

The Future of Global Positioning System in Law Enforcement

Article

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GPS is a satellite-based navigation system originally developed for military purposes and is maintained and controlled by the United States Department of Defense (DOD). The system is fully operational with 24 satellites, a master control station in Colorado, and five monitoring stations around the world.<sup>1</sup> The orbital planes of the satellites have an inclination of 55 degrees relative to the equator and an altitude of 11,000 miles. They typically complete orbit in about 12 hours. There is a four-minute-per-day difference between a satellite's orbit and the rotation of the earth. The satellites are positioned in such a manner that a minimum of five satellites is observable by a user anywhere on earth at any given time. The radio broadcasts from the satellites are called signals-in-space (SIS).

GPS permits land, sea, and airborne users to determine their three-dimensional position, velocity, and time. It can be used by anyone with a receiver anywhere on the planet, at any time of day or night, in any type of weather. GPS position determination is based on a concept called TOA (time of arrival) ranging, which is a complex way of saying, "signal travel time from one point to another." An example of TOA ranging is the sending or transmission of a signal at a precise and known time and the arrival or reception of the same signal at a later precise and known time. The interval between the time of transmission and the time of reception is the TOA value.<sup>2</sup>

In 1973 the U. S. Deputy Secretary of Defense directed that the Air Force be the executive service to consolidate the Timation, a high-tech research program for two-dimensional, latitude and longitude, navigation system and 621B

program into a single, all weather navigation system to be called NAVSTAR Global Positioning System.<sup>3</sup> There are two GPS systems: NAVSTAR, the American system, and GLONASS, the Russian version.

The NAVSTAR system is often referred to as the GPS since it was generally available first. Many GPS receivers can use data from both the American NAVSTAR and the Russian GLONASS systems. The first GLONASS satellite was launched in late October 1982, with semi-annual launches since. GLONASS satellites are launched three at a time from the Soviet Space Center in central Asia. Most of the satellites have been plagued with a very short life span, functioning for less than two years each. The operational GLONASS constellation has 24 satellites in three planes inclined 64.3 degrees to the equator. Each of the three planes contains eight satellites evenly separated from adjacent satellites by 45 degrees. The orbit of the GLONASS satellites is normally circular with an altitude of 11,900 miles and a period of 11 hours 15 minutes and 44 seconds.

There are two GPS services: the Precise Positioning Service (PPS), which is used and reserved by the U. S. Department of Defense, and the Standard Positioning System (SPS), which is available free to all worldwide civilian users.

Each of these systems is being linked to an ever-expanding array of communications, data, and mapping/locating devices by military and corporate advancements, many of which may be applicable to law enforcement.

### Environmental Scanning

Environmental scanning is a technique for monitoring the pulse of change in the external environment, whether it is in political, economic, technological, or social arenas. The goal of environmental scanning is to prevent surprise, and whenever possible, to manage the issues that will shape law enforcement's future. Resources that an individual would utilize in environmental scanning include journals, magazines, newsletters, and newspapers.

GPS World, a respected technology magazine, examined the impact of using GPS technology in an undercover capacity. The article discussed how police gathered evidence linking a man to his nine-year-old missing daughter. Police obtained a search warrant for the suspect's pick-up truck and during their search they surreptitiously placed a GPS tracking unit in the vehicle. Two weeks after placing the device in the suspect's vehicle, detectives downloaded a progressive position history and consequently identified four areas of interest. Additional investigation of these sites found an empty grave. However, further investigation at a second site revealed a fresh grave, which was as a direct result of positioning data obtained from GPS technology. Detectives located the victim's body, and subsequently charged and convicted the suspect of second-degree murder. <sup>4</sup>

On September 11, 2001, at about 8:50 a. m. EST, two hijacked airliners on a suicide mission crashed into the World Trade Center complex located in New York, demolishing the 110 story twin towers and killing thousands of people. Shortly thereafter, another passenger plane crashed into the Pentagon outside Washington and within an hour, a fourth airliner crashed near Pittsburgh, killing

everyone aboard. This was the worst terrorist attack ever on United States soil.<sup>5</sup> The final death toll may not be known for months. The four planes had 266 people aboard. Authorities estimate 189 people dead at the Pentagon. Had they been equipped with advanced GPS technologies, could the movement of the aircraft have been more accurately tracked and the targets predicted? Had they possessed GPS locators, could more people trapped within the Pentagon and World Trade Towers have been pinpointed and rescued?

Wireless companies have built E-911 technology using a tiny Global Positioning Satellite receiver, which was originally built for the U.S. Military. GPS works by comparing signals beamed down by satellites to determine the receiver's exact geographical position. The technology has become so inexpensive that some cellular companies plan to embed tiny receivers in mobile phones.

Thousands of people worked at the trade center, and many were inside when it collapsed. Unfortunately, the FCC did not have in place any policy requiring cell phone companies to maintain automatic positioning capabilities and there were no means of tracking the myriad of distress calls made from these locations. Had this been in place, many cell phone carriers could have been located and possibly saved.

There have been several newspaper articles written about the use of a GPS tracking unit for commercial airliners since the terrorist attack in New York. The FAA and the Department of Transportation are developing the Wide Area Augmentation System (WAAS) program for use in precision flight approaches.

WAAS consists of approximately 25 ground reference stations positioned across the United States that monitor GPS satellite data. Two master stations, located on either coast, collect data from the reference stations and create a GPS connection for GPS satellite orbit. Currently, GPS alone does not meet the FAA's navigation requirements for accuracy and availability, which is complicated by the speed and altitude at which jets travel.<sup>6</sup> WAAS corrects the GPS signal errors caused by ionospheric disturbance; timing and satellite orbit errors and provides vital integrity information regarding each GPS satellite. WAAS has not been approved for aviation; the system is available for civilian use, such as boaters and recreational GPS users. If the technology passes testing over the next few years, it could assist the FAA in maintaining security in the air, as GPS has developed speed and accuracies that far exceed that of our aging radar systems.

Studying this issue is not only important to law enforcement but also to every resident who lives in our communities. This issue will provide a benefit to all because if GPS technology is properly developed the impacts are endless. The reason GPS is needed is because this technology has become less expensive and the miniaturation of the units have been made available.

#### Strategic Plan

It is important for the future of law enforcement that the implementation of GPS technology begins as we move into the 21<sup>st</sup> century. Emerging technology is essential in order to provide the community with a higher quality of law enforcement service. To achieve success, federal and local funding must be

made available to law enforcement agencies. Without proper funding agencies will not be able to implement such a costly program. The model agency is a mid-size law enforcement department located in Southern California. The department has 215 sworn officers and a support staff of 300 employees.

The study is to provide a past, present, and most of all future perspective of the status and trends of GPS and its related technologies that have developed since the system was first made available to users in 1984. This project provides an overview of several issues that may positively or negatively impact law enforcement in the application of GPS technology.

### Stakeholder Analysis

Another necessary step in the planning process is to identify all the stakeholders. Stakeholders are described as individuals or groups who can have an impact or who care about what you do, relative to the issue at hand. It is also important to recognize “snaildarters” which are either individuals or events that can stand as obstacles to the desired issue.

A recommended method for identifying all of the stakeholders is a group brainstorming process. A brainstorming effort of the groups can produce a large list of stakeholders. A common list might include, but not be limited to:

Police officers	Civilian employees
Vendors	Bargaining units
Labor unions	Citizens
American Civil Liberties Union	Environmental groups
Crime victims	Media personnel

Influential individuals	Animal rights group
Local bar association	Minority groups
Other Department heads	Elderly community

The list of candidate stakeholders should be discussed and those most important to the issue should be identified and discussed in greater detail. The list should contain the top five to seven most important stakeholders. This discussion must include the relationship of the stakeholder to the issue and the possible benefits, as well as any detrimental impact on the issue.

A significant “snaildarter” relative to this issue could be an event brought about by a negative ruling of the United States Supreme Court.

### Strategy

After selecting and describing the most important stakeholders, the agency can begin to understand the potential problems associated with implementation of this type of technology. Identifying problems will assist law enforcement in determining what programs associated with GPS can be implemented to aid the citizens of the community.

The development of a departmental mission statement is important in the strategic planning process in that it provides a direction for the department as well as identifying its purpose. This gives a framework for determining the level of success of the organization.

Some common reasons for implementing GPS include improved efficiency of public safety personnel responding to emergency calls, accountability of

personnel, tracking of offenders, improvement of fleet management, and the ability to track senior citizens who become lost within the community. These are a few examples of GPS.

For GPS technology to be beneficial it must receive approval from the users. Everyone involved in its implementation must understand that individuals must be educated on what GPS is all about. Everyone has heard about this technology, however not everyone understands how it works. Training will be an important factor that may determine if GPS will be successful in the law enforcement arena. Law enforcement officers are not used to change or the implementation of new technology. Some agencies are progressive and encourage their personnel to apply new ideas.

Despite the fact that GPS has been around for several years, this technology has not been widely used by law enforcement agencies. Funding will be a major concern for most agencies. Typically, grant funding has not been used specifically in the area of technology. Both federal and state agencies are now providing technology grants to law enforcement agencies. These grants give the agencies the latitude to implementing technology that will improve the agency as a whole. Some grant sites for California law enforcement agencies include: Office of Community Oriented Policing Services (Federal), Local Law Enforcement Block Grant (Federal – LLEBG), Office of Criminal Justice Planning (State-OCJP), California Law Enforcement Equipment Program (State -CLEEP), and Citizens' Option for Public Safety (State-COPS).

The primary role of GPS technology is to support the goals and objectives of law enforcement and to facilitate efforts to provide efficient and effective services to all members of the community. The plan will guide managers and policy makers in the development of their technology plan.

### Recommendations for the Future

Before September 11, 2001, the use of GPS technology in law enforcement was not clear due to funding issues. After the attack of the World Trade Center and the Pentagon, Americans and elected officials have made the threat of terrorism a top priority for national security. Law enforcement may see additional monies being spent on improving technology used by public safety personnel.

Another area is in the automotive industry. More and more new automobiles are equipped with GPS devices or tracking systems.<sup>7</sup> These vehicles can be the first step in implementing a GPS system used by agencies. Affordability of the system will be a major concern for most law enforcement agencies. However, with federal intervention or grant funding, the government can absorb the increased costs of the GPS equipped cars.

The New World of Communication, a respected automotive magazine, examined wireless communication technology as the automotive industry's new toy. The article discussed the fact that by the year 2003, more than 10 million mobile terminal modules would be built into cars in the United States and in European countries. These smart cars offer a range of services, including tracking and communication (route planning and cargo planning); information

(on-board navigation and traffic information); safety (emergency assistance) and remote services, which allow a car to be controlled remotely.<sup>8</sup>

### Conclusion

During the past several years, technology advancements have impacted most law enforcement agencies across the nation. GPS is one technology that is constantly being improved and now with the miniaturization of the system GPS can become another tool for agencies.

If law enforcement agencies are going to be successful, they must continue to work at improving their service. Technology is rapidly being improved daily and we must continue to look beyond the traditional four walls. GPS provides law enforcement with a new tool that can propel advancement well into the 21<sup>st</sup> century. Agencies such as the Department of Defense should be encouraged to look at their GPS technology to assist law enforcement in applying the technology.

## Bibliography

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