Section 4: What Happens When Called

Topic 16

Preparing for Deployment

Objectives

Welcome to Topic 16.

In this topic, you will learn about the steps an emergency communications volunteer should take to be ready to respond quickly and be fully prepared to handle their emergency communications assignment.

Student Preparation required:

None.

What We Prepare For

Remember the Boy Scout motto, “Be Prepared”? Nearly 100 years ago, a young British Boy Scout asked Sir Robert Baden-Powell, the founder of Scouting, what exactly it was he should be prepared for. Baden-Powell’s famous answer was, “Why, for any old thing, of course!”

The same should be true of emergency communications volunteers. You never know which challenges an emergency situation will offer. You might have ac power, or just the batteries you bring along. Safe drinking water may be available, or you may have only your canteen. Sometimes you can find out in advance what sort of conditions are likely for your assignment, but many times no one will know — particularly during the early stages of an emergency.

Being prepared for an emergency communication deployment involves a wide range of considerations, including radio equipment, power sources, clothing and personal gear, food and water, information, and specialized training. No two deployments are the same, and each region offers its own specific challenges. What is appropriate for rural Minnesota in January probably won’t work for urban southern California in any season.

Go-Kits

The last thing you should need to do when a call for assistance comes is think of and locate all the items you might need. Any experienced emergency responder knows how important it is to keep a kit of the items they need ready to go at a moment's notice. This is often called a "jump kit" or "go-kit." Without a go-kit, you will almost certainly leave something important at home, or bring items that will not do the job. Gathering and packing your equipment at the last moment also wastes precious time. It is important to think through each probable deployment ahead of time, and the range of situations you might encounter.

Here are a few basic questions you will need to answer:

- Which networks will you need to join, and which equipment will you need to do so?
- Will you need to be able to relocate quickly, or can you bring a ton of gear?
- Will you be on foot or near your vehicle?
- Is your assignment at a fixed location or will you be mobile?
- How long might you be deployed — less than 48 hours, or even a week or more?
- Will you be in a building with reliable power and working toilets or in a tent away from civilization?
- What sort of weather or other conditions might be encountered?

- Where will food and water come from?
- Are sanitary facilities available?
- Will there be a place to sleep?
- Do you need to plan for a wide variety of possible scenarios or only a few?
- Can some items do "double duty" to save space and weight?

Other questions may occur to you based on your own experience. If you are new to emergency communications or the area, consult with other members of your group for their suggestions.

Most people seem to divide go kits into two categories: one for deployments under 24 hours, and one for up to 72 hours. For deployments longer than 72 hours, many people will just add more of the items that they will use up, such as clothing, food, water, and batteries. Others may add a greater range of communication options and backup equipment as well.

Go-Kit Idea List

- Something to put it in — one or more backpacks, suitcases, plastic storage tubs, etc.
- Package individual items in zipper-lock bags or plastic kitchen containers.

Radios and Accessories

- Handheld VHF or dual-band radio (some people like to bring a spare)
- Spare rechargeable batteries for handhelds
- Alkaline battery pack for handhelds
- Alkaline batteries
- Speaker-mic and earphone for handhelds
- Battery chargers, ac and dc for handhelds
- Mobile VHF or dual-band radio
- HF radio
- Multi-band HF antenna, tuner, heavy parachute cord or nylon mason's twine
- VHF/UHF gain antennas and adapters (roll-up j-pole, mobile magnetic mount, etc.)
- Coaxial feed lines, jumpers
- Ground rod, pipe clamp, and wire
- Ac power supplies for VHF/UHF mobile and HF radios, accessories
- Large battery source for VHF/UHF mobile and HF radios, with charger
- All related power, data, audio, and RF cables and adapters
- Small repair kit: hand tools, multi-meter, connectors, adapters, fuses, key parts
- Materials for improvisation: wire, connectors, small parts, insulators, duct tape, etc.

- Photocopies of manuals for all equipment
- Headphones for noisy areas and privacy with proper connector, adaptors
- Specialized gear for packet, ATV or other modes
- Multi-band scanner, weather radio
- Personal cell phone, pager, spare batteries, and chargers
- Pencils, legal pads, pencil sharpener

Personal Gear

- Clothing for the season, weather, and length of deployment
- Toilet kit: soap, razor, deodorant, comb, toilet paper
- Foul-weather or protective gear, warm coats, hats, etc., as needed
- Sleeping bag, closed-cell foam pad, pillow, earplugs
- High-energy snacks
- Easily prepared dried foods that will store for long periods
- Eating and cooking equipment, if needed
- Water containers, filled before departure
- First aid kit, personal medications and prescriptions for up to one week
- Money, including a large quantity of quarters for vending machines, tolls, etc.
- Telephone calling card

Information

- ID cards and other authorizations
- Copy of Amateur Radio license
- Frequency lists and net schedules
- Maps, both street and topographic
- Key phone numbers, e-mail and internet addresses
- Contact information for other members in your group, EC, DEC, SEC, and others
- Copy of emergency plans
- Resource lists: whom to call for which kinds of problems
- Log sheets, message forms
- Operating supplies
- Preprinted message forms
- Log sheets or books
- Standard forms used by the partners
- Letter or legal size notepads
- Sticky notes
- Paper clips and rubber bands
- Blank envelopes
- Stapler, spare staples

Subdividing Your Kits

You may want to divide your go kit into smaller packages. Here are some ideas:

- Quick deployment kit: handheld radio kit, personal essentials, in a large daypack
- VHF/UHF, HF kits for fixed locations
- Accessory and tool kit
- Emergency power kit
- Short- and long-term personal kits in duffel bags
- Field kitchen and food box in plastic storage tubs
- Field shelter kit (tents, tarps, tables, chairs, battery/gas lights) in plastic storage tubs

You may not want to prepack some items for reasons of expense or shelf life. Keep a checklist of these items in your go-kit so that you will remember to add them at the last minute.

Preplanning

When the time comes, you need to know where to go and what to do. Having this information readily available will help you respond more quickly and effectively. It will not always be possible to know these things in advance, particularly if you do not have a specific assignment. Answering the following basic questions may help.

- Which frequency should you check in on initially?
- Is there a "backup" frequency?
- If a repeater is out of service, which simplex frequency is used for the net?
- Which nets will be activated first?
- Should you report to a predetermined location or will your assignment be made as needed?

Learn about any place to which you may be deployed to familiarize yourself with its resources, requirements, and limitations. For instance, if you are assigned to a particular shelter, you might ask your emergency communications superiors to schedule a visit or talk to others who are familiar with the site.

- Will you need a long antenna cable to get from your operating position to the roof?
- Are antennas or cables permanently installed, or will you need to bring your own?
- Will you be in one room with everyone else, or in a separate room?
- Is there dependable emergency power to circuits at possible operating positions?
- Does the building have an independent and dependable water supply?
- Is there good cell phone or beeper coverage inside the building?
- Can you reach local repeaters reliably with only a rubber duck antenna, or do you need a more efficient antenna or one with gain?
- If the repeaters are out of service, how far can you reach on a simplex channel?
- Will you need an HF radio to reach the net?

If you will be assigned to an EOC, school, hospital, or other facility with its own radio system in

place, learn under what conditions you will be required or able to use it, where it is, and how it works. In addition to radios, consider copiers, computers, fax machines, phone systems, and other potentially useful equipment.

Consider escape routes. If you could be in the path of a storm surge or other dangerous condition, know all the possible routes out of the area. If you will be stationed in a large building such as a school or hospital, find the fire exits, and learn which parking areas will be the safest for your vehicle.

Training and Education

If the partner offers job-specific training for emergency communication volunteers in areas related to communication, take it. Your emergency communications managers should help you to learn how the partner's organization works. Learn their needs and how you can best meet them. Work within your own emergency communications organization to get any additional training or information you might need. For instance, the American Red Cross (ARC) offers self-study or classroom courses in mass care, damage assessment, and other areas that either directly involve or depend upon effective communication. Many emergency management agencies offer additional training in areas such as radiological monitoring, sheltering, mass casualty response and evacuation. The Federal Emergency Management Agency (FEMA) and the Emergency Management Institute (EMI) offer a wide range of courses, some of which may be related to your partner's mission.

Your own group may offer general or partner-specific training in message handling and net operations under emergency conditions. If your group has its own equipment, it should offer opportunities for members to become familiar with its setup and operation in the field. On your own, set up and test your personal equipment under field conditions to be sure it works as expected.

Participate in any drills or exercises offered in your area. Some are designed to introduce or test specific skills or systems, others to test the entire response. ARRL's Field Day and Simulated Emergency Test are two good nationwide examples, but local organizations may have their own as well.

Reference Links

Federal Emergency Management Agency (FEMA)
https://training.fema.gov/nims/

More information about preparation can be found in The ARES Field Resources Manual
http://www.arrl.org/files/file/Public%20Service/ARES/ARESFieldResourcesManual-2019.pdf

Review

Preplanning and physical preparation are essential to an effective and timely emergency response. Know in advance where you are going, and what you will do when you get there. Keep a stocked and updated “go kit” ready to go at a moment’s notice. Be sure your kit is adequate for the types of deployments you are most likely to encounter. Information is as important as equipment. Keep updated lists of other volunteers and contact information, frequencies, and other resources on hand as well as copies of all emergency communications pre-plans.

Section 4: What Happens When Called

Topic 17

Equipment Choices for Emergency Communication

Objectives

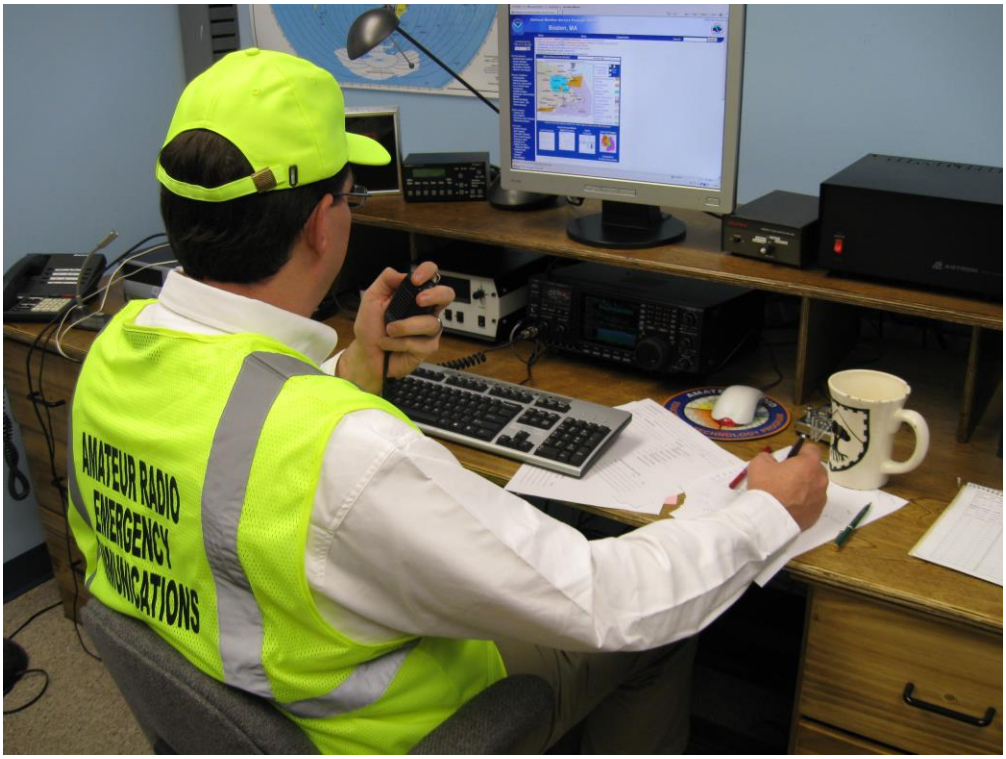
Welcome to Topic 17.

There is no one "best" set of equipment that will ensure success for every assignment, but the principles outlined in this topic will help you to make intelligent choices.

Student preparation required:

None.

ARRL — ARES® Branded Apparel Standard



There are many articles of ARES-branded clothing on the market. Some is from ARRL itself, but much more is from other manufacturers and sellers with the ARES logo added.

There is a strong need for ARES volunteers to have a uniform look when they are on actual deployments. Other organizations have instituted standards for volunteers that provide identity, support public relations, and comply with new emergency communications standards (the American Red Cross [ARC] is an excellent example of this). ARES volunteers, however, continue to appear in all sorts of garb, are not easily recognized, and may fail to meet the increasing clothing and ID requirements of National Incident Management System (NIMS) applications.

This recommended standard (specifics in following pages) does not affect or change the availability or marketing of ARES-branded clothing in non-deployment uses. It refers only to periods when ARES volunteer personnel are deployed for public service or emergency response situations. The result is easier identification, better recognition of the services that ARES performs by and for the public, more professional and peer acceptance, and an esprit de corps across ARES groups that surpasses localized identities.

Apparel Specifics

Garment Colors

Safety Green (many people call it yellow) with silver reflective tape that meets ANSI Class 2 standards.

Garment Types

Three types to accommodate climate conditions:

1. T-shirts — long- and short-sleeve, 50/50 cotton/poly.
2. Vests — Velcro or zip front, break-away, 100% polyester, solid or mesh.
3. Jacket or coat.

The Backs of Garments

All garments shall be imprinted on the back with 2-inch-tall Arial Black font, black in color, three lines, center justified:

AMATEUR RADIO
EMERGENCY
COMMUNICATIONS

If the size of the vest does not allow for that size font, the next closest Arial Black font size that fits should be used.

Those in a leadership position may add their title (SEC, DIRECTOR, EC, PIO, etc.) below Emergency Communications in not less than 3-inch-tall Serpentine font, black.

The Fronts of Garments

Front left chest shall be imprinted with the ARES logo, no less than 3.5 inches, and black in color. If the vest size is such that it does not allow room for that size logo, the closest size to it that fits there shall be used.

The right chest area of the garment shall be left blank to allow wearer to affix their name/call badge or official ID badge.

Adding Organizational Names to Garments

Local jurisdictions may elect to add their organization name in the either or both of two places:

1. On the front below the ARES logo, Arial Black font, black in color, in not larger than ½-inch lettering.

2. On the back by adding the organization name (such as SUSSEX COUNTY, DELAWARE ARES) above Amateur Radio Emergency Communications with no larger than 1-inch Arial Black font, black in color.

Implementation of Apparel

The current safety apparel items that are being manufactured are ANSI/ISEA 107-2004 Class 2 compliant, a design and performance criteria for vests worn by police officers, firefighters, emergency medical services, and other public safety personnel.

ARES volunteers in deployments, both emergency- and community service-related, will be encouraged to wear outermost garments meeting these standards.

Clubs and other groups are encouraged to make group buys through ARRL, which may provide discounts for such purchases for ARRL-affiliated clubs and groups. Garments available through the ARRL store are described at www.arrl.org/shop/Public-Service/.

ARES members who may note merchants still selling ARES deployment clothing (intended for outerwear while on actual deployment) not meeting these standards are requested to politely inform the merchant of the new standards.

VHF/UHF Transceivers

The most universal choice for emergency communications is a dual band FM 35- to 50-watt mobile transceiver. Radios in this class are usually rugged and reliable, and can operate at reasonably high duty cycles, although an external cooling fan is always a good idea if one is not built in. Handheld transceivers should be used only when extreme portability is needed, such as when "shadowing" an official or when adequate battery or another dc power is not available. Handheld radios should not be relied upon to operate with a high duty cycle at maximum power, since they can overheat and fail.

Both portable and mobile dual-band radios can be used to monitor more than one net, and some models allow simultaneous reception on more than one frequency on the same band (sometimes known as "dual watch" capability). Some mobiles have separate external speaker outputs for each band. For high-traffic locations, such as a Net Control Station (NCS) or Emergency Operations Center (EOC), a separate radio for each net is a better choice since it allows both to be used simultaneously by different operators. (Antennas must be adequately separated to avoid "de-sensing.")

Many dual-band transceivers also offer a "cross-band repeater" function, useful for linking local portables with distant repeaters, or as a quickly deployable hilltop repeater. True repeater operation is possible only if all other mobile and portable stations have true dual-band radios. Some so-called "dual" or "twin" band radios do not allow simultaneous or cross-band operation — read the specifications carefully before you purchase one.

HF Transceivers

Operation from a generator-equipped Emergency Operations Center can be done with an ac-powered radio but having both ac and dc capability ensures the ability to operate under all conditions. Most 12 V HF radios fall in either the 100-watt or low power (less than 5 watts, also known as "QRP") categories. Unless power consumption is extremely important, 100-watt variable output radios should be used. This gives you the ability to overcome noise at the receiving station by using high power, or to turn it down to conserve battery power when necessary.

Do not use dc-to-ac inverters to power HF radios. Most use a high-frequency conversion process that generates significant broad-spectrum RF noise at HF frequencies that is difficult to suppress. Direct dc powering is more efficient in any case.

Voltage Tolerance and Current Drain

Some transceivers nominally powered using 12 V dc actually have a rather narrow range of voltage (e.g., 13.0 to 13.8 volts) over which they will operate properly, and even a high-quality battery part way through its discharge cycle can easily fall below such a tolerable range. Transceivers with a wide range of acceptable input voltages (e.g., 11.5 to 15 volts) are preferable in limited-power situations; they will keep operating as the external battery discharges.

Similarly, some transceivers draw much more power than others during receive. If your chosen rig has a current drain on the high side, look for menu settings that will lower the overall drain, especially if you will be operating from a limited power source.

Radio Receiver Performance

For radios on all bands, several aspects of a radio receiver's performance can affect its suitability for emergency communications. These include sensitivity (ability to receive weak signals), selectivity (ability to reject signals on adjacent frequencies), and intermodulation rejection (ability to prevent undesired signals from mixing within the receiver and causing interference). If you are inexperienced at comparing radio specifications, be sure to ask for guidance from another more experienced ham radio operator. An in-depth discussion of radio performance specifications is beyond the scope of this topic.

When operating near public service and business radio transmitters, an FM receiver's "intermodulation rejection" is important. Mobile radios generally have better intermodulation rejection than handheld radios, but you should review each individual radio's specifications. External intermodulation (band-pass) filters are available, but they add to the expense, complexity, size, and weight of the equipment. Band-pass filters will also prevent you from using a broadband radio to monitor public service frequencies. Some older "ham bands only" FM mobile radios have better front-end filtering than newer radios with broadband receive capability, making them more immune to intermodulation and adjacent channel interference. Receiver filters are important for effective HF operation. Choose appropriate filters for the types of operations you are most likely to use, including CW, RTTY, and phone.

Digital Signal Processing (DSP) may be the single most important filtering feature available. Internal or external DSP circuits can allow clear reception of signals that might not otherwise be possible in situations with heavy interference.

"Noise blankers" are used to reduce impulse noise from arcing power lines, vehicle and generator ignition systems, and various other sources. While most all HF radios have some form of noise blanker, some work better than others. Test your radio in suitably noisy environments before designating it for emergency communications use.

Please read the article in the link below for more information regarding *QST* Product Reviews:
http://www.arrl.org/files/file/Technology/tis/info/pdf/QST_Aug_2004_p32-36(1).pdf

Antennas

VHF/UHF

A good antenna, mounted as high as possible without incurring large feed line losses, is more important than high transmitter power. Not only does it provide gain to both the transmitter and

receiver, but a higher gain antenna may also allow output power to be reduced, thus prolonging battery life. In relatively flat terrain, use a mast-mounted single- or dual-band antenna with at least 3dBd gain. If you are operating in a valley, the low angle of radiation offered by a gain antenna may actually make it difficult to get a signal out of the valley. Low or "unity" gain antennas have "fatter" radiation lobes and are better suited for this purpose. Unity gain j-poles are rugged, inexpensive, and easily built. For directional 2-meter coverage with about 7-dBd gain, a three- or four-element Yagi can be used. Collapsible and compact antennas of this type are readily available. For permanent base station installations, consider a more rugged commercial two-way collinear antenna, such as the well-known "Stationmaster" series. Most 2-meter versions will also perform well on 70 centimeters. Commercial open dipole array antennas will work well for a single band and are more rugged than a fiberglass radome-encased collinear antenna.

A magnetic mount mobile antenna is useful for operating in someone else's vehicle. They can also be used indoors by sticking them to any steel surface, such as filing cabinets, beams, or ductwork, even up-side down.

Handheld radio antennas, known as "rubber duckies," have negative gain. Use at least a 1/4-wave flexible antenna for most operations and consider a telescoping 5/8-wave antenna for long-range use in open areas where the extra length and lack of flexibility will not be a problem. "Roll-up j-pole" antennas made from 300-ohm television twin lead wire can be tacked up on a wall or hoisted into a tree with heavy-duty string. In addition to unity gain, the extra height can make a big difference. Even a mobile 1/2-wave magnetic mount antenna can be used with a handheld when necessary.

HF

There is no single perfect antenna for HF operation; however, when possible, choose an antenna resonant on the band you will be operating, a compromise antenna also means compromise performance. Your choice depends on the size and terrain of the area you need to cover, and the conditions under which you must install and use it.

For local operations (up to a few hundred miles), a simple random wire or dipole hung at a less than 1/4-wavelength above the ground works well and is easy to deploy. This is known as a "Near Vertical Incidence Skywave" (NVIS) antenna. The signal is radiated almost straight up, and then bounces off the ionosphere directly back downward. During periods of high solar activity, NVIS propagation works best on 40 meters during the day, switching to 80 meters around sunset. During low parts of the sunspot cycle, 80 meters may be the most usable daytime NVIS band, and 160 meters may be needed at night. The new 60-meter band is also ideal for NVIS operation.

An antenna tuner is necessary for most portable wire antennas (especially for NVIS antennas) and is a good idea for any HF antenna. The antenna's impedance will vary with its height above ground and proximity to nearby objects, which can be a real problem with expedient installations. An automatic tuner is desirable, since it is faster and easier to use, and many modern radios have one built in. Include a ground rod, clamps, and cable in your kit since almost

all radios and tuners require a proper ground in order to work efficiently.

For communication beyond 200 miles, a commercial trapped vertical may work, although it has no ability to reject interfering signals from other directions. Mobile whip antennas will also work, but with greatly reduced efficiency. The benefits of a mobile antenna are its size and durability.

Directional (beam) antennas offer the best performance for very wide area nets on 10 to 20 meters, since they maximize desired signals and reduce interference from stations in other directions. This ability may be critical in poor conditions. Beam antennas also have a number of limitations that should be considered. They are usually expensive, large, and difficult to store and transport. In field installations, they can be difficult to erect at the optimum height, and may not survive storm conditions. One strategy is to rely on easily installed and repaired wire dipole antennas until conditions allow the safe installation of beam antennas.

Feed Lines

Feed lines used at VHF and UHF should be low-loss foam dielectric coaxial cable. For short runs of 30 feet or less, RG-58 may be suitable. For longer runs, consider RG-8X or RG-213. RG-8X is an "in-between" size that offers less loss and greater power handling capability than RG-58 with far less bulk than RG-213. If you wish to carry only one type of cable, RG-8X is the best choice.

On HF, the choice between coaxial cable and commercial (insulated, not bare wire) "ladder" line will depend on your situation. Ladder line offers somewhat lower loss, but more care must be taken in its routing, especially in proximity to metal objects or where people might touch it. Coaxial cable is much less susceptible to problems induced by routing near metal objects or other cables.

Operating Accessories

Headphones are useful anywhere and are mandatory in many locations. Operators in an Emergency Operations Center or a Command Post where multiple radios are in use must use headsets. They are also beneficial in locations such as Red Cross shelters, to avoid disturbing residents and other volunteers trying to get some rest.

Some radios and accessory headsets provide a voice operated transmit (VOX) capability. During emergency communications operations, this should always be turned off and manual "push-to-talk" buttons used instead. Accidental transmissions caused by background noise and conversations can interrupt critical communications on the net. As an alternative to VOX, consider using a desk or boom microphone and foot switch to key the transmitter. A microphone/headset combination and foot switch also work well.

Batteries

Battery power is critical for emergency communications operations, as ac power cannot usually be relied upon for any purpose, and portable operation for extended periods is common. Batteries must be chosen to match the maximum load of the equipment, and the length of time that operation must continue before they can be recharged.

NiCad, NiMH, and Li-Ion Batteries

For handheld transceivers, the internal battery type is determined by the manufacturer. NiMH batteries store somewhat more energy than NiCad batteries for their size. Many smaller radios are using lithium-ion (Li-Ion) batteries, which have much higher power densities, without the so-called "memory effect" of NiCad's. Many handhelds have optional AA alkaline battery cases and are recommended emergency communications accessories. Common alkaline batteries have a somewhat higher-power density than NiCad batteries, are readily available in most stores, and may be all you have if you cannot recharge your other batteries. Most handheld radios will accept an external 13.8Vdc power connection for cigarette lighter or external battery use.

External batteries of any type can be used with a handheld, as long as the voltage and polarity are observed. Small 12- to 15-volt gel cells and some battery packs intended for power tools and camcorders are all possibilities. For maximum flexibility, build a dc power cable for each of your radios, with suitable adapters for each battery type you might use. Molex plugs work well for power connections, but Anderson Powerpoles can withstand repeated plugging and unplugging without deterioration and have become the standard used by most ARES units. This standardization allows easier swapping and sharing of equipment if needed.

Lead-Acid Batteries

There are three common types of lead-acid batteries: flooded (wet), Valve Regulated Lead Acid (VRLA), and Sealed Lead Acid (SLA). Wet batteries can spill if tipped, but VRLA batteries use a gelled electrolyte or absorptive fiberglass mat (AGM technology) and cannot spill. SLA batteries are similar to VRLA batteries but can be operated in any position — even up-side down. All lead-acid batteries are quite heavy.

Lead-acid batteries are designed for a variety of applications. "Deep-cycle" batteries are a better choice than common automotive (cranking) batteries, which are not designed to provide consistent power for prolonged periods and will be damaged if allowed to drop below approximately 80 percent of their rated voltage. Deep-cycle batteries are designed for specific applications and vary slightly in performance characteristics. For radio operation, the best choice would be one specified for uninterruptible power source (UPS) or recreational vehicle (RV) use. For lighting and other needs, a marine type battery works well. For best results, consult the manufacturer before making a purchase.

Sealed lead acid (SLA) or "gel cells," such as those used in alarm or emergency lighting systems, are available in smaller sizes that are somewhat lighter. These batteries are also the ones sold in a variety of portable power kits for Amateur Radio and consumer use. Typical small sizes are 2, 4, and 7Ah, but many sizes of up to more than 100Ah are available. SLA batteries should never be deeply discharged. For example, a 12-volt SLA battery will be damaged if allowed to drop below

10.5 volts. Excessive heat or cold can damage SLA batteries. Storage and operating temperatures in excess of 75 degrees F. or below 32 degrees F. will reduce the battery's life by half. Your car's trunk is not a good place to store them. Storage temperatures between 40 and 60 degrees will provide maximum battery life.

Battery "Power Budgeting"

The number of ampere/hours (Ah — a rating of battery capacity) required, called a "power budget," can be roughly estimated by multiplying the radios receive current by the number of hours of operation, and then adding the product of the transmit current multiplied by the estimated number of hours of transmission and by the duty cycle for that mode. For a busy net control station, the transmit current will be the determining factor because of the high percentage of transmit time. For low-activity stations, the receiver current will dominate. The value obtained from this calculation is only a rough estimate of the ampere/hours required. The Ah rating of the actual battery or combination of batteries should be up to 50 percent higher, due to variations in battery capacity and age.

Don't confuse the percent of time transmitting with "duty cycle," which is mode-specific (e.g., 100 percent for FM and digital, 50 percent for CW, and 30 percent for uncompressed SSB).

Estimated 24-hour power budget example:

Receive current: 1-amp x 24 hours = 24 Ah
Transmit current: 8 amps x 6 hours = 48 Ah (figuring 6 hours as the 25 percent transmit time)

Total AH: 72 Ah estimated actual consumption
Actual battery choice 72 x 1.5 = **108** Ah (figuring 50 percent higher due to variations)

Battery Management

If you are operating on battery power, you will eventually need to recharge your batteries. As discussed earlier, some batteries need more time to recharge than others, and this time needs to be taken into account in your planning. Deep-cycle marine batteries, for instance, can require a full day or longer to fully recharge. Sealed lead-acid (SLA) batteries require up to 18 hours to recharge, depending on the size of the battery. NiCad, Li-Ion, and similar batteries can be recharged quite quickly, although repeated rapid charge cycles can reduce overall battery life.

If you are using slow-charging batteries, you may need to have enough on hand to last the entire length of the operation. If your batteries can be charged quickly, some means must be provided for doing so. Some chargers can be powered from a vehicle's 12-volt system and are a good choice for emergency communications. If no local means of charging is available, your logistics team may need to shuttle batteries back and forth between your position and a location with power and chargers.

Chargers, Generators, and Solar Power

Battery Chargers: You should have two or more batteries so that one can be charging while another is in use.

NiCad and NiMH Batteries: The type of charger required depends on the battery — for instance; most NiCad chargers will also charge NiMH, but not Li-Ion batteries. Several aftermarkets "universal" chargers are available that can charge almost any battery available. A rapid-rate charger can ensure that you always have a fresh battery without waiting, although rapid charging can shorten a battery's overall life span.

Lead-Acid Batteries: Always consult the battery's manufacturer for precise charging and maintenance instructions, as they can vary somewhat from battery to battery. It is best to slow-charge all batteries, since this helps avoid overheating and extends their overall life span.

In general, automotive and deep-cycle batteries can be charged with an automobile and jumper cables, an automotive battery charger, or any constant-voltage source. If a proper battery charger is not available, any dc power supply of suitable voltage can be used, but a heavy-duty isolation diode must be connected between the power supply and the battery. (This is important, since some power supplies have a "crowbar" overvoltage circuit, which short-circuits the output if the voltage exceeds a certain limit. If a battery is connected, the crowbar could "short-circuit" the battery with disastrous results.) The output voltage of the supply must be increased to compensate for the diode's voltage drop. Take a measurement at the battery to be sure.

Wet Batteries: These should be charged at about 14.5 volts, and VRLA batteries at about 14.0 volts. The charging current should not exceed 20 percent of the battery's capacity. For example, a 20-amp charger is the largest that should be used for a battery rated at approximately 100 Ah. Consult the battery's manufacturer for the optimum charging voltage and current whenever possible.

Deep-cycle batteries do not normally require special charging procedures. However, manufacturers do recommend that you use a charger designed specifically for deep-cycle batteries to get the best results and ensure long life.

SLA or "Gel Cell" Batteries: Gel cell batteries must be charged slowly and carefully to avoid damage. All batteries produce hydrogen gas while recharging. Non-sealed batteries vent it out. SLA batteries do what is called "gas recombination." This means that the gas generated is "recombined" into the cells. SLA batteries actually operate under pressure, about 3 psi for most. If the battery is charged too quickly, it generates gas faster than it can recombine it and the battery over-pressurizes. This causes it to overheat, swell up, and vent, which can be dangerous and will permanently damage the battery. The charging voltage must be kept between 13.8 and 14.5 volts. Wherever possible, follow the battery manufacturer's instructions. Lacking these, a good rule of thumb is to keep the charging current level to no more than a third of its rated capacity. For example, if you have a 7Ah battery, you should charge it at no more than 2 amps.

The time it takes for an SLA battery to recharge completely will depend on the amount of charge remaining in the battery. If the battery is only 25 percent discharged, then it may recharge in a few hours. If the battery is discharged 50 percent or more, 18 – 24 hours may be required.

Solar Panels and Charge Controllers: These are readily available at increasingly lower costs. These provide yet another option for powering equipment in the field when weather and site conditions permit their use. When choosing solar equipment, consult with the vendor regarding the required size of panels and controller for your specific application.

dc-to-ac Inverters: While direct dc power is more efficient and should be used whenever possible, inverters can be used for equipment that cannot be directly powered with 12Vdc. Not all inverters are suitable for use with radios, computers, or certain types of battery chargers. The best inverters are those with a "true sine-wave" output. Inverters with a "modified sine-wave" output may not operate certain small battery chargers, and other waveform-sensitive equipment. In addition, all "high-frequency conversion" inverters generate significant RF noise if they are not filtered, both radiated and on the ac output. Test your inverter with your radios, power supplies, and accessories (even those operating nearby on dc) and at varying loads before relying upon it for emergency communications use.

Effective filtering for VHF and UHF can be added rather simply (using capacitors on the dc input, and ferrite donuts on the ac output), but reducing HF noise is far more difficult. Inverters should be grounded when in operation, both for safety and to reduce radiated RF noise.

As an alternative to an inverter, consider a mid-size 12 V computer uninterruptible power source. Smaller, square-wave UPS units are not designed for continuous duty applications, but larger true sine-wave units are. Most true sine-wave units use internal batteries, but with minor modifications can be used with external batteries. The larger commercial UPS units run on 24 or 48 volts and require two or four external batteries in series. UPS units will have a limit on the number of depleted batteries they can recharge, but there is no limit to the number of batteries that can be attached to extend operating time.

Generators are usually required at command posts and shelters for lighting, food preparation, and other equipment. Radio equipment can be operated from the same or a separate generator but be sure that co-located multiple generators are bonded with a common ground system for safety. Not all generators have adequate voltage regulation, and shared generators can have widely varying loads to contend with. You should perform a test for regulation using a high-current power tool or similar rugged device before connecting sensitive equipment. A voltmeter should be part of your equipment any time auxiliary power sources are used.

Noise levels can be a concern with generators. Some are excessively noisy and can make radio operations difficult and increase fatigue. A noisy generator at a shelter can make it difficult for occupants to rest and can result in increased levels of stress for already stressed people. Unfortunately, quieter generators also tend to be considerably more expensive. Consider other options, such as placing the generator at a greater distance and using heavier power cables to compensate. Placing a generator far from a building can also prevent fumes from entering the

building and causing carbon monoxide poisoning, an all too common problem with emergency generators.

Several other devices may be helpful when dealing with generators or unstable ac power sources. High-quality surge suppressors, line voltage regulators, and power conditioners may help protect your equipment from defective generators. Variable voltage transformers ("Variacs") can be useful to compensate for varying power conditions.

Generator and Power Safety

Take some care in the placement of generators so that they will not be a problem for others. Engine noise can make it difficult for shelter residents and volunteers to get much-needed rest. Exhaust fumes should not be allowed to enter the building or nearby tents or vehicles. Carbon monoxide tends to settle, so exhaust components should be carefully located so that fumes cannot settle into inhabited basements or other enclosed areas below the generator. A position "downwind" of any occupied location is best. Even when vehicles are not included, internal combustion engines are still the number one cause of carbon monoxide poisoning in the United States. Propane-powered engines produce as much or more CO as gasoline or diesel engines. Earth grounding of portable or vehicle-mounted ac generators is not required as long as only plug and cord connected equipment is used, and the generator meets National Electrical Code (NEC) standards listed in Article 250-6. The main exception is for generators that will be connected, even temporarily, to a building's permanent electrical system. For further details on grounding ac electrical systems, please refer to Article 250 of the NEC.

Ground Fault Interrupters (GFIs) add a further degree of safety when working with generators and portable power systems. GFIs detect any difference between the currents flowing on the hot and neutral conductors and open the circuit. Also, be sure to test any GFI device to be used with or near HF radios to be sure that the GFI will function properly while the radio is transmitting.

Ac extension cords used to connect to generators or other power sources should be rated for the actual load. Consider radios, lights, chargers, and other accessories when calculating the total load. Most extension cords are rated only for their actual length and cannot be strung together to make a longer cord without "de-rating" the cord's capacity.

For example, a typical 16-gauge, 50-foot orange "hardware store" cord is rated for 10 amps. When two are used to run 100 feet, the rating drops to only 7 amps. Choose a single length of cord rated for the load and the entire distance you must run it. If this is not possible, you can also run two or more parallel cords to the generator in order to reduce the load on any single cord. For more information on portable power cord requirements, consult Article 400 of the NEC.

While some groups have used "Romex"-type wire for long extension cords, this is actually a violation of the National Electrical Code (NEC), and a dangerous practice. Repeated bending, rolling, and abrasion can cause the solid copper conductors and insulation to break, resulting in a fire and electrocution hazard. Use only flexible insulated extension cords that are UL rated for temporary, portable use.

Equipment for Other Modes

If you plan to operate one of the digital modes (packet, APRS, AMTOR, PSK31, etc.), then you will also need a computer and probably a TNC or computer sound card interface. Some newer radios have built-in TNCs. Be sure to identify all the accessories, including software and cables, needed for each mode. Include the power required to operate all of the radios and accessories when you are choosing your batteries and power supply. The internal battery in your laptop computer will probably not last long enough for you to complete your shift. Be prepared with an external dc power supply and cable, or a dc to ac inverter. If you need hard copy, then you will also need a printer, most of which are ac-powered.

Scanners and Other Useful Equipment

In addition to your Amateur Radio equipment, you may find a few other items useful.

- Multi-band scanning radio (to monitor public service and media channels)
- FRS, GMRS (separate license required), or MURS handhelds
- Cellular telephone (even an unregistered phone can be used to call 911)
- Portable cassette tape recorder with VOX (for logging, recording important events)
- AM/FM radio (to monitor media reports)
- Portable television (to monitor media reports)
- Weather Alert radio with “SAME” feature (to provide specific alerts without having to monitor the channel continuously)
- Laptop computer with logging or emergency communications-specific packet software

Testing the Complete Station

After making your equipment selection (or beforehand if possible), field-test it under simulated disaster conditions. This is the fundamental purpose of the annual ARRL Field Day exercise in June, but any time will do. Operations such as Field Day can add the element of multiple, simultaneous operations on several bands and modes over an extended period. Try to test all elements of your system together, from power sources to antennas, and try as many variations as possible. For instance, use the generator, and then switch to batteries. Try charging batteries from the solar panels and the generator. Use the NVIS antenna while operating from batteries and then generator. This procedure will help reveal any interactions or interference between equipment and allow you to deal with them now — before proper operation becomes a matter of life and death.

Leaving Your Equipment Behind

You are exhausted and ready to head home, but the emergency communications operation is far from over. You brought along a complete station, and when you leave, the next operator is not nearly as well equipped. Should you leave your equipment behind for the next operator?

You have several options here — and they are all yours to choose from. No one can, or should, tell you to leave your equipment behind. If you feel comfortable that someone you know, and trust will look after your gear, you may choose to leave some or all of it behind. If you do, be sure every piece is marked with at least your name and call sign. Do not leave behind anything that the next operator does not truly need. Also, remember that even if you leave the equipment in the possession of someone you know, you still have the ultimate responsibility for its operation and safety. Emergency stations are difficult places to control and monitor. If your equipment is stolen, lost, or damaged, you should not hold anyone but yourself responsible. Conversely, if someone leaves their equipment in your care, treat and protect it better than you would your own, and be sure it is returned safely to its owner.

Reference Links

Anderson Powerpole connectors
www.westmountainradio.com/kb_view_topic.php?id=ST166

Deep-cycle battery tips
www.batteryfaq.org/

Molex 1545 Series connector data
www.molex.com/molex/

Review

All equipment chosen should be flexible and easy to use, rugged, and capable of being battery-powered. Antennas should be compact, rugged, and easily erected. Directional or omnidirectional gain antennas for VHF and UHF are essential in many locations, and the higher they are mounted, the better, as long as feed line losses are kept low. Battery power is essential, as is a means of charging batteries. Testing equipment under field conditions before assigning it to emergency communications uses ensures fewer surprises in an actual deployment. All equipment should be tested periodically for proper operation and inspected for damage or deterioration.

Section 4: What Happens When Called

Topic 18

Emergency Activation

Objectives

Welcome to Topic 18.

This topic outlines some of the methods used to activate an emergency communications group when an emergency occurs. After reading the material, you will be able to use the methods outlined as you work in an emergency activation setting.

Student preparation required:

None.

How You Will Know

The actual method by which emergency communications volunteers are notified of activation will be determined locally, but this lesson outlines some of the most popular methods. To begin with, you must be registered with a local emergency communications group in advance in order to be on its notification list. “Last-minute” volunteers are extremely difficult to integrate into an already confusing emergency response. Join the group well in advance of any emergency, get any training it offers, and be ready when a call comes.

Every emergency communications group should have developed a formal written plan with its partners to activate their members when needed. The plan should be developed in detail and then reduced to a simple “checklist” that both the partners’ officials and emergency communications managers can keep nearby at all times. It should detail the circumstances under which emergency communications activation might occur, who will call whom, and the various methods that can be used to contact them. The checklist can also list the actual telephone numbers and other contact information for each individual listed in the order that it is to be used. This information should be verified and updated on a regular schedule. Each member should know the plan and follow it closely.

Initial Notification by the Partners

In most cases, three or more members serve as "activation liaisons" to the partners. When the emergency communications volunteers are needed, one of these members is called first. *Never rely on a single point of contact.* If that person is unavailable for any reason, the partners should have one or more alternatives to try. They may be called by phone at work or at home, but the most reliable primary method is commercial radio paging (beeper). In the event that the paging system or an individual pager is not operating, the partners should have all possible telephone numbers, including fax and mobile, and even e-mail addresses.

Group Alerting Systems

Once a liaison has been notified, a number of group alerting methods may be used. The most common ones are described below. No one method should be relied upon exclusively, since emergency conditions may render it useless. Commercial paging systems and ham repeaters might be off the air, phone lines down, and internet service disrupted. Again, a written plan and checklist should be developed well in advance and updated periodically.

Text Messaging: Even when voice cell phone systems are overloaded, there may be text messaging capabilities. Depending on your cell phone, it may be possible to create lists of contacts and quickly send text messages to each person on the list. Recognize, however, that text messages sent over cellular phone systems can be delayed for several hours or more in times of heavy use. Consider utilizing apps such as GroupMe or WhatsApp to create notification groups; many text message apps can use the cellular network or Wi-Fi connection to send messages.

Telephone Tree: In this system, the liaison calls two members, each of whom call two other members and so on until the entire group has been notified. If any one person cannot be reached, the person calling must then call the members that person would have called had they been reached. This method ensures that the "tree" is not broken. Messages should always be left on all answering machines and voice mailboxes.

Amateur Radio Paging: A low-cost method of "paging" a group using an amateur repeater uses a specific Continuous Tone Coded Squelch System (CTCSS) tone. Members leave their radios turned on in the "CTCSS decode" mode when they are not actively listening to the repeater. When the correct CTCSS tone is turned on for emergency communications activation, everyone can hear the transmissions.

Since many newer radios include CTCSS decoding as a standard feature or low-cost option, this method is generally simple to implement. The tones may need to be generated by the repeater itself, since many repeaters will not "pass through" received tones. If the repeater is not operating, a mobile operating simplex on the repeater's output frequency from a high or central location can often work quite well.

E-mail: While e-mail might not immediately reach members anywhere they happen to be, it is a good backup method as long as it continues to function. Many people have full-time high-speed internet connections at home and the office, and most people check their e-mail frequently. Someone who has otherwise been unreachable may check their e-mail even several hours later, just as they might check an answering machine or voice mailbox.

Self-Activation: *As a general rule, self-activation is not encouraged, however, there are some circumstances when you will know that you need to start taking steps to be ready for deployment.* If you become aware of an incident or situation that might require the activation of your ARES group, you should take immediate steps to make yourself available. Depending on your group's activation plan, this might mean monitoring the assigned net or partner's frequencies or making contact with one or more appropriate persons in the group or partners. SKYWARN members might also monitor National Weather Radio (NWR). Remember, if you are not specifically authorized to directly contact a partner's personnel or travel to an incident location, do not do it. Know your plan and follow it.

After You Have Been Notified

Your group's activation plan should tell each member what steps to take immediately after learning of emergency communications activation. In most cases, the first step should be to check in on a specific frequency or repeater. If a repeater is used as the primary gathering point for members, a backup simplex frequency (the repeater's output frequency works well) should be specified in the event that the repeater is no longer operating. In other cases, some members may also have specific assignments. These might include making contact with the partners, going directly to a specific location such as an EOC, or making certain preparations. These members should quickly check into the "activation" net to let emergency communications managers know that they have been reached and are responding.

One of the liaison stations should be available on the net to provide additional information from the partners and directions to members as they check in. If a member is preassigned to act as Net Control Station (NCS) for the "activation" net, that person should take over the task as soon as possible to free up the liaison to work with the partners or take other action. Some groups simply have the first person signing on act as a temporary NCS until an assigned NCS checks in. Again, it is important to have more than one person assigned to take on the NCS duties in the event that anyone is unavailable.

En Route

While you are headed home to pick up your go kit or other gear, or while you are on your assigned location, there are several things you may need to do. Check into and continue to monitor the activation net for further information or instructions. Fill your vehicle with fuel and pick up any supplies you may need, including alkaline batteries for radios and lights, food, water, and other supplies on your checklist. Contact your spouse, children, or other family members to let them know what is happening and where you will be. Give them any instructions they will need to be safe. Tell them when you will next try to contact them and how to contact you if necessary. Knowing that everyone is okay can let you do your job without needless worry, and, of course, the same is true for them.

Review

The "emergency communications activation liaisons" are several people who can be contacted by the partners to activate the emergency communications group. Notification systems that can be used are telephone trees, commercial or amateur paging systems, e-mail, or simple CTCSS receiver activation. Regardless of which primary notification method your group uses, there should be several backup methods as well. Each member should know where to go, what frequencies to monitor, and what nets to check into immediately after notification.

Section 4: What Happens When Called

Topic 19

Setting Up, Initial Operations, and Shutdown

Objectives

Welcome to Topic 19.

Following completion of this topic, you will be able to implement the steps necessary to set up, begin, and end operations in temporary locations, such as shelters in schools or churches, or temporary command centers at any location.

Student Preparation required:

None.

Responding After the Activation

If you already have your assignment, confirm that it is being activated by monitoring and checking into the local activation net. If you do not have a standing assignment, you should check into an activation net and make yourself available for an assignment. It might be a "resource" logistics net if one is active, or the general "tactical" command activation net. (Because local procedures vary widely, you should get to know your group's specific plans and procedures well in advance.)

After you have gathered your equipment and supplies, filled the gas tank, and are ready to respond, you may need to do several things, depending on local plans and the nature of the emergency. You may be asked to check in to a specific net to let them know you are en route, and then periodically to report your progress, particularly if travel is hazardous.

In some cases, you may be asked to proceed to a "staging" or "volunteer intake" area to wait for an assignment. This could take some time, especially if the situation is very confused. Often, the development of the response to the emergency is unclear and it will take some time to develop a cohesive and uniform response plan for that incident. As each incident is unique, you should expect the situation to be fluid, and respond accordingly. Be prepared to wait patiently for a determination to be made and an assignment to be given. In other cases, such as the immediate

aftermath of a tornado or earthquake, you may be forced to make expedient arrangements as you go. Travel may be difficult or impossible, so you may need to do what you can, where you can. Nets may be established on an ad-hoc basis using whatever means are available.

Who Is in Charge

At each station, the EC or other emergency communications manager should appoint one member of the emergency communications group to take a leadership role as "station manager," with full responsibility for all operations at that site. This person serves as a point of contact, information, and decisions for the team with the incident commander and with other groups aiding in the response. This helps avoid confusion and arguments.

When you accept a position as an emergency communications volunteer, you do so knowing that you will often need to follow the directions of another person. Cooperation and good teamwork are key elements that result in an efficient and effective emergency communications operation. As the situation develops, you may have to step into a role of a leader to keep the operation moving forward. Expect to work with others. Expect that there are times when it is appropriate for you to be the follower. Expect that other times you may be the leader.

Arriving at the Site

If you are assigned to a facility operated by the partners, such as a shelter, introduce yourself to the person in charge as an "emergency communicator" assigned to serve that location. They will be busy, so get right to the point.

Identify yourself and explain that you have been assigned to set up a communication station for that location, and by whom.

Inform them that you would like to set up your equipment and get on the air. Ask if another communicator has already arrived. Ask if they have a preference for the station's location and explain your needs.

If you are the first communicator to arrive, be prepared to suggest an appropriate location — one that can serve as both an operating and message desk, has feed line access to a suitable antenna location, has access to power and telephone, and is isolated just enough from the command center for operators to avoid disturbing each other.

Ask if there are any hazards or considerations in the immediate area that you should be aware of, or may cause you to have to relocate later.

If no building or other suitable shelter is available, you may need to set up your own tent or work from your car. Choose a location that provides shelter from wind, precipitation, and other hazards, and is close enough to the partners' operations to be convenient but not in each other's way.

Being a Good Guest

In many cases, you will be occupying a space that is normally used by someone else for another purpose. Respect and protect their belongings and equipment in every way possible. For instance, if you are in a school and will be using a teacher's desk, find a way to remove all the items from its surface to a safe place for the duration of operations. A cardboard box sealed and placed under the desk usually works well. Do not use their office supplies or equipment or enter desk drawers or other storage areas without specific permission from a representative of the building's owners. Some served agencies will seal all filing cabinets, drawers, and doors to certain rooms with tamper-evident tape upon arrival to protect the host's property and records.

When installing antennas, equipment, and cables, take care not to damage anything. For instance, avoid using duct tape to fasten cables to walls or ceilings, because its removal will usually damage the surface. If damage is caused for any reason, make note of it in your log and report it to the appropriate person as soon as possible.

Initial Setup and Information Gathering

In most cases, your first priority will be to set up a basic station to establish contact with the net. Pack that equipment in your vehicle last so that you can get to it first. If you arrive as a team of two or more, station setup can begin while others carry in the remaining equipment.

Set up and test the antenna for proper SWR, and then check into the net. Test to find the lowest power setting that produces reliable communication, especially if you are operating with battery or generator power, to conserve power for extended operations. High power should also be avoided whenever lower power will work just as well to prevent interference with other radio systems, telephones, and electronic equipment.

Once your basic station is on the air, you can begin to work on other needs:

- Check for working telephones, faxes, internet, and other means of communication
- Learn about the partner's operations and immediate needs at that site
- Install additional stations or support equipment
- Make a list of stations within simplex range
- Identify possible alternative message paths
- Find sanitary facilities
- Determine water and food sources, eating arrangements
- Review overall conditions at the site and how they will affect your operations
- Find a place to get some occasional rest

As soon as possible, ask a member of the partner's staff to spend a few moments to discuss the partner's operational needs. What are the most critical needs? Whom do they need to communicate with, and what sort of information will need to be transmitted? Will most messages be short and tactical in nature or consist of long lists? Will any messages be too confidential for radio? Are phones and fax still working? What will traffic needs be at different times of day? How long is the site anticipated to be open? Will there be periodic changes in key partner staff?

You may also need to provide partner staff with some basic information on how to create a message, show them how to use message forms, and instruct them on basic procedures to follow. Be sure to let them know that their communications will not be private and "secure" if sent by Amateur Radio and discuss possible alternatives.

Ending Operations

Emergency communications operations may end all at once or be phased out over time. Several factors may affect which operations end, and when:

- Damaged communication systems are restored and returned to service
- Traffic loads are reduced and can be handled with normal systems
- Shelters and other locations are closed

How you are notified to end operations will depend on the policies of your emergency communications group and partners, and on the specific situation. For instance, even though a shelter manager has been told to shut down by the partners, your orders may normally come from a different person who may not be immediately aware of the shelter's closing. In this case, you might need to check with the appropriate emergency communications manager before closing your station. Once the decision to close your station has been received and verified, be sure that the person in charge of the location is aware that you are doing so, and if necessary,

why.

File and package all messages, logs, and other paperwork for travel. Return any borrowed equipment or materials. Carefully remove all antennas and equipment, taking care to package and store them correctly and safely. Avoid the temptation to toss everything into a box with the intention to "sort it out later," unless you are under pressure to leave in a hurry. In the event you are redeployed quickly, this will save time in the end.

Departure

Several actions may be necessary when leaving. First, be sure to leave the space you used in as good a condition as possible. Clean up any messes, remove trash, and put any furniture or equipment back where it was when you arrived. If you sealed desktop items in a box for safekeeping, simply place the box on the cleaned desk. Do not unpack the items and attempt to replace them on the desk. This will provide proof to the desk's owner that you took steps to protect their belongings, and it helps keep them secure until their owner takes possession again. Do not remove tamper-evident tape or similar seals placed by others unless told to do so by the appropriate person, or in accordance with the partner's policy.

Thank all those who worked with you. Even a simple "thanks" is preferable to nothing. Do not forget the building's owners or staff, the partner's staff, or others you worked with, and any other emergency communications personnel. This is also the time for any apologies. If things did not always go well, or if any damage was caused, do your best to repair the relationship before departing. These simple efforts can go a long way toward protecting relationships between all groups and individuals involved.

The Debriefing

After each operation, your emergency communications group, and perhaps even the partners, will probably want to hold a meeting to review the effectiveness of the operation. There may be issues or events that occurred during operations that you will want to discuss at this meeting. Events may have occurred within the partner organization that involved communications you handled. If you try to rely entirely on your memory or logbooks, you will probably forget key details or even forget certain events altogether.

Keep a separate "debriefing" diary specifically for use during this meeting. Some entries might only refer briefly to specific times and dates in the station operating log, or they may contain details that are not appropriate in the station log.

If you will be required to turn over your station logs immediately at the end of operations, your debriefing diary will need to contain full details of all events and issues for discussion. Such information might include:

- What was accomplished
- Whether anything is still pending (Note unfinished items for follow-up)

- What worked well (Keep track of things that worked in your favor)
- What needed improvement
- Ideas to solve known problems in the future
- Key events
- Conflicts and resolutions

During the debriefing, organize the session into (a) what worked well, and (b) what could be improved for the next operation. Change criticisms and judgment statements into a constructive manner by saying, “This method might have worked better if…” rather than “This method was stupid.” Also, avoid personal attacks and finger-pointing. In most cases, interpersonal issues are dealt with most effectively away from the group meeting.

Reference Links

ARES Manual
http://www.arrl.org/files/file/Public%20Service/ARES/ARESmanual2015.pdf

ARES Field Resources Manual
http://www.arrl.org/files/file/Public%20Service/ARES/ARESFieldResourcesManual-2019.pdf

Review

The process of setting up, operating, and taking down your station should be an orderly and thoughtful one. A little advance planning can save considerable time. From the very first minute, work closely with the partner’s personnel to pick a location for your station, and learn what their operational needs are. Protect the building and its contents in every way possible. Log all events and issues for discussion in the post-event debriefing.

Section 4: What Happens When Called

TOPIC 20:

The Incident Command System

Objectives

Welcome to Topic 20.

Following completion of this Learning Topic, you will understand the Incident Command System (ICS) concept and the National Incident Management System (NIMS) and how they are used to coordinate and unify multiple agencies during emergencies.

Student Preparation required:

FEMA Course IS-100b, Introduction to the Incident Command System.
FEMA Course IS-700b, National Incident Management Systems

Introduction

In the early 1970s, a disorganized and ineffective multi-partner response to a series of major wildfires in southern California prompted municipal, county, state and federal fire authorities to form an organization known as Firefighting Resources of California Organized for Potential Emergencies (FIRESCOPE). California authorities had found that a lack of coordination and cooperation between the various responding agencies resulted in overlapping efforts, and gaps in the overall response. Many specific problems involving multi-partner responses were identified by FIRESCOPE. These included poor overall organization, ineffective communication between agencies, lack of accountability, and the lack of a single, universal, and well-defined command structure.

Their efforts to address these difficulties resulted in the development of the original Incident Command System. Although developed for wild fires, the system ultimately evolved into an “all-risk” system, appropriate for all types of fire and non-fire emergencies.

There are other versions of the ICS in use, but the Incident Command System (ICS), as developed by the National Fire Academy (NFA), has been widely recognized as a model tool for the command, control, and coordination of resources and personnel at the scene of an emergency and is used by most fire, police, and other agencies around the country. The use of the ICS is now required by various federal laws for all hazardous material incidents, and in other situations by many state and local laws. The ICS has also been adopted for use in many other countries.

Looking at a larger scale, the success of the ICS also led to development of protocols that would guide whole regions of the country, including non-government responders. This became NIMS — the National Incident Management System.

NIMS

The National Incident Management System (NIMS) provides a systematic, proactive approach to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly to prevent, protect against, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life and property and harm to the environment.

NIMS works hand in hand with the National Response Framework (NRF). NIMS provides the template for the management of incidents, while the NRF provides the structure and mechanisms for national-level policy for incident management.

The ICS

The Incident Command System is a management tool designed to bring multiple responding agencies, including those from different jurisdictions, together under a single overall command structure. Before the use of the ICS became commonplace, various agencies responding to a disaster often fought for control, duplicated efforts, missed critical needs, and generally reduced the potential effectiveness of the response. Under ICS, each partner recognizes one "lead" coordinating partner and that person will handle one or more tasks that are part of a single over-all plan and interact with other agencies in defined ways.

The Incident Command System is based upon simple and proven business management principles. In a business or government partner, managers and leaders perform the basic daily tasks of planning, directing, organizing, coordinating, communicating, delegating and evaluating. The same is true for the Incident Command System, but the responsibilities are often shared among several agencies. These tasks, or functional areas as they are known in the ICS, are performed under the overall direction of a single Incident Commander (IC) in a coordinated manner, even with multiple agencies and across jurisdictional lines. The ICS also features common terminology, scalability of structure and clear lines of authority.

What the ICS is Not

Many people who have not studied the full details of the Incident Command System have a variety of erroneous perceptions about what the system means to them and their agencies. To set the record straight, the Incident Command System is not:

- A fixed and unchangeable system for managing an incident.
- A means to take control or authority away from agencies or departments that participate in the response.
- A way to subvert the normal chain of command within a department or partner.

- Always managed by the fire department or the first partner to arrive on-scene.
- Too big and cumbersome to be used in small, everyday events.
- Restricted to use by government agencies and departments.

Incident Commander	Information Officer Safety Officer Liaison Officer

Planning Section	Operations Section	Logistics Section	Finance/Administration Section
Planning Chief	**Operations Chief**	**Logistics Chief**	**Financial Chief**
High level representatives from each agency involved	Police Fire Public Works Red Cross Relief Agencies	Communications Medical Support Transportation Supplies Personnel Food Service	Financial staff from each agency will keep track of the cost of the response
Responsible for information gathering and dissemination, and working out the details of each agency's responses	These are people from agencies who are actually in the field doing the work to protect and serve the public	Above services are for responding agency personnel not the general public	Very important if Federal Disaster Relief funds will be requested

The ICS Structure

The Incident Command System has two interrelated parts. They are **management by objectives** and the **organizational structure**.

Management by Objectives

Four essential steps are used in developing the response to every incident, regardless of size or complexity:

- Understand the policies, procedures and statutes that affect the official response.
- Establish incident objectives (the desired outcome of the agencies' efforts).
- Select appropriate strategies for cooperation and resource utilization.
- Apply tactics most likely to accomplish objectives (assign the correct resources and monitor the results).

The complexity of the incident will determine how formally the "management by objectives" portion will be handled. If the incident is small and uncomplicated, the process can be handled by oral communication between appropriate people. As the incident and response become more complex, differences between the individual agencies' or departments' goals, objectives, and methods will need to be resolved in writing.

Organizational Structure

The ICS supports the creation of a flexible organizational structure that can be modified to meet changing conditions. Under the ICS, the one person in charge is always called the "Incident Commander" (IC). In large responses, the IC may have a "Command Staff" consisting of the Information, Safety and Liaison Officers. In a smaller incident, the IC may also handle one, two or all three of these positions, if they are needed at all.

Various other tasks within the ICS are subdivided into four major operating sections: Planning, Operations, Logistics and Finance/ Administration. Each operating section has its own "chief," and may have various branches or units working on specific goals. The Logistics section handles the coordination of all inter-partner communication infrastructures involved in the response, including Amateur Radio when it is used in that capacity.

These operating sections may be scaled up or down, depending on the needs of the situation. In a small, single partner response, the IC may handle many or all functions. As the size and complexity of a response increase, and as other agencies become involved, the various tasks can be re-assigned and sub-divided. For instance, if the only responding partner is the fire department, communications will be handled according to existing department policies. If the incident expands, more agencies become involved, and other communication assets are required, a Logistics Chief may handle communication decisions along with other tasks, or assign the job to a "communication unit leader" directly or through a service branch director as his own workload increases.

The Incident Commander

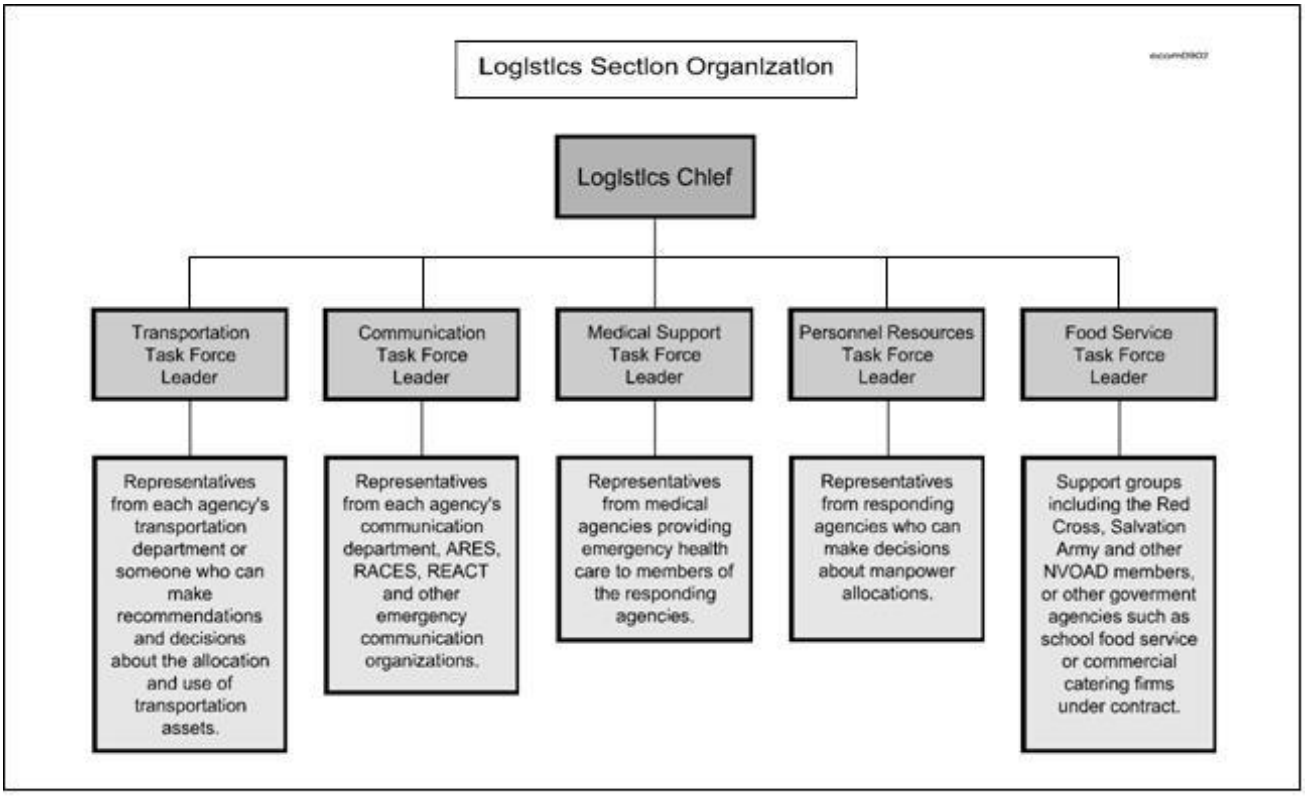
The initial IC is usually the most senior on scene officer from the first responding partner. The IC is responsible for the management of the incident and starts the process by helping to set initial incident objectives, followed by an "Incident Action Plan" (IAP). In a small incident, the IC may perform all the ICS functions without aid, but in a larger incident, he or she will usually

delegate responsibilities to others. The IC still has overall responsibility for the incident, regardless of any duties delegated.

The persons filling certain ICS positions may change several times during an incident as the needs of the response change. For instance, in the early stages of a hazardous materials spill, the Incident Commander may be a fire department officer. As the Coast Guard or other federal partner arrives to begin cleanup efforts, one of their officers will become the Incident Commander.

How an Emergency Communications Group Fits Into the ICS

Involvement in any incident where ICS is used is by "invitation only" — there is no role for off-the-street volunteers. The relationship of an emergency communications group to the ICS structure will vary with the specific situation. If your group is providing internal communication support to only one responding partner and has no need to communicate with other agencies that are part of the ICS, you may not have any part in the ICS structure itself except through your partners. If your group is tasked with handling inter-partner communications, or serves more than one partner's internal communication needs, it is likely your group will have a representative on the Logistics Section's "communication unit." In certain situations, an emergency communications group might serve one or more agencies simultaneously. As the responsibility for managing the incident shifts from one partner to another, the Emergency communications group's mission may shift to assisting the new lead partner, or simply end. In some cases, your group might begin by supporting your own partners, and end up supporting a new and unfamiliar partner. The choice of whether to use your emergency communications group's services may be made by the partners, Communication Unit Leader, Service Branch Director, Logistics Chief, or Incident Commander, depending on the specific situation and the degree of ICS structure in use.



Reference Links

Incident Command System courses
https://training.fema.gov/nims/

NIMS
www.fema.gov/pdf/emergency/nims/NIMS_core.pdf

National Response Framework
www.fema.gov/pdf/emergency/nrf/nrf-core.pdf

Review

The ICS is a management tool that preserves the command structure of each responding partner, while bringing them all together under a common plan and leader. Emergency communications groups often operate as part of the Logistics section of the ICS. If the emergency communications group serves the internal communication needs of only one partner, it may not be a formal part of the ICS structure.

Student Activities

Section 4 (Topics 16-20)

NOTE: These activities are for student review only and are not required to be submitted.

Topic 16

1. Make a list of items suitable for a go-kit for your area and assignment.

2. Develop a list of contacts and resources to keep in your go kit.

3. Using the list you created above, put together a basic go-kit. It need not be complete, as you will be updating the kit over time.

Topic 17

1. Evaluate the equipment you now own to see if it is suitable for emergency communications operation. Make a list of equipment you already own and make a second list of the items you will need to complete a basic emergency communications package appropriate to your needs. Describe this evaluation.

Topic 18

1. List the strengths and weaknesses of the telephone tree as an alerting system.

2. List the strengths and weaknesses of paging as an alerting system.

3. List the strengths and weaknesses of self-activation as an alerting system.

4. Design an emergency communications activation system for a seven-member team. Be sure to include backup methods.

Topic 19

1. Suppose that you were given the assignment of coaching a new member of your emergency communications group. Describe six rules would you teach the new member regarding behavior at a partner's emergency communications event.

2. It is always a good idea to pack the equipment needed to get on the air right away in your vehicle last so that you can get to it first. Consider all the gear that you might need for a three-day emergency communications assignment. Describe how you might load your gear in a vehicle.

3. Develop a checklist of actions you should take upon arrival if you were assigned to a different partner during an emergency communications event.

4. Develop a checklist of actions you should take before departing a partner at the conclusion of an emergency communications event. Describe these actions.

Topic 20

1. Contact a leader of your local emergency communications group. Ask the leader:

   A. If the emergency communications group is affiliated with a specific partner.

   B. If there is a local, planned ICS structure and if so, how the emergency communications group fits into the local ICS structure.

   C. Ask the leader if the emergency communications group has ever been activated. If so, what were the lessons learned from operating with local agencies?

2. Suppose that during an emergency activation, you find yourself to be the leader of the local emergency communications group. To which partner would you report? To whom within the partner would you report? What would your duties be as leader of the emergency communications group?