



IN-SUIT COMMUNICATIONS EQUIPMENT

The U.S. Department of Homeland Security (DHS) Science and Technology Directorate (S&T) established the System Assessment and Validation for Emergency Responders (SAVER) program to assist emergency responders making procurement decisions.

DHS S&T's Nation Urban Security Technology Laboratory (NUSTL) manages the SAVER program and conducts objective assessments and validations on commercial equipment and systems. These results, along with other relevant equipment information, is provided to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List.

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

For more information on this and other technologies, contact NUSTL by e-mail at NUSTL@hq.dhs.gov or visit the SAVER website: www.dhs.gov/science-and-technology/SAVER.

In-suit communications (ISC) equipment are radio accessories that enable emergency responders to effectively communicate when wearing encapsulated or partially encapsulated personal protective equipment or a self-contained breathing apparatus (SCBA), air-purifying respirator or powered air-purifying respirator. These accessories are extensions of responders' existing portable two-way radios and include microphones, headsets, earpieces and activation accessories such as push-to-talk or hands-free voice-operated exchange. ISC equipment enables communication in high noise or high background audio environments.

Overview

The centerpiece of any responder communication system is their portable radio, and not all ISC equipment is compatible with all radios. Various types of microphones and earpieces/headsets are available to meet different emergency responder needs. The strengths and weaknesses of ISC equipment require careful consideration to ensure that the accessories chosen meet the responder's needs.

Traditional boom-mounted microphones and headsets offer excellent voice clarity, but the physical presence of the microphone boom can be cumbersome in many cases.

Bone conduction microphones are good for high noise or high background audio environments, as they only pick-up the vibration of the skull when the user is talking. These microphones are often worn inside helmets or attached to the straps of a facemask, but must maintain good contact with the skull.

In-ear microphones rely on the vibrations produced in the wearer's ear canal when speaking, as well as serving as a voice receiver/headset. These one-piece devices are convenient and provide good noise reduction.

Throat microphones are worn around the neck and are able to pick-up low volume speech, but can be sensitive to positioning and can cause discomfort. To activate voice transmission, a large push-to-talk button worn on a chest strap is often used. Voice amplification accessories are also available that enable responders to communicate from within their suits with others that do not have radios.



Figure 1. Key ISC Components Include a Radio, a Headset/Microphone and Push-to-Talk or Voice Activation Device

Image courtesy of Pacific Northwest National Laboratory



ISC Equipment Radio Accessories

SCBA Facemask-Mounted Radio Accessories

Various manufacturers offer earpiece/microphone accessories that are specific to certain SCBA facemasks. Some products also include voice amplification, improved voice intelligibility and/or Bluetooth communication directly to a responder's Bluetooth-enabled field radio. Some products with voice amplification do not utilize an earpiece, as communications received by the radio are transmitted directly to the device, and amplified in the direction of the ear.



Figure 2. SCBA Facemask-Mounted Voice Amplifier Communication Device

Image courtesy of 3M (Scott Safety)

Bone Conduction Radio Accessories

Bone conduction communication devices come in a variety of designs including helmet-mounted devices. Because they utilize bone conduction, they significantly reduce background noise. They are compatible with facemasks, and some models do not interfere with hearing ambient sounds, as nothing covers or is inserted in the ear.



Figure 3. Bone Conduction Headset/Microphone

Image courtesy of Savox

In-Ear Microphone/Receivers

In-ear microphones offer the convenience of having the voice transmitted and received in a single device, and minimizing any interference with a facemask or helmet.

In-ear microphones are similar to bone conduction microphones in that they detect vibrations in the ear canal generated during speech. Some products offer custom molded earpieces that can improve comfort and possibly performance.



Figure 4. In-Ear Microphone/Receiver Shown with Push-to-Talk Device

Image courtesy of Cavcom

Throat Microphones

Throat microphones are usually worn just off center of the throat and capture acoustic vibrations produced from the vocal cords. They are very sensitive—can transmit a whisper—and perform well in high noise environments. Throat microphones can be used with an earpiece, helmet speakers or earbuds.



Figure 5. Throat Microphone/Headset

Image Courtesy of Savox

ISC Equipment Selection Criteria

The selection considerations for ISC equipment include durability, compatibility with personal protective equipment, comfort/fit, ease of operation and voice intelligibility. Other features that may be important are intrinsic safety (for use in explosive environments), ingress protection rating (from dust and water) and other National Fire Protection Association requirements. The equipment descriptions of these radio accessories emphasize different characteristics that may be needed for different use-case scenarios. Numerous manufacturers not referenced here offer these types of radio accessories.