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Automatic Vehicle Locators: Enhancing Law Enforcement's
Ability to Respond to Calls for Police Service

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ABSTRACT

Law enforcement agencies are constantly looking for new and innovative ways to enhance an officer's ability to perform their duties and provide better service to the communities they serve. One technology that is becoming more and more popular in law enforcement today is the Automatic Vehicle Locator (AVL) system. An AVL system monitors the exact location of a departments resources to allow for better officer safety, dispatch the closest vehicle to a call for police service, and manage resources in a more efficient manner.

The technology involved in AVL systems has improved dramatically during the past several years. The accuracy in pinpointing a vehicles location has continued to shrink from as much as several hundred feet to as close as 10 feet in some cases. Where dispatchers once had to guess where an officer should be, an AVL system tells the dispatcher exactly where an officer is.

By knowing the exact location of an officer, should an emergency arise in which the officer should lose contact with dispatch or the officer becomes incapacitated, assistance could be sent to the officers exact location. By being able to dispatch the closest unit to a call for police service, response times could be reduced. Law enforcement could also benefit from the use of an AVL system in situations such as pursuits or other moving incidents.

It is concluded that AVL systems have given law enforcement agencies another tool in which to provide enhanced officer safety, reduce response time to calls for service, and better manage departmental resources.

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Introduction

Law enforcement agencies are continually examining new and innovative technologies to increase their ability to provide modern equipment for their employees and enhanced services for the communities they serve. One such technology is an Automatic Vehicle Locator System (AVL). AVL systems are not new to law enforcement, but improvements in technology over the years have made these systems more reliable and easier to integrate with other systems currently in use, such as Computer Aided Dispatch Systems (CAD).

This project will examine if an AVL system would benefit law enforcement agencies ability to respond to calls for police service. Law enforcement agencies have traditionally divided their areas of responsibility into grids or districts in an effort to respond to calls for service in a timely manner. When an officer is dispatched to a location, it is usually because they are assigned to the grid or district where an officer is needed. Dispatchers can only assume that officers are in their assigned areas of responsibility. However, this may not be the case. With an AVL system, dispatchers would be able to see where each unit is and assign the closest available unit to the call for service. Additionally, should an officer require assistance in an emergency situation, the dispatcher would be able to direct responding units to the exact location of the officer needing assistance. Other situations that might benefit from AVL would be vehicle pursuits and managing resources at major incidents.

This project will use information obtained from magazines, police periodicals, an internet search, surveys, and interviews to gather information about the benefits of an AVL system to law enforcement. It will also examine the different types of AVL systems and the technology that makes them work.

It is hypothesized that an AVL system will benefit law enforcement agencies ability to respond to calls for police service. These benefits include an increase in officer safety by being able to know the exact location of police vehicles. Should an officer need immediate assistance, a dispatcher would be able to send assistance without the officer having to give his location. It is also hypothesized that being able to send the closest unit to a call for service will reduce response times to calls. Should a call for service involve a large area, such as some type of moving emergency, officers could be dispatched to locations enabling them to better assist in the emergency in a more efficient and timely manner.

By using AVL technology, officers will know that their locations are constantly tracked allowing dispatchers to better serve those officers should assistance be required. Administrators can use the information gathered by an AVL system to better manage departmental resources. The community can also benefit from AVL technology knowing that in a time of crisis, the closest unit to their location will be dispatched, thus reducing response time.

Review of Literature

An important issue facing law enforcement today is the ability to respond to calls for police service in a timely and efficient manner. In the past, police dispatchers have dispatched officers to calls for service based on some type of grid system or by having officers report their positions. But law enforcement has now begun to use a technology that has been around for many years, primarily used in the trucking and transit industries. This technology is an Automatic Vehicle Locator (AVL) system (Strandberg, 1993).

An AVL system is a means to determine the location of a vehicle, display that location in some type of format such as a map, and make the location of the vehicle available to those who need it (ND, 1994). In the case of law enforcement, the location of police vehicles could be displayed in a dispatch center enabling dispatchers to know the exact location of all their resources.

AVL systems operate in a number of different ways including the use of dead reckoning, LORAN (Long-range Navigation), and GPS (Global Positioning System) (NIL, 1994). Dead reckoning involves installing sensors in a vehicle that can measure the speed, travel time, and compass direction to compute a vehicle's location with respect to a known location. This information is plotted on a map that allows for monitoring a vehicle location (Siuru, 1992). LORAN uses an existing network of land-based transmitters to determine a vehicle location by triangulation. GPS, the most widely known form of monitoring a vehicle location, utilizes a network of government satellites in high orbit above the earth (NIJ, 1994).

GPS (Global Positioning System) is the newest and most effective way an AVL system can pinpoint a vehicle location. GPS was originally designed for the military for use in Desert Storm, but has now made its way into the civilian sector (Pilant, 1995). When the GPS system was first created, the satellites transmitted two separate signals, the (P-code) for military use and the (CIA signal) for civilians. Because the civilian signal was so accurate, the Department of Defense used what it called "selective availability" to randomly degrade the accuracy of the system to prevent unfriendly nations from using the system for strategic purposes (Allen, 1993). Naturally, this created a problem for law enforcement in being able to accurately track their units. However, on May 1, 2000, as ordered by presidential decree, selective availability was turned off. This has increased receiver accuracy by as much as 10 times and it is speculated that

GPS readings will be more accurate than U.S. Geological Survey topographic maps (Keckler, 2000).

A VL technology has been around for decades, but only in the last few years has law enforcement been reaping the benefits (Ronshagen, 2001). Part of the reluctance to respond to this technology could possibly be from patrol officers' fear of knowing that their location, speed, and heading are known. Even though their activities are legitimate, officers would rather avoid having to explain their actions (Pilant, 1995).

For law enforcement, knowing the real-time position of its resources can have many benefits. First, it provides an element of officer safety. Should dispatch receive an emergency signal from an officer, the officer's exact location is known. Second, response times should be reduced. By knowing officers locations, the nearest unit can be sent to a call for service (Strandberg, 1993).

AVL systems can also be used to support operations that involve multiple units, as in the case of pursuits. Statistical information obtained by an AVL system can support officers' legal testimony, document vehicle movements during an event, and help allocate resources more effectively (Pilant, 1995).

From an officer safety standpoint, AVL offers many benefits. Should an officer be involved in a motor vehicle accident or be injured in some other way, help could be sent to his exact location. Should an officer engage in a pursuit, the dispatcher would know the officers location with no input from the officer (Rogers, 2000).

One of the leading manufacturers of GPS/ AVL equipment is Trimble Inc. (Workman, 2001). The Trimble GPS/AVL Subsystem can provide service along with hardware and software that is compatible with customer's existing communications network (Trimble, 2001a).

According to Trimble Inc. (2001b), their GPS/AVL system will enable public safety agencies to decrease emergency call response times and improve operational efficiency.

Recent advances in CAD (Computer Aided Dispatch) systems have integrated AVL/GPS into their systems that will recommend to the dispatcher the closest available unit to send to a call for service (Motorola, 2001). One such CAD system is Premier CAD by Printrak. This CAD system can be programmed to recommend units based on their capabilities, a beat or grid system, or by the closest available unit (Printrak, 2001).

The cost of this technology can vary drastically depending on departments existing equipment. The Dallas Police Department spent \$9.4 million in 2000 to upgrade technology in squad cars and the dispatch center. \$180,000 of that price was to equip nearly 800 of the department's vehicles with AVL (Witham, 2001). This upgrade included new in-car computers that were capable of integrating an AVL system for only a few hundred dollars per vehicle.

The city of Westminster Colorado recently proposed the purchase of an AVL system for their police and fire units. Here, the city had to purchase receivers for 68 units at a cost of \$50,932, or \$749.00 per unit (Workman, 2001).

Methodology

The purpose of this research paper is to determine if an Automatic Vehicle Locator (AVL) system can benefit law enforcement's ability to respond to calls for police service. It is hypothesized that an AVL system will benefit law enforcement agencies ability to respond to calls for service. One of the benefits would be an increase in officer safety by being able to know the exact location of police vehicles. Should an officer require assistance or lose

communications, their position would always be known. It is also hypothesized that being able to send the closest unit to a call for service will result in faster response times to calls for service. An AVL system can also be utilized by departments to manage their resources in a more efficient and timely manner.

This project used magazines, police periodicals, and an internet search to conduct a literature review of the information available on AVL systems. An informal survey was conducted of patrol officers, dispatchers, and administrators within the Mesquite Police Department, which does not currently have AVL capabilities, to get their opinions about the benefits of an AVL system. Two telephone surveys were also conducted with representatives of the Dallas and Highland Park Police Departments, both of which are currently using an AVL system.

In the informal survey within the Mesquite Police Department, 21 current patrol officers (approximately 1/5th of the total number of patrol officers in Mesquite), 5 dispatchers, and 5 administrators were all asked how they viewed AVL technology.

In the telephone surveys, both departments were asked about their experiences with the use of an AVL system, had AVL been beneficial in the area of officer safety, and was there a change in response times with the use of AVL.

Findings

Automatic Vehicle Locator (AVL) Systems are not new in the field of technology; however, the technology involved in monitoring the position of a vehicle has made rapid advancement over the past few years. As these advancements have developed, the use of AVL

in law enforcement has become an important factor in officer safety issues, responding to calls for service, and managing a departments resources.

All of the literature reviewed indicates the use of an AVL system is beneficial to law enforcement in many areas. Officer safety is a very important issue that can only be enhanced with the use of AVL. Knowing the location of an officer at all times gives the officer and dispatcher comfort in knowing that in the event of an emergency, should an officer need assistance, their location will be known and help can be sent directly to their location without delay.

In responding to calls for service, AVL decreases response times and allows for more efficient use of resources (Siuru, 1994). It only stands to reason that being able to know the location of all available units will enable the dispatcher to send the closest unit to a call for service.

AVL systems have now been integrated into CAD systems. When a call for service is received, the CAD system will use the AVL data to automatically recommend the closest available unit, eliminating the need for the dispatcher to manually locate the closest unit.

Another advance in AVL technology is in mapping. Monitors or mobile computers can be installed in the vehicles being tracked that can display their location on an electronic map (McKay, 2000). This electronic map can also show the location that the officer has been dispatched providing the officer with on-board navigation, eliminating the need for a conventional map should the officer be unfamiliar with the area.

There are many departments that are currently using AVL technology. Most departments that have an AVL system only track vehicles in their fleet. However, in Utah, a coalition of public safety agencies have purchased an AVL system that can track hundreds of emergency

vehicles throughout the state. The participating agencies will have the capability of monitoring their vehicles with the option of viewing the locations of other participating agencies vehicles (GIS Company News, 2001).

The survey within the Mesquite Police Department provided some interesting results. Of the 5 administrators surveyed, all believed that an AVL system would be beneficial for the department. Of the 5 dispatchers surveyed, all were in favor of using AVL to assist them in the performance of their duties and to be able to know the location of an officer should assistance be needed. Of the 21 officers, the feelings were mixed. All 21 were in favor of an AVL system for purposes of officer safety; however, 6 of the 21 were very concerned about how the system might be used for other purposes, mainly in the area of discipline. It was also interesting to note that the officers with the most experience tended to be the officers with the most concerns.

In Highland Park, TX, the police department has been using GPS/AVL since 1993. According to Captain Richardson, when their AVL system was first installed, officers had the common feelings about "big brother" knowing their every move. Richardson stated that officers would experiment in ways to defeat the system but quickly realized its value the first time an officer needed assistance and the system knew where he was. A more recent event occurred when an officer was running to an emergency call and crashed. The officer had gone backwards down the embankment of a creek and had lost consciousness. Assistance was sent to the location shown by the AVL system and the injured officer was located. Had AVL not been in use, the outcome might have been much worse due to the fact that the accident could not be seen from the roadway.

An interesting position taken by Highland Park is that they do not capture or record any of the AVL information that could be retrieved at a later date. Unlike many other departments

that do capture AVL data, Richardson stated that they use their system primarily for officer safety. Another benefit of Highland Park's AVL system is the reduction in response time. Though there is no data to support this reduction, the AVL system "absolutely has reduced response time" said Richardson.

In Dallas, TX, the police department installed their GPS/ AVL system in 2000. This system was in conjunction with the installation of mobile computers and dispatch upgrades. According to Lieutenant Summers, their mobile computers are called mobile workstations (MWS), which have the AVL system built in, so when an officer logs on the MWS it also activates the AVL. Like other departments, the AVL system was not well received by the officers who felt "big brother" would be watching them.

According to Summers, their AVL system can pinpoint the exact location of a vehicle to within 10 feet. He told of a unit that had gotten in pursuit and lost contact with dispatch. The dispatcher, through the use of AVL, sent cover units to his location, which showed to be in an alley between two streets. When the first unit arrived, instead of using the usual code to indicate they were on-scene, the officer stated that the missing unit was right where the dispatcher said it would be.

Along with officer safety issues, reducing response times was an important factor of AVL for the Dallas department. Although there have been no studies, Summers feels that the system has helped to decrease response times. Their system also captures AVL data, which can be retrieved should the need arise.

Discussion/Conclusions

The purpose of this project was to examine if an AVL system would be beneficial to law enforcement agencies. Some of the areas that were explored were improving officer safety, reducing response time to calls for service, and managing resources more efficiently during pursuits or other major incidents.

It was hypothesized that an AVL system would increase officer safety by knowing the location of an officer. Should an emergency arise, help could be sent to the exact location of the officer in distress. It was also hypothesized that an AVL system would reduce response times to calls for police service by sending the closest unit.

All of the literature located for this project indicated that an AVL system was beneficial to law enforcement agencies. It stands without question that by knowing the location of officers while on patrol can only enhance officer safety. Should an officer request assistance, lose radio communications, or become involved in some type of an emergency such as a motor vehicle accident or some sort of confrontation, dispatch will know the officers location and can send additional units to their exact location with no input from the affected officer. Both of the departments contacted about the their use of AVL indicated that officers have benefited in the area of officer safety. The informal survey in the Mesquite Police Department discovered that all of the officers surveyed were in favor of AVL for officer safety reasons.

In the area of reducing response times to calls for police service, all of the literature indicated that being able to send the closest unit to a call for police service would indeed reduce response times. This is a common sense conclusion that the closest unit should be able to arrive or respond faster than a unit that is farther away. No research or scientific studies could be located to indicate if response time could in fact be reduced. It would be rather difficult to do a

study in this area because the variables are not constant. You cannot predict when or where a call for service will originate or where the available units will be located.

AVL technology has brought a new dimension to law enforcement's ability to respond to calls for police service. Officers will know that should they encounter any type of emergency in which they are disabled or lose communications with dispatch, assistance can be sent to their exact location. The community can benefit from AVL technology by knowing that in times of crisis, the closest unit to their location can be dispatched. AVL technology can also benefit police administrators by better managing their resources.

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