<u>**Human Repeaters and Simplex Operation of Nets During Disaster- a Training memo**</u> 9-13-15 W4SET

Genesis: This material was written with the needs and environment of Hamilton County , TN as background. Although there are several repeaters on local mountains and ridges, when they become inoperable, operators should be able to operate nets by simplex.

Objective: To educate amateur radio operators in the establishment and proper operation of a Simplex Net.

What this is not: This training is not training to be a Net Control Operator

Takeaway Lesson: Establishing a simplex net from scratch takes time- time that is needed during a real disaster which disrupts repeater operation. To avoid becoming totally dependent on repeaters, cell phones, and internet connections which may be inoperative during a disaster, much practice and knowledge of the hams in the area is necessary. This necessitates many drills on simplex.

 Credits: Some materials excerpted from the ARRL EmComm materials, PBDARES, Maricopa County AZ MARC, and TCARES, .

<u>**Definitions for this exercise-**</u> the "STAR" or "Hubs and Spokes Relay Method"

- **Main Hub-** the location of the main net control operator; the station responsible for providing information to served agencies during a disaster
- **Area Hub-** the operator who is responsible for collecting information from hams in his area and relaying that information to the Main Hub; this operator may be on the same frequency as the entire net or on a separate frequency to prevent doubling.
- **Spoke-** like a bicycle wheel spoke, the path from the Main Hub to the Area Hub.
- **Relay-** when one Area Hub operator who can hear an Area Station which cannot communicate with the Main Hub receives and repeats the traffic to the Main Hub (a Human Repeater).
- **Human Repeater-** that would be you.

<u>**Components**</u>

1. Most local and regional EmComm activity takes place on 2 meter or 70 centimeter FM.
2. VHF and UHF FM are preferred for local operations because equipment is common, portable, has a clear voice quality, and the coverage is extended by repeater stations. The downside is dependency on repeaters.
3. Since the disaster may eliminate repeaters as a resource before any net is established, operators should have a list of pre-selected simplex frequencies in your jump kit, and pre-programmed into your radios.
4. Simplex range is inhibited by terrain, output power, and antenna height and gain. Operators must know who they can communicate with in their area.
5. Each "area hub" should have an operator that has an excellent radio and antenna system which can reach the" main hub" with clear transmissions. This operator should be well practiced in net control operations.

<u>**When To Use Simplex and How To Start a Simplex Net**</u>

Simple answer: When you have to!

1. If the repeaters are no longer available, start or continue the net by the Net Control Operator (who should have a strong clear signal through most of the County area) monitoring the input frequency of the repeater to hear operators attempting to access the dead repeater and announcing on the output frequency of the repeater that a Simplex Net will be started on the assigned simplex frequencies.
2. For drill and practice, the repeater will not be inoperable, so a simplex frequency that is clear must be chosen and communicated over the repeater. Monitoring the Input Frequency or the Output Frequency of the "still alive" repeater will allow late check-ins to be informed of the exercise and encouraged to join it.
3. Through drills, practice, and training, operators should be able to diagnose that the repeater is out of service and change to their Area's Simplex frequency and listen for the Area Hub Net Control to provide instructions. The nets in Hamilton County have been using 147.420 simplex as a backup.

4. The VHF National Simplex Calling Frequencies are 146.5200 and 144.2000 and UHF 446.0000. Avoid these frequencies because they may be cluttered in a real emergency disaster.
5. An operator with wide area coverage –transmitting and receiving- should be assigned and continue to monitor the input and output of the primary repeater to advise other operators that a simplex net has been started and instruct them in the procedure applicable to their Area Hub.
6. The net resumes with check-ins to the Area Hubs and the Area Hubs relaying information to the Main Hub.
7. Operators must be trained to recognize when a station is not being heard by his/her Area Hub and "relay" the traffic to the Area Hub. If net control does not acknowledge an operator, it is a safe assumption that net control did not hear that operator.

Ways to Improve Simplex Relay Coverage
– Use an omni-directional antenna with large gain (say, 9-13 dB) to receive Area Stations; ditch the rubber duck; use a "J Pole" or multiple wavelength vertical dipole
--Use an antenna which will provide a more groundward angle of radiation or skyward radiation depending on where you are located and what your role is in the relay net
– Move the antenna away from obstructions
– Use a directional antenna to reach the Main Hub; home built 3 element YAGIs can more than triple your reach
– Increase antenna height to 15' or higher
– Increase transmitter power as a last resort; high power may interfere with other counties' nets
--Reset squelch to the open/minimum ; you may be able to copy weak stations in the noise floor because you know the voice of the operator
--Speak calmly and normally to prevent splattering. During an emergency, it is easy to get excited.
-- Hand held radios are convenient but subject to fading. If you want to participate fully in amateur radio as an EmComm operator, get a base station, good feed line, and a gain antenna.

Differences Between a Simplex Relay Net and a Repeater Net
● Simplex operation during a disaster brings another set of challenges to all operators.
● Due to increased stress, operators and net controllers will have to use strict net control procedures such as the Directed Net Protocol.
● To avoid errors or mis-communications, every message should be repeated to the sender for confirmation. Yes, this takes longer, so economy of words is important.
● All operators should keep timed check-in and check-out logs so they will know who is available in their area.
● Net controllers should keep detailed, timed written logs of all traffic.

A Simple Script for Simplex Nets
"Calling Relay Area ?? Hamilton County Amateur Radio Emergency Service net. This is (call sign) (name), Net Control. This is a directed net. Please follow the instructions of net control. Please stay on frequency until released by net control. Follow the net operations training which you have received during training nets."
" WE ARE OPERATING WITHOUT THE AID OF A REPEATER. YOU WILL PROBABLY NOT HEAR ALL OF THE RADIO OPERATORS, AND NET CONTROL MAY NOT HEAR SOME EITHER. AT ANY TIME YOU MAY BE REQUESTED TO AID OPERATORS WHO CAN NOT BE HEARD BY NET CONTROL. IN THE EVENT THAT NET CONTROL FAILS TO HEAR AN OPERATOR, HELP BY TRANSMITING "RELAY, CALL SIGN" and await net control's acknowledgement and instructions."
"Leave a short space between transmissions so stations with EMERGENCY traffic may be recognized. Use Break Tags as appropriate. Do not use ITU phonetics unless net control requests their use. Net control will repeat your traffic to confirm it with you. To advise net control that the traffic is correct, say "ROGER, CALL SIGN"".

"If net control cannot hear your "ROGER", net control will ask for a confirmation by relay from another operator or ask you to key down 3 times if confirming and 5 times if correction is needed." Authenticate all traffic.

Net Control Operator is in Command of the Net

Net control stations should consider this script a rather solid guideline, but you may need to adjust it for circumstances. It is your net to run your way. For consistency and good net operation, net control should generally follow the script as written.

If an operator is disruptive to net operations, use tact and reference to Net Control Operator Training guidelines for net operations to request compliance. It is not personal. It is your area's agreed upon procedure.
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