

SUBJECT: THERMAL IMAGE CAMERA(S)**SECTION:** 301.11**REVISED:** FEBRUARY 6, 2008**PAGE(S):** 5

PURPOSE

- A. To establish a procedure to facilitate the most effective method for deploying thermal image camera(s) in a way that provides the most protection for our personnel.
- B. To provide a reference document to be used for training of personnel in the uses, deployment, limitations, operation, and care and maintenance of the Thermal Image Camera(s).

POLICY

It shall be the policy of this department to utilize thermal image cameras (TIC) in every structure fire and any other situations as identified where it will enhance the safety and capability of fire department personnel.

PROCEDURE

- A. A TIC is carried on Engine 83, Engine 283, and Tower 84. Personnel should become familiar with the location of the TIC on each apparatus. Ultimately, the company officer should determine who will operate the TIC.
- B. It is the officer's responsibility (or person riding in this position) to carry the TIC into a structure whenever the initial response involved a full assignment regardless of initial size-up reports.
- C. When the Company arrives on the scene of a fire or any other incident where smoke will or could hamper visibility, the person riding in the officer's position of apparatus should remove the camera from its holder and take it to the entry point of the structure. The rider of this apparatus will continue to be responsible for deploying the handline.
- D. When operating in the "Rescue Mode", company personnel should use available thermal image cameras to aid in the search for victims. If operating ahead of or separate from the first hand line, the tag line stored next to the TIC, will be used (once placed in service). The operator of the camera should utilize any strapping or hardware to secure the camera to his/her person to avoid the possibility of being separated from the camera.
- E. The third arriving thermal image camera should be reserved for use by the established Rapid Assistance Team (RAT). Subsequent cameras will be used by additional entry crews.
- F. If conditions warrant the use of the camera, the nozzle person should be the operator of the camera. Through field exercises it has been determined that the safest and most efficient operation of the camera occurs when its operator's

- view is not obstructed by other firefighters. Camera operators must be aware that they have a tendency to move faster than the rest of the team who are operating in zero visibility. Truck Company personnel operating with the initial hand line crew should coordinate their efforts in order to maintain compliance with the "Two In and Two Out" S.O.G. Search and suppression activities should occur in compliance with their respective S.O.G.'s and standard firefighting practices should be observed with the Thermal Imaging Camera acting as an "extension of the tool in the hand." Two person teams are the policy.
- G. In moderate to heavy smoke conditions the Camera allows a crew to quickly check a smoke filled area to determine whether or not there is fire present. The camera operator must remember not to move too quickly, so that the rest of the team is not lost in the zero visibility environment.
 - H. The Camera has the potential to inspire overconfidence because it allows firefighters to "see" in an environment that in reality has zero visibility. Firefighters should remember that they must stay low even if the camera allows them to see that the majority of the heat is at the ceiling. The possibility of a flashover in the dynamic atmosphere of a structure fire is higher than ever before because of new materials, construction methods and rapid responses. Personnel must understand that the camera could fail and an escape route must be easily located, either by following a hose line or rope tag line to safety.
 - I. The camera can also serve as a tool for detecting heat during the overhaul phase of an incident. It must be remembered, however, that the TIC cannot penetrate most construction materials including drywall, plaster and lathe, concrete, glass or plastic. Also, the TIC cannot penetrate water. Because the camera has a black and white display it is sometimes difficult to differentiate between what is heat or fire trapped in a wall and what is radiant heat. A Heat Detector (Thermal Spy) is still the primary tool for locating areas or objects that have a higher temperature than their surroundings because it allows the differential between that area or object and its surroundings to be determined in actual degrees. Not all TICs are equipped with heat detection capabilities.
 - J. Thermal Imaging Camera equipped companies operating in the County of Hamilton should be the operators of their cameras when deployed unless there are other trained personnel on the scene and approved by the officer.

THERMAL IMAGE CAMERA USES

- A. Provides safer navigation in a space where there is zero visibility due to smoke.
- B. Allows personnel to "see" in a zero visibility environment which is a very useful addition to traditional search and rescue techniques. The time necessary for completing a primary search can be cut by almost half by utilizing a Thermal Imaging Camera.
- C. Enables suppression crews to execute a faster, more effective interior attack. The shortest route to the fire, holes in the floor and obstacles in the structure can be determined and located efficiently.
- D. Reduces fatigue of interior crews because efficiency in performing searches and suppression is increased.

- E. Allows Rapid Assistance Teams (RAT) to quickly and efficiently locate downed firefighters.
- F. May be used to determine fluid level within a container which may be useful during an incident involving a hazardous material.
- G. May be used as a search tool to locate lost persons in open wilderness areas.

BACKGROUND INFORMATION

- A. Lack of visibility on the fireground is caused by products of combustion, primarily smoke. Smoke is composed of two elements; fire gases produced by the fuel's chemical breakdown and soot. Heavy smoke causes all the light to be scattered or blocked since the light waves cannot penetrate the particles. This zero visibility condition is what limits the effectiveness of lighting for interior firefighting operations. This lack of visibility heightens the potential for firefighters to become disoriented and lost within the fire building and in turn could hamper their ability to exit the structure in an emergency situation.
- B. Thermal energy is not visible to the human eye, but the firefighter can feel the heat present. The Thermal Imaging Camera, TIC, allows a thermal heat view of one's surroundings.
- C. A Thermal Imaging Camera is a device that translates a thermal picture into an electrical picture and then a visual image for the human eye. This is accomplished because it relies on the thermal energy emitted by all objects and not on reflected visible light. Thermal Imagers provide vision capability with zero light present. Thermal energy is characterized by its long wavelength, and fortunately for firefighters, the nature of this long wave thermal energy allows it to travel through smoke and mist. In essence the TIC "sees" through smoke and mist.
- D. Everything viewed through the TIC's lens retains its shape, people look like people and rooms look like rooms. The TIC provides the firefighter with a black and white television view through the smoke and darkness.
- E. When viewing a room using the TIC, hot things appear white, hotter objects appear brighter white, and colder items appear black to gray. The whiter the representation displayed, the more heat present in the object.

LIMITATIONS

- A. The Thermal Imaging Camera allows a two dimensional view of a smoke filled environment. Depth perception is limited. Firefighters operating the camera should remain low to the ground, scanning the entire area before them. When scanning an area with the TIC begin at the ceiling and conclude at the floor area immediately in front of them. Walking with the TIC is discouraged as trip hazards may be overlooked.
- B. Thermal energy does not travel directly through walls. A TIC does not allow an area to be viewed which is behind a wall. If fire is present inside a wall, the camera will only be able to "see" it if the fire has increased the temperature of the wall itself. Fire inside wooden clad walls will be picked up much faster than

- fire on the other side of a more significant barrier such as concrete. Normal overhaul procedures must be utilized in order to locate fire extension.
- C. A human being will not provide sufficient thermal energy to penetrate most standard construction materials or solid items such as furniture. Therefore, it is reinforced that while conducting a search, rescuers must look under/ around beds, sofas and other objects where victims may have hidden to escape fire.
 - D. Water, plastic and glass are all effective barriers for the TIC and may cause a reflective image. The team operating the camera must remember that the image present on the TIC's screen could be a "mirror image" of themselves or fire behind them being reflected off of glass, plastic or water. To test suspicious images, the crew should wave their arms and determine whether they are seeing their own image.
 - E. Also, firefighters and occupants, who are wet from hose line operations, could be masked from the camera's view during a search because there is a momentary balance of thermal signatures.
 - F. The Thermal Imaging Camera must be used with the understanding that it is only a mechanical device and it can fail. Firefighters must plan for this possibility by carrying flashlights, maintaining contact with the wall, a hose line, employing a tag line or other routine methods for remaining oriented to location and the position of exits in a zero visibility environment. Crews should continue to employ standard fire fighting practices.
 - G. Count on no more than twenty minutes of operation per battery, less in cold temperatures. Change the battery each time the operator leaves the structure to exchange SCBA bottles unless the TIC is being handed off to another crew that is completing the primary search.
 - H. Be aware that if the controls on the TIC are bumped the unit could become deactivated.
 - I. The image displayed by the TIC may decrease in quality as soot builds up on the lens and screen while operating on the fire ground. A soft cotton cloth should be used to clean the lens and screen periodically while operating the camera.
 - J. If the picture displayed on the screen suddenly becomes distorted, check to insure the carrying strap is not in front of the lens.
 - K. "White Out" is a condition caused by aiming the unit at a very hot object or flame which causes the TIC's sensor to become overloaded and the display to show all white, rendering the TIC useless. To correct the problem, aim the camera away from the extreme heat source and the display should return to normal in under one minute, often within just a few seconds.
 - L. The Thermal Imaging Camera has not been determined to be intrinsically safe as an ignition source. This device is not to be used in a potentially explosive atmosphere.

DAILY INSPECTION

- A. The camera should be checked as part of the daily equipment check.
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- B. The camera should be inspected for cleanliness. If any part of the camera is dirty a clean rag dampened with face piece cleaner should be used to clean the camera.
- C. The camera and its carrying strap must be thoroughly dry before being returned to the airtight case.
- D. The camera should be turned on and checked for proper operation and then turned off.
- E. If the battery charge indicator displays low capacity the spare battery should be placed in the unit and the discharged battery charged with the provided charging unit.
- F. The camera should be returned to its location.
- G. Problems with the unit should be reported to the OIC and a defective equipment form filled out.

MAINTENANCE

- A. Batteries should be rotated weekly and charge as necessary on Sundays.
- B. Screws on the camera should be checked periodically for tightness.
- C. After the camera is used on an incident it should be thoroughly cleaned and dried before it is returned to its airtight case and the camera's battery, along with the spare, should be fully charged.

SAFETY

No operation as outlined in this SOP shall preclude any person from using good judgment with due regard for the safety of all personnel.