Effective Emergency Communications with a Handheld Radio

(no, these do not have to be mutually exclusive)

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Learning Objectives

- Overcoming the obstacles to handheld radio use
  - Location
  - RF Power
  - Antenna
- Overview of alternate electrical power sources
  - Battery options
  - Generator basics
  - Solar power basics

Audience Questions

- What is the furthest distance you have ever communicated on 2m FM …
  - Using a handheld radio?
  - Using a mobile radio?

- What is the value of one emergency communications radio message?

The Necessity

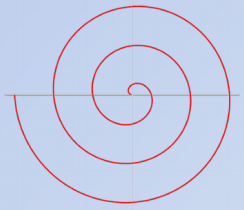
- You are new to amateur radio and …
  - Someone has loaned you one of their handheld radios
  - A handheld radio is all that you own
  - You have a high-end handheld and like the features
- Your handheld radio is the only one which survived the disaster/catastrophe
- You are away from home and only have your handheld radio with you

Not Being Heard?

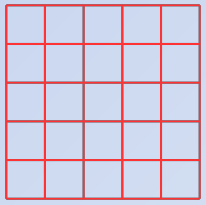
- Three options …
  - Change your location
  - Increase your power
  - Upgrade your antenna

Change Your Location

- Move away from signal-absorbing objects
- Turn around (to minimize body shielding)
- Move a bit to find a better spot
  - A spiral out from your initial position



  - A forward-backward and left-right grid pattern



Change Your Location

- If you are indoors, go outdoors
- Move your antenna higher
  - Raise you handheld above your head
    - An microphone accessory helps here
  - Move to the upper level of a building
  - Go to a hill top

Increase Your Power

- If your handheld radio has higher power capability, use it
  - Be aware that this will shorten battery life
- Add an amplifier … VHF/UHF example:
  - 4 watts input, 45 watts output (VHF)
  - 4 watts input, 35 watts output (UHF)
    http://www.mirageamp.com/Product.php?productid=BD-35
  - $240

Increase Your Power

- If your handheld radio has higher power capability, use it
  - Be aware that this will shorten battery life
- Add an amplifier … VHF example:
  - 5 watts input, 105 watts output
  - 20 watts input, 225 watts output
    http://www.rmitaly.us/index.php?main_page=product_info&cPath=2&products_id=137
  - $500

Increase Your Power

- If your handheld radio has higher power capability, use it
  - Be aware that this will shorten battery life
- Add an amplifier … VHF example:
  - 4 watts input, 160 watts output
  - 10 watts input, 200 watts output
    http://tesystems.com/144-148.htm
  - $500

Increase Your Power

- If your handheld radio has higher power capability, use it
  - Be aware that this will shorten battery life
- Add an amplifier … VHF example:
  - 50 watts input, 1250 watts output
    http://www.m2inc.com/FG2M1K2
  - $3,000

Upgrade Your Antenna

- In order to make a compact flexible antenna for a handheld radio, the designer had to make certain compromises
- They work, but not as well as one might like
- Your options are:
  - Upgrade the flexible antenna
  - Connect into an external antenna

Upgrade Your Antenna

- Example: 2m/70cm handhand whip (15” long)

  https://powerwerx.com/dual-band-gain-antenna-standard-sma

  https://powerwerx.com/dual-band-gain-antenna-reverse-sma

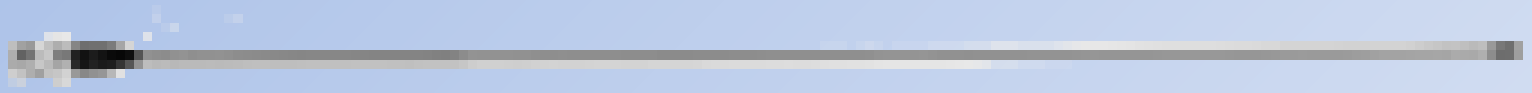
  - Powerwerx is a SEAPAC 2018 Exhibitor

Upgrade Your Antenna

- Example: 2m/70cm handhand whip (17” long)

  http://www.cometantenna.com/amateur-radio/ht-antennas/ht-dual-band

  - NCG (Comet/Daiwa) is a SEAPAC 2018 Exhibitor



Upgrade Your Antenna

- Example: portable/mobile whip (17¼” long)

  http://alphaantenna.com/index.php?main_page=product_info&cPath=17&products_id=90

  - Alpha Antennas is a SEAPAC 2018 Exhibitor

Upgrade Your Antenna

- Example: 2m/70cm portable/fixed j-pole

  http://www.jpoles.com/pictures.html

  - JPoles is a SEAPAC 2018 Exhibitor

Upgrade Your Antenna

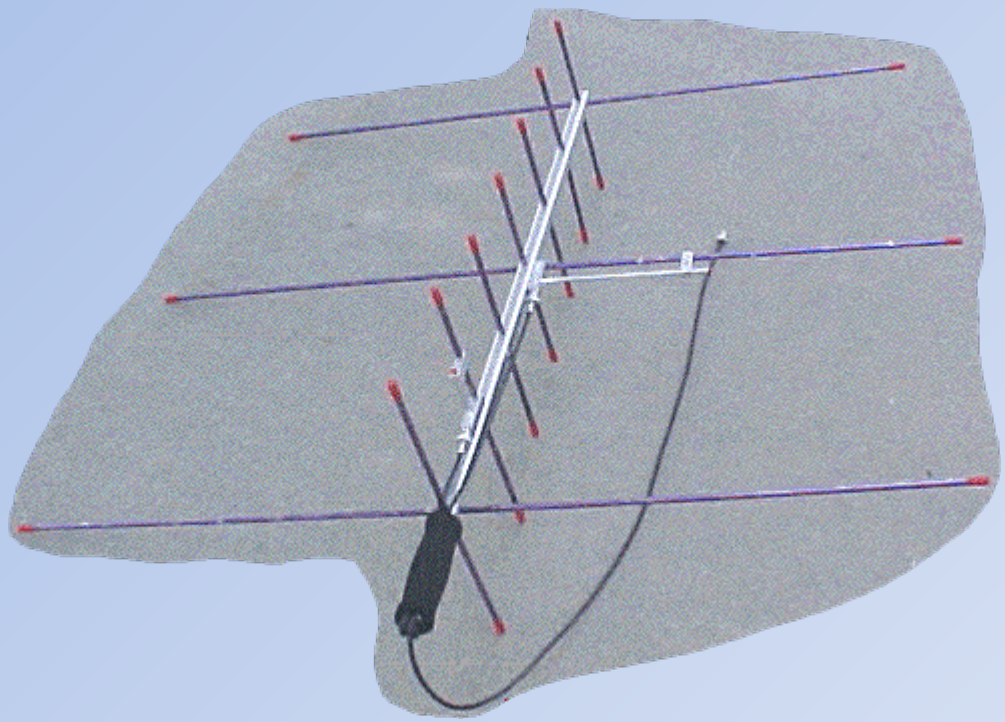
- Example: 2m portable/fixed slim jim

  https://www.jpole-antenna.com/shop/2-meter-slim-jim-antenna

Upgrade Your Antenna

- Example: 2m/70cm handheld beam

  http://arrowantennas.com/arrowii/146-437.html



Upgrade Your Antenna

- Example: 2m/70cm portable/fixed beam

  https://elkantennas.com/product/dual-band-2m440l5-log-periodic-antenna

  - Elk Antennas is a SEAPAC 2018 Exhibitor

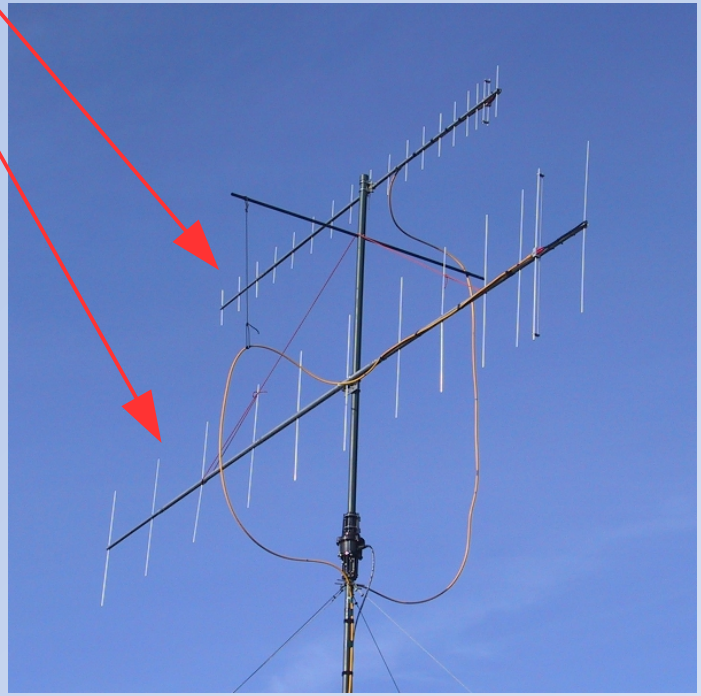
Upgrade Your Antenna

- Or perhaps a mid-sized beam …

70cm (18 elements): https://www.hamradio.com/detail.cfm?pid=H0-000726

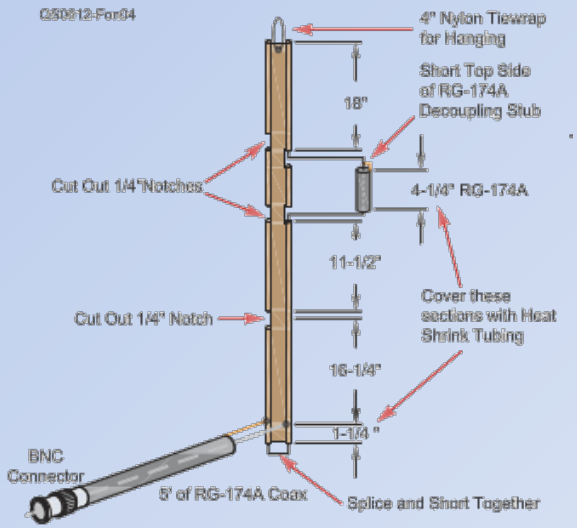
2m (12 elements): https://www.hamradio.com/detail.cfm?pid=H0-000710

  - HRO is a SEAPAC 2018 Exhibitor



Upgrade Your Antenna

- But what if you are caught out somewhere without any of these antennas?
  - A roll-up J-Pole is a good choice
    - Example: 2m/70cm portable roll-up j-pole
      - Edison Fong, WB6IQN, QST, March 2007
      - ARRL is a SEAPAC 2018 Exhibitor



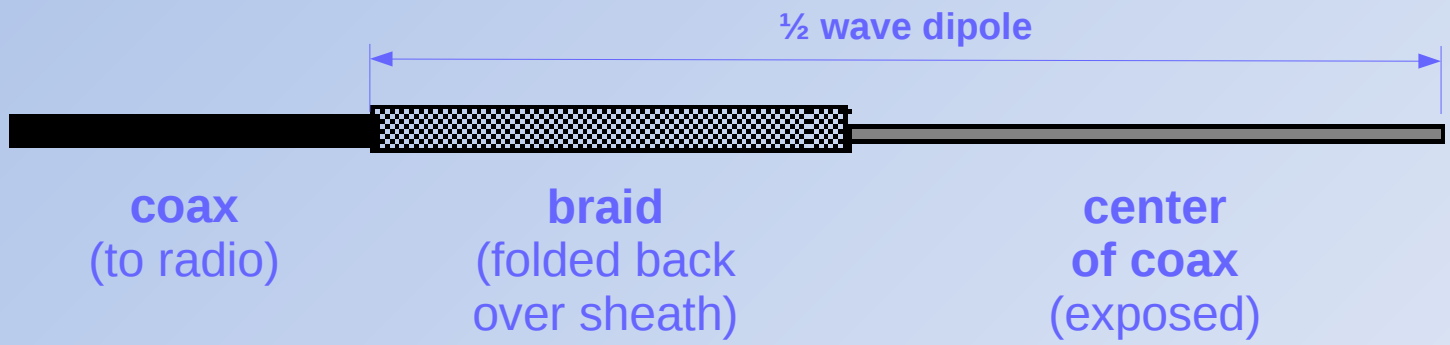
Upgrade Your Antenna

- But what if you are caught out somewhere without any of these antennas?
  - A roll-up J-Pole is a good choice
    - Example: 2m/70cm portable roll-up slim jim

      http://www.2wayelectronix.com/Dual-band-2m-70cm-Slim-Jim-Antenna-DUAL-STD.htm

Upgrade Your Antenna

- But what if you are caught out somewhere without any of these antennas?
  - A roll-up J-Pole is a good choice
  - In a real pinch … a piece of coax with the braid folded back ¼ wavelength will work



When Your Battery Goes Dead

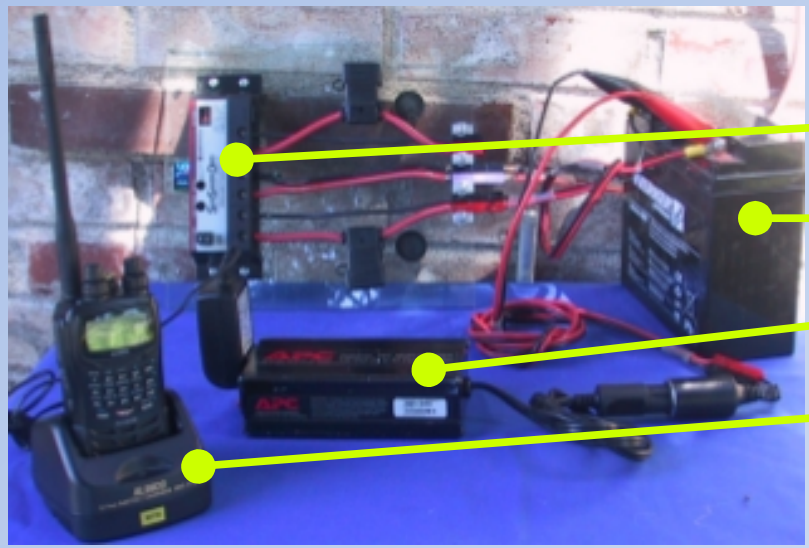
- Once you've addressed any location, power, and antenna issues, then you need to worry about how long you can communicate before needing to recharge your batteries
  - And yes, we presume you've thought ahead to preparing with several spare batteries

When Your Battery Goes Dead

- Recharge the NiMH or Li-ion battery pack via your drop-in charger
  - Usually needs 110V
    - But, your utility power is down
    - After a few days, you run out of fuel for your portable generator
    - Then what?

When Your Battery Goes Dead

- Recharge the NiMH or Li-ion battery pack via your drop-in charger
  - Here is one solution …



Solar panel (not shown)

Solar charge controller

12V 18AHr battery

Small inverter

Drop-in charger

When Your Battery Goes Dead

- Swap in a spare battery pack which uses common sizes of dry cells
  - AA, AAA, etc.

When Your Battery Goes Dead

- Swap in a spare battery pack which uses common sizes of dry cells
  - AA, AAA, etc.
  - No, you can't recharge them … but
    - You can store extra dry cell batteries for years
    - Dry cell batteries may arrive on relief supply trucks/aircraft/vessels sent into the disaster/catastrophe zone

When Your Battery Goes Dead

- Connect to an external 12V battery
  - Maximize interoperability by using Anderson connectors and clip leads
  - DcPwr (a supplier of connector parts and red/black wire) is a SEAPAC 2018 Exhibitor

When Your Battery Goes Dead

- Connect to an external 12V battery
  - But, you will still need a way to recharge that 12V battery
  - Remember to match the charging system to the battery type

Generator Basics

- Common fuel types
  - Gasoline
  - Diesel
  - Propane
- Some generators will work on, or have adapters for, multiple fuel types

Generator Basics

- **Gasoline** generators
  - Highly flammable fuel
  - Easily portable
  - Least expensive
  - Octane rating degrades over time
    - Less so if fuel stabilizer is added

Generator Basics

- **Propane** generators
  - Extremely flammable fuel
  - Can be somewhat portable
  - More expensive than gas
  - Indefinite shelf life

Generator Basics

- **Diesel** generators
  - Combustible fuel
  - Not easily portable (unless trailer mounted)
  - More expensive than gas & propane generators
  - Fuel susceptible to fungus/bacteria growth

Generator Basics

- **Safety**
  - No matter what type of generator you select, do not use it in a fully or partially enclosed space
  - Shut off the generator when fueling
  - Disconnect everything powered by the generator before shutting it down
  - Water and electricity do not mix, so don't handle the cords and plugs if they get wet

Solar Power Basics

- **Caution**
  - Do not even think about connecting 12V equipment directly to a solar panel
    - The voltage coming off the panel fluctuates outside the tolerance levels of your radio
  - Solar panel constructed for connecting to the electrical grid are not the same as those you will want to power your radios

Solar Power Basics

- What to need to have:
  - Solar panel(s)
  - Solar charge controller
  - Battery
- But where do you start?

Solar Power Basics

1. Select the battery voltage
   - 12V [most common]
   - 24V [easy to step down to 13.8 V (for mobile radios)]
2. Select the battery technology
   - Flooded lead acid [like your vehicle battery]
   - AGM [absorbent glass mat]
   - $LiFePO_4$ [lithium iron phosphate]
     - Light weight, better discharge power curve

Solar Power Basics

3. Select your solar charge controller
   - Amperage rating should be more than the combined output of the panels you connect
   - The technology used by the controller must match the technology of the battery
     - $LiFePO_4$ batteries are fairly new on the market and they require a solar charge controller designed for them

Solar Power Basics

3. Select your solar charge controller
   - Three basic types
     - Simple [on/off]
     - PWM [pulse width modulation]
     - MPPT [maximum power point tracker]

Solar Power Basics

3. Select your solar charge controller

- Three basic types
  - Simple [on/off]
    - Provides a constant charge rate until the battery reaches a set high voltage level, then it stops until the voltage drops
    - Cheapest type
    - No “smart” charging capability
    - If the manufacturer does not list “PWM” or “MPPT” as the type of controller, then assume it is a simple controller
    - Do not get this type of solar controller as it will reduce battery life significantly

Solar Power Basics

3. Select your solar charge controller

- Three basic types
  - PWM [pulse width modulation]
    - Adjusts charging cycle through bulk, absorption, and float stages based on the battery's level of charge
    - Minimum technology level you want for charging batteries
    - Equally efficient in hot and cold conditions
    - Less complex electronically (fewer parts to fail) than MPPT
    - Better output when one panel in series is shaded

Solar Power Basics

3. Select your solar charge controller

- Three basic types
  - MPPT [maximum power point tracker]
    - Most expensive type
    - Slightly more efficient than PWM, especially at lower temperatures and in cloudy conditions
    - Has the advantage over PWM as the voltage difference between the panels and batteries increases, but the advantage is reduced as the outdoor temperature increases
    - Early models produced enough RFI to interfere with ham radios, so watch the product labeling and manufacturer guarantees carefully

Solar Power Basics

4. Select your solar panels
   - Three basic types
     - Thin Film
     - Polycrystalline Silicon
     - Monocrystalline Silicon

Solar Power Basics

4. Select your solar panels
   - Three basic types
     - Thin Film
       - Made by depositing thin layers of photovoltaic material onto a substrate, and can be made flexible
       - 7% to 13% efficiency
       - Least expensive
       - Require more space than other panel types for the same output, and degrade faster than silicon panels
       - Vast improvements in this technology are expected over the next 10 years

Solar Power Basics

4. Select your solar panels
   - Three basic types
     - Polycrystalline Silicon
       - Made by melting raw silicon and pouring it into a square mold
       - 13% to 16% efficiency
       - Less expensive than monocrystalline solar panels
       - Can be identified by their bluish color
       - Performance slips slightly at high temperatures

Solar Power Basics

4. Select your solar panels
   - Three basic types
     - Monocrystalline Silicon
       - Made from cylindrical pure silicon ingots
       - 15% to 21% efficiency
       - Most expensive of current "production" technologies
       - Can be identified by their uniform dark gray color
       - Longest life of current solar panel technologies
       - If partially covered the entire circuit can break down

Summary (1)

- You can overcome the shortcomings of using a handheld radio in emergency communications
  - By changing your location, adding an external amplifier, and/or upgrading your antenna
- Plan for re-charging of your batteries
  - After the utility power fails and your portable generator runs out of fuel

Summary (2)

- When buying a generator
  - Look for one you can use safely for extended operational periods
    - Remember generator and fuel storage safety
- A basic solar panel, charge controller, and battery combination is not difficult to set up
  - Can be less expensive then a portable generator

Questions