

# CARE AND USE OF LAND MOBILE RADIOS

Radios are a central component of the public safety communications toolkit.

By Michael A. Scales

**W**hen most public safety employees (police, fire, EMS or communications) are hired, they must attend some type of academy to certify they have the proper knowledge to perform their duties. They spend hours learning to operate weapons, fire hoses and pumps, life saving devices or radio/telephone consoles. However, the device (tool) that you, as a responder, will use the most and rely on heavily throughout your career is the one you may be least trained on. These are your radios and communications systems. Field employees are normally issued vehicles with radios, portable radios and possibly pagers. The employee should be aware of the operations and potential dangers that accompany their tools. When you are in a situation where your life or someone else's life may depend on you being able to get a message to another person or dispatch, knowledge of those communication devices should be second nature.

Organized radio service in the United States began with the Radio Act of 1912. The Federal Radio Commission was created to help coordinate and regulate the use of radio frequencies. The Federal Radio Commission (FRC) was replaced in 1934 by the Federal Communications Commission (FCC) which continues today. When public safety determined a need in daily operation for communications other than word of mouth or paper, it became more innovative. Innovations ranged from using a light on community water towers to let the field officer know to swing by dispatch/office for a call to using the local AM radio station to announce the officer needed to call the office for a message or information. Public safety

communications expanded into single mode then dual mode transmissions between the cars and the office.

Low band radio (30-60 MHz range) was the first of many bands authorized for use of public safety agencies. Low band had a wide area coverage with high power radios. Things have progressed over the years to VHF (150-170 MHz), UHF (450-470 MHz), 800 MHz, and now into the 700 MHz band. Antenna sizes for the cars get smaller as the frequency gets higher.

Most vehicle antennas are now capable of being hidden on detective units while still being the same size as the current AM/FM radio for the vehicle, or a decal on the windows. Public safety radios started in two functions and models: transmitter and receiver. Transmitters sent the message out, and receivers heard the message. This required two separate devices at each location for proper operation in a two-way mode. This was a space invader of the worst kind in most vehicles. Most broadcast stations (AM/FM) have the broadcast transmitter located in a large field on a tower or roof of a building. Homes and vehicles (later the pocket radio) were the receivers. As the technology evolved, the devices were combined into what is known as a transceiver. This device can both receive and broadcast messages.

Field units consist of remote base locations such as police/sheriff sub stations, fire houses, ambulance buildings and other fixed locations. A mobile radio with a power supply and a tower or building antenna is still considered a fixed base operation.

Today, land mobile radio (LMR) is the backbone radio network for most public safety agencies. A few agencies have transitioned to the computerized digital networks of long-term evolution (LTE). Mobile radios are defined as transceivers mounted in mobile command posts, patrol cars, fire trucks, ambulances, or other vehicles. Portable radios consist of hand-held transceivers, pagers and monitoring devices. Most LMR systems are privately owned and operated by the agency licensing the frequencies or several agencies as a cooperative agreement.

As the use of the radio frequencies increased, the FRC and later FCC found a need to have coordination and a dedicated spectrum for different types of uses and

agencies, Frequency Advisory Committees (FACs) were created and certified by the FCC and each coordinator was assigned its pool of channels:

- PF** Fire Service Coordinator
- PH** Highway Coordinator
- PP** Police / Law Enforcement Coordinator
- PM** Medical Coordinator
- PO** Forestry / Conservation Coordinator
- PS** Special Emergency Coordinator
- PX** Any Public Safety Coordinator
- IB** Business and Industrial

These coordinators assist agencies in obtaining the necessary FCC license in order to operate on the designated channel. APCO AFC is a certified coordinator for PP and PX but can coordinate and gain consent from the other coordinators on all designated channels. Agencies must license the frequencies they are using and indicate to the FCC the type of devices being used at each location being licensed. Note that the number of units listed on the license is the total number that can be “online and operational” at any one time. This is not the total number of radios that the agency has in its fleet. This allows for sharing agreements with other agencies as needed. The use of repeaters to enlarge an area of coverage is most popular with all radio users. Years ago, most agencies could use handheld radios to converse with employees throughout their municipality. With the increased use of Wi-Fi, commercial two-way radio systems and other radio frequency devices the agencies found they could no longer communicate without additional support. The need for repeaters increased. Multicast, simulcast and trunking systems

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were designed and implemented to improve LMR service for the agencies’ needs.

Radios are continuing to involve. With the need for radios to perform jobs (GPS, messaging, etc.) similar to cellular phones, manufacturers are turning out a computer with a transceiver attached to it. While the older tube radios were affected by vibration or jarring, these new radios may be affected by strong magnetic fields. Older radios used crystals and the variable electricity into a vacuum tube to help maintain the frequencies in the radios (some worked better than others). Today’s radios, being mostly computer — are programmed the same as any other computer. The solid-state components allow for miniaturization to keep the radio an appropriate size. But strong magnetic fields near the radios will cause damage or erase programming. As the radio is also a computer, concern has arisen of the possibility that viruses or hacking of radios could be a problem for public safety agencies.

Mobile and portable radios bring many hazards into their operation. The antennas for base stations and repeaters are normally out of reach on the roof of a building or attached to a tower. Vehicle antennas are not out of reach of an adult sized person as they are either trunk lid, cowl, glass or roof mounted on the vehicle. Medium powered radios are normally transmitting in the 45-50 watt range; high power radios transmit 100-125 watts. If the antenna is a “gain” model, that wattage could increase twice or three times the output of the radio. Touching the antenna while the radio is transmitting could cause a severe burn.

A portable radio transmits 1 to 7 watts (depending on programming) with the antenna attached to the body of the radio. When a radio is worn, it is usually attached to the operators’ belt or on the front of their body armor. The human body will absorb some RF radiation without damage; however, the absorption of this radiation is cumulative, and, if the radio is always on the belt while transmitting, the signal may be absorbed and your message may or may not be sent with clarity or distance.

Batteries on your portable radio come in many sizes and types: the traditional lead alkaline, the rechargeable nickel cadmium (NiCad), and the newer rechargeable lithium

ion (li-ion). Labels on the batteries warn against shorting the terminals. Nickel cadmium batteries developed a memory of use. If you are using NiCad, the longer you leave the radio on before you recharge the battery, the longer it will last in the field. If you find cracks in the battery casing, it is best to ask for a replacement. The contacts on both the radio and batteries should be clean and shiny. Any corrosion on these terminals may cause failure when you need it to perform the most. If they are dull, a simple pencil eraser works well for removing the oxidation. Corrosion may require additional cleaners for proper removal. Care should be given to lithium ion (Li-Ion) batteries. Corrosion on any battery may also indicate the battery is breaking down and may fail at any time. When these batteries short, they heat up

quickly and have been known to explode or cause severe burns.

Don't grasp a portable radio by the antenna or use the antenna as a handle or hold in any case. It can damage the antenna and render the radio inoperable. Never use your radio for something it is not designed for. One example is a door stop — serious damage to the radio could occur. When you inspect your radio, look for damage to the rubber coating on the antennas.

Mobile and portable communication devices are an integral part of our public safety lives. We are dedicated to washing and waxing our vehicles, polishing our shoes, and putting patches, badges and flash on our uniforms to show how proud we are. Law enforcement officers check their weapons and defensive gear every shift. Fire and EMS personnel check their equipment and mark their checklists

regularly. The little things in life (like the radio that is always there and bothersome) needs to be brought to the forefront of our attention. Always check for damage to your batteries, antennas and radio cases. What would happen to teenagers without their smartphones? Can you imagine your day at work without a working radio? ●

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## CDE EXAM #58167

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| <p>1) When did organized public safety programs begin?<br/>a. 1900<br/>b. 1912<br/>c. 1934<br/>d. 2000</p> <p>2) APCO AFC is the coordinator mainly responsible for what groups?<br/>a. PF and PX<br/>b. PM<br/>c. PP and PX<br/>d. PH and PX</p> <p>3) Mobile radios are normally attached to:<br/>a. Belt or vest<br/>b. Backpack<br/>c. Tower<br/>d. Vehicle</p> | <p>4) Portable radios can be used for door blocks.<br/>a. True<br/>b. False</p> <p>5) Magnetic fields may affect the operation of your radios.<br/>a. True<br/>b. False</p> <p>6) The initials of the regulatory agencies for communications are:<br/>a. APCO<br/>b. FRC/FCC<br/>c. FAA<br/>d. AARP</p> <p>7) The current types of public safety radio systems are:<br/>a. FCC and FRC<br/>b. HAM and EGGS<br/>c. LTE and LMR<br/>d. High and Low</p> | <p>8) Radio licenses are not required by public safety to operate.<br/>a. True<br/>b. False</p> <p>9) Public safety communications included:<br/>a. Lights on towers<br/>b. Sirens<br/>c. AM Radio broadcasters<br/>d. Transistor radios<br/>e. All of the above<br/>f. None of the above</p> <p>10) Portable radios have power outputs of:<br/>a. 5-10 watts<br/>b. 100-125 watts<br/>c. 1-7 watts<br/>d. 45-50 watts</p> |
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