Nets: What They Are and How They Work

Key Terms:

Controlled Net: A means of ensuring orderly use of limited frequency resources to conduct communications for a scheduled event or during an emergency.

Net Control Station (NCS): The person charged with control of information flow on the frequency used by a controlled net.

Please take a moment to study the NCS definition. During an emergency the NCS does *not* control the *event*! NCS is there simply to control information flow. The Incident Command System (ICS) provides a coordinated system of command, communications, organization, and accountability in managing emergency events.

Net Types

Nets are typically categorized by their structure or function:

Structure

Open (Informal) Nets - During an open net almost any type of traffic or communication is permitted. Conversations are often permitted provided they break whenever needed to allow incident related traffic to flow.

Directed Nets - A directed net is typically used when a large number of stations need to use the frequency or the volume of traffic cannot be dealt with on a first-come first-served basis. The NCS will determine who uses the frequency and what traffic will be passed first. A directed net may be conducted in which each station transmits only to the NCS or station to station contacts may be directed. In some situations the NCS may authorize direct station to station contacts on a net (especially an event net if the net is relatively small and consists of experienced net operators), but the NCS always has absolute control over the net.

Function

Tactical - Tactical nets are the primary coordination nets for the event. They will be a directed net, using tactical calls, restricted to traffic for the event *only*. Traffic is as directed by the NCS.

Resource - The resource net is intended to acquire volunteers for the event and make work assignments for the event. This net will be a directed net using FCC issued calls, normally restricted to traffic pertaining to the event. All traffic goes through the NCS.

Traffic - Traffic nets are for the passing of formal, normally written, traffic. They are generally directed nets, using FCC issued calls. Traffic may be passed on the net frequency or sent off to another frequency at the option of the NCS. Casual conversations may be allowed at NCS discretion during periods when there is no traffic ready to be handled.

ICS Nets

During an emergency a large percentage of our served agencies use the Incident Command System as a model for their operations. When this system is used by your served agency you will need to understand how the terms in ICS correspond to terms in common use.

REACT / ARES / RACES Typical Net Name	Incident Command System Function Name
TACTICAL	OPERATIONS
RESOURCE	LOGISTICS

Please understand that the name you use for any given net is a local option. The same holds true for tactical identifiers. Use the name for your nets and locations that convey the most information to the necessary people at your event.

Net Participant Guidelines

Legal

Legal requirements within nets are those of identification and operation on frequencies within the appropriate radio services. For the Amateur Radio Service, the FCC regulations require that you *must* identify at ten minute intervals during a conversation and in your last transmission. There are similar rules with other requirements for other radio services. During periods of heavy activity in event nets it is easy to forget when you last identified.

The easiest way for amateur radio operators to ensure they comply with the FCC identification requirements during an event net is to identify with their FCC issued call as they complete an exchange. This serves two functions: (1) Tells the NCS they consider the exchange to be complete without having to use extra words (saves time), and (2) Fulfills all FCC identification requirements.

Customary

Customary protocols will normally be used in long standing, non-emergency nets. They may include such practices as identifying with the FCC call of both stations on each transmission, giving the FCC call of the next person to talk, or many other variations. Whenever joining an existing radio net, please listen to the net before joining. Customary protocols will easily stand out.

Tactical Calls: When and How To Use Them

Tactical calls are used to identify a location (such as "North Avenue Shelter") or function (such as "Truck Five") during an event regardless of who is operating. This is an important concept. The tactical call allows you to contact a location without knowing the FCC call of the operator there. It also virtually eliminates confusion at shift changes and when a person takes a break from operating. Think about that. Do you answer a call from the sound of a person's voice or from the identified location? Obviously from the identified location.

Once location or functional assignments have been made, tactical calls should be used for all emergency nets if there are more than three participants and most public service nets if there is more than minimal traffic. Net control will assign the tactical call as each location is opened. It will normally be some unique identifier that indicates which location or function this is. Some examples are:

NET CONTROL - for the Net Control Station

FIRE-BASE-1 - for the first fire base established or the fire base in a region

CHECKPOINT-1 - for the first checkpoint in a public service event

C P - for the event command post

AID-3 - for the third aid station on a route

NORTH AVENUE SHELTER - a shelter located on North Avenue

E O C - the Emergency Operations Center

Tactical call signs may be any unique identifier that is easily recognized.

Proper Use of Tactical Calls

Initiating a call

- If you were at aid station three during a directed net and wanted to contact Net Control you would say "NET CONTROL THIS IS AID3" or, in crisper nets, simply "AID3." If you had emergency traffic you would say "AID3, emergency traffic" or for priority traffic "AID3, priority traffic."

- Notice how you have conveyed all information necessary without using any unnecessary words or taking any unnecessary time.

- If you had traffic for another location, such as checkpoint five, you would say "AID3, traffic for CHECKPOINT 5". This tells NCS everything needed to handle the traffic. NCS will then call check point 5 with "CHECKPOINT 5, call AID3 for traffic," if there is no other traffic holding.

- Notice that there have been no FCC issued calls used. At this point none are necessary.

Traffic during a call

- When the contact involves several short exchanges, it is normally not necessary to repeat the tactical calls with each short transmission unless there might be some confusion such as when a separate location is mentioned in the message.

Completing a call

- To complete the call from AID3, after the message/traffic is complete you would say "AID3, (your call)". This fulfills your identification requirements and tells NCS that you believe the call to be complete.

The above is the same for all participants under virtually all traffic examples.

Participating in a Net

Enjoy yourself - public service is fun!

Prepare yourself. Are your batteries charged? Are you on your best antenna for the frequency you will be on? Do you have pencil, paper, and other items you think you will need?

Listen. If you are there at the start of a net or join one in progress, listen for several minutes before you check in.

The NCS will announce or ask for what they want.

Follow NCS instructions. NCS will ask for specific people or categories of people as they are needed. Follow instructions.

Do not editorialize. "This is Phred in the North East portion of the county at 9300 feet where it is snowing, but it was sunny five minutes ago when I came in from feeding the birds, geese, and hamsters, but it's cold right now and it looks like it could rain in the next day or so. Just checking in," is unnecessary and almost always unwanted. This ties up the net and does nothing to add usable information. Check in with your callsign. Add name and other information as requested by NCS.

Plan your transmission. If you have more information than just your name and callsign, jot it down. You can, if necessary, just read your note. This promotes clear concise communications.

During any sort of event, especially any incident or emergency, check in *only* if you are going to be part of the net. Do not check in as "in and out" or "for the count." Either you are joining the net or you should just listen.

Checking in with, "This is," then a pause or unkey followed by the call works on most nets, but causes delays and potential problems on others. This is a local net option, so follow the protocol normally used by the net you are joining.

Unless your transmission is longer than ten minutes, you need only identify at the end of the transmission/exchange of information.

Let the NCS know when you leave or if you need to leave early. Do not go into details of why you need to leave unless asked or if the reason is directly related to the event or incident.

During an event or incident, if the authorities ask you to move, do so immediately and without comment, then notify the NCS of your change in status as soon as you can.

If an on-scene authority requests that you shut your radio off, or that you not transmit, do what they ask immediately and without question. This is one circumstance where you do not notify the NCS of a change in your status. This deserves a little explanation. This would normally occur only if there is a presence of explosives or explosive chemicals or vapors, and there is the possibility that a spark-producing electronic device is present which might be triggered by an RF signal.

Be patient with the NCS. An NCS operator is under high stress. His questions and requests should be clear and crisp; but as he/she begins to tire, there may be a tendency to become rather terse. Typically, there is a whole lot going on at an NCS that the field operators never know about.

*REACT*ers are patriotic, independent people and they are volunteers. The attitude among a few people is that, "Volunteers don't have to take orders." That's absolutely correct. We don't *have to* take orders. But if you are not ready to follow instructions, you may want to do something else instead of emergency communications.

Leaving a Net - You will leave a net for one of three reasons:

1. The location is closing - If NCS has given you directions to close the location, simply identify with your FCC issued callsign, the location tactical call and the word "Closed." The NCS will tell you if anything else is needed. If you are closing the location on orders of the served agency, you will identify with your FCC issued callsign, location tactical call and the phrase "location closed per (name and/or title of person and agency)."

2. You need a break and there is no relief operator - Tell NCS, "I will be away from the radio for (number of minutes)" and end with your tactical ID and your callsign.

3. You have turned the location over to another operator - You will normally not need to tell NCS that you are leaving. However if there are specific instructions from NCS then follow those instructions.

Don't *Over* Identify

There is normally nothing that will expend more time, needlessly, than over-identification. Someone who uses their FCC issued call in every transmission is usually a person who is unsure of themselves or, worse yet, someone who is more interested in having their call known to everyone at the event. In the latter situation, help them find work elsewhere.

The FCC regulations require that Amateur Radio operators only need identify at ten minute intervals during a conversation (*not* during a net*, unless you talk for more than ten minutes) and during your last transmission. The requirements in other radio services are generally even less frequent. For example, GMRS stations must identify every 15 minutes compared to 10 for the Amateur Radio Service. If you end each exchange with your call, that fulfills all FCC requirements and tells everyone that you are of the opinion the exchange is complete.

Write It Down

The easiest way to minimize what you say during a net is to write down everything before you key the microphone. Since very few of us like to write lengthy notes, this will promote brevity. An excellent place to keep this information is in your location log. This serves two purposes: (1) You have a complete log of everything that came from your location (2) It will become very brief.

Roles in a Net

NCS

The NCS is in charge of the net while the net is in session. He or she is responsible for controlling who uses the frequency and when they pass traffic. This needs to be balanced with the fact that you will be dealing with volunteers.

Net Control needs to have a commanding signal, i.e., a clear, crisp signal with good audio characteristics. An NCS who can barely be heard will not be able to effectively control the net.

NCS must keep track of which resources are on the net and who has cleared the channel. NCS is also responsible for knowing what traffic each person is capable of dealing with (sending traffic to be relayed on HF to a Technician class ham will not work well).

In medium and large operations you need to have a backup NCS *and* a person to maintain the log.

Keep a written record of the incident and all traffic passed. This does not mean that the NCS must copy of all formal traffic; the NCS log can be simply an overview of the messages including the stations sending and receiving the traffic. The NCS would copy all formal traffic that was sent TO the NCS.

Make *all* instructions clear and concise, using as few words as possible.

Use tactical call signs. If participants do not follow your lead, only recognize those using tactical calls (obviously an exception must be made if it is emergency traffic).

Different nets handle different traffic. If someone tries to pass traffic that should be on another net, refer them to the correct net unless it is actual emergency traffic.

NCS Backup

There are two types of NCS backups. The first is located in the same room/area as the NCS and acts as relief for the NCS at regular intervals. The second type is a person who maintains a duplicate log of everything happening at the event and is available should there be a failure at the primary NCS location. Whenever there are enough people working an event, an offsite backup NCS should be maintained. This person must be operating with the knowledge and consent of the NCS station and should be known to the entire net.

Loggers

People to keep an operational log for the event are very important to the smooth operation of the event. These people free the NCS from having to split their time/effort down to a level that is neither efficient nor productive. Every net will be enhanced by a good logger.

Site Communicators

Site communicators are responsible for listening to everything that happens on the net and maintaining contact with the served agency people at their site. They need to produce formal traffic as applicable, maintain a log of activity at their location, and be responsive to the needs of their served agency people.

It will be far easier to handle all of the tasks at the location if there are at least two people there, especially in an emergency situation.

General Communicators

Report to the NCS promptly as they become available.

Ask clearance from NCS before using the frequency.

Answer promptly when called by NCS.

Use tactical call signs.

Follow established net protocol.

Listeners

Just listen

Listeners are not really part of a net, but we discuss them here because there are always people who show up at a scene or on a net frequency because they just want to help. If you are one of these people, be a good listener.

The most helpful listener, during an emergency, is one who listens and stays quiet! NCS does not care that you are there listening unless he asks for assistance from listeners. Normally there will be enough people working the net to handle anything NCS needs. If additional people are needed, the NCS will make an appropriate announcement.

Liaison Stations

Liaison stations provide the communications link between different nets. The nets may be simultaneous or at different times. Liaison Station generally will be limited to only two nets if those nets are simultaneous so they can maintain good communications on both nets. It is *very* difficult to listen to more than two nets at the same time even if the nets are not very busy. A Liaison Station might service several nets if the nets are at different times such as local and sectional NTS traffic nets.

Liaison stations serving simultaneous nets will need to have at least two radios, each with its own antenna. These antennas must be separated sufficiently to not interfere with each other when the operator transmits on either frequency.

Liaison stations will be appointed by NCS or the staffing officer, usually from trained operators.

Never listen to one net to bring information to another net unless you are an *assigned* liaison station or it is traffic specifically designated for relay to the other net. This is especially critical in emergency and Skywarn nets where such a second-hand report may be misinterpreted as an independent "confirmation" of something that was erroneously reported on the first net.

Traffic Handling

Formal (written) message traffic can be handled over many different kinds of nets. Each kind of net has advantages and disadvantages. This section will briefly outline some of the considerations.

CW Nets

Not all nets need to use voice to pass traffic. CW nets can be used to move traffic in an efficient manner over conditions that are not favorable for voice networks. During such times, CW can be an effective means of passing traffic. Examples are:

- Limited power at the transmitting location, requiring conservation of energy.
- Limited antenna capability, especially during a windstorm such as a hurricane or tornado, where it is not possible to deploy a full, directional antenna.
- Extreme interference due to foreign broadcast, commercial paging, or similar high-output conditions.
- Poor propagation and high static, especially on 40m and 80m, diminishing the use of voice for efficient two-way communications.

Digital Nets

- HF digital is *not* plug & play
  - Receiver stability, bandwidth, dynamic range, and operator skill are essential.
  - Interfacing requires special care for both RF and audio lines.
  - Each mode requires operator understanding of software and hardware such as TNC commands, a sound card interface etc. Digital station operators must know how to monitor/operate the particular mode being used.
  - HF net frequency specifications are unique.
- Like CW, skill in HF digital operation comes with practice.
- Controlling a digital net is more daunting than a voice net.
  - Typing skills
  - Know essential commands
- Higher data throughput
- Less prone to scanner-listeners

Voice Nets

SSB Nets - SSB nets are found mostly on the HF bands and are designed to meet the needs of particular groups of radio operators. Nets can be found for most everyone's operating habits, including emergency communications. Because of the nature of HF, these nets can be international, national, or regional in coverage. Band selection and propagation will usually dictate the net coverage, and many nets are placed to take advantage of particular band conditions. In addition to the HF SSB nets, there are some regional and local SSB nets on VHF throughout the country that can be put to emergency use if the need arises. A good reference to the many nets in current operation, including regular emergency nets, exists in the ARRL's Net Directory.

Standard Frequency: As part of your local emergency plan, there should be some reference to your local and section nets and their operating frequencies and times. A standard operating frequency is important, as this is where everyone will congregate when an emergency occurs. Alternates to this frequency are also important if the frequency should become unusable for some reason. Make sure you keep a current list of nets, their frequencies and times, and any emergency frequencies that may be called into service if the need arises.

NCS Rotation: Emergency nets need well trained net control stations. Most major emergency nets keep a rotation list of net control operators. It is the responsibility of these net control operators to make sure that the nets run smoothly and efficiently: They *control* the net. You should follow the net control's lead in understanding how a particular net is operated by listening first. It is important for a net control station to designate an alternate NCS during the operation of any nets, because of the potential loss of a NCS due to equipment failure or other problem.

Traffic: The goal of all nets is to transfer information (which we call traffic). Important things to remember here are that each net has its own priority for differing kinds of traffic. The normal order is Emergency, Priority, Routine, and Health and Welfare traffic. Some nets will not take Health and Welfare traffic, preferring to send operators with such traffic to other nets specifically set up for that traffic. *All* nets should take priority and emergency traffic if there is not a better net available to handle such traffic. If you have any traffic, when you check in, make sure you state this information to the NCS.

Participation: Regular participation in emergency nets is the best way of staying current and understanding the operations of a particular network. In addition, it makes sure your equipment is operating properly and helps you to understand your station's propagation coverage in a particular net.

Check-ins/Check-outs: All nets have particular procedures for checking into the net. Listen to the net preamble to learn about the proper way to check in to that net. If there are no specific instructions, listen to how the net participants operate. Generally you can announce your call during a pause in communications (not during traffic or if instructed to stand by) and, if acknowledged by NCS, check in.

Relays: SSB nets and FM simplex nets will require relays if there are weak stations trying to check in with traffic. Many nets have established policies in dealing with relays, sometimes alternating NCS to widen the net's reception due to propagation. (Note: Nets on FM repeaters will require relays if someone is trying to get into the repeater and cannot maintain a full quieting signal. A station closer to that unreadable station can sometimes relay the request by listening to the unreadable station's transmission directly on the repeater input frequency and relaying the request to the net on the repeater.)

FM Simplex - Regularly scheduled nets held on FM simplex frequencies are usually called into effect as backups when normal FM repeater communications are disrupted or to handle local traffic. These nets hold special challenges for all concerned, and are closer to SSB nets in function than they are to FM repeater nets. For that reason, experience in operating on HF SSB nets will hold the operator in good stead during a simplex net.

Location – location – location: The first fundamental of efficient simplex operation is location. If you are mobile, move your antenna until you can receive a good signal and use enough power to be able to communicate with the NCS. Some stations will relocate to a high point to conduct a simplex net to improve their coverage.

Net Control challenged: As part of the challenges facing simplex operations, the NCS must learn to use relay stations properly to pass traffic. Since not all stations can hear each other on most simplex nets, there is a need to establish those stations with the best reception coverage as relay points. If you try to check in to such a net and NCS does not acknowledge you, ask for a relay.

Practice regularly to develop skills: A regularly scheduled simplex net can get everyone up to speed on the problems facing simplex operations and can stimulate those involved to steadily improve their stations and operating skills to the point that simplex becomes a well established alternative to emergency communications should the local repeater system fail.

Have a plan: It is important to have a local emergency plan. All of the local radio operators should know what that plan is. Knowing what frequency to turn to in the event of an emergency is the best way to ensure that there are enough operators available to assist in an emergency situation. Having backups to these established frequencies is also an important need that should be in the plan. These backups should include both FM repeater and simplex frequencies. Reference to local section HF nets should also be mentioned for those with HF capabilities. Find out what the local plan has in it. If there's not one, help make one. Amateur Radio operators should get with the local EC. Local emergency communications plans prepared by *REACT* Teams and local ARES units are a good start, but to be fully effective any plan must be fully coordinated with the local emergency management agency and should include any other major local organizations that will be involved in emergencies, such as the American Red Cross and other voluntary agencies.

"Simplex Repeaters" - There is increasing use of "simplex repeaters" in emergencies. These are simply radios equipped to listen to a particular simplex frequency and record what is being received. When the carrier drops, they will repeat that same information on the same frequency. This is usually from a location with wide coverage and may be using higher power than the sending station. These provide a special challenge and require different operating skills for those who use such repeaters. While coverage is definitely increased for a simplex net using a simplex repeater located at a high point, the drawback is that there is a time delay while the messages are being repeated, literally doubling the communications time for any message. There is also a great deal of confusion (especially among operators not used to a simplex repeater) if the receiving station can hear the original sender. If time is of the essence and a communications path is available, it would be better to conduct emergency traffic directly. A move to a different frequency probably would be the best way to conduct such traffic if a simplex repeater is in place. Simplex repeaters definitely have value, especially in areas where there are coverage problems. It is important to recognize that "simplex repeaters" do not fall within the definition of a "repeater" in the FCC rules. A "simplex repeater" requires a control operator present to control the station even though the function is fully automatic.

Repeaters - VHF and UHF FM repeaters are, by far, the most common method for local nets, including regularly scheduled club social nets, local traffic nets, and local emergency nets.

Repeater Etiquette:

Leave at least a 1-2 second break between transmissions. This allows other stations to break into a conversation should there be an emergency.

Some repeaters have courtesy beeps. These signify that the time out timer is reset.

Autopatch: Most are "closed," which means the autopatch is for club members only. For all autopatches you need to think of the following:
- Keep calls short and to the point.
- Inform the person on the phone line that this call can be heard by others.
- Remind the person on the phone line that there is to be no profanity.
- Don't say anything to the person on the phone line that you would not say loudly at the local shopping mall.

Various repeaters may have purposes other than or in addition to rag chewing. Learn about the repeater you intend to use *before* you begin a long rag chew.

Linked repeaters: In general, linked systems are not a good place to hold long rag chews. You will not just tie up a single frequency pair. You may, in some systems, have repeater pairs in as many as ten cities tied up. Be careful.

"Q" signals are for CW, not phone, and especially not for repeaters.

Leave the "10-codes" on radio services where they are normal practice.

September 2017