Creating a Radio Usage and Interoperability Training Program

Suggestions for both entry-level and continuing education programs

Course Manual

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INTRODUCTION

Two-way radio usage is an everyday occurrence in public safety and yet "communications" still arises in many after-action-reviews as one of the primary problem issues. On actual incidents and in planned events, it has been shown time and again that individuals don't fully understand or are capable of using the functions of the radio that they carry and depend on.

Training in radio usage is often very limited and even less regarding interoperability. Significant expenditures have been made in acquiring communications equipment, including that for interoperability; however, oftentimes training on that equipment is either limited or not conducted on a reoccurring basis.

GOAL

Upon completion of this course, participants will have an overview of minimal components necessary to establish and provide initial and sustained training in the fundamentals of using the radio equipment associated with their jurisdiction.

OBJECTIVES

- Participants will define the governance and requirements of radio communications and interoperable communications.
- Participants will demonstrate the controls, channel access, group/zone access of the radios in their respective jurisdiction.
- Participants will define operable and interoperable communications.
- Participants will define various radio networks for an incident or event.
- Participants will define and demonstrate the ability to monitor multiple radio channels or networks.
- Participants will define a gateway device and, if one is available to that jurisdiction, shall demonstrate the set up and operation of a gateway.
- Participants will define the benefits of using two-way radios versus cellular devices on an incident or event.
- Participants will define and demonstrate recommended radio communications best practices.
- Participants will define and demonstrate the use of related communications documents, including but not limited to ICS form 205, channel lists, and the Texas State Interoperability Channel Plan.
- Participants will define the benefits and expected outcomes of routine communications exercises.

WHAT YOU NEED TO KNOW

Participants must possess a basic understanding of the use of two-way radios and the radio equipment used in the participant's respective jurisdiction. The participant must be able to read and comprehend the basic usage manuals associated with the radio equipment in their respective jurisdiction. Participants should have a working knowledge of the Texas State Interoperability Channel Plan and know how to access it at the Texas Department of Public Safety's website.

1. Governance and Requirements

1.1 Federal

The Federal Communications Commission (FCC) is the licensing entity for state and local public safety agencies. Some frequencies are designated for "intersystem use" (commonly known as) interoperable channels.

The US Department of Homeland Security's Office of Emergency Communications is responsible for the naming and developing the recommended usage of interoperable channels. This agency also produces the National Emergency Communications Plan (NECP) and the National Field Operations Guide for interoperability.

The adoption of the National Incident Management System (NIMS) is a requirement for all federal, tribal, state and local public safety, public health and emergency management entities.

1.2 State

The State of Texas has a few plans that require adoption and adherence which relate to interoperable communications. One is the State of Texas Emergency Management Plan. Others are the Statewide Communications Interoperability Plan (SCIP) and the Texas Statewide Interoperability Channel Plan.

1.3 Local

Local political subdivisions are required to adopt local emergency management plans which contain components that mirror the state emergency management plan. The plans include the requirement of those entities to utilize the incident command system (ICS) which has interoperable communications as one of its components. All political subdivisions and governmental entities are required to adopt NIMS to become eligible to apply for federal or state grants. NIMS includes ICS.

2. Your Radios Operations and Features

2.1 Controls

A working knowledge of the controls of the various radios in which the individual will utilize is one of the essentials of this course and for all end-users of radio equipment. Knowledge can be gain from user manuals, the local radio provider or entity staff, the Internet, other end-users and from completing this training course and conducting/participating in, regularly scheduled exercises.

2.2 Channel Access

A working knowledge of how to access and change channels of the various radios in which the individual will utilize is also one of the essentials of this course and for all end-users of radio equipment. Knowledge can be gain from user manuals, the local radio provider or entity staff, the Internet, other end-users and from completing this training course and conducting/participating in, regularly scheduled exercises.

2.3 Group/Zone Access

Some radios have multiple groups (called "zones" in some radios) of channels. There are procedures unique to each radio as to how to access these groups of channels. A working knowledge of how to access and change channels of the

various radios in which the individual will utilize is also one of the essentials of this course and for all end-users of radio equipment. Knowledge can be gain from user manuals, the local radio provider or entity staff, the Internet, other end-users and from completing this training course and conducting/participating in, regularly scheduled exercises.

3. Radio Applications
3.1 Simplex
Simplex is when a single frequency is used to communicate with two or more radios on that same frequency. The range on simplex is determined by the frequency band, terrain and other factors. Simplex, on some bands is a very reliable means of communications while in other bands it will be very limited and not recommended.

3.2 Repeater
A repeater is a device that receives a signal and retransmits it at a higher level or higher power, or onto the other side of an obstruction, so that the signal can cover longer distances.

3.3 Direct
The "direct channel" is the output frequency of a repeater and is used in a simplex mode. Some uses of this are (1) The user wants to monitor the repeater, but is close enough to the radio they need to talk to, that they can communicate in a simplex mode. This also keeps from tying up the repeater or possibly the user doesn't want the radio traffic to be broadcast over a larger area. (2) The mobile or portable radio is outside of the range of the repeater, but close enough to communicate with a radio that is on the repeater channel. Because the radio is transmitting on the receive frequency of the repeater or the "direct" frequency, the other radio will hear them if they are in range. When the called radio is also changed to "direct," both radios can communicate with each other. (3) If the repeater fails for some reason, a direct channel can be used to communicate with the other radios, within range, to inform them that the repeater isn't functioning and to switch to an alternate channel.

3.4 Trunked
Trunked systems utilize two or more radio repeaters and connects them to a single antenna. A force-multiplier is gained with trunked systems because a computer switches between the various radios connected to the trunk as user's key up their radio. This allows more users to access the system with less waiting time for a clear channel. User's radios are grouped in to "dedicated talk groups" and monitor a control channel. When a radio keys up, the computer assigns a repeater that is available and sends a signal to the other radios in that talk group which automatically switches those radios to the designated repeater channels. After the conversation is completed, the radios automatically switch back to the designated monitoring control channel. Mobile and portable radios which are on a trunked system can also have conventional repeater and simplex channels programed in them.

3.5 **Operable**
These are the day-to-day operating channel(s) of a particular entity. Most radio users are very familiar with the use of their primary channel. However, even internal operations often require the changing of channels. In many instances, there has been a lack of knowledge on how to accomplish this simple task. Often the end-users have not been trained on this or what local channels are in their radio.

3.6 **Interoperable**
Interoperable channels are common channels designated by the FCC (also referred to as "intersystem") and are in the common public safety bands – VHF, UHF, 700 and 800 MHz. Interoperable communications are essential to many unified command or mutual aid incidents or events. Having interoperable communications is a requirement of all federal, tribal, state, regional and local public safety agencies. However, it is clear that many end-users do not know if interoperable channels are in their radios, or how to access them, or how they are to be used. This course is designed to help address these common issues. Here is a link to the Texas Statewide Interoperability Channel Plan:
http://www.dps.texas.gov/LawEnforcementSupport/communications/interop/documents/tsicpMOU.pdf

3.7 **Creating Networks**
Sometimes incidents or events are so complex or large that multiple radio channels are needed to manage them. Some networks include tactical, command, dispatch and air-to-ground.

3.8 **Monitoring Multiple Channels or Networks**
Often it is necessary to monitor multiple channels or networks on an incident. This can be accomplished by several methods including, but not limited to, the use of two radios with each one set to a desired channel, or setting a priority channel and scanning the other channels on a single radio, or co-locating at a command post with someone who is monitoring the other channels.

3.9 **Gateways**
Gateways are devices that are used to connect two or more radios of different bands which can then be used to transmit and receive radio signals to other radios if they are operating on one of the frequencies of one of the radios in the gateway. For example, say there was an incident in which some of the responders were operating on VHF while others only had UHF and still others only had 800 MHz radios. These radios could not communicate with each other. A gateway could be brought in and radios of the various bands described above were installed in it and connected together. If the radios of the various responders had a channel common to the radio in the gateway, which was on their operating band, all of the responders could communicate with each other.

3.10 **Radio versus Cellular Phones**
Two-way radios allow multiple individuals with radios on that channel and in range of the other radio to hear conversations. Information heard translates into situational awareness. When cellular phones are used to relay information, this is generally a one-on-one communication and situational awareness is dramatically decreased.

4. Practical Uses

4.1 Microphones

Two-way radios have microphones which convert noise, such as a human voice, into electronic signals that are transmitted through the air to a receiver. Some microphones are located in the radio chassis, such as in a portable radio. Others can be attached to the radio and have a multitude of applications ranging from a handheld microphone to one mounted on a diver's face piece.

4.1.1 Recommended procedures for speaking into a microphone
Generally speaking a microphone should be held a few inches from the mouth for clear reception. There are exceptions such as use in aircraft or on motorcycles where the microphone may need to be right next to the mouth. Microphones levels can sometimes be adjusted.

4.1.2 Avoiding high-noise environments when transmitting
Most microphones pick up background noise and don't distinguish it from the human voice. The radio user should be aware of their surroundings when transmitting. Sample problem areas include fire truck pumps, helicopter prop wash, sirens, trains, building fire alarms, highway traffic, etc.

4.2 Antennas

Two-way radios need an antenna to transmit a signal. Routine checks should be made to ensure the antenna is still in place, is tight on its base and is not damaged.

Portable radios often use a rubber coated wire-wound antenna to make them more "functional" than having a long antenna protruding above the radio. The wire-wound antenna often decreases the range of the radio and by having the portable radio on the side of the wearer can decrease the effectiveness of the radio even further. It might be necessary for the wearer to literally orient their side with the radio, toward the repeater site to avoid blocking a portion of the signal with their body. In some cases, the radio may need to be held up in the air to maximize the antenna height in order to be heard on the receiving end.

Radios send electronic energy when transmitting. Avoid touching an antenna, especially on a base or mobile radio, when the radio is transmitting.

4.3 Best Practices

- Use proper names or unit identification when transmitting.
- Keep radio transmissions as short as possible.
- Transmit official messages only.
- Don't use profane or unacceptable language and don't tolerate it on your incident.
- Check periodically to determine that your microphone is not accidentally "keyed" which could tie up the channel (all radios should be programmed with a time-out timer of no more than 120 seconds/2 minutes).
- Monitor the channel for a few seconds prior to transmitting. Someone may be in the middle of a conversation.

- Avoid the use of "10-codes" or acronyms that others may not be familiar with.
- Avoid sounding excited on the radio.
- Make sure the radio is on the correct channel.
- Ensure the battery is charged on portable radios or that you have an extra battery or a means of charging the battery. If a power outage is expected or possible, say due to severe weather, take every opportunity to charge batteries.
- If multiple channels are used on the incident or event, say the channel you are on when calling.
- If using a repeater where there are multiple repeaters being monitored, say the name of the repeater you are using.

4.4 Extended Operations

There may be situations where field deployments will extend beyond the life of the battery on a portable radio. Having extra batteries on hand, or battery holders for AA batteries, a 12VDC charger, or a 110VAC charger with a 12VDC-to-110VAC inverter may be required.

Prior to purchasing portable radios, determine if the manufacturer offers holders for AA or other disposable batteries that can be replaced in the field without the requirement for chargers.

5. Companion Documents

5.1 ICS 205

An ICS Form 205 is a common document, often a single page, which is generally a key part of an incident action plan (IAP) for an incident or event. It lists the radio frequencies, channel function, channel assignment, and other pertinent information regarding the use of radios on that mission.

5.2 Note Cards

These can be everything from a laminated pocket card that lists the various channels or groups/zones in a radio to a "how to" guides for operating the radio.

5.3 Electronic Notes

With smartphones, there are ways to store channel lists and "how to" guides for various radio equipment. These can be as detailed as are needed and often very easy to share in the field, electronically.

6. Exercises / Evaluations

6.1 Demonstrations of various radios, repeaters and gateways

A real-time demonstration will be conducted with the participants on either generic equipment or better yet, the actual equipment they will be using in their respective jurisdictions.

6.2 How to set up and conduct simple radio usage exercises

Very simple and little-to-no-cost exercises will be discussed with the participants that they can implement at their local jurisdiction to ensure the end-users can operate their radio equipment.

6.3 **How to evaluate the success of an exercise**

Checklists will be discussed and displayed that the participants can utilize to create their own evaluation of the ability of the end-users in their jurisdiction to successfully demonstrate radio operation and recommended usage, including interoperability.