



Harvard School of Public Health  
Center for Public Health Preparedness

## **COMMUNICATIONS EQUIPMENT & SYSTEMS**

### **TRAIN THE TRAINER PROGRAM**

April 2004

Prepared by:

**HARVARD SCHOOL OF PUBLIC HEALTH  
CENTER FOR PUBLIC HEALTH PREPAREDNESS  
Boston, Massachusetts**

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### TABLE OF CONTENTS

---

Welcome, Introductions & Ice Breaker.....	iv
Presentation Overview.....	iv
Pre-Test Evaluation.....	v
Communications Equipment & Systems.....	1
1. Learning Objectives.....	2
2. Fundamental Components of Communication Equipment & Systems.....	5
3. Why is Communication Important?.....	6
4. What Makes a Good Communications System?.....	9
5. With Whom Do You Communicate?.....	11
6. What Information Should Be Communicated?.....	12
7. Fundamental Components of Communications Equipment & Systems.....	14
A. Understand Different Forms of Communication.....	14
B. Identify Potential Obstacles to Communication.....	19
1) Technology/System Failure.....	21
a. Strategy: Redundancy.....	22
2) Lack of Interoperability.....	25
a. Strategy: Interoperability.....	26
3) Lack of Expertise & Coordination.....	28
a. Strategy: Preplanning.....	29
4) Choices & Cost.....	32
a. Strategy: Do Your Research.....	33
C. Recognize Current Communications Technologies.....	34
1) Basic Equipment.....	35
a. Conventional Telephones.....	36
b. Cellular Telephones.....	37
c. Push-to-Talk Cellular Telephones.....	38

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### TABLE OF CONTENTS, continued

---

d. Two-Way Radios.....	40
2) Radio Transmission.....	41
a. Frequency.....	41
b. Channels.....	42
c. Bands.....	43
d. Repeaters.....	46
e. Security.....	47
3) Advanced Technologies.....	48
a. Satellite Telephones.....	49
b. Wireless Wide-Area Networks.....	50
c. World Wide Web.....	51
d. Amateur Radio.....	52
e. Specialized Systems.....	54
D. Know How to Use Communications Technologies.....	55
1) How to Use a Radio.....	57
2) Brief Radio Glossary.....	60
E. Identify Local Resources & Design Your System.....	62
1) Technology & Local Resources.....	63
2) Communications Protocols.....	64
F. Practice, Practice, Practice!.....	66
8. Summary of the Fundamental Components.....	68
Group Exercise.....	69
Post-Test Evaluation with Answer Key.....	71
Closing Exercise.....	74
References.....	75

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### **WELCOME:**

Welcome to the Maine Train the Trainer Program, Communication Equipment & Systems module. Before we begin, let us have introductions so we are better acquainted with one another.

### **INTRODUCTIONS & ICE BREAKER:**

In this exercise, you will be introducing the person next to you. Please turn to the person to your right or left and find out three items about them; a) their name b) primary position or role c) one of their favorite pastimes. With this information, please introduce this colleague to the larger group.

**Post-Introductions:** Now that we are introduced to one another, let us proceed with the presentation. I encourage each one of you to continue getting to know one another throughout the time that we are gathered here today.

### **PRESENTATION OVERVIEW:**

This presentation has been prepared by the Harvard School of Public Health Center for Public Health Preparedness to provide an overview of the Communications Equipment & Systems. This presentation is intended for use by individuals for personal education, or by educators and trainers to present to a class of students.

The content has been developed for public health professionals, but should prove beneficial to all hospital personnel, first line-responders, and the general public interested in learning more about communication equipment and systems in emergency preparedness.

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### PRE & POST TEST QUESTIONNAIRE

This Pre & Post Test Questionnaire is designed to measure achievement of the Communications Equipment & Systems learning objectives for this module by first measuring level of knowledge about the fundamentals of Communications Equipment & Systems among training participants prior to receiving a training on this topic and measuring level of knowledge gained after participants have completed the training.

- Please complete this questionnaire and hand it back to your trainer.
- Please circle the correct answer from the answer choices provided.

#### 1. A good communications system should

- a) have layers of redundancy
- b) be accessible to and understood by users
- c) include the most advanced technology currently on the market
- d) be tested frequently
- e) all of the above
- f) a, b & d

#### 2. A common obstacle to communication is

- a) system failure or overload
- b) not knowing how to operate HAM radio
- c) incompatibility of communications systems between agencies
- d) a & c
- e) all of the above

#### 3. A useful strategy for overcoming obstacles to communication is

- a) to learn sign language
- b) to use redundant technologies within your communications system
- c) to use only wireless technologies

#### 4. Conventional telephones

- a) are vulnerable to overload
- b) can fail in the event of a power outage if they are digital/electronic
- c) use radio waves to transmit information
- d) a & b

#### 5. Cellular telephones

- a) use radio waves to transmit information
- b) are vulnerable to overload
- c) can be digital or analog
- d) all of the above

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### **6. Two-way radios**

- a) use radio waves to transmit information
- b) transmit information faster than telephones
- c) have different channels for transmission assigned by the FCC
- d) all of the above
- e) a & c

### **7. When speaking on a radio**

- a) speak loudly
- b) speak clearly
- c) be brief
- d) stay calm
- e) all of the above
- f) b, c & d

### **8. Radios should be used**

- a) to make social plans with friends
- b) to transmit confidential information
- c) to communicate important information clearly and concisely

### **9. Communications protocols should**

- a) be created with specific local needs in mind
- b) specify under what circumstances the protocol should be used
- c) include contact information for all relevant agencies and individuals
- d) all of the above

### **10. Once the communications system has been established, the most important thing to do is**

- a) practice frequently
- b) keep equipment stored somewhere locked and secured
- c) come up with creative radio handles for all users

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### GROUP EXERCISE

#### Emergency Communications Incident

At 8:50 PM, a 36 passenger airplane crashes into the local telephone company 2 blocks from the Maplewood Hospital in Maine. Immediately after the crash, telephone service is disrupted in most neighborhoods in Maplewood, including The Maplewood Hospital. Luckily, in an effort to improve coordination between local agencies involved in emergency response, the local fire department had recently supplied the Maplewood Hospital Emergency Department with one of their handheld 2-way radios to communicate with responders on scene and coordinate emergency response. Below is a transcript of the 2-way radio conversation between the fire chief on the scene of the crash and the Maplewood Hospital ED attending.

#### Transcript:

- **ED Physician:** Hello? This is Dr. Greg of Maplewood Hospital. Over.
- **Fire Chief:** Hello. This is Fire Chief Mark. A plane just crashed into the Cytel Phone Company so all phones in the area are out. I am at the crash scene and a number of people are badly hurt. We need your hospital's assistance to give immediate care to some of these victims as we devise a plan to transport them to a trauma unit. Over.
- **ED Physician:** Acknowledged. How many victims are we talking about? Over.
- **Fire Chief:** We have recovered 18 people who are seriously injured so far and there may be more as we are still recovering victims. How many beds do you have available? Over.
- **ED Physician:** We can take 12 patients right now. You will need to have those most seriously injured airlifted to Elmwood Hospital Trauma Unit. Over.
- **Fire Chief:** Acknowledged. We have already arranged for the helicopter to come. Do you have any personnel available to come to assist on the scene? Over.
- **ED Physician:** Affirmative. I will send 2 paramedics and 2 nurses. Are there any hazards at the scene? Over.
- **Fire Chief:** Affirmative. Our number one concern right now is the spilt aviation fuel. All of my firemen here at the scene are in protective gear and we have some on hand for your staff when they get here. Over.
- **ED Physician:** Acknowledged. How soon do you estimate a helicopter will get to the scene? Over.
- **Fire Chief:** It should get here in the next 20 minutes. Over.
- **ED Physician:** My team should get there in less than 10 minutes. Over and Out.
- **Fire Chief:** Thank you, doctor. Over and Out.

# COMMUNICATIONS EQUIPMENT & SYSTEMS TRAIN THE TRAINER PROGRAM

## GROUP EXERCISE

### Emergency Communications Incident, Continued

#### QUESTIONS FOR DISCUSSION:

Using the 6 “Fundamental Components of Communications Equipment & Systems” that we just discussed, let us answer some basic questions regarding this scenario

1. Think about your agency/institution’s communications system. How would you respond to an emergency like this at your own agency/institution in the event that both conventional and cellular telephones were not working?
2. What steps would you take to create permanent back-up communication systems?

# COMMUNICATIONS EQUIPMENT & SYSTEMS TRAIN THE TRAINER PROGRAM

## PRE & POST TEST QUESTIONNAIRE

This Pre & Post Test Questionnaire is designed to measure achievement of the Communication Equipment and Systems learning objectives for this module by first measuring level of knowledge about the fundamentals of Communication Equipment and Systems among training participants prior to receiving a training on this topic and measuring level of knowledge gained after participants have completed the training.

- Please complete this questionnaire and hand it back to your trainer.
- Please circle the correct answer from the answer choices provided.

### 1. A good communications system should

- a) have layers of redundancy
- b) be accessible to and understood by users
- c) include the most advanced technology currently on the market
- d) be tested frequently
- e) all of the above
- f) a, b & d

*Answer: f) A good communications system does not necessarily have to include the most advanced technology available. Instead, it is much more important that it has layers of redundancy, is accessible to and understood by users, and is tested frequently.*

### 2. A common obstacle to communication is

- a) system failure or overload
- b) not knowing how to operate HAM radio
- c) incompatibility of communications systems between agencies
- d) a & c
- e) all of the above

*Answer: d) System failure or overload and incompatibility of communications systems between agencies are both common obstacles to communication.*

### 3. A useful strategy for overcoming obstacles to communication is

- a) to learn sign language
- b) to use redundant technologies within your communications system
- c) to use only wireless technologies

*Answer: b) Using redundant technologies within your communications system is the best strategy to overcome system failure or overload.*

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### 4. Conventional telephones

- a) are vulnerable to overload
- b) can fail in the event of a power outage if they are digital/electronic
- c) use radio waves to transmit information
- d) a & b

*Answer: d) Cellular telephones and 2-way radios use radio waves to transmit information, but conventional telephones do not. However, the vulnerabilities of conventional telephones include their susceptibility to overload and power failure.*

### 5. Cellular telephones

- a) use radio waves to transmit information
- b) are vulnerable to overload
- c) can be digital or analog
- d) all of the above

*Answer: d) Cellular telephones use radio waves to transmit information, are vulnerable to overload, and can be digital or analog.*

### 6. Two-way radios

- a) use radio waves to transmit information
- b) transmit information faster than telephones
- c) have different channels for transmission assigned by the FCC
- d) all of the above
- e) a & c

*Answer: e) Two-way radios use radio waves to transmit information and have different channels for transmission assigned by the FCC, but they transmit information slower than telephones.*

### 7. When speaking on a radio

- a) speak loudly
- b) speak clearly
- c) be brief
- d) stay calm
- e) all of the above
- f) b, c & d

*Answer: f) When speaking on a radio, speak clearly, be brief, and stay calm, but do not shout.*

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### 8. Radios should be used

- a) to make social plans with friends
- b) to transmit confidential information
- c) to communicate important information clearly and concisely

*Answer: c) Two-way radios should be used to communicate important information clearly and concisely, and should not be used for social purposes or to transmit confidential information.*

### 9. Communications protocols should

- a) be created with specific local needs in mind
- b) specify under what circumstances the protocol should be used
- c) include contact information for all relevant agencies and individuals
- d) all of the above

*Answer: d) Communications protocols should be created with specific local needs in mind, specify when they should be used, and include relevant and current contact information.*

### 10. Once the communications system has been established, the most important thing to do is

- a) practice frequently
- b) keep equipment stored somewhere locked and secured
- c) come up with creative radio handles for all users

*Answer: a) Once the communications system has been established, it is crucial to practice often.*

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### CLOSING EXERCISE:

- Imagine looking at 2 glasses of water standing on a table.
- Let us suppose an Aspirin tablet is dropped into one glass, what happens to that Aspirin?
- Now let us suppose an Alka-Seltzer tablet is dropped into another glass of water. What would happen to that Alka-Seltzer tablet?
- Now that you have received this information about Communications Equipment & Systems, let us all go out and be like those Alka-Seltzer tablets, rising to the top, fizzling and spreading out, bubbling with energy and ready to share this information with others.

# COMMUNICATIONS EQUIPMENT & SYSTEMS

## TRAIN THE TRAINER PROGRAM

### REFERENCES

- Amateur Radio Emergency Services (ARES) [www.ares.org](http://www.ares.org)
- National Association for Amateur Radio (ARRL) [www.arrl.org](http://www.arrl.org)
- International Federation of Red Cross and Red Crescent Societies, Emergency Response Unit "Telecommunications" (Geneva, 1995)
- Imai, Yoshinori (Ed.), Media, Technology & Disaster Communications (Special Session of the International Institute of Communications (IIC) Conference, Osaka, 1995)
- Milot, Michel, Major Plans and Programs to Deal with "Telecommunications" Civil Emergency Plans (Ottawa, Canada, 1995)
- Motorola Inc. [www.motorola.com](http://www.motorola.com)
- Radio Amateur Civil Emergency Service (RACES) [www.races.net](http://www.races.net)
- Understanding Wireless Communications in Public Safety. National Law Enforcement and Corrections Technology Center January, 2003 [www.nlectc.org](http://www.nlectc.org)
- Wood, Mark, [Disaster Communications](#), (Published by the Disaster Relief Communications Foundation (UK)) (Topsham, England, 1995 and 1996) <http://www.reliefweb.int/library/dc1/dcc1.html>