My Advice for Making Well-Equipped ARES Stations

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Author's Note:

This was originally prepared for members of the Upshur County ARES group. After the creation of this document, it was determined that the contents were nearly identical to training material prepared by John Kieth —W5BWC, for the ARES training nets. This was prepared before the author had seen said material, but due to the possibility of certain aspects of this document being a derivative of Mr. Kieth's work on the air, credit is given for his assistance in compilation.

Disclaimer

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In other words, this is my opinion—nothing more, nothing less. Read at your own risk!

Well-Equipped ARES Stations

Background

This is not the first time a list of ARES station equipment has been compiled, and I don't pretend to be the expert on the subject. However, growing up in a household that focused on preparedness all my life, this is the stuff I think about often. And being a ham for two years with the honor of watching those that are experts has provided me with a few tips and tricks that I think are useful. I am sure there are similarities between this and other lists, so I won't even claim all of it as original, but I am claiming it as helpful.

My list is broken into four sections: equipment, information, records, and tools. These contain what I feel are the most useful items to have on hand for an ARES activation or other emergency event. The groups I picked should keep your focus on the necessities for your particular operating style, which will affect the exact items you choose. Items in the equipment, information, and records sections are easily obtainable, and I believe, are essential to any station. Tools are always needed, and I think the items I have listed are a good choice for a small emergency kit—or a "go-kit".

Although this list is focused on the needs for an ARES station, I believe these items are things that each amateur should have in his station or "go-kit." For instance, a radio and power supply are an absolute necessity. Without an antenna and something to feed it, no one could talk very far. But if your coax connector breaks or your coax seems wet, you need tools to test and repair it. And when you do finally talk to someone, you need a way to keep records of what happened.

My essentials

- Equipment
  - Radios
    - This can include whatever you want. I think having a mobile or base station rig in addition to at least one HT is a smart choice. The HT lets you work local stations on a repeater or simplex, leaving your other radio free to run more power on HF or VHF if you need to.
  - Power supplies
    - Make sure this includes chargers for HT batteries, phones, laptops, backup batteries (e.g. the deep-cycle batteries in your backup supply), and even flashlight batteries or anything else you might need. Do a dry-run and commit your self to stay at your operating position and don't leave the shack. You will usually find that *something* is always *somewhere* other then where you need it—including batteries for those things you take for granted.
  - Power cables
    - Equipment power cables are really easy to walk off without if you are going mobile or to another operating position. Think about AC extension cords, too. Sometimes you need extra length, like when the breaker in your shack goes bad and you need to run it off of another circuit. Just make

sure it is rated for the current that your equipment draws (from the AC mains, that is), and try to keep them short!

- Tip: The Anderson Power Pole connector is becoming an industry standard for DC connectors in the amateur community, especially ARES groups. You might consider replacing your connectors with these as the need arises, or keep an adapter or two handy, just in case. They aren't everywhere as of yet though.
  - https://www.andersonpower.com/us/en/resources/PowerPoleResourcesPage.html
  - Many ham radio suppliers carry these, including DX Engineering; https://www.dxengineering.com/

- Coax and accessories (cable, connectors, adapters, jumpers)
  - I like to be able to plug anything into anything else and everything into everything else at the same time. This might not work for you, but make sure you have the essential connections, like those from your antenna to your radio, including those for HT's.
    - Tip: If considering an adapter to go from your HT to coax cable, you should buy a small-diameter coax jumper which will reduce the strain on the HT's antenna connector.
- Antennas
  - These include those found on your base station, mobile station, or your HT. For HF, just about anything will do, but an NVIS antenna is generally used for local communications. For VHF and up, omnidirectional verticals are good for causual FM work, and horizontal antennas are generally used for SSB or digital modes. Beam or other directional antennas are especially useful during emergencies because they may allow lower output power to be used (saving energy during situations when it's limited) and allow more distant stations to be reached. Mobile antennas also vary, but the same principles apply concerning antennas for VHF and up. HT's should be outfitted with something better than a "rubber duck" to allow more reliable communications. Having an extra(or multiple) antennas is a good idea since these can make or break your entire setup.
- A scanner
  - Not only are these helpful for monitoring police and fire departments, they also come in handy for monitoring traffic on many different repeaters or simplex channels at once. As an added bonus, lots of listening won't drain the battery on you HT or emergency power supply, and most scanners can easily receive transmissions from first responders and other agencies of interest.
- A weather alert radio
  - These are lifesavers—literally. Simple units activate and notify the user whenever the NWS emits a series of alert tones over one of the seven broadcast channels. More advanced units only "trip" when a special encoding is used that matches the code set on the radio. Actually, the

specific area message encoding (SAME) makes sure you only get alerted for the county you set on the unit, which prevents alarms for counties other than the ones you want to hear.

- Tip: These are great to keep running 24/7 to make sure you get alerted of severe weather—or any other public hazard that the government may need to broadcast a warning for. For operation in remote areas or ones without Internet access, the NWS broadcast bands are a vital resource for keeping on eye on the weather. Some scanners and HT's have the ability to listen in on these channel, too.
- https://midlandusa.com/product-category/weather/

- Spare parts
  - Things like connectors, fuses, and maybe antenna insulators, are things to think about here. Usually fuses are the main thing to keep on hand, and you should consider keeping some for you car/truck, generator, radios, tuners, power supplies, fuse boxes (does any still uses those on the mains?), etc.. I also like to keep a few crimp-type butt connectors on hand in case a wire gets cut or damaged. If you have something that would cease to function should parts break or get lost, consider keeping a few replacements on hand.

- Information
  - License grant
    - This should be the official copy printed from the FCC ULS database, not the "reference copy" that anyone can access.
  - Identification
    - Any time you are activated or volunteer for something, you need credentials to show why you are qualified to do what you claim you can. For ARES, an ARES ID card would work, and if a RACES member or SKYWARN spotter, resources for these would be required. *Make sure they are up to date!* A drivers license is also a good idea if you are going to a remote site for an activation whether you are driving or not.
  - ARES Emergency Reference sheet (ARRL FSD-255)
    - This is available from the ARRL website at www.arrl.org/public-service-field-services-forms, but the important thing is to have contact info for local law enforcement, police, ambulance, emergency coordinators, NCO, NWS offices, etc. If they play a role in emergencies, then you should probably have a way to contact them.
  - Traffic handling information
    - If you aren't experienced in traffic handling, then you need to figure out what you are doing before even thinking about passing a piece of traffic. My favorite resource is "Traffic Training" by Jo Ann Keith, KA5AZK. It is available at: http://www.7290trafficnet.org/roster/Traffic

%20Training%20Revised%20June%202019.doc The ARRL also has information concerning traffic handling, and even if you are experienced in traffic handling, these resources are still a valuable reference.

- Contact info for others in the Amateur Radio community
  - In addition to ARES members and emergency coordinators (that means keep the club roster handy), having information for the following people is helpful:
    - Local repeater trustees or managers (useful if you find out an important repeater is down or being interfered with)
    - Net control stations in charge of local or regional nets (This can be useful if you need a fill-in NCS, or if you need to spread information quickly)
    - Geniuses (self explanatory—the smart ones can help fix any problems that may arise)
- Channel Guides
  - Like TV listings, these "channel guides" will help keep track of when and where nets take place. They should contain the information needed for regular ARES and/or SKYWARN nets, in addition to HF nets which can cover a much larger area. Having all of your equipment won't help you if you can't remember what frequency the local repeaters are on, so make sure you have the frequency, tone, and any other info that you (or others) might need. Good resources include:
    - http://www.arrl.org/arrl-net-directory
    - http://w5mz.com/nets/ (some information is outdated, but still useful overall)
    - http://freedom-link.org/
    - https://www.4sarc.org/?page_id=16
  - Tip: Most clubs will have a page on their website devoted to local nets. Be sure to check these out.
- Band plans
  - These are vital to make sure you stay within your frequency allocations when operating. References may include:
    - http://www.txvhffm.org/coordination/bandplan.php (This one is specific for Texas)
    - https://www.icomamerica.com/en/amateur/amateurtools/US-BandPlan-Update-1-2020.pdf (My personal favorite)
    - http://www.arrl.org/band-plan

- Repeater information
  - Repeater directories or online services (such as RepeaterBook) are vital to keep track of repeaters. The info contained in print directories may become inaccurate as new repeaters are moved or added, so making sure your copy is up to date is important. Another option is to print lists from https://repeaterbook.com/. The advantage to this is that repeater info can be updated by the users, so information may be more accurate—and it's free. If you like books, then the ARRL Repeater Directory is a good resource. Also, many clubs will have a lists of local repeaters on their website, and these *should* be accurate.
    - Tip: If printing lists from the Internet, print two lists: one filtered by frequency, the other by distance. This lets you find repeater data quickly if you only know the frequency.
- Maps
  - Maps should be a part of every amateur's station, and may include the great circle map and a county map. The great circle map allows easy pointing of antennas, and can be a useful tool for gauging distances from your location. County maps are especially helpful during severe weather, as most NWS bulletins list counties when issuing watches or other warnings. A map or atlas showing counties, towns, cities, and roads, can be especially useful when trying to keep track of damage or storm reports in locations you are not familiar with, and lets you know what county's ARES group you may need to contact. Grid square (Maidenhead locator) maps can be handy, too.
    - Tip: Great circle maps can be printed from the Internet and are a big help for the, well, directionally challenged, hams. https://ns6t.net/azimuth/
- Public service radio data
  - This is optional, but having the frequency information for local law enforcement, fire departments, ambulances, and the like, may prove useful if you need to hear what they have going on. Also, depending on the situation, you may need to relay information between organizations or even provide emergency communications for those agencies.
    - https://www.radioreference.com/
- Unlicensed radio data
  - Don't forget that hams aren't the only ones that can provide communications in a dire situation. Having the frequency and PL tone data for services such as the MURS, FRS, GMRS, CB, and even Marine Radio Services, can allow interaction between licensed and unlicensed users. Remember: When lives depend on it, you aren't bound by what service the frequency is assigned to. Whatever means necessary to get help are at you disposal.

- Specialty information
  - This is very dependent on your setup, but should always include equipment manuals. If you don't know how to do everything with your equipment, chances are high (because of good ol' Murphy) that you will need to do something you don't know how to do—and in a pinch, too. Having the manual is vary helpful here. These other things I keep close by are:
    - A manual for my primary HF rig in case of confusion
    - Manuals for digital mode software—usually on the PC with the software if I need them
    - Manuals for my packet TNC/modem
    - APRS information—including SSID settings, path recommendations, services that can be accessed over the radio (like Winlink and weather reports)
    - The ARRL Handbook
      - To be honest, this is a lot like my soldering iron: I can't keep it put away. You will usually see this sitting on or next to my desk, and believe me, it is a very useful reference. You don't need a brand new one, anything within the last few (3-6) years will work fine. Really, any version will probably answer most questions, but coax styles have changed and tubes have been replaced (mostly) by power MOSFET's and transistors. Mine is a 2017 version and it suits my needs. I don't recommend this for use in a go-kit because of its size, though.
    - Login credentials
      - A DVD or a flash-drive works great to store login information for important websites, and you can encrypt them to prevent the data from being stolen. Or, a piece of paper secured in a discrete location works fine.
    - SKYWARN spotter information
      - This includes hail-size charts, wind-speed estimators, and contact data for the NWS. I can't find any links for this one, as it was a handout from the NWS. Spotter books may also be helpful.
  - Most manuals are available online. I recommend downloading these and printing them out. Nifty Accessories (https://www.niftyaccessories.com/) has a wide selection of guides for radios and equipment if you like more condensed versions of the manuals. (I haven't tried them personally, but I've seen a lot of them online.)
    - Tip: Just because you know how to use your station doesn't mean everyone else does. It is a good idea to keep records, manuals, and wiring diagrams for your station in case another operator needs to take over. This is also true of complex mobile setups. Be considerate of

anyone who may need to utilize your equipment. Labels and tags help a lot! As a bonus, they also make repairs and troubleshooting go much faster.

- Record Keeping
  - Whether you are handling formal traffic, taking check-ins on a net, or just monitoring the local repeater to see what's going on, record keeping is always helpful. Good tools include:
    - A notebook and pencil
      - Perhaps the most important tools because of their versatility, these are a must for taking notes. Pens are nice, too, and have their uses.
    - ARRL Radiograms
      - These are the standard form for handling formal traffic, so keeping a few handy is a good idea. (These are not a necessity, however, and the same information can be recorded on plain paper, but they are useful at times—especially for beginners.) They are available in book form, a typeable PDF, or printable format from the ARRL website and other sources. http://www.arrl.org/files/file/Public%20Service/RADIOGRAM-2011.pdf
    - Log books
      - While formal record keeping is no longer necessary under the FCC rules, keeping a log of what stations you talk with, when, and on what frequency, is a smart choice during ARES or other emergency activities. *You should always keep this same information with status or damage reports—traffic! A piece of unlabeled traffic is useless!* Nevertheless, a log book is also helpful when taking check ins on a net, since most logs will also contain spaces for names, locations, and signal reports. I prefer to use a spreadsheet with a column for each field that I need, and print them for storage in a three-ring binder—another thing I keep by my desk.
        - Tip: Log books can also be handy for recording propagation data. Think of them as an SWL's log book.
    - A computer
      - These can be "all-in-one" tools for many of the above points. However, it should be remembered that paper does not require power or Internet to operate, and thus provides a level of security not provided by a device such as a PC or phone. Keep in mind that emergency situations (such as those that may warrant the activation of an ARES group) do not always provide the resources needed to effectively use a computer. Therefore, I consider this an optional piece of the station setup.

- Tools
  - I don’t consider any station complete without a well stocked tool box. Connectors may fail and need replaced, fuses blow, and wires get nicks in the insulation. It’s important to keep the items on hand you need to diagnose or repair common problems. This list is not exhaustive, and may be lacking, but the items I have listed here are what I consider to be the bare minimum to keep on hand—no matter the situation. Many other items are a good idea to have, but are out of the scope of this document. Some of the things I like to include are:

    - Electrical tape
      - Works great for sealing coax connectors—if you do it right, and the obvious use of insulating connectors and wire. I like Scotch brand products, and I haven’t used anything from them I haven’t liked. But the cheaper stuff usually works.
      - Tip: Not all tapes are equal—make sure you buy one with temperature and voltage ratings to fit the conditions you need. Also, make sure you have a roll of outdoor-rated tape for sealing things like coax connectors and wires.
    - Multi-tool
      - May include: pliers, wire cutters, knife, saw, screw drivers, bottle opener (a necessity in some instances...), and scissors.
    - Wire cutters/strippers
      - My pair has slots for crimping, cutting, stripping, and looping of wire, screw cutters, and a needle-nose point.
    - Multi-screwdriver
      - Philips #1 and #2 are the most useful, in addition to 1/4” and 3/16” flat head bits. The bits in mine are removable, and allow the shaft to be used as a nut driver.
    - Duck tape
      - Man’s best friend…its potential uses are endless. (Has anyone tested duck tape at RF?)
    - Multi-meter
      - This is one of those must-have tools. It can be a very useful troubleshooting aid. Handy as a go/no-go tester for coax and connectors.
        - Tip: A multi-meter won’t measure coax impedance, just the resistance, so don’t expect to see 50 ohms of resistance on your meter unless your coax is insanely long! You’ll need a VNA or antenna analyzer to really check your cable, but those aren’t a necessity.
    - Hammer

- Good for beating stubborn items into submission.

- Lubricant
  - Either one of these will work:
    - Ballistol (https://ballistol.com/) is my go-to cleaner and lubricant—it smells a little, but works great. And it claims it won't kill you with prolonged use. I use it on everything from Kitchen Aid mixers to farm equipment to coax connectors. This works well on bolts and pivot points to reduce friction and prohibit rust. As an added bonus, it emulsifies with water, so you can dilute it if need be. Works good on battery terminals and connectors that tend to corrode, too.
    - WD-40. Need I any description? I like this if I need to lay down a lot of oil at one time or clean parts off. This is the lightest weight oil I use, and I usually leave it for the messier jobs or outdoor use.
- Zip-ties
  - These can be used hold things together in a pinch—like antennas and cables on the side of a pole or tower.
- Wire
  - I keep a roll of 14G (maybe 16G?) primary wire in my tool box for quick repairs. This will work for patching a power cord or repairing a wiring harness in a vehicle. Keeping a length of smaller hook-up wire (like the innards of a CAT5 or phone cable) is helpful for repairing smaller items like circuit board traces or front panel controls for equipment.
- Soldering tools—solder and an iron are really all you need here for a go kit.
  - A temperature controlled iron is fine for most electrical applications; a small butane torch works great for coax connectors. There are even some battery operated irons sold that should work for smaller jobs.
  - Solder should be of the rosin core type for electrical work, other then that, it's up to personal preference. I like Kester brand tin/lead solders, as lead solders generally have a lower melting point then lead-free alternatives. Just don't hold it in your mouth while soldering. Having a role of acid-core silver bearing solder might be smart for structural repairs—or broken water pipes.
  - Solder-wick braid or a de-soldering pump can also be useful.
  - A tip cleaner is great, I use bundled up copper-wool in a baby food jar. (Actually, the copper mesh they use to plug weep holes in brick walls.) A small sponge works, too.
  - A helping-hands type soldering helper. I got one with six different bendy-arms that works great for holding wires, connectors, and circuit boards. Some models have a magnifier.

- Solder tool kit. A few different companies make these, but one of the ones I have is made by Elenco. These may include a leg bender, picks, wire brush, and a scraper.

Conclusion

It isn't hard to assemble a well-equipped station. It doesn't have to cost a lot either. The important thing is to assemble a station around your needs and operating style, and to have fun doing it. A great way to figure out what you need is by getting on the air, and testing your setup on Field Day, or a training drill with your local club or another ham. These tests will let you find any weaknesses in your station, as well as give you experience outside the comfort of your shack. Always expect the unexpected and be prepared; you might not ever have the "perfect" station, but that shouldn't stop you from trying.