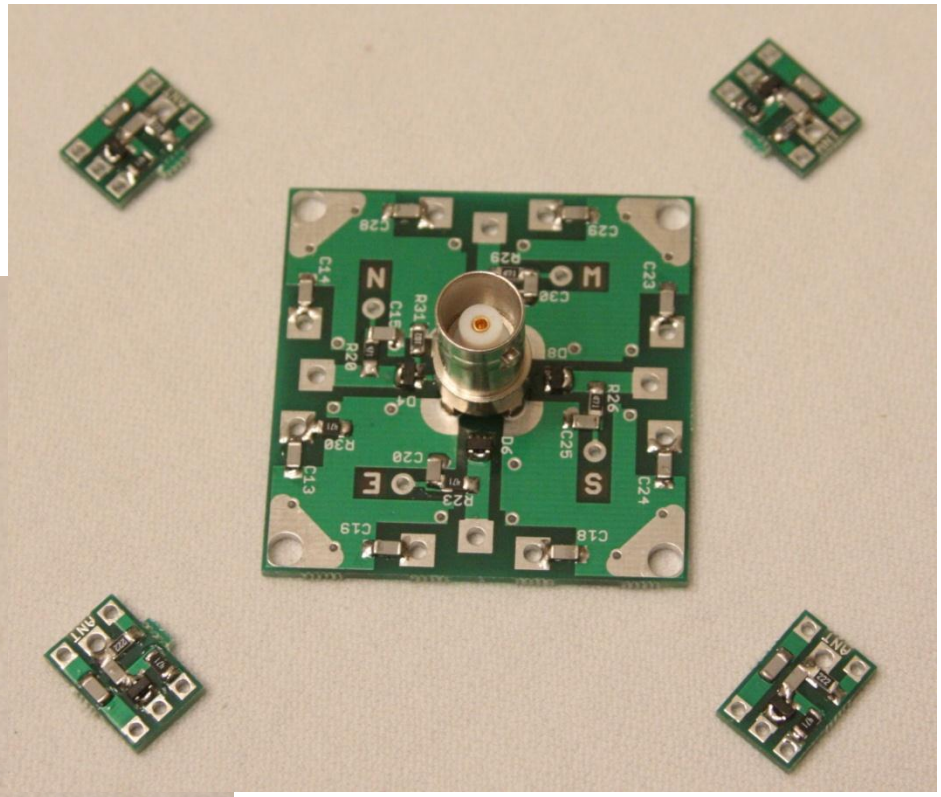


Figure 5—Assembly drawing of one of the four Pop Top Mag-Mount antennas.

PicoDopp – The Project

http://www.silcom.com/~pelican2/PicoDopp/PICODOPP.htm





ARDF – For the Sport of It

- 2011 IARU Region II ARDF Championship to be held in Albuquerque Sept 16-18 of this year http://www.wb8wfk.com/2011_ARDF_WEB/index.html

- World Wide competition - Hams & non Hams

- Also known as Radio Orienteering

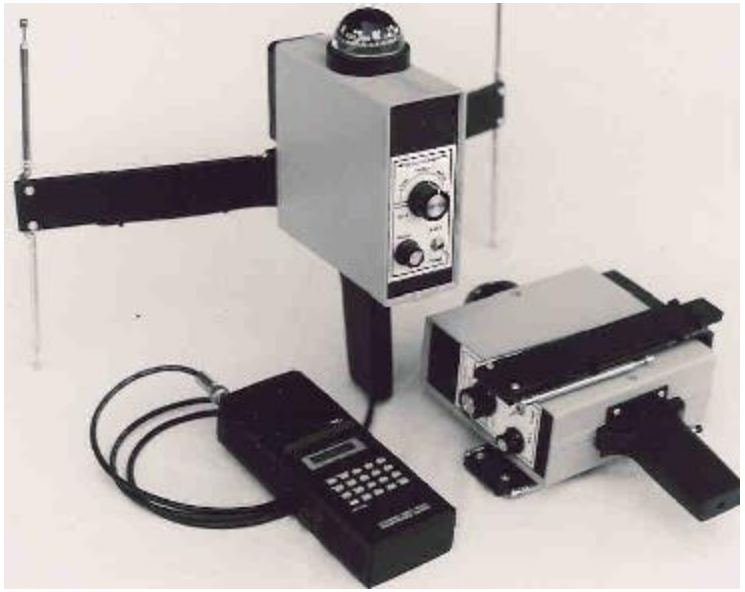
Orienteering

- GA Orienteering Club http://www.gaorienteering.org/
- Can be Foot, Bike, Canoe, Ski, Radio, Car
- Teaches Navigational skills
- Some versions use GPS to find “cache”

Finding Interference

- A full night's topic by itself
- I've hunted "professionally" in current job and advise local engineers on locating interference
- Tracked recent Interference impacting NFARL repeaters (444.475 & 147.06)
- Tracked down 2 GHz microwave interference
- Tracked down HF interference

Commercial Equipment



National VHF Vector Finder

National HFDF Vector Gun

http://www.nationalrf.com/index.htm