Rialto Amateur Radio Club

Amateur Radio Emergency Communications Course

Level I Part I

Amateur Radio Communications Course Level I

Part 1: LU-1 Through LU-13

Presented for

The Rialto Amateur Radio Club

By

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House Keeping Issues

Parking Rules

Rest Room Locations

Break/Lunch Room

Comments and Questions Etiquette

Amateur Radio Communications Course Level I

Course Book: ARECC Level I, 3rd Edition

PG, COL & PP Notes on Slides:

- PG – Page
- COL – Column of text on the page.
- PP- Paragraph – Number of complete paragraphs from the top of the column. Also, “Top” and “Final” or “Last” may be used.

Test Preparations Suggestions for Students:

- Read each chapter through completely.
- Answer each question and note where in the text that the answer is located.
- Hi-Lite the sections of the text that apply to each question.
- Review the Hi-Lited areas of the text and their associated questions to prepare for the ARECC Level I test.

Introduction to Emergency Communication LU 1

Day-to-Day Versus Emergency Communications

- Emergency communications include both amateurs and professionals.
- Emergency operations happen in real time.
- Emergency communications are often dealing with several continuous nets simultaneously to pass critical messages within a limited time frame.
- Emergency communicators may need to organize and coordinate field operations with little or no warning.
- Emergency communicators may need to interact with several key organizations simultaneously.
- Emergency stations must be portable and be set up and operational anywhere in a very short time.

Introduction to Emergency Communication LU 1

Day-to-Day Versus Emergency Communications (Continued)

- Emergency communicators need to contact specific stations quickly to pass important messages.
- Emergency operations have no schedule – They could last for days!
- Unlike commercial operations, amateur radio emergency communicators have the equipment and skills to create additional capacity in a very short time.

Introduction to Emergency Communication LU 1

The Mission

- **The job you will be asked to do will vary with the agency you serve:**
  - **Red Cross Shelters**
  - **State wide emergency communications support**
  - **Hospital communications support**
  - **Forest fire communications support**
  - **Search and rescue**
  - **SKYWARN support for the National Weather Service**

Introduction to Emergency Communication LU 1

Communications is Job #1

- VHF/UHF/HF Radios
- Phone and FAX
- CB, FMS and GMRS
- The agency's radio communications equipment

Introduction to Emergency Communication LU 1

Anatomy of a Communication Emergency

- In the early phases of many disasters (except earth quakes, tornados, explosions, etc.) there is usually no need for emergency communication services.
- A "Watch" or "Warning" period gives you time to monitor developments and prepare to deploy while monitoring the NWS broadcasts.
- A supported agency or Emergency Operations Center (EOC) may put out a call for volunteers to deploy to field locations.
- A Rapid Response Team (RRT) may be deployed with a one hour notice.
- Communications assignments are made and supported until relieved.
- After the operation, a review of the effectiveness of its response by the supported agency, either alone by the amateur radio communicator or with the agency. This should be accomplished ASAP after operations have ended while the events are clear in everyone's mind.

Amateur Radio Communications Course Level I

LU 1-1 When does a communication emergency exist?

A. Whenever the public is at risk.

B. When there is an earthquake in your area and the public is inconvenienced.

C. When a critical communication system fails and the public is inconvenienced.

D. When a critical communication system fails and the public is put at risk. (PG 5, COL 1, PP 1)

LU 1-2 Which of the following is it most important for an emcomm group to do at the end of an emergency communication operation?

A. Review the effectiveness of its response. (PG 8, COL 1, PP 1)

B. Take photos of the activity.

C. Call the local newspaper to schedule interviews.

D. Review the activities of the first responders.

Amateur Radio Communications Course Level I

LU 1-3 Which of the following is it NOT a responsibility of emergency communicators?

A. **Making demands on the agency being supported. (PG 6, COL 2, PP 3)**

B. **Having radios, frequencies and basic radio skills.**

C. **Being licensed and preauthorized for national and international communications.**

D. **Possessing emergency communications skills.**

LU 1-4 Which of the following describes the function of a Rapid Response Team (RRT)?

A. **To Handle large-scale emergencies over an extended period.**

B. **To deploy a quick response in a very short time. (PG 7, COL 2, PP Last)**

C. **To establish and operate a storm watch prior to any emergency.**

D. **To review of the effectiveness of an emergency communications group.**

Amateur Radio Communications Course Level I

LU 1-5 In an emergency situation – when a served agency asks you to forward an urgent message – which of the following methods would you NOT employ?

A. CB radio

B. Family radio

C. Informal, conversational grapevine (PG 7 COL 2, PP 2)

D. The served agency's own radio system.

Amateurs as Professionals - The Served Agency Relationship LU 2

Who Works for Whom

- The relationship between the volunteer communicator and the served agency will vary somewhat from situation to situation, but the fact is that *you work for them*.
- Your job is to meet the communication needs of the served agency.
- When you volunteer your services to an organization, you implicitly agree to accept and comply with reasonable orders and requests from your "employer."
- When asked to do something not permitted by FCC rules, regardless of the reason, respectfully explain the situation and work with the served agency or your superiors to come up with an alternative solution.

Amateurs as Professionals – The Served Agency Relationship LU 2

How Professional Emergency Responders Often View Volunteers

- Unless a positive and long established relationship exists between professionals and volunteers, professionals who do not work regularly with competent volunteers are likely to look at them as “less than useful.”
- Volunteers are often viewed as “part timers” whose skill level and dedication to the job vary widely.
- If your offer of assistance is refused, do not press the issue.
- Remember: the served agency’s authority should never be challenged – They are in charge, and you are not.

Amateurs as Professionals – The Served Agency Relationship LU 2

Performing Non-Communication Roles

- In today's fast paced emergency responses, your job description will more than likely be "any function that also includes communication," as defined by the served agency.
- Emergency communication groups should engage in pre-planning with the served agency to ensue that these jobs are clearly defined.
- Assignments could include radio operator, dispatcher, resource coordinator, field observer, damage assessor, van operator, etc.
- You may need to complete task-specific training courses and take part in exercises and drills in addition to those required for emergency communication and Amateur Radio.

Amateurs as Professionals – The Served Agency Relationship LU 2

Specific Agency Relationships

- The relationship between the volunteer and the served agency can vary greatly from agency to agency, and even within an agency.
- "Memorandums of Understanding" MOU's, "Statements of Understanding" SOU's, "Statements of Affiliation" SOA's are in place with many served agencies, i.e. DHS, FEMA, American Red Cross, The Salvation Army (SATERN), state and local Emergency Management and SKYWARN.
- In Palm Beach County ARES members are also RACES registered operators.

Amateurs as Professionals – The Served Agency Relationship LU 2

Talking to the Press

- **The press should *never* get information regarding the served agency or its efforts from *you*. Politely refer all such inquiries to the served agency's spokesperson.**
- **If you must say something, only discuss your part of the emergency communication effort, but only if you are part of a separate emcomm group such as ARES, and *only if that organization's policy permits it*.**
- **In ARES, the spokesperson is the Public Information Officer (PIO).**
- **Know in advance how your organization or served agency would like you to deal with press issues.**

Amateurs as Professionals – The Served Agency Relationship LU 2

Volunteering Where You Are Not Known

- If an emergency occurs outside of your area and you wish to offer your services, make your offer before making any significant preparations or leaving home.
- It is possible that your offer might be accepted, but, it is equally possible that it will be refused. There are good reasons for this, particularly where the served agency has specific requirements, such as specialized training requirements, official ID's and/or background checks.

Amateurs as Professionals – The Served Agency Relationship LU 2

Volunteering where You Are Not Known (Continued)

- If your offer of assistance is accepted, the situation you find may be well organized or not.
- A well organized effort will have someone to help orient you to the response effort, provide required information and answer your questions. You assignment will be clear, a relief person sent at the end of a pre-determined shift, and arrangements for food, sanitation and sleep will be explained to you.
- If the effort is not well organized, you might be given an assignment, but with little additional information or support. You will have to improvise and fend for yourself.

Amateurs as Professionals – The Served Agency Relationship LU 2

Workers Compensation Coverage and Legal Protections

- In some states, Worker Compensation insurance coverage can be extended to volunteers working in behalf of a government or non-profit agency.
- Volunteers providing services to government agencies or Section 501 c (3) tax-exempt private organizations are provided immunity from liability by Federal law through the Volunteer Protection Act of 1997, 42 USC Section 14501.
- The law does not cover volunteers who cause harm while operating motor vehicles, or if the volunteer is grossly negligent, or engages in criminal acts.

Amateurs as Professionals – The Served Agency Relationship LU 2

Student Activity

- **Review the SOU between the American Red Cross and the ARRL. List three forms of assistance that the Red Cross may request of ARRL, ARES and NTS.**
- **Answer: "Whenever there is a disaster requiring the use of amateur radio communications facilities, the Red Cross, through its local chapter or through the national sector, may request the assistance of the ARES and NTS near the scene of the disaster. This assistance may include: alert and mobilization of ARRL amateur radio volunteer emergency communications personnel in accordance with a prearranged plan, establishment and maintenance of fixed, mobile, and portable station emergency communication facilities for local radio coverage and point-to-point contact between American Red Cross personnel and locations and maintenance of the continuity of communications for the duration of the emergency period until normal communications channels are substantially restored, or until Amateur Radio communications are no longer necessary in support of the response to the disaster."**

Amateur Radio Communications Course Level I

LU 2-1 Which of the following best describes your main job as an emergency communicator?

A. Dispatcher. Organizing the flow of vehicles. Personnel, and supplies.

B. Weather spotter.

C. Radio operator, using Amateur or served agency radio systems. (PG 12, COL 2, PP 4)

D. Resources coordinator, organizing the assignments of disaster relief volunteers.

LU 2-2 Which of the following best describes the role of a modern emergency coordinator?

A. You are strictly limited to communication tasks.

B. You may be asked to serve any function that includes communication. (PG 12, COL 2, PP 4)

C. You do anything the served agency asks.

D. You transmit and receive messages.

Amateur Radio Communications Course Level I

LU 2-3 If you are asked by a served agency to perform a task that falls outside FCC rules, which of the following is a proper response?

A. Document the request, and then do what is asked.

B. Document the request, but refuse to do it.

C. Leave immediately.

D. Discuss the situation with the served agency, and develop an alternative solution. (PG 11, COL 2, PP Last)

LU 2-4 In an emergency situation, which of the following is the most appropriate response that you as an emcomm group member can make to a inquiry from the press?

A. Answer any question that you are asked.

B. Volunteer information and make yourself helpful to them.

C. Refer all inquiries to the served agency's public information officer (PIO). (PP 14, COL 1, PP First)

D. Ignore them and hope they will go away.

Amateur Radio Communications Course Level I

LU 2-5 Which of the following will most affect your relationship with a served agency?

A. Your radio and electronic equipment.

B. Your knowledge of FCC regulations.

C. Your attitude. (PG 11, COL 1, PP 1)

D. Your radio skills.

Network Theory and the Design of Emergency Communications Systems LU 3

- **The study of information transfer between multiple points is known as "network theory."**
- **During an emergency, the available communication pathways vary in how well they handle messages having different characteristics.**
- **The best pathway is that which can transfer the information with the most efficiency, tying up the communication resources the least amount of time, and getting the information transferred most accurately and dependably.**

Network Theory and the Design of Emergency Communications Systems LU 3

Single verses multiple destinations

- Some messages are for one single addressee while others need to be received by multiple locations simultaneously.
- A specific instruction to a particular shelter manager is a completely different kind of communication than an announcement to all shelters.
- Yet, it is common to hear these messages on the same communications channel.

Network Theory and the Design of Emergency Communications Systems LU 3

High Precision verses Low Precision

- Precision is not the same as accuracy.
- All messages must be received accurately. But, sending a list of names or numbers requires precision at the "character" level, while a report that "the lost hiker has been found" does not.
- Over low-precision communications channels (such as voice modes) even letters can be misinterpreted unless a phonetic system, feedback or error-correcting mechanism is used.
- Conversely, sending low priority logistics information over a high-precision packet link may be more time consuming that a voice report.

Network Theory and the Design of Emergency Communications Systems LU 3

Complexity

- Long complicated messages can confuse the recipient.
- Detailed maps, long lists, complicated directions and diagrams are best put in hard copy or electronic storage for later reference. This will lessen or completely avoid the need to repeat and ask for “fills.”
- FAX and packet radio modes, by there very nature generate a reference copy.

Network Theory and the Design of Emergency Communications Systems LU 3

Timeliness

- Highly time-critical messages must get through without delay.
- Timeliness also relates to the establishment of a communications link, i.e. telephone, FAX, voice, etc.
- What matters is the total elapsed time from the time the message originates to the time it is delivered to its final party.

Network Theory and the Design of Emergency Communications Systems LU 3

Priority

- The concept of priority as used by Network Theory is better know to hams as QSK, the ability to “break in” on a communication in progress.
- Some communications modes and equipment allow for this; others do not.

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels

- **Telephones – This voiced-based mode is surprisingly reliable. However, it can become overloaded during large scale disasters.**
  - **The telephone system is very good for transferring simple information requiring low precision.**
  - **The one-to-one communication pathway – It cannot be used for broadcasting.**
  - **Ideal for passing sensitive or confidential information, such as casualty lists.**
  - **Difficult or impossible to "break in" on a conversation for a higher priority message.**
  - **The system requires wires and cables that can be damaged or destroyed during severe weather.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **Cellular Phones – They are simple to operate, are lightweight and eliminate the need for tracking individuals as they move around.**
  - **Ideally suited for one-to-one communications.**
  - **They are unsuitable for multiple recipient messages that are better handled by a broadcast-capable communications mode.**
  - **They rely on a complex central switching and control system that is subject to failure or overloading.**
  - **There is no "go to simplex" contingency option with cellular phones.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **FAX – FAX machines overcome the limitations of voice communications when it comes to dealing with high-precision, lengthy and complex information.**
  - **FAX machines can transfer drawings, pictures, diagrams and maps – information that is practically impossible to transfer over voice channels.**
  - **FAX machines can be found at schools, churches, hospitals, government centers and other institutions involved in emergency disaster efforts.**
  - **They produce a permanent record of the message.**
  - **However, they rely on the telephone system and require 120VAC power.**
  - **Laptop PCs may have a battery powered fax modem installed that can be connected to the telephone system.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **Two-Way Voice Radio – Whether on the public service bands or ham frequencies, whether SB or FM, via repeater or simplex, voice radio is simple and easy to operate.**
  - **Most radios can operate on multiple frequencies making it a simple matter to increase the number of available communications channels.**
  - **These units are generally self-contained, portable, increasing the reliability of the system in adverse environmental conditions.**
  - **They are ideal for broadcasting.**
  - **They suffer from the low-precision inherent in voice modes of communication.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **Trunked Radio Systems – Similar to the standard voice radio communication systems described earlier with two exceptions:**
  - **First. They allow increased message density over fewer frequencies. But, during an emergency the communication needs skyrocket and a priority queue is established and messaged are delayed. Medium and low priority messages, and even some high-priority messages, may not get through.**
  - **Second. Trunked systems rely on a complex central signaling system to dynamically handle the mobile frequency requirements. When the central control unit goes down for any reason, the entire system must revert to a pre-determined simplex or repeater-based arrangement. This fallback is risky because of the small number of frequencies available.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **Packet Radio – Digital data modes, such as packet radio, ensure near perfect message transmission and reception accuracy and facilitate high-precision message transfer.**
  - **Like FAX machines they provide a relatively permanent record of the message for later reference.**
  - **Packet stations are generally self-contained, and if located within line-of-sight, do not need a central switching system.**
  - **This mode is perfect for the distribution of high-precision information to a large number of destinations simultaneously.**
  - **However, real time packet operators must use a key board, which makes this mode unacceptable for low-precision but lengthy messages.**

Network Theory and the Design of Emergency Communications Systems LU 3

Characteristics of Communications Channels (Continued)

- **Store-and-Forward Systems – Sometimes considered a subset of packet radio, bulletin boards, messaging gateways, electronic mailboxes, etc., can handle non-time-critical messages and reference material, in situations when the sender and receiver can not be available simultaneously.**
- **Other Modes – Slow-scan and fast-scan television, satellite communications, human couriers, the internet, e-mail and other modes have their own characteristics.**

Network Theory and the Design of Emergency Communications Systems LU 3

Planning and Preparation – The Keys to Success

- **Planning**
  - **Planners should give advance thought to the kinds of information that might need to be passed during each type of emergency. Will maps, long lists of names, addresses, etc. by passed.**
  - **Planners should consider the origins and destinations of the messages. Will dissemination to multiple remote sites be required? Will there be many one-on-one communications? How about store-and forward system requirements?**
  - **Will there be a need for break-in for pressing traffic?**
  - **How will confidential and sensitive information be passed?**
  - **How many messages will have to be handled?**

Network Theory and the Design of Emergency Communications Systems LU 3

Planning and Preparation – The Keys to Success

- **Preparation**
  - **Now that you have identified the ideal pathways for the most common messages, you now need to ensure that the needed modes will be available during the emergency.**
  - **Hams traditionally put together excellent "jump kit" emergency packs containing 2-meter radios, extra batteries and roll-up antennas. Include a list of critical phone numbers (including FAX, pager and cellular numbers) in the kit.**
  - **It is a good idea to include copies of the operating instructions for the FAX and copy machines you might have to use at the served agency.**
  - **Remember, if you plan for problems, they cease to be problems and become merely part of the plan.**

Amateur Radio Communications Course Level I

LU 3-1 What mode should be used to send a list of casualties ?

A. A VHF repeater system.

B. A secure mode. (PG 18, COL 2, PP Last)

C. PACKET RADIO.

D. An HF net.

LU 3-2 What types of messages are good to sent by fax ?

A. High precision, lengthy and complex messages. (PG 19, COL 1, PP last)

B. Simple low-precision, and short messages.

C. Messages to many destinations simultaneously.

D. High detail color photographs.

Amateur Radio Communications Course Level I

LU 3-3 What types of messages should be handled by a packet bulletin board ?

A. Time sensitive messages of immediate priority.

B. Low precision messages.

C. Non-time-critical messages and reference material, when the sender and receiver cannot be available simultaneously. (PG 20, COL 2, PP 4)

D. Messages to be “broadcast” to numerous stations.

LU 3-4 What is the pitfall that is common to telephone, cellular phone and trunked radio systems?

A. They do not take advantage of the benefits of Amateur Radio.

B. They are all difficult to use.

C. They are seldom available at shelters and public safety agencies.

D. They all require the use of a complex central switching system that is subject to failure in a disaster situation. (PG 19, COL 1, PP 2& Various)

Amateur Radio Communications Course Level I

LU 3-5 Which of the following is an example of an efficient communication?

A. A ham communicating a lengthy list of needed medical supplies over a voice net.

B. A lengthy exchange between two stations on a primary voice channel being shared by a numbers of users.

C. Typing out a digital message that "the delivery van containing coffee has arrived at this location" on a high-precision packet link.

D. Sending a shelter list on the office fax machine. (PG 17, COL 2, PP 2)

Emergency Communication Organization & Systems LU 4

- Imagine a random group of volunteers trying to tackle a full-scale disaster communication emergency, working together for the first time. They do not know each other well, have very different approaches to solving the same problem, and half of them want to be in charge.
- Ask anyone who has been around emcomm for a while – they have seen it!
- Emcomm organizations provide training, and a forum to share ideas and develop workable solutions to problems in advance of the real disaster.

Emergency Communication Organization & Systems LU 4

Amateur Radio Emergency Service (ARES)

- Sponsored by the American Radio Relay League since 1935. Composed of "Sections." Most Sections are entire states. Florida has two sections, North Florida and South Florida.
- The Section Emergency Coordinator (SEC) is appointed by the Section Manager.
- The District Emergency Coordinator (DEC) and Emergency Coordinator (EC), usually for a county, are also appointed by the Section Manager.
- The EC may appoint one or more Assistant Emergency Coordinators (AEC) as required.

Emergency Communication Organization & Systems LU 4

Amateur Radio Emergency Service (ARES) (Continued)

- ARES has Memoranda of Understanding (MOU's) with a variety of agencies at the national level, including FEMA, American Red Cross, Salvation Army and the National Weather Service.
- Local ARES groups often have MOU's or other written or verbal agreements with state, county and city emergency management departments, hospitals, schools, police and fire departments, public works agencies, and others.

Emergency Communication Organization & Systems LU 4

Radio Amateur Civil Emergency Service (RACES)

- Created by the federal government after WWII.
- The RACES rules addressed the need for Amateur Radio operators to function as an integral part of a state, county or local emergency management agencies in time of national emergency or war.
- The RACES authorization provides for the means to continue to serve the public even if the President of the FCC suspends regular Amateur operations. In this situation, the RACES rules provide for the use of almost all regular Amateur frequencies, but place strict limits on the types of communications made, and with whom.
- In Palm Beach County, ARES members are RACES-registered operators and can “switch hats” when the need arises.

Emergency Communication Organization & Systems LU 4

Salvation Army Team Emergency Radio Network (SATERN)

- SATERN members are also Salvation Army Volunteers. Their HF networks are used for both logistical communication between various Salvation Army offices and for health and welfare messages.
- AT the local level, ARES, REACT and other groups often help support the Salvation Army's operations.

Emergency Communication Organization & Systems LU 4

The Rapid Response Team (RRT)

- The RRT is a small team within a larger emcomm group. Their job is to put a few strategically placed stations on the air within the first half-hour to an hour. These stations will usually include the Emergency Operations Center (EOC), a resource net NCS, and often a few field teams where needed most. This is a Level 1 RRT response.
- A Level 2 RRT response follows within a few hours, bringing additional resources and operators.
- Level 1 teams have pre-assigned jobs, and short-term (12 – 24 hour) "jump kits," ready to go whenever the call comes. Level 2 teams have longer term (72 hours) "jump kits," and a variety of other equipment, including tents, portable repeaters, extended food and water, etc.

Emergency Communication Organization & Systems LU 4

ARES Mutual Assistance Team (ARESMAT)

- ARESMAT consists of hams who are willing and able to travel to another area for a period to assist ARES groups based in the disaster area.
- They may bring additional resources, radios, portable repeaters, antennas, and other critical equipment.
- Remember, the local ARES group is still in charge and you do what they need to be done! In this case the local ARES group becomes a served agency.

Emergency Communication Organization & Systems LU 4

Military Affiliate Radio Service (MARS)

- MARS is a Department of Defense sponsored auxiliary communication program.
- There are three separately managed and operated programs, Army MARS, Air Force MARS and Navy/Marine Corps MARS.
- MARS members are licensed hams who operate disciplined and structured nets on assigned military radio frequencies adjacent to the amateur bands.
- Special call signs are issued.
- The MARS system is specifically authorized to communicate with other government radio services in times of emergency, including the federal SHARES HF networks.

Emergency Communication Organization & Systems LU 4

National Traffic System (NTS)

- The NTS consists of local, regional and national nets operating on a regular basis to pass messages from place to place.

Emergency Communication Organization & Systems LU 4

National Communications System (NCS)

- A Federal agency, that consists of 23 government organizations tasked with ensuring that the Federal Government has the necessary communication capabilities under all conditions from day-to-day use to national emergencies and international crises.
- Includes the Forest Service, FEMA, Coast Guard, FBI, ATF and others.
- The Manager of NCS is the Director of Defense Information Systems Agency (DISA), usually an Air Force General.

Emergency Communication Organization & Systems LU 4

Shared Resources System (SHARES)

- Part of the NCS. It pairs certain MARS operators with various federal agencies and state emergency operations centers to provide a high frequency (HF) communication backbone if normal communications should fail.
- AT&T and the American Red Cross have SHARES radios.

Emergency Communication Organization & Systems LU 4

FEMA National Radio System (FNARS)

- This is a FEMA high frequency (HF) radio network designed to provide a minimal essential emergency communication capability among federal agencies, state, local commonwealth, and territorial governments in times of national, natural and civil emergencies.
- FNARS radios are at a state's emergency operations center (EOC).

Emergency Communication Organization & Systems LU 4

Radio Emergency Associated Communications Teams (REACT)

- REACT is a national emcomm group, that includes Citizen's Band (CB) radio operators, Hams and others.
- In addition, they may use the General Mobile Radio Service (GMRS), Family Radio Service (FRS) and the Multiple Use Radio Service (MURS).
- REACT has MOU's with ARRL as well as other agencies.
- They offer crowd and traffic control, logistics, public education, and other services that usually (but not always) include a need for radio communication.

Emergency Communication Organization & Systems LU 4

Emergency Warning Systems

- Emergency Alert System (EAS) – Broadcast Radio & TV – These stations relay emergency alert messages from federal, state and local authorities.
- NOAA Weather Alert and National Weather Radio (NWR) – The National Weather Service (NWS) division of NOAA.
- Uses seven frequencies in the 162MHZ band for public broadcast.
- Specific Area Message Encoding (SAME): an alert mechanism that activates special radio receivers when the SAME code for a specific area is received.
- Do you have a weather alert radio?

Emergency Communication Organization & Systems LU 4

Emergency Warning Systems

- National Warning System (NAWAS) – A federal government maintained "hardened" and secure national phone network connecting the "warning points" in each state, usually the state police HQ or the state EOC.
- Located at NORAD's Cheyenne Mountain command and control complex in Colorado.
- Provides notification in case of enemy attack, and to inform and coordinate alert and warning formation.
- Statewide Warning Systems: Similar to NAWAS, but at a state level.
- National Earthquake Information Center (NEIC) – Run by the U.S. Geological Survey. It is located in Golden, Colorado. Issues rapid reports of earthquakes at least 4.5 on the Richter Scale in the United States, or 6.5 on the Richter Scale in the rest of the world.

Amateur Radio Communications Course Level I

LU 4-1 Which of the following best describes the ARES organizational structure?

A. ARRL – District-Section-County

B. ARRL – Section-District-County (PG 24, Fig 4-1)

C. ARRL – County-Region-Section

D. ARRL – State-Region-Section

LU 4-2 Which of the following best describes the ARES chain of command within a section?

C. Section Manager-Section Emergency Coordinator-District Emergency Coordinator-Emergency Coordinator-Assistant Emergency Coordinator (PG 28, COL 2, PP 1, 2 AND 3)

Amateur Radio Communications Course Level I

LU 4-3 Which of the following best describes a Level 2 RRT?

A. Is a first responder in any emergency.

B. Operates a few strategically placed stations within the first hour of an emergency.

C. Responds within a few hours and is prepared with longer term (72 hour) jump kits. (PG 25, COL 1, PP 2)

D. Always affiliated with SATERN.

LU 4-4 Which of the following best describes an ARES Mutual Assistance Team (ARESMAT)?

A. Is generally available for tasks lasting less than one day.

B. Is always from the local area.

C. An ARES team who are willing and able to travel to another area. (PG 25, COL 1, PP Last)

D. Is called out only when the President suspends regular Amateur operations.

Amateur Radio Communications Course Level I

LU 4-5 Which of the following is true about REACT?

A. REACT is a part of the ARRL.

B. REACT does not have an MOU with ARRL.

C. REACT's mission is more restricted than that of the ARRL.

D. REACT's resources include CB, Amateur Radio, GMRS, FRS, and MURS. (PG 26, COL 2, PP 2)

Served Agency Communication Systems LU 5

- Most served agencies will have their own communication systems and equipment.
- Many of these radio systems are quite different from ham radio, and special training may be required.

Served Agency Communication Systems LU 5

State and Local Government Radio Systems

- Licensed to police, sheriffs, highway and other state, county, or city departments.
- On air standard operating procedures will be different than those in ham radio.
- They may also use a non-ITU phonetic alphabets and “10 codes.”

Served Agency Communication Systems LU 5

Medical Radio Systems

- An older system, “MedStar,” used 10 simplex VHF frequencies with a dial type pulsed-tone encoder to signal specific hospitals.
- The newer Emergency Medical Radio Service uses 10 UHF duplex frequency pairs; one assigned to each hospital, the other to the ambulance and seven VHF simplex channels. The UHF channels are identified as “Med 1” through “Med 10.”

Served Agency Communication Systems LU 5

American Red Cross (ARC)

- They have a national FCC licensed frequency (47.42Mhz) that can be used by all ARC chapters. This frequency is intended primarily for disaster or emergency operations.
- Some chapters may use 47.50Mhz and/or rent space on commercial systems.

Served Agency Communication Systems LU 5

Types of Served-Agency Radio Systems

- **Community Repeater Systems**
  - **A "community" or "shared" repeater system uses different Continuous Tone Squelch System (CTCSS) tones for each of several user groups.**
  - **In an emergency situation, these shared channel systems can become overloaded. Non-essential communications may be moved over to an Amateur system under these conditions.**
- **Trunked Systems**
  - **They use several co-located repeaters tied together, using computer control to automatically switch a call to an available repeater. When one radio of the group moves to a new frequency, all the others in the group automatically follow.**
  - **Most trunked systems suffer from a lack of reserve capacity and can become quickly overloaded.**

Served Agency Communication Systems LU 5

Types of Served-Agency Radio Systems

- **Association of Public Safety Communications Officers (APCO) Project 25 Radio Systems**
  - **The P25 radio systems are extremely flexible, with both forward and backward compatibility.**
  - **They can be configured to operate in both analog and digital modes and as part of trunked and conventional radio systems.**
  - **Specialized training will be required to operate this equipment.**
- **Telephone Systems**
  - **Your served agency may have a telephone system with many options and functions. If you will be required to use their telephone system, make sure you get the appropriate specialized training and obtain a copy of the system operating manual as part of your emergency kit.**

Served Agency Communication Systems LU 5

Types of Served-Agency Radio Systems

- **Satellite Telephones**
  - **Some phones or terminals require that an antenna be pointed directly at the satellite, others do not, but all require line-of-site to the satellite.**
  - **Besides voice, paging and FAX capabilities are available.**
  - **Again, if you are going to operate one of these systems, request the appropriate training and get a copy of the operating manual.**
- **Satellite Data Systems**
  - **Most popular system is the NOAA Emergency Management Weather Information System (EMWINS) which provides up to the second weather maps and information.**

Served Agency Communication Systems LU 5

Types of Served-Agency Radio Systems

- **Other Agency-operated Equipment**
  - **In addition to radio and telephone, you may need to use fax machines, copiers, computers, emergency power, security and surveillance systems.**
  - **If you may be required to use or operate any of these equipment types, get a copy of the manuals, or at least get the specialized training necessary to operate them safely and efficiently.**

Amateur Radio Communications Course Level I

LU 5-1 When emcomm team members are called upon to operate on Public Safety Radio Systems, which of the following may they not do?

A. Use special "10 codes."

B. Use the served agency's standard operating procedure.

C. Use the phonetic alphabet employed by the served agency.

D. Engage in casual conversations. (PG 29, COL 1, PP 2)

LU 5-2 Which of the following is another trademarked version of Continuous Tone Coded Squelch System (CTCSS)?

A. Private Guard.

B. Private Channel.

C. Line Guard.

D. Private Line. (PG 29, COL Objectives Box, PG Top of Page)

Amateur Radio Communications Course Level I

LU 5-3 Which of the following best describes the newer Emergency Medical Radio Services?

A. Ten UHF duplex frequencies and seven VHF simplex channels. (PG 30, COL 2, PP 2)

B. Ten simplex VHF frequencies with pulsed tone encoders for each hospital.

C. Seven UHF duplex frequencies and ten VHF simplex channels.

D. The MedStar system with channels Med 1 through Med 10.

LU 5-4 Which of the following statements is true about trunked systems?

A. Trunked systems are able to operate without the use of computer controllers.

B. The number of frequencies on a trunked system is always a multiple of 10.

C. Amateur radio does not currently use this type of system. (PG 31, COL 1, PP End of top paragraph)

D. Most trunked systems have ample reserve capacity.

Amateur Radio Communications Course Level I

LU 5-5 When emcomm teams work with a served agency, a number of assumptions are made. Which of the following assumptions are true?

A. **Amateur Radio operators can operate any communications equipment they encounter.**

B. **There are NO significant differences between Amateur Radio operating procedures and the procedures used by the served agencies.**

C. **Served agencies must provide training if Amateur Radio operators are to be used effectively. (PG 32, COL 2, PP Last)**

D. **All phonetic alphabets are essentially the same and are thus interchangeable.**

Basic Communication Skills LU 6

Introduction

- An emergency communicator must do his or her best part to get every message to its intended recipient, quickly, accurately, and with a minimum of fuss.
- A number of 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 an emergency, any given message can have huge and often unintended consequences.
- An unclear message, or one that is modified, delayed, miss-delivered or never delivered at all can have disastrous results.

Basic Communication Skills LU 6

Communication Skills

- **Listening**
  - **Listening is at least 50% of communication.**
  - **Listening also means avoiding unnecessary transmissions.**
  - **Local ambient noise and/or weak radio signal conditions may make it difficult to perform your emergency communication responsibilities. A set of head phones can help under these conditions.**
- **Microphone Techniques**
  - **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. Speak a little slower and pause longer between transmissions.**
  - **Voice operated transmissions (VOX) are not recommended for emergency communications.**

Basic Communication Skills LU 6

Communication Skills

- **Brevity & Clarity**
  - Each communication should consist of only the information necessary to get the message across clearly and accurately.
  - If you are the author of a message, change the wording as necessary to make it as clear and short as practical. If you are not the author, work with the author to achieve same.
  - If you can not locate the author, pass the message as stated with any errors or redundancies included. DO NOT CHANGE MESSAGES!
  - Communicate one complete subject at a time.
- **Plain Language**
  - All messages and communications during an emergency should be in plain language.
  - "Q" signals (except in CW communications) or "10 codes" and similar jargon should be avoided.
  - Avoid words or phrases that carry strong emotions.

Basic Communication Skills LU 6

Communication Skills

- **Phonetics**
  - **Certain words in a message may not be immediately understood. The best way to be sure it is correctly understood is to spell it.**
  - **Use the ITU phonetic Alphabet unless the served agency requests that you use their standardized phonetic alphabet.**
  - **Numbers are always pronounced individually. The number "sixty" is pronounced as "six zero."**
  - **Standard practice for unusual words is to first say the word, then say "I spell," then spell the word phonetically.**

Basic Communication Skills LU 6

Communication Skills

- **Pro-words**
  - **Pro-words, called "pro-signs" when sent in Morse code or digital modes, are procedural terms with specific meanings.**
  - **Clear – End of Contact.**
  - **Over – Used to let a specific station know to respond.**
  - **Go ahead – Used to indicate that a station may respond.**
  - **Out – Leaving the air, will not be listening.**
  - **Stand by – A temporary interruption of the contact.**
  - **Roger – Indicates that a transmission has been received correctly and in full.**

Basic Communication Skills LU 6

Communication Skills

- **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. 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.**
  - **Tactical call signs are usually pre-assigned by the served agency. However, if one does not already exist, the NCS may assign a tactical call sign as each location is "opened."**
  - **In a directed net, you, as "AID 3," may call the NCS by "Net, AID 3," or just "AID3" on a busy net. If you have traffic, say "AID 3, emergency (or priority) traffic."**
  - **To pass traffic to a specific station, i.e. Firebase 5, say "AID 3, priority traffic for Firebase 5." The NCS will then direct "Firebase 5, contact AID 3 for priority traffic."**

Basic Communication Skills LU 6

Communication Skills

- **Station Identification**
  - **The FCC requires that you identify at ten-minute intervals during a conversation and at the end of the last transmission.**
  - **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. This tells the NCS that you consider the exchange complete and fulfills all FCC identification requirements.**

Amateur Radio Communications Course Level I

LU 6-1 In emergency communications, which of the following is NOT true?

A. Listening is only about 10% of communication. (PP 35, COL 1, PP 3)

B. Any message can have huge and unintended consequences.

C. A message that is never delivered can yield disastrous results.

D. Listening also means avoiding unnecessary communications.

LU 6-2 Which of the following procedures is best for using a microphone?

A. Hold the microphone just off the tip of your nose.

B. Talk across, rather than into, your microphone. (PG 35, COL 2, PP 2)

C. Shout into the microphone to insure that you are heard at the receiving end.

D. Whenever possible, use voice operated transmissions (VOX).

Amateur Radio Communications Course Level I

LU 6-3 In emergency communications, which of the following is true?

A. Never use "10 codes" on Amateur Radio. (PG 37, COL 1, PP 1)

B. Use "Q signals" on served-agency radio systems.

C. Under NO circumstances use Q" signals on a CW net.

D. Use technical jargon when you feel that it is appropriate.

LU 6-4 Which of the following is always true of a tactical net?

A. Personal call signs are never used.

B. Personal call signs are always preferred.

C. Personal call signs are required at ten-minute intervals or at the end of your last transmission.

D. Personal call signs are required at ten-minute intervals during a conversation and at then end of your last transmission. (PG 38, COL 2, PP 5)

Amateur Radio Communications Course Level I

LU 6-5 which of the following is the most efficient way to end an exchange on a tactical net

A. Say "Over".

B. Say "Roger".

C. Give your FCC call sign. (PG 38, COL 2, PP 6)

D. Ask Net Control if there are any further messages for you.

Introduction to Emergency Nets LU 7

Emergency Nets

- **What is an Emergency Net?**
  - **An "Emergency Net" is a group of stations who provide communication to one or more served agencies, or to the general public, in a communications emergency.**
- **Net Formats**
  - **Directed (formal) Nets: A Net Control Station (NCS) organizes and controls all activity.**
    - **To call another station you must get permission from the NCS.**
    - **The best format when there are a large number of member stations.**
  - **Open (informal) Nets: A Net Control Station (NCS) is optional. Stations may call each other directly. Used when there are few stations and minimal traffic. There may still be an NCS, but he or she usually exerts little or no control.**

Introduction to Emergency Nets LU 7

Emergency Nets

- **Types of Emergency Nets**
  - **Traffic Net – Handles formal written messages in a specified (i.e. ARRL, ICS 213, etc.) format. The National Traffic System (NTS) and ARES or RACES nets are examples.**
  - **Tactical Nets – Used for real-time coordination of activities related to the emergency. They tend to be fast moving and less formal.**
  - **A "Resource" or "Logistics" Net – May be needed to acquire resources and volunteers, and handle assignments.**
  - **Information Net – An open net used to collect or share information on a developing situation, without overly restricting the use of the frequency by others.**
- **Checking into an Emergency Net**
  - **You need to "check in" to a net when you first join and/or when you have messages, questions or information to send.**
  - **To become part of a Directed Net, wait for the NCS to call for "check ins."**
  - **DO not be surprised if you receive a cool reception to your offer of assistance.**

Introduction to Emergency Nets LU 7

Emergency Nets

- **Passing Messages**
  - **If you told the NCS that you had traffic 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 on the frequency or another frequency.**
  - **The NCS will then ask you to send your message by requesting that the receiving station call you for your traffic.**
  - **The NCS may authorize that you contact the receiving station directly by saying "(your station) 'go direct to' (receiving station)."**
- **"Breaking" the Net**
  - **If the net is in progress, wait for a pause between communications and simply say "Break, (Your call)." The NCS will say "Go Ahead (Your call)."**

Introduction to Emergency Nets LU 7

Emergency Nets

- **Checking Out of an Emergency Net**
  - ❖ **Always let the NCS know when you are leaving the net, even for a few minutes.**
  - ❖ **There are three reasons for checking out of (leaving) a net.**
    - ➢ **The location of your station is closing.**
    - ➢ **You need a break and there are no relief operators.**
    - ➢ **You have turned the station over to another operator.**
  - ❖ **There are two special situations to be aware of:**
    - ➢ **If someone in authority asks you to move your station, do so immediately and without argument.**
    - ➢ **If you are requested by someone in authority to turn off your radio, or refrain from transmitting, do so immediately and without question.**

Introduction to Emergency Nets LU 7

Emergency Nets

- **Levels of Nets**
  - **Networks are often "layered." There may be local nets, area nets and national nets. Message traffic can be passed between nets, i.e. local to area to national and back down. This network is called the National Traffic System (NTS).**
- **The Nets of the National Traffic System (NTS)**
  - **The NTS was created by the ARRL in 1949 to handle medium and long distance traffic.**
  - **The NTS is a layered set of nets, beginning at the local level with the Local nets and continuing through the Section Nets, Region Nets, Area Nets and finally the Transcontinental Corps.**
  - **Assigned "liaison" stations pass messages between various nets as necessary to reach their final destination.**
  - **Each message follows a pre-determined path to its destination.**

Introduction to Emergency Nets LU 7

Emergency Nets

- **Non-Voice Nets**
  - **High speed CW nets can actually handle more messages per hour than most voice nets.**
  - **Packet communication on VHF and UHF is often used for local communication where accuracy and a record of the message is required.**
  - **HF Digital modes such as AMTOR and PACTOR are used for long distance circuits.**
  - **Amateurs are currently experimenting with PSK31 on both HF and VHF/UHF bands.**
  - **WinLink 2000 is an automatic system that blends radio and Internet transmission paths to permit rapid and seamless email transfer to stations anywhere on Earth. For most emergencies, it will be possible for stations in the affected area to link to a WinLink 2000 PACTOR node outside the affected area, allowing rapid contact with the outside world.**

Amateur Radio Communications Course Level I

LU 7-1 Which of the following best describes a net?

A. A group of stations that purposely frequent the airwaves.

B. A group of stations who gather on one frequency with a purpose. (PG 41, COL Objectives Box, PP Definitions)

C. A group of stations who occasionally meet on various frequencies.

D. A group of stations who propose to meet at a particular time.

LU 7-2 What is a major difference between an "open net" and a "directed net"?

A. The presence or absence of full control by a Net Control Station. (PG 41, COL 1 & 2, PP Net Formats)

B. The presence or absence of formal traffic.

C. The type of radio traffic on the net.

D. The approval or sanction of net operations by the FCC.

Amateur Radio Communications Course Level I

LU 7-3 Which of the following is true of a "tactical net"?

A. The net is used to acquire volunteers and handle assignments.

B. The net is used for the coordination of activities associated with future emergencies.

C. The net may be directed or open, but will usually have a Net Control Station. (PG 42, COL 1, PP 2)

D. The net handles only formal traffic.

LU 7-4 When should you check into an emergency net?

A. When you want to comment on something that someone else has said.

B. When you are tired of listening.

C. When you first join the net and when you have messages, questions or relevant information. (PG 42, COL 1, PP Last)

D. When you first join the net and when you would like to send greetings to one of the participating stations.

LU 7-5 What is the most frequent cause of errors on voice nets?

A. Speaking too softly.

B. Speaking too rapidly. (PG 35, COL 2, PP 3)

C. Failure to write down the message before sending it.

D. Failure to copy the message exactly as it was received.

Basic Message Handling Part 1 LU 8

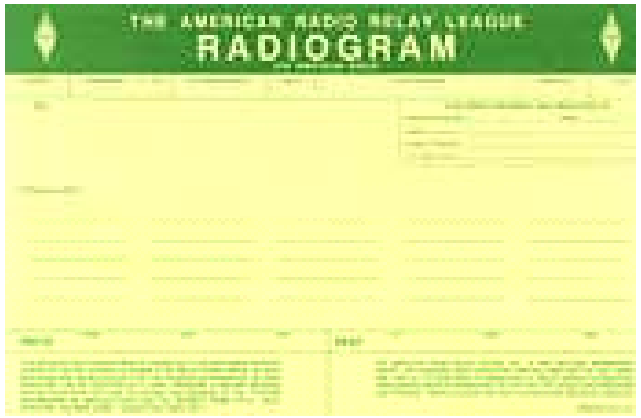
Formal vs. Informal Messages

- In general, informal messages are best used for non-critical and simple messages, or messages that require immediate action, those are delivered directly from the author to the recipient.
- Formal messages are more appropriate when two or more people will handle them before reaching the recipient, or where the contents are critical and contain important details.

Basic Message Handling Part 1
LU 8

The Standard ARRL Radiogram

- **The ARRL Radiogram is a standard format for passing messages on various nets, and is required for all messages sent through the National Traffic System.**
- **It serves as a baseline that can be readily adapted for use within a specific served agency.**



Basic Message Handling Part 1 LU 8

Components of the Standard ARRL Radiogram

- The "Preamble" – The header. Consists of administrative data, i.e. Message number, precedence, handling, and date and time of origination.
- The "Address" – The "to" block. Includes the name, address, city, state and Zip code of the recipient. It should also include a telephone number as most Radiograms are ultimately delivered with a local phone call.
- The Text" - Limited to 25 words or less. Punctuation is not used! The "X" may be used to separate phrases or sentences, but never at the end of the text.
- The "Signature" – A full name and title, a name and call sign, or a single name.

Basic Message Handling Part 1 LU 8

Details of the Preamble

- There are eight (8) sections or blocks in the preamble. Two of them, "time filed" and "handling instructions," are optional for most messages.
- Block #1 – Message Number – Any number assigned by the originating station. Common practice is to start with the number "1" at the beginning of the emergency operation. Alphanumeric combinations are acceptable, but not recommended.

Basic Message Handling Part 1 LU 8

Details of the Preamble

- **Block #2 – Precedence – The relative urgency of the message. There are four levels of precedence:**
  - **Routine – "R" – Most day-to-day message traffic.**
  - **Welfare – "W" – Used for an injury as to the health and welfare of an individual in a disaster area, or a message from a disaster victim to friends and family.**
  - **Priority – "P" – Time limited messages. Only used with official traffic to, from or related to a disaster area.**
  - **EMERGENCY – "EMERGENCY" – No abbreviation. Used for life or death situations. Due to lack of privacy on radio, EMERGENCY messages should only be sent via Amateur Radio when regular communication facilities are not available.**

Basic Message Handling Part 1 LU 8

Details of the Preamble

- **Block #3 – Handling Instructions – The seven standard HX pro-signs are:**
  - **HXA – Collect telephone delivery authorized.**
  - **HXB – Cancel if not delivered in (X) hours of filing time.**
  - **HXC – Report to originating station date and time of delivery.**
  - **HXD – Report to originating station, relay station and date and time of delivery.**
  - **HXE – Get and send reply from addressee.**
  - **HXF – Hold delivery until (specify date).**
  - **HXG – Deliver by mail or telephone. If expense involved, cancel message.**
  - **HX combinations can be used, i.e. HXAC.**

Basic Message Handling Part 1 LU 8

Details of the Preamble

- **Block # 4 – Station of Origin – First station to put message in NTS format.**
- **Block #5 – The check – Number of words in the text section only. The originating station counts the number of text words and the receiving station confirms the number upon receipt.**
- **Block #6 – Place of Origin – The name of the community, building, or agency where the originator is located, whether a ham or not.**
- **Block #7 – Time Filed – This is an optional field unless handling instruction "HXB" is used. During emergencies, it is better to use local time indicators such as PST or EDT.**

Basic Message Handling Part 1 LU 8

Details of the Preamble

- **Block #8 – Date – The date that the message was first placed into the traffic system. Use same date as the time zone in Block #7.**
- **Header Example:**
  - **CW – NR207 P HXE W1FN 10 LEBANON NH 1200EST JAN 4**
  - **Spoken – "Number two zero seven Priority HX Echo Whiskey One Foxtrot November One Zero Lebanon NH One Two Zero Zero EST January 4."**

Basic Message Handling Part 1 LU 8

Pro-Words and Pro-Signs

- When sending formal traffic, standard “pro-words” or “pro-signs” (CW) are used to begin or end parts of the message, and to ask for portions of the message to be repeated. They save considerable time and confusion.
- ARRL Form FSD-218 – Available on-line at arrl.org.

Amateur Radio Communications Course Level I

LU 8-1 The preamble to an ARRL radiogram message contains a block called "Precedence." Which of the following represents the correct precedence for an EMERGENCY message?

A. "URGENT."
B. "U."
C. "EMERGENCY." (PG 49, COL 1, PP 5)
D. "E."

LU 8-2 The preamble to an ARRL Radiogram message contains a block called "Handling Instructions." What is the meaning of the handling instruction "HXE"?

A. Delivering station to get and send reply from addressee. (PG 49, COL 2, PP Top)
B. Report date and time of delivery to the originating station.
C. Cancel message if not delivered within (X) hours of filing time.
D. Collect telephone delivery authorized.

Amateur Radio Communications Course Level I

LU 8-3 ARRL Radiogram messages contains a block called "Time Filed." Which of the following is true of entries in that block?

A. This field is always completed.

B. Time entries are always Universal Coordinated Time.

C. During emergencies "local time" is used. (PG 50, COL 2, PP Top)

D. During emergencies "local time" along with the local date is used.

LU 8-4 ARRL Radiogram messages contains a block called "The Check." Which of the following is true of entries in that block?

A. The check contains a count of the words in the entire message.

B. The check contains a count of the words in the preamble and the text of the message.

C. The check contains a count of the words in the preamble, address and text of the message.

D. The check contains a count of the words in the text of the message. (PG 49, COL 2, PP Last)

LU 8-5 Which of the following statements is true of the punctuation within an ARRL Radiogram?

A. **Punctuation is always helpful; it should be used whenever possible.**

B. **Punctuation is rarely helpful; it should never be used.**

C. **Punctuation should be used only when it is essential to the meaning of the message. (PG 48, COL 2, PP Top)**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **General Comments**
  - ❖ **Do not speculate on anything relating to an emergency! There are many people listening and any incorrect information could cause serious problems for the served agency.**
  - ❖ **You do not want to be the source of a rumor.**
  - ❖ **Pass messages exactly as written or spoken. Send text with misspelled words or confusing text exactly as received. Only the originator of the message may make changes.**
  - ❖ **Non-Standard Format Messages should be passed exactly as received. This applies to most of the tactical messages passed during an emergency.**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **The Importance of the Signature**
  - ❖ **It is critical that you include the signature and title of the sender of every message.**
  - ❖ **Because, the message may include requests for expensive and limited shelf life supplies, or for agencies that will only respond for properly authorized requests, i.e. Medivac helicopters, blood supplies, prescription medicines, etc.**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **ARRL Numbered Radiograms**
  - ❖ These are a standardized list of often-used phrases (ARRL Form FSD-3).
  - ❖ Each phrase on the list is assigned a number.
  - ❖ There are two groups:
    - ➢ Group One – 26 phrases numbered consecutively from “ONE” to “TWENTY SIX” and preceded by the letters “ARL.”
    - ➢ Group Two – 21 routine messages.
  - ❖ Be sure to decode a message containing an ARL text into plain language before delivering it.
  - ❖ A copy of FSD-3 can be obtained from arrl.org.

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **Copying Hints**
  - ❖ **The standard ARRL Radiogram form is set up for hand copying with spaces for each word.**
- **Modified Message Form for Disasters**
  - ❖ **A served agency may have a specific message form unique to their support functions or type of emergency.**
  - ❖ **A popular form is the Incident Command System (ICS) form ICS-213 uses by most government agencies.**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **Service Messages**
  - **A "service message" lets the originating station know the status of a message they have sent.**
  - **During emergencies, service messages should only be sent for Priority and Emergency messages.**
- **Logging and Record Keeping**
  - **An accurate record of formal messages handled and various aspects of your station's operation can be very useful, and is required by law in some cases.**
  - **Log all incoming and outgoing messages. Record the name of the sender, addressee, and station that passed the message to you.**
  - **The NCS may have another person maintain a station log when the net is busy.**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **Writing Techniques For Message Copying**
  - Logs should be neat and legible.
  - Logs that will become legal documents should always be written in permanent ink on consecutively numbered pages.
  - If a message, exchange or event should be logged, try to do so as soon as possible afterwards, or ask the NCS to add it as a notation in his log.
  - If there are other operators available, it is a good practice to assign one of them to log incoming and outgoing messages.

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **Message Authoring – Them or Us?**
  - **Should emcomm operators author (create) agency-related messages. Probably not. They usually have no direct authority and usually lack necessary knowledge.**
  - **If a served agency message originator request that you "take care of the wording for me," it is a good idea to get their final approval and signature before sending the message.**
  - **However, you may be able to generate an official message if you have been given the authority to do so.**
  - **Messages that deal solely with communications, i.e. frequencies, relief operators, etc. should be authored by the emcomm operator.**

Basic Message Handling Part 2 LU 9

Message Handling Rules

- **Message Security & Privacy**
  - ❖ **Information transmitted over Amateur Radio can never be totally secure, since FCC rules strictly prohibit us from using any code designed to obscure a message's actual meaning.**
  - ❖ **Messages sent via Amateur Radio should be treated as privileged information, and revealed only to those directly involved with sending, handling, or receiving the message.**
  - ❖ **Messages relating to the death of any specific person should never be sent via Amateur Radio. Sensitive messages should be sent using telephone, landline fax, courier, or a secure served-agency radio or data circuit.**

Amateur Radio Communications Course Level I

LU 9-1 As part of an emcomm group handling message traffic in a emergency, you are asked to forward a message that contains typographical errors. Which of the following is your best course of action?

A. Delay sending the message.

B. Forward the message exactly as received. (PG 55, COL 1, PP 3)

C. Return the message to the originating station.

D. On your own, correct the error in the message and forward it.

LU 9-2 As part of an EMCOMM net handling message traffic in an emergency, you are asked to forward a message in a non-standard format. Which of the following is your best course of action?

A. Delay sending the message until you have conferred with the originator.

B. Return the message to the originator.

C. On your own, rewrite the message in proper format and forward it.

D. Forward the message exactly as received. (PG 55, COL 2, PP 1)

Amateur Radio Communications Course Level I

LU 9-3 You have been asked to send an ARRL Radiogram dealing with birthday greetings. Which of the following is the correct way to write it in the message text?

A. ARRL 46

B. ARL 46

C. ARL FORTY SIX (PG 56, COL 1, PP 5 & ARRL FORM FSD3)

D. ARRL FORTY SIX

LU 9-4 When delivering an ARRL numbered radiogram, which should be done?

A. Deliver the message exactly as received.

B. Deliver the message exactly as received but add your own written explanation.

C. Decode the message into plain language before delivery. (PG 56, COL 1, PP 1)

D. Deliver the message exactly as received but add your own verbal explanation.

Amateur Radio Communications Course Level I

LU 9-5 During an emergency, service messages should be sent for which of the following categories of message?

A. Emergency, Priority, Welfare and Routine.

B. Emergency, Priority and Welfare.

C. Priority and Welfare.

D. Emergency and Priority. (PG 56, COL 2, PP 4)

Net Operating Guidelines LU 10

The NCS

- The NCS is appointed by the Net Manager to be in charge of one specific net.
- The NCS decides what happens in the net, and when.
- The NCS needs to be aware of everything going on around him or her and handle the needs of the net, its members and served agency as quickly and efficiently as possible.
- The NCS can be located anywhere.

Net Operating Guidelines LU 10

Net Scripts

- Many groups open and close their nets with a standard script.
- Using a standard script ensures that listeners know the purpose of the net and that the net will be run in a similar format each time it operates.

Net Operating Guidelines LU 10

The Backup 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.
- Two types of backup NCS
  - First type is at the same location as the primary NCS operator.
  - Second type is at a different location and maintains a duplicate log. This is especially important during an emergency where antennas can be damaged or power lost.

Net Operating Guidelines LU 10

Net Members

- Operators at various sites are responsible for messages going to and from their location
- They must listen to everything that happens on the net and maintain contact with the served agency's people at the site.
- Whenever possible, two operators should be at each site.

Bulletin Stations

- This station relays ARRL bulletins or those authorized by the served agency to all stations on the net.

Liaison Stations

- Liaison stations pass messages between two different nets.

Relay Stations

- Passes messages between two stations that can not hear each other.

Net Operating Guidelines LU 10

Interference Problems

- If interference is coming from adjacent or co-channel stations who may be unaware of the emergency net, the NCS should politely inform them of the net as ask for their corporation.
- Never discuss, acknowledge or try to speak with an intentionally interfering station. This only encourages the offender.
- Have a plan in place that when interference occurs, all net members know to move to the alternate frequency without being told to do so on the air.

Amateur Radio Communications Course Level I

LU 10-1 Which of the following best describes the responsibilities of the NCS in an emcomm operation?

A. The NCS is responsible for all aspects of the emcomm operation.

B. The NCS is responsible for station check in.

C. The NCS is responsible for all aspects of the net's operation. (PG 61, COL 2, PP 2)

D. The NCS is responsible for writing the net script.

LU 10-2 As an acting "fill in" NCS, which of the following practices would you avoid?

A. Try to run an existing net much as the previous NCS did.

B. Handle messages in order of precedence: Emergency-Priority-Welfare.

C. Keep notes as you go along: do not let your log fall behind.

D. Ask stations to pass messages on the main net frequency whenever possible. (PG 62, COL 2, PP Top – Line 15)

LU 10-3 Which of the following is true of a liaison station?

A. The liaison station mainly relays bulletins authorized by the served agency to all stations on the net.

B. A liaison station passes messages only on a pre-set schedule.

C. A liaison station handles only one-way traffic.

D. A liaison station passes messages between two nets. (PG 63, COL 1, PP 1)

LU 10-4 Packet modes include which of the following groups?

A. FM packet, HF packet and PACTOR. (PG 65, COL 2, PP 1)

B. HF packet, PACTOR and PSK31.

C. PACTOR, PSK31 and RTTY.

D. PSK31, RTTY and PACTOR.

Amateur Radio Communications Course Level I

LU 10-5 You are the NCS of a net involved in an emcomm operation and you notice that some other station is intentionally interfering with your net. Which of the following represents your best course of action?

A. Shut down the net and go home.

B. Address the interfering station directly and inform them of the error of their ways.

C. Move the net to an alternate frequency. (PG 64, COL 2, PP 1)

D. Contact the EOC and continue to operate.

The Incident Command System LU 11

What is the ICS?

- The Incident Command System (ICS) is a management tool that preserves the command structure of each responding agency, while bringing them all together under a common plan and leader.
- Under ICS, each agency recognizes one “lead” coordinating agency and person, will handle one or more tasks that are part of a single over-all plan, and interact with other agencies in defined ways.

The Incident Command System LU 11

What the ICS is Not

- Not a fixed and unchangeable system.
- Not a means to take control or authority away from agencies or departments.
- Not a way to subvert the normal chain of command.
- Not always managed by the fire department.
- Not to big and cumbersome to be used in small every day events.
- Not restricted to use by government agencies.

The Incident Command System LU 11

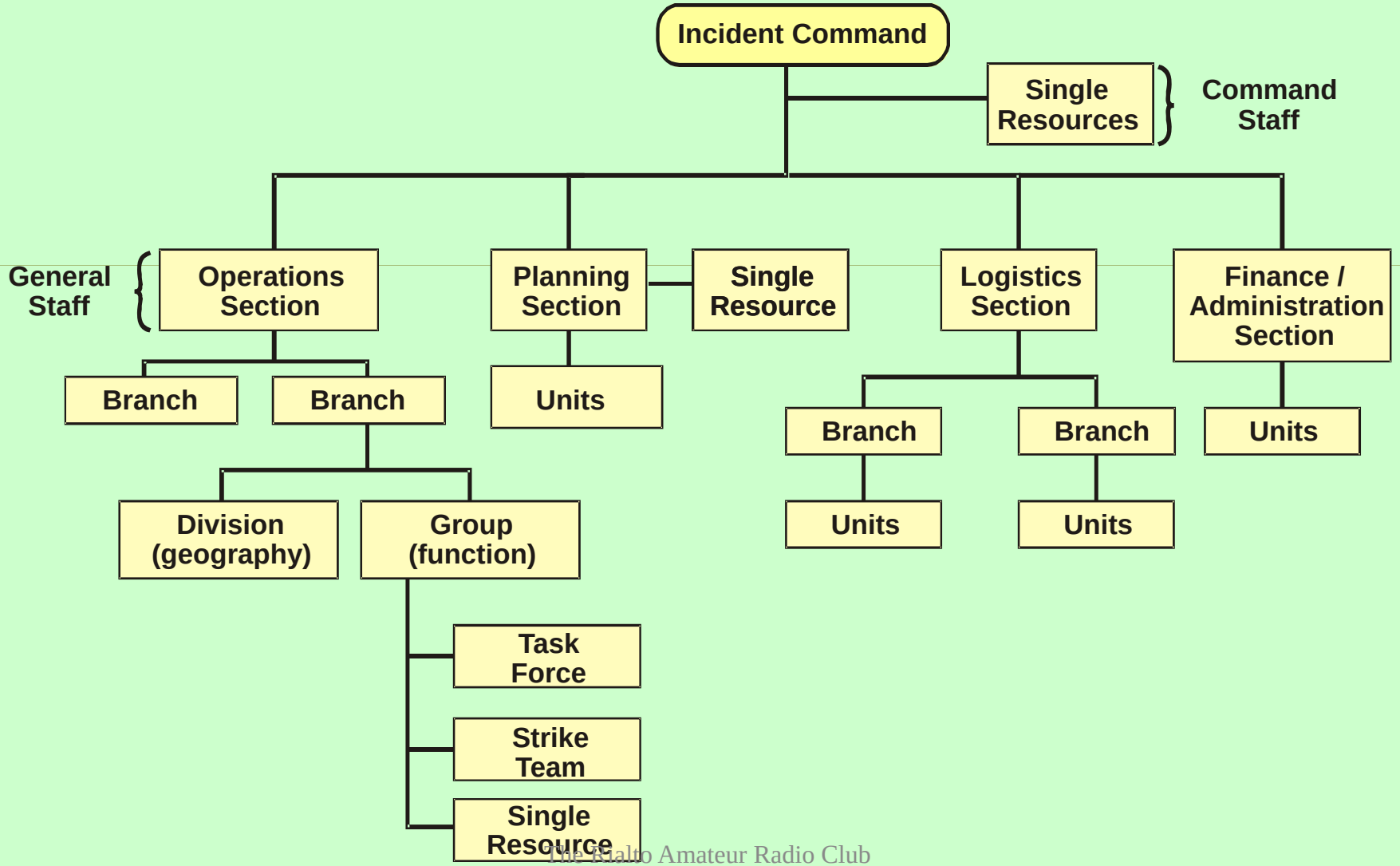
The ICS Structure

- There are two interrelated parts:
  - ❖ Management by Objectives – Four steps –
    - ➢ Understand the policies, procedures and statutes.
    - ➢ Establish incident objectives.
    - ➢ Select appropriate strategies for cooperation and resource utilization.
    - ➢ Apply tactics most likely to succeed.

The Incident Command System LU 11

The ICS Structure (Continued)

- There are two interrelated parts (Continued):
  - ❖ Organizational Structure
    - ➢ Incident Commander (IC)
    - ➢ Planning Section Chief
    - ➢ Operations Section Chief
    - ➢ Logistics Section Chief
    - ➢ Finance/Administration Section Chief



The Incident Command System LU 11

The Incident Commander (IC)

- The IC is usually the most senior on-scene officer from the first responding agency.
- The IC is responsible for the management of the incident and starts the process by helping setting initial incident objectives, followed by an “Incident Plan” (IP).
- The IC has overall responsibility for the incident, regardless of the duties delegated.

The Incident Command System LU 11

How Does an Emcomm Group "Fit Into" The ICS

- Involvement in any incident where ICS is used is by "invitation only" – there is no role for off-the-street volunteers.
- Your group may not have a part in the ICS structure except through your served agency.
- If your group is tasked with handling inter-agency communications it is likely that you will have a representative on the Logistics Section's "communications task force."
- Whether to use your emcomm group services may be made by the served agency, Communications Task Force leader, Logistics Chief or Incident Commander.

Amateur Radio Communications Course Level I

LU 11-1 What do the letters "ICS" stand for?

A. International Correspondence School

B. Incidence Command System (PG 67, COL 1, PP 3)

C. Institutional Control System

D. Internal Control Sequence

LU 11-2 What is ICS?

A. A management tool for coordinating the resources of several agencies within a single command structure. (PG 67, COL 2, PP 1)

B. A fixed and unchangeable system for managing an incident.

C. A means of subverting the normal command structure within an agency or department.

D. A managed system restricted to use by government agencies and departments.

Amateur Radio Communications Course Level I

LU 11-3 The ICS has two interrelated parts. What are they?

A. A mission statement and management objectives.

B. Management by objectives and organizational structure. (PG 68, COL 2, Last)

C. Organizational structure and a financial plan.

D. A financial plan and an operational plan.

LU 11-4 Aside from the Incident Commander, there are four major operating sections within an ICS. What are they?

A. Planning, Operations, Logistics and Public Relations.

B. Personnel, Planning, Operations and Finance/Administration.

C. Planning, Operations, Logistics and Finance/Administration. (PG 69, COL 2, PP2)

D. Payroll, Finance/Administration, Logistics and Operation.

Amateur Radio Communications Course Level I

LU 11-5 What is an emcomm group's relationship to the ICS structure during an incident?

A. The emcomm group always serves within the Logistics area.

B. The emcomm group may or may not be a formal part of the ICS structure. (PG 70, COL 1, PP Last)

C. The emcomm group always serves the Task Force leader directly.

D. The emcomm group always serves the Incident Commander Directly.

Preparing for Deployment LU 12

Prepared for what?

- Being prepared for an emergency communication deployment involves a wide range of considerations, including radio equipment, power sources, clothing and personal gear, food and water, information, and specialized training.
- Pre-planning and physical preparation are essential to an effective and timely emergency response. Know in advance where you are going, and what you are going to do when you get there.
- Keep a stocked and updated "jump kit" ready to go at a moments notice. Be sure that your kit is adequate for the types of deployments you are most likely to encounter.

Preparing for Deployment LU 12

Jump Kits

- Any experienced emergency responder knows how important it is to keep a kit of the items they heed ready to go at a moments notice.
- Without a jump kit, you will almost certainly leave something important at home, or bring items that will not do the job.
- Think about each probable deployment you might encounter and answer these basic questions:
  - Which networks will you need to join/what equipment will you need?
  - Will you relocate quickly or have time to pack a lot of gear?
  - Will you be mobile, on foot or at a fixed location?
  - What sort of weather, food clothing, etc. will you face or need?
- Divide Jump kits into two categories; 24hour and up to 72 hour deployments.

Preparing for Deployment LU 12

Jump Kits Idea List

- Backpacks, plastic tubs, suitcases, etc. make it easily to store and stage.
- Package individual items (including clothing) in zip-lock bags. It can get wet out there.
- Radios and Accessories – VHF/UHF HT, spare batteries, speaker mic and headset, VHF/UHF gain antennas, etc.
- Personal Gear – Seasonal clothing, toilet kit, sleeping bag, money, first aid kit, personal meds, telephone calling card, etc.
- Information – ID cards, copy of ham license, frequency lists and schedules, maps (street & topographic), key phone numbers, etc.
- The PBCARES Yahoo Group web site has a more detailed list of jump kit items tailored to our area and the weather that we will probably experience.

Preparing for Deployment LU 12

Pre-planning

- When the time comes, you need to know where to go & what to do.
- What frequency should you check in on? Is there a back up repeater? What is the simplex frequency?
- Is there emergency power available? Are antennas or cables permanently installed? Will you need a gain antenna?
- Will you need a long antenna cable to get to the roof? Will long power cables be required?
- If inside, does the building have a reliable water supply?
- You can not get enough information. However, you can stock reasonable supplies and equipment for most events you will be activated for.

Preparing for Deployment LU 12

Training & Education

- If the served agency offers emcomm volunteers job-specific training in areas related to communication, take it.
- For instance, the American Red Cross offers self-study or classroom course in mass care, damage assessment and other areas that either directly involve or depend upon effective communication.
- FEMA's Emergency Management Institute offers a wide range of courses, some of which may be related to your agency's mission.
- The ARRL offers three course in Emergency Communications, ARECC Levels I, II and III. These course are specifically tailored to Amateur Radio emcomm group training and education.

Amateur Radio Communications Course Level I

LU 12-1 Of the following, which is the best reason for preparing a jump kit in advance?

A. **You will not leave something important at home or waste valuable time. (PG 73, COL 2, PP 1)**

B. **You are spared the added expense of shopping for something after an emergency arises.**

C. **You can be fully rested on the day of the emergency.**

D. **You can test the batteries on your hand-held VHF before leaving home.**

LU 12-2 Which of the following would you omit from a jump kit prepared for a 12-hour deployment?

A. **Hand-held VHF or dual-band radio.**

B. **Spare rechargeable batteries for the hand-held radio.**

C. **High energy snacks.**

D. **Camp cot and tent. (PG 74, COL 1, PP 2)**

Amateur Radio Communications Course Level I

LU 12-3 Among the following, which are the most important items of information to include in your jump kit?

A. ID cards and other authorizations. (PG 74, COL 2, PP Information)

B. Field cookbook.

C. Automobile repair manual.

D. Instruction book for your chain saw.

LU 12-4 Among the following, which is the least important item of personal gear to include in your jump kit?

A. Frequency lists and net schedules.

B. Contact information for other members of your group, EC, DEC and SEC.

C. Key phone numbers, email and internet addresses.

D. A deck of playing cards. (PG 75, COL 1 & 2)

Amateur Radio Communications Course Level I

LU 12-5 If you are assigned in advance to a particular location for emcomm operations, what is the least important thing to know in advance?

A. The escape routes from the facility itself.

B. The regular business hours maintained at the facility. (PG 75, COL 1, PP Pre-Planning)

C. The availability of radio equipment at the facility.

D. The location of your operating position and the planned location of the antenna.

Equipment Choices for Emergency Communication LU 13

Transceivers – VHF/UHF

- The most universal choice for emcomm is a dual band FM 35-50 watt mobile transceiver.
- Handheld transceivers should be used only when extreme portability is needed, such as “shadowing” an official, or when adequate battery or other DC power is not available.
- Some handheld and mobile dual-band radios can monitor more than one net, and several models allow simultaneous reception on more than one frequency on the same band.
- The Net Control or EOC locations should have a separate radio for each net.

Equipment Choices for Emergency Communication LU 13

Transceivers - HF

- Operation from a generator equipped EOC can be done with an ac powered radio, but having both ac and dc capability ensures the ability to operate under all conditions.
- Do not use dc to ac converters to power HF radios. Most use a high-frequency conversion process that generates significant broad-spectrum RF noise at HF frequencies that is difficult to suppress. The best inverters are those with a true sine wave output.
- Direct dc powering is more efficient in any case.

Equipment Choices for Emergency Communication LU 13

Radio Receiver Performance

- Several aspects of a radio receivers performance suitable for emcomm include sensitivity, selectivity and intermodulation rejection.
- Mobile radios generally have better intermodulation rejection characteristics than handheld radios.
- Digital Signal Processing (DSP) may be the single most important filtering feature available.
- “Noise blankers” are used to reduce impulse noise from arcing power lines, vehicle and generator ignition systems, and various other sources.

Equipment Choices for Emergency Communication LU 13

Antennas

- **VHF/UHF**
  - **A good antenna, mounted as high as possible, is more important than high transmitter power. It provides TX and RX gain and may also allow output power to be reduced and extend battery life.**
  - **In relatively flat terrain, use a mast-mounted single or dual-band antenna with at least 3dBd gain.**
  - **For permanent base stations, a more rugged 2-way collinear antenna should be considered.**
  - **A magnetic mount mobile antenna for operating in someone else's vehicle and can be mounted indoors on a metal file cabinet.**
  - **"Rubber duck" hand-held radio antennas have negative gain!**

Equipment Choices for Emergency Communication LU 13

Antennas (Continued)

- **HF Antennas**
  - **For local operations (up to a few hundred miles), a simple random wire or dipole hung less than 1/4 wavelength above the ground works well and is easy to deploy. This is known as an NVIS antenna.**
  - **An antenna tuner is necessary for most portable wire antennas as the impedance of the antenna will vary with its height above ground.**
  - **For communication beyond 200 miles, a commercial trapped vertical may work.**
  - **Directional (beam) antennas offer the best performance for very wide area nets on 10 and 20meters since they maximize desired signals and reduce interference from stations in other directions.**

Equipment Choices for Emergency Communication LU 13

Antennas (Continued)

- **Feedline**
  - **Feedline used at VHF and UHF frequencies should be low-loss foam dielectric coaxial cable. For short runs, RG-58 may be suitable, but for longer runs consider RG-8X or RG-213.**
  - **Feedline for HF may be coaxial or "ladder line." The choice will depend on the situation.**
  - **However, coaxial cable is much less susceptible to problems induced by routing near metal objects or other cables.**

Equipment Choices for Emergency Communication LU 13

Operating Accessories

- **Headphones – They are useful anywhere, in a high ambient noise environment in the field, in a high radio traffic area like the EOC, or when your communications may disturb shelter residents.**
- **A microphone/headset and a foot switch works very well.**
- **Do not use voice operated transmit (VOX) during emcomm operations as ambient noise could inadvertently trigger the transmit switch.**

Equipment Choices for Emergency Communication LU 13

Batteries

- Battery power is critical for emcomm operations!
- Batteries must be chosen to match the maximum load of the equipment, and length of time that operation must continue before they can be recharged.
- NiCad, NiMH, and Lion: These battery types have higher power densities that AA alkaline cells. Many hand-held radios have optional AA alkaline battery cases and are recommended emcomm accessories.
- Anderson power pole electrical connectors are the standard connectors for ARES equipment.

Equipment Choices for Emergency Communication LU 13

Batteries (Continued)

- **Lead Acid – There are three common types of lead-acid batteries:**
  - **Flooded (wet) – Can spilled if tipped.**
  - **Valve Regulated Lead Acid (VRLA) – Use gelled electrolyte and cannot spill.**
  - **Sealed Lead-Acid (SLA) – Similar to VRLA batteries, but can be operated in any position, even upside down.**
  - **Deep cycle batteries are a better choice than the common automotive batteries. For radio operation, the best choice would be one specified for UPS or RV use.**
  - **SLA batteries are used in alarm or emergency lighting systems.**

Equipment Choices for Emergency Communication LU 13

Chargers, Generators and Solar Power

- Battery chargers – You should have two or more batteries so that one is charging while the other is in use.
- Most NiCad chargers will also charge NiMH, but not Lion batteries.
- Lead-acid batteries
  - Wet batteries should be charged at about 14.5 VDC, and VRLA batteries about 14.0 VDC. The charging current should not exceed 20% of the battery's capacity.
  - SLA or "gel-cell" batteries must be charged slowly to avoid production of hydrogen sulfide gas which could over pressurize the cell and cause mechanical damage.

Equipment Choices for Emergency Communication LU 13

Chargers, Generators and Solar Power (Continued)

- Solar Panels and charge controllers are readily available at increasingly lower costs. Many import cars have units installed by the manufacturer at the plant and are designed to provide a trickle charge to keep the automobile's battery at full charge while parked in storage lots. They are generally removed by the dealer before the vehicle is sold.
- DC to AC converters – While direct DC power is more efficient, inverters can be used for equipment that cannot be directly powered with 12VDC. The best inverters are those with a "true sine-wave" output.
- Large uninterruptible power supplies (UPS) are designed for continuous duty and produce true sine-wave outputs. They can also be used to charge batteries external to the units.

Equipment Choices for Emergency Communication LU 13

Chargers, Generators and Solar Power (Continued)

- **Generators – Usually located at EOC's or Shelters.**
  - ❖ **Be sure that co-located multiple generators are bonded with a common ground system for safety..**
  - ❖ **Load regulation can be highly variable on these units.**
  - ❖ **You may want to obtain a high quality surge suppressor, line voltage regulator and or a power conditioner to help protect your equipment from defective generators.**
  - ❖ **Have voltmeter handy to measure the generator voltage.**

Amateur Radio Communications Course Level I

LU 13-1 In considering power sources for HF radios, which of the following is true?

A. DC to AC inverters can be used to power HF radios.

B. Standard automobile batteries last longer than deep cycle batteries.

C. AC powered HF radios are suitable for all emcomm use.

D. Whenever possible, use deep cycle batteries to power HF radios. (PG 82, COL 1, PP2)

LU 13-2 In considering antennas for VHF/UHF radios, which is the best rule?

A. High transmitter power is more important than having a good antenna.

B. Transmitter power and antenna selection are equally important.

C. A good antenna is more important than high transmitter power. (PG 81, COL 1, PP Last)

D. If properly used, "rubber ducky" antennas can compensate for low transmitter power.

LU 13-3 Beam antennas have many advantages. Which of the following is the best reason for selecting a beam antenna?

A. They are inexpensive and easy to transport.

B. They are easy to erect and very stable in storm conditions.

C. They are compact and easy to store.

D. They maximize desired signals and reduce interference from other stations. (PG 81, COL 1, PP 3)

LU 13-4 Which of the following statements about battery charging is true?

B. The optimum charging voltage for 12-volt lead acid batteries should be about two volts more than the battery's rated voltage.

Amateur Radio Communications Course Level I

LU 13-5 In comparing the 30 amp Anderson power pole connector with the 10 amp Molex connector, Which of the following is true?

A. The Molex is better for high power applications.

B. The Molex is better for heavy duty cycles.

C. The Anderson is capable of being plugged and unplugged a greater number of times without deterioration. (PG 82, COL 1, PP Top)