Portable HF Operations

Connecting From Anywhere &
Having Fun
Comm Academy 2019

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Introduction: a little about me

• Long time Ham
• Out-of-doors person
• Career in Technology and Emergency Management
• Active volunteer:
  – Seattle ACS - Director
  – NW Incident Management Team
  – COML/COMT
  – Forest Service Lookout: Red Top, Tyee & Sugarloaf
  – Public service events: RAMROD, Plain 100, Fat-Salmon
• Passion for portable HF
  – connecting from anywhere
Goal — stimulate Portable HF enthusiasm

Objectives

Discuss Portable HF covering these topic:

• Operating Purpose or the why
• Location – where matters
• Radios – options and best fit
• Power – batteries and generation
• Antennas – short or long range, adapting to where you are
• Building a kit – carry it well
• Activities – what to do
Disclaimer:

• I am not a doctor, engineer or scientist.
• I won’t give you a lot of formulas, software references or mathematical analysis.
• What I am going to talk about is practical – information from my and others experience.
• Hopefully, a starting point to stimulate interest.
Why HF?

Pros:
- Supports local and distant communications
- Minimal network infrastructure required
- Supports voice and data
- Connects to remote locations and moving platforms
- Short latency in long distance data communications

Cons:
- Affected by changes in environment (solar/earth)
- Subject to human caused interference
- Limited bandwidth
The Market finds new purpose for HF

Latency arbitrage – *beating the competition*

- Time value of money – capitalizing on the price fluctuations
- Completing a faster transaction by milliseconds
- Electromagnetic waves travel much faster through air than glass (fiberoptic cable)
- An edge in market trading
Sunspots – have a significant impact on HF

- The 11 year cycle
- Goodbye 24, hello 25
- Will HF ever be as good as it was?
- Next peak likely in 2024
- Forecast – weak
- Predicted range 95 -130 sunspots
- Typical range 140 – 220 sunspots
Why Portable HF?

Voice & Digital

• Support ACS-RACES-ARES Mission
• Support Public Service Events
• Personal back-up communications
• Recreational fun
• Escape the urban noise
• Because you can
ACS-RACES-ARES HF Mission

- Support operations at alternate EOC locations (evacuation)
- Field Operations when repeaters are not available
- Connection with other agencies and partner teams
- Situational awareness
- E-mail over radio
- Field Day – a great way to practice
HF Support for Wide Area Public Service Events

- HF maybe the solution for large area events
- Overcome challenges of distances, topography and limited repeater and internet access.

- Examples:
  - NW Ride of Dreams State wide motorcycle ride event 2011
  - RAMROD RFID tracking
  - Bigfoot & Plain 100
Portable HF
Personal Backup Communications

• Power and Cell service are fragile in the wilder regions of the west.
• Rent or own a vacation home or cabin in the woods?
• Take a ski vacation?
• A small HF rig may be your backup lifeline to the outside world.

Cabin at Lake Wenatchee WA
Sometimes everyday communications get a little overloaded.

Carpenter Road Fire Camp near Fruitland WA, 2015
HF Portable is Good Recreational Fun

- Build a compact kit and take it wherever you go.
- World traveling – make the appropriate licensing arrangements
- Hiking, camping or a road trip
- Boating
- Walking and bicycling
Location - considerations

• Support for antennas
• Access to power
• Exposure to weather (lightening)
• Topography e.g. hill top or valley
• Interference sources
• Creature comforts
  • Shelter
  • Water
  • access

Red Top Lookout,
Liberty, WA
In Search for
the Joy of HF
Quiet
Noon-time Net Check-in from my front yard in Seattle
Noon-time Net Check-in from Carkeek Park on Puget Sound
Radio Selection

what factors to consider?

What do mean by portable?

- Size and weight – will your desk radio work or is smaller important?
- Power
  - Output
  - Consumption - draw on receive
  - Internal batteries
- Operating features
  - SSB/CW all bands
  - 1 or 2 bands
  - CW only – etc.
- Technical features
  - Internal/external tuner
  - Filters/DSP
  - Dual receivers. Etc.
- Cost
  - Factory wired
  - Kit
  - BMW vs Hyundai

Elecraft KX3

HFPACK – Mizuho MX-7S

Yaesu FT 817 ND

Yaesu FT 857D

Xiegu X-108G
Portable Power Systems

- Power Storage:
  - Batteries – *the critical element in all systems*
    - Internal
    - Lead/Acid
    - Lithium Ion
    - Lithium Iron Phosphate
- Power Generation:
  - Solar
  - Wind
  - Gas
Batteries

- Lead/Acid Gel or AGM
- Lithium Ion
- Lithium Iron Phosphate
- Internal battery packs
- Alkaline or rechargeable
- Many provisions for internal charging or non-rechargeable options.
  - Check manufacture for accessories also after market suppliers
Lead Acid Batteries

- Two main service designs: Cranking and Deep Cycle
- Three Types: Wet Cell (flooded), Absorbed Glass Mat (AGM) and Gel
- Wet Cell – 2 types serviceable & maintenance free.
  - Pro: inexpensive & easy to charge
  - Con: possible spills, leaks and off-gassing

- AGM & Gel Batteries
  - Pro: store well, won’t spill or off-gas hydrogen and long life.
  - Con: Twice the cost of flooded.
- AGM vs Gel
  - AGM more tolerant in charging – Gel requires lower charging voltage and can be damaged
  - AGM hold charge longer than Gel
  - Gel more tolerant of extreme heat and very deep cycle operations
  - AGM is most compatible with solar and wind system
  - Both are available on 2nd hand market often for free. UPS replacements cycles.

Reference:
http://www.batterystuff.com/kb/articles/battery-articles/battery-basics.html#4
Lithium Ion Batteries Examined:

Advantages:
- High energy density – less weight & smaller form factor
- Reduced self-discharge
- No-maintenance discharge cycles required
- Variety of types & sizes

Disadvantages:
- Charge/discharge protection circuits required
- Aging in terms of elapsed time and charge cycles effects useful life
- Air travel limitations – fear of short circuit fire or explosion (remember - Boeing 787 thermal runaway issue)
- New technology – issues to resolve and improvements likely

References:
http://www.radio-electronics.com/info/power-management/battery-technology/lithium-ion-battery-advantages-disadvantages.php
http://batteryuniversity.com/learn/article/lithium_based_batteries
Lithium Iron Phosphate Batteries Examined

Advantages

• thermally and chemically stable
• 50% to 70% lighter than a traditional SLA battery
• Allows for extraction of >80-90% of the rated capacity
• Service life of 2000+ charge cycles at 5-10+ years
• Charging equipment reasonably priced
• Great for backpacking

Disadvantages

• These batteries are very expensive

Comparison LiFePO4 vs AGM:

• 20 AH LiFeP04: $193 weight 5.4 LBS size 6.5 x 4.31 x 3.3 in.
• 20 AH AGM: $40 weight 14 lbs size 7.15 x 6.59 x 3.03 in.

https://en.wikipedia.org/wiki/Lithium_iron_phosphate_battery
https://www.bioennopower.com/
Solar and Wind Battery Charging Systems

Components of a “green power” generation system”:

- Generator:
  - Photo- galvanic cells ($150/100 Watts),
  - Slick Folding Kit ($240/200 Watts)
  - Wind ($350/300 Watts) or
  - Water turbine (expensive)
- Charge Controller $45 and up.
- AGM Batteries 35 AH $65 100 AH $190
- Lithium Iron Phosphate battery 30 AH $280 100 AH $640 +
Wind – available technology

• 400 Watt unit less than $150 w/ charge controller

• Low wind – starts at 6 MPH

• Small form factor
Field Power – examples
Gas Generators

Considerations:

- Weight, size & output
- Voltage stability and quality (*multi step AC/DC/AC inversion*)
- Noise RF and audible
- 120 volt AC vs 12 volt DC
Portable Antennas a most critical component of HF
Communications objective:
• Local net check-in,
• County or regional tactical
• Personal e-mail from beyond cell coverage
• Local chat with friends
• Stay in touch with friends at home from along the road
• Across the country communications
• DX

Hardware strategies and preferences:
• Bring supplies adapt to what supports are there
• Build pre-configured kits that can be quickly deployed given a variety of supports
• Bring your own supports
• Buy commercial portable packaged antennas
NVIS Local Communications
Works primarily on 80, 60 & 40 meters

Near Vertical Incidence Skywave (NVIS):
• Horizontal antenna close to ground creates vertical wave
• Note - near coverage by ground wave out to 30 miles
• Umbrella coverage from approximately 30 out to 300 miles by NVIS Skywave
• Effective with low power and simple wire antennas
• This can work with less than elegant craftsmanship – a tossed wire works

Reference:
http://www.qsl.net/wb5ude/nvis/
NIVIS Wire Antennas
DX Engineering example

References:


http://www.w0ipl.net/ECom/NVIS/nvis.htm
Antennas for Distance aiming for a lower angle to the horizon

Easy options:

• End feed wire to high point e.g. tree, flag pole or kite with counterpoise
• Sloped or high off-center fed wire
• A simple dipole with height
• Vertical wire with counterpoise

Note: all options require a turner
Commercial Portable Antennas

A few examples:
- BuddyPole
- Hamstick dipole
- Steppir CrankIR
- Outbacker
More Antennas
Portable HF can be Simple
Here is my Basic Portable Antenna Package
Build a Kit
make it easy to take your gear and setup in the field

Design considerations:
- Enclosure - carry and operate
- Power interconnection
- Heat
- Remote connections to antennas and tuners.
- Internal, external or remote tuners.
Some more Kits
Practical setup in the Field

Considerations:

• Look for opportunities – adapt found objects for antenna supports
• Use a tuner – don’t sweat length measurements – *unless you want to*
• For end-fed wire and sloper configurations counterpoise and radials really help
• How much power? Sweet spot about 20 watts. *(5 watts slim 100 watts luxurious)*
• In the mountains it is so quiet – you can hear it all.
• Your friends in the City with high noise may not hear you.
• Experiment try different antenna/ground configurations – try a loop.
Where I have Operated Portable HF
Summits On The Air – SOTA:

- Contest-like activity
- Carry radio gear to designated summits
- Activate by making at least 4 contacts
- *Chasers* hunt the *activators* make contact get credit point

http://www.pnwsota.org/

How about SOTA?
Sugarloaf FS Lookout
near Leavenworth, WA
SOTA site
Field Day – a great opportunity to practice Portable HF

• 2019 ARRL Field Day is June 22-23
• Great team building event
• Practice setup and operating a field communications post
• Gain experience using emergency power
Discussion

Let’s look at the Gear