Title: Thermal Imaging Camera Guided Searches

Time: 2.0 hours

Equipment: Thermal Imaging Camera (TIC)
1 Space Heater
1 Wool Blanket
1 Apparatus Drip Pan
1 Mannequin
1 Shower Curtain
1 Full Length Mirror

Enabling Objectives (EOs):
EO 1: Shall be able to turn the thermal imaging camera on and off
EO 2: Shall be able to recognize and utilize all indicators and functions of the thermal imaging camera
EO 3: Shall be able to identify several advantages to utilizing and speeding up the primary search with the thermal imaging camera
EO 4: Shall be able to describe and identify at least 3 limits of the thermal imaging camera during search and rescue

Motivation:
The Thermal Imaging Camera (TIC) will convert the heat radiation of an object into a visual image that can be utilized by the rescuer. Due to the use of radiant heat, smoke and visual light will not affect the thermal image provided. These properties assist search and rescue crews by allowing them to increase their speed, expand their area of coverage and better identify objects and victims.

Student Performance Objective:
Given a Thermal Imaging Camera (TIC) and a set of scenarios, the attendee will be able to utilize the TIC to locate and identify simulated victims as well as potential limitations of the image.

Overview:
- Basic TIC operation and functions
- Methods of utilizing the TIC during search
- Advantages of the TIC
- Limitations of the TIC
- Practical exercises

I. Basic TIC operation and functions
a) Location on apparatus and removal from charger

b) Turning on
   i) Testing the operation of the TIC
      (1) Provide a test object such as your hand or a partner, prior to entering the IDLH
   ii) Check the battery indicator to ensure proper charge
   iii) Understand all available settings and functions of the TIC
      (1) Make sure you know how to place the camera in “fire” or “search” mode if available

c) Image Displayed
   i) Basic images are displayed in black and white
      (1) White = hot. This means the white object is the warmest object the TIC had to compare to in its scan
   ii) Color is used to highlight “high heat” within a given temperature range compared to the objects around it
      (1) Temperature range may automatically adjust based on the readings. Such as:
         (a) Low heat: 0-300 degree scale
         (b) Medium heat: 300-100 degree scale
         (c) High heat: >1000 degree scale

II. Methods of utilizing the TIC during search
   a) Scan from shoulder to shoulder to expand the field of vision of the image
   b) Scan the three fields within the compartment (High – Middle – Low)
      i) High: heat at the highest point, type of construction/ceiling type (drop ceiling?), possible extension
      ii) Middle: room orientation, layout, egress points (windows or doors), furniture to search by hand
      iii) Low: victim ID, debris, holes

III. Advantages of the TIC
   a) Increase the speed of the search team and ability to identify objects and victims during primary search
      i) Search does not rely on constant sweep of arm or tool. With a quick scan of the TIC, you can cover a larger area and rule out areas needing further inspection
   b) Enhance the ability to locate the seat of the fire
      i) Since smoke does not affect the image, TIC can identify the location of the seat of the fire
   c) Quickly identify a means of egress within a structure
      i) As you scan, locate the doors and windows
      ii) Due to the temperature differences, often times you will be able to see studs within a wall. A wall that stands out as being “hot”, may contraindicate a wall breach in the event of an emergency due to conditions on the other side
   d) Identify extension around the search crew in the event of searching without a hose line
IV. Limitations of the TIC

a) Provides image based on surface temperature only, does not measure or indicate temperature of atmosphere in the compartment
   i) TIC measures the radiant heat being emitted from an object only
b) TIC will reflect an image off of shiny metal objects, mirrors and shiny tile floors
   i) Must ensure you’re not seeing an object (victim, door, window) through a reflection
c) Cannot see through any objects and therefore may disguise a victim
   i) Objects such as shower curtains, blankets and windows are enough to “hide” the victim behind or underneath
d) Image misinterpretation due to training
   i) During training do not focus on the coloring of objects, you must train to recognize shapes
      (1) In training, the human body will generally display white, as it is the warmest object in the view of the camera to compare. However, in a live fire environment this may be reversed. The human body will blend as part of the gray scale since it may no longer stand out as “warm” compared to the objects absorbing heat around it
V. Practical exercises

a) Utilizing the TIC during search
   i) In a blacked out room, place a mannequin or other type of victim in the room. Time the search crew as they begin a primary search without the use of a thermal imager. During the search, have the team identify all means of egress (windows and doors). After locating the victim, continue to time as the crew attempts to locate the means of egress and removes the victim. Repeat the drill while providing the search team a TIC.
      (1) Encourage the team to blend conventional search methods with the use of the TIC. They should maintain proper orientation and conventional movements after a “scan” of the TIC.
      (2) Attempt to refrain from using a live victim. By using a mannequin, you will assist the crew in training their eyes to respond to shapes of objects instead of the “bright white person”
b) Locating the seat of the fire and hot spots
   i) In a hallway with several doors, place a space heater inside one of the rooms behind the door. Allow the heater time to warm the door before starting the drill. Place a crew in the hallway and allow them to identify the room that has the simulated fire.
      (1) See if the crew can recognize the “V” pattern on the door
      (2) This can be added to the scenario above to access the search teams decision making ability in regards to progression of search (closest to fire first)
c) Limitations of the TIC
i) In a blacked out room, place one live victim under a blanket on a bed or couch. Have a crew enter using a TIC and scan the room. See if the crew can identify the victim laying under the blanket.  
   (1) Have the victim get under the blanket just prior to the crew entering the room so the blanket temperature remains as neutral as possible

ii) Using a bathroom with a shower or tub, place a victim behind the shower curtain. Have the crew enter the bathroom and scan with the TIC.  
   (1) Students should note the reflection of the user in the mirror and the inability of the camera to locate the victim behind the shower curtain

**Review:**

- Basic TIC operation and functions
- Methods of utilizing the TIC during search
- Advantages of the TIC
- Limitations of the TIC
- Practical exercises