

WHAT OPERATIONAL IMPACT WILL EMERGING GLOBAL
POSITIONING SYSTEM TECHNOLOGY HAVE ON A MID-SIZE
LAW ENFORCEMENT AGENCY BY 2007?

A project presented to
California Commission on
Peace Officer Standards and Training

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This Command College Project is a FUTURES study of a particular emerging issue in law enforcement. Its purpose is NOT to predict the future, but rather to project a number of possible scenarios for strategic planning consideration.

Defining the future differs from analyzing the past because the future has not yet happened. In this project, useful alternatives have been formulated systematically so that the planner can respond to a range of possible future environments.

Managing the future means influencing the future; creating it, constraining it, adapting to it. A future study points the way.

The view and conclusions expressed in this Command College project are those of the author and are not necessarily those of the Commission on Peace Officer Standards and Training. (POST)

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CHAPTER ONE

ISSUE IDENTIFICATION

Introduction

This project explores the potential effects of applying emerging Global Positioning System (GPS) technologies to improve and enhance public safety services. Will dispatchers be able to accurately determine where resources such as police cars, fire trucks and rescue equipment are located at any given time? The study examines how GPS has evolved throughout the years and discusses both the potential benefits and negative impacts of applying these technologies. The technology of GPS has already resulted in significant changes in society. The application of GPS is constantly expanding and accelerating at a rapid pace. The cost of GPS receivers is decreasing and their sizes attaining miniaturization, while at the same time the accuracy of the system is attaining levels not previously thought possible.

The purpose of the project is to provide a past, present, and most of all, future perspective of the status and trends of GPS. This project provides an overview of several issues that may positively or negatively impact law enforcement with the application of the GPS technology.

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.¹ 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.²

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.³ 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.

Statement of the Issue

What operational impact will emerging global positioning technology have on a mid-sized law enforcement agency by 2007?

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. ⁴

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.⁵ 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.⁶ 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 project will show how the new technology can aid law enforcement.

CHAPTER TWO

FUTURES STUDY

Introduction

The Nominal Group Technique forecasts trends and events that may impact this issue. The most critical trends and events emerging through this process will help identify the future, desired or otherwise. These potential trends and events can perhaps be encouraged or discouraged via a plan and transition in an effort to shape the future into the most desirable one.

This project explores the potential effects of applying emerging GPS technologies to improve and enhance public safety services. GPS based systems are used to improve the responsiveness and efficiency of emergency services. These systems can save lives by shaving minutes off the time between a call and the arrival of an emergency team at an incident site or an accident scene.

Nominal Group Technique

On October 2, 2001, a Nominal Group Technique (NGT) exercise was conducted for the purpose of forecasting potential trends and events regarding the issue of this paper. The NGT panel consisted of nine members. There was a representative from the National Law Enforcement and Correction Technology Center, a police captain, a representative from Allen Instrument, a police union labor representative, a police technology specialist, a representative from the City Attorney's Office, and a GIS coordinator for a municipal government (Appendix A).

Each member of the panel was provided with the issue statement and a description of the process three weeks prior to the meeting. Some of the members had

questions regarding the process and their questions were answered prior to the NGT. Several members of the panel did not have any experience with the NGT process and time was taken at the beginning of the process to provide a basic explanation. The panel formulated and discussed 26 trends and 23 events (Appendix B and Appendix C). These lists were filtered down to nine most significant trends and events.

During the initial discussion, several panel members felt that one of the biggest obstacles facing the use of the global positioning system is the cost factor involved in purchasing and maintenance of the system. Another concern was the feasibility of integrating GPS and GIS (Global Information System) with other law enforcement computerized systems. GPS is a global positioning system while GIS is an integrated system of computer hardware, software, and trained personnel linking topographic, demographic, utility, facility, image and other resource data that is geographically referenced. There was also strong interest in legal questions that may arise as a result of program implementation. Lastly, there was concern toward the affected employee bargaining unit or labor group's involvement.

Additionally, the panel identified the need for training in the use of GPS, and some panel members described the increased amount of technology and information as information overload.

The most difficult part of the process was developing the trends and cross impact summary.

Trends

Trends are a series of incidents taking place, which seem to indicate a direction. It is based on the past, present or future and can be quantitative or qualitative. Trends can be positive or negative and should be simple observations.

Summary Trend Table

| | -5 Years | Today | +5 Years | +10 Years | Concern 1-10 |
|--------------------------------|----------|-------|----------|-----------|--------------|
| Personal Tracking Device | 11 | 100 | 171 | 267 | 6 |
| Privacy Issues | 76 | 100 | 171 | 236 | 8 |
| Combine GPS / Transmitter | 4 | 100 | 171 | 233 | 5 |
| Level of Personal Freedom | 77 | 100 | 150 | 189 | 7 |
| Use of GPS for Law Enforcement | 49 | 100 | 163 | 230 | 7 |
| Level of Accuracy | 33 | 100 | 159 | 216 | 4 |
| Undue Reliance | 39 | 100 | 140 | 201 | 5 |
| Maintenance Costs | 44 | 100 | 120 | 144 | 5 |
| Improve Fleet Management | 19 | 100 | 144 | 189 | 4 |

Analysis of Trends identified by the panel:

The trend table was used by the nominal group to forecast the level of each trend (Summary Trend Table). This form uses a baseline of 100 as the level of the trend today, and then the group forecasts what the trend will be in five years and then ten years. The median estimates of the trend, as forecast by the group, are shown on the chart.

1. Frequency Number of Personal Tracking Device in Use - Users will purchase a GPS unit for personal security for themselves and their families.

The panel thought this trend was significant as far as the general public being able to protect themselves from crime, or the possibility of being a crime victim. Discussion included the incident that occurred in New York, which were the terrorist attack of the twin towers and the attack on the Pentagon in Washington, D. C. The panel believed that people missing could have been located sooner had they been equipped with a personal tracking device.

Panel members believe this trend will increase because decreasing cost and the improved accuracy of the smaller hand held GPS units.

2. Level of Concern over Privacy Issues - Whether the U. S. Constitution will govern how GPS regulations are adopted

This trend brought about the most discussion, which included positive and negative reactions. Issues such as Constitutional protection (4th Amendment and 14th Amendment protection), workplace privacy, and employee and employer rights raised a higher level of interest and discussion. The police union representative thought public safety employees could be subjected to on the job tracking and the fear would be that employees would not have any recourse if this practice affects all employees. The panel discussed the possibility of the United States Supreme Court ruling on various issues dealing with technology.

Also discussed were the effects that would occur if the courts required criminal offenders to wear a tracking GPS device as a condition of probation or parole.

Panelists believe that monitoring of a criminal should occur because safety in the community is the most important area that impacts everyone.

3. Level of Integration of Combining GPS / Transmitter - Combining GPS with other systems is necessary if the system is to do more than just provide a location. An example is the combined use of GPS with a GIS system.

Only one member in the panel thought that this trend was important and that the future of GPS would be dependent on the possibility of integrating a transmitter into a GPS device. When discussing GPS, most people believe that a GPS device gives your precise location once it is activated. This belief is wrong and, unless the system is integrated with a transmitter, a precise location cannot be determined. Once the discussion began, several members of the panel agreed and thought that if the units are not made smaller, its users will not be the average people. Panel members believe that combining the system would be more advantages for law enforcement use because GPS would become 100% accurate.

4. Willingness to Give Up Personal Freedom - The possibility of using GPS information for criminal, civil, or employee relations' hearings.

This trend is closely related to privacy issues discussed earlier. Panelists felt that some laws need to be changed which affect technology and civil rights issues. In light of the World Trade Center terrorist attack, panel members had a difficult time deciding what our priority should be. Panel members felt that safety is paramount over personal freedom. Panel members thought that it was important that Americans become more flexible on this issue. Law enforcement should be given the latitude to conduct investigations and utilize current technology without the fear of the courts imposing

restrictions. Panel members project that Americans will allow an infringement on the level of personal freedom by the government over the next ten years.

Human resources were consolidated with this trend. Panel members believe that employees would have to decide whether it was more important to have rules to control individual behavior or having the freedom of monitoring problem employees with a tracking device.

5. Use of GPS for Law Enforcement Safety - Aid public safety employees in various aspects of their job.

The panel thought that this was an important trend. GPS can be used in a wide range to provide information that can aid law enforcement. Officers can be dispatched faster to crime scenes when their exact locations are monitored constantly.

One panel member discussed the possibility of using a smart device integrated with a GPS device to monitor officer's vital signs during stressful situations. Other panelist thought this information was medical information and should be private and not available to dispatch employees. Panel members believe that the use of a "smart device" was a privacy issue and not a safety issue because of current case law.

6. Level of Accuracy - Current technology has enabled GPS to be integrated with other systems and has improved its accuracy.

The panel felt that this trend is significantly important because accuracy of the GPS unit is an important element of the system. One panel member discussed that current GPS technology without modification can track the user within six meters. Another panel member said that six meters was not acceptable during a critical incident. A

suggestion was made that for GPS to be acceptable, it would have to track a user within inches for public safety to fully accept the technology.

A discussion occurred regarding the sale of new cell phones, which are required to have GPS devices built into the phone. Panel members believed that this trend would increase because of the federal mandates on cell phone companies.

7. Level of Reliance on GPS - The system can be turned off any time by the military.

The panel talked about the selective availability of the system to be turned off by the military. Also mentioned was the possibility of major system failure. Also discussed were the current satellite configuration and how many satellites a GPS unit needs to provide an accurate signal. There are 28 satellites and only 24 are being used. Four satellites are used as a back up in the event that one of the satellites fails. Panel members believe this trend will increase because of the sophistication of technology.

8. Maintenance Cost - What agency will be responsible for providing financial support in maintaining the system?

The panel thought this trend was important to law enforcement because most agencies do not have the budget to support the cost of creating a new system. Financial funding must be made available for agencies to pay for this type of technology. The panel believe that if federal monies were not made available, this technology would not be utilized by some agencies because of financial restraints.

9. Use of GPS for Fleet Management - Automatic notification when vehicle repairs are due.

The panel discussed the importance of maintaining fleet management system with the use of this technology. This reporting system will reduce staff time by reporting

vehicle problems in a timely manner. Vehicle repairs will be conducted and the life of vehicle may be extended for an additional year or two. New vehicle purchases may be delayed and the savings can be used on other purchases. Panel members believe this trend will have a positive impact on agencies implementing the system because potential cost savings.

Events

Events are different from trends in that they are singular occurrences. Events occur at a specific time and date. The events you identify can be actual situations that have occurred or could occur. The event may be positive or negative and, in the panel's opinion, have a significant impact on the issue.

Summary Event Table

| | Year > 0 | +5 Years | +10 Years | Impact -10 to +10 |
|--------------------------------|----------|----------|-----------|----------------------|
| System Sabotage | 4 | 36% | 51% | -8 |
| Terrorist Use | 3 | 69% | 87% | -8 |
| Tech Grant For GPS | 4 | 61% | 83% | 9 |
| Earthquake – Natural Disaster | 5 | 61% | 84% | 0 |
| GPS Causes Cancer | 5 | 10% | 20% | -7 |
| Satellite Failure | 5 | 35% | 54% | -9 |
| Court rules GPS Constitutional | 5 | 65% | 84% | 10 |
| DGPS Network | 4 | 61% | 88% | 6 |
| FCC Mandates E911 | 2 | 82% | 99% | 8 |

Analysis of Events identified by the panel:

By the use of the event table, the group further analyzed the selected events.

The group was asked to determine the year that the probability of occurrence would first exceed zero, then forecast the probability of the event occurring within five years and within ten years. Also analyzed by this process was the positive or negative impact of each event on the issue of GPS technology.

1. System Sabotage – Panel members felt that sabotage by a terrorist group will likely occur within the next few years.

The panel identified this as a significant event that would have an impact on the entire system. Several months ago this event was not seen as a high probability, but since the World Trade Center attack this issue has become top priority for America. On September 11, 2001, terrorist attacks occurred in the United States and this day has brought to the forefront the possibility of sabotage by a foreign government. On October 7, 2001, the United States along with its allies fired missiles into Afghanistan and these missiles were guided with GPS devices.

Panel members also discussed the possibility of criminals accessing the system to monitor public safety. Overall, panel members believe that sabotage to the system would create system failure to all users of GPS because technology has simplified the process.

2. Terrorist Use – Panelists felt that terrorists could possibly use the system to gather intelligence information on their enemies.

The panel identified this as an event that has a high probability to occur in the immediate future. If this event occurs, terrorists may be able to monitor high profile

dignitaries throughout the nation. The panel discussed the possibility of the placement of the GPS units covertly on vehicles used by the government. Panel members projected that terrorist groups may possibly use the system against law enforcement and the military by hacking into the computer systems because they represent the first line of defense to national security.

3. Technology Grants for GPS – Panelists felt that additional funding from federal and state agencies will be necessary to assist law enforcement agencies.

The panel identified this as an event that would impact the method in which the system is utilized by law enforcement. The likelihood of its occurrence is high because of all the terrorist activity in the past few months. The panel viewed economic restrictions as an issue that would cause the use of GPS to be unaffordable. The federal government must provide funding to support this program. Panel members projected if technology grants were not offered to agencies the implementation of a GPS system would be slow or non-existent because of the cost of implementation of new systems.

4. Earthquake / Natural Disaster – A panelist identified any natural disaster as being a significant event that could cause the system to malfunction.

The panel identified this event as having a significant impact on the use of GPS. Damage caused by an earthquake or a natural disaster will not impact loading stations that supply information to agencies. Infrastructures that are used to support the system may fail and become disabled. Panel members project that a major disaster had the possibility of crippling the system for all users.

5. American Medical Association declares GPS Causes Cancer – The American Medical Association finds that users of GPS units are susceptible to a higher rate of cancer in comparison to individuals that do not use GPS.

The panel identified this as a significant event that would have a detrimental impact on the use of GPS. Courts would review the use of GPS technology by government agencies. The panelists were concerned with the impact that this ban would have on the military and the security for the nation. The other issue would be the civil litigation that would arise from people who acquire cancer. Panel members projected that the medical issues would put an immediate halt to GPS technology for several years because of the high cost of agencies defending against negligence lawsuits.

6. Satellite Failure – The panelists felt that since several of the satellites are older than ten years, the potential for system failure has increased.

This was discussed as a significant event that would impact the system and the possibility of receiving false locations due to the failure. The panel discussed that there are 28 satellites in orbit and only 24 are needed to operate the system.

Several satellites in orbit have failed and several others are in need of repair. The panel discussed that if these satellites are not replaced, the possibility of the system failing is greatly increased and the impact will be felt worldwide. Panel members projected this event is beyond any human control and a plan must be in place to offset the shutdown of the system.

7. Court rules GPS Constitutional – The panel felt that this would be a significant event to the overall use of GPS.

Several panel members felt that this would broaden the use of the GPS system.

Tracking the movement of suspects involved in criminal activity may be conducted with minimal scrutiny from the courts. GPS tracking devices will become a tool that could be used by every level of law enforcement because of its acceptance by the high court.

8. DGPS Network Implemented – Panel members felt that a receiver would be able to determine GPS positions more accurately if it has access to differential GPS.

DGPS works by having GPS receivers at stationary, known locations, near to where accurate position determination is desired.

One panel member discussed the importance of Differential GPS. Differential GPS is a way of making GPS more accurate and works by canceling out most of the errors established by the Department of Defense. Overall, the panel felt that the impact would be positive because of an accurate measurement.

Concern was discussed over the ability of DGPS being able to give an accurate reading because of its potentiality for the situation being life or death. Panel members project that implementation of DGPS would make the system more attractive to law enforcement users because of its accurate reading.

9. FCC Mandates GPS On Cell Phone 9 11 – Panel members felt that cell phones with a tiny GPS chip embedded into the phone would assist law enforcement in locating citizens who need help.

One panel member discussed the change in FCC law governing the policy regarding all cell phones being embedded with automatic positioning capabilities. The panel discussed the importance of tracking cell phones during emergencies. One example

cited was the incident where a Florida woman died after her car sank in a canal. After the crash she called 9-1-1 and reported the accident, but was unable to give her location. Panel members projected that this feature on cell phones would provide an added sense of security for cell phone users. the crash she called 9-1-1 and reported the accident, but was unable to give her location. Panel members projected that this feature on cell phones would provide an added sense of security for cell phone users because of the locating device installed in the cell phone.

Cross Impact Analysis

Another element of the nominal group technique is the estimate of the relationship between the trends and events, as well as that of each trend to each event. The process is known as cross-impact analysis. As the chart shows, the group is asked to analyze the impact of the occurrence of one trend upon the probability of occurrence of each other event, and then suggest the impact of each trend on each event.

Cross Impact Chart

| | Trend1 Personal Device | Trend 2 Privacy Issues | Trend 3 Combine GPS/ Transmitter | Trend 4 Personal Freedom | Trend 5 Safety for L. E. | Trend 6 Level of Accuracy | Trend 7 Undue Reliance | Trend 8 Maintenance Cost | Trend 9 Improve Fleet Managmt. |
|-------------------------------------|------------------------------|------------------------------|---|--------------------------------|--------------------------------|---------------------------------|------------------------------|--------------------------------|---|
| Event 1 System Sabotage | -3 | 0 | -3 | 0 | -3 | 0 | 0 | 0 | -1 |
| Event 2 Terrorist Use | -3 | 0 | -3 | 0 | -3 | 0 | 0 | 0 | -1 |
| Event 3 Technology Grant -GPS | 0 | -2 | 0 | 1 | 5 | 2 | 0 | 2 | 3 |
| Event 4 Earthquake Disaster | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Event 5 GPS Causes Cancer | -5 | 0 | -5 | 0 | -5 | 0 | 0 | 0 | -5 |
| Event 6 Satellite Failure | -5 | 0 | -5 | 0 | -5 | -5 | 2 | -3 | -2 |
| Event 7 Supreme Court | 0 | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 |
| Event 8 DGPS Implemented | 3 | 0 | 5 | 0 | 5 | 5 | 2 | 0 | 0 |
| Event 9 FCC Mandate | 5 | 0 | 3 | 0 | 2 | 0 | -2 | 0 | 0 |

Introduction

Cross Impact Analysis is a further means of measuring the correlation between variables. It is most commonly used as a forecasting tool to identify how technological developments in one area will affect those in another, the strength of that influence and whether it makes the outcome more or less likely.⁷ The panel members that participated in the NGT provided the data for the cross-impact table. The median estimates of the cross impact, as forecast by the group, are shown on the chart.

Event: System Sabotage / Trend: Personal Tracking Device

This would have a negative effect on the viability of personal GPS tracking because the system could easily be tampered with or altered at any given date or time.

Event: Terrorist Use / Trend: Personal Tracking Device

The group felt that this would cause the manufacturers to develop a system that would protect individuals. Personal GPS may increase in price. Individuals will not purchase any type of system if there was a possibility of the system becoming disabled.

Event: GPS Causes Cancer / Trend: Personal Tracking Device

This would have a significant impact on the use of the system by law enforcement and the civilian population. Cancer is a disease that causes death and panel members did not believe that individuals would risk their health in order to be tracked.

Event: Satellite Failure / Trend: Personal Tracking Device

This would potentially have a significant impact on the viability of the system because accuracy would be compromised and positional reading could be altered. If the satellites are not operational, the system will not work. GPS devices are dependent on the satellite for capturing data.

Event: FCC Mandates GPS on Cell Phones / Trend: Personal Tracking Device

This would have a positive impact on this trend because users would have automatic access to GPS technology. Cell phone companies could offer family plans for their phones that would enable every member of a family to possess a phone. The cost would be minimal for the purchase of a cell phone.

Event: Supreme Court Ruling / Trend: Privacy Issues

This could have a significant impact on the use of GPS technology by law enforcement. The courts will use a balancing test to determine whether personal privacy issues fall within the definition of the 4th Amendment. The courts have not resolved this issue; however, due to recent terrorist activity in the United States, Congress and the court may review this issue.

Event: FCC Mandates GPS on Cell Phones / Trend: Privacy Issue

Panel members felt that this event will not impact issues of privacy. Their reasoning was that the federal government is requiring all cell phone manufacturers to equip the phone with GPS chips. Safety of the consumer is the reason given by the government.

Event: System Sabotage / Trend: Combine GPS with Transmitter

This trend would be significantly impacted if individuals were able to sabotage the system. Because of the improved accuracy, false positioning location could be programmed, and this would jeopardize using GPS technology

Event: Terrorist Use / Trend: Combine GPS / Transmitter

This could potentially have a significant impact on the viability of the system. If terrorists were able to infiltrate the system, all data could be altered or modified. This could have the possibility of disabling the entire system.

Event: FCC Mandates GPS on Cell Phones / Trend: Combine GPS with Transmitter

Panel members felt that this event would have a positive impact on GPS. Currently, accuracy of the system is within six meters. By adding a transmitter to GPS,

the signal can be improved to be as accurate as two meters. This would significantly improve the marketing of cell phones to the general public.

Event: Supreme Court Ruling / Trend: Level of Personal Freedom

This could have a significant impact on the level of an individual's expectation of privacy. The courts will balance whether personal freedom is more important than public safety.

Event Terrorist Use / Trend: Use of GPS by Law Enforcement

This would have a detrimental impact on law enforcement. If criminals were able to track public safety personnel or track police units, there would be the potential for an increase in the crime rate. Public safety personnel could be targeted and the first line of security could be compromised by terrorist activity.

Event: Technology Grant / Trend: Use of GPS by Law Enforcement

This would have a significant impact on the use of GPS usage. Law enforcement agencies would be able to equip each officer with GPS technology. Safety equipment could be purchased and provided to officers. With added funding, smart technology could be utilized by agencies, and implementation of regionalized data centers may be created.

Event: GPS Causes Cancer / Trend: Use of GPS by Law Enforcement

All panelists felt that this event would severely impact the use of any type of a GPS device. Issues of job related injuries would overshadow the use of this technology. Agencies would face lawsuits if implementation of the system became mandatory and if administrators knew of the medical risks involved with GPS.

Event: Satellite Failure / Trend: Use of GPS by Law Enforcement

Panel members felt that any type of failure would significantly impact this trend. Satellite failure would create a financial nightmare for public safety. The cost of launching a satellite into space is expensive and law enforcement does not have the resources to accomplish this task.

Event: Differential GPS Implemented / Trend: Level of Accuracy

Panel members felt that this event would have a positive impact on this issue. Differential GPS provides added accuracy that will automatically improve the system.

Event: Technology Grant / Trend: Maintenance Costs

Panel members discussed how law enforcement would be able to fund for maintenance of the system. The only possibility of achieving this would be to acquire funding through a combination of state and federal grants. Financial concerns would restrict implementation of a GPS system to track maintenance cost of equipment.

Alternative Scenarios

Introduction

A scenario can be defined as a future history. It is written in order to guide the development of policies by providing alternatives from which decision makers may select. There are three basic modes of scenario writing: optimistic, pessimistic, and surprise free future. Elements of the following scenarios have been identified through the NGT process.

SCENARIO 1 – Optimistic Future

California, 2007

While driving to work I listened to the local news station. The top story was regarding the use of global positioning systems (GPS) by law enforcement. The Supreme Court ruled the use of the GPS device was legal and Constitutional. I knew the benefits of GPS and began to wonder how the City was going to use the system. I heard that GPS could be used to track the travel of suspects and track property such as bait vehicles. I also knew that the police union was going to be upset about the ruling because they felt it was “Big Brother” watching their movement. The police department stopped using GPS tracking on the recommendation from the City Attorney’s Office.

All the patrol cars had GPS chips placed in the trunks of the units. The locations of the chip were not known because the police administrators were fearful of the chips being removed by disgruntled employees. No one else in the department knew about the installation, but I found out through the technology specialist for the department.

As I got to the police station to change into my uniform, I saw several officers running toward their police cars. I heard tires screeching and smelled the odor of burning rubber from the police cars. I heard sirens and soon saw the police helicopter overhead traveling in a northerly direction. I immediately ran into the station and saw another officer leaving. I yelled, "What the hell is going on?" The officer replied, "an officer was shot and the suspect stole his police car." My first thought was how this could happen here. I ran to the locker room and changed into my uniform. I went to the watch commander’s office and asked, "Where do you want me?" Sergeant Jones said,

"Stay here because I need you to catch the suspect." I looked at the sergeant in amazement and had a puzzled look on my face.

About a minute later, Sergeant Jones said, "get in the field and go south on the highway." I told him that the shooting was on the north side of the city and he looked at me and said, "Just do what I tell you." I knew by his tone of voice that he did not want to talk about his order. I began driving south on the highway waiting for further instructions. It seemed like I waited for a long period of time before I heard the sergeant's voice. In reality it was less than two minutes when Sergeant Jones said, "the stolen police car just went east on the freeway." I continued driving as the sergeant had directed me. I was driving at about 85 miles per hour when I saw the stolen police car. I continued to follow the stolen police car and waited for additional backup. Soon I had sufficient back up and I stopped the stolen police car. The suspect was taken into custody and I recovered the gun that was used to shoot the officer.

While conducting the investigation, Sergeant Jones arrived and said, "Without a GPS the stolen police car would not have been found, and we would not have caught this suspect." It was great to hear the news about the GPS device. The officer who was shot was in good condition and his injuries were not serious. I turned to Sergeant Jones and said, "Thank God for GPS."

I later knew that the changes that I feared might actually make my job easier.

SCENARIO 2 – Pessimistic Future

California, 2007

Today is my last day of work because retirement is just ten hours away. My career as a police officer has been great and now I reflect on the high points. I plan to

go to City Hall and complete the stacks of paperwork before I can consider myself retired. While at Personnel, the clerk asks me if I had the medical report. The medical report is needed because I want to know how much my monthly pension payment will be.

Six years ago, I was part of an experimental project, where a tiny GPS chip was implanted in my body.⁸ This experiment was part of a federal research project that tracked police officers during their duty day. There were 1,000 peace officers in the state from various agencies that participated in the project. When I had the chip implanted it was done at the county hospital and the process took about one hour. I have a small scar on my ankle from the implantation.

I thought the project was a great idea, however there were several problems that affected the project. First of all, several GPS satellites experienced system failure and the accuracy of the system became unreliable. The system was inoperable for about one year because the federal government owned the satellites and funding was stalled in Congress. Eventually, funding was obtained and three new satellites were launched and operational in a matter of days. Now the GPS system was giving accurate readings and the data was impressive. Overall, 30% of the participants felt that GPS was instrumental in saving their lives during the past six years. I did not have any negative experience with the implantation of the device.

The reason that I am retiring is due to medical reasons. The American Medical Association reported in their latest journal that studies conducted by several organizations have revealed that GPS devices cause cancer. Participants from the federal project received medical exams, and 40% of the participants were diagnosed

with cancer. Unfortunately, I was diagnosed with leg cancer two months ago and am being forced to retire. My career is over and the doctors have told me that I will experience leg problems for the rest of my life. The most important thing to me is that the cancer will not cut my life short, but pain medication will become part of my daily life.

SCENARIO 3 – Surprise Free Future

California, 2007

Today is the first day of a new year and I welcome a fresh start. Last year was a period that I had never seen before. Most municipalities suffered large budgetary cuts caused by earlier terrorist activity. The City of Monica suffered a 9 million dollar deficit and more cuts were anticipated. The police department was called upon to hire additional officers and provide a wide range of services. Something called Homeland Security was introduced last year and no one really knew what it meant. Financial analysts were predicting that the economy was going to improve this year and that the hard times were behind us.

During the first quarter of the year, the federal government announces that one billion dollars was going to be earmarked for a new law enforcement technology grant. The City immediately applied for the funding and we were guaranteed 5.5 million dollars over three years. The City has a population of 100,000 residents and the police department has 550 employees, 240 of which are sworn police officers. GPS technology was the technology that the organization immediately purchased.

The police department had a small GPS chip placed in every officer's badge and in every police vehicle. The new technology allowed officers to activate the tracking

GPS device at the beginning of each shift and also allowed the system to be shut down at the end of the shift. We were the envy of the other police agencies in the area because we were on the cutting edge of technology.

The new technology was quickly tested during one of our patrol shifts. One night several officers were involved in a vehicle pursuit throughout the county. Officer Blue was involved in an accident and his vehicle had plunged into a ditch. The ditch was 40 feet deep and 20 feet wide. No one could locate Officer Blue and with the aid of the GPS device, dispatch located the police car in the area of Main Street and Colorado. Additional information indicated that the police vehicle was not moving. Several officers checked the area on foot, and with the aid of the GPS device, Officer Blue was located alive. He was transported to a local hospital and is listed in good condition. Had it not been for GPS, Officer Blue would not have been located and the outcome may have been fatal.

This chapter looks at the possible impacts of trends and events and how GPS technology can change the manner in which law enforcement conduct their daily functions. The three scenarios explored how specific trends can impact a police agency.

CHAPTER THREE

STRATEGIC PLAN

Introduction

It is important for the future of law enforcement that the implementation of GPS technology begins as we move into the 21st 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.

Organizational Analysis

Weaknesses, Opportunities, Threats, and Strengths are identified as each relates to the issue and to the identified trends and events. This tool of strategic planning seeks to assess the external environment (the community) as well as the limitations and possibilities of the organization.

Weaknesses

The agency and the community must identify and describe weaknesses as they relate to the issue and to the identified trends and events. According to a panelist who participated in the NGT, some weaknesses may include system sabotage, the system being used by terrorists, satellite failures, and most importantly the potential of negative medical implications. Law enforcement agencies must understand that future forecasting can assist them in creating a strategic plan. Middle managers and

command staff should be able meet and discuss future goals on a regular basis. Open communication is paramount if change is to occur.

Opportunities

Implementation of GPS technology can be used as an officer safety tool with the possibility of improving the services provided to the community. The increase of grant funding is an obvious benefit that could be used to purchase equipment and provide training for personnel. Another benefit may be the perception of a more efficient law enforcement agency to the community.

Threats

Existing satellites need replacement and, if there is a failure, the entire system is jeopardized and the result may mean total system shut down. Illegal use and sabotage to the system are real threats, and unfortunately law enforcement does not have the resources to combat this type of activity. Another threat is the possibility of a negative court ruling that will impact the use of GPS technology.

Strengths

Every police agency traditionally has the support of the community. With new technological advances, every member of the community needs to be educated on how GPS will improve the service provided. Without the support of the community, law enforcement cannot succeed and move forward. Law enforcement agencies must feel comfortable in applying emerging technology. Miniaturization of GPS will add a variety of uses of the system.

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 |
| City manager | Other support groups |

The model agency’s stakeholders would be:

| | |
|--------------------------------|------------------------|
| Police officers | Civilian employees |
| City Manager | Citizen’s Group |
| Labor unions | City Attorney |
| American Civil Liberties Union | Other department heads |

The list of candidate stakeholders should be discussed and those most important to the issue should be identified and discussed in greater detail. Representatives from the police department and the city manager's office should be responsible for the selection of the necessary stakeholders. 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 of 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.

CHAPTER FOUR

TRANSITION MANAGEMENT

Introduction

This chapter will provide insight on how to develop a plan that will assist in the transition from the current situation to the desired future. At the conclusion of Chapter Three, several sites where law enforcement agencies can request funding were provided.

Transition management techniques are designed to ensure that a smooth transition from the current to the desired future occurs.

The techniques include:

- 1) A determination of the most important stakeholder, also known as critical mass,
- 2) An analysis of each member of the critical mass to determine the commitment level that one has to the issue, and
- 3) By using responsibility charting, each member of the critical mass is assigned a responsibility relative to a specific task or activity.

Commitment Plan

The most important stakeholder must be identified so that a determination can be made as to how each can affect the implementation of GPS. Those stakeholders who have the most influence are identified as the critical mass. Our most important stakeholder is public safety. Police officers, deputy sheriffs, and firefighters are the three groups in the public safety category. The reason that they are the most important

stakeholders is because this group will be using the system on a day-to-day basis. Any problems and improvements will be based on the feedback from the stakeholders. Although other stakeholders are important in the development of the system, the core group is vital to the success of GPS being implemented in the public safety arena.

Another step in critical mass identification is to identify the one stakeholder who has the influence to hinder the implementation of the strategic plan but is not easily recognized. Commonly referred to as a snaildarter, this stakeholder will have sufficient authority and influence to greatly slow down implementation or even to stop it completely.

The snaildarter identified by panelists was the United States Supreme Court. The Supreme Court has the ability to mold the future of GPS technology. A recent criminal case has drawn national media attention to GPS privacy issues. This case has no direct impact on the commercial location technology market, but the media attention suggests that privacy issues may be an area of considerable concern to the public.

In a recent case, the United States Court of Appeals for the Ninth District addressed the constitutionality of the government's installing, without a warrant, a GPS tracking device on the undercarriage of a suspect's vehicle while it was parked outside the suspect's home. The Ninth Circuit Court held that there was no constitutional search issue because the suspect did not have a reasonable expectation of privacy under these circumstances. The Ninth Circuit Court also found that there was no seizure because there was no evidence that the device deprived the suspect of "dominion and control" of the vehicle, or caused damage to the electrical system.⁹

In another case, police in Spokane, Washington, obtained a warrant to search the vehicle of a man suspected of murdering a woman and child. Pursuant to the warrant, the police allegedly installed a GPS tracking device within the suspect's vehicle. Using location data from the GPS device, the police were led to two gravesites.¹⁰ The suspect's counsel claims that the GPS tracking device raised constitutional questions.

Under the Fourth Amendment, a search occurs when there is an infringement of a reasonable expectation of privacy and a seizure occurs when there is an unreasonable interference with an individual's possessory interest in his or her property. Unlike the *Mclver* case, the Spokane case involved a search warrant, which will change the focus of any constitutional challenge. This case should be closely watched by law enforcement and by companies developing GPS devices for law enforcement. The reason is because privacy issues may be particularly significant for companies doing business in California, where the state constitution recognizes a separate constitutional privacy right.¹¹

Transition Technique

In order for a GPS program to be properly evaluated, an implementation team must be organized and several key positions must be identified. A vital part of transition management is identifying who is going to do what. The key members in this process are assigned certain responsibilities in relation to the task that needs to be accomplished. This may seem to be an obvious element, but if one task is overlooked, the transition process can be chaotic, and the result may not be exactly what was envisioned.

The team should consist of at least 8-10 department members as well as a Police Technology Specialist. Team members should be carefully selected and their area of expertise within the organization is critical in gathering proper documentation. Each member will play an important role in the implementation process. Each member must have credibility within the organization so that others will actively participate in the program. The group should determine: 1) who are the key actors; and 2) what is their involvement. The program needs to have the support of the department head as well as the city manager so that funding will not become an obstacle through the process. Guidelines need to be established by the department implementing the GPS system as well as how each group will be involved in the project. This needs to be clearly stated before the system is implemented so that everyone knows what role they will play in the process.

The implementation team should consist of the following members: the Chief of Police, a representative from the City Attorney's Office, a police union representative, a police technology specialist, representative from each office of the police department, and a member from the community.

The direction of the team will be clearly outlined if any snaildarters are identified early in the process. Recent court decisions have ruled favorably on the issues regarding the use of GPS by law enforcement. Technology can aid law enforcement move toward the future, however management must be comprised of risk takers who are not afraid of making mistakes. Implementation of a GPS system will be new for law enforcement and at times the objective may be reached by trial and error.

CHAPTER FIVE

CONCLUSION

Project Summary

The future for GPS in the commercial marketplace looks bright, especially as the government finally relaxes some of the restrictions. The United States government launched the first satellite, NAVSTAR, in 1973. The system was created to provide the highest level of navigational accuracy for U.S. military aircrafts and ships. Because GPS is owned, controlled, and maintained by the United States government, use of the navigational data is free and all that is needed is a GPS receiver.

Chapter Two discussed several trends and events and how they would impact the use of GPS by law enforcement agencies. From this analysis, three scenarios describing possible futures were written. The scenario that was written that had the greatest impact was the “pessimistic” one. This scenario suggests that implantation of a miniature GPS into the human body of public safety personnel can occur by the year 2007. The concern with this scenario is that the medical results have not been tested or evaluated.

Chapter Three discussed the strategic planning process and suggests example application for the various techniques for any law enforcement agency desiring to explore the use of GPS technology. This chapter suggests the use of a WOTS-UP analysis to determine the weaknesses, opportunities, threats, and strengths of both the organization and the community. It describes how stakeholder analysis is used to identify all the stakeholders, internal as well as external, to the organization. Also, the

need for developing a departmental mission statement should be established as a guideline for policy alternative. A mission statement should read as follows:

The Santa Monica Police Department will provide the community with the highest quality of law enforcement services. We continually improve on the public's perception of community safety through the eradication of criminal activity and any conditions that have a detrimental impact on public safety.

We strive to enhance our tradition of excellent service to all. We continue to seek the support and cooperation of the community we serve and those of us who serve the community. Our organizational culture is responsive to new ideas and is one in which all employees are given the opportunity to develop to their highest potential and see themselves as agents of change. We base all our relationship on the premise that the public and police are one.

Chapter Four discussed various transition management techniques designed to take an organization from the present to the desired future. This chapter discussed how and why a critical mass must be identified, how and why each stakeholder's commitment to the plan must be analyzed, and how and why assigning certain responsibilities to each of the key stakeholders is important to the transition.

Evaluation Activities

Once the program has been implemented, an overall assessment of the use of GPS will be necessary. An evaluation process must be put into place so that accurate information can be captured. The first evaluation of the effectiveness of the GPS device should occur three months after the implementation of the program. The evaluation should include any uses of GPS by public safety. The moderator of the evaluation group should be a neutral party who has a basic understanding of GPS. The purpose of the evaluation is to obtain an honest snapshot of how the programming is progressing. Any feedback by the evaluation group can be used to correct any unforeseen problems.

The following evaluative questions would provide the organization the best possible information for evaluating the project:

- Has GPS been an effective tool to monitor officers during critical incidents?
- Has the efficiency of officers' response to calls for service improved?
- Has GPS been used as an investigative tool?
- Has morale improved as a result of GPS technology?
- Has GPS been an effective tool for supervisors?
- Has GPS saved the city any money?

Evaluation of the program is important, and if it is going to be successful, evaluators must provide honest information. Due to technology becoming more advanced on a daily basis the program must be monitored closely.

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.¹² 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.¹³

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 21st 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. Public safety benefits from GPS through better resources management and vehicle dispatch of emergency services.

This paper shows what impact GPS can have on a mid size law enforcement agency. The goal was to explore various uses of this technology and how it will effect law enforcement. GPS technology can be used to improve efficiency in responding to

emergency calls, search and rescue operations, locating contraband, tracking/recovery of stolen vehicles, enhanced 9-1-1 services, security of high governmental officials and dignitaries, and monitoring and tracking parolees. The law enforcement uses are endless and its application of the technology needs to be financially supported.

APPENDIX A

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APPENDIX B

Trends

1. Personal tracking device
2. Property tracking
3. Regionalization cost
4. Centralization of system
5. Cost Reduction
6. Increase accuracy
7. Size reduction / miniaturization
8. Improve customer service
9. Consolidation of data
10. Safety for law enforcement
11. Privacy issues
12. Increase public perception of safety
13. Improve fleet management
14. Timing and other application
15. Increase mobile information sharing
16. Radiating power
17. Improve battery life
18. Undue reliance
19. Access to military technology
20. Personal freedom
21. Combine GPS with a transmitter
22. Locator of property
23. Maintenance costs
24. Cost reduction
25. Increase accuracy
26. Personal body monitoring system

APPENDIX C

Events

1. Government scrambles signals
2. Major system failure
3. Court ruling prohibits GPS
4. Federalized law enforcement
5. Legislation mandates GPS on sex registrants
6. FCC mandates cell phones to have GPS chip
7. National DGPS network implemented
8. Technology grant
9. Satellite failure
10. Police department requires officers to wear GPS device
11. System sabotage
12. Racial riot
13. Insurance Company begins tracking customers
14. GPS causes cancer
15. Economic collapse
16. Government requires child registration
17. Sexual assault
18. Massive traffic collision
19. Terrorist use GPS
20. Earthquake/Natural disaster
21. Mayor's child kidnapped
22. Government provides technology
23. Law enforcement terminates pursuit

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