Section 2: The Networks for Messages

Topic 10

Specialized Nets and Their Operations

Objectives

Welcome to Topic 10.

After completing this topic, you will be able to provide a brief review of what specialized nets are, whom they are designed to serve, and the differences between basic net operations and specialized nets.

Student Preparation required:

None.

Why We Have Specialized Nets

Specialized nets are created to serve specific agencies that are served by Amateur Radio emergency communications. These vary from region to region, as not all sections and districts will be serving the same agencies. From a general standpoint, the most common served agencies are the American Red Cross (ARC), The Salvation Army, the National Weather Service (NWS), and other such national organizations that have Memoranda of Understanding (MOUs) with ARRL and its ARES® program.

These nets are customized to fit the needs of an individual partners, and they are most often quite different in nature from the basic net, resource net, or other general types of net operations that we have discussed so far.

Differences in Specific Specialized Nets

In the many sections and districts, we work for and with different partner agencies. There are some that we do have in common, however, and we will use examples of the most common among ARES operations, and how they differ.

For example, many of us work with the American Red Cross and local Emergency Operation

Centers (EOCs). When we are conducting a net on behalf of the ARC, much of the information is relative to their functions, such as communication between a local Red Cross Chapter office and shelters that may be opened during a disaster. The information that is needed varies, depending on the type of disaster. If there is an evacuation due to fire or flood, then the Chapter will want to know detailed information about the number of "clients" who check in at the shelter and the provision of adequate supplies that are needed to accommodate them.

While most of these nets can be operated by simplex voice, there are times when the distance between locations would indicate that a repeater might best cover the area needed. Bear in mind that not only will the Chapter office need to communicate with *each* shelter, but the shelters will

often need to talk to each other as well. For this reason, a strong, well-organized NCS will be needed so that the traffic will flow smoothly and in an orderly fashion.

Also, you must remember that traffic that contains sensitive information must be confined to a *secure* communications method and never be transmitted through direct voice communication in which proper names and/or health conditions are mentioned.

Amateur Radio is not a secure method of communication. Using various digital modes, we can greatly decrease the possibility of interception, but these are not secure, and we should never allow a partner to assume that they are. The most secure methods to be used for sensitive materials are telephone, fax, text message, and e-mail.

While digital modes such as packet, D-STAR, and PSK31 are *more* secure than voice, you must remember that they are not totally reliable as "secure" modes. Some modes, such as Winlink, use compression so security is always high. In Topic 13 we will compare various modes and their precision and security.

Amateur Radio is not a secure method of communication.
Using various digital modes, we can greatly decrease the possibility of interception, but these are not secure and we should never allow a partner to assume they are.

After the first several hours of an event, health and welfare traffic may be the most valuable type of traffic for your partners, so every communicator working with such a partner will need to have a good supply of NTS forms (and other forms as required for your individual area) so that such traffic can be passed when called upon.

Working with a local EOC can be different because most emergency managers are looking for different kinds of information to be passed during a callout. Since the creation of the Department of Homeland Security (DHS), the National Incident Management System (NIMS) or Incident Command System (ICS) system has become more widely used. For this reason, being familiar with the ICS 213 and other such forms used in that system is also good practice. We must be accustomed to the proper format and protocol that is dictated by the partners, and not what we would elect to use. Advance preparation in these formats and protocols is strongly advised.

As has already been discussed, an EOC is usually not the best place for an NCS to operate, since the chaos and noise factors can make such operation difficult. It is often better to have the NCS located off-site in a different location for best results. Also, an EOC will often require communications and tracking of information among a variety of different agencies it works with. Good advance preparation in your area of responsibility might consist of identifying and appointing a specific person as liaison for each of the other agencies that an EOC works with.

Health-Oriented Served Agencies

During the last few years, many health organizations such as hospitals and health departments have discovered the value of Amateur Radio communications and have included an association with us into their emergency plans. Working with these types of served agencies can present some unique methods and challenges.

For example, some organizations elect to involve Amateur Radio for the relay of information while engaged in Point of Dispensing (POD) for mass inoculation and vaccination. Often, they will ask that we link to an area hospital, EOC, and/or health department so that they can track how many doses have been expended and in what length of time. They would also need to know how many people have passed through a POD location and what remaining supplies are on hand. For this type of traffic, a directed net usually works best. Each POD location would have communicators on hand to gather information then pass it on in regular intervals. NCS operators must be sensitive to accuracy of the information being relayed from each point. Note that this application is also a good workout for packet and digital communication systems with specially assigned frequencies so that normal traffic does not conflict with the POD voice traffic in progress.

We Are Not Alone

Remember that your group may not be alone! The American Red Cross has a corps of dedicated Amateur Radio operators who are its own ARC volunteers. It's important to consider how your group will work with them. The Salvation Army has SATERN volunteers working ham radio. The Southern Baptist Men's Group also has volunteer Amateur Radio operators within its ranks as communicators. These groups may need to bring their full resources into your region depending on the severity of the situation. It's important to have a plan for working cooperatively.

Planning and Drills

Working with different partner agencies and providing nets to each can be difficult. In addition, the agencies often interact with each other, so planning and knowing assignments such as NCS operators can make a huge impact on the success of our operations with such agencies. Sitting down well in advance with partner leadership to determine their needs and requirements will help to make things flow smoothly during an actual event or emergency. One good way to handle such advance training would be a tabletop exercise during which demonstrations of

Amateur Radio in action are shown and interaction between agencies can take place.

The Mutual Aid Net

One other specialized type of net needs to be discussed, even though we hope never to have to use it.

In the event of a major disaster, you cannot plan on your own local people being available, as they may be victims. Help will come in from your neighboring sections, and even from across the country.

But the task of the local or district ARES members is not over! Your SEC, DEC, and others will need to form a special resource net that efficiently tracks needs and locations for operators, to whom they should report when they arrive, and what skills and equipment they bring to the task. In this case, the "partner" is ARES itself!

It is necessary to form solid working relationships with neighboring Sections and conduct drills and testing of a Mutual Aid net. These nets are conducted between Sections to allow cohesion between SECs, DECs, ECs, and others who would be working together in the event of a disaster. It is good to establish a communications plan under which such requests are made, and resources gathered.

Depending upon the geography, many different bands and modes may be chosen. For example, in the west, where states and Sections are spread out and larger, HF might be the best solution. If the internet is not down, an IRLP, D-STAR, or EchoLink node or system to link wide areas might be the mode of choice. If it is down, Winlink 2000 or a similar mode of operation might help. In any event, this will be unique to your own area and situation, and planning and testing of such Mutual Aid scenarios is a must.

Working Together

Finally, remember that this is not the place for "my group, my repeaters, my plan" small-mindedness. The NCS of a specialized net reports to both the EC and liaison directly involved with the partner for which the net was created and (usually via that liaison) to the leadership of the partner for which the net was created. We serve the public, not our egos, and the best service we can render in a truly major event is to provide and distribute a corps of trained operators into the right places of the scene in that first, critical 48 hours. Table-topping such a major event and developing a special resource net with your SEC — and even with neighboring sections — is excellent preparation. And, the same holds true at the local level. Working with neighboring ARES units during tabletop and even more extensive practice nets is a must.

Reference Links

For more information on specialized nets in your area, which may be unique in your district or

section, contact the Section Manager (SM), Section Emergency Coordinator (SEC), or District Emergency Coordinator (DEC) for your ARRL Section.

Also consult the ARRL Operating Manual *chapters on emergency communications, traffic handling, and nets. See also* The ARES Field Resources Manual http://www.arrl.org/files/file/Public%20Service/ARES/ARESFieldResourcesManual-2019.pdf

Review

Specialized nets are specific to various partner agencies and are not general nets. These nets are most often customized to fit the partners involved and the types of communications and traffic relative to the individual partner, which vary in scope and type. Specialized nets should be conducted away and apart from general, resource, or tactical nets (if run in conjunction with other nets) and should use a frequency unique to this net. NCS operators must be versed in the operations of the specific partner for which the net is created.

Section 2: The Network for Messages

Topic 11

Severe Weather Nets / SKYWARN®

Objectives

Welcome to Topic 11.

This topic will cover what you need in order to understand the basics of severe weather reporting programs and nets, including local or regional National Weather Service (NWS) SKYWARN® nets, and the wide-area Hurricane Watch Net (HWN).

Student Preparation required:

Review the Memorandum of Understanding (MOU) between the National Weather Service and the ARRL at www.arrl.org/files/file/Public%20Service/National%20Weather%20Service%20MOU.pdf and the Hurricane Watch Net's website at www.hwn.org.

SKYWARN

The name SKYWARN, like ARES®, is a registered name and cannot be used by other organizations (if you are using the name in a publication, you must include the registration mark after the name — SKYWARN®). The SKYWARN program is sponsored by the National Weather Service. Like ARES, it is a program, and not a club or organization. Amateur Radio operators and other SKYWARN volunteers report actual weather conditions in their own communities. These are sometimes called "ground truth" observations. Accurate information and rapid communication during extreme weather situations have proven to be indispensable to the NWS. Amateur Radio SKYWARN operations have become integral to many communities' disaster preparedness programs.

Unlike most Amateur Radio operators, SKYWARN observers are a "first-response" group, invaluable to the success of an early storm-warning effort. Weather spotting is popular because the procedures are easy to learn and reports can be given from the relative safety and convenience of a home or vehicle.

This learning unit concentrates primarily on the Amateur Radio nets themselves. While some

discussion of general spotting techniques is presented here, specific weather observation training for your area should be obtained locally from NWS.

To become a registered SKYWARN volunteer, you must complete a short course of training in severe weather observation and reporting. Most courses are only a few hours long. Once completed, NWS personnel may assign you a spotter number and a toll-free number to call with your reports. Many amateurs are members and registered spotters, and they provide a valuable service to National Oceanic and Atmospheric Administration (NOAA) and local NWS offices around the country. If there is no active program in your area, you might wish to find out more about starting one in conjunction with your local ARES group. For more information on SKYWARN® training, contact your local NWS office or your local emergency management partner.

What Is Generally Reported

Reports on a severe-weather net are limited to specific critical weather observations, unless the NWS office requests other information. For this reason, amateurs without SKYWARN training should monitor the net and transmit only when they can offer needed help. If they *are* members, they should report as requested and as needed by their local leadership and NWS office, and using their assigned SKYWARN spotter number. Many areas open a net for the collection of such severe-weather data.

Weather forecasters, depending on their geographical location, need specific types of data.

During the summer or thunderstorm season, SKYWARN observers report:

- Tornadoes, funnel clouds, and wall clouds
- Hail — usually measured with a specific size
- Strong winds, usually 50 miles per hour or greater
- Flash flooding
- Heavy rain, with a sustained rate of 1 inch per hour or more
- Damage
- Adverse traffic and driving conditions affecting travel

During the winter, they report:

- High winds
- Heavy snowfall
- Freezing precipitation
- Sleet
- New snow accumulation of 2 or more inches per hour
- Damage caused by snow or ice

A four-step method of "What, Where, When, Details" can be used to describe severe weather that you see. For example:

1. What: Tornadoes, funnel clouds, heavy rain, etc.

2. Where: Give direction and distance from a well-known location; for example, "Three miles south of Newington Center, on Route 15."

3. When: Time of observation.

4. Details: Storm's direction, speed of travel, size, intensity, and destructiveness. Include any uncertainty as needed; e.g., "funnel cloud, but too far away to be certain if it is on the ground." Indicate if amounts are measured or estimated; i.e., wind gauge vs. visual estimate.

Activation

SKYWARN observers are usually aware that the potential for severe weather has been forecast. As conditions begin to deteriorate, they should monitor the primary net frequency and the NOAA All Hazards Weather Radio (NWR), a system of VHF FM radio transmitters operated nationwide by the NWS on seven channels between 162.400 and 162.550 MHz. The SKYWARN net may be formally activated upon the request of the local NWS office, or by net members if conditions warrant immediate action.

SKYWARN® Recognition Day (SRD)

SKYWARN Recognition Day was developed in 1999 by the National Weather Service and ARRL. The first weekend in December of each year is reserved for SKYWARN Recognition Day. This is a day that serves to celebrate the contributions to public safety and to the National Weather Service by Amateur Radio operators during threatening weather. On this day, SKYWARN operators visit NWS offices and contact other radio operators around the world.

The object is for amateur stations to exchange information with as many National Weather Service Stations as possible on the 80-, 40-, 20-, 15-, 10-, and 6-meter bands, as well as the 2- and 70-centimeter bands, local repeaters, and VoIP modes such as EchoLink. Contacts via repeaters are permitted. See www.wrh.noaa.gov/mtr/hamradio/ for more information on SKYWARN Recognition Day.

Operating the Weather Net

The format and operation of weather nets will vary from area to area and should be designed to meet local needs. In areas with specific hazards, such as in “tornado alley,” the net may be formal and well disciplined. In other areas with less sudden dangerous weather, the net may be less formal and may not even have an NCS operator. When it is a directed net, the NCS maintains control over traffic being passed to NWS, and may organize a liaison with other area repeaters. Often wide-area, high-level repeater systems will work best due to their coverage. Also, many ARES organizations designate an EC or AEC assigned to the NWS, who becomes an NCS during activation. Many of them also become Weather Net Managers.

The Net Manager or NCS should designate one or more alternate frequencies in anticipation of an overload or the loss of a repeater, or if the net needs to split to handle different tasks or regions. If a disaster should occur during a severe-weather net, the net may take on disaster-relief operations in addition to tracking the progress of the storm. If the traffic on the net increases substantially, a separate net should be set up to handle relief operations to ensure that critical information gets through in a timely fashion. At least one station should be assigned as a liaison to monitor both nets and relay any critical messages or information between nets.

At the National Weather Service: In some areas, a permanent or temporary amateur station is operated from the local NWS office. In other areas, an off-site station relays information to the

local NWS office via telephone, fax, or e-mail. In either case, this station receives, collates, and organizes the information being sent to NWS and passes it on to the forecasters as quickly as possible.

NWS personnel may request that a handheld radio or scanner be placed at the severe-weather desk. In such cases, they need to be aware of which frequencies are to be monitored so that they may receive the most accurate and up-to-date information in real time. This arrangement allows them to monitor incoming traffic directly. Nevertheless, all traffic should be written on report forms and passed quickly to the forecasters.

Ham Radio at the National Hurricane Center (WX4NHC)

https://www.youtube.com/watch?v=MBKGmpH72JQ

Hurricane Watch Net (HWN)

The Hurricane Watch Net serves as eyes and ears for the National Weather Service in the Caribbean, the Gulf of Mexico, and along the US Atlantic and Pacific coasts. Net members relay official weather bulletins to those monitoring the net in affected areas, and field observation reports back to NWS — primarily to the hurricane forecasters in the National Hurricane Center, which has an on-site Amateur Radio station, WX4NHC. It also serves as a backup communication link between NWS forecast offices, National Specialized Centers, critical EOCs, and other disaster relief efforts.

HWN differs from SKYWARN in two important ways. First, its volunteers are exclusively Amateur Radio operators. Second, its operations are primarily on HF-SSB rather than VHF or UHF-FM.

The primary functions of the HWN are to:

1. Disseminate hurricane advisory information to marine interests, Caribbean island nations, Emergency Operations Centers, maritime mobile amateur stations, and other interests for the Atlantic and Eastern Pacific as released by the National Hurricane Center in Miami, Florida.

2. Obtain ground-level weather observations and damage reports from reporting stations and observers who are not part of the routine network for the National Weather Service or the World Meteorological Organization, and forward them quickly and accurately to the National Hurricane Center.

3. Function as a backup wide-area communication link for the National Hurricane Center, Emergency Operation Centers, the National Weather Service, and other vital interests involved in the protection of life and property before, during, and after hurricane events.

4. Relay initial assessments of hurricane damage to the National Hurricane Center. Damage assessments come in about roads, power outages, structural damage, phone and communication problems, and of course, reports on the number of injuries and deaths. These non-weather report items are usually relayed to the appropriate agencies via other nets in operation on 20, 40, and 80 meters, or by the crew at WX4NHC to agencies that stay in regular contact with the National Hurricane Center.

Membership in the net is not restricted to stations in hurricane areas. Amateur Radio operators outside hurricane-prone areas can participate as relays or net control stations. The net has an urgent need for stations in the Midwest and on the West Coast as propagation shifts westward. The net also has a need for stations that are available during the workday in all areas.

If you live in a hurricane-prone area, and your amateur license class will not allow operation on the 20-meter band, you can still participate in the system. The National Hurricane Center monitors the APRS packet reporting system. You can submit your information manually via APRS, or better yet, connect a weather station to your packet station for automatic reporting. In some areas, local FM nets relay observations to NWS through HF operators on the HWN net.

Activation: The Hurricane Watch Net activates for all hurricanes that are a threat to land in the Atlantic and Eastern Pacific oceans. The net will normally activate when a hurricane is moving toward land at a range of 300 miles. On occasion, it may activate for tropical storms, or at any time when requested by the National Hurricane Center.

Before checking into the net, listen long enough to determine the nature and immediacy of events. If the storm is still hours from any serious impact, the net control will provide a window of opportunity to check in. If a hurricane is within an hour of landfall, check in *only* if you are in the affected area and can assist with a specific relay or supply information of immediate value to the net or National Hurricane Center.

Net Operations: The Hurricane Watch Net, and WX4NHC at the National Hurricane Center in Miami, are staffed entirely by volunteers. HWN is a 24-hour Net or until their services are no longer required, using 14.325 by day and 7.268 by night and both frequencies may be used simultaneously. We all know hurricanes can and do make landfall at night and while net operations are normally conducted on 14.325 MHz USB, and 7.268 MHz, night time operations may require a shift to 80 meters or when band conditions warrant.

Safety Concerns for All Weather Net Stations

As an Amateur Radio operator providing communications in the path of a dangerous storm, you need to be concerned for your own safety. Under no circumstances should you place yourself in physical danger in order to gather or report information. Remember, if your area is under an evacuation order, it is too dangerous for you as well. Antennas and supports should be placed so that winds will not carry them into power lines. Stations should be located as far from potential flood, flash flood, or storm surge areas, and as close to an escape route as possible. If setting up a portable station, choose buildings that were specifically designed to withstand storm winds. Stay

away from unprotected windows, and make sure that you have more than one downwind emergency exit should a fallen tree or other debris block the main exit. Park vehicles downwind from buildings and structures to protect them from flying debris. Bring adequate supplies that allow you to remain in place for an extended time should evacuation or resupply not be possible.

VoIP Modes

Radio amateurs using Voice over Internet Protocol (VoIP) modes such as EchoLink (www.echolink.org/) and IRLP (www.irlp.net/) are also supporting forecasters tracking hurricanes.

The EchoLink and IRLP partnerships created for hurricanes and severe weather have seen upwards of 100 VoIP connections during storm emergencies, many of which represent repeaters and conference rooms with many people listening.

The VoIP-WX Net (www.voipwx.net/) also has a large number of Technician-class operators who were not able to report via HF in the past. The HWN operates on 14.325 MHz — beyond the reach of operators lacking at least a General-class Amateur Radio license. Those connecting via VoIP modes often do so using VHF/UHF radios on battery power via an IRLP or EchoLink-equipped repeater.

For additional information, visit the WX4NHC website: www.wx4nhc.org/

Weather Net Operating Tips

For nets spanning more than one time zone, use UTC time in all reports, not local time. If you are not sure of the correct UTC time, use local time and be sure to notify the net control that you are using it.

If you are going to give a damage, injury, or casualty report, and it is not based on your own personal observation, be prepared to provide the time, the name of the person providing it, their call sign or official position, if any, and if possible, a telephone number and address or other means of contact so it can be confirmed later. Also be keenly aware that sensitive information should *not* be broadcast over general nets and must be kept to more secure modes such as telephone, fax, or direct delivery, if possible. This will avoid release of proper names and sensitive information to those who might be listening and not directly involved with disaster efforts.

Use “push-to-talk” — not VOX. Background noise in the room, from the storm, and from other radios may cause VOX to key your transmitter without you noticing and disrupt the net. Also, use headphones if possible at on-site locations to ensure that you receive accurate information without disruption from such background noise.

Reference Links

Hurricane Watch Net
www.hwn.org/

National Weather Service
http://nws.noaa.gov/

NOAA All Hazards Weather Radio (NWR)
www.weather.gov/nwr/

NWR Coverage Maps
http://nws.noaa.gov/nwr/Maps/

NWS SKYWARN®
www.nws.noaa.gov/skywarn/

SKYWARN® (non-NWS commercial website)
www.skywarn.net/

SKYWARN® Online Spotter Training
https://www.meted.ucar.edu/training_course.php?id=23

SKYWARN® Recognition Day (SRD)
www.wrh.noaa.gov/mtr/hamradio/

Information on becoming a Net Control Station of the Hurricane Watch Net
www.hwn.org/home/membership-info.html

Blank HWN report forms
http://www2.fiu.edu/orgs/w4ehw/

Other wide-area Amateur Radio nets that deal with severe weather events:

The Intercon Net
www.interconnet.org

The Maritime Mobile Service Net
www.mmsn.org/

The SATERN Net
www.satern.org/

The Waterway Net
www.waterwayradio.net/

See also:

Storm Spotting and Amateur Radio, 2nd Edition, by Mike Corey, KI1U, and Victor Morris, AH6WX

Review

The NWS SKYWARN® program and the Hurricane Watch Net make up the bulk of Amateur Radio weather nets. Both use Amateur Radio to relay real-time "ground-truth" weather information to the appropriate National Weather Service office. Amateurs participating in either type of net should take care not to expose themselves to dangerous weather conditions.

Section 2: The Networks for Messages

Topic 12

Social Media and Emergency Communications

Objectives

Welcome to Topic 12.

After reading this topic, you will have a better idea of what the term "social media" refers to. This is only an introduction to various social media sites, not an exhaustive study of the topic. Keep in mind that while this topic discusses a variety of communication options that do not depend on Amateur Radio, some examples might be useful as a form of communications during emergencies.

Student Preparation required:

None.

What Social Media Is

Social media refers to a means of interacting with other people by sharing information, such as text, photos, and videos, and receiving information from them using a variety of web-based communications tools.

The word "media" has long been used to refer to the technologies people use to communicate. Since the internet is making communication technologies more interactive and social, the term "social media" was coined to refer to the highly interactive qualities of newer forms of electronic media, which allow for ways of communicating and sharing information that differ from traditional mass media such as TV, newspapers, and radio.

Most early forms of internet media were highly social, including bulletin boards, forums, packet radio, and popular online networks such as CompuServe and America Online. But the term "social media" didn't become popular until after 2000, when the rapid rise of social networks such as Myspace, Facebook, and YouTube brought greater attention to online media sharing.

Social media takes many forms and includes social networks, a subset of the larger social media

universe. Social networking specifically refers to services such as Twitter and LinkedIn, which provide online tools for making, organizing, and managing connections between individuals and groups. The definition of social media is broad enough to include file-sharing technologies such as SoundCloud, video-sharing services such as YouTube, and photo-sharing services such as Instagram and Flickr. There are literally thousands of other more specialized services such as Facebook Events or Meetup for events and Retail Me Not or Groupon for social shopping; they qualify as social media, too. One of the great aspects of social media is the ability to have two-way or many-to-many dynamic information exchanges during an emergency.

Some Popular Social Media Sites

Founded in 2004, **Facebook** is the most popular social network site in the world for staying in touch with friends and family. Facebook's mission "is to give people the power to share and make the world more open and connected." People use Facebook to stay connected with friends and family, to discover what's going on in the world, and to share and express what matters to them. Amateur Radio, ARES, and emergency communications are represented on Facebook, as are many other topics. Just type a keyword in the "search" box and find hundreds of sites of Amateur Radio interest. ARRL has a Facebook page, too; check it out at https://www.facebook.com/ARRL.org.

Twitter (https://twitter.com)is a microblogging site. It provides users with a platform for short text messages that may include web links, pictures, audio, and video content. The term "micro" is used as Twitter restricts users to posting short messages or "tweets," which consist of no more than 140 characters. Tweets are similar to text messages (SMS or Short Message Service), except that they are shared publicly to anyone with access to Twitter. Twitter users typically orient their activity toward the interests of a specific audience or group of followers; for instance, one can

search for “ham radio” from the Twitter home page to see related posts. Users can subscribe to other users’ posts (which are called “tweets”), send direct messages, or reply publicly. Users often share comments about related subjects through the use of hashtags. A common hashtag for social media in emergency management is #SMEM. The hashtag for ARES is #ARES.

Ham radio operators who are involved in emergency communications find that having a Twitter account gives them the potential to reach out to other users to share information. What is special about tweets or Twitter posts is that when the account holder enables the location feature, the geodata it contains can help provide a more accurate common operating picture. This is true particularly when the posts include a picture or video.

LinkedIn® is another example of a social networking site. These sites allow individuals, companies, organizations, and associations to post text, video, pictures, links to other web content, or combinations of all of these electronic media. This posted media, with some permanent and some constantly changing sections, comprises the profile of an individual or organization. Increasingly, more information about the individual can be shared, such as location-based information and media preferences (music, pictures, video, etc.). These sites are used more widely by organizations and the public to keep others up to date on their statuses and activities or to advertise events.

Sites such as **Flickr**, **Picasa**, **YouTube**, **Vimeo**, **Instagram**, **Snapchat**, **Tumblr,** and others offer hosting for pictures and videos. Users can include text commentary, group photos, or video. Editing can be performed directly on the site, including embedding certain graphics, links, or metadata such as the GPS coordinates, date, and time an image was recorded in their content files. This media can then be embedded in a blog or on a Facebook page, or linked in a tweet.

Using Social Media in Emergency Communications

As emergency managers and their agencies become more actively engaged with their communities using social media, they usually find it necessary to modify their approach to using traditional media. Social media has already affected the way journalists do their jobs; many of them are already well positioned to interact with emergency managers through social media rather than through conventional press releases. Social media also allows anyone to become a journalist. Many media outlets encourage citizens to make use of social media outlets to report news as it happens. The National Weather Service has taken advantage of this as it allows meteorologists to see near real-time photos and videos of weather events.

Public Information Officers (PIOs) often find social media helps them stay current with the continuous news cycle. Because the operational tempo increases quickly in emergencies and disasters, **Joint Information Systems (JIS)** need to address the use of social media in disseminating information and monitoring the message in the media before an event unfolds. Whether we like it or not, the disaster-affected public and many responders already have a social media presence.

Successful communication depends upon PIOs and incident commanders establishing and

aligning communication priorities to incident objectives early, and updating them often during the response phase. Defining hashtag conventions and key messages for each hazard will help PIOs and others hit the ground running when disaster strikes.

Virtual Operations Support Teams (VOST), as applied to emergency management and disaster recovery, are an effort to make use of new communication technologies and social media tools so that a team of trusted agents can lend support via the internet to those on-site who may otherwise be overwhelmed by the volume of data generated during a disaster. VOSTs are activated to perform specific functions in support of affected organizations and jurisdictions. Each VOST has a Team Leader that reports directly to the affected organization/jurisdiction. As additional VOSTs are established, a VOS Group (VOSG) may be established to coordinate the work of the VOSTs to maintain an effective span of control. The VOSG has a Group Supervisor that reports to the affected organization/jurisdiction. The VOST Leaders report to the Group Supervisor. For more information, refer to the following resources:

https://eena.org/vost-teams/

https://tox.nlm.nih.gov/dimrc/vostbasics.pdf

How Social Media Is Being Used in Emergency and Disaster Communications

- Saving lives through rapid communication
- Communicating (more) effectively and directly with partners
- Reaching a larger group of people
- Building situational awareness
- Responding quickly and effectively to new, incorrect, or conflicting information
- Participating in government and building mutual trust in the community
- Fostering transparency and accountability
- Crowdsourcing communication during a disaster
- Measuring reach and continuously improving

Situational Awareness

Knowing and understanding what is happening around you is called *situational awareness*. Using technology to gather and collect data we can have a better understanding of current conditions and how changes over time can have an impact on our decision-making process. Integrated with traditional data, social media has made it possible to request, share, and provide content-rich information in real time using various forms of text, video, and photo imagery. For more information, see this publication, which explains social media and situational awareness: "Using Social Media for Enhanced Situational Awareness and Decisional Support," by the Department of Homeland Security (DHS): http://www.iaem.com/documents/Using-Social-Media-for-Enhanced-Situational-Awareness-and-Decision-Support.pdf.

Reference Links

Facebook
www.facebook.com

Flickr
https://www.flickr.com/

Google Photos
https://photos.google.com/

Instagram
https://www.instagram.com

LinkedIn
https://www.linkedin.com/uas/login

Situational Awareness
http://www.iaem.com/documents/Using-Social-Media-for-Enhanced-Situational-Awareness-and-Decision-Support.pdf

Snapchat
https://www.snapchat.com/

Tumblr
https://www.tumblr.com/

Twitter
https://twitter.com

Vimeo
https://vimeo.com/

Virtual Operations Support Group
https://vosg.us/

YouTube
https://www.youtube.com/

Section 2: The Networks for Messages

Topic 13

Digital Communications

Objectives

Welcome to Topic 13.

This topic will help you chose the correct operating mode for each situation in an emergency or disaster communications environment.

Student Preparation required:

You should be generally familiar with phone (voice), CW, packet, and other digital modes.

Introduction

Your purpose as a communicator is to provide accurate and rapid transfer of information from one place to another. To do that job well, you must understand the strengths and weaknesses of each mode of communication. In addition, you must be thoroughly familiar with the needs and priorities of the agencies you are serving. Some messages must be delivered quickly, while others are less urgent. Some are detailed, while some are simple. Sometimes you should not even use radio.

Digital Modes

Traffic nets handling large volumes of written or high-precision traffic should consider using one of the digital modes. Digital modes can be used to transmit long lists such as health and welfare traffic and logistics messages involving lists of people or supplies. Some digital modes provide virtually error-free transmission, and relays can be accomplished by retransmitting the received digital message without having to retype it. Packet systems can provide automatic relays. Digital modes that do not provide automatic error correction should only be used when clean and interference-free signals can be guaranteed. These modes include RTTY, AMTOR mode A, and PSK31 in BPSK mode.

HF: While there are many “favorites,” over the years the most commonly used digital modes for emergency HF operations appear to be packet, AMTOR mode B, Olivia, and PSK31. But this is

changing with new options to interface with the internet. In general, antenna and radio considerations are similar to voice or CW operation, although certain digital signals require less power than voice modes to achieve the same effect. Modes such as WSPR, while not particularly useful for message handling, can provide information on current propagation characteristics.

VHF/UHF: The Terminal Node Controller, Version 2 (TNC2) FM packet is the most common mode used on VHF and UHF frequencies. The antenna and coverage considerations are the same as for FM voice.

Packet: Packet communication is error-free in point-to-point "automated repeat request" (ARQ) or "forward error correction" (FEC) broadcast modes. The most effective way to send messages via packet radio is to use a "bulletin board." The sending station "posts" his or her messages on the bulletin board and other stations can then retrieve their messages at will. Urgent messages can also be sent directly to the receiving station if needed.

Bulletin board stations are also useful when several stations are sending messages to a single point, such as a command post, weather service office, or emergency operations center. Similarly, bulletin boards can be useful in handling outgoing traffic. Stations with traffic can post messages to the bulletin board. The traffic handlers can periodically pick up the traffic and send it to the outbound NTS nets.

If your group is using FM packet, ask if transmissions are simplex point to point, or if nodes, digipeaters, or bulletin board forwarding systems are being used. You will need to know which frequencies and modes are used and for what purpose, what their call signs or aliases are, and how various parts of the system interconnect. A consideration is that multipath propagation may distort digital signals enough to cause failure when a voice might still be understandable. The solution is the same as in voice mode — move the antenna a few inches or feet until you get a clear signal.

AMTOR Mode B: AMTOR mode B (also known as FEC mode) is an advanced teletype mode with forward error correction, making it ideal for high-precision messages over long distances.

Olivia: Olivia is designed to work in high-noise conditions on HF and VHF/UHF. The signals can be decoded even when they are 10 to 14 dB below the noise floor. It also decodes well when other noise conditions are present such as QRM, QSB, flutter, and aurora conditions. Olivia is available in *Ham Radio Deluxe*, *fldigi*, *MultiPSK*, and *MIxW*.

PSK31: The ability of PSK31 to be usable in very poor conditions makes it ideal for HF emergency communication. In addition, the efficiency resulting from the very narrow bandwidth of the PSK31 signal means that even a low power transmitter will work quite well. There are two PSK31 modes: BPSK, which has no error correction, and QPSK, which has forward error correction. BPSK should be used unless the received copy is poor, since QPSK is 3dB less efficient and requires more careful tuning. Under all but the worst conditions, BPSK will provide perfect transmissions.

Packet Teleprinting Over Radio (PACTOR): This is a combination of packet and AMTOR. It

is designed for HF use only, and it combines the best features of both. PACTOR uses FEC and ARQ modes and a standard keyboard. PACTOR is quite robust (more so than AMTOR and RTTY), but it can be slowed by poor band conditions.

TCP/IP Packet: TCP/IP internet protocols and network services are useable on packet radio. TCP/IP systems have advantages over conventional packet protocols that could be important in amateur emergency communications operations. One IP system is JNOS, which has extensions written by Johannes Reinalda, WG7J, to the original Network Operating System (NOS) written by Phil Karn, KA9Q.

JNOS is a TCP/IP oriented e-mail system. If you're familiar with internet e-mail, you'll be familiar with typing e-mail into JNOS. It sends e-mail via SMTP mail protocol and can interface to the internet. A JNOS station can relay packet radio messages to the internet and vice versa, unattended. It will print incoming messages automatically on to a printer, unattended. If the printer is a cut-sheet printer such as an inkjet or laser printer, individual messages will automatically appear on separate sheets.

The operator can open up to eight windows for multiple sessions for messaging. It has a ninth window for command mode for controlling the system, and a tenth window for debugging. It can multitask efficiently on a 386 computer with one megabyte of memory. In a minimal configuration, it can run on a PC/XT (640KB 8086) as an end-node station. It supports multiple communications ports and multiple radio/TNC combinations. It is shareware and is available on the internet.

APRS: While not a message handling mode, APRS is a digital information mode with applications in emergency communications. Originally called "Automatic Position Reporting System," this mode is now sometimes called "Automatic Packet Reporting System," owing to new applications of the technology. The newest application of APRS is the automated reporting of data from digital weather stations. The original application for APRS, developed by Bob Bruninga, WB4APR, is to track a station's location. A GPS receiver is connected to a computer, and its position information is transmitted to other stations using APRS packet software, displaying the location of the sending station on a map. APRS also has a messaging mode similar to "instant messaging," in which quick one-line messages can be exchanged online.

APRS has two obvious applications for emergency communications. First, the locations of various emergency vehicles can be tracked visually in real time in an automated and unattended fashion. Second, weather and other environmental data can be reported automatically in near real time. Both applications can both speed data acquisition and reduce the workload on critical emergency nets.

D-STAR

D-STAR is a digital system, but it has significant differences from some other systems. D-STAR allows for both voice and data communications. Even small handheld radios can send and receive short digital messages. D-STAR uses VHF, which allows for a slow bit rate, or UHF, which is much faster. It does not currently have HF options. D-STAR also uses the internet for

long-distance messaging. For example, a short digital message may be composed on a handheld portable radio, be sent over the air to a D-STAR repeater, enter the internet, be received by another D-STAR repeater in another state, and then sent out over the air to the addressee.

DMR

DMR has taken off in many areas and adds a new element to the VHF/UHF digital voice offering. Like other digital voice and analog voice modes, DMR provides another means for communications, and many ARES groups run DMR nets. DMR does require specialized equipment, and radio programming is far more involved than with analog voice radios. Before investing in additional radio equipment, check to see if DMR is in use in your area.

System Fusion

Until now, FM repeaters were used only for conventional FM communication, and digital repeaters were used only for digital communication; there had been no option for cross-communication in a single repeater. However, System Fusion can be used in multiple ways: for digital communication, for conventional FM communication, and even for internet communication. Most importantly, System Fusion enables intercommunication between all users. This is enabled by the Automatic Mode Select (AMS) function used in System Fusion. With AMS, the modulation of your station is automatically selected according to the received signal. If a member transmits in conventional FM, the other radios in the System Fusion automatically select their modulation to conventional FM to communicate between all members.

By simply replacing the current conventional FM repeater station with a System Fusion AMS digital repeater, you can continue to use the conventional FM communication, as well as the repeater for digital communications. Because the System Fusion repeater is capable of converting and transmitting digital communication to conventional FM communication, you can intercommunicate with members using either conventional FM communication or those using C4FM digital communication. Previously, when a repeater group planned to use a digital system, all other members of the club using conventional FM communication needed to purchase equipment capable of digital communication. With System Fusion, digital communication and conventional FM communication can join in a single multiple function system.

Winlink

The Winlink system utilizes various modes, including PACTOR, packet, Telnet, and sound card mode WINMOR, to send email via radio.

Winlink requires *Windows* Vista or later and .NET 3.5. The client Winlink Express is the most flexible in supporting all the above modes and connection types. This client allows for additional call signs and is aimed at the individual operator.

Paclink, the original Winlink mini e-mail sever from the Winlink development team, may attach an SMTP Mail client such as Outlook, Mail, etc., and can serve multiple VHF/UHV/Telnet combinations with hierarchal routing scheme. Modes available are PACTOR, packet, and Telnet. Connection types are limited to client to gateway. Paclink does have a use function inside of a LAN environment for either web-based or standard SMTP Mail clients.

Standard call signs may be used as well as temporary tactical addresses, which attach to call signs to be legally sent over the Amateur Radio spectrum.

Airmail is an older program and is not maintained by the Winlink development team. It provides PACTOR, packet, and Telnet capability. The target user is the amateur maritime community while cruising off shore. In addition, there are many programs that are used for the Winlink gateway stations that are not from the Winlink development team. Each has a specific purpose, and programs from other sources are also available to make gateway stations more flexible. They include BPQ32, which may have a Winlink gateway function enabled.

Another flexible program is *AGWPE*. This allows frame-by-frame switching between packet programs and TNCs. Paclink and RMS Packet do have interfaces for this program.

Gateway station locations and frequencies for nodes can be seen on the Winlink website under Tools/RMS Map or Tools/RMS List. Both entries require you to select the RF mode of operation.

The Winlink system is a work in progress, and all users need to keep their installed programs up to date. Also, note that all accounts will expire 400 days after the last use.

In the US, for civil service authorities and their critical infrastructure partners, there is another non-amateur spectrum use of the Winlink radio e-mail system. Amateurs may become involved only under NCC SHARES member agency guidance. For more information, see https://www.dhs.gov/shares

Mesh Networks

In 2001, the ARRL HSMM Working Group created a high-speed digital network for the Amateur Service. What began as the “ARES-MESH” later became known as High-Speed Multi-Media, hence HSMM-MESH. The primary purpose for HSMM is to provide a means for emergency communications to be carried on over a high-speed wireless data network that can handle voice, data, and video communications. For several years, Broadband Hamnet, or BBHN (www.bbhn.org), led the development of HSMM, utilizing Linksys desktop routers to establish neighborhood networks. Today the technology is advancing through the efforts of the Amateur Radio Emergency Data Network, or AREDN Project (www.arednmesh.org/). In its current form, utilizing environmentally robust routers from the wireless ISP industry referred to as “nodes,” multi-megabit links are now feasible across spans of 50 miles or more.

As an example of what can be done with MESH, ham radio operators throughout an eight-county

region of Southern California have coordinated their implementations using a series of interconnecting backbone nodes. Their efforts have produced a mesh capable of supporting Memoranda of Understanding (MOUs) with agencies virtually anywhere within Southern California serving a population of over 16 million people. HSMM can also be used in the day-to-day aspects of Amateur Radio communications.

For a list of supported devices, check the AREDN and BBHN websites.

https://www.arednmesh.org/

http://www.broadband-hamnet.org/

It is easy to reprogram the routers with the free software developed by these groups, to operate over the 802.11b/g Wi-Fi channels in the Part 15 spectrum, and also, in the case of AREDN, 802.11b/g/n support on similar channels entirely within the 900 MHz, 2.4 GHz, 3.4 GHz, and 5.8 GHz Amateur Radio bands. Remember, no hardware modifications are necessary. The software converts the router to a microwave mesh node. Each node of the mesh network can acquire data from an external device and relay data acquired by the other nodes. As the nodes are powered up, the software enables each node to discover other nodes within range, form network paths, and transfer data automatically.

An HSMM node is an endpoint connection *and* a repeater. If one endpoint cannot see its desired destination but can see nodes in between, the data will hop from one to the next until the final connection is made completely automatically. If one repeating node falls out, the software automatically reroutes traffic through other available nodes.

A Technician-class Amateur Radio license is required to operate these in the ham bands.

All sorts of devices can be connected — computers, webcams, VoIP phone, servers, anything that "talks" over a computer network. For the most part, the services you establish will be dependent on the requirements of the agencies you intend to serve.

- A simple example is a large ARRL Field Day site with several stations each with a laptop and a connection to a MESH network, if one node has internet connectivity, which can be shared with other nodes on the mesh, so every node at the FD site can have internet access.
- In a more complex example, the MESH may be used to provide e-mail connectivity, PBX-based telephone service to desktop VoIP phones and cell phones running VoIP applications. You may even be able to restore cell-provider services to a disaster site.

In more complex applications of this technology, it behooves one to become an expert in optimizing these networks for their intended purposes and configuring these higher-level services. In all cases, care must be taken to ensure the network is operated within your Part 97 license grant.

Ham radio operators have already constructed MESH infrastructure in many cities throughout

the US, so check the developer sites listed above for more information.

Amateur Television (ATV)

There are two forms of ATV — slow-scan and fast-scan. Fast-scan ATV is live, full-motion TV similar to what you see on commercial TV, but usually at reduced quality. Slow-scan ATV uses a voice-grade channel to send a still picture line by line. It can take more than a minute for a color picture to be transmitted.

ATV has a number of emergency communications applications, all of which involve letting emergency managers see what is going on in the field without ever leaving their offices. ATV crews usually take a passive "observer" approach and avoid interaction with bystanders to ensure that a situation is accurately represented. No emergency communications ATV transmission should ever be "staged" for the camera.

Narrow Band Emergency Messaging System (NBEMS)

Narrow Band Emergency Messaging System (NBEMS) is an integrated suite of programs that can be used for both emergency communications and recreational operations. The software is designed to run on nearly any modern computer and can easily interface with almost any radio.

NBEMS uses the either the soundcard of your computer or an external sound card connected to your computer's USB port to generate digital audio signals that are output from your computer's speakers or headphone jack and transmitted. Incoming signals are routed to your computer's soundcard by a microphone connected to the computer (either built in or connected to the mic input) or via the line-in input and then decoded and displayed by the program.

NBEMS is in active development with regular releases of new versions containing additional features and bug fixes. Consider this section of this book as a overview of NBEMS. For the latest information, please visit the official NBEMS website at www.w1hkj.com

Advantages of NBEMS: NBEMS has been rapidly growing in popularity for a variety of reasons. Training operators in use of NBEMS is relatively easy. Much of the workflow is either drag-and-drop or requires just a few mouse clicks. The user interface is much simpler than other digital modem and rig-control programs. NBEMS can be configured to automatically open and display incoming messages either in *flmsg* or your web browser without operator intervention. In *flmsg* (version 4.0 and later) there is an option to set up in an "agency" (simple) interface. This provides partner agency personnel a "dead simple" forms interface that can be used with virtually any means of transport from hard copy to e-mail to radio.

NBEMS excels on our existing analog FM repeater network. This means we don't need a dedicated digital network; we can instead leverage our existing repeaters and turn them into a digital network as needed. This allows us to combine voice and digital operations on bands easily where permitted by FCC regulations. We also find that NBEMS works very well on HF. Using

macro keys, it's easy to customize NBEMS to simplify local net operation practices, for example.

The most popular mode on VHF/UHF FM for emergency communications, MT63, works well without requiring a hardwired interface between radio and computer when using a technique known as acoustical coupling. All you need to do is hold your radio's mic up to the computer's speakers and push the radio's PTT to transmit. To receive data, just place the radio's speaker near the computer's microphone. We have found that the most difficult part of NBEMS to get to work is rig control. Use of acoustical coupling eliminates this problem. It also means we don't need to navigate a complex series of wires and cables to operate the radio or risk forgetting a cable.

All components of NBEMS are released under the GNU Public License (GPL). It is unencumbered by licenses or patents, so we can easily and freely redistribute it. It is possible to carry around a copy of NBEMS on a USB thumb drive so that it can be installed on computers as needed during an incident. Because of the GPL, there is no need to deal with software licensing issues or tracking the number of available seats that can be used in a license. Hams are able to modify or extend NBEMS because it is open source with the code available to all. Because the code is open source, we don't need to worry about what might happen should a commercial vendor go out of business or attempt to change the terms of a software license. And, because of the GPL, the cost to Amateur Radio operators is affordable: it's completely free.

NBEMS is developed and supported by an active community of ham radio operators. This means that support is readily available through mailing groups. It also means that end users have a major voice in the development of new features and improvements in usability. *Flwrap* and *flmsg* grew directly out of discussions between the NBEMS development team and ham radio operators in the emergency communications community.

NBEMS runs on *Windows*, *Linux*, and *Mac OS X* operating systems. It also works with nearly any radio on either VHF/UHF or HF. You also do not need expensive proprietary external hardware. NBEMS is technology that is inclusive to the amateur community.

Because NBEMS contains recreational modes like PSK31 and RTTY and features like contest logging and callbook lookup, you can use NBEMS between disasters, deployments, and drills. When we are called upon to serve the public, we know we will be ready because we will be using the same tools we use every day for our recreational ham radio activities, and we will know our equipment is in working order.

EchoLink

For licensed hams, EchoLink® opens up new possibilities for communicating around the world with other amateurs. Your PC links you or your local repeater to any of thousands of other stations over the Internet.

There are several different ways you can use the EchoLink. You can set up a "simplex link" in your shack, with a VHF or UHF transceiver connected to your PC, to allow anyone in range of your station to communicate by voice with any other EchoLink station around the world.

Or, you can use the PC's microphone and speakers and remotely connect to any of more than 2,000 different repeaters that have EchoLink capability.

Related Considerations

Become familiar with and practice using any digital mode or system well in advance of an emergency. Most are complex enough that some experience is required to use them efficiently and effectively.

Digital communications can be enhanced by composing the message off-line in a text editor. With a little ingenuity, “fill in the blank” forms can be created in most word processors to reduce the amount of typing required and help standardize message formats. For packet communication, consider an emergency communications-specific program like ARESPACK, http://www.laarc.org/arespack.PDF

The high duty-cycle of many digital modes requires a rugged radio and power supply with adequate cooling. Test your equipment under field conditions for an extended period to identify any possible problems.

Reference Links

Amateur Radio Emergency Data Network (AREDN)
https://www.arednmesh.org/

ARRL web page on digital modes
www.arrl.org/digital-modes

DMR
www.dmr-marc.net/

EchoLink
www.echolink.org/

HSMM
https://www.arrl.org/shop/High-Speed-Multimedia-for-Amateur-Radio/

NBEMS and fldigi
www.w1hkj.com

Olivia
www.oliviamode.com/

Winlink
www.winlink.org/

WSJT
https://physics.princeton.edu/pulsar/k1jt/

Review

Choosing the correct mode and frequency for each type of message will make your nets more efficient and improve service to your partner. Voice modes are low-precision, multi-point modes, and many digital modes are high-precision point-to-point modes. Sometimes Amateur Radio is not the best way to send a message. Confidential messages are best sent via telephone, fax, or courier.

Section 2: The Networks for Messages

Topic 5

Basic Communication Skills

Objectives

Welcome to Topic 5.

This topic introduces you to communication skills that are specific to emergency communications operations and will help you appreciate how they differ from typical Amateur Radio operations.

Student Preparation required:

None.

Introduction

An emergency communicator must do his or her part to get every message to its intended recipient, quickly, accurately, and efficiently. Several factors can affect your ability to do this, including your own operating skills, the communication method used, a variety of noise problems, the skills of the receiving party, the cooperation of others, and adequate resources. In this unit, we will discuss basic personal operating skills. Many of the other factors will be covered in later units.

Life-and-death communications are not part of our daily experience. Most of what we say and do each day does not have the potential to severely impact the lives and property of hundreds or thousands of people. In an emergency, any given message can have huge and often unintended consequences. An unclear message, or one that is modified, delayed, misdelivered, or never delivered at all can have disastrous results.

Listening

Listening is at least 50 percent of communication. Discipline yourself to focus on your job and "tune out" distractions. If your attention drifts at the wrong time, you could miss a critical message. Listening also means avoiding unnecessary transmissions. A wise person once said, "A man has two ears and one mouth. Therefore, he should listen twice as much as he talks." While you are asking, "When will the cots arrive?" for the fourth time that hour, someone else with a

life-and-death emergency might be prevented from calling for help.

Sometimes the job of listening is complicated by noise. You might be operating from a noisy location, the signal might be weak, or other stations may be causing interference. In each of these cases, it helps to have headphones to minimize local noise and help you concentrate on the radio signal. Any veteran of a major emergency will tell you that headphones are one of the "must have" items in emergency communications operations. Digital Signal Processing (DSP), filters, and other technologies may also help to reduce radio noise and interference.

Microphone Techniques

Even something as simple as using your microphone correctly can make a big difference in intelligibility. For optimum performance, hold the mic close to your cheek, and just off to the side of your mouth. Talk across, rather than into, the microphone. This will reduce breath noises and "popping" sounds that can mask your speech.

Speak in a normal, clear, calm voice. Raising your voice or shouting can result in over-modulation and distortion and will not increase volume at the receiving end. Speak at a normal pace — rushing your words can result in slurred and unintelligible speech. Pronounce words carefully, making sure to enunciate each syllable and sound. Radios should be adjusted so that a normal voice within two inches of the mic element will produce full modulation. If your microphone gain is set so high that you can achieve full modulation with the mic in your lap, it will also pick up extraneous background noise that can mask or garble your voice.

A noise-canceling microphone is a good choice since it blocks out nearly all unwanted background noise and is available in handheld and headset boom configurations.

Headset boom microphones are becoming less expensive and more popular, but care should be taken to choose one with a cardioid or other noise-canceling type element. Many low-cost headset boom mics have omnidirectional elements and will pick up extraneous noise.

"Voice operated transmission" (VOX) is *not* recommended for emergency communication. It is too easy for background noise and off-air operator comments to be accidentally transmitted, resulting in embarrassment or a disrupted net. Use a hand or foot switch instead.

When using a repeater, be sure to leave a little extra time between pressing the push-to-talk switch and speaking. A variety of delays can occur within a system, including Continuous Tone Coded Squelch System (CTCSS) decode time and transmitter rise time. Some repeaters also have a short "kerchunk" timer to prevent brief key-ups and noise from keying the transmitter. It also gives time for some handhelds to come out of the "power-saver" mode. Leaving extra time is also necessary on any system of linked repeaters, to allow time for all the links to begin transmitting. Momentary delay in speaking after keying up will ensure that your entire message is transmitted, avoiding time-wasting repeats for lost first words.

Lastly, pause a little longer than usual between transmissions any time there is a possibility that other stations may have emergency traffic to pass. A count of "one, one thousand" is usually sufficient.

Brevity and Clarity

Each communication should consist of only the information necessary to get the message across clearly and accurately. Extraneous information can distract the recipient and lead to misinterpretation and confusion. If you are the message's author and can leave a word out without changing the meaning of a message, leave it out. If the description of an item will not add to the understanding of the subject of the message, leave it out. Avoid using contractions within your messages; words like "don't" and "isn't" can be easily confused. If someone else has drafted the message, work with the author to make it more concise.

Make your transmissions sound crisp and professional, like the police and fire radio dispatchers and the air traffic controllers. Do not editorialize or engage in chitchat. An emergency net is no place for conversation on the order of, "Hi Larry, long time no hear," "Hey, you know that rig you were telling me about last month …," or any other non-essential conversation.

Be sure to say exactly what you mean. Use specific words to ensure that your precise meaning is conveyed. Do not say, "That place we were talking about," when "Wellington Middle School" is what you mean. Using non-specific language can lead to misunderstandings and confusion.

Communicate one complete subject at a time. Mixing different subjects into one message can cause misunderstandings and confusion. If you are sending a list of additional food supplies needed, keep it separate from a message asking for more sandbags. Chances are that the two

requests will have to be forwarded to different locations. If they are combined, one request will be lost.

Plain Language

As ham radio operators, we use a great deal of jargon (technical slang) and specialized terminology in our daily conversations. Most of us understand each other when we do, and if we do not on occasion it usually makes little difference. In an emergency, however, the results can be much different. A misunderstood message could cost someone's life.

Not everyone involved in an emergency communication situation will understand our slang and technical jargon. Even terms used by ham radio operators vary from one region to another, and non-hams or new hams will have no knowledge of most of our terminology. Ham radio operators assisting from another region might understand certain jargon very differently from local ones.

For these reasons, all messages and communications during an emergency should be in plain language. "Q" signals (except in CW communication), 10 codes, and similar jargon should be avoided. The one exception to this is the list of standard "prowords" (often called "prosigns") used in amateur traffic nets, such as "clear," "say again all after," and so on.

Avoid words or phrases that carry strong emotions. Most emergency situations are emotionally charged already, and you do not need to add to the problem. For instance, instead of saying, "horrific damage and people torn to bits," you might say "significant physical damage and serious personal injuries."

And please watch the speed at which you speak. It should be at a normal rate. Many times, emergency operators get too excited and talk very fast, making it hard for receiving stations to understand them.

Phonetics

Certain words in a message may not be immediately understood. This might be the case with an unusual place name, such as "Franconia" or an unusual last name, like "Smythe." The best way to be sure it is understood correctly is to spell it. The trouble is, if you just spell the word using letters, it might still be misunderstood, because many letters sound alike at the other end of a radio circuit. "Z" and "C" are two good examples. For that reason, radio communicators often use *phonetics*. These are specific words that begin with the letter being sent. For instance, "ARRL" might be spoken as "alpha romeo romeo lima."

To reduce requests to repeat words, use phonetics any time a word has an unusual or difficult spelling, or may be easily misunderstood. Do not spell common words unless the receiving station asks you to. In some cases, they may ask for the phonetic spelling of a common word to clear up confusion over what has been received. Standard practice is to first say the word, say "I spell," and then spell the word phonetically. This lets the receiving station know you are about to spell the word they just heard.

Several different phonetic alphabets are in common use, but most ham radio operators and public safety agencies use the ITU Phonetic Alphabet, shown below, and others use military alphabets. Many ham radio operators like to make up their own phonetics, especially as a memory aid for call signs, and often with humorous results. *This practice has no place in emergency communications*. In poor conditions, unusual phonetic words might also be misunderstood. We need to be sure that what we say is always interpreted exactly as intended — this is why most professional communicators use standardized phonetics.

ITU Phonetic Alphabet	**Numbers**
A — alpha (AL-fa) B — bravo (BRAH-voh) C — charlie (CHAR-lee) D — delta (DELL-tah) E — echo (ECK-oh) F — foxtrot (FOKS-trot) G — golf (GOLF) H — hotel (HOH-tell) I — india (IN-dee-ah) J — juliet (JU-lee-ett) K — kilo (KEY-loh) L — lima (LEE-mah) M — mike (MIKE) N — november (no-VEM-ber) O — oscar (OSS-cah) P — papa (PAH-PAH) Q — quebec (kay-BECK) R — romeo (ROW-me-oh) S — sierra (SEE-air-rah) T — tango (TANG-go) U — uniform (YOU-ni-form) V — victor (VIK-tor) W — whiskey (WISS-key) X — x-ray (ECKS-ray) Y — yankee (YANG-key) Z — zulu (ZOO-loo)	Numbers are somewhat easier to understand. Most can be made clearer by simply "over-enunciating" them. **Phonetics** One: "Wun" Two: "TOOO" Three: "THUH-ree" Four: "FOH-wer" Five: "FY-ive" Six: "Sicks" Seven: "SEV-vin" Eight: "Ate" Nine: "NINE-er" Zero: "ZEE-row" Numbers are always pronounced individually. The number "60" is spoken as "six zero", not "sixty." The number "509" is spoken as "five zero nine," and not as "five hundred nine" or "five oh nine."

Prowords

Prowords, called "prosigns" when sent in Morse code or digital modes, are procedural terms with specific meanings ("pro" is short for "procedural"). They are used to save time and ensure that everyone understands precisely what is being said.

Some prowords are used in general communication, others while sending and receiving formal messages. The usage and meaning of some prowords in other services, such as police, fire, or military, may differ from Amateur Radio usage. Here are some prowords and prosigns in

common usage in Amateur Radio communications:

Voice	Morse	Meaning and Digital Function
Clear	SK*	End of contact; end of communication. In CW, SK is sent before final identification.
Over	KN*	Used to let a specific station know to respond.
Go ahead	K	Used to indicate that any station may respond.
Out	CL*	End of contact; end of communication, no reply expected.
Stand by	AS*	A temporary interruption of the contact.
Roger	R	Indicates that a transmission has been received correctly and in full.

*Two letters are sent as one character in CW.

Tactical Call Signs

Tactical call signs can identify the station's location or its purpose during an event, regardless of who is operating the station. This is an important concept. The tactical call sign allows you to contact a station without knowing the FCC call sign of the operator. It virtually eliminates confusion at shift changes or at stations with multiple operators.

Tactical call signs should be used for all emergency nets and public service events if there are more than just a few participants. If one does not already exist, the Net Control Station (NCS) may assign the tactical call sign as each location is "opened." Tactical call signs will usually provide some information about the location or its purpose. It is often helpful if the tactical call signs have a meaning that matches the way in which the partner identifies the location or function.

Some examples might be:

Net — for net control station
Springfield EOC — for the city's Emergency Operations Center
Firebase 1 — for the first fire base established, or a primary fire base
Checkpoint 1 — for the first checkpoint in a public service event
Canyon Shelter — for the Red Cross shelter at Canyon School
Repair 1 — for the roving repair vehicle at a bike-a-thon
Mercy — for Mercy Hospital

To be effective, a tactical call sign, once assigned, should be used consistently (i.e., don't use "EOC" one time and "Command" the next). A list of tactical call signs and the locations or functions to which they are assigned should be made known to all who might make calls to or receive calls from each such location or function.

Calling with Tactical Call Signs

If you are at "Aid 3" during a directed net and want to contact the net control station, you would say, "Net, Aid 3". If you had emergency traffic, you would say, "Aid 3, emergency traffic," or for priority traffic, "Aid 3, priority traffic." Notice how you will have quickly conveyed all the

information necessary without having used any extra words.

If you have traffic for a specific location, such as Firebase 5, you would say, "Aid 3, priority traffic for Firebase 5." This tells the NCS everything it needs to correctly direct the message. If there is no other traffic holding, the NCS will then call Firebase 5 with, "Firebase 5, call Aid 3 for priority traffic." Note that no FCC call signs have been used — so far.

Here is an example of how tactical call signs were used during the 2012 Boston Marathon

https://www.youtube.com/watch?v=zc3foaw_jnE

Station Identification

In addition to satisfying the FCC's rules, proper station identification is essential to promoting the efficient operation of a net. The FCC requires that you identify at 10-minute intervals during a conversation *and* at the end of your last transmission. During periods of heavy activity in tactical nets it is easy to forget when you last identified, but if you identify at the end of each transmission, you will waste valuable time.

The easiest way to be sure you fulfill FCC station identification requirements during a net is to give your FCC call sign as you complete each exchange. Most exchanges will be far shorter than 10 minutes. This serves two important functions:

1. It tells the NCS that you consider the exchange complete (and saves time and extra words).

2. It fulfills all FCC identification requirements.

Completing a Call

After the message has been sent, you would complete the call from Aid 3 by saying, "Aid 3, <*your call sign*>." This fulfills your station identification requirements and tells the NCS that you believe the exchange to be complete.

If the Net Control Station believes the exchange is complete, and Aid 3 had forgotten to identify, then the NCS should say, "Aid 3, do you have further traffic?" At that point, Aid 3 should either continue with the traffic, or "clear" by identifying as indicated above.

For this method to work properly, the NCS must allow each station the opportunity to identify at the close of an exchange.

A Review of Habits to Avoid

- Thinking aloud on the air: "Ahhh, let me see. Hmm. Well, you know, if …"
- On-air arguments, criticism, or rambling commentaries

- Shouting into your microphone
- "Cute" phonetics
- Identifying every time you key or un-key the mic
- Using "10" codes, Q-signals on phone, or anything other than "plain language"
- Speaking without planning your message in advance
- Talking just to pass the time

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

Clear, concise communications save time and reduce misunderstandings. Avoid any non-essential transmissions. Use tactical call signs to call other stations and give your FCC call sign only at the end of the complete exchange, or every 10 minutes during longer exchanges. Plain language is understood more easily than most codes and jargon, and by a wider range of people.

Section 2: The Networks for Messages

Topic 6a

Basic Net Operations

Objectives

Welcome to Topic 6a.

This topic will provide you with a brief review of basic net operations as a foundation for other material to follow in this section of the curriculum.

Student preparation required:

If you are unfamiliar with network (net) operations, monitor several sessions of an Amateur Radio scheduled or emergency net.

Why We Have Nets

Any list of the major strengths of Amateur Radio in an emergency setting includes our abilities to share information in a "group setting" in real time across multiple locations and even multiple served agencies. Unlike many other types of communications, our radio messages can be heard by everyone in the group at once — and they can respond. This gives flexibility to emergency response managers, which is very useful.

During an emergency communication situation, a high volume of disorganized messages can quickly turn an overloaded communication system into a disaster of its own. To prevent this from happening, Amateur Radio operators use regular protocols called a "network" or "net" to organize the flow of messages. The mission of the net is to effectively move as much traffic as accurately and quickly as possible. Nets can be either formal or informal, as needs dictate. Nets can be conducted via voice, Morse code, or digital modes, depending on the situation.

Anatomy of Net Operations

The Net Manager is the person in charge of a net and is most often not the person who conducts the net on the air. Net Managers ensure that there is a Net Control Station (NCS) with enough operators for each shift, and monitor net and band conditions to see if changes in frequency are needed. If more than one net is operating, a Net Manager may be responsible for a group of nets.

The Net Manager coordinates the various nets and their NCSs to ensure a smooth flow of traffic within and between nets. Net Managers may assign various human and equipment resources to meet the needs of each net.

Net Managers may be responsible for a regularly scheduled net, or they may be temporarily appointed to manage one or more ad hoc nets created for a particular emergency incident.

A Net Control Station directs the minute-by-minute operation of the net on the air. The NCS controls the flow of messages according to priority and keeps track of where messages come from and where they go, as well as any that have yet to be sent. They also keep a current list of which stations are where, their assignments, and their capabilities. In a busy situation, the NCS may have one or more assistants to help with record-keeping.

Liaison stations handle messages that need to be passed from one net to another. The NCS or Net Manager may assign one or more stations to act as liaisons between two specific nets. These stations can monitor one or both nets, depending on resources. It is easier to monitor only one net at a time. This can be accomplished by having one station in each net assigned as the liaison to the other, or by having a single liaison station check into both nets on a regular schedule. In the event that an “emergency” precedence message needs to be passed to another net when the liaison is not monitoring that net, any net member can be assigned to jump to the other net and pass the message.

Learning proper NCS technique and handling such duties is one of the most important functions in emergency communications. During an emergency or disaster, the first operator to arrive on frequency is the NCS operator — at least until a Net Manager or a leadership official arrives on frequency to take control and perhaps to assign someone else to be the NCS.

Net Types

Open (Informal) Nets

During an open emergency net, there is minimal central control by a Net Control Station, if indeed there is an NCS at all. Stations call one another directly to pass messages. Unnecessary chatter is usually kept to a minimum. Open nets are often used during the period leading up to a potential emergency and as an operation winds down, or in smaller nets with only a few stations participating.

https://www.dropbox.com/s/stbcps6y5cjstx8/nondirected_net.mp3?dl=0

Click on the link above to listen to an example of an informal net.

Directed (Formal) Nets

A directed emergency net is created whenever large numbers of stations are participating, or where the volume of traffic cannot be dealt with on a first-come, first-served basis. In a communication emergency of any size, it is usually best to operate a directed net. In such situations, the NCS can prioritize traffic by nature and content.

https://www.dropbox.com/s/rx9etkowlzz6dhc/directed_net_-_nurses_trapped.mp3?dl=0

Click on the link above to listen to an example of a formal net.

In a directed net, the NCS controls all net operations. Check-ins may not "break into" (interrupt) the net or transmit unless specifically instructed to do so by the NCS, or unless they have an emergency message. The NCS will determine who uses the frequency and which traffic will be passed first. Casual conversation is strongly discouraged, and tactical call signs or tactical designators will probably be used. Tactical call signs or designators can be assigned to stations at various sites and locations, and for different purposes. For example, mobile operators can often be assigned the signs "rover 1," "rover 2," and so on.

At his or her discretion, the NCS operator may often elect to create a "sub net" depending on the volume of traffic and its content and nature. In this case, a "sub net" NCS may be appointed to take over the newly created net.

Net Missions

Each net has a specific mission or set of missions. In a smaller emergency, all the communication needs may be met by one net. In a larger emergency, multiple nets may be created to handle different needs. Here are some examples:

Traffic Net

Traffic nets handle formatted written messages between partners' locations or between other nets. In emergency operations, these nets may handle the majority of message originations and deliveries. Messages to or from outside the immediate area may be handled by a Section-level net and depending on the distances involved and the degree to which the public telephone network and internet are impaired, by region nets and area nets. Even if you expect to handle traffic primarily on VHF/UHF repeaters, understanding how these layers of nets operate will help you to optimize your use of the system. HF traffic nets can provide you additional practice and expose you to traffic handling that you might not encounter on VHF/UHF. During an emergency American Radio Emergency Service® (ARES®) and the National Traffic System (NTS) work together closely, so it's a good idea to understand emergency traffic from the NTS operator's perspective.

Resource Net

When incoming operators arrive on scene, this is the net that they would check into to receive assignments or to be reassigned as needs change. A resource net may also be used to locate needed equipment, or operators with specific skills. Several different resource nets may be used in large-scale events. One might be used for collecting new volunteers over a wide area, and other local nets could be used for initial assignments. If required due to geography or high net activity, a third net could handle ongoing logistical support needs.

Tactical Net

In general, the tactical net(s) handle the primary on-site emergency communication. Their mission may be handling communications for a partner, weather monitoring and reporting, river gauging, or a variety of other tasks that do not require a formal written message. Often a tactical net may be set up as a "sub net" to handle specific types of traffic during high-volume emergency situations. In such cases, an additional NCS may be assigned for the sub net.

Information Net

An information net might be used to make regular announcements, disseminate official bulletins, or answer general questions that might otherwise tie up other nets that are busy handling incident-related communications.

Health and Welfare (H&W) Nets

These nets usually handle messages between concerned friends, families, and persons in the disaster area. Most H&W nets will be on HF bands, but local VHF or UHF "feeder" nets may be needed within a disaster area. Band conditions, operator license constraints, and specific use needs will almost always determine which mode may be the best choice of the mode of certain net operations.

Reference Links

To learn about Nets in your area, contact your Section Manager (SM), or Section Traffic Manager (STM). To locate your Section Manager (SM), see the ARRL Section Manager List at: http://www.arrl.org/field-appointments You can also find your SM listed on page 16 of every issue of QST.

For a list of ARES and NTS nets in your area, see: http://www.arrl.org/arrl-net-directory-search

Review

Amateur Radio allows for multiple participants to hear and pass messages in a group setting. This capability is a major strength of Amateur Radio and is put to its best use by using nets. Nets are used to control the flow of message traffic on a specific frequency. The net's mission and overall operation are handled by a Net Manager, while the Net Control Station (NCS) is like a traffic cop directing the flow of traffic on the air. Liaison stations pass messages between two different nets. Nets can be directed (formal) or open (informal), depending on the number of participants and volume of messages. Nets can serve many needs, including welfare message handling, resource management, and tactical message handling.

Section 2: The Networks for Messages

Topic 6b

Introduction to Emergency Nets

Objectives

Welcome to Topic 6b.

This topic will provide you with an overview of operations in a radio network, or "net" environment. It sets the stage for the following topic lessons, which present various aspects of net operation and message handling in greater detail. After reading the topic's content, you will identify information that is appropriate for net operations in a variety of settings and is representative of nets around the country. Local procedures may vary slightly.

Student Preparation Required

Review the sections "Net Types" and "Net Missions" in Topic 6a.

Learn the following definitions:

Formal Messages:	Written messages that are sent in a standardized format.
Informal or "Tactical" Messages:	Brief oral or informal written messages, intended for direct and immediate delivery.
Traffic:	Messages sent over Amateur Radio, usually formal, written messages; more generally, any messages or activity on a particular frequency.
Pass:	To send messages from one station to another.
Third-Party Traffic:	Messages transmitted on behalf of a person or organization other than a licensed Amateur Radio operator. This term also applies when a person other than a licensed operator is allowed to use the microphone.
Liaison Station:	A station responsible for passing messages between different nets.

What an Emergency Net Is

The purpose of any net is to provide a means for orderly communication within a group of stations. An "emergency" net is a group of stations that provide communication to one or more partner agencies, or to the public, in a communications emergency. An emergency net may be formal or informal, depending on the number of participants and volume of messages.

Checking into an Emergency Net

There are two situations when you will need to "check in" to a net.

1. When you first join the net.

2. When you have messages, questions, or information to send.

If you are part of the organization operating the net, simply follow the instructions for checking into directed and open nets as discussed below.

To become part of a directed net, listen for the NCS to ask for "check-ins" and listen to any specific instructions, such as "check-ins with emergency traffic only." At the appropriate time, give only your call sign. If you have a message to pass, you can add, "with traffic." If it is an emergency message, say "with emergency traffic." The same is true for stations with priority traffic. Wait for a response before offering more information. Checking into a directed net when the NCS has not asked for check-ins is usually considered a bad practice. However, if a long period passes with no request, you might wait for a pause in the net's activity and briefly call the NCS like this: "Net control, W1FN, with traffic."

To check in to an open net for the first time, briefly call the net control station, as above. If there appears to be no NCS, call anyone on the net to find out if anyone is "in charge," and then contact them. If you are already part of the net and have a message to send, simply wait for the frequency to be clear before calling another station.

If you are *not* part of the organization operating the net, do not just check in and offer to assist. Listen for a while. Be sure you have something specific to offer before checking in (such as the ability to deliver a message close to your location when none of the regular net members can). If the net really does seem to need help that you feel you can provide, you might check in briefly to ask if they have a resource net in operation, then switch to that frequency. If not, make a brief offer of assistance to the NCS.

Do not be surprised if you receive a cool reception to your offer of help. It is usually nothing personal. Emergency nets are serious business. Most emergency communications managers prefer to deal with people with known training and capabilities, and with whom they have worked before. You may not have the experience, skills, or official credentials they require — and they have no way of knowing what your true capabilities are. Some emergency communications managers will assign you as an apprentice, logger, or "runner." If you are given

such an opportunity, take it! It is all good experience, and a great way to introduce yourself to the group. Better yet, become involved with your local emergency communications group now — do not wait for the next disaster.

Passing Messages

If you told the NCS you have traffic to send when you checked in, he or she will probably ask you to "list your traffic" with its destination and priority. After you send your list, the NCS will direct you to pass each message to the appropriate station in the net, either on the net frequency or on another frequency to avoid tying up the net. When moving to another frequency to pass the message, always check to see if the frequency is in use before beginning.

When the NCS asks you to send your message, the standard procedure is for the NCS to tell the receiving station to call the sending station.

The entire exchange might sound like this:

> ***NCS*:** W1AW, list your traffic.
>
> ***You*:** W1AW, two priority for Springfield EOC, one welfare for the Section net.
>
> ***NCS*:** Springfield EOC, call W1AW for your traffic.
>
> ***Springfield EOC:*** W1AW, Springfield EOC, go ahead.
>
> ***You*:** Number 25, Priority…

(After you have sent your messages to the Springfield EOC, the NCS will next direct the section net liaison station to call you for their message.)

When you have finished, simply sign with any tactical call sign and your FCC call. (You will learn more about messages and message handling, as well as emergency, priority, and other types of precedence later.)

"Breaking" the Net

If the net is in progress, and you have emergency traffic to send, you may need to "break" into the net. Procedures for doing this vary from net to net, but the most common method is to wait for a pause between transmissions and simply say, "Break," and your call sign. The NCS will say, "Go ahead, [call sign]," and you respond, "[call sign] with emergency traffic."

Checking Out of an Emergency Net

Always let the NCS know when you are leaving the net, even if it is only for a few minutes. If the NCS believes you are still in the net, he or she may become concerned about your unexplained absence. This could result in someone being unnecessarily dispatched to check on your well-being.

There are three reasons for checking out of (leaving) a net.

1. The location of your station is closing.

   If the NCS has given you directions to close the location, simply acknowledge the request, and sign with your tactical call sign, if you are using one, and your FCC call sign. If the order to close has come from a local official, state that your location has been closed, along with the name and title of the official who ordered it, and sign off as above. Long "goodbyes" only tie up the net needlessly and do not sound very professional.

2. You need a break and there is no relief operator.

   Tell the NCS that you will be away from the radio for a certain length of time and the reason, and sign off with your tactical call sign, if you are using one, as well as your FCC call sign.

3. You have turned the location over to another operator.

   Tell the NCS that you have turned the station over to (give the new operator's name and FCC call sign), and that you are leaving. Sign off with your tactical call sign, if you are using one, as well as your FCC call sign.

There are two special situations to be aware of: First, if someone in authority, such as a law enforcement officer, asks you to move your station, then move immediately and without argument. Notify the NCS of the situation at the first appropriate opportunity. Second, if you are requested by someone in authority to turn off your radio, or to refrain from transmitting, do so immediately and without question. Do not notify Net Control until you have permission to transmit again and can do so safely. There is usually a good reason for such a request. It may be an issue of security, or it may be a potential hazard, such as an explosive device that could be triggered by radiofrequency (RF) energy.

Levels of Nets

Network systems are often "layered" for greater operating efficiency. Some networks are designed to handle messages within specific areas, and others to handle messages between areas. Think of this much like you would the Interstate Highway System. Local messages (cars) travel between destinations directly on local nets (local roads). When a message has to go to a distant city, it is passed to a regional net (state highway), and if it is really distant, to a long-distance net (interstate highway). At the other end, it is returned to regional, then local nets for delivery. What

has been just described is the extensive National Traffic System (NTS), discussed further below.

ARES or RACES can use a similar structure on a smaller scale. For instance, each city might have a local FM net. A county net would handle messages going from city to city. A section HF net would handle messages from county to county. Any net in such a system could have "liaison" stations to pass into the NTS any messages that need to travel out of the section.

Non-Voice Nets

Emergency nets may also use other modes of communication besides voice (phone). Traffic nets have used CW (Morse code) since the beginning of Amateur Radio, and it is still a viable option for long-distance formal traffic. High-speed CW nets can handle more messages per hour than most voice nets. Packet communication on VHF and UHF is often used for local communication when accuracy and a record of the message are required. HF digital modes such as AMTOR, PACTOR, or sound card modes are used on long-distance circuits. Many groups are now using emergency communication applications for modes such as PSK31 on HF and VHF/UHF bands.

Most CW nets are directed nets. Packet nets are not generally directed by a human, due to the automatic "store and forward" nature of the mode, and they are usually operated as open nets with no NCS.

Two systems have received significant attention from many emergency communications groups and offer digital message handling capabilities:

- "Winlink 2000," an automatic system that blends radio and internet transmission paths to permit rapid and seamless email message transfer to stations anywhere on Earth. For most emergencies, it will be possible for stations in the affected area to link to a Winlink HF gateway station outside the affected area, allowing contact with the outside world.

- The D-STAR digital voice and data protocol specification, developed as the result of research by the Japan Amateur Radio League (JARL), is an on-air and packet-based standard that is now widely deployed and sold by a major radio manufacturer. D-STAR compatible radios are available on VHF, UHF, and microwave Amateur Radio bands. In addition to the over-the-air protocol, D-STAR also has network connectivity, enabling D-STAR radios to be connected to the internet or other networks. It also has provisions for routing data streams of voice or packet data directly to specific call signs.

More on these later, but one additional point needs to be made:

Practice and train using digital as you would any other mode.

How do you hold a training net on D-STAR or Winlink? Digital modes are often not keyboard-to-keyboard in real time, and messages might take a while to get to their intended destination. Therefore, any attempt at a "conventional" net must be truly in slow motion. But without taking this time, net members will not know who else is up and operating, that equipment is working properly, and there are no "bugs" in the system. An emergency is not the time to see if your

digital planning works — try it out in a drill or net before you really need it.

Reference Links

To learn about NTS in your area, contact your Section Manager (SM), or Section Traffic Manager (STM). To locate your Section Manager (SM), see the ARRL Section Manager List at http://www.arrl.org/sections

For a list of ARES and NTS nets in your area
http://www.arrl.org/arrl-net-directory

D-STAR
http://en.wikipedia.org/wiki/D-STAR

Winlink 2000
https://www.winlink.org/

Review

Large nets are usually directed (formal) nets with a NCS in charge. Smaller nets may be “open” (informal), and an NCS is optional. Nets can serve many purposes, including passing formal messages, handling logistics, or passing informal tactical messages. Large emergencies may require more than one of each type of net; small emergencies may have one combined net. Medium- and long-distance messages are often handled by the National Traffic System (NTS).

Section 2: The Networks for Messages

Topic 6c

Net Operating Guidelines

Objectives

Welcome to Topic 6c.

This topic will help you understand how to operate efficiently and effectively in a net environment under emergency conditions.

Student Preparation required:

None.

Introduction

Every organization needs an executive-level manager to oversee the entire operation and ensure that everything runs smoothly. Depending on the type of net, the Net Manager (NM) will be responsible for recruiting and training Net Control Station (NCS) operators, liaison stations, and other net members.

The Net Manager sets up the net's schedule and makes sure that one or more qualified NCS operators will be available for each session of the net. In a long-term emergency net, the Net Manager may also arrange for relief operators and support services. Some Net Managers may be responsible for more than one net.

The NCS

Think of the NCS as a ringmaster or traffic cop. The NCS decides what happens in the net and when it happens. If the Emergency Operations Center (EOC) has a priority message for Red Cross Shelter 1, and Medical Station 4 has an emergency message for Mercy Hospital, it is the NCS's job to make sure that the emergency message is sent first. He or she decides when stations will check in, with or without traffic, and whether messages will be passed on the net's frequency or a different one. The NCS needs to be aware of everything going on around him or her and handle the needs of the net, its members, and partners as quickly and efficiently as possible. It can be a daunting task in a busy and challenging net.

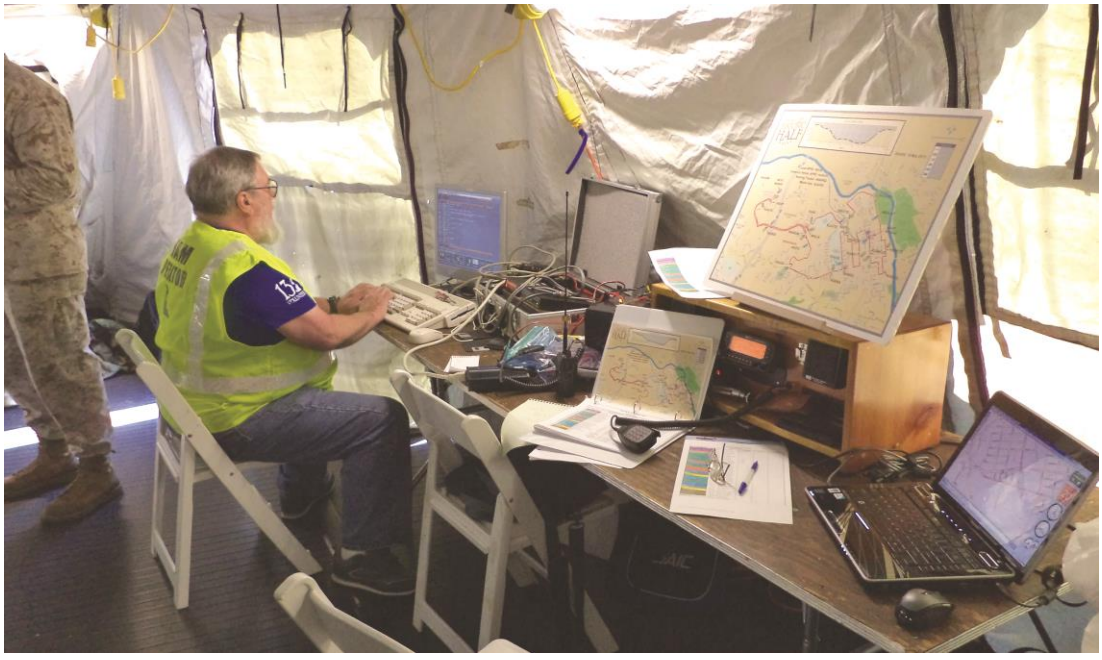
The NCS can be located anywhere but should be able to hear most, if not all, stations in the net. This helps avoid time-consuming "relays." Some groups place their NCS at the EOC or command post; others like to keep the NCS away from the noise and confusion.

The NCS oversees one specific net but should not be responsible for the entire emergency communications operation. That is the job of the Emergency Coordinator (EC) or similar emergency communications manager. It is not possible to be in command of all aspects of an emergency response and still run a net effectively since each job requires 100 percent of an individual's attention.

Net Scripts

Many groups open and close their nets with a standard script. The text of the script lets listeners know the purpose and format of the net. Using a standard script also ensures that the net will be run in a similar format each time it operates, regardless of who is acting as the NCS.

A backup NCS needs to be readily available should there be an equipment failure at the primary NCS location, or if the primary NCS operator needs to take a break. There are two types of backup NCS; the first is collocated with the primary NCS; the second is a backup NCS located off site. Off-site backup NCS should maintain a duplicate log, or if cloud sharing is available, have access to the primary NCS log, so they can seamlessly take control of the net when called upon. An off-site NCS also allows for station redundancy so that the net may continue to function should something happen at the primary net control location. Depending on the situation, either the Net Manager or the primary NCS appoints both types of backup NCS. All members of the net should be made aware of the backup NCS assignment early in the net's operation.



Acting as a "Fill-in" NCS

Even before you have had a chance to be trained by your group to act as a NCS operator, an opportunity might arise for you to handle the job temporarily. During an emergency, anyone and everyone can be asked to take on new and unfamiliar tasks in order to deal with a rapidly changing situation. Fortunately, basic NCS skills are not difficult to teach or learn. Here are some basic guidelines:

- Treat members with respect and accept suggestions from other experienced members.
- If you are taking over an existing net, try to run it much as the previous NCS did.
- Always follow a script if one is provided.
- Write your own script if necessary but keep it short and to the point.
  Handle messages in order of precedence: Emergency — Priority — Welfare — Routine.
- Speak clearly and in a normal tone of voice. Use good mic technique.
- Make all instructions clear and concise, using as few words as possible.
- Keep notes as you go along; do not let your log fall behind.
- Write down which operators are at which locations. When one leaves or is replaced, update your notes.
- Ask stations to pass messages off the main net frequency whenever possible.
- All the reading and study in the world will not replace actual experience. You should look for opportunities to practice being an NCS operator well before an emergency occurs.

Net Members

Operators at various sites are responsible for messages going to and from their locations. They must listen to everything that happens on the net and maintain contact with the partners' people at the site. They assist the partners with the creation of messages, put them into the appropriate format, and contact the NCS when they are ready to be sent.

Whenever possible, two operators should be at each site. When the station is busy, one can handle logging and message origination and work with the partners' staff while the other monitors the net, sends messages, and copies incoming traffic. During slower periods, one member can be "off-duty" for rest, meals, or personal needs.

Bulletin Stations

In some nets, the NCS does not send out bulletins and other incident-related information. That is the role of the "bulletin station." This station relays ARRL bulletins, or those authorized by the partners, to all stations in the net. They may also be transmitted on a preset schedule, such as at

the top and bottom of each hour. The bulletin station must be located with the partners or have a reliable communication link to them.

Liaison Stations

Liaison stations pass messages between two different nets. Depending on the type of organization, the NCS or Net Manager usually assigns these stations. Messages may be passed as needed or on a preset schedule. In some cases, a liaison station will monitor one net full time. When a message must be passed to another net, they leave the net temporarily to pass it, and then return. The other net has a liaison station that does exactly the same thing, but in reverse.

In other situations, a single liaison station may need to handle messages going both ways between two nets. There are two ways to do this. You can use two radios to monitor both nets at the same time, a difficult task if either or both nets are busy. The radios antennas must be separated sufficiently to prevent interference between radios when one is used to transmit. In the second method, one radio is used, and the liaison station switches between the two nets on a regular schedule.

Relay Stations

While it's not a regular net position, a relay station passes messages between two stations in the net that cannot hear each other. Relay stations are generally designated by the NCS on an "as needed" basis. If you can hear a station or stations that the NCS cannot, it is okay to volunteer to act as a relay station.

Workload and Shift Changes

Although it happens frequently, an operator should not try to work excessively long hours. When you become tired, your efficiency and effectiveness decline, and your partner is not getting the best possible service. Net managers and NCS operators should work with the EC or other emergency communications manager to ensure that all net members get some rest on a regular basis. It is a good practice for any replacement NCS, liaison, or net member to monitor the net for at least 15 minutes and review the logs with the present operator before taking over. This ensures continuity in the net's operation.

Operating Considerations for Non-Voice Modes

Packet modes include FM packet, HF packet, and PACTOR. Because packet modes can provide an automatic connection between two stations, it is not proper to speak of a "packet net." Although messages can be transmitted between two stations "keyboard to keyboard" as with Radioteletype (RTTY) or PSK31, it is usually better to transmit them as "traffic," using the bulletin board or mailbox facility of the terminal node controller (TNC). Packet messages are automatically routed and stored without any action by the receiving station's operator or an NCS.

Non-packet digital modes are not automatic and may require an NCS operator to manage the net in much the same way as a phone or CW net. These include RTTY, PSK31, AMTOR, and Olivia.

CW Procedures: Clean and accurate code sent at 10 words per minute is better than sloppy code sent at 30 words per minute. Sending speed is not a true measure of effectiveness, but accuracy is.

When propagation or interference makes communication difficult, or when the receiving operator cannot keep up, it is time to reduce the sending speed. Always send at a speed that the receiving station can copy comfortably.

There are variations used when passing traffic via CW, especially when both stations are operating in "full break-in" mode (both stations can receive signals between each Morse character sent). The receiving station can "break" (stop) the sending station at any point for needed fills, instead of waiting for the entire message to be sent. There are additional special prosigns used, and interested amateurs should be familiar with ARRL Publication FSD-218 (http://www.arrl.org/public-service-field-services-forms). This publication is sometimes referred to as the "pink card," and contains CW net procedures as well as a description of the Amateur Message Form, message precedence, and Handling Instruction abbreviations.

Interference Problems

If your net experiences interference, the NCS has several options. If the interference is coming from adjacent or co-channel stations that may be unaware of the emergency net, the NCS should politely inform them of the net and ask for their cooperation. Alternatively, the NCS might ask an HF net to move over a few kHz. If the problem cannot be resolved in this manner, each net should have one or more alternative frequencies that it can move to as required. If possible, the frequencies themselves should not be published or mentioned on the air.

Never discuss, acknowledge, or try to speak with an intentionally interfering station. Many years of experience have proven that this only encourages the offender. If the interference is making communication difficult, simply announce to the net that everyone should move to the alternate frequency and sign off. Better yet, put a plan in place so that when interference occurs, all net members know to move to the alternate frequency without being told to do so on the air. If intentional interference persists, the Net Manager or NCS can contact an elected ARRL official or a Volunteer Mentor and ask that the FCC be notified of the interference. In some cases, the FCC may be able to track down and contact the responsible station.

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

ARRL Publication FSD-218
http://www.arrl.org/public-service-field-services-forms

Review

As the net's "ringmaster," the NCS operator is responsible for keeping the net operating smoothly and ensuring that messages are sent in order of priority. An off-site backup or alternate NCS operator is essential for long-running nets in the event of equipment failure or operator fatigue. Net member stations should monitor the net continuously whenever possible, as well as maintaining contact with the partner's staff at that location. Liaison stations pass traffic between two different nets, sometimes only in one direction, and sometimes in both directions. Bulletin stations transmit bulletin messages from the partners to the net. CW nets can move messages very quickly and accurately, but slightly different procedures are used than with phone. Packet radio doesn't use a conventional net format due to its automatic nature and is well suited to handling large volumes of traffic or highly detailed and lengthy messages.

Section 2: The Networks for Messages

Topic 6d

The FCC Rulings for Emergency Communications, Drills and employees

Objectives

Welcome to Topic 6d.

This chapter will introduce the student to Part 97 regulations that relate to Amateur Radio emergency communications.

Student Preparation required:

Read FCC Rules and Regulations for the Amateur Radio Service http://www.arrl.org/part-97-amateur-radio

Introduction

On July 14, 2010, the Federal Communications Commission (FCC) issued a Report and Order — FCC 10-124 — amending the rules to permit Amateur Radio operators to transmit messages, *under certain limited circumstances*, during either government-sponsored or non-government-sponsored emergency and disaster preparedness drills, regardless of whether the operators are employees of entities participating in the drill.

FCC 10-124

Although public safety land mobile radio systems are the primary means of radio-based communications for emergency responders, experience has shown that Amateur Radio has played an important role in preparation for, during, and in the aftermath of natural and man-made emergencies and disasters. We emphasize, however, that the amendment does not permit

communications unrelated to the drill or exercise being conducted.

Final Rules

Part 97 of Chapter 1 of Title 47 of the Code of Federal Regulations is amended as follows:

§ 97.113 Prohibited transmissions.

(a) No amateur station shall transmit:

(3) Communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer, with the following exceptions:

(i) A station licensee or control station operator may participate on behalf of an employer in an emergency preparedness or disaster readiness test or drill, limited to the duration and scope of such test or drill, and operational testing immediately prior to such test or drill. Tests or drills that are not government-sponsored are limited to a total time of one hour per week; except that no more than twice in any calendar year, they may be conducted for a period not to exceed 72 hours.

(ii) An amateur operator may notify other amateur operators of the availability for sale or trade of apparatus normally used in an amateur station, provided that such activity is not conducted on a regular basis.

(iii) A control operator may accept compensation as an incident of a teaching position during periods of time when an amateur station is used by that teacher as a part of classroom instruction at an educational institution.

(iv) The control operator of a club station may accept compensation for the periods of time when the station is transmitting telegraphy practice or information bulletins, provided that the station transmits such telegraphy practice and bulletins for at least 40 hours per week; schedules operations on at least six amateur service MF and HF bands using reasonable measures to maximize coverage; where the schedule of normal operating times and frequencies is published at least 30 days in advance of the actual transmissions; and where the control operator does not accept any direct or indirect compensation for any other service as a control operator.

Note that not every amateur transmission from a work location is necessarily on behalf of an employer. For example, an ARES® member using an employer-provided station to check into a local ARES net as an individual is not necessarily transmitting on behalf of the employer. This is a new ruling for us all, and specific examples will be debated and discussed for a long time to come. Use your very best judgment. We all want to be helpful but keep Amateur Radio “amateur.”

§97.403 Safety of life and protection of property.

No provision of these rules prevents the use by an amateur station of any means of radio communication at its disposal to provide essential communication needs in connection with the immediate safety of human life and immediate protection of property when normal communication systems are not available.

§97.405 Station in distress.

(a) No provision of these rules prevents the use by an amateur station in distress of any means at its disposal to attract attention, make known its condition and location, and obtain assistance.

(b) No provision of these rules prevents the use by a station, in the exceptional circumstances described in paragraph (a) of this section, of any means of radio communications at its disposal to assist a station in distress.

Reference Links

http://www.arrl.org/files/file/Regulatory/March%208,%202018.pdf

Section 2: The Networks for Messages

Topic 7

The Net Control Station (NCS)

Objectives

Welcome to Topic 7.

Following completion of this topic, you will acquire knowledge of how the Net Control Station (NCS) runs a net, and many of the skills required.

Student Preparation required:

None.

Introduction

The NCS

Formal (directed) nets will always have one station "in control." This station is known as the Net Control Station (NCS). The person running the NCS is known as the NCS operator. Think of the NCS operator as a sort of traffic cop, directing the orderly flow of messages. His or her skills are critical to the success of any emergency communication net. For this reason, many emergency communication groups elect to have training or classes designed to teach operators NCS skills. Practice sessions are often helpful for this purpose, and many ARES® groups schedule regular weekly practice.

When an NCS Is Needed

All formal (directed) nets require an NCS. Formal nets are used to maintain order when a large number of stations are in the net, or when a large volume of messages is being sent. The NCS operator decides who speaks when, in which order messages are passed, keeps a log of which messages went where and when, and keeps a list of messages that have yet to be passed.

Some informal nets will have a "standby" NCS, although informal nets are not controlled. This person is there to keep things organized when necessary, to answer questions, keep the frequency clear, and to step in to upgrade the net to "formal" status if it becomes necessary. This often

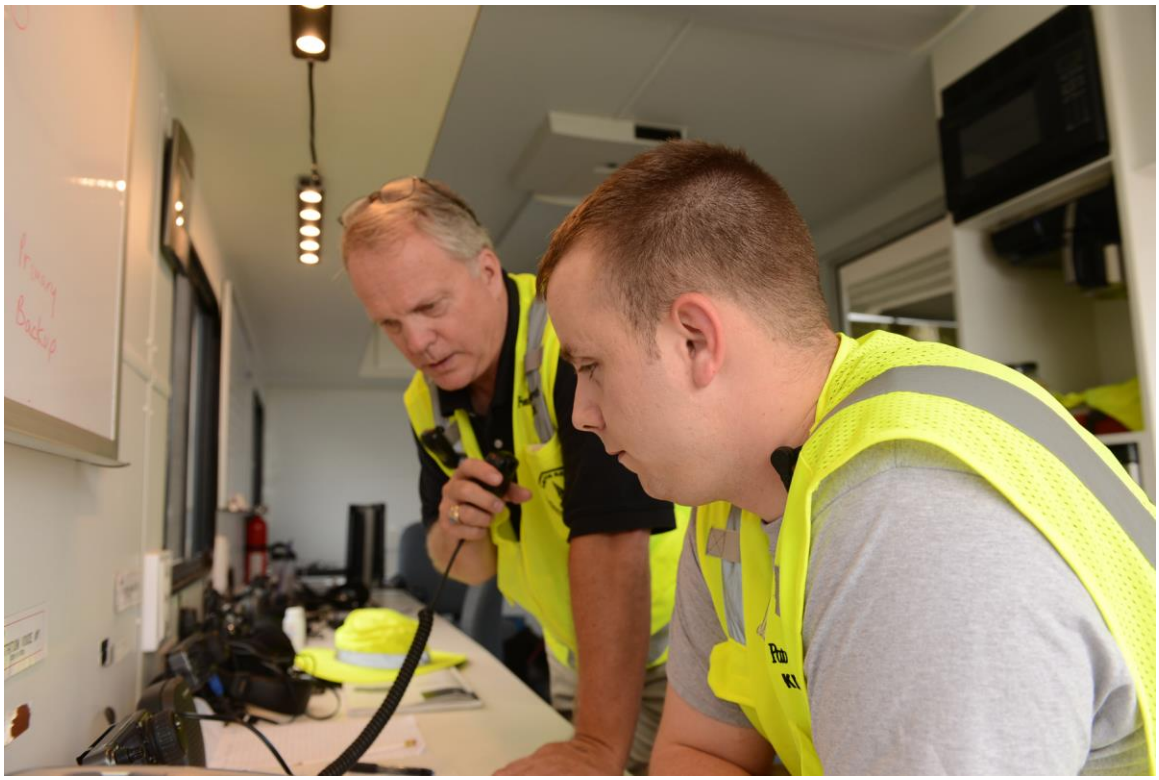
happens with initially light-duty nets that have the potential to grow as a situation evolves. SKYWARN® tornado watch nets are a good example. During the "watch" phase, not much is happening other than informal sharing of information between observers. If a tornado appears, the traffic on channel will increase, and if damage occurs on the ground, the net could quickly evolve into a high-volume disaster relief net. Having an NCS operator on standby helps make for a smooth transition.

The Importance of a Well-Trained NCS Operator

The value of the NCS operator's skill is unquestionable. A well-run net meets the needs of the partner; a poorly run net can end Amateur Radio's relationship with the partner altogether.

A poorly run net may exhibit several negative qualities. Routine messages may be passed on-channel, while emergency or priority messages wait in line. Messages may be disorganized, lost, changed, or misdirected. The NCS operator may lose their cool while under stress and alienate net members.

Training should, ideally, result in an NCS operator who is a good organizer, and who knows how to defuse tension and stress with an appropriate sense of humor. The NCS operator also must have the ability to absorb new terminology quickly, as there is no environment more fertile for the growth of jargon than the emergency management community!



The Right Stuff

Here is a short list of basic prerequisites for a good NCS operator:

- A clear speaking voice, with the ability to enunciate words crisply, for maximum intelligibility.

- Fluency in the primary language used — thick accents or an inability to use the language quickly, precisely, and with ease, may make it difficult for others to understand.

- The ability to handle mental and physical stress for long periods. Information and demands will be coming from all directions all at once, sometimes for hours on end. The NCS operator must handle that without losing their composure or their voice. The NCS must think and act quickly when seconds count, using prudence, and must be able to make decisions under pressure.

- The ability to listen and comprehend in an often noisy and chaotic environment. The NCS operator needs to be able to tune out all the distractions and focus only on the job at hand.

- Good hearing — NCS operator of a voice net is not an ideal task for someone who has a hearing loss that makes it difficult to understand human voices. Ham radio operators with limited hearing problems may elect to act as NCS operator for a digital mode net, according to their abilities.

- The ability to write legibly what is heard, as it is received, and to make accurate notes in real time, rather than relying on memory.

- Above-average general knowledge and operating skills in the modes used (phone, digital, and CW).

Transferable Skills

Some of the skills used in everyday Amateur Radio activities will be useful to an NCS operator.

- A well-designed and maintained station is critical to success. An NCS operator must be able to choose the correct antenna, know how to get the best sound from a microphone, be radio agile, knowing how to operate, program, and maintain the radio on short notice and have all controls and supplies within easy reach.

- An understanding of propagation is necessary, so that the NCS operator can choose the appropriate frequency as band conditions change.

- Amateurs who have extensive experience with chasing DX contacts learn how to pick weak signals out of the noise and deal with crowded band conditions — skills that are

helpful to NCS operators.

- Many of the skills used in ham radio contesting are applicable to controlling a net. Both activities involve dealing with many stations on the same frequency at the same time. The contester running a pileup will try to contact as many stations as possible in the least amount of time. The mission of the NCS operator is to move as much traffic as possible in the least amount of time, accurately and effectively.

Learned Skills

A good NCS operator is trained, not born. The following are some skills a ham may need to learn to become an effective NCS operator.

- Working as a team player to achieve the goals of the net.
- Effective leadership skills — keeping the team on track and motivated by developing a confident, self-assured management style.
- Decisiveness — the ability to make quick and appropriate decisions.
- Record-keeping — log sheets (writing, thinking, and talking all at once).
- Planning ahead — net scripts, assignments, materials on hand.
- HF propagation and antenna choices — knowing when to move to a different band.
- Dealing with stress — a "burned-out" operator is a danger to the net.
- Delegation — knowing when and how to hand off some jobs and responsibilities.
- A working knowledge of the Incident Command System (ICS) and how Amateur Radio fits in.

Learning and Practicing Skills

Book-learning alone does not make for a competent NCS operator. It takes practice to learn these skills in a way that they will be ingrained and useful in a real emergency. Continued practice is necessary to maintain these skills once they have been learned. Many ARES groups conduct weekly local nets, with rotation of NCS operators, in order to practice and maintain skills.

Net control skills can be learned and honed through classroom sessions, tabletop exercises, and regularly scheduled training nets. Actual emergency conditions can be simulated with periodic drills and simulations such as the annual Simulated Emergency Test (SET), and public service events such as road races, marathons, and bike rides. Some ARES units conduct simulated

emergency nets weekly, and some have simulated emergency weather nets during the severe weather season.

To begin your own NCS training, find out if your local group offers any formal training. Some will begin with tabletop exercises, in which a group sitting around a table will simulate a net operation, taking turns as NCS and net member stations. Tabletop exercises allow quick feedback and greater interaction among participants.

Other groups will simply let you take over as NCS for several scheduled training nets. Before you do this, try to listen to other, more experienced operators on your own net, and on as many other formal nets as you can. Pay close attention to how they run the net, what scripts they use (if any), and any mistakes they make.

If your group or local club provides communication support for events such as marathons, large parades, or races, these provide additional opportunities to get some real-world NCS operator experience.

A real emergency is not the time to learn or practice new skills, unless there is no other option. A poorly trained or inexperienced NCS operator can do as much harm as good. Participation in regularly scheduled nets is important, so that anyone who is or may become an NCS operator during a disaster or emergency can be effective and vital to the overall success of the mission.

What the NCS Operator Is Not

The duties of the NCS operator should be limited to running the net. This is a full-time job. The NCS operator should not oversee the overall communication effort, or of any portion of the response beyond his or her own net and shift. The Net Manager generally handles the assignment of NCS operators, frequencies, and schedules, and may also recruit members for the net. Also, it is best for the Net Control Station to work away from any location that is also a significant originator or destination of message traffic.

Reference Links

NTS Methods and Practices Guidelines
www.arrl.org/files/file/NTS_MPG2014.pdf

To learn more about local ARES and NTS net operations, contact your Section Manager (SM), Section Emergency Coordinator (SEC), or District Emergency Coordinator (DEC)
http://www.arrl.org/sections

ARRL Net Directory — search for ARES and NTS nets operating in your area
http://www.arrl.org/arrl-net-directory

Review

The NCS operator oversees controlling the flow of information on a net. In addition to training and practice, a good NCS operator has several attributes, including a clear speaking voice and patience. The Net Manager assigns an NCS for each net session or operating shift. The duties of the NCS operator should be limited to running the net.

Section 2: The Networks for Messages

Topic 8

Net Control Station (NCS) Operator Practices

Objectives

Welcome to Topic 8.

Following completion of this topic, you will have gained knowledge of the basic steps of serving as Net Control operator for a net.

Student Preparation required:

Ongoing observation of local, regional, or national nets.

The following is a list of questions the NCS operator should answer before opening the net.

- **Can the NCS hear all the stations in the net from his or her location?**

  The NCS should be able to hear all the stations in the net whenever possible. Relays may be used, but they slow the operation of the net significantly. For best results, some area testing should be conducted via simplex well in advance, to see which stations can communicate with which others, so that stations can properly be put in place to ensure good communications during an emergency relay.

- **Is the NCS location sufficiently separated from the partners' operations?**

  It is good practice to assign net control duty to a station in a low-traffic location. The noise and commotion in an Emergency Operations Center (EOC) can greatly degrade the ability to run a net well. Establishing net control at another location permits the EOC station to concentrate on passing traffic and working with the partners. Of course, the NCS and the EOC station need to work together as a team. It is common for the overall incident to be managed from the EOC, while the off-site NCS assumes responsibility for managing check-ins and net traffic. In practice, it's not hard to work out a productive division of labor.

- **Do you have the best-performing antenna for the conditions?**

  A “rubber duck” (short, flexible, helically wound) antenna is not adequate unless you can see the repeater antenna — and if the repeater fails, you are out of business. A higher gain flexible or telescopic antenna would extend the range of the handhelds over that of the rubber duck antenna. On HF, an Near Vertical Incidence Skywave (NVIS) antenna is essential for skip-zone communication. For long-range nets, conventional vertical, beam, or dipole antennas (or a combination of these) will work best.

- **If you are running your radio with battery power, do you have at least 1 hour of battery capacity available?**

  Ideally, you will have a fully charged battery and access to backup batteries. If you are the only choice for NCS, make sure that you can run the net long enough to have someone else prepare to assume the duty, so you can recharge your batteries when needed.

- **Are you using a headset with a noise-canceling microphone?**

  Even from home, background noise can affect how well you can hear and be heard.

- **Do you have a sufficient supply of pencils/pens and paper to run the net for your shift?**

  You will not be able to remember enough about the traffic or participants to be effective unless you write down the information. Also keep on hand a sheet of paper for tracking net participants and their requests, as well as a good supply of any required forms.

- **For VHF/UHF repeater operations, are you familiar with the characteristics and control commands of the repeater system hosting your net?**

  Your effectiveness as NCS may be adversely affected if you are unfamiliar, with linked systems in particular.

- **Do you have a runner, liaison, or logging person to support you?**

  For large emergency events, all three are required. It is nearly impossible to handle the net, keep accurate and complete logs, and handle messages at the same time.

- **Do you have a designated backup net control station?**

  In case you go off the air, another station should be ready to take control of the net.

- **Do you have a designated relief operator?**

  Everyone gets tired, and the NCS must be the most alert operator on the net.

Opening and Closing the Net

Nets may be opened or closed on a specific schedule, or when the situation dictates. For instance, training and regular traffic nets may open at specific times, and may run for a specified period, or as long as it takes to complete the net's business. Emergency nets are often opened and closed as needs dictate.

Each net session should begin with the reading of a standard script that describes the purpose of the net and its basic procedures and protocols. Here is a sample script:

> This is W1HQ calling the Newington Emergency Net. This is a directed net, and all stations must call Net Control only. This net is handling only Emergency and Priority Traffic at this time. Only ARES stations assigned to this net should participate. Once checked in, please check out with Net Control before leaving the frequency. Stations with emergency traffic may check in or break the net at any time.

At the end of each net session, you can read a similar script, also briefly thanking members for participating and reminding them of any future nets or other obligations. All scripts should be kept short and to the point.

The Importance of Message Precedence

In a communications emergency, one of the NCS operator's primary concerns is "information overload." Without a system in place for regulating the flow of information, a message requesting "more bedpans for a shelter" may end up being sent before one requesting "a trauma team for a train wreck." Failure to organize the information flow could result in critical messages

being delayed or lost.

There are four levels of message precedence:

1. **Emergency** (Relating to the immediate protection of life or property)

2. **Priority** (Partners and ARES® messages directly related to the emergency, but not as time-sensitive as an emergency precedence message)

3. **Health and Welfare** (Inquiries or information about the whereabouts or condition of persons in the affected area)

4. **Routine** (Messages unrelated to any emergency: birthday greetings, net activity reports, etc.)

Highest Precedence

The primary job of the NCS operator is to ensure that messages with the highest precedence are sent first — *emergency*, then *priority*, then *health and welfare*, then *routine*.

Most emergency nets refuse to handle any *routine* messages at all, because they usually have little or no bearing on the emergency itself or the partners' needs. Other nets may handle only *emergency and priority* messages, or primarily *health and welfare* messages.

Asking for Check-ins

Ask for check-ins immediately after reading the opening script, and then periodically during the net's operation.

If the net is handling only *emergency and priority* messages, and not *welfare* or *routine* messages, it is important to state this in the opening script and when asking for "check-ins with messages."

If *emergency* precedence messages are likely, it is a good idea to ask for them first, then move on to *priority*, and finally *welfare*. Try to ask for "check-ins with traffic only" as often as possible and ask for "check-ins with or without traffic" at least every 15 minutes, so that new stations may join the net.

In a busy net, it can be difficult to balance the need to handle the current message backlog and still take check-ins on a regular basis. It is important to ask for check-ins with traffic frequently to ensure that priority or emergency messages get through expeditiously.

When taking check-ins, the NCS should read back the calls it received, and then ask if anyone was missed. This method can cut the time required for check-ins.

Time-Tested Techniques

Listen! When asking for reports or soliciting traffic, *listen carefully*! This might seem obvious, but it is easy to miss critical information when operating under the stress of an emergency. Wear headphones and reduce any distractions around you.

Log check-ins first. After asking for check-ins, note on your net worksheet or log as many calls as you can *before* you acknowledge anyone. Acknowledge all stations heard by call, ask for fills on any partial calls heard, and then ask if you've missed anyone.

Pair up stations to pass traffic on a different frequency whenever possible. This practice results in net "multi-tasking" and a higher rate of traffic handling. This is true especially when longer formal messages are being passed, or when a protracted discussion or exchange of information is required.

Every net has a style of operating, suited to the needs of the net. Most participants will catch on to the methods used, but if they do not, take time to explain. Things get done much more quickly if everyone uses the same techniques.

Be as concise as possible. Use the fewest words that will completely say what you mean. This will minimize the need for repeating instructions and messages.

Take regular breaks. While you may not recognize the stress that being NCS produces, it is constant, and it will become evident in your voice. If you find yourself asking when your last break was, you know it is time to take one. Turn over the net to your backup at least every 2 hours and rest. Do not listen to the net while you're resting — just rest. Once you have rested, listen to the net for a few minutes before resuming as NCS.

Control the tone of your voice. Be as calm as possible. Tension tends to cause voices to increase in pitch, and net members will detect this change. When you use a calm tone, other members of the net will tend to remain calm as well. Remember to speak with confidence and authority. A weak or indecisive demeanor undermines your effectiveness as NCS, and consequently the productivity of the net.

Legally identify yourself. In the heat of things, especially using tactical call signs, it is easy to forget the requirement to identify. A good NCS will identify at least every 10 minutes as required by FCC rules and regulations.

When conducting a net using a repeater with a PL tone, don't forget to announce the PL tone. Valuable time can be lost trying to find it, and emergency messages could be waiting.

Net Disciplines

You can reasonably expect trained net members to:

- Report to the NCS promptly as they become available
- Ask the NCS operator for permission to call another station
- Answer promptly when called by the NCS operator
- Use tactical call signs
- Identify legally at the end of each exchange
- Follow established net protocol

One method to enlist the cooperation of the net is to explain what you are doing in a calm and straightforward manner. This may involve supplying a small amount of real-time training. The one thing you must *never* do is to criticize someone on the air. It is better to lead by example — it produces better results. If a problem persists, try to resolve it on the telephone or in person afterward.

Microphone Technique

Know how to use your microphone. An NCS operator that cannot be understood due to poor microphone technique will be ineffective.

Articulate; don't slur. If your natural speech is rapid-fire, you may want to train yourself to slow down on the air.

Different microphones perform differently. Experiment to find the best microphone placement. Have another station listen while you make adjustments. There are no general rules that apply to all situations. If your mic came with a manual, following its guidance is a good starting point, but you'll still want to experiment to find what works best for you.

Three major categories of microphones are commonly used in amateur stations.

Noise canceling — A noise-canceling microphone is designed to filter ambient noise from the desired sound, which is especially useful in noisy environments. If you are using this type of microphone, you must speak close to the microphone element for the best effect.

Unidirectional — This type of microphone picks up sound primarily from one direction. If you are using a unidirectional microphone, speak directly into it (on axis) for best performance. However, these mics tend to produce more bass tones as you get closer; this is called "proximity

effect." You can sometimes compensate for too much bass by backing off or speaking slightly off-axis. Consistent technique is critical with these microphones because small changes in angle and distance can have a pronounced effect on volume and frequency response, making it hard for others to understand you.

Omnidirectional — This type of microphone picks up sounds from multiple directions. The common electret mics that are supplied with most rigs are omnidirectional — equally sensitive in all directions. These mics tend not to suffer from proximity effect, but they often do a great job of picking up unwanted background noise in addition to your voice. If you are using an omni in a noisy environment, get up close to the mic and reduce the mic gain on the rig to make the mic less sensitive to the background noise.

Some microphones are prone to sibilance (a hissing sound when "s," "f," or "ch" sounds are spoken) or "popping" (during "p" or "b" sounds). Much of this extraneous noise is caused by turbulence produced when air flowing from your mouth strikes some part of the microphone. The trick is to aim the mic so that it responds to the pressure wave produced by your voice while avoiding the high-velocity airflow. For example, you can sometimes improve things by changing the angle of the mic slightly (i.e., speaking "across" the mic instead of directly into it) or pointing the mic at the corner of your mouth. In the most severe cases, try placing a foam windscreen over the microphone. You can use a rubber band to hold it in place. The best microphones are relatively impervious to wind noise and speaking directly into the mic may yield the best sound.

On HF, it is critical to adjust the mic gain and compression to achieve a good signal. Over-modulation and distortion should be avoided at all costs. The goal is maximum intelligibility. Even on VHF and UHF FM rigs, it is a mistake to assume that mic gain, and deviation controls are adjusted to optimum levels for your voice and operating style. All-band radios have speech compression that can be turned on and off. It is meant to be used with SSB, and should never be used with FM. It can cause over-deviation, or at least distorted transmit audio. Sometimes a small adjustment makes a big difference in the quality of your audio.

Road noise can be a huge problem when operating mobile. It is human nature to speak louder as the vehicle's speed increases, simply because we have trouble hearing ourselves over the noise. The problem is, the louder we holler, the more strained and distorted we sound. The solution is to get close to the mic, turn down the mic gain, and force yourself to speak at a constant volume and uniform speed regardless of background noise. With a little practice, you can train yourself to do this.

For good microphone technique, use the "Monitor" function that is available on most modern transceivers to monitor your audio quality through your headphones. Then you can hear what you sound like and make corrections yourself.

Finally, when you find a technique that works, *use it consistently*.

More Hints for Successful Operation

- Keep transmissions as short as possible without losing message clarity.

- For voice nets, use only plain English and standard "prowords" (procedure words). "Q" signals are only for Morse code operation, and 10-codes are passé even in the CB community — most served agencies have abandoned codes in favor of plain English. Keep the net formal and professional but friendly. An informal or casual style during an emergency net promotes sloppiness and does little to impress served agencies.

- If the net is a scheduled net, start on time! Tardiness indicates poor management and doesn't inspire confidence in the NCS.

- Use a script to promote clear and concise communication. Scripts can be used to open and close the net, and for periodic "housekeeping" announcements. If you don't have a preprinted script, take a moment to write one.

- Frequently identify the name and purpose of the net. Advise listeners of the sub-audible squelch tone (CTCSS or DCS) required, if applicable. This can be part of your periodic "housekeeping" script.

- If the net is an emergency operation, use your scripts to tell listeners where to find other nets, such as resource or specialized nets. In some cases, this may help prevent un-needed but well-meaning stations from checking in just to offer their services, which distracts the net from its mission.

- Be friendly, yet in control. Speak slowly and clearly with a calm, even, tone — not a monotone. Speak with confidence, even if you are nervous.

- Acknowledge requests promptly and specifically so that net participants are not left wondering if they were heard, or which one of several callers was recognized.

- Ask specific questions and give specific instructions. This reduces the need for "repeats" and prevents confusion.

- Have pencil and paper ready — write down *all* calls and tactical call signs. Practice writing down everyone's calls when you are not the NCS.

- Read your radio's owner's manual and know your radio before an emergency occurs. Random fumbling with knobs wastes valuable time and is very unprofessional.

- Know how to use your microphone. Have another station advise you on the best distance and angle from your mouth to the microphone and the proper mic gain setting. You may have to adjust your mic technique to compensate for increased background noise — talking louder will likely cause over-modulation or distortion. Articulate, don't slur.

- When there is a "double" (i.e., when two or more stations transmit on the same frequency at the same time), listen to see if you can identify either station by call sign or by text. Then, ask all stations to stand by while you solicit clarification or repeats from each

station involved, as needed.

- During check-ins, recognize participants by their tactical call sign whenever possible — it helps to let everyone else know which stations are on the air and become familiar with what the tactical call signs are.

- Don't be afraid to ask for assistance if you need it. The Net Manager should be able to assist you or locate additional help. That is part of their job.

- You will make mistakes. Acknowledging them will earn the respect and support of net members, but don't dwell on them.

- Avoid thinking out loud. If you need a moment to consider what to do next, say something like "stand by" or "please wait" and un-key your microphone while you think.

- Transmit only facts. If there is a *real* need to make an educated guess or to speculate, make it clear to others that it is *only* speculation and not fact.

- Avoid becoming the source for general information about the event. If it is an emergency, refer event status questions to the proper public information net or Public Information Officer (PIO). Avoid casual discussions about the partners' response efforts on the air because the press or the general public might be listening and take information out of context.

- When necessary, use standard ITU phonetics. Assume that there is no such thing as "common spelling." Send all numbers as individual numbers, e.g., 334 is "three three four," not "three hundred thirty-four."

Reference Links

For more information on the NCS operators function, please see the chapter on emergency communications in The ARRL Operating Manual
http://www.arrl.org/shop/ARRL-Operating-Manual-11th-Edition/

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

ARRL Net Directory
www.arrl.org/arrl-net-directory

To learn more about local and Section-wide ARES and NTS net operation, contact your Section Manager (SM), your Section Emergency Coordinator (SEC), or District Emergency Coordinator

(DEC). To locate your Section Manager, see
www.arrl.org/sections

NVIS
www.arrl.org/nvis

Review

The NCS operator has many skills, some of which are transferable, and some specific to the NCS's job. He or she must not only control the flow of messages, but also keep the net moving quickly and professionally. The NCS operator must effectively handle any problems with net members, interference, special situations, and urgent messages.

Section 2: The Networks for Messages

Topic 9

The Net Manager

Objectives

Welcome to Topic 9.

After reading this topic, you will be able to comprehend the importance and functions of the position of Net Manager. This topic is based on the official job description published by ARRL.

Student Preparation required:

You should have a basic knowledge of the Amateur Radio Emergency Service® (ARES®) and the ARRL Field Organization, obtainable by reviewing the ARRL's ARES Manual and overview of the ARRL Field Organization.

Introduction

The Net Manager (NM) has overall responsibility for the planning and operation of one or more nets. Net Managers are used in the ARES organizations, as well as many other Amateur Radio emergency communications organizations such as SATERN and the Hurricane Watch Net (HWN). This person works with ARES leadership to define the net's purpose, sets standards of operation, and communicates that information to net members.

Whether you have one net or a dozen, you need a Net Manager. It is often wondered if the Net Control Station (NCS) could also function as Net Manager, however, during an emergency, NCS operators might change every few hours. In addition, the jobs of NCS and Net Manager must be done simultaneously. In order to be done well, they should be staffed by separate individuals.

The Net Manager appointment is recommended to the Section Manager (SM) by either the Section Traffic Manager (STM), Section Emergency Coordinator (SEC), District Emergency Coordinator (DEC), or Emergency Coordinator (EC), depending on the level of the net. The NM may choose one or more assistants to take over when he or she needs a break, or to handle certain aspects of the net's operation, such as training. It is also the NM's responsibility to make sure that the NCS operators on the roster have received the proper training in the way nets should be conducted, before appointing them as NCS.

During an emergency, "ad hoc" nets may be created to meet specific needs. These may either be

assigned to the permanent NM, or to a temporary NM for the duration of the event. Those in such a position should be prepared in advance should this need arise and be trained in protocol of different types of nets, their purposes, and how they should be conducted.

Organization

Net Managers may be assigned to handle only one net, or several. The number of NMs appointed might depend on a Section's physical size, the number of nets, how often the nets meet, or factors having to do with the way the Section is organized. In small Sections, there may be only one NM in charge of all section nets. In larger Sections, there may be several NMs, each having responsibility for a different region, mode, or type of net. Separate NMs should be appointed for ARES and NTS since the needs and functions of the nets of the two organizations can be quite different.

All ARRL NMs should work under the Section Traffic Manager (STM) and/or Section Emergency Coordinator (SEC), guided by a coordinated Section traffic and ARES communications plan.

Duties

The Net Manager's duties include resource management and quality control. He or she makes certain that a NCS operator and alternate are assigned to each session, and that replacements are

available for each shift. This person may also recruit members for certain types of nets to ensure that delivery of messages is possible everywhere. The NM is also responsible for assigning regular liaison stations to move messages to and from other nets, although the NM may delegate this task to the NCS to handle on an ad hoc basis.

The nature of this job, like other leadership positions, demands excellent people and management skills. At times, the NM will need to work with a group of volunteers performing under stressful conditions. The NM's own operating and message handling skills should be superior so that the NM can help teach others and ensure that they are all properly trained before giving them an assignment.

The Net Frequency

In most cases, the Net Manager will choose the net's frequency or frequencies. Scheduled and pre-planned nets usually operate on designated frequencies, but temporary nets often choose a frequency based on which bands and frequencies are available. HF nets that operate on a regular schedule will usually have less difficulty getting a clear frequency than those who only operate when needed. Net frequencies on HF should always be listed as "plus or minus 5 kHz" to allow for interference. If the net will be active on a weekend, when contests are usually under way, the Net Manager may consider moving to bands where contesting is prohibited — 12, 17, 30, and 60 meters. In the MF/HF Amateur Service bands, an emergency communications declaration may be declared keeping one or two channels of the 60-meter band clear for emergency communications. These channels are shared between federal users and the Amateur Radio Service, allowing interoperability between users of different services.

One or more alternate frequencies should be chosen in advance and should be known by all net members. In the case of VHF/UHF nets, alternate frequencies should be chosen for both repeaters, as well as simplex frequencies due to the fact that in an emergency many repeaters may be off the air. In the event that interference or band conditions render the primary frequency unusable, net members should automatically switch to the alternate.

FM simplex nets should use a frequency that is seldom used by local ham radio operators for day-to-day conversations and should never hold a net on a national calling frequency such as 146.52 or 446.000 MHz.

Nets that use repeaters should make prior arrangements with the repeater's owner. If a net uses a repeater as its primary meeting place, a backup simplex frequency should be chosen and publicized in the event the repeater fails. One way to do this is to give instructions that in the event of repeater failure, the first place to meet is the *output* of the repeater. All NCS operators and responders must know and fully understand how to operate their individual radios so that they can adjust the offset for simplex duty.

Some ARES units provide a backup for their own repeater by striking an agreement with a local radio club to use their repeater in the event that the ARES repeater fails during an emergency. This goes over very well if the ARES unit also invites the radio club to use the ARES repeater if the radio club's repeater goes down (during non-emergency periods). This win-win arrangement

provides both organizations with a backup machine and fosters good relations.

Points for Net Managers to Remember

- You are responsible for managing the net; do so with tact and diplomacy. Teach net discipline by setting a good example and take the net yourself from time to time to do so.
- Ensure that traffic on the net is handled in a timely manner. Do not let the net become too informal and/or waste time.
- Know your operators' capabilities, locations, and coverage range, taking terrain and other factors into account. This information is especially valuable at times when you need to use simplex. One way to gather such information is to organize periodic practice nets using simplex instead of the repeater. It is often surprising how many net members can be heard and can hear others on simplex. Do not assume who can and can't hear on simplex; you will never know unless you try it. A good practice exercise to keep operators sharp is to take the repeater out of service with no advance warning and find out how good your simplex coverage is.
- Know how and where your net fits into the overall net structure at all times, because the situation may change periodically. Working with SECs, DECs, and ECs will help produce good results.
- Assign or identify liaison stations to move traffic from one net to the other(s).
- Assign an alternate NCS to stand by, in case the primary NCS goes off the air.
- Get all the information you can (type of situation, needed station locations, potential shift lengths, frequencies, partners or agencies involved, etc.) before you put a net into service, but do not delay too long in waiting for any single piece of information.
- Provide direction in the routing and handling of various types of messages. Determine the physical location of each partner's site early on, to ensure proper routing.
- Monitor the net(s) to be sure proper procedures and message formats are being used.
- Training is crucial to success during a true disaster or emergency situation. A varied and interesting training schedule will help keep net members ready to go. The practice net on simplex mentioned previously is an interesting training session.

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

ARRL Field Organization Overview
www.arrl.org/field-organization

For more information on the Net Manager function, please see The ARRL Operating Manual *chapters on emergency communications and traffic handling.*

To learn more about ARES net operation, contact your Section Manager (SM), your Section Emergency Coordinator (SEC), or District Emergency Coordinator (DEC).
www.arrl.org/sections

Review

The Net Manager has overall responsibility for the operation of a net, including recruiting and training NCS operators, net members, frequency choices, and scheduling. A Net Manager may be appointed permanently for one or more regularly scheduled nets, or temporarily to manage ad hoc nets created for a particular event or disaster.

Student Activities

Section 2 (Topics 5-13)

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

Topic 5

1. Looking at the following exchanges, tell how you might revise the language to make them more clear and concise.

    a. "KA1XYZ at Ramapo Base, this is Bob, K2ABC, at Weston EOC calling."
    b. "K2ABC, this is KA1XYZ. Hi, Bob. This is Ramapo Base, Harry at the mic. Go ahead. K2ABC from KA1XYZ."
    c. "KA1XYZ, this is K2ABC returning. Hi, Harry. I have a message for you. By the way, remember to call me later about the get-together the club is having next month. Are you ready to copy the message? KA1XYZ, this is K2ABC, over to you, Harry."

2. Based upon what you have read in this lesson, list five common errors to avoid when communicating during an emergency.

Topic 6a

1. Outline a net plan for a possible disaster in your own area. Describe the types of nets you would include and the links between them.

2. Monitor three HF or VHF/UHF traffic nets. Identify each net by category. If you do not have a receiver capable of monitoring such nets, contact your local ARES group or Amateur Radio club – a member may be able to let you listen to a few nets at their station.

Topic 6b

1. Describe the various types of emergency nets and how they are used.

2. Find a local emergency net in your area and listen in.

Topic 6c

1. What are the major topics found in ARRL's FSD-218?

2. Many nets open and close their sessions with a standard script. Listen in on your local net and describe the language of the opening and closing script used.

Topic 6d

1. Understand the FCC's ruling on drills and employees. Describe how this ruling may apply to you.

Topic 7

1. Participate in a formal net as a member. Review the performance of the net control stations. List five positive features and any negative features of net operation that you encountered. If you do not have the capability to check into a net yourself, listen to nets on VHF/UHF or HF and review their operations and the effectiveness of the NCS operators.

   While net frequencies or times change, see the ARRL Net Directory book or go to the ARRL Web site at http://www.arrl.org/arrl-net-directory to find the latest known information about major nets.
   - U.S. Coast Guard Amateur Radio Net 14.300 or 14.327 MHz
   - International Assistance and Traffic Net: 14.303 MHz
   - East Coast Amateur Radio Service Net: ECARS, 7.255 MHz (SSB)
     South Coast Amateur Radio Service Net: SCARS, 7.251 MHz (SSB)

     Midwest Amateur Radio Service Net: MIDCARS, 7.258 MHz (SSB)

   - Mobile Emergency and County Hunters Net, Primary: 14.336 (SSB), 14.0565 MHz (CW); Secondary: 7.188 MHz (SSB), 7.0565 (CW)

   If you do not have a receiver capable of monitoring such nets, contact your local ARES group or Amateur Radio club – a member may be able to let you listen to a few nets at their station.

Topic 8

1. Develop your own set of guidelines for operating the ideal net. These guidelines should show what you imagine to be the best way to operate. Monitor two or more nets if you can and compare each net's performance with your guidelines. Alternatively, describe efficient and effective communications techniques that you observe being used in a well-run DX operation or a contest.

2. Formal nets have both opening and closing scripts. Develop outlines for both an opening and closing script.

3. Develop a method that works for you so that you can have immediate access to critical phone numbers, e-mail addresses, and other contact information for local served agencies, police, fire, section officials, and others who you might need to contact in a hurry while still working a net.

Topic 9

1. Describe the importance and functions of the Net Manager.

2. Imagine that you have just been appointed the NM for a Section-wide ARES tactical net. Your mission is to provide an HF link between local FM nets and the State EOC. Create a simple plan to accomplish this and list the tasks you would need to complete in order to be successful. Describe the different considerations you would face if this were to be a recurring net.

Topic 10

1. Imagine that you have just been appointed the NCS for an inter-district American Red Cross net following a major flood. Evacuation centers have been set up in several locations in your city and others nearby. Your mission is to see that four shelters are staffed, on frequency, and will form a net to provide coverage between the local chapter and the four shelters. For this scenario, the use of a repeater for optimum coverage may be needed. Develop a simple plan to accomplish this and list the tasks you would need to complete to be successful; provide the proper information and relay needed by the partner you are serving. How would you handle lists of clients? What if there were proper names to be transferred from shelters to the chapter headquarters?

Topic 11

1. Determine if there are any weather nets operating in your state. For any such nets, and the Hurricane Watch Net, list the details of operation including:

    - Sponsoring or partners
    - Qualifications for participating in the net
    - Next scheduled training event
    - Key contact personnel
    - Frequencies employed
    - Procedure(s) for activating the net

2. Suppose that you are placed in charge of training SKYWARN participants in your area. What information would be critical for your participants to know?

Topic 12

1. Name six ways that Social media can be used in emergency or disaster communications.
2. Describe which social media you have used. Which social media would you find useful in emergency or disaster activities?

Topic 13

1. Consider your own personal radio resources. Of the modes mentioned in this lesson, describe which one(s) you would consider acquiring for your own use. Why? Which one(s) would you not consider acquiring? Why not?

2. Select three of the digital modes. Identify the positive and negative aspects of using each of the three in an emergency communications situation and describe.

3. Based on the considerations you have identified above, develop a simple communication equipment plan for a small emergency communications unit based in a small community. Within your plan, be sure to identify and discuss the equipment and modes you would employ.

4. Describe how the plan you developed above would be different if your emergency communications group were quite large and located in a large community.