# International Association of Fire Chiefs

*Digital Problem Working Group*

# *Best Practices*

# Section Description

## Section 1

Addresses field user portable radio use considerations.

## Section 2

Addresses procedural and technical issues that should be considered by command staff, radio system managers, and technical personnel.

## Section 3

Radio manufacturers information.

# Section 1 Overview

- Background
  - Explanation of the concerns that brought about the creation of the Digital Problem Working Group and the process that the Group has been using to address the concerns.
- Portable Radio Best Practices
  - The Working Group has created a number of different practices that should be considered for adoption by users and organizations to minimize or eliminate the impact of background noise when using radios. The Best Practices provided in this section are primarily focused on the field radio user environment.

# Section 1
## Background

- In late 2006 and early 2007 the IAFC received reports from a few fire departments of potential audio distortion problems with radios using digital audio modulation when operating in environments with high levels of background noise.
  - In response to the concerns raised the IAFC Board of Directors established a Digital Problem Working Group to investigate the problem and report back to the Board.

# Section 1

## Background Continued

- In May 2007 the Digital Problem Working Group held its initial meeting in Fairfax County, Virginia
  - Representatives from the Fire Service, the National Institute of Standards and Technology (NIST), and Industry participated in the meeting
    - Industry representation included radio equipment and SCBA manufacturers
  - The Working Group divided into two Sub-Committees to continue investigating the problem and potential solutions
    - The Testing Sub-Committee was charged with conducting tests in a laboratory environment to quantify the nature of the distortion problem and identify potential solutions and their effectiveness
    - The Best Practices Sub-Committee was charged with developing recommended practices that radio users can implement to minimize or eliminate the distortion problem

# Section 1

## Background Continued

- The Testing Sub-Committee continues to work towards developing test data that can be used to address the distortion problem.
- The Best Practices Sub-Committee has developed a number of practices that radio users can implement to help minimize or eliminate the problem of audio distortion
  - The majority of these practices are suggestions that radio end-users can be trained to consider when using a portable radio in a high noise environment
  - Some of the suggested practices are technical or procedural considerations that organizations should consider adopting to maximize end-user safety and efficiency

# Section 1

# Portable Radio Best Practices

## Recommendation 1:

- **Use the radio for the initial distress call before manual activation of the PASS in a Mayday situation when practical.**
  - PASS devices create a great deal of background noise very close to the radio microphone so transmitting on the radio before activating a PASS optimizes the probability that a voice message can be transmitted successfully.

## Background:

- Providing a voice message imparts more information than activating the PASS device. Providing a clear radio report maximizes the probability of a successful resolution to the problem.
  - Recommended Sequence:
    - Transmit a voice message
    - Activate the PASS

# Section 1

## Portable Radio Best Practices

## Recommendation 2:

- **Ensure that the microphone is placed 1 to 2 inches from the mouth or SCBA voice port with the microphone facing the user.**

## Background:

- The microphones in portable radios and accessories are optimized by the manufacturers to be 1 to 2 inches from the audio source when in use.
- Microphone performance is maximized when the audio is coming directly into the microphone and not entering the microphone from the side or back.
- Users should refer to the manufacturer's documentation for the microphone location on their radio specific equipment.

# Section 1

## Portable Radio Best Practices

### Recommendation 3:

- **Speak in a loud, clear, and controlled voice to maximize audio intelligibility.**

### Background:

- This practice dramatically improves radio performance and is applicable in all circumstances.

# Section 1
# Portable Radio Best Practices

## Recommendation 4:

- **Shield the microphone from noise sources to improve the intelligibility of the audio in high noise environments.**
  - **When Practical:**
    - **Turn or move away from the noise source**
    - **Use a free hand to shield the microphone from noise**
    - **Use the helmet brim or visor to shield the microphone from rain and water**

## Background:

- Protecting the microphone from direct impacts from water and debris dramatically improves audio intelligibility.

# Section 1

## Portable Radio Best Practices

## Recommendation 5:

- **When practical consider using a free hand to muffle a mask-mounted SCBA low air alarm when trying to transmit on a radio.**

## Background:

- The sound generated by mask-mounted SCBA low air alarms emanates from a source that is very close to the facepiece voice port that the user's voice passes through.
- Putting an available hand over the alarm can mute the sound of the alarm notably thereby improving audio intelligibility.

# Section 1
## Portable Radio Best Practices

### Recommendation 6:

- **Consideration should be given to the location of radios and microphones in relation to PASS devices and other noise generating user equipment.**

### Background:

- Agencies and users should consider the locations of the alarm emitters on PASS devices and takes whatever measures that are possible to provide as much separation as practical between the emitters and radio hardware.
- Emitters located close to microphones can severely degrade audio intelligibility.

# Section 2 Overview

- Technical & Procedural Best Practices
  - The practices are associated with procedures and technical issues that should be considered by the appropriate personnel in each agency for appropriate follow-up.

# Section 2

## Technical & Procedural Best Practices

## Recommendation 1:

- **Incident commanders should evaluate background noise in the environment as a safety consideration in task assignments.**
  - **Additional personnel may need to be assigned to a task to ensure communications capability when there are high levels of background noise in the environment.**

## Background:

- Traditionally incident commanders may not be considering background noise when evaluating safety concerns and the required resources to mitigate those concerns. Given that background noise can significantly degrade communications capabilities (regardless of the radio modulation being used) consideration should be given to assigning additional staff to provide communications for personnel operating in high noise environments.

# Section 2

## Technical & Procedural Best Practices

## Recommendation 2:

- **System Manager and users should work with their vendors to ensure that their radios and accessories are configured with the optimal system settings to maximize audio intelligibility in high noise environments.**

## Background:

- Modern radios are very intricate devices with many configurations options. Some options can have a significant impact on a radio's performance when operating in high noise areas.
  - Each radio manufacturer can work with users to ensure that the configuration in use maximizes their radio's performance when operating in a high noise environment.

# Section 2

## Technical & Procedural Best Practices

## Recommendation 3:

- **Fire departments should be actively involved in the design and development of requirements for any communication system implementation from the beginning.**
  - The importance of fire department participation in the development and installation of radio communication systems cannot be overstated.

## Background:

- Radio systems that are designed and constructed without consideration of fire department requirements frequently do not meet the needs of fire and rescue users.

# Section 2

## Technical & Procedural Best Practices

## Recommendation 4:

- **When practical consider the use of accessories, such as throat microphones and in-ear microphones, to reduce the impact of background noise.**

## Background:

- Radio accessories can dramatically reduce the impact of background noise on audio intelligibility.
- Special attention must be paid when selecting radio accessories to ensure that they are compatible with the environment that they are to be used in.

# Section 2

## Technical & Procedural Best Practices

## Recommendation 5:

- **Consideration must be given to communications equipment integration requirements in the design of SCBA and PASS equipment and other equipment and systems that contribute to the firefighter's protective envelope.**

## Background:

- Communications equipment is an essential component of a firefighter's overall safety ensemble and as such needs to be given appropriate consideration when procuring and integrating equipment for the firefighter's protection and safety.

# Section 3 Overview

- Manufacturer Specific Information
  - The radio manufacturers listed on the next slide have participated in the development of this presentation.
  - Users are encouraged to contact the appropriate manufacturer for more detailed radio-specific information.
    - Manufacturers may be contacted via website, phone, or sales and service representatives for more detailed radio-specific information.

# Section 2

## Manufacturer Specific Information

- EF Johnson
- Kenwood
- M/A-Com
- Motorola