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Thermal Imaging: Is It Appropriate For Dayshift Patrol Operations

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By
Robert Flores

Allen Police Department
Allen, Texas
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ABSTRACT

Technology has effected virtually every profession. Technology advances in law enforcement are no exception. The fact that law enforcement will always be required to search for people, be they fleeing fugitives or lost children will never change. The fact that crime and accident scenes will have to be processed for evidence will always exist. Law enforcement will be forced to respond to incidents in the dark of night, and in the light of the day. A relative new tool for law enforcement is thermal imaging or forward looking infrared technology. This technology detects the heat difference in objects and produces an infrared picture. This technology was first introduced to the military, it has long been thought of as having night time applications only.

The purpose of this research is to determine if thermal imaging technology has a place in dayshift patrol operation. Several agencies using thermal imaging technology were contacted, the applications in which they utilized thermal imaging technology were documented. Information was also gathered from meetings held by agencies that were involved in the National Institute of Justice grant to study the effectiveness of thermal imaging technology in law enforcement. Information was gathered concerning the cost of the equipment as well as cost to train operators.

It is concluded that thermal imaging technology can enhance officer safety and be an effective tool in the processing of crime and accident scenes. New applications are being discovered that have dayshift patrol applications. Thermal imaging technology has proven to be effective anytime, day or night.

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Introduction

Law Enforcement is the only profession in the world where you actually get paid to go out and look for trouble. There is actually technology that makes looking for trouble easier and more effective. This technology is in the area of thermal imaging. Thermal imaging cameras detect the slightest difference of surface temperature. This infrared camera scans the object or area, a sensitive detector takes a thermal picture, and like a movie camera reproduces images (Siru, 1993). This technology was introduced to the military in the 1950's and is often referred to as forward looking infrared, nightvision, or nightsight technology. The military has used this technology for such things as search and rescue missions, search and destroy missions, and heat seeking missiles. During 1991 in the deserts of the Middle East, Operation Desert Storm took place. It was during this police action that the world saw thermal imaging technology in action, as a scud missile struck a target during the night hours in a raid over Kuwait. That image was televised throughout the world. Technological advances in the field of thermal imaging have truly benefited law enforcement by bringing the cost of thermal imaging cameras down while enhancing the quality of the images produced. Technology has also advanced to the point that thermal imaging cameras can now be mounted on aircraft, vehicle rooftops, and handheld units.

The purpose of this research is to determine if thermal imaging technology is applicable for day shift patrol functions. Law enforcement agencies must be willing to make a substantial investment that includes the cost of equipment and the cost to train officers to operate equipment. With such an investment it does not seem cost effective to limit the use of the thermal imaging technology to nighttime operations only. The main purpose of thermal imaging in law enforcement has been to locate individuals, be they fleeing, lost, search and rescue operation, or recovery mission.

Data was collected through questionnaires sent to ten law enforcement agencies that utilize thermal imaging technology. Questions asked include the type of equipment used by the agency, and the application for which the thermal imaging equipment is used. Information was also gathered from companies that manufacture thermal imaging cameras. Cost factors were evaluated, to include initial setup, maintenance, and cost of training individuals to operate the equipment.

It is hypothesized that thermal imaging technology could play an important and vital role in dayshift patrol operations. It is believed that nightsight technology is only limited by the operator. As thermal imaging equipment continues to improve, applications will continue to evolve. This research will help law enforcement to determine whether technology once thought of as only having night time applications will have applications during the dayshift operations.

Review of Literature

All objects emit heat, this radiation is invisible to the naked eye. Thermal imaging systems detect the surface temperature of an object. The infrared picture produced is known as a thermogram. Thermal imaging works much like a television camera, a sensitive detector takes a thermal picture. The picture seen will be normal, with the brightness controlled by the temperature of the object that appears (Stevens, 1982). Thermal imaging cameras do not send out any type of radar beam or rays, and are non intrusive, as they can not penetrate glass or any solid object.

One major hurdle that law enforcement faced was court challenges on the use of thermal imaging cameras. In U.S. v Kilgus (1978), the court ruled that thermal imaging could be used for genetic identification of objects. In Arizona v Cramer (1992), the court ruled that the use of

an infrared heat measuring device by police to measure the heat emanating from a home did not constitute a search.

With the availability of thermal imaging technology law enforcement was faced with the challenges of having operators that were properly and thoroughly trained and certified to operate the equipment (Paytner, 1999a). Thus, the Law Enforcement Thermographers' Association, (L.E.T.A.) a non-profit law enforcement association and the United States Drug Enforcement Administration began to address both training and prosecution aspects. Through L.E.T.A. a larger segment of the law enforcement community was trained and certified in the uses and operation of thermal imaging equipment. The training consisted of a 40 hour basic certification course. Additional certifications are available to include advanced thermographers course, which includes an additional 16 hours of training. An instructors course is also available, with approval by the L.E.T.A. board.

In 1997 the National Institute of Justice (N.I.J.) commissioned a two year study on the applications of thermal imaging technology in law enforcement. The study centered around the Dallas metroplex and in particular the U.S. Highway 75 corridor. Agencies initially involved included the Dallas County Sheriff's Office, Collin County Sheriff's Office, Grayson County Sheriff's Office, Richardson Police Department, Plano Police Department, Allen Police Department, McKinney Police Department, and the Texas Rangers Company B. Approximately a year into the study additional agencies were added; Denton County Sheriff's Office, Garland Police Department, Farmers Branch Police Department, Dallas Police Department, and Highland Park Department of Public Safety.

Each agency was provided with thermal imaging cameras and in July 1997, L.E.T.A. was brought in to instruct officers from the initial agencies on the use of the thermal imaging

cameras. Charles Stowell, (D.E.A. retired), one of the chief pioneers in use of thermal imaging by law enforcement was brought in as an instructor. The training revealed that there were nine applications for the thermal imaging camera . The first application was search and rescue. Since the thermal imaging camera is able to detect body heat a larger area can be scanned quickly and with little manpower. A second application is locating fugitives. The cover of darkness has been an asset to the fleeing fugitive. The thermal imaging camera can be used to track and locate fleeing fugitives.

Flight safety is a third application. Thermal imaging enables pilots to avoid obstacles such as hightension wires, towers, and antennas, as well as unfamiliar terrain. Vehicle pursuits are a fourth application for thermal imaging in law enforcement. An aircraft equipped with thermal imaging equipment is able to detect a fleeing motorist. Therefore, fleeing suspects can not simply turn off their lights and avoid detection. Structure profile is another application that deals with the use of thermal imaging cameras to locate hidden compartments in houses and vehicles .

Marine is the sixth use of thermal imaging in law enforcement. This technology has proven to be valuable in the tracking of ships and boats. The sea provides a difficult challenge. Thermal imaging allows large areas to be searched quickly and efficiently. Another application is in environmental law enforcement. It has been discovered that thermal imaging allows for locating of toxic waste, oil spills, the residue of clandestine drug labs and other pollutions .

Perimeter surveillance is the eighth application for thermal imaging. Thermal imaging cameras are used to establish perimeter surveillance at correctional institutes, industrial and national security complexes, airports, laboratories and even sports stadiums and arenas. Disturbed surface scenario is the ninth application for thermal imaging. This application deals

with searching land areas that have been disturbed in some manner. The L.E.T.A. training dealt with night time application and practical training took place during the late evening and night time hours.

Since 1997 additional applications have been added to the use of thermal imaging in law enforcement. Officer safety is one obvious addition, as officers are able to remain undetected from armed suspects. Additionally this technology can be used to search accident and crime scenes, (Paytner, 1999b). An interesting finding from the N.I.J. study was the fact that officers using thermal imaging cameras felt that the element of surprise had moved from the criminal element to the side of law enforcement.

As early as 1976, police in New Zealand used infrared cameras to search for a missing hitchhiker. Although the hitchhiker was never found, the infrared camera proved to be beneficial in the search (Dickinson, 1976). The progression in the use of thermal imaging equipment continued in early 1993, when the San Luis Obispo Sheriff's Office, CA, used thermal imaging to monitor beaches and inland areas for illegal drug activity. In Canada, the Royal Canadian Mounted Police, are using thermal imaging to detect unsafe air brakes on truck tractors (Carigan, 1999). The application for night vision have been advanced, such as the equipment. Years ago the only night vision technology most agencies had access to or even knew about were rifle scopes, and goggles (Levine: Martin, 1992).

Fire Departments have also found applications for thermal imaging technology, to include locating hot spots and searching smoke filled buildings. New uses for thermal imaging technology in public safety will continue as more agencies get access to the technology (Caldwell, 2001).

Methodology

Law enforcement has proven to be effective and creative with new technology. The technology of thermal imaging, also known as nightvision, and nightsight has proven to be effective in enforcement. The terms nightsight and nightvision tend to lead one to believe that this technology is limited to night time hours. Is thermal imaging technology appropriate for dayshift patrol operations?

It is hypothesized that thermal imaging has a place in law enforcement and will be effective during dayshift operations. Quality proven equipment and highly trained personnel will be effective anytime, day or night. With new problems, comes new solutions, and thermal imaging will be a solution.

To examine this issue a telephone survey was conducted. Ten agencies in the Dallas metroplex were contacted and questioned about their use of thermal imaging equipment. The ten agencies surveyed were Rowlett Police Department, Plano Police Department, Richardson Police Department, Mesquite Police Department, McKinney Police Department, Garland Police Department, Dallas Police Department, Addison Police Department, Dallas County Sheriff's Office, and the Collin County Sheriff's Office. The information gathered will provide insight on the uses and applications of thermal imaging in law enforcement. All ten of the agencies contacted responded to the survey.

In 1997 as part of a N.I.J. grant eight law enforcement agencies in the Dallas metroplex area studied the use of thermal imaging in law enforcement. Each agency was provided with thermal imaging cameras and officers were trained on the use of the equipment. Every time the cameras were used the information was documented and forwarded to an evaluator who tracked and evaluated the study. Monthly meetings were also held by the user agencies to review

activity and discuss equipment concerns. Information from these meetings was also used to determine the conclusion of this research. Heat Beat, a monthly publication by Raytheon Systems Company, started as a result of the N.I.J. grant also contributed to the findings.

Findings

Preliminary results from the N.I.J. grant report that all the thermal imaging cameras are effective and have a place in law enforcement. Thermal imaging does improve public safety, 43.5 percent of the officers using thermal imaging reported that thermal imaging technology did contribute to the safety of the public. This compares to 55% of the officers reporting that thermal imaging contributed to the safety of officers. The most common use of thermal imaging was searching for suspects and persons (49%), followed by surveillance reactive (19%), and surveillance proactive (14%) (Ginger,1999).

Data gathered indicated that the use of thermal imaging cameras was predominately done in the outdoor environment, compared to approximately 10% of thermal imaging use indoors. The use by fire departments in smoke filled buildings has decreased search and rescue time. A typical five to six minute search may in many cases be done in less than one minute. The same theory applies to officers searching for persons. A park or field may be scanned in minutes with the use of a thermal imaging camera. The same park or field might take officers hour(s) to safely search on foot.

Survey results indicated that thermal imaging technology is most commonly used for search and rescue, fugitive apprehension, and surveillance. The following is a breakdown of how thermal imaging equipment is utilized by surveying agencies.

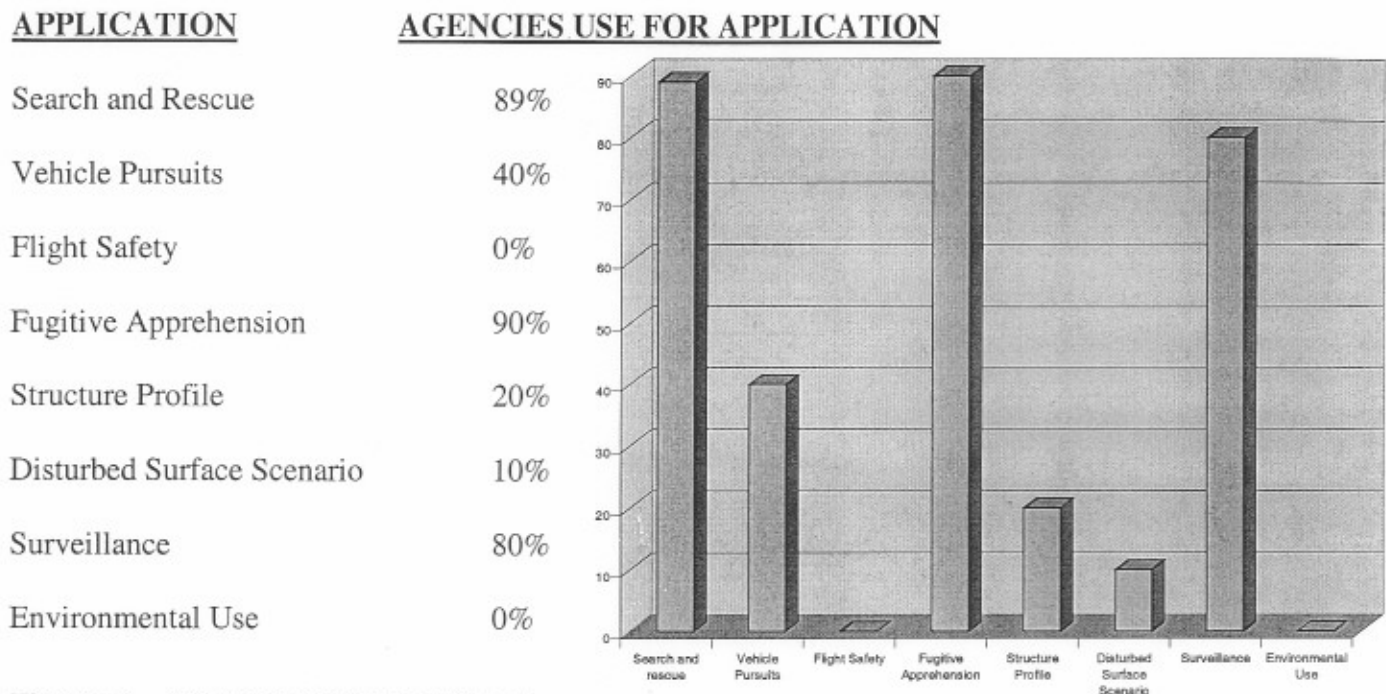


Figure 1 – Equipment Usage Chart

Other applications included accident investigation and crime scene investigation. Thermal imaging technology has been used to determine when a vehicle braked, as anti-lock brakes do not leave skid marks. One of the more creative uses of the thermal imaging cameras is a partnership between the Dallas County Sheriff's Office and Raytheon Systems Company. A handheld thermal imaging camera known as a palm IR, was mounted on a monopole with a cable connected to a video screen to the opposite end of the pole. This device allows officers to search attic and crawl spaces, commonly used hiding places for fugitives, without exposing the officer to unnecessary danger.

An important factor in any procurement is cost. Cost to not only obtain the equipment, but also cost factors concerning training and maintenance. The cost for a handheld unit is approximately \$13,250, while the cost for a vehicle roof mounted unit is approximately \$11,100. However the thermal imaging cameras are extremely durable and require little maintenance. Keeping vehicle roof mounted cameras facing the rear when not in use reduces the likelihood of damage to the camera. The most common damage to roof mounted cameras is to the lens by

road debris and tree branches. Replacement of the lens cost is approximately \$500, according to Jeanee Jones of Raytheon (personal communication, October 2000). Training through the Law Enforcement Thermographers Association is approximately \$350 per officer.

Additional applications were also discovered by officers of the N.I.J. grant. The application of tactical support to include sniper spotter, scout and perimeter cover. In addition hidden contraband in vehicles and buildings may now be located, such as drugs, money, guns, and evidence. The application of vehicle profiling includes locating stolen vehicles and locating suspect vehicles hiding with other vehicles.

Many applications for thermal imaging have been added since the nine original applications taught by L.E.T.A. in July of 1997. The majority of the additional applications are from research directly associated with the N.I.J. grant. As use of thermal imaging cameras become more affordable and more public safety agencies obtain thermal imaging cameras, additional applications are sure to be discovered.

Conclusion

As law enforcement agencies continue to struggle with tight budgets it is important that resources be fully utilized. Thermal imaging cameras have always been thought of as only having night time applications, but with the cost of thermal imaging cameras exceeding \$11,100 it is not practical nor cost effective to limit the use of the thermal imaging camera to only during night time hours. The purpose of this study was to determine if thermal imaging technology has applications outside the obvious night time applications, and if it would be appropriate for dayshift patrol operations?

It was hypothesized that thermal imaging technology could play an important and vital role in day shift patrol. Based on the information gathered, thermal imaging cameras have been

used in ways that would benefit officers, day or night. Applications in thermal imaging such as accident scene investigation have been used during dayshift operations. Studies have also been made in the use of thermal imaging concerning officer safety. The use of handheld thermal imaging cameras mounted on a monopole connected to a video camera screen, to search for suspects in attics and crawl spaces greatly enhances officer safety, this application could be used at anytime. With certain cameras heat, readings can be either white hot or black hot. Thermal imaging cameras can be used during day time hours to find vehicles that have been recently operated, with hot spots being in the engine, exhaust, tire, and brake areas. Thermo imaging has also proven to be effective in detecting overheated brake parts and improper adjusted brakes on truck tractors equipped with air brakes.

The finding of this research, and the subsequent conclusions, support the hypothesis concerning thermal imaging technology. The use of thermal imaging by law enforcement and fire departments will continue to expand. As more agencies obtain technology, additional applications for thermal imaging will be discovered. Thermal imaging applications will continue to enhance safety for police and fire personnel, this technology will also act as an investigative tool at accident scenes, as well as fire scenes. Therefore, thermal imaging is appropriate for day shift patrol operations.

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