

# **The Integration of Global Positioning Systems into Law Enforcement**

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## ABSTRACT

Global Positioning Systems (GPS) are becoming more widely used in and are substantially helping law enforcement agencies obtain a better picture of problems in their area. This research reviewed specifically how GPS are impacting the law enforcement community and how different agencies are using this technology. The purpose of this research was to identify the most useful and cost effective applications that GPS integration has in the current realm of law enforcement.

Reviewed are a number of examples across the country of how GPS applications are playing such a tremendous role in assisting law enforcement agencies to address crime problems. Some of these examples reveal dilemmas such as, which companies to use. The overall finding that has been outlined in this research is the availability of this technology throughout the world.

The research identified a number of very important applications of GPS, some of which can have enormous benefits. An agency looking into this new technology need not look very far due to the abundance of companies making GPS available to law enforcement. These benefits show what impact GPS can have on either a specific investigation or solving broader problems within a community.

The most significant impact that some GPS applications have on law enforcement agencies is that it provides technology to make the individual officer safer in today's world. Police departments are embracing GPS applications to aid in streamlining investigations and to conduct their work more efficiently. With budget cuts on agencies throughout the country, GPS has proven to be a tool to help reduce labor costs and still maintain the quality of an investigation that is needed.

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## INTRODUCTION

There is an ever-increasing amount of technology that is in use within the law enforcement world. Some technology is fairly reasonable in cost, making it attainable to local agencies, while other pieces of technology are so expensive, only large agencies can afford them. Agencies need to weigh the costs and benefits of the next step in technology chosen. When systems are expensive, smaller agencies at times look to the county, state or federal government to piggyback off their systems. Global Positioning Systems (GPS) are an example of these expensive systems, and are a part of technology which law enforcement trends follow. There are several ways GPS can be used in law enforcement.

This research will be looking at how several law enforcement agencies integrate GPS and their successes and failures. How is the integration of GPS affecting law enforcement in today's world? Is the integration of GPS going to assist law enforcement agencies in the future or not? What cost factors are involved? What are the negative aspects to Geographical Information Systems (GIS) technology integration with GPS? What problems are agencies faced with in using this technology? This paper will also look at some potential technology in the future with GPS such as surveillance operations.

One of the biggest GPS integrations comes with tactical operations, mostly due to the fact that GPS was first developed by the military. Now it is used broadly by not only the military, but also all aspects of government and the private sector. The Washtenaw County Sheriff's Department recently met with the GIS team of Washtenaw County to work on tactical operations within the county using digital mapping. This program worked in conjunction with GIS and GPS coordinates to identify where agency members are located within tactical operation settings.

This paper will touch on some of the advantages and disadvantages of this technology, particularly in terms of crime scene investigations and everyday police work.

The initial idea prior to doing this research was that GIS-GPS integration is dominating the technology field in certain law enforcement agencies. The idea surrounding GPS was that it is supportive technology for law enforcement agencies. However, are all or just some of these applications beneficial to all or some of the organizations? Do the costs outweigh the benefits or the benefits provide valuable information to assist law enforcement agencies in obtaining information more quickly so they can react more effectively and more efficiently? Not being aware of the cost can make it difficult to see what the actual cost benefits are.

### **BACKGROUND AND SIGNIFICANCE**

When looking into the background of GPS, one must understand the concept of Geographical Information Systems since in most cases it generally works hand in hand with GPS. Some of the most recognized authors of publications about GIS define it as follows: “The field now known as Geographical Information Systems developed from the confluence of different disciplinary origins” (Chrisman, 1998). The University of Edinburgh defines GIS as “A computer system for capturing, storing, checking, integrating, manipulating, analyzing and displaying data related to positions on the Earth’s surfaces” (U.S. Census Bureau, 1998). GIS is not a computer program, it’s not a map and it’s not run by an individual person. GIS is a concept consisting of many different areas of specialty working together on one concept. This includes mapping, computer software programs, data entry and a group of individuals to put all that together to form a geographical information system. One application incorporated into GIS is that of GPS.

## **What is GPS?**

In the late 1960's, the concept of GPS was first introduced. Funding for global positioning systems came in the early 1970's with the United States Department of Defense. On February 22, 1978 the first satellite was launched into space and the Magellan Corporation introduced the first hand held GPS receiver (Parkinson, 1994). The Department of Defense spent \$12 billion to triangulate and put into orbit 24 satellites (Harries, 1999). The military's main purpose for developing GPS technology was to meet the needs of precise weapon delivery and to provide the capability of a navigations system in the military (Parkinson, 1994).

“The Global Positioning System (GPS) is a world wide radio-navigation system formed from a constellation of 24 satellites and their ground stations” (GPS Navigation, 2004). GPS uses reference points from satellites to calculate positions on the earth as close to one meter away and in some cases one centimeter away (GPS Navigation, 2004). Information on GPS technology can be viewed on many websites, newspaper articles and books.

GIS and Global Positioning generally cannot work independent of each other. Law enforcement agencies are using this technology and have been for several years now (Bratt, Lake, & Whistler, 2004). Although GPS has several different applications, law enforcement agencies are finding what fits their needs and then purchasing the product. The most significant applications are in the area of criminal investigations, automated vehicle locators, autotheft investigations, accident investigations and tactical operations. Each of these applications has its own specific purpose that determines how GPS is being used. All of these uses are concentrating on one thing: specific points of reference or identification of current location.

## LITERATURE REVIEW

As explained earlier, there are numerous GPS applications within law enforcement. Identified in this section are applications that seem to be most useful in law enforcement and have produced significant results. Indicated below are a total of six areas that were identified as the most useful and common applications in police work. In some of these applications, you will note only the larger agencies are currently using certain applications, while much smaller agencies use the technology they can afford at this time. Overall, GPS is something being implemented by agencies of all sizes based on its affordability in certain applications.

### **Surveillance Operations Application**

Taking the word from Webster's Dictionary, "surveillance" is defined as "close watch". In police work, it is monitoring the day to day activity of an individual through some type of supervision. Many departments are utilizing different forms of GPS in surveillance operations across the country. With GPS technology, this can be done by placing a GPS device on a vehicle and using the equipment and technology to monitor the movements of a perpetrator. What is generally reported and publicized are the successes of this technology.

In Spokane, Washington (1999), a GPS device installed into 2 separate vehicles of a murder suspect eventually led police to the gravesite of the suspect's daughter. GPS in this case proved that the suspect had been to her daughter's gravesite on two separate occasions after reporting her missing (Willing, 2004). In Las Vegas, Nevada (2000), the FBI used a GPS device that had been built into a vehicle in order to eavesdrop on an individual suspected of organized crime. For both of these cases, GPS surveillance was only a tool to aid in the investigation and assist investigators in solving these crimes. The GPS device in and of itself did not provide the sole

evidence. But in the Spokane case, it assisted police in locating a victim that may have not been found without this piece of technology.

In a highly sensitive case, the Modesto Police Department in Modesto, California recently used GPS to track a suspect in a high profile homicide investigation. After the murder of Laci Peterson, the Modesto Police Department used a GPS unit, which was planted on Scott Peterson's vehicle (suspect arrested and charged in this case) to track the movements of his vehicle. This data was subsequently allowed by a judge to be used as evidence in the trial of Scott Peterson, which at this time is still pending. Because the trial is pending in this case, this research is only relevant to explain how a police agency used GPS as a method of surveillance (Dearen, 2004).

In another somewhat similar situation, the Nassau County Police in New York planted a GPS device on the vehicle of a male suspect named in numerous burglaries. Over a month's time, the GPS device monitored the suspect's movements. The questions raised in this case are: (1) Were the suspect's rights violated? And (2) Did the Nassau Police need a search warrant to plant a GPS device on the suspect's vehicle? (Lam, 2004). A Nassau County judge ruled in Nassau County on May 7, 2004 that the police do need a search warrant to be able to use GPS units on a suspect vehicle to track his/her movements. Although in this case, the judge did not suppress evidence gathered by the police (Lam, 2004). The device was placed on his girlfriend's vehicle and the judge felt the suspect had no expectation of privacy. According to the National Associated Press, there are only a small number of judges across the country that have required police to obtain search warrants to use these tracking devices. Prosecutors studying these cases in the future can only speculate what the judge may rule in these specific circumstances. Law

enforcement may be directed in the future to error on the side of caution and obtain search warrants prior to implementing these tracking devices.

Being able to monitor suspects without following them around in surveillance vehicles gives a new face to police surveillance, especially when police can monitor them from the office. What played a significant role in these cases was whether or not the police needed warrants to place devices on these vehicles. As of this time, depending on the jurisdiction, the court may dictate the need for a warrant. Most likely at some point in the near future, the Supreme Court will make a ruling on the use of this tool by law enforcement.

### **Investigation Applications**

With criminal investigations, GPS are generally being used to pinpoint locations of potential evidence. For example, in the past, evidence was usually identified by measuring a point from a fixed location to the evidence. It was assumed the fixed point (e.g. telephone pole) would always be there if there would be a need to come back and identify a location such as a body or shell casings from a shooting investigation. GPS takes that assumption away and identifies it through coordinates using satellites and pinpoints the location through longitude, latitude and elevation points. Generally in law enforcement, investigations involve criminal information of some form or another. Depending on the type of crime scene, the role of GPS can be either large or no role at all. A crime scene within a building or house will generally not involve GPS. The reason behind this is that within a structure a signal cannot be retrieved from all the necessary satellites to gain a specific location. Where it does play a significant role is with investigations that are outdoors in which the GPS can give you specific locations to document for future use, such as in court. Two types of investigations below are examples of GPS use at an outdoor scene.

The Space Shuttle Columbia Disaster was a significant event where GPS played an important role in identifying specific locations of evidence. Because of the enormous area in which debris had fallen, there was an immediate need to find and identify potential evidence. As with all types of tools in law enforcement, some do not always work with the current technology. One unavoidable difficulty with this recovery was dealing with the multi-jurisdictional region across the state of Texas. There were multitudes of agencies that wanted to assist, but with varying levels of technology. Problems intensified when different areas having different technology attempted to integrate GPS to different Geographical Information Systems being used across this path of destruction.

Some procedures recommended as a result of this investigation were the following:

- Conduct workshops for local law enforcement, emergency medical personnel, and volunteers in the fundamentals of Global Positioning Systems receivers
- Establish uniform mapping standards among all possible collaborating/cooperating agencies for use during times of emergency
- Determine organizations willing to provide crucial response equipment such as GPS receivers, computers with GIS software/capability and high quality large format printers (Brown, Crum & Foote, 2003).

Investigations surrounding vehicle accidents have started to take on a significant influence in terms of the GPS technology software, which provides very accurate data at accident scenes. A system known as AutoDOCS provides accurate measurements that manual methods are unable to produce. A company called Optimus Corporation operating under the Small Business Research program developed this program. Results of studies examining this technology have shown that AutoDOCS can be three to five times faster than conventional scene documentation methods

(Rodgers, 2003). The main features identified to collect more accurate data and to assist the National Highway Transportation Safety Administration are the following:

- Better than two centimeters RMS base measurement accuracy
- Lower cost than alternative measurements and documentation systems
- Procedure guidance and automatic data recording
- Standardized electronics for efficient analysis, transmission and storage
- Automated computer-aided design (CAD) drawing and text report
- Rapid single investigator operation
- Ability to incorporate supplemental manual or laser measurements

(Rodgers, 2003)

### **Bait Vehicles Application**

Auto theft is a nationwide problem. The FBI released information revealing that for the first six months in 2002, motor vehicle theft went up 4.2 percent nationally. In the San Francisco area, more than 3000 autothefts were reported to local authorities in 2002 (Donovan, 2003).

Many agencies taking a proactive approach to auto theft are using GPS in “bait vehicles” in order to catch car thieves. The Ohio State Patrol is one of these agencies teaming up with other local agencies in working auto theft cases. In addition to law enforcement agencies, insurance companies are also collaborating their resources to take advantage of this technology.

Progressive Insurance recently purchased some GPS units and distributed them to local law enforcement along with free monitoring services (Morckel, 2002). In this scenario, local agencies identified different regions where there would be a high probability of vehicle thefts and placed the bait vehicles (common vehicles that are often stolen) in these areas. Depending on the technology that the specific GPS unit has, there could be a number of different tactics employed to derail a theft. Some bait cars may have remote activated fuel shut-off devices in order to eliminate any high-speed pursuits (Morckel, 2002). The cost of a specific device depends on the specific brand the agency is using. Furthermore, depending on the brand, and

factoring in all the bells and whistles, the cost can range from \$400 to \$10,000 per unit (Morckel, 2002).

Using bait vehicles as a way to catch perpetrators is surfacing at many large agencies exploring this technology. The Arlington Police Department in Virginia recently demonstrated for the news media how their undercover vehicles equipped with GPS did not give virtually any chance for the suspected car thief to escape (Coggiola, 2004).

### **Automated Vehicle Locators Applications (AVL)**

In some agencies, Automated Vehicle Locators are non-existent. But more and more agencies are implementing this technology to better equip their dispatch centers in assisting with response to officer's calls for service. Simply done, AVL is part of a GIS based program that uses GPS technology to track patrol vehicles as they navigate within the jurisdiction. AVL systems are not only used within police agencies, but also large fleets within various companies across the world.

CJ Driscoll & Associates completed a nation-wide study in February 2003 that revealed several companies, including public safety agencies are using AVL systems. Some of the highlights of this study, which is comprised of 179 pages, are the following:

- Over 1 million U.S. fleet vehicles are currently equipped with GPS-based vehicle location systems.
- The number of local commercial fleet vehicles equipped with AVL systems has more than doubled over the past three years due to the lowering of AVL equipment pricing.
- There are an estimated 150-200 AVL suppliers in the U.S. and Canada which maintains competition to ensure low pricing (Driscoll, 2003).

In some locations, CAD (Computer aided dispatch) will identify the call and indicate to the dispatcher which patrol unit is the closest responding vehicle. For the most part, it offers a safety factor to the officers on the street. CAD, in conjunction with AVL systems is used by dispatchers of police agencies to retrieve up to the second information on the location of patrol vehicles. Some agencies, such as the Omaha Police Department, have officers concerned that the new GPS systems going into their vehicles with mobile terminals could be used to discipline officers. Conversely, if a dispatcher is aware of the location of one of its Omaha Officers, there would be no need to check other vehicles in proximity to the scene (Burrows, 2003).

### **PinPointing Gun Fire Application**

Many agencies across the country receive calls of “shots fired” in which patrol officers respond and on most occasions come up with very little information to support the call. Usually callers who report this activity are uncooperative individuals that do not want to have any involvement with an investigation. The public has an expectation that a call to report individuals shooting off guns results in police response, and the activity will usually cease for a period of time. For the most part, police have been handicapped in these situations with no way to locate where these shots were fired. Information is usually from a dispatcher, or an anonymous call, or some concerned citizen on the street.

As a result of the 2002 Washington DC sniper attacks, Synchron Technology developed a device known as the GDS (Gunshot Detection System). This device is made up of acoustic sensors incorporated with GPS, which can recognize gunshots and separate them from other noises such as firecrackers. This device can under certain circumstances go as far as indicating the caliber of the weapon (Cameron, 2003).

### **Tactical Operations Application**

During the middle of 2003, members of the Washtenaw County Sheriff's SWAT Team, in partnership with the Washtenaw County Geographical Information System Team, met to discuss the benefits of GIS integration into tactical operations. As a result of several meetings, the Washtenaw County Sheriff's SWAT Team received a computer program (Arcmap by ESRI) from the GIS Team, which contained digital topographical maps of the entire Washtenaw County area. These topographical photographs were taken in 2002 and are updated every 4 years.

With this program, longitude and latitude grids (X-Y coordinates) were integrated into these maps. This GIS program enabled team members to use hand-held Garmin Rino GPS units to identify their position out in the field and provided the command post with a "real time" location of where these team members were in the field within about 2-3 meters most of the time.

Because of this, it eliminated any potential crossfire situation with any member and provided fresh members arriving on the scene an accurate location of where they would need to respond, replace, or assist another team member. Team members out in the field could verify their accuracy by identifying a point of reference. This would be confirmed through the command post by looking at a map of the area and confirming the location through an identifiable source displayed on a digital map.

Finally, these Garmin Rino 120 GPS units could also transmit different members' X-Y coordinates using only the radio transmit button provided on the GPS unit. This eliminated the need for any verbal communication over the radio in the case of a potential perpetrator having the same capability. The cost of these GPS Rino units is approximately \$200 each. The WCSD team currently has 6 of these units, which are distributed to team members. A licensed software program for one laptop is approximately \$1200-\$1500 and was developed by Environmental

Systems Research Institute (ESRI) and incorporates the program ArchMap. The software used on the WCSD tactical operations laptop includes the program Arch-map along with some software for base data (\$500) already included. Incorporated with this software is the digital topographical map of Washtenaw County. There are a total of approximately 720 square miles in Washtenaw County and digital photography costs approximately \$106 every square mile. Washtenaw County pays on average between 80 and 100 thousand dollars every four years to contract for a fly-over of the county. The Washtenaw County GIS team currently comprises two full time staff members and an intern with an operating budget of approximately \$100, 000 (K. Wraight, personal communication, March 4, 2004).

### **METHODOLOGY/PROCEDURES**

Several types of research were used to obtain information contained within this paper. Over the course of about 50 hours, a substantial amount of information was obtained via the Internet using the search engines Dogpile and Google. I also conducted research at the Eastern Michigan Halle University Library reviewing over fifty books and articles, including the electronic library through their website. I reviewed indexes and databases through Eastern Michigan University Halle Library website. The specific databases in which I conducted searches were, Lexis-nexis (academic), National Criminal Justice reference database, Wilson Select Plus and Worldcat. I spent time talking with personnel in twenty-five law enforcement agencies across the United States via telephone. Some agencies were selected at random and some were known current users of GPS. I spoke to them about the uses of GPS application in their agency and the pros and cons observed.

## RESULTS

Throughout the research in this paper, I was able to readily identify how different applications of global positioning are working throughout the country. With certain applications, small agencies could afford the technology while other applications were quite expensive, and out of reach for the same small agencies. Listed below are the results of literature review on how agencies are using GPS technology and in some cases spending millions of dollars to have this technology implemented.

There were over 5,000 cars stolen in Vancouver in 2001 (Hogben, 2002). In 2002, the Vancouver Police Department implemented several GPS tracking bait vehicles. These systems were at a cost of approximately \$1,500 each. The \$700,000 program was expected to save around \$2.1 million in claims if the auto theft rate would be lowered by 10 percent.

Other agencies have experienced great success with the bait vehicle program. This can impact their budget by saving the taxpayers money according to Susan Luder, a deputy with Maricopa County in Arizona. The Phoenix police have reported that in the first half of 2002, they had a decline in auto theft by seven percent. Furthermore, of the 41 criminal cases filed, not a single case went to trial with all of them resulting in plea-bargains ("High-tech Bait", 2002). Cases that do not go to trial provide enormous savings for the judicial system. Generally, these cases can put a back log on the court system, causing unnecessary overtime by police officers appearing in court. This technology, which enables effective police work, allows cost savings from several different viewpoints.

The Task Force for Regional Autotheft Prevention (TRAP) out of Los Angeles experienced great success while using bait vehicles in their area. There are a total of six TRAP teams that run operations on bait vehicles once or twice a week resulting in 5-15 arrests in a four-hour period.

Other agencies, such as the Minnesota Police department, experienced a 35 percent reduction in auto thefts using a system called the HGI stinger (Mertens, 2003).

One can look at all the influences that GPS is having on law enforcement today and the positive results based on the amount of money being spent. For example, in December 2003 the San Diego Metropolitan Transit Authority selected Motorola for a new \$19 million-dollar communications system, which will incorporate Computer Aid Dispatch (CAD) and AVL system. One government official was quoted as saying, “a system, which will provide so many benefits to transit operations, patrons and the San Diego community as a whole” (“San Diego Region”, 2003). Pennsylvania State Police employed a statewide system of in-car terminals back in October 2002, which included GPS capabilities to retrieve coordinates for locations statewide. This deployment included wireless mobile units at a cost of \$6.9 million (“San Diego Region”, 2002).

An interview with Wayne Johnson, Officer of the Minneapolis Police Department confirmed the continued use of bait vehicles being used by their agency. Studies have shown that this program had led to a 60% reduction in auto thefts after one month of use (Jaishankar, 2001).

### **State of Kentucky Accident investigations**

Most interesting is the fact that some agencies are seeking the assistance of other governmental entities and private sectors to help them with GPS technology. The Kentucky Transportation Cabinet, which covers around 27,000 miles of roads in Kentucky and takes 85% of the accident reports, purchased 6,000 handheld Magellan GPS receivers for accident investigators (“Taking GPS”, 2003). These units, according to the customer support department out of Santa Clara, California, cost a consumer \$169.99 each (“Taking GPS”, 2004). All of this information would eventually be compiled in a database providing specific and accurate

locations for accidents. The Assistant Director of the Transportation Cabinet Division of Planning was quoted as saying,

“Thales Navigation’s Magellan GPS offered us fast delivery, affordability, durability, reliability- everything we needed for this vital public service function” (“Taking GPS”, 2003).

### **Manteca Police and Automated Vehicle Locators Systems**

Manteca Police Department out of Northern San Joaquin Valley has outfitted its entire fleet with GPS receivers and was funded through a state grant, which included an upgrade to their communication division. A police spokesman for the agency provided information to McClathy Newspapers about an incident in 2001 in which two of his officers were involved in a high-speed chase. While dispatchers were tracking the pursuit, they were able to warn their officers of a sharp curve approaching using the Global Positioning Systems. Because of this information, the officers backed off, the suspect vehicle did not, resulting in the fatality of the suspects (Doo, 2003).

GPS technology has also helped police when personal vehicles are equipped with these devices. The results of this are shown in Guadalajara, Mexico where police retrieved four stolen vehicles in a matter of hours with estimated recovery cost of around \$800,000. The results of this were from a system known as Guidepoint, which is a telematics service out of Pontiac, Michigan selling global positioning systems to auto dealers (Edwards, 2004).

GPS has grown tremendously over the past several years. The United States Air Force has just worked out a contract to explore the next generation of GPS. The cost of this, \$20.8 million was awarded to the company Boeing (“Air Force”, 2004).

Finally, in a survey (appendix A) conducted with the 2004 Eastern Michigan Police Staff and Command class on the use of GPS in area agencies produced the following results: The survey

included 22 responses from agencies with senior upper command officers completing the surveys. There were no departments that identified their agency's use of GPS for bait vehicles and pinpointing gunfire. One agency identified their agency's use of GPS for tactical operations and two agencies were identified as using GPS with investigations. Thirty-six percent of the agencies are using automated vehicle locators (AVL). Of the 22 agencies surveyed, 64% were agencies having less than 100 officers and 36% had agencies in excess of 100 officers. Since AVL systems were the most commonly used GPS systems being used by agencies, I found that 63% of the eight agencies using AVL had a department size of less than one hundred officers.

### **DISCUSSIONS/CONCLUSIONS**

GPS within law enforcement is here to stay until superceded by further technology. This research explored a number of different options when integrating GPS into law enforcement functions. Budget cuts that are strapping funds for many agencies across this country are forcing agencies to look for other means to fight crime. GPS integrated within a GIS system helps eliminate many laborious hours in tracking down criminals. A significantly positive impact with AVL systems is the fact that other individuals know an officer's current location most, if not all, of the time. Some commentary from a few police officers in law enforcement voice concern about being constantly monitored (Burrows, 2003). GPS cannot only assist in catching and apprehending criminals, but also in reducing labor costs, making for a safer police agency. Craig Klyve, Director of Investigative Technology Bureau of Wisconsin Division of Criminal Investigations explained how their efforts working with GPS technology in criminal investigations has been a "real time and manpower saver". The Wisconsin Bureau of Criminal Investigations has used GPS technology in investigative cases involving narcotics, kidnappings, burglary rings, arsons and surveillance operations. Klyve notes an example of how they tracked

a suspect from Wisconsin to Mexico during a narcotics investigation. Klyve went on to say that the Wisconsin Bureau of Criminal Investigations has supported hundreds of investigations using GPS with very successful results.

As an administration, one must look at a number of different programs and software to assess what is the best technology for their agency. Whether performing routine investigations or crash data collection and using AVL's or any type of GPS receiver, proper research will get the best product for the price. "To choose GPS receivers for field traffic studies, transportation engineers need to consider features such as accuracy, position updated rate and computer interface, and they must make a compromise between required features and price" (Schuo & Zhu, 2003).

When looking at GPS in any of the applications mentioned in this research, one must realize this is only a tool to assist agencies in improving the handling of general investigations. As mentioned, there is a lot of information on the success of GPS technology. What generally is not publicized, especially by the manufacturer, are the problems with this technology. For example, some devices perform better than others, depending on how much money is invested on the individual device. When the technology of fingerprinting became available, the public became aware of the numerous cases of suspects being identified through fingerprinting at crime scenes. What had not been reported were the thousands of investigations in which law enforcement was not able to acquire fingerprints. This is an example of how some technology is only used as a tool and does not always produce optimal results. Same idea with GPS units. At times these systems may not work for a number of reasons. This is why research into a specific unit or system needs to be done due to the abundance of GPS companies out there.

## RECOMMENDATIONS

Global Positioning Systems is a future technology that an agency is not going to want to be without. Several agencies across the world are already using this technology or are in the early stages of employing its use. If an agency is not considering using this technology in the near future, the service they provide to their officers and the public will be greatly affected in a negative way. Research has shown that GPS can be cost efficient and in some cases have great cost cutting effects within an agency as well as to the public. Based on the research conducted over the past several months into GPS technology, the following recommendations can be made if an agency is choosing this technology.

### **Becoming Involved with GPS:**

An agency that is considering looking into GPS technology does not have to conduct a lot of leg work to determine what type of GPS systems would work within their agency. Again, several agencies are already using different forms of this technology. To figure out what best fits the needs of a community and agency, start with exploring any agency that is currently using GPS in a similar community. As a result, one will find the cost savings are beneficial and the efficiency within an agency will increase.

### **Funding through other sources:**

GPS technology did not evolve with law enforcement. GPS technology has been around since the early 70's and was first introduced by the military. From there, other government entities have incorporated this technology (Aviation, Marine, Planning, Equalization, Forestry). The recommendation is to attempt to solicit support from areas of a government that are already using this technology and see what ways it can be implemented within an agency. This most

likely is through contacting someone from Geographical Information Systems and working with their group on a formal plan.

### **Training**

With any implementation of technology, an agency must have a training plan to incorporate the new technology. Purchasing thousands, if not millions, of dollars of new equipment and not being able to properly train the officers who use it can be a disservice to an agency. The more knowledge officers have about the uses of GPS technology, the more efficient the organization will operate.

Many colleges and universities are already conducting this research and have looked into the various areas of GPS technology that can be applied in addition to law enforcement. For example, installing GPS into bait vehicles and not looking into GIS-GPS applications with AVL is not maintaining the big picture. Although one may produce some increased arrest numbers, AVL provides a much larger picture in the realm of officer safety and public response from the police.

### **Communication**

One of the problems the Space Shuttle Challenger investigation had with GPS-GIS technology is that everyone was using somewhat of a slightly different system. One could speculate that one of the barriers was money. What could an agency get for the funding they had available? When looking at different applications with GPS technology, look at the applications being used around your county or surrounding counties. It does not make any sense if an agency in Ann Arbor, Michigan is using technology developed out of Tokyo, Japan if the technology is not compatible with the surrounding agencies. One way to eliminate this problem is to have a county or tri-county consortium to keep up with and coordinate the technology advances coming in the future.

## REFERENCES

- Air Force Awards Boeing 20.8 Million Contract GPS III. (2004). *Satellite Today* 3(4).
- Bratt, R., Lake, J., Whistler, T. (2004). *Implementation of GIS at Local Law Enforcement Agencies*. Retrieved April 26, 2004, from <http://www.esri.com/lawenforcement.com>
- Brown, S., Crum, S., & Foote, V. (2003). GIS and GPS Emergency Response Lessons Learned From the Space Shuttle Columbia Disaster. *Journal of Extension* 41(4). Retrieved April 1, 2004, from <http://www.joe.org/joe/2003august/iw1.shtml>
- Burrows, D. (2003, October 27). Police Cruisers May Get GPS. Retrieved April 16, 2004, from <http://www.pocketgps.co.uk/modules.php?name=News&file=article&sid=129>
- Cameron, A. (2003, August 1). Pinpointing gun fire, *GPS World*.
- Chrisman, N. (1998). The History of Geographical Information Systems. In *Academic Origins of GIS* (chap. 3). Retrieved March 30, 2004, from <http://www.census.gov/geo/www/cols/jan98.html>
- Coggiola, J. (2004, February 19). High-tech crime stopping. *Wolf Blitzer Reports*. Retrieved March 30, 2004 from <http://www.cnn.com>
- Dearen, J. (2004, February 18). Admissibility of GPS Evidence in Peterson Homicide Trial. *Oakland Tribune*. Retrieved April 28, 2004, from <http://web.lexis-nexis.com>
- Donovan, K. (2003, February 20). Onstar's Satellite technology helps police crack down on autotheft. *PR Newswire*. Retrieved July 7, 2004 from <http://web4.infotrac.galegroup.com.ezproxy.emich.edu/itw/infomark/>
- Doo, J. (2003, December 1). Manteca Police Turn to GPS to Keep Officers Safe. *Modesto Bee*, p. B1.
- Driscoll, C. (2003). *U.S. Fleet AVL Market study*. Retrieved July 7, 2004, from [http://www.driscoll.com/fleet\\_AVL\\_market.ht](http://www.driscoll.com/fleet_AVL_market.ht)
- Edwards, B. (2004, April 26). Guidepoint Recovers 4<sup>th</sup> Stolen Vehicle in Mexico in 8 Weeks; GPS tracking service helps police recover vehicles quickly, safely. *PR Newswire*. Retrieved May 9, 2004, from <http://www.guidepointsystems.com/>
- GPS Navigation. (2004). Retrieved March 29, 2004, from <http://www.trimble.com/gps/>

- Harries, K. (1999). The integration of GIS and GPS. In *National Criminal Justice Reference Source* (chap. 6). Retrieved March 30, 2004, from [http://www.ncjrs.org/html/nij/mapping/ch6\\_5.html](http://www.ncjrs.org/html/nij/mapping/ch6_5.html)
- High-tech Bait Cars Reel in Arizona Thieves. (2004, March 28). *Arizona Republic*.
- Hogben, D. (2002, September 26). Police Tempt Auto Thieves with High-Tech Bait Cars: Vehicles will be loaded with Anti-Theft Gear. *Vancouver Sun*, p. B1.
- Jaishankar, K. (2001). Role of Global Positioning Systems (GPS) in Policing. *The Asian GPS Conference*. Retrieved April 16, 2004, from <http://www.gisdevelopment.net/technology/gps/techgp0042.htm>
- Lam, C. (2004, May 1). *Follow that car?* Retrieved May 6, 2004, from <http://www.newsday.com/mynews/ny-ligps013781613may01,0,5531286.story>
- Mertens, J. (2003, April). Thieves Tempted by Bait. *Law Enforcement Technology* 30(4), 36, 38-40, 42-43.
- Morckel, K. (2002, December). GPS Vehicle Tracking Improves Auto Theft Enforcement. *Police Chief*, 69(12), 39-42.
- Parkinson, B. (1994, September). GPS Eyewitness: The Early Years. *GPS World*, p. 42.
- Pennsylvania State Police Deploying Mobile Data System Statewide. (2002, October 4). Retrieved June 23, 2004 from <http://www.motorola.com/LMPS/pressreleases/page 2817.htm>
- Rodgers, C. (2003, July 1). AutoDOCS and GPS with accident investigations. *GPS World*.
- San Diego Region Selects Motorola for New \$19 Million Communications Systems. (2003, December 17). Retrieved June 23, 2004, from <http://www.motorola.com/LMPS/pressreleases/page 3299.htm>
- Schuo, L. & Zhu, K. (2003). GPS Accuracy and Position Update Rate for Field Traffic Studies. *ITE Journal* 73(2), p. F.
- Taking GPS to the Streets. (2003). *Thales Navigation*. Retrieved March 29, 2004, from [www.thalesnavigation.com](http://www.thalesnavigation.com)
- United States Census Bureau. (1998). *Definition of GIS through University of Edinburgh*. Retrieved March 30, 2004, from <http://www.census.gov/geo/www/cols/jan98.html>
- Willing, R. (2004, June 10). Surveillance gets a satellite assist. *USA Today*. Retrieved June 17, 2004, from <http://www.usatoday.com/>

## Appendix A-Survey

### GPS APPLICATIONS SURVEY July 13, 2004

Please fill out the information requested in this document and return either to my mail slot or myself ASAP.

Thanks,

Sgt Jim Anuskiewicz  
Washtenaw County Sheriff Office

**Please indicate the type of Global Positioning System application your agency is using.**

- Yes    No      Automated Vehicle Locator Systems (AVL for patrol vehicles).  
Company Used (If Known) \_\_\_\_\_
- Yes    No      GPS units installed in bait vehicles for Auto theft enforcement.  
Company Used (If Known) \_\_\_\_\_
- Yes    No      GPS units used in Criminal Investigations/Accident Investigations.  
Company Used (If Known) \_\_\_\_\_
- Yes    No      GPS involved with tactical operations deployment.  
Company Used (If Known) \_\_\_\_\_
- Yes    No      GPS applications with pinpointing gun fire in neighborhoods.  
Company Used (If Known) \_\_\_\_\_
- Yes    No      Our agency does not use any type of Global Position Technology at this time.
- Other GPS applications you're using?  
     • Please explain
- Your Name \_\_\_\_\_
- Your Department \_\_\_\_\_
- Size of Agency (number of personnel) \_\_\_\_\_